Federal Register

Thursday,
April 8, 2004

Part V

Department of the Interior

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petition To List the West Coast Distinct Population Segment of the Fisher (*Martes pennanti*); Proposed Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petition to List the West Coast Distinct Population Segment of the Fisher (*Martes pennanti*)

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding for a petition to list the West Coast distinct population segment of the fisher (*Martes pennanti*) under the Endangered Species Act of 1973, as amended. After review of all available scientific and commercial information, we find that the petitioned action is warranted, but precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Upon publication of this 12-month petition finding, this species will be added to our candidate species list. We will develop a proposed rule to list this population pursuant to our Listing Priority System.

DATES: The finding announced in this document was made on April 2, 2004. Comments and information may be submitted until further notice.

ADDRESSES: You may send data, information, comments, or questions concerning this finding to the Field Supervisor (Attn: FISHER), Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, Room W–2605, Sacramento, CA 95825 or via fax at 916/414–6710. You may inspect the petition, administrative finding, supporting information, and comments received during normal business hours by appointment at the above address.

FOR FURTHER INFORMATION CONTACT: Jesse Wild or Arnold Roessler at the above address (telephone: 916/414–6600; fax: 916/414–6710; electronic mail: *fisher@fws.gov*). In the event that our Internet connection is not functional, please submit your comments by the alternate methods mentioned above.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the List of Threatened and Endangered Species that contains substantial scientific and commercial information that listing may be warranted, we make a finding within 12 months of the date of the receipt of the petition on whether the petitioned action is: (a) Not warranted, or (b) warranted, or (c) warranted but that the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether any species is threatened or endangered, and expeditious progress is being made to add or remove qualified species from the List of Threatened and Endangered Species. Section 4(b)(3)(C) of the Act requires that a petition for which the requested action is found to be warranted but precluded shall be treated as though resubmitted on the date of such finding, *i.e.*, requiring a subsequent finding to be made within 12 months. Such 12-month findings are to be published promptly in the **Federal Register**.

On December 5, 2000, we received a petition dated November 28, 2000, to list a distinct population segment (DPS) of the fisher, including portions of California, Oregon, and Washington, as endangered pursuant to the Act, and to concurrently designate critical habitat for this distinct population segment. A court order was issued on April 4, 2003, by the U.S. District Court, Northern District of California, that required us to submit for publication in the **Federal Register** a 90-day finding on the November 2000 petition (*Center for Biological Diversity, et al.* v. *Norton, et al.*, No. C 01–2950 SC). On July 10, 2003, we published a 90-day petition finding (68 FR 41169) that the petition provided substantial information that listing may be warranted and initiated a 12-month status review. Through a stipulated order, the court set a deadline of April 3, 2004, for the Service to make a 12-month finding under 16 U.S.C. 1533 (b)(3)(B).

Taxonomy

The fisher is classified in the order Carnivora, family Mustelidae, subfamily Mustelinae, and is the largest member of the genus *Martes* (Anderson 1994). The only other North American member of the genus *Martes* is the American marten (*M. americana*). The fisher (*Martes pennanti* Erxleben 1777) is the only extant species in its subgenus *Pekania*.

Goldman (1935) recognized three subspecies of fisher, although he stated they were difficult to distinguish. Both Grinnell *et al.* (1937) and Hagmeier (1959) examined specimens from across the range of the fisher and concluded that differences in skull morphology or pelage were not sufficient to support recognition of separate subspecies. Hall (1981) retained all three subspecies in his compilation of North American mammals, as did Anderson (1994), but neither addressed Hagmeier's conclusion that the subspecies should not be recognized (Powell 1993). Several authors address genetic variation in fisher populations in their northern and eastern ranges (Williams *et al.* 1999, 2000; Kyle *et al.* 2001) and in the west (Drew *et al.* 2003; Aubry and Lewis 2003; Wisely *et al.* in litt. 2003). These analyses found patterns of population subdivision similar to the earlier described subspecies (Drew *et al.* 2003). Drew *et al.* (2003) stated that, although it is not clear whether Goldman's (1935) subspecific designations are taxonomically valid, ''* * * it is clear (based on genetic results) that population subdivision is occurring within the species, especially among populations in the western USA and Canada.''

Description

The fisher is light brown to dark blackish brown with the face, neck, and shoulders sometimes being slightly gray. The chest and underside often has irregular white patches. The fisher has a long body with short legs and a long bushy tail. At 6.6 to 13.2 pounds (lbs) (3 to 6 kilograms (kg)), male fishers weigh about twice as much as females (3.3 to 5.5 lbs; 1.5 to 2.5 kg). Males range in length from 35 to 47 inches (in) (90 to 120 centimeters (cm)) while females range from 29 to 37 in (75 to 95 cm) in length. The fishers from the Pacific States may weigh less than fishers in the eastern United States (Seglund 1995; Dark 1997; Golightly 1997; Aubry and Lewis 2003). Fishers are estimated to live up to 10 years (Powell 1993).

Distribution and Status

Fishers occur in the northern coniferous and mixed forests of Canada and the northern United States, from the mountainous areas in the southern Yukon and Labrador Provinces in Canada southward to central California and Wyoming, the Great Lakes and Appalachian regions, and New England (Graham and Graham 1994; Powell 1994). The fisher's range was reduced dramatically in the 1800s and early 1900s through overtrapping, predator and pest control, and alterations of forested habitats by logging, fire, and farming (Douglas and Strickland 1987; Powell 1993; Powell and Zielinski 1994; Lewis and Stinson 1998). Since the 1950s, fishers have recovered in some of the central and eastern portions of their historic range in the United States as a

result of trapping closures, changes in forested habitats (*e.g.*, forest regrowth in abandoned farmland), and reintroductions (Brander and Books 1973; Powell and Zielinski 1994). However, fishers are still absent from their former range southeast of the Great Lakes (Gibilisco 1994). Grinnell *et al.* (1937) estimated extremely low population numbers for the fisher in California at a time when trapping for the fur trade had greatly reduced populations of furbearing animals. Although it is possible that fisher populations recovered somewhat immediately following the trapping prohibitions in the 1930s and 40s, Powell and Zielinski (1994) more recently note population declines for fisher populations in the west. Fishers are believed to be extirpated from the lower mainland of British Columbia; however, they may still occupy the higher elevations of these areas in low densities (BC Species and Ecosystems Explorer 2003). In the Pacific States, fishers were historically more likely to be found in low to mid-elevation forests up to 8,200 feet (ft) (2,500 meters (m)) (Grinnell *et al.* 1937; Schempf and White 1977; Aubry and Houston 1992). In recent decades, the scarcity of detections in Washington, Oregon, and the northern Sierra Nevada indicates that the fisher may be extirpated or reduced to very low numbers in much of this area (Aubry and Houston 1992; Zielinski *et al.* 1995; Aubry and Lewis 2003).

Washington

The fisher historically occurred both east and west of the Cascade Crest in Washington (Scheffer 1938; Aubry and Houston 1992). Lewis and Stinson (1998) conclude that, ''Based on habitat, the historical range of fishers in Washington probably included all the wet and mesic forest habitats at low to mid-elevations. The distribution of trapping reports and fisher specimens collected in Washington confirms that fishers occurred throughout the Cascades, Olympic Peninsula, and probably southwestern and northeastern Washington.'' Aubry and Houston (1992) compared current and historical records of fishers in Washington to determine their distribution in relation to major vegetation and elevation zones. In total, they found 88 reliable records, dating from 1955 to 1991. West of the Cascades, fishers occurred from 328 to 5,900 ft (100 to 1800 m), with most records from below 3,280 ft (1,000 m). On the east slope of the Cascades where precipitation is lower, fishers were recorded from 1,970 to 7,200 ft (600 to 2,200 m) (Aubry and Houston 1992). Similar to elsewhere in the range, the upper elevational limit may be determined by snow depth (Krohn *et al.* 1997). Based on a lack of recent sightings or trapping reports, the fisher is considered to be extirpated or reduced to scattered individuals in Washington (Aubry and Houston 1992; Lewis and Stinson 1998).

Oregon

Aubry and Houston (1992) noted that most fisher records for Washington occurred in the western hemlock and sitka spruce forest zones. Given that these forest zones occupy large portions of northwestern Oregon (Franklin and Dyrness 1988), it is likely that the fisher historically occurred in this part of the State. Based on extensive camera and track plate surveys, Lewis and Stinson (1998) concluded that the fisher is greatly reduced in Oregon. Based on extensive inquiry and review of records, Aubry and Lewis (2003) found that extant fisher populations in Oregon are restricted to two disjunct and genetically isolated populations in the southwestern portion of the State: one in the northern Siskiyou Mountains of southwestern Oregon and one in the southern Cascade Range. The fishers in the Siskiyou Mountains near the California border are probably an extension of the northern California population (Aubry and Lewis 2003). The population in the southern Cascade Range is reintroduced and is descended from fishers that were translocated to Oregon from British Columbia and Minnesota (Aubry and Lewis 2003). The Oregon Cascade Range population is separated from known populations in British Columbia by more than 404 miles (mi) (650 kilometers (km)) (Aubry and Lewis 2003).

California

In eastern California, the fisher historically ranged throughout the Sierra Nevada, from Greenhorn Mountain in northern Kern County northward to the southern Cascades at Mount Shasta (Grinnell *et al.* 1937). In western California, it ranged from the Klamath Mountains and north Coast Range near the Oregon border southward to Lake and Marin Counties (Grinnell *et al.* 1937). Krohn *et al.* (1997) note that the map of fisher distributions by Grinnell *et al.* (1937) suggests that fishers may have been less common in the central Sierra Nevada than elsewhere in California during the early 1900s, but it is unknown whether this distribution was the historical condition or reflects human effects on forests and fishers prior to their assessment. The map was based on the trapping records of one 5-year period prior to which there was already concern that trapping had dangerously decreased the population of fisher in California (Grinnell *et al.* 1937).

Substantial efforts have been made in recent years to assess the status of fishers and other forest carnivores in California using systematic grids of baited track and camera stations (Zielinski *et al.* 1995, 1997a, 1997b, 2000; Zielinski and Stauffer 1996; Zielinski 1997). Recent surveys indicate that fishers appear to occupy less than half of the range they did in the early 1900s in California, and this population has divided into two remnant populations that are separated by approximately 260 mi (420 km) (Zielinski *et al.* 1995), almost four times the species' maximum dispersal distance as reported by York (1996) for fishers in Massachusetts. One population is located in northwestern California and the other is in the southern Sierra Nevada Mountains. Since 1990, there have generally been no detections outside these areas except for one in 1995 in Mendocino County and one in 1995 in Plumas County (CDFG 2002, updated November 13, 2003).

Failure to detect fishers in the central and northern Sierra Nevada, despite reports of their presence there by Grinnell *et al.* (1937) and reports from the 1960s collected by Schempf and White (1977), suggests that the fisher population in this region has declined, effectively isolating fishers in the southern Sierra Nevada from fishers in northern California (Truex *et al.* 1998; Lamberson *et al.* 2000). However, prior to the recent development of a rigorous fisher survey protocol, differences in the type and quality of data available over the previous 60-year period make interpretation of distributional changes difficult (Zielinski *et al.* 1995).

Population Size

Although reductions in the fisher's distribution in the Pacific States are well documented (Aubry and Lewis 2003; Gibilisco 1994; Powell and Zielinski 1994), accurate information on fisher densities and abundance outside the northeastern United States is very limited. There have been no good population estimates for fisher populations in California, Oregon, and Washington, so it is unknown precisely how many fishers exist. Estimates of fisher abundance and vital rates (*e.g.*, survival, reproduction) are very difficult to obtain (Douglas and Strickland 1987) and may vary widely based on habitat composition and prey availability (York 1996). In addition, the assumptions of

many methods for estimating populations (*e.g.*, equal trapability, no learned trap response, sufficient trapability to yield adequate sample sizes) may not be valid for fishers (Powell and Zielinski 1994). Consequently, only a few estimates of local fisher population density are available for the Pacific States and British Columbia, and are summarized here.

In British Columbia, densities of fishers are estimated to be between 1 and 1.54 fishers per 38.6 mi ^{2} (100 km ^{2}) in the highest quality habitats in the province (Weir 2003). Using the area of each habitat capability rank within the extent of occurrence of fishers in British Columbia, the late-winter population for the province is estimated to be between 1,113 and 2,759 fishers (Weir 2003). In a preliminary progress report of fisher studies on the Hoopa Valley Indian Reservation in the Klamath mountain range (Humboldt County, California), Higley *et al.* (1998) report high capture numbers and small home ranges, some of which overlap each other, indicating that densities in this 25 mi ^{2} (65 km ^{2}) study area may be very high relative to those in the rest of the occupied West Coast range. In their analysis of two fisher studies in California, Zielinski *et al.* (in press 2003a) provided a rough estimate of approximately 5 female fishers per 38.6 mi ^{2} (100 km ^{2}) for their 154 mi ^{2} (400 km) north coast study area (in the Six Rivers and Shasta-Trinity National Forests of southeastern Humboldt and southwestern Trinity Counties), whereas they estimated approximately 8 females per 100 km ^{2} in their 108 mi ^{2} (280 km ^{2}) southern Sierra Nevada study area (in the Sequoia National Forest in Tulare County). For the purpose of modeling population viability, Lamberson *et al.* (2000) estimated that there were between 100 and 500 individuals in the southern Sierra Nevada fisher population. Based on trapping records from the 1920s, Grinnell and colleagues (1937) provided a dire estimate of 1 fisher per 100 mi ^{2}, or 300 in California. However, although Grinnell *et al.* employed accepted methodologies at the time they conducted their research, we believe that their population estimate for California is incorrect by modern standards due to the lack of a significant sample size, survey bias, and inadequate knowledge of the historical baseline.

Despite the lack of precise empirical data on fisher numbers in the western states, the relative reduction in the range of the fisher on the West Coast, the lack of detections or sightings over much of its historical distribution, and the high degree of genetic relatedness within some populations (esp., native fishers in California) (Drew *et al.* 2003), indicate that it is likely extant fisher populations are small.

Diet

The fisher is an opportunistic predator with a diverse diet that includes birds, squirrels, mice, shrews, voles, reptiles, insects, carrion, vegetation, and fruit (Powell 1993; Martin 1994; Zielinski *et al.* 1999; Zielinski and Duncan, in press 2003). Fishers hunt exclusively in forested habitats and generally avoid openings (Earle 1978; Rosenberg and Raphael 1986; Powell 1993; Buskirk and Powell 1994; Jones and Garton 1994; Seglund 1995; Dark 1997). Being dietary generalists, fishers tend to forage in areas where prey is both abundant and vulnerable to capture (Powell 1993).

Reproduction

Except during the breeding season, fishers are solitary animals. The breeding season for the fisher is generally from late February to the end of April (Leonard 1986; Douglas and Strickland 1987; Powell 1993; Frost and Krohn 1997). Birth occurs nearly 1 year after copulation, due to delayed implantation in which the embryos remain in a state of arrested development for approximately 10 months. Arthur and Krohn (1991) and Powell (1993) speculate that this system allows adults to breed in a time when it is energetically efficient, while still giving kits adequate time to develop before winter. Raised entirely by the female, kits are completely dependent at birth and weaned by 10 weeks (Powell 1993). The mother becomes increasingly active as kits grow in order to provide enough food (Arthur and Krohn 1991; Powell 1993), and females may move their kits periodically to new dens (Arthur and Krohn 1991). At 1 year, kits will have developed their own home ranges (Powell 1993). Fishers have a low annual reproductive capacity, and reproductive rates may fluctuate widely from year to year (Truex *et al.* 1998).

Home Range Size

A home range is an area repeatedly traveled by an individual in its normal activities of feeding, drinking, resting, and traveling. Fishers have large home ranges and male home ranges are considerably larger than those of females (Buck *et al.* 1983; Truex *et al.* 1998). Fisher home range sizes across North America vary from 3,954 to 30,147 acres (ac) (16 to 122 km ^{2} for males and from 988 to 13,096 ac (4 to 53 km ^{2} for females (Powell and Zielinski 1994; Lewis and Stinson 1998). However, Beyer and Golightly (1996) reported that male home ranges in northern California may be as large as 31,629 ac (128 km^2).

Truex *et al.* (1998) compared fisher home range sizes in three study areas: the Klamath Mountains (Shasta-Trinity National Forest, the North Coast Ranges), Six Rivers National Forest, and the southern Sierra Nevada (Sequoia National Forest). They found the largest home range sizes in the eastern Klamath study area in northern California where habitat quality was generally considered poor. A preliminary summary of an unpublished study conducted in coastal redwood forests in the Coast Ranges of northwestern California indicates female home range sizes of 790 to 2050 ac (3.2 km ^{2} to 8.3 km ^{2}) (Joel Thompson unpublished data; Neal Ewald, pers. comm. 2003), which is somewhat larger than range sizes reported by other researchers for the species in North America. Zielinski *et al.* (in press 2003a) found that females had home ranges that were almost three times larger in their northern California study area in the Coast Ranges than in their southern Sierra Nevada study area. They too suggest that this difference in home range size is a result of better quality habitats in the southern Sierra Nevada, which are occupied by a higher density of animals within a smaller area of suitable habitat (Zielinski *et al.*, in press 2003a). Based on northeastern fisher home range sizes, Allen (1983) assumed that a minimum of 62 mi ^{2} (161 km ^{2} of potentially suitable and connected habitat must be present before an area can sustain a population of fishers. However, Allen's estimates of amount of habitat required to support a fisher population may be an underestimate when applied to western forests, where male home ranges have been found to be somewhat larger (Beyer and Golightly 1996).

Dispersal

Dispersal (movement away from the natal home range) is the primary mechanism for the spread of a population. Arthur *et al.* (1993) reported an average maximum dispersal distance of 9.3 and 10.7 mi (14.9 and 17.3 km) for females and males, respectively (range = 4.7 to 14.0 mi (7.5 to 22.6 km) for females and 6.8 to 14.3 mi (10.9 to 23.0 km) for males) in a population in Maine with high trapping mortality and low density. In areas with high mortality and low density, young fishers may not have to disperse as far in order to find unoccupied home ranges (Arthur *et al.* 1993). York (1996) reported dispersal distances for juvenile male and female fishers averaging 20 mi (33

km) (range = 6 to 66 mi; 10 to 107 km) for a high-density population in Massachusetts. Based on field observation and microsatellite genotype analyses of the southern Cascades fisher population, Aubry *et al.* (USDA Forest Service, Pacific Northwest Research Station, in press 2003) found empirical evidence of male-biased juvenile dispersal and female philopatry (the drive or tendency of an individual to return to, or stay in, its home area) in fishers, which may have a direct bearing on the rate at which the fisher may be able to colonize formerly occupied areas within its historical range.

Habitat

Assessment of habitat relationships of fisher in current western U.S. forests is complicated by broad-scale changes in forest structure and composition over the past century. Grazing, wildfire suppression, and timber harvest have resulted in dramatic changes in forest ecosystems, including reduction of large tree component, increased dominance of shade-tolerant conifer species, increased stand density, and reduced structural diversity (McKelvey and Johnson 1992; Agee 1993; Skinner 1995; Chang 1996; Norman 2003). These effects vary among forest ecosystems, but generally are more pronounced in drier interior forests of the eastern Cascades, Sierra Nevada, and eastern Klamath Mountain ranges. The degree to which currently-described habitat relationships, particularly at broader scales, existed under historical conditions is unknown.

According to Buskirk and Powell (1994), the physical structure of the forest and prey associated with forest structures are thought to be the critical features that explain fisher habitat use, rather than specific forest types. Powell (1993) stated that forest type is probably not as important to fishers as the vegetative and structural aspects that lead to abundant prey populations and reduced fisher vulnerability to predation, and that they may select forests that have low and closed canopies. In the Klamath and north coast regions of California, Carroll *et al.* (1999) also found a strong association with high levels of tree canopy cover, tree size class, and percent conifer. Within a given region, the distribution of fishers is likely limited by elevation and snow depth (Krohn *et al.* 1997), and fisher are unlikely to occupy forest habitats in areas where elevation and snow depth act to limit their movements. However, in mid-elevation areas with intermediate snow depth, fishers may use dense forest patches with large trees because the overstory closure increases snow interception (Weir 1995a).

In a track-plate study conducted on private timberlands in the redwood-Douglas-fir transition zone of the Coast Ranges of northwestern California, Klug (1997) detected fishers on 238 occasions at 26 of 40 (65 percent) survey segments located in second-growth Douglas-fir and redwood. Fishers were detected more frequently than expected (based on availability) in areas at higher elevations, in stands where Douglas-fir was the dominant or co-dominant vegetation type, and with greater amounts of hardwoods. Klug (1997) found no relation between fisher occurrence and stand age or old-growth habitats; however there was less than 2 percent old-growth on his study area. The mean canopy cover for all stations Klug sampled was 94.7 percent, and mean stand age was 42.6 years, an age which, in productive lowland redwood and Douglas-fir habitats, often correlates with large-tree conditions. During subsequent studies in this area (Ewald, pers. comm. 2003), 24 individual fisher were captured (10 males, 14 females). Nine of 11 adult females showed signs of reproduction, and 9 natal and maternal dens were located. In their adjacent study area in Redwood National and State Parks with coastal forests dominated by redwood, Slauson *et al.* (2003) found that redwood was the dominant overstory and understory species where fishers were detected; Douglas-fir was dominant at sites where they were not. This study area had 38 percent old-growth habitat; however, fisher were detected more often in second-growth redwood stands. In contrast to forests further north and further inland, the milder temperature and higher humidity in these coastal areas may create suitable habitat conditions, at least for foraging, in younger forests.

Fragmentation

A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and conversely prefers large areas of contiguous interior forest (Coulter 1966; Kelly 1977; Buck 1982; Mullis 1985; Rosenberg and Raphael 1986; Arthur *et al.* 1989a; Powell 1993; Jones and Garton 1994; Seglund 1995; Dark 1997).

Rosenberg and Raphael (1986) assessed forest fragmentation in northwestern California and its effect on fishers. Their study shows a significant positive association with a plot's distance to a clearcut, and significant negative associations with a stand's length of edge, degree of insulation (defined as "the percentage of its perimeter that was clearcut edge''), percent clearcut, and total edge. Rosenberg and Raphael (1986) state, "Among the species suspected of being most sensitive to forest fragmentation in our study, only the fisher and spotted owl were also associated with old-growth forests.'' They show a significant positive association between fisher presence and forest stand area, detecting fishers more frequently in stands over 247 ac (100 ha) (70 percent frequency of occurrence) and stands of 126 to 247 ac (51 to 100 ha) (90 percent frequency of occurrence) than in smaller stands; fishers were detected in 55 percent of stands that were 52 to 124 ac (21 to 50 ha), in 30 percent of stands that were 27 to 49 ac (11 to 20 ha), and in 17 percent of stands under 25 ac (10 ha).

The fisher's need for overhead cover is very well-documented. Many researchers report that fishers select stands with continuous canopy cover to provide security cover from predators (de Vos 1952; Coulter 1966; Kelly 1977; Arthur *et al.* 1989; Weir and Harestad 1997, 2003). Fishers may use forest patches with large trees because the overstory closure increases snow interception (Weir 1995a). Forested areas with higher density overhead cover provide the fisher increased protection from predation and lower the energetic costs of traveling between foraging sites. Fishers probably avoid open areas because in winter open areas have deeper, less supportive snow which inhibits travel (Leonard 1980; Raine 1983; Krohn *et al.* 1997), and because they are more vulnerable to potential predators without forest cover (Powell 1993). Furthermore, preferred prey species may be more abundant or vulnerable in areas with higher canopy closure (Buskirk and Powell 1994).

Several studies have shown that fishers are associated with riparian areas (Buck 1982; Jones 1991; Aubry and Houston 1992; Seglund 1995; Dark 1997; Zielinski *et al.* 1997c; Zielinski *et al.* in press 2003b, in press 2003a). Riparian forests are in some cases protected from logging and are generally more productive, thus having the dense canopy closure, large trees and general structural complexity associated with fisher habitat (Dark 1997). According to Seglund (1995), riparian areas are important to fishers because they provide important rest site elements, such as broken tops, snags, and coarse woody debris.

Composition of Home Ranges

Mazzoni (2002) measured habitat composition within the home ranges of 11 fisher in the southern Sierra Nevada. Home range areas averaged 24.8 percent

coverage by "late-successional'' (greater than 50 percent canopy cover, greater than 24 in (61 cm) diameter) conifer forest habitat (range 15.0 to 32.1 percent). The mean percent of home range area with dense (greater than 50 percent canopy cover) conifers of all sizes was 53.6 percent (range 34.9 to 76 percent). Also in the southern Sierra Nevada, Zielinski *et al.* (in press 2003a) found that home ranges of 12 fishers consisted of 12.8 percent (SD=10.9) large tree (greater than 24 in (61 cm)) conditions. Intermediate tree size classes (12–24 in dbh), dense (greater than 60 percent) canopy closure, and Sierran Mixed Conifer forest type composed the greatest proportion of the home ranges studies (60.7, 66.3, and 40.1 percent, respectively).

In the North Coast Range of northern California, Zielinski *et al.* (in press 2003a) found that home ranges of nine fishers were dominated by mid-seral Douglas-fir and white fir (42.8 percent); home ranges included 14 percent (SD=13.36) late-successional Douglas-fir on average and 13.97 percent true fir (SD=10.23), on average.

Resting and Denning Habitat

Powell and Zielinski (1994) and Zielinski *et al.* (2003b) suggest that habitat suitable for resting and denning sites may be more limiting for fishers than foraging habitat. Numerous studies have documented that fishers in the western United States utilize stands with certain forest characteristics for resting and denning such as large trees and snags, coarse woody-debris, dense canopy closure and multiple-canopy layers, large diameter hardwoods, and steep slopes near water (Powell and Zielinski 1994; Seglund 1995; Dark 1997; Truex *et al.* 1998; Self and Kerns 2001; Aubry *et al.* 2002; Carroll *et al.* 1999; Mazzoni 2002; Zielinski *et al.* in press 2003b).

Rest sites have structures that provide protection from unfavorable weather and predators. Fishers also use rest sites as protected locations to consume prey following a successful foraging bout (Zielinski, pers. comm.). Re-use of rest sites is relatively low (14 percent: Zielinski *et al.* in press 2003b), indicating that habitats providing suitable resting structures need to be widely distributed throughout home ranges of fishers (Powell and Zielinski 1994; Truex *et al.* 1998), and spatially interconnected with foraging habitats.

Rest Site—Stand Characteristics

The most influential variables affecting rest site selection in California fisher populations include maximum tree sizes and dense canopy closure, but other features are important to rest site choice as well, such as large diameter hardwoods, large conifer snags, and steep slopes near water (Zielinski *et al.* in press 2003b). Fishers select areas as rest sites where structural features are most variable but where canopy cover is least variable, suggesting that resting fishers place a premium on continuous overhead cover but prefer resting locations that also have a diversity of sizes and types of structural elements (Zielinski *et al.* in press 2003b). Seglund (1995) found that a majority of fisher rest sites (83 percent) were further than 328 ft (100 m) from human disturbance and Dark (1997) found that fishers used and rested in areas with less habitat fragmentation and less human activity. Characteristics of forest stands containing rest sites on industrial timberlands were similar to those reported elsewhere in northern California. Fishers in Shasta County used rest sites in stands of the largest tree size classes available, with mean canopy closure of 71 percent (Self and Kerns 2001).

Rest Site Structure Type and Size

Rest site structures used by fishers include: cavities in live trees, snags, hollow logs, fallen trees, canopies of live trees, platforms formed by mistletoe ("witches brooms'') or large or deformed branches, and to a lesser extent stick nests, rocks, ground cavities, and slash and brush piles (Heinemeyer and Jones 1994; Higley *et al.* 1998; Mazzoni 2002; Zielinski *et al.* 2003b). Tree size, age, and structural features are important characteristics of a rest structure. Zielinski *et al.* (in press 2003b) stated that rest structures in their study areas in the North Coast and the southern Sierra Nevada were among the largest diameter trees available, averaging 46.2, 47.2, and 27.2 in (117.3, 119.8, and 69.0 cm) for live conifers, conifer snags, and hardwoods, respectively. Most rest locations in the study areas of Zielinski *et al.* (2003b) were in cavities or broken tops of standing trees. Trees must be large and old enough to bear the type of stresses that initiate cavities, and the type of ecological processes (*e.g.*, decay, woodpecker activity) that form cavities of sufficient size to be useful to fishers; tree species that typically decay to form cavities in the bole are more important than those that do not (Zielinski *et al.* 2003b). Cavities in hardwoods were the most frequently used rest structure in the southern Sierra Nevada study area where Douglas-fir is absent (37.5 percent of rest structures were in black oaks); and in the North Coast study area, Douglas-firs were the most frequently used species (65.6 percent) and black oaks were used less frequently (11.4 percent) (Zielinski *et al.* 2003b). Higley *et al.* (1998) found that fishers in their Klamath study area use live hardwood trees most frequently for resting (57.14 percent) followed by live conifer trees (26.29 percent), snags and logs (14.86 percent—hardwoods and conifers combined) and the ground (1.71 percent). On managed industrial timberlands in northwestern California, fisher resting sites (N=35) were predominantly located on dwarf mistletoe in western hemlocks, large lateral branches and mammal nests in Douglas-firs, and cavities in cedars (Simpson Resource Company 2003). The majority of 34 rest sites described by Self and Kerns (2001) were located in mistletoe brooms in live Douglas-firs, whereas only 20 percent were in snags or hardwoods.

Natal and Maternal Dens

Most dens are found in live trees, and there is little evidence that den sites are reused over time (Campbell *et al.* 2000). The trees must be large enough for cavities that can be used for natal and maternal dens. Of 19 tree dens documented by Truex *et al.* (1998) across three study areas in California, the average diameter was 45 in (115 cm) for conifers and 25 in (63 cm) for hardwoods. Of 16 maternal and natal dens located on managed timberlands in northwestern California, nine were in cavities in hardwoods and seven were in conifer snags: diameters of den trees ranged from 24.6 in (62.5 cm) to 116 in (295 cm) (Simpson Resource Company 2003). According to Lewis and Stinson (1998), natal dens are most commonly found in tree cavities at heights of greater than 20 ft (6 m), while maternal dens may be in cavities closer to the ground so active kits can avoid injury in the event of a fall from the den. The mean height of natal and maternal dens found in British Columbia was 99 ft (26 m) above ground (Weir and Harestad 2003). The height of these dens may help prevent predation by the larger male fishers or by other species.

Foraging Habitats

Fishers in the Pacific States appear to be dietary generalists, and therefore, they may be flexible in their requirements for foraging habitat. Selection of foraging habitat may be driven by habitat relationships of primary prey species.

Several studies have characterized foraging habitat which, similar to resting habitat, is often typified by characteristics associated with mature and late-successional forests (Jones and Garton 1994; Zielinski *et al.* 1997c).

However, fishers have been found to use a broader range of successional stages for hunting than for resting (Jones 1991; Heinemeyer 1993; Jones and Garton 1994). Jones (1991) found that younger-aged forests appeared suitable for hunting but were rarely used for summer resting; more structurally complex forests seemed to have been preferred for both activities, but simpler stand structures were used for hunting. In their use of younger forests, fishers in Idaho still appeared to select localities with higher availability of large-diameter trees, snags, and logs (trees over 18 in (47 cm) diameter, snags over 20 in (52 cm) diameter, and logs over 18 in (47 cm)) relative to randomly-located plots in the home range (Jones 1991).

Complex down woody material including large down logs, and multi-layered vegetative cover are important habitat elements for fishers. Fishers are often detected at sites with higher amounts of downed logs than at random sites (Klug 1997; Slauson *et al.* 2003), and high volumes of coarse woody debris and structural complexity near the forest floor (Weir and Harestad 2003), at least in part because high structural diversity is associated with prey species richness and abundance (Slauson *et al.* 2003) and greater prey vulnerability to capture (Buskirk and Powell 1994). Shrubs also provide food for prey and for fishers in the form of fruits and berries. Slauson *et al.* (2003) found that sites in their study area where fishers were detected had higher shrub cover (40–60 percent) than sites where they were not detected. Fishers may also avoid areas with too much low shrub cover because it may adversely affect the hunting success of fishers (Weir and Harestad 2003).

Conclusion

The key aspects of fisher habitat are best expressed in forest stands with late-successional characteristics. Fishers use habitat with high canopy closure, large trees and snags, large woody debris, large hardwoods, multiple canopy layers, and avoidance of areas lacking overhead canopy cover (Aubry and Houston 1992; Buskirk and Powell 1994; Buck *et al.* 1994; Seglund 1995; Klug 1996; Dark 1997; Truex *et al.* 1998; Mazzoni 2002; Weir and Harestad 2003; Zielinski *et al.* in press 2003b, in press 2003a). Fisher also occupy and reproduce in some managed forest landscapes and forest stands not classified as late-successional that provide some of the habitat elements important to fisher, such as relatively large trees, high canopy closure, large legacy trees, and large woody debris, in second-growth forest stands (Klug 1997; Simpson Resource Company 2003). However, intensive management for fiber production on industrial timberlands does not typically provide for retention of these elements. It is unlikely that early and mid-successional forests, especially those that have resulted from timber harvest, will provide the same prey resources, rest sites and den sites as more mature forests (Zielinski and Powell 1994).

Late-successional coniferous or mixed forests provide the most suitable fisher habitat because they provide abundant potential den sites and preferred prey species (Allen 1987). Forest structure of good quality fisher habitat should provide high diversity of dense prey populations, high vulnerability of prey to fishers, and natal and maternal dens and resting sites (Powell and Zielinski 1994). Younger forests in which complex forest structural components such as large logs, snags, and tree cavities are maintained in significant numbers, and which provide a diverse prey base, may be suitable for fisher (Lewis and Stinson 1998).

Distinct Population Segment

In a 12-month finding, we must determine if (1) the petitioned action is warranted, in which case we would promptly publish a proposed rule to list the species; (2) the petitioned action is not warranted; or (3) the petitioned action is warranted but precluded by other higher priority listing activities. Under the Act, a species is defined as including any subspecies and any distinct population segment of a vertebrate species. To implement the measures prescribed by the Act and its Congressional guidance, we and the National Marine Fisheries Service (National Oceanic and Atmospheric Administration—Fisheries), developed a joint policy that addresses the recognition of DPSs of vertebrate species for potential listing actions (61 FR 4722). The policy allows for a more refined application of the Act that better reflects the biological needs of the taxon being considered, and avoids the inclusion of entities that do not require its protective measures. The DPS policy specifies that we are to use three elements to assess whether a population segment under consideration for listing may be recognized as a DPS: (1) the population segment's discreteness from the remainder of the species to which it belongs and (2) the significance of the population segment to the species to which it belongs. Our evaluation of significance is made in light of Congressional guidance that the authority to list DPSs be used "sparingly'' while encouraging the conservation of genetic diversity. If we determine that a population segment meets the discreteness and significance standards, then the level of threat to that population segment is evaluated based on the five listing factors established by the Act to determine whether listing the DPS as either threatened or endangered is warranted.

Below, we address under our DPS policy the population segment of the fisher that occurs in the western United States in Washington, Oregon and California. The area for this DPS includes the Cascade Mountains and all areas west, to the coast in Oregon and Washington; and in California, the North Coast from Mendocino County north to Oregon, east across the Klamath (Siskiyou, Trinity, and Marble) Mountains, across the southern Cascade Mountains and south through the Sierra Nevada Mountains. The mountainous areas east of the Okanogan River in Washington and the Blue Mountains west to the Ochoco National Forest in eastern Oregon are not included in this DPS due to their geographical isolation from the remainder of the DPS.

Discreteness

Under our DPS policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following two conditions: (1) it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant with regard to conservation of the taxon in light of section 4(a)(1)(D) of the Act.

The proposed DPS is markedly separated from other fisher populations as a result of several factors. Native populations of the fisher in California and the reintroduced population in the southern Cascade Mountains of Oregon are physically isolated from the Canadian populations by over 200 miles (Weir 2003), given the northward contraction of the British Columbia population (Weir 2003) in Canada. Substantial information is available indicating the West Coast population is also physically separated from known populations of the fisher to the east.

The range of the fisher in Washington, Oregon, and California is separated from the Rocky Mountains and the rest of the taxon in the central and eastern United

States by natural physical barriers including the non-forested high desert areas of the Great Basin in Nevada and eastern Oregon, and the Okanogan Valley in eastern Washington. At its extreme northern (unoccupied) extent in northern Washington, the DPS is separated from the western extension of the Rocky Mountains and associated ranges by the Okanogan Valley, a distance of approximately 93 to 124 mi (150 to 200 km), which is well beyond the dispersal range for the species. Other physical barriers that separate the West Coast population from Rocky Mountain and eastern U.S. fisher populations include major highways, urban and rural open-canopied areas, agricultural development, and other nonforested areas. Fishers have a strong aversion to areas lacking in forest cover or to crossing large rivers that do not freeze in the winter (Powell 1993; Powell and Zielinski 1994; Aubry and Lewis 2003); these behavioral factors, along with the other numerous barriers identified above, represent a significant impediment to eastward or westward movement for the fisher.

We currently have limited information on dispersal distances of fishers in the western United States. However, studies conducted on fisher dispersal in the northeastern United States indicate that dispersal distances are relatively short (Arthur *et al.* 1993; York 1996). There is no evidence that fishers are successfully dispersing outside of known population areas in California and Oregon. This is possibly due to the extent of habitat fragmentation, developed or disturbed landscapes, and highways and interstate corridors (see dispersal section above).

Genetic information (Drew *et al.* 2003) indicates that the West Coast population of fisher originally colonized the Pacific states from British Columbia. The current range of fisher in British Columbia has been reduced and connection to fisher populations in the continental United States no longer exists (Weir 2003, BC Species and Ecosystems Explorer 2003). The fisher's present range in British Columbia has contracted northward from the international boundary by about 200 kilometers. (Weir 2003). Movement of fisher from British Columbia southward to areas occupied by the West Coast population is not possible based on lack of available habitat, habitat preferences, and dispersal behavior of the fisher.

The West Coast population also appears to be separated from other populations as a result of ecological factors, as they use forest types that differ in species composition, tree size, and habitat structure as compared to those used by fishers in other populations. The fisher is regarded as a habitat specialist in the western United States (Buskirk and Powell 1994), occurring only at mid to lower elevation in mature conifer and mixed conifer/hardwood forests characterized by dense canopies and abundant large trees, snags, and logs (Powell and Zielinski 1994). In contrast, fishers in the northeastern United States and the Great Lakes region inhabit areas with a large component of deciduous hardwood forest containing American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and other broadleaf species (Powell and Zielinski 1994). The majority of conifer forest habitat in Canada is characterized as boreal forest, which is different from the relatively dryer environmental conditions associated with Washington, Oregon, and California. In the Rocky Mountains of north central Idaho, certain all-conifer habitat types which include grand fir and Engelmann spruce appear to be important to, and preferentially selected by fishers (Jones 1991).

With regard to physiological differences, the fishers in the native northern California population are significantly smaller in size (based on condylobasal length) than fishers from western and central Canada (Hagmeier 1959; Zielinski *et al.* 1995; Aubry and Lewis 2003.

The West Coast population of the fisher is also delimited to the north by the international governmental boundary between the United States and Canada because of differences in control of exploitation, management of habitat, conservation status, and regulatory mechanisms that may be significant with respect to section 4(a)(1)(D) of the Act. Canada has no overarching forest practices laws governing management of its national lands. In contrast, lands within the National Forest System in the United States are considered under the National Forest Management Act of 1976, as amended (16 U.S.C. 1600), and associated planning regulations. The fisher is covered by British Columbia's Wildlife Act which protects virtually all vertebrate animals from direct harm, except as allowed by regulation (*e.g.*, hunting or trapping). The fisher is designated as a Class 2 furbearer in British Columbia and, as such, can be legally harvested by licensed trappers under regional regulations. However, the fisher was reclassified to the Red List in British Columbia in 2003 with a provincial conservation ranking of "S2,'' as assigned by the British Columbia Conservation Data Centre to "score'' the risk of extinction or extirpation (BC Species and Ecosystems Explorer 2003). The Red List designation means that the species is considered imperiled at the provincial level. The change in the fisher designation was the result of an estimated provincial population of fewer than 3,000 individuals and habitat loss due to logging, hydro-electric development and other land use changes (BC Species and Ecosystems Explorer 2003). Although the change in Red List designation for the fisher in British Columbia carries no legal implications, trapping seasons for it have been closed until new information is collected that indicates the population is secure (BC Ministry of Land, Water, and Air Protection 2003). Beyond this voluntary closure of the trapping season, the fisher carries no protected status in British Columbia. Trapping the species has been prohibited for decades in Washington, Oregon, and California (Lewis and Stinson 1998). For the reasons stated above, we believe that these factors collectively play a role in delimiting the northern DPS boundary along the international border with Canada from the Cascade Mountains west to the Pacific Ocean.

Based on the available information on fisher range and distribution, we conclude that the West Coast population of fisher is distinct and separate from other fisher populations in the United States and meets the requirements of our DPS policy for discreteness. The West Coast population of fisher is separated from fisher populations to the east by geographical barriers and to the north by habitat availability; it is further delineated by the international boundary with Canada, within which there are differences in control of exploitation, conservation status, and regulatory mechanisms that are significant to its conservation.

Significance to the Species

Under our DPS policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. This consideration may include, but is not limited to, the following factors: (1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon; (3) evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; and (4) evidence that the discrete population segment differs markedly

from other populations of the species in its genetic characteristics. Significance is not determined by a quantitative analysis, but instead by a qualitative finding. We have found substantial evidence that the West Coast DPS of the fisher meets two of the significance factors and is supported by a third significance factor, and we have described them below.

Fishers in the West Coast population persist in an ecological setting that is unusual in comparison to the rest of the taxon, with a different climate, topography, and habitat than that found in the majority of its range. The forests inhabited by fishers on the west coast lack the extensive broadleaf hardwood component that is common in the eastern portions of the species' range. The Pacific coast's wet winter followed by a dry summer is unique in comparison to climate types in the east and Canada, and produces distinctive sclerophyll forests of hardleaved evergreen trees and shrubs (Smith *et al.* 2001). This climate is characterized by mild, wet winters and warm, dry summers (Bailey 1995), while the climate in the animal's range in the Rocky Mountains consists of cold winters and cool, dry summers, and in the Great Lake States, eastern Canada, and the northeast United States it is characterized by cold winters, and warm, wet summers. Fishers on the west coast primarily occur in habitat in steep, mountainous terrain, while those in the Great Lakes region, eastern Canada, and the northeastern United States inhabit level terrain or low lying glaciated mountains. Releases of eastern fishers into western forests have generally been unsuccessful; Powell and Zielinski (1994) state that, "Roy's (1991) results [unsuccessful attempts to reintroduce Minnesota fishers to Montana] indicate that many fishers from eastern North America may lack behaviors, and perhaps genetic background, to survive in western ecological settings.'' The repeated introductions of fishers from British Columbia and Minnesota to the southern Cascade Mountains of Oregon (from 1960s to 1980s) have resulted in an apparently stable, but small population there; however, the species is not expanding and dispersing from the areas into which it was introduced.

The loss of the West Coast DPS of the fisher would eliminate the entire southwest portion of the fisher's North American range. Additionally, the West Coast DPS of the fisher represents the southernmost range of the *Martes* genus. The West Coast populations represent three of the known remaining four populations in the western United States (fourth being the Rocky Mountain population), and a significant portion of the western range of fishers in North America. Based on figures from Weir (2003), the total range of the fisher in North America has been reduced approximately 33 percent in geographical area since the 1600s. This reduction is most apparent in the fishers southern and western range—largely in the United States. Based on our review of Lewis and Stinson's (1998) maps (modified from Gibilisco 1994), these are three of only six or seven remaining areas occupied by fishers in the United States. Although these maps consider a large area of Canada to be within the 1994 range of the fisher, distribution has diminished in some areas of southeastern Ontario and Quebec, in the prairie provinces (Alberta, Saskatchewan, and Manitoba), and in the western United States (Gibilisco 1994); and because of the lack of inventories for the species in Canada, it is not known to what extent the range in Canada is occupied. Additionally, the populations in the southern Sierra Nevada and northern California/southern Oregon appear to be the only native populations of the fisher remaining in the west (Truex *et al.* 1998; Aubry *et al.* in press 2003; Drew *et al.* 2003), and are "the only populations that have not been augmented with individuals (and genes) from other regions'' (Zielinski *et al.* 2003b).

As stated earlier (see distribution section), the extent of area known to be currently occupied by fishers in Washington, Oregon, and California is roughly 20 percent of their historical extent in these States. The loss of the species from the United States west of the Rocky Mountains and south of British Columbia would result in a significant gap in the range of the species as a whole and represent the loss of a major geographical area of the range of the taxon. It would represent a loss of the species from about 20 percent of its historical range in the United States, a significant portion of its North American range, recognizing that the historical range was not continuously occupied spatially or temporally, and that the present range we identify is also not occupied continuously nor is all of the historical habitat still available, especially in the midwest and east.

The extinction of fishers in their west coast range would also result in the loss of a significant genetic entity, since they have been described as being genetically distinct from fishers in the remainder of North America. More specifically, native fishers in California have reduced genetic diversity compared to other populations (Drew *et al.* 2003). Additionally, the extant native populations in California share one haplotype that is not found in any other populations (Drew *et al.* 2003).

Quantitative measures of genetic discontinuity indicate that there is no naturally occurring genetic interchange with the California fisher populations. Based on genetic evidence, and supported by paleontological and archeological evidence, Wisely *et al.* (in litt. 2003) theorize that fishers probably colonized the Pacific peninsula from the north, not the east. The fisher was once distributed throughout much of the dense coniferous forests in British Columbia, Washington, Oregon, and California (Drew *et al.* 2003). This historical connectivity among populations along the Pacific Coast is evidenced by the presence of British Columbia haplotypes in museum specimens from California and Washington (Drew *et al.* 2003). The historical continuity in fisher distribution no longer exists, as discussed above. Genetic variation shows the Oregon southern Cascade population is a reintroduced population descended from fishers translocated to Oregon from British Columbia and Minnesota (Drew *et al.* 2003). There is evidence that there has been no genetic interchange between the native northern California/southwestern Oregon Siskiyou population and the reintroduced southern Cascade Oregon population (Aubry *et al.* in press 2003).

Conclusion

We have evaluated as a DPS the population of fishers in the West Coast range and have addressed the elements our policy requires us to consider in deciding whether a vertebrate population may be recognized as a DPS and considered for listing under the Act. In assessing the population segment's discreteness from the remainder of the taxon, we have described the factors separating it from other populations. We considered distributional, ecological, behavioral, morphological, and genetic information, information from status surveys, and geographical and biogeographical patterns, and have concluded that this population segment is discrete under our DPS policy. In assessing the population segment's significance to the taxon to which it belongs, we have considered the geographical area represented by the western DPS, its genetic distinctness from fisher populations in the central and eastern United States, its unique ecological setting, and other considerations and factors as they relate to the species as a whole. We conclude that loss of the species from the west

coast range in the United States would represent (1) a significant gap in the species' range, (2) the loss of genetic differences from fisher in the central and eastern United States, and (3) the loss of the species from a unique ecological setting. Therefore, as the population segment meets both the discreteness and significance criteria of our DPS policy, it qualifies as an entity that may be considered for listing. We now evaluate its status as endangered or threatened. In making this determination, we evaluate the factors enumerated in section 4(a)(1) of the Act (16 U.S.C. 1533 (a)(1)).

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and implementing regulations at 50 CFR 424, set forth procedures for adding species to the Federal endangered and threatened species list. In making this finding, information regarding the status and threats to this species in relation to the five factors in section 4 of the Act is summarized below.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range. Vegetation management activities such as timber harvest and fuels reduction treatments, stand-replacing fire, large-scale forest disease outbreaks or insect infestations (*e.g.*, pine beetle), and development can destroy, alter, or fragment forest habitat suitable for fishers.

Timber Harvest

The extent of past timber harvest is one of the primary causes of fisher decline across the United States (Powell 1993), and may be one of the main reasons fishers have not recovered in Washington, Oregon, and portions of California as compared to the northeastern United States (Aubry and Houston 1992; Powell and Zielinski 1994; Lewis and Stinson 1998; Truex *et al.* 1998). Timber harvest can fragment fisher habitat, reduce it in size, or change the forest structure to be unsuitable for fishers.

Habitat fragmentation has contributed to the decline of fisher populations because they have limited dispersal distances and are reluctant to cross open areas to recolonize historical habitat. Based on northeastern fisher home range sizes, Allen (1983) estimated that a minimum of 161 km^2 (39,780 ac) of potentially suitable and contiguous habitat must be present before an area can sustain a population of fishers. However, fisher populations in western forests may need even larger areas because male home ranges in northern California have been reported to be as large as 128 km^2 (Beyer and Golightly 1996). A habitat suitability model developed in British Columbia figures that a minimum of 259 km^5 of contiguous habitat is required for fisher transplant attempts (Apps 1996 as cited in Craighead *et al.* 1999).

Fishers use large areas of primarily coniferous forests with fairly dense canopies and large trees, snags, and down logs; vegetated understory and large woody debris appear important for their prey species. Fishers in the Pacific Northwest use late-successional forest more frequently than the early to mid-successional forests that result from timber harvest (Aubry and Houston 1992; Buck *et al.* 1994; Rosenberg and Raphael 1986). Elimination of late-successional forest from large portions of the Sierra Nevada and Pacific Northwest (Morrison *et al.* 1991; Aubry and Houston 1992; McKelvey and Johnston 1992; Franklin and Fites-Kauffman 1996) has probably significantly diminished the fisher's historical range on the west coast (Lewis and Stinson 1998).

Several studies have found sharp declines in late-successional/old-growth forests (Beardsley *et al.* 1999, Bolsinger and Waddell 1993, the Report of the Forest Ecosystem Management Assessment Team (FEMAT) 1993, Franklin and Fites-Kaufmann 1996, Morrison *et al.* 1991, Service 1990). Old growth comprised about 50 percent of the forests of Washington, Oregon, and California in the 1930s and 1940s, but made up less than 20 percent of those forests in 1992 (about 10.3 million ac; 41,683 km^2) (Bolsinger and Waddell 1993).

Franklin and Fites-Kaufman (1996) find that forests with high late successional/old-growth structural rankings are now uncommon in the Sierra Nevada of California (8 percent of mapped area). Mixed conifer forests are a particularly poorly represented forest type as a result of past timber harvesting, and key structural features of late successional/old-growth forests, such as large-diameter trees, snags, and logs, are generally at low levels (Franklin and Fites-Kaufman 1996). The loss of structurally complex forest and the loss and fragmentation of suitable habitat by roads and residential development have likely played significant roles in both the loss of fishers from the central and northern Sierra Nevada and the fisher's failure to recolonize these areas (USDA Forest Service 2000).

Within the Northwest Forest Plan area, 60 to 70 percent of the forested area of the region was historically dominated by late-successional and old-growth forest conditions. Most of the forest (perhaps 80 percent) probably occurred in relatively large contiguous areas (greater than 1000 ac; 4 km^2) (Bolsinger and Waddell 1993, USDA Forest Service and U.S. Department of Interior Bureau of Land Management (USDI BLM) 1994a). Franklin and Spies (1986) estimated that 15 million ac (60,703 km^2) of old-growth forest existed west of the Cascade Mountains in Oregon and Washington in the 1800s, and only about 5 million ac (20,234 km^2; 33 percent) remain. FEMAT (1993) reports the status of forests in several regions: private and State lands within western Washington and western Oregon Cascades have mostly been harvested, whereas Forest Service and Bureau of Land Management lands (BLM) still include significant areas (albeit highly fragmented) of late successional/old-growth forest; the Klamath Provinces of southwestern Oregon and northwestern California have forests that are highly fragmented by timber harvest and natural factors (poor soils, dry climate, wildfires); the southern end of the Cascades Range in Oregon extending into California has forests that are highly fragmented due to harvest activities and natural factors.

The NWFP states that fisher populations are believed to have declined on Federal lands in old-growth habitat for two primary reasons: (1) Loss of habitat due to forest fragmentation resulting from clearcutting, and (2) the removal of large down coarse woody debris and snags from the cutting units (USDA Forest Service and USDI BLM 1994). Fishers in the eastern Klamath area of northern California have lower population densities, larger home ranges, lower capture rates, and a higher proportion of juveniles than other populations studied, possibly due in part to timber harvest having decreased habitat quality for the fisher in this area (Truex *et al.* 1998).

The conversion of low-elevation forests in western Washington to plantations and non-forest uses may have eliminated a large portion of the fisher habitat in the state (Powell and Zielinski 1994). There were historically many mature and old-growth stands (Aubry and Houston 1992). Over 60 percent of the 24.7 million ac (100,000 km^2) of forest believed to be present in Washington when white settlers first arrived were potential fisher habitat (Lewis and Stinson 1998). By 1992, the area of old-growth forest was reduced to 2.7 million ac (10,927 km^2) (Bolsinger and Waddell 1993). During the last 50 years, the structure, composition, and landscape context of much of

Washington's 16,803,100 ac (68,000 km^2) of commercial timberland has significantly changed because of intensive timber harvesting activities (Morrison 1988). Most of the remaining younger low and mid-elevation forest is fragmented and has reduced amounts of large snags and coarse woody debris, and may not be able to sustain fisher populations (Rosenberg and Raphael 1986; Lyon *et al.* 1994; Powell and Zielinski 1994). The higher elevation forests are less suitable for fishers because of deep snowpacks (Aubry and Houston 1992; FEMAT 1993).

Some forest management practices change the dominance of certain forest subtypes in western states (Lewis and Stinson 1998, Bouldin 1999). This change in forest structure is important because certain habitat types or tree species are suitable for fishers. In addition, logging and fire suppression have created higher densities of small trees which have led to higher insect and pathogen-induced mortality and the loss of structural diversity, and increased chances for stand-destroying fires (Bouldin 1999), the effects of which are discussed below.

Mazzoni (2002) found that timber harvest, fire, and succession resulted in fisher habitat fragmentation in the southern Sierra Nevada from 1958 to 1997. Rosenberg and Raphael (1986) emphasize that the fragmentation of northwestern California Douglas-fir forests is relatively recent in comparison with forests of other regions, and that the true long-term responses of species to the break-up of their habitat cannot yet be discerned.

The effects of timber harvest on fisher habitat depend on the silvicultural prescriptions used and the condition of the habitat prior to harvest. Habitat fragmentation is a concern. Clearcutting, selective logging, and thinning change the suitability of fisher habitat by removing overhead cover and insulating canopy, exposing the site to the drying effects of sun and wind (Buck *et al.* 1994) or to increased snow deposition, removing prime resting and denning trees, and increasing exposure of the fisher to predators.

Fuels Reduction and Loss of Habitat From Fire

Mechanical thinning or prescribed fire negatively affect fishers if it impacts habitat quality by reducing canopy cover and coarse woody debris over large areas or fragment habitat. Fuels reduction treatments, including thinning and the removal of down woody debris, dense understory, snags, and low overstory tree crowns may significantly affect fishers in the immediate area. Prescribed burning generally promotes forest health, and can enhance suitability for wildlife, but may vary in its effect on fishers. Small fires should not be detrimental to fishers because of the fishers' large home ranges (unless they impact natal dens during breeding season); however, hotter or more widespread fires may displace fishers or destroy habitat. Prescribed fire can also consume habitat structural elements such as snags and downed logs that are important to fishers.

The potential for stand-replacing wildfire has increased in areas where fire suppression has played a role in raising fuel load to levels that place late successional forest-dependent species at a higher risk of habitat loss (USDA Forest Service and USDI BLM 1994b). Stand replacing fires can impact large areas and render them unsuitable for fisher for several decades (Lewis and Stinson 1998). The combination of increased tree density and standing tree mortality (with associated increased surface/ground fuel loads) over the past century presents the greatest single threat to the integrity of Sierra Nevada forest ecosystems (McKelvey *et al.* 1996, USDA Forest Service 2000). On the other hand, while increased density of trees and woody debris ("fuel loading'') increases the risk of stand-replacing fire, they may also enhance habitat for the fisher in the short term.

Forest Disease and Insect Outbreaks

Although large area epidemics may displace fishers if canopy cover is lost, the usual pattern of localized outbreaks and low density of insect and disease damage is probably not a great threat to fisher habitat. In some cases, the diseased trees are beneficial, providing structures conducive to resting and denning. However, timber removal and thinning prescriptions in response to outbreaks may fragment or degrade habitat in the short term in order to prevent catastrophic fire that will eliminate habitat altogether for decades (see previous discussion). In addressing outbreaks of the mountain pine beetle (*Dendroctonus ponderosae*) and other insects in British Columbia, Weir (2003) states that reduction in overhead cover may be detrimental to fishers and that wide-scale salvage operations may substantially reduce the availability and suitability of fisher habitat.

Sudden Oak Death Phytophthora affects oaks and redwoods and may affect tanoak, evergreen huckleberry, and Pacific rhododendron (*Rhododendron macrophyllum*). Four sites on Federal, private industrial, and private nonindustrial forestlands in Oregon (near Brookings) have been confirmed as having Sudden Oak Death. The outbreaks at these sites affect from less than 1 ac (0.4 ha) to approximately 8 ac (3 ha) in size. Chances of continued introductions and establishment of the disease appear high in southwestern Oregon and northwestern California because these areas have the hosts, the climatic conditions preferred by the pathogen, and many potential pathways for its movement. It is a potentially significant threat if it spreads into areas in which oaks are the primary trees used for fisher denning.

Development, Recreation, and Roads

Urban Development and Recreation

Forested area in the Pacific coast region decreased by about 8.5 million ac (34,400 km^2) between 1953 and 1997 (Smith *et al.* 2001). Alig *et al.* (2003) state that "Forest cover area [in the Pacific coast states] is projected to continue to decrease through 2050, with timberland area projected to be about 6 percent smaller in 2050 than in 1997. Forest area is projected to decline in all three subregions [Washington, Oregon, and California]. Population and income are expected to further fuel development in the region, as population is projected to increase at rates above the national average, leading to more conversion of forest to nonforest uses.''

Rural and recreational development, such as campgrounds, recreation areas, and hiking, biking, off-road vehicle and snowmobile trails, may adversely affect fishers. Recreational activities can alter wildlife behavior, cause displacement from preferred habitat, and decrease reproductive success and individual vigor (USDA Forest Service 2000). A study of fisher habitat use on the Shasta-Trinity National Forest indicates that fishers use landscapes with more contiguous, unfragmented Douglas-fir forest and less human activity (Dark 1997).

Roads

Highways and associated developments can substantially influence movement patterns of wildlife (Bier 1995). The adverse effects of roads include direct loss of habitat, displacement from noise and human activity, direct mortality, secondary loss of habitat due to the spread of human development, increased exotic species invasion, and creation of barriers to fisher dispersal. The impacts of these effects on low density carnivores like fishers are more severe than most other wildlife species due to their large home ranges, relatively low fecundity, and low natural population density

(Ruediger *et al.* 1999), and their general avoidance of non-forested habitats. Disruption of movement can contribute to a loss of available habitat (Mansergh and Scotts 1989), isolate populations, and increase the probability of local extinctions (Mader 1984). The loss of structurally complex forest (Beesley 1996) and the loss and fragmentation of suitable habitat by roads and residential development (Duane 1996) has likely played a significant role in both the loss of fishers from the central and northern Sierra Nevada and its failure to recolonize these areas.

Areas with more roads may have increased fisher mortality due to road kill (Heinemeyer and Jones 1994). Given patterns of human population growth in areas near and within fisher habitat, road development and traffic, and associated mortality, can be expected to increase. Campbell *et al.* (2000) stated that many records of fisher locations come from roadkills; for example, Yosemite National Park reported four fishers killed by automobiles between 1992 and 1998. Proulx *et al.* (1994), York (1996), and Zielinski *et al.* (1995, 1997a) all cite the risk of fishers being struck and killed by vehicles as a potential threat to populations. The potential for vehicle collisions increases with the density of open roads in suitable habitat. Vehicles caused the death of two of the 50 radio-collared fishers in a 5-year Maine study (Krohn *et al.* 1994), and three of 97 fishers in a 3-year study in Massachusetts (York 1996). Vehicle collisions could be a significant mortality factor, especially for small fisher populations. Off-highway and over-snow vehicles are used throughout the range of the fisher, and can also directly kill fishers or cause behavioral changes due to disturbance.

Vehicle traffic during the breeding season in suitable habitat may impact foraging and breeding activity. Dark (1997) found that fishers more often used areas with a greater than average density of low use roads, and may not have used areas that were dissected by moderate to high use roads. Campbell (2004) found that sample units within the central and southern Sierra Nevada region occupied by fishers were negatively associated with road density. This relationship was significant at multiple spatial scales (from 494 to 7,413 ac (2 to 30 km ^{2}). In a stand-scale level study, Robitaille and Aubry (2000) found that martens, close relatives of fishers, were less active near roads. Paved roads are expected to cause more mortality than unpaved roads because of the higher use and speeds associated.

The access to forest areas provided by roads leads to increased human disturbances from resource use and extractive activities. These disturbances result in an overall degradation of habitat. Because fishers occur at relatively low elevations, they are likely to be directly affected by human activities (Campbell *et al.* 2000). Roads also provide access for trappers who target other species, but might incidentally trap fishers (Lewis and Zielinski 1996).

In conclusion, habitat loss and fragmentation appear to be significant threats to the fisher. Forested habitat in the Pacific coast region decreased by about 8.5 million ac (34,400 km ^{2}) between 1953 and 1997 (Smith *et al.* 2001). Forest cover in the Pacific coast is projected to continue to decrease through 2050, with timberland area projected to be about 6 percent smaller in 2050 than in 1997 (Alig *et al.* 2003). Thus fisher habitat is projected to decline in Washington, Oregon, and California in the foreseeable future.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes. The fisher has been commercially trapped since the early-1800s. Although exact numbers are unknown, trapping caused a severe decline in fisher populations. Aubry and Lewis (2003) state that overtrapping appears to have been the primary initial cause of fisher population losses in southwestern Oregon. The high value of the skins, the ease of trapping fishers (Powell 1993), year-round accessibility in the low to mid-elevation coniferous forests, and the lack of trapping regulations resulted in heavy trapping pressure on fishers in the late 1800s and early 1900s (Aubry and Lewis 2003).

In 1936, the Chief of the U.S. Biological Survey urged closing the hunting/trapping season for 5 years to save fisher and other furbearers from joining the list of extinct wild animals, noting that these species had disappeared from much of their former range in Oregon, Washington, and other states (USDA 1936). Commercial trapping of fishers has been prohibited in Oregon since 1937, in California since 1946 (Aubry and Lewis 2003), and in Washington since 1933 (Lewis and Stinson 1998). Where trapping is legal in other states and in Canada, it is a significant source of mortality. Krohn *et al.* (1994), for example, found that over a 5-year period, trapping was responsible for 94 percent of all mortality for a population of the fisher in Maine. In British Columbia, the fisher is classified as a furbearing mammal that may be legally harvested; however, due to a recent change in conservation status, the trapping season has been closed until it can be determined that the populations can withstand trapping pressure.

Although it is currently not legal to trap fishers intentionally in California, Oregon and Washington, they are often incidentally captured in traps set for other species (Earle 1978; Luque 1983; Lewis and Zielinski 1996). It is legal to harvest many mammals that are found in fisher habitat, including bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), mink (*Mustela vison*) and other furbearers. Red fox (*Vulpes vulpes*) and marten (*Martes americana*) may also be trapped in Oregon and Washington. Incidental captures often result in crippling injury or mortality (Luque 1983; Strickland and Douglas 1984; Cole and Proulx 1994). Lewis and Zielinski (1996) estimated an incidental capture of 1 per 407 trap set-nights (number of set locations—where usually 1 or 2 leg-hold traps were set—multiplied by the number of nights when traps were set) and an average mortality-injury rate of 24 percent, based on reports from five practicing trappers in California (72 incidental fisher captures over 50,908 set-nights).

Even low rates of additive mortality from trapping have been predicted to affect fisher population stability (Powell 1979, Lewis and Stinson 1998), and may slow or negate population responses to habitat improvement (Powell and Zielinski 1994). Powell (1979) reported that as few as one to four additional mortalities per year due to trapping over a 100 km^2 (39 mi^2) area could cause a significant decline in a reduced fisher population. The potential effects on fishers of legal trapping of other species may be significant when considered in conjunction with habitat loss and other sources of mortality.

In summary, information available suggests that historical trapping caused a severe population decline, and current mortalities and injuries from incidental captures of fishers could be frequent and widespread enough to prevent local recovery of populations, or prevent the re-occupation of suitable habitat.

Factor C. Disease or Predation. Fishers are susceptible to many viral-borne diseases, including rabies (Family *Rhabdoviridae*), canine and feline distemper (*Mobillivirus* sp.), and plague (*Yersinia pestis*). Contact between fishers and domesticated dogs and cats and other wild animals susceptible to such diseases (raccoons, coyotes, martens, bobcats, chipmunks, squirrels, *etc.*) may lead to infection in fishers. Although specific information on fisher diseases is limited, populations of three

other mustelids, the black-footed ferret (*Mustela nigripes*), the marten, and the sea otter (*Enhydra lutris*), have experienced outbreaks of various parasitic, fungal, or bacterial diseases. An epidemic of canine distemper in black-footed ferret in 1985 led to the extirpation of the species from the wild (Thorne and Williams 1988). Evidence of plague was found in martens in California through detection of plague antibodies and host fleas (Zielinski 1984). In a study on sea otter, it was determined that infectious disease caused the deaths of 38.5 percent of the sea otters examined at the National Wildlife Health Center collected in California from 1992–1995 (Thomas and Cole 1996).

Studies in the urban-wildland interface suggest a correlation between the prevalence of disease in wild populations and contact with domestic animals, however fisher populations do not currently appear to be at risk.

Mortality from predation could be a significant threat to fishers. Potential predators include mountain lions (*Puma concolor*), bobcats, coyotes, and large raptors (Powell 1993; Powell and Zielinski 1994; Truex *et al.* 1998). Although generalist predators such as bobcats and mountain lions are not common in dense forest environments, they can invade disturbed habitat. Healthy adult fishers are apparently not usually subject to predation, except for those that have been translocated (Powell and Zielinski 1994) to an unfamiliar area, or those in areas with less canopy cover and forest structure (Buck *et al.* 1994). However, Powell and Zielinski (1994) and Truex *et al.* (1998), report that predation as well as human-caused death are significant sources of mortality. Of mortalities recorded by Truex *et al.* (1998), nine were suspected to be from predation and five were suspected to be human-caused, including two vehicle collisions, two cases where the collar was cut (indicating poaching), and one fisher that died after being trapped in a water tank. Four fishers out of seven that died during a study by Buck *et al.* (1994) were killed by other carnivores; the death of one juvenile was suspected to have been caused by another fisher.

In conclusion, mortality from disease and predation does not appear to be a significant threat unless populations are extremely small as is the case of the West Coast population of the fisher. Diseases in other mustelids affect this species and there is the potential for such disease outbreaks to occur in fisher populations.

Factor D. The Inadequacy of Existing Regulatory Mechanisms. Existing regulatory mechanisms that could provide some protection for the fisher include: (1) Federal laws and regulations; (2) State laws and regulations; and (3) local land use processes and ordinances. However, these regulatory mechanisms have not prevented continued habitat fragmentation and modification, incidental trapping, and predator control programs all of which result in population declines of fisher in the west. Although many States, Tribes, and Federal agencies recognize the fisher as a species which has declined substantially, their use of available regulatory mechanisms to conserve the species is limited. There are no regulatory mechanisms that specifically address the management or conservation of functional fisher habitat. However, the states in the petitioned area provide the fisher with protections from hunting and trapping, and regulatory mechanisms governing timber harvests incidentally provide conservation benefits for the fisher. The fisher is regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a treaty established to prevent international trade that may be detrimental to the survival of wild plants and animals.

Federal Regulations

National Forests

Federal activities on National Forest lands are subject to compliance with Federal environmental laws including the Multiple-Use Sustained-Yield Act of 1960 (16 U.S.C. 528 *et seq.*), National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), and Clean Water Act of 1972 as amended (33 U.S.C. 1251 *et seq.* 1323 *et seq.*), as well as the National Forest Management Act of 1976 (90 Stat. 2949 *et seq.*; 16 U.S.C. 1601–1614) (NFMA).

The 1982 NFMA planning rules currently in effect require the Forest Service to "maintain viable populations of existing native and desired non-native vertebrates in the planning area [National Forests System lands]'' (30 CFR 219.19). The 2000 planning rule shifted the emphasis from maintaining viable populations of individual vertebrate species to providing ecological conditions that provide a high likelihood of supporting the viability of native and desired non-native species well distributed throughout their ranges within the plan area (§ 219.20). The viable population mandate, with associated monitoring requirements, could serve as the basis for forest management consistent with maintaining fishers. The viability requirement was integral in guiding the protection and management of late successional forest through the NWFP process, and through the SNFPA amendment process; the regulatory contributions of both plans to fisher conservation is discussed below.

The Forest Service's Sensitive Species Policy (Forest Service Manual 2670.32) calls National Forests to assist and coordinate with states, the Service, and NOAA Fisheries in conserving species with viability concerns. The fisher has been identified as a sensitive species by the Region 5 (Pacific Southwest Region) Regional Forester. The Forest Service defines Sensitive Species as "those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trend in numbers or density.''

On December 6, 2002, the Forest Service published a proposed rule to revise the 2000 NFMA planning rule. It is uncertain how the proposed rule, if and when implemented, will affect the interpretation of viability and the implementation of management for species viability.

National Environmental Policy Act

The National Environmental Policy Act of 1969, as amended (NEPA), requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of major federal actions and management decisions significantly affecting the human environment. The resulting documents are primarily disclosure documents, and NEPA does not require or guide mitigation for impacts.

Projects that are covered by certain "categorical exclusions'' are exempt from NEPA biological evaluation. The Forest Service and the Department of Interior have recently revised their internal implementing procedures describing categorical exclusions under NEPA 68 FR 33813 (June 5, 2003). The joint notice of NEPA implementing procedures adds two categories of actions to the agency lists of categorical exclusions: (1) Hazardous fuels reduction activities; and (2) rehabilitation activities for lands and infrastructure impacted by fires or fire suppression. These exclusions apply only to activities meeting certain criteria: mechanical hazardous fuels reduction projects up to 1,000 ac (4 km^2) in size can be exempt, and hazardous fuels reduction projects using fire can be exempt if less than 4,500 ac (18.2 km^2). See 68 FR 33814 for other applicable criteria. Exempt post-fire

rehabilitation activities may affect up to 4,200 ac (17 km^2). As stated above under Factor A, fuels reduction activities can reduce key fisher habitat elements such as large down logs and woody debris, large snags, but have counter-balancing benefits of reducing fire probability and brushy undergrowth which is not favored by fishers.

On July 29, 2003, the Forest Service published a notice of final interim directive (68 FR 44597) that adds three categories of small timber harvesting actions to the Forest Service's list of NEPA categorical exclusions: (1) The harvest of up to 70 ac (28 ha) of live trees with no more than 0.5 mi (.8 km) of temporary road construction; (2) the salvage of dead and/or dying trees not to exceed 250 ac (101 ha) with no more than 0.5 mi (.8 km) of temporary road construction; and (3) felling and removal of any trees necessary to control the spread of insects and disease on not more than 250 ac (101 ha) with no more than 0.5 mi (.8 km) of temporary road construction. Again, as stated above under Factor A, timber harvest and road construction can reduce key habitat elements for the fisher such as dense canopy cover and large trees, and results in at least temporary habitat fragmentation, but have corresponding long-term benefits.

Northwest Forest Plan

The NWFP was adopted in 1994 to guide the management of 24 million ac (97,125 km^2) of Federal lands in portions of western Washington, Oregon, and northwestern California. The NWFP represents a 100-year strategy intended to provide the basis for conservation of the northern spotted owl (spotted owl) and other late-successional and old-growth forest-associated species on Federal lands (USDA *et al.* 1993).

Implementation of the NWFP (November 2003) would over time provide a network of connected reserves of late successional forest habitat surrounded by younger forest. Implementation of the plan will lead to a substantial improvement in current habitat conditions for the fisher on Federal lands. However, the assessment of NWFP implementation on the fisher projected a 63 percent likelihood of achieving an outcome in which habitat is of sufficient quality, distribution, and abundance to allow the fisher population to stabilize and be well distributed across Federal lands. We will need to reassess this prediction as the NWFP is implemented and other fisher conservation efforts (*e.g.*, reintroductions) are initiated.

Sierra Nevada Forest Plan Amendment (SNFPA)

The SNFPA was adopted in January 2001 as a guidance and policy document for managing 11 national forests and about 11 million ac (44,516 km^2) of California's National Forest lands in the Sierra Nevada and Modoc Plateau. The SNFPA includes measures expected to lead to an increase over time of late-successional forest; these measures include requirements to retain conifers greater than 30 in (76.2 cm) DBH and hardwoods greater than 12 in (30.5 cm) DBH in westside forests, retention of important wildlife structures such as large diameter snags and coarse downed wood, and management of about 40 percent of the plan area as old forest emphasis areas (USDA Forest Service 2001). The SNFPA also established a Southern Sierra Fisher Conservation Area with additional requirements intended to maintain and expand the fisher population of the southern Sierra Nevada. Conservation measures for the fisher conservation area include maintaining at least 60 percent of each watershed in mid-to-late successional forest (11 to 24 in (28 to 61 cm) dbh and greater) with forest canopy closure of 50 percent or more. The plan also includes protections for den sites; as discussed elsewhere in this document, this tends to provide limited conservation value. Implementation of the 2001 plan was expected to maintain and restore fisher habitat in Southern Sierra Fisher Conservation Area, and encourage recovery to its historic range (USDA Forest Service 2001).

In response to appeals to the adoption of the SNFPA, the Regional Forester assembled a review team to evaluate specific plan elements, including the fuels treatment strategy, consistency with the National Fire Plan, and agreement with the Herger-Feinstein Quincy Library Group Recovery Act. The review was completed in March 2003 (USDA Forest Service 2003b), and in June 2003, the Forest Service issued a Draft Supplemental Environmental Impact Statement (DSEIS) for proposed changes to the SNFPA (USDA Forest Service 2003a). The Final Supplemental Environmental Impact Statement (FSEIS) was issued in January 2004, and the new Record of Decision was issued on January 21, 2004 (USDA Forest Service 2004).

The preferred alternative in the FSEIS, Alternative S2, was chosen in the final Record of Decision. This alternative includes an objective to retain 30 in (76.2 cm) and larger trees (with exceptions allowed to meet needs for equipment operability) and a desired condition for the Southern Sierra Conservation Area which states that outside of any Wildland Urban Interface areas, a minimum of 50 percent of the forested area has at least 60 percent canopy cover for known or estimated female fisher home ranges (USDA Forest Service 2004, Record of Decision p. 41). Furthermore, it directs that where home range information is lacking, the watershed mapped at the Hydrologic Unit Code 6 level be used as the analysis area for this desired condition. The Record of Decision also states that if fishers are detected outside of the Southern Fisher Conservation Area, habitat conditions should be evaluated and appropriate mitigation measures implemented to retain suitable habitat within the estimated home range.

The FSEIS preferred alternative includes standards and guidelines which apply to fishers and provide protections for verified fisher den sites, including a 700 ac (2.8 km^2) buffer around confirmed fisher birthing and rearing dens during March 1 through June 30. However, the guidelines would provide little protection to fishers or their habitat, because: (1) Den sites are difficult to detect even in studies using radio-collared fishers (fewer than 10 den sites have been found to date) and project-level surveys are unlikely to locate dens (USDA Forest Service 2000); (2) there is little evidence that den sites are reused over time (Campbell *et al.* 2000), limiting the value of protecting past den sites; (3) some restrictions can be waived, including the limited operating period for vegetation treatments; and (4) it is unclear how and to what extent the impacts of roads, off highway vehicles, and recreation would be minimized.

National Forest Land and Resource Management Plans

Each National Forest is operated under a Land and Resource Management Plan (LRMP). The NWFP standards and guidelines apply for National Forests within the range of the northern spotted owl except when the standards and guidelines of LRMPs are more restrictive or provide greater benefits to late-successional forest species. Most National Forests within the range of the fisher in its west coast range have LRMPs that incorporate the provisions of the NWFP or are amended by the SNFPA, and therefore implement the standards and guidelines of the applicable plan. Most individual Forest LRMPs do not provide any additional protections to fisher or fisher habitat; therefore, the above discussion regarding the NWFP and SNFPA

summarizes the primary regulatory mechanisms in place on National Forest lands within the DPS area.

In California, the Humboldt-Toiyabe, Modoc, Lassen, Plumas, Tahoe, Eldorado, Stanislaus, Sierra, Inyo, and Sequoia National Forests and the Lake Tahoe Basin Management Unit are within the area covered by the SNFPA.

In Oregon, National Forests located on the west side of the Cascade Mountains (Mt. Hood, Willamette, Umpqua, Rogue, Siuslaw, Siskiyou National Forests) are within the boundaries of the NWFP.

Forests on the east side of the Cascade Mountains (Winema, Deschutes, Fremont National Forests) only partially overlap the NWFP area. Outside of the NWFP boundaries, the Inland Native Fish Strategy (INFISH) and Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens) amend the LRMPs for the eastern portion of the Winema National Forest and all of the Fremont National Forest. The guidelines, developed to protect fish habitat, may also provide benefits to fisher by protecting riparian corridors; establishing large woody debris requirements (greater than 20 pieces per mi (12.4 pieces per km); greater than 12 in (30.5 cm) diameter; greater than 35 ft (10.7 m) long); and delineating Riparian Habitat Conservation Areas (RHCAs), which would prohibit timber harvests within them in most situations. Minimum widths for RHCAs range from a minimum of 300 ft (91 m) slope distance on either side of fish-bearing streams to 150 ft (46 m) on either side of perennial non-fish-bearing streams and around most lakes, ponds, reservoirs and wetlands. Seasonally flowing or intermittent streams, wetlands less than an acre, landslides, and landslide-prone areas would have protections ranging from about 50 to 100 ft (15 m to 30 m) or one site-potential tree height, depending on watershed priority.

The Eastside Screens provide interim direction for timber harvest associated with forest health and prohibit the harvest of large diameter trees (21 in (53 cm) DBH or larger) and protect snags and large woody debris for wildlife. Both INFISH and the Eastside Screens were expected to be short-term strategies to be replaced once LRMPs are amended by other guidance, such as the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

At this time, a decision notice for ICBEMP has not been issued, although a Memorandum of Understanding (MOU) has been signed which implements the associated Interior Columbia Basin Strategy (Strategy). The purpose of the MOU is to cooperatively implement the Interior Columbia Basin Strategy guiding the amendment and revision of Forest Service National Forest and BLM LRMPs and project implementation on public lands. The plans and MOU currently being implemented could maintain or enhance fisher habitat by preventing the loss of old-growth forests and promoting long-term sustainability of old forest habitat, although short-term adverse impacts may occur as a result of activities including thinning and silvicultural treatments. Maintaining wildlife movement corridors primarily associated with deer and elk are usually included as part of project designs and may also benefit fishers.

Potential fisher habitat in Washington State is located on the Olympic, Mount Baker-Snoqualmie, Gifford Pinchot, Wenatchee, and Okanogan National Forests. There are approximately 1,479,749 ac (5,987 km^2) of fisher habitat on Federal lands in Washington State, of which 1,108,994 ac (4,489 km^2; 75 percent) are in National Forests and the remainder is in National Parks.

Most of the potential fisher habitat in Washington State is within the range of the northern spotted owl and thus also within the NWFP Area. Over 80 percent of the habitat is in areas that are designated as reserves (Congressionally withdrawn, LSRs, or natural areas). Logging within these areas is restricted and limited to thinning or individual tree removal. The WDFW recently conducted a feasibility analysis to determine areas for potential reintroduction of the fisher. Based on this analysis, the largest blocks of suitable habitat are located in the Olympic NF, areas around the Goat Rocks and Indian Heaven Wilderness on the Gifford Pinchot NF, portions of the Wenatchee NF east of Mount Rainier National Park, and the foothills to the west of the Alpine Lakes and Glacier Peak Wilderness Areas on the Mount Baker-Snoqualmie NF. Approximately 81 percent of the Olympic, 75 percent of the Gifford Pinchot, 63 percent of the Mount Baker-Snoqualmie, 40 percent of the Wenatchee, and 22 percent of the Okanogan National Forests are below 4000 ft (1,220 m) in elevation. Although most of the remaining fisher habitat will be protected as long as the NWFP remains in effect, the landscape remains fragmented.

Bureau of Land Management (BLM) Lands

The NWFP standards and guidelines apply to BLM lands within the range of the northern spotted owl except when the standards and guidelines of Resource Management Plans (RMPs) are more restrictive or provide greater benefits to late-successional forest species. The BLM's Alturas District in northern California is currently in the process of rewriting its RMP. However, the District has very little land with potential fisher habitat. Neither fishers nor their potential habitat are mentioned in the RMP, and the RMP is not affected by the SNFPA or NWFP. The RMPs for the Arcata, Redding, and Ukiah Field Offices also do not contain any protective measures for fisher or require pre-project surveys. In Oregon, BLM Resource Management Plans were amended by the NWFP in the west Cascades, and by INFISH and Eastside Screen interim guidance in the east Cascades. Therefore, management would be similar to that described above for the National Forests. The BLM and U.S. Timberlands (private landowner) are working together, where their land ownerships are checkerboarded, to reduce wildlife impacts by restricting access and closing roads. BLM lands are limited in Washington state and do not contribute to fisher habitat.

National Park Lands

The land management plan for Redwood National Park does not contain any protective measures for fishers and does not require pre-project surveys. Undeveloped areas of Crater Lake National Park are managed toward natural processes and are expected to maintain fisher habitat. Hunting and trapping are not allowed in the park, and park facilities are currently confined to certain areas, primarily in the higher elevations above fisher habitat. Studies are planned to evaluate snowmobile use in the park.

The Columbia River Gorge National Scenic Area in Oregon (and Washington) encompasses about 292,500 ac (1,184 km^2) and is operated under a land use management plan that provides protection to all lands in the gorge. About half of the land in the Gorge is state or federally owned and has special management area guidelines dedicated to scenic and natural values. The remainder of the Gorge is private lands managed under general guidelines that are currently being revised. The fisher is a protected species within the area covered by the Columbia River Gorge management plan. On Federal lands, the restriction against removal of old-growth forests and clearcut logging would protect fisher habitat. After the Gorge forest practices guidelines are revised it is expected that habitat conditions will be retained for fisher because of the priority concept of

retaining old growth, scenic, and natural values in the Gorge.

Fisher habitat occurs in the Olympic, North Cascades and Mount Rainier National Parks. However, the interiors of all three parks are classified as alpine and are too steep and rugged to be suitable for fishers. Approximately 33 percent of the 1 million ac (4,047 km^2) Olympic National Park, 30 percent of the North Cascades NP and Ross Lake National Recreation Area (just over 500,000 ac (2,023 km^2), combined), and less than 15 percent of Mount Rainier National Park (235,500 ac; 953 km^2) is typed as fisher habitat. The largest blocks of habitat occur in a ring around the mountainous interior of the Olympic Peninsula, in areas to the south and east of Mount Rainier National Park, in the Ross Lake National Recreation Area, and in river valleys on the west side of the North Cascades National Park.

Because the interior of the Cascades and Olympic Peninsula are alpine, fisher habitat is limited to a relatively narrow band along the foothills. In addition, most of the low elevation passes are bisected by major transportation corridors. Efforts are currently under way to provide wildlife corridors (under or overpasses) along Interstate 90 to facilitate north-south movement of wildlife through the Washington Cascades.

National Resource Conservation Service (NRCS)

The NRCS does not manage lands, and has not been involved with forest related work, but plans to develop forest-related projects in the near future. Initial projects will likely be east of the NWFP boundary, along the Sprague River in Oregon and elsewhere. Focus would be on thinning projects to enhance wildlife habitat and could enhance potential fisher habitat where it exists. The NRCS would be subject to NEPA and other existing regulatory mechanisms discussed elsewhere.

Tribal

In California, the Hoopa Valley Indian Reservation forest management plan (Tribal Forestry 1994) addresses the 88,958 ac (360 km^2) where fishers are known to be present, and which contains about 75,000 ac (303.5 km^2) of commercial timberland. The forest management plan also recognizes the fisher as a traditional and culturally important species and designates the fisher as a species of special concern, and forest management activities are not allowed to knowingly result in ''take'' of species of concern unless approved by the Tribal Council. The plan contains some protective measures for fisher such as setting aside three to seven habitat reserves (each 50 ac (20 ha) or less in size) for pileated woodpeckers, mink, and fishers. Intensive timber harvest will not occur within the reserves. The plan establishes 32 no-harvest reserves (minimum of 60 ac (24 ha) each) for late-seral, cultural, sensitive, and listed species.

The Yurok Tribe manages roughly 4,000 ac (16 km^2) of collective Tribal land holdings, held in trust by the Department of the Interior. Tribal lands include about 1,000 ac (4 km^2) of late-seral redwood forest. The land management plan for the Yurok Tribe does not contain specific protective measures for fishers and does not require pre-project surveys. It is unclear to what extent this plan will help to maintain appropriate habitat elements for the fisher.

The Tule River Reservation in the southern Sierra Nevada includes about 56,000 ac (227 km^2) of lands, which includes forest lands managed for timber and firewood. Information is not available regarding regulatory mechanisms for these Tribal lands.

The Warm Springs Reservation of Oregon encompasses almost 1,000 mi^2 (2,590 km^2) on the western slope of the Cascade Range. The Integrated Resource Management Plan (IRMP) for forested areas of the Warm Springs Reservation of the Confederated Tribes includes guidelines that ensure buffers of 30 to 100 ft (9 to 30 m) (depending on the size of the feature) for riparian features such streams, wetlands, seeps, springs, or bogs. Standards to protect wildlife habitats and species include protection of at least four overstory trees per acre, retaining a minimum of ten class 1–3 logs per ac (12 in (30 cm)) diameter and 20 ft (6 m) long), and a 60:40 forage to cover ratio in wildlife management zones. The IRMP identifies conditional use areas that are not part of the commercial forest base although these areas could be harvested at some point in the future. These areas typically have cultural value and comprise about five percent of the Reservation. There are 14 spotted owl activity centers on the reservation.

For the Klamath Tribes in Oregon, the only activity identified that may impact the fisher is bobcat trapping. According to Rick Ward (Klamath Tribe biologist), trapping activity is currently very low due to presently low pelt prices. However, as reported in the Klamath News, an official publication of the Klamath Tribe (2003), there is a current effort to return approximately 690,000 ac (2,792 km^2) of the former reservation from the Fremont-Winema National Forest to the Klamath Tribes. This includes areas where fisher have been documented. If the land ownership changes, that would likely alter management of fisher habitat.

The Coquille Tribe of Oregon manages their land according to the guidelines of the NWFP. The Coquille lands were formerly managed by the BLM. When the lands were transferred from the BLM to the Tribe, the Tribe agreed to manage their lands according to the guidelines in the NWFP and the Coos Bay BLM Resource Management Plan. Their land holdings in southwest Oregon are all in NWFP ''matrix'' designation (*i.e.*, areas contemplated for timber harvest) which does not provide any benefits to fisher conservation.

There are 19 Tribes with forest lands within the range of the fisher in Washington State. The majority of those Tribes do not have any suitable fisher habitat or do not have sufficient acreage. The Tribal lands of the Makah, Quinault, and Yakama Indian Nations may have suitable fisher habitat, but only the Quinault and Yakama Tribes have management plans that protect enough habitat for the northern spotted owl (a late-successional associate) that the plans likely incidentally also provide habitat for fishers.

The Confederated Tribes and Bands of the Yakama Nation reservation is located in south central Washington State, east of the Cascade crest, and contains about 526,000 ac (2,129 km^2) of forests. In 1998, 144,559 ac (585 km^2) of reservation forest were typed as suitable habitat for spotted owls (Yakama Nation 2003). Of these, about 43 percent (62,266 ac; 252 km^2) are currently not managed for commercial timber production, while the remaining 57 percent will receive some level of stand management. Timber harvest is generally conducted using uneven-aged management prescriptions (King *et al.* 1997), in which up to 30 percent of the volume may be removed during an entry. Based on the Tribe's forest management practices and the distribution of spotted owl habitat, Yakama lands may widely provide suitable foraging habitat for fishers, and sufficient habitat elements including snags and downed logs to provide some denning/resting habitat, particularly in the areas reserved from harvest. Owl habitat may be a rough surrogate for fisher habitat, since both require late successional forests.

The North Boundary Area of the Quinault Tribe Reservation is contiguous with Forest Service Late Successional Reserves to the north and southeast, and National Park Service lands to the east, and is the only area on the reservation that has potential

habitat for the fisher. Negotiations are currently under way with the Tribe to protect habitat around occupied owl and murrelet sites, which may incidentally protect potential fisher habitat.

State

Washington

The Washington Department of Natural Resources (WDNR) manages the State lands in Washington. State lands occupy a substantial portion of the fisher's historic range in the State, consisting of roughly 1.6 million ac (6,475 km^2) of forest within the range of the northern spotted owl (primarily lands west of the crest of the Cascade Mountains). Because these lands generally occur at lower elevations than National Forest lands, a higher proportion is within the elevation range preferred by the fisher (Aubry and Houston 1992; WDNR 1997). Thus, State lands are important to the conservation of the fisher. However, over half of all WDNR forests are less than 60 years in age and less than 150,000 ac (607 km^2, about 9 percent) are over 150 years, indicating that most old growth on Washington State lands has been liquidated (WDNR 1997).

Several State Parks in Washington contain remnant stands of mature and late-successional forest and may have suitable habitat for the fisher. Like elsewhere, these parks are widely scattered and isolated by large areas that are unsuitable for fishers. There are approximately 18,858 ac (76 km^2) of mature or old-growth forests within State Parks in Washington. Unfortunately, many of the larger parks are on islands and would not contribute to the recovery of the fisher. A few state parks and forests, such as Mount Pilchuck State Forest, and Rockport, Ollalie, Hamilton Mountain/Beacon Rock, Twin Falls, and Wallace Falls State Parks have limited habitat which may provide some foraging opportunities for dispersing fishers and extend the habitat on Federal lands in the Cascades. Trapping of fishers has been prohibited in Washington since 1933, but fishers have been caught incidentally in traps set for other species, and the impact of incidental captures in Washington is unknown (Lewis and Stinson 1998).

In October 1998, the State of Washington listed the fisher as Endangered (WAC 232–12–297), which provides additional protections in the form of more stringent fines for poaching and a process for environmental analysis of projects affecting the species. There are no special regulations to protect habitat for the fisher or to conduct surveys for this species prior to obtaining forest activity permits. Although a few individuals may still reside in remote areas, the species is believed to be extirpated from Washington and the State is currently in the process of completing a feasibility report to determine suitable areas for reintroduction.

About 7 million ac (28,330 km^2) of non-Federal forest lands exist within the possible range of the fisher in the Olympic Peninsula and Cascades in Washington. A geographic information system (GIS) analysis of general habitat suitability typed about 2 percent (approximately 152,300 ac (616 km^2)) as suitable habitat for fisher. This analysis included mature/old-growth, northern spotted owl habitat, and habitat meeting other criteria as suitable fisher habitat. Because the remnant patches of mature forest are widely scattered and isolated, it is unlikely that there is sufficient habitat on non-Federal lands to support resident fishers. However, if proposed fisher reintroduction efforts occur and are successful, private lands may be important to maintain habitat in key linkage areas across the Puget Trough lowlands to provide connectivity between the Olympic Peninsula and the Cascades.

The primary regulatory mechanism on non-Federal forest lands in western Washington is the Washington State Forest Practice Rules, Title 222 of the Washington Administrative Code. These rules apply to all commercial timber growing, harvesting, or processing activities on non-Federal lands, and give direction on how to implement the Forest Practice Act (Title 76.09 Revised Code of Washington), and Stewardship of Non-Industrial Forests and Woodlands (Title 76.13 RCW). The rules are administered by the WDNR, and related habitat assessments and surveys are coordinated with the Washington Department of Fish and Wildlife (WDFW).

Washington's forest practice rules are more protective of riparian and aquatic habitats, and require more trees to be left than Oregon's forest practice rules. Clearcuts are limited to 120 ac (49 ha) in size with exceptions given up to 240 ac (97 ha). In all cutting units, three wildlife reserve trees (over 12 in (30)) in diameter), two green recruitment trees (over 10 in (25 cm) diameter, 30 ft (9 m) in height, and 1/3 of height in live crown) and two logs (small end diameter over 12 in (30 cm), over 20 ft (6 m) in length) must be retained per acre of harvest. These trees may be counted from those left in the "riparian management zones,'' which range in size from 80 to 200 ft (25 to 62 m) for fish-bearing streams, depending on the size of the stream, the class of site characteristics, and whether the harvest activity is east or west of the Cascade crest (Washington Administrative Code 222–30). Riparian management zones for non fish-bearing streams are 50 ft (15 m), applied to specified areas along the streams. Seventy acres (28 ha) of habitat must be protected around all known spotted owl activity centers during the nesting season, outside of which logging can occur. Washington's forest practices rules do not specifically preserve key components of fisher habitat.

Riparian buffers may provide some habitat for fishers, primarily along perennial fish-bearing streams where the riparian buffer requirements are widest. In western Washington—the majority of the State area addressed by the petition, the Forest Practice Rules require 90 to 200 ft (27 to 61 m) buffers on fish-bearing streams, depending on site class (site potential for tree growth). The riparian buffer of fish-bearing streams is divided into three zones, including a 50-ft (15-m) "core zone'' where no timber cutting is permitted. The remainder of the buffer is divided into an "inner zone'' where partial harvest is permitted consistent with achieving stand basal area requirements, and an outer zone where logging must generally leave at least 20 conifers per acre, of 12 inches DBH or greater. For parcels of 20 contiguous acres or less, landowners with total parcel ownership of less than 80 forested acres are exempt from the riparian buffer requirements described above; less stringent rules apply to those parcels.

While it has been noted that the Washington State Forest Practice Rules do not specifically address the fisher and its habitat requirements, some habitat components important to the fisher, like snags, canopy cover, *etc.*, are likely to be retained as a result of the rules.

Oregon

In Oregon, two final forest management plans for state forests in northwest and southwest Oregon were approved by the Oregon Board of Forestry in January 2001: the Northwest Oregon State Forests Plan and the Southwest Oregon State Forests Plan. The Elliott State Forest Management Plan was approved in 1994 and the Elliott State Forest Habitat Conservation Plan for northern spotted owls and marbled murrelets was approved in 1995, however, both the management plan and HCP are now being revised. Additionally, Oregon has proposed to develop the Western Oregon State

Forests Habitat Conservation Plan for threatened and endangered species and other species of concern on western Oregon state forests in 2004–2005.

The management plans for Oregon's State Forests generally appear to be of little benefit to the fisher. The 18,074 ac (73 km^2) of State forest lands in the Southwest Oregon State Forests Plan area consists of generally small parcels that range in size from 40 ac to 3,500 ac (0.16 km^2 to 14 km^2) and are widely scattered. There are no specific measures for or mention of the fisher in the plan. The Northwest Oregon State Forests Management Plan provides management direction for 615,680 ac (2,491 km^2) of state forest land, located in twelve northwest Oregon counties, but has no specific provisions for fishers. Both plans include provisions to protect some forest reserves, but these are not likely to benefit the fisher because of the fragmented nature of the lands. In Oregon, the fisher is designated a protected non-game species, and is listed as a "Sensitive Species—Critical Category.'' The Oregon Department of Fish and Wildlife (ODFW) does not allow take of fisher in Oregon, but some fishers may be injured and killed by traps set for other species. Training and testing is required of applicants for trapping licenses in order to minimize the potential take of non-target species such as fisher.

The Oregon Department of Forestry (ODF) implements the Forest Practice Administrative Rules and Forest Practices Act (ODF 2000). Interim procedures (section 629–605–0180, Oregon Forest Practice Rules) exist for protecting sensitive resource sites on all State, county, and private lands in Oregon. These procedures apply only to threatened and endangered species, and to bird species listed as "sensitive'' in the rules, and currently do not apply to the fisher. Prior approval from the State Forester is also required before operating near or within critical wildlife habitat sites (629–605–0190), including habitat of species classified by ODFW as threatened or endangered, or any federally listed species, but fisher does not currently benefit from this status.

Although Oregon's rules governing forest management on State, county and private lands do not directly protect the fisher or its habitat, the rules may provide some fisher habitat elements. In clearcut harvest units that exceed 25 ac (10 ha), operations must retain two snags or two green trees, and two downed logs per acre. Green trees must be over 11 in (28 cm) DBH and 30 ft (9m) in height, and down logs must be over 6 feet long and 10 cubic feet in volume. Riparian management areas (RMAs) provide for vegetation retention along fish-bearing (Type F) and domestic-use streams without fish (Type D), in a band of 20 to 100 ft (6 to 30 m) width, depending on stream size and type. In general, RMAs for fish-bearing and domestic-use streams require no tree harvesting within 20 ft (6 m) of the stream, and, within the entire RMA, retention of a minimum basal area of conifer trees (40 trees per 1000 ft of stream for thinning operations). Along fish-bearing streams, the RMAs are intended to become similar to mature streamside stands, dominated by conifers; streams lacking fish will have sufficient streamside vegetation to support the functions and processes important to downstream fisheries, domestic water use, and wildlife habitat. Similar guidelines retain vegetation around wetlands, lakes, seeps and springs. No RMA is required for streams that do not provide for domestic water use or bear fish, for small wetlands, or for lakes 0.5 ac (.2 ha) or less.

California

The State of California manages relatively little forested lands. California has eight Demonstration State Forests totaling 71,000 ac (287 km^2), of which less than 20,000 ac (81 km^2) are within the current range of the fisher. These forests are managed primarily to achieve maximum sustained production of forest products, not for late-successional characteristics, and appear to provide little habitat for the fisher. California has about 270 State Park units and 1.3 million ac (5260 km^2), which are mostly outside the historic range of the fisher and appear to provide little habitat for fishers. The largest state park in the fisher's historic range, Humboldt Redwoods State Park, includes about 53,000 ac (214 km^2) in southern Humboldt County and has a Preliminary General Plan (June 2001) with a stated goal of protecting California species of concern. Although it does not include specific measures for fisher management, the general emphasis on retention of some habitat components (snags, canopy cover, *etc.*) will provide incidental benefits to the fisher.

The State of California classifies the fisher as a furbearing mammal that is protected from commercial harvest, which provides protection to the fisher in the form of minor fines for illegal trapping; trapping is discussed further under Factor B. The fisher is not listed under the California Endangered Species Act or as a State "fully protected'' species and thus does not receive protections available under those statutory provisions. The California Department of Fish and Game (CDFG) has identified the fisher as a Species of Special Concern (CDFG 1986). This status is applied to animals not listed under the Federal or the State endangered species acts, but judged vulnerable to extinction.

The California Environmental Quality Act (CEQA) requires disclosure of potential environmental impacts of public or private projects carried out or authorized by all non-Federal agencies in California. CEQA guidelines require a finding of significance if the project has the potential to "reduce the number or restrict the range of an endangered, rare or threatened species'' (CEQA Guidelines 15065). The lead agency can either require mitigation for unavoidable significant effects, or decide that overriding considerations make mitigation infeasible (CEQA 21002), although such overrides are rare. CEQA can provide protections for a species that, although not listed as threatened or endangered, meet one of several criteria for rarity (CEQA 15380).

Regulatory Mechanisms for Private and State Timberlands

In California, logging activities on commercial (private and State) forestlands are regulated through a process that is separate from but parallel to CEQA. Under CEQA provisions, the State has established an independent regulatory program to oversee timber management activities on commercial forestlands, under the Z'berg-Nejedly Forest Practice Act of 1973 and the California Forest Practice Rules (FPRs) (CDF 2003). The California FPRs are administered by the California Department of Forestry and Fire Protection (CDF), and apply to commercial harvesting operation for non-Federal, non-Tribal landowners of all sizes.

While the FPRs may incidentally protect some habitat or habitat elements used by the fisher, the rules do not require fisher surveys, protection of fisher or fisher den sites, or a mechanism for identifying individual or cumulative impacts to the fisher or its habitat.

The California FPRs provide specific, enforceable protections for species listed as threatened or endangered under CESA or the ESA, and for species identified by the California Board of Forestry as "sensitive species'' (CDF 2003); however, the fisher is not currently on any of these lists. The FPRs also include intent language about reducing significant impacts to non-listed species (FPR § 919.4, 939.4, 959.4) and maintaining functional wildlife habitat (FPR § 897(b)(1)), however,

implementation of these measures to provide protection to the fisher is not documented or tracked.

Some California FPR provisions could incidentally contribute to protection of important elements of fisher habitat, such as late seral forests and snags, downed wood, and large live trees containing the structural attributes that are used by fishers for resting and denning sites and contribute to the diversity and abundance of prey species. These are discussed below.

While the California FPRs generally require that snags within a logged area be retained to provide wildlife habitat, they also allow exceptions to this requirement. The FPRs do not require the retention of downed woody material, decadent or other large trees with structural features such as platforms, cavities, and basal hollows, which appear to be important components of fisher habitat. Some timber operations, such as salvage, fuelwood harvest, powerline right-of-way clearing, and fire hazard reduction are exempt from timber harvest plan preparation and submission requirements. In 2002, new rules were passed that prohibit the harvest of large old trees under exemptions, although harvest is still allowed in cases of safety, building construction, or when the tree is dead or will be dead within the year. Overall retention of habitat features important to fishers does occur to some degree but is specific to fishers.

California's FPRs provide for disclosure of impacts to late successional forest stands, in some cases. The rules require that information about late successional stands be included in a timber harvest plan when late successional stands over 20 ac (8 ha) in size are proposed for harvesting and such harvest will "significantly reduce the amount and distribution of late succession forest stands'' (FPR § 919.16, 939.16, 959.16). If the harvest is found to be "significant,'' FPR § 919.16 requires mitigation of impacts where it is feasible. In practice, such a finding during plan review can be challenged by the landowner.

The California FPRs require retention of trees within riparian buffers to maintain a minimum canopy cover, dependent on stream classification and slope. The rules currently mandate retention of large trees in watersheds identified as having "threatened or impaired'' values (watersheds with listed anadromous fish). For Class I (fish-bearing) streams, the 10 largest conifer trees per 330 ft (133 m) of stream channel must be retained along qualifying watercourses. These trees are retained within the first 50 ft (15 m) of permanent woody vegetation measured out from the stream channel; this provides about 26 trees per acre within that zone. The threatened and impaired provision applies to many streams within the fisher's range in northern California, but not to most of the Sierra Nevada nor to most of the upper Trinity River basin (where fishers still occur), and is set to expire in 3 years. Where applied, the threatened and impaired rules should result in the retention of some large trees of value to fishers, but the value may be limited, as it applies to only a small part of any affected watershed and in a fragmentary pattern. Averaged over the landscape, the measure provides on average less than one retained tree per forested acre in qualifying watersheds, based on an evaluation of a sample of timber harvest plans (Scott Osborn, CDFG, pers. comm. 2003). Over time, the retained trees may develop late seral and decadent characteristics, but this is likely to take place over time scales of decades and centuries.

Outside of "threatened and impaired'' watersheds, watercourse protection measures are limited. Class I streams must retain at least 50 percent of the overstory and 50 percent of the understory. No minimum canopy closure requirements are specified for Class II and Class III streams. Harvest plans are required to leave 50 percent of the existing total canopy including understory, and provide no protection for large trees or other late-seral habitat elements.

Regulations Providing Protections for Other Listed Species

Regulatory protections for habitat of the federally-listed northern spotted owl, marbled murrelet, and anadromous salmonids may provide some elements that benefit the fisher, but because these protections are not implemented consistent with specific life history requirements of the fisher (wide ranging, avoids open areas, *etc.*), these measures may be of limited conservation value for fishers. For example, fishers are likely to require larger habitat blocks in contiguous spacing (Lewis and Stinson 1998). Finally, a large part of the current and historic west coast range of the fisher is outside the range of the listed owl, murrelet and salmonids.

Regulatory Mechanisms for Private and State Timberlands

In California, logging activities on commercial (private and State) forestlands are regulated through a process that is separate from but parallel to CEQA. Under CEQA provisions, the State has established an independent regulatory program to oversee timber management activities on commercial forestlands, under the Z'berg-Nejedly Forest Practice Act of 1973 and the California Forest Practice Rules (FPRs) (CDF 2003). The California FPRs are administered by the California Department of Forestry and Fire Protection (CDF), and apply to commercial harvesting operation for non-Federal, non-Tribal landowners of all sizes.

Based on the best available information on fisher habitat, fishers can use areas of younger (non-old-growth) forest, but the presence of late seral elements within those forests is important in providing resting/denning sites and adding to increased foraging opportunities and prey base.

The California FPRs provide specific, enforceable protections for species listed as threatened or endangered under CESA or the ESA, and for species identified by the California Board of Forestry as "sensitive species'' (CDF 2003); however, the fisher is not currently on any of these lists. The FPRs also include intent language about reducing significant impacts to non-listed species (FPR § 919.4, 939.4, 959.4) and maintaining functional wildlife habitat (FPR § 897(b)(1)). However, this language has not been effective in securing protections for the species, due to the lack of specific enforceable measures in the rules. Moreover, FPR language (§ 1037.5(f)) makes it difficult for CDF to adopt mitigation measures above those specified in the California FPRs, unless the landowner agrees to them. In comments to CDF on timber harvest plans in northwestern California, CDFG has raised concerns regarding adverse effects on fishers and other species associated with the loss of late seral habitat elements and has recommended retention of such elements. These efforts have generally not been successful in effecting mitigation measures for the fisher and other late-seral species (Ken Moore, CDFG, Yreka, pers. comm., 2003; Scott Osborn, CDFG, pers. comm., 2003).

Some California FPR provisions could incidentally contribute to protection of important elements of fisher habitat, such as late seral forests and snags, downed wood, and large live trees containing the structural attributes that are used by fishers for resting and denning sites and contribute to the diversity and abundance of prey species. These are discussed below.

While the California FPRs generally require that all snags within a logged area be retained to provide wildlife habitat, they also allow broad

discretionary exceptions to this requirement, which greatly reduce the effectiveness of the snag retention requirement. The FPRs do not require the retention of downed woody material, making retention of these structural elements voluntary. Similarly, the California FPRs do not contain enforceable and/or effective measures for protection of decadent or other large trees with structural features such as platforms, cavities, and basal hollows, which appear to be important components of fisher habitat. Some timber operations, such as salvage, fuelwood harvest, powerline right-of-way clearing, and fire hazard reduction are exempt from timber harvest plan preparation and submission requirements. CDF considers applications for exemptions as ministerial in nature, and therefore exemptions receive minimal review by CDF. In 2002, new rules were passed that prohibit the harvest of large old trees under exemptions, although harvest is still allowed in cases of safety, building construction, or when the tree is dead or will be dead within the year.

California's FPRs provide for disclosure of impacts to late successional forest stands, in some cases. The rules require that information about late successional stands be included in a timber harvest plan when late successional stands over 20 ac (8 ha) in size are proposed for harvesting and such harvest will "significantly reduce the amount and distribution of late succession forest stands'' (FPR § 919.16, 939.16, 959.16). If the harvest is found to be "significant,'' FPR § 919.16 requires mitigation of impacts where it is feasible. In practice, such a finding during plan review is very rare and likely to be challenged by the landowner. Also, few proposed harvests trigger the late successional analysis because very little forest on commercial timberlands meets the definition of late successional forest, due to past logging history (Curt Babcock, CDFG, pers. comm. 2003).

The California FPRs require retention of trees within riparian buffers to maintain a minimum canopy cover, dependent on stream classification and slope. The FPR prescriptions are not designed or intended to protect late seral habitat, but this may occur at times. The rules currently mandate retention of large trees in watersheds identified as having "threatened or impaired'' values (watersheds with listed anadromous fish). For Class I (fish-bearing) streams, the 10 largest conifer trees per 330 ft (133 m) of stream channel must be retained along qualifying watercourses. These trees are retained within the first 50 ft (15 m) of permanent woody vegetation measured out from the stream channel; this provides about 26 trees per acre within that zone. There are no additional protection measures required for non-fish-bearing streams (classes II and III) within "threatened or impaired'' watersheds. The threatened and impaired provision applies to many streams within the fisher's range in northern California, but not to most of the Sierra Nevada nor to most of the upper Trinity River basin (where fishers still occur), and is set to expire in 3 years. Where applied, the threatened and impaired rules should result in the retention of some large trees of value to fishers, although the protective value is limited, as it applies to only a small part of any affected watershed and in a fragmentary pattern. Averaged over the landscape, the measure provides on average less than one retained tree per forested acre in qualifying watersheds, based on an evaluation of a sample of timber harvest plans (Scott Osborn, CDFG, pers. comm. 2003), and on Arcata FWO calculations on watercourse density on commercial timberland ownerships in northwestern California. Also, in many watersheds, few large trees remain along watercourses, thus most of the trees retained under this measure are likely to be of a size and age that provide little current value as late seral elements commonly used by fishers. Over time, the retained trees may develop late seral and decadent characteristics, but this is likely to take place over time scales of decades and centuries.

Outside of "threatened and impaired'' watersheds, watercourse protection measures are limited. Class I streams must retain at least 50 percent of the overstory and 50 percent of the understory. No minimum canopy closure requirements are specified for Class II and Class III streams. Harvest plans are required to leave 50 percent of the existing total canopy including understory, and provide no protection for large trees or other late-seral habitat elements.

Habitat Conservation Plans (HCPs)

Some non-Federal lands are managed under HCPs with strategies that conserve habitat. These HCPs may provide some incidental benefit to fishers and some have fisher-specific protection measures. Habitat conservation plans cover large areas within the historic range of the fisher, particularly in western Washington and northwestern California. Although the fisher is a covered species in seven HCPs within Washington and California, the species is currently known to be present only on lands under two California HCPs. In most HCPs, the areas where late successional habitat will be protected or allowed to develop are mostly in riparian buffers and smaller blocks of remnant old forest. The HCP conservation strategies generally do not provide the large blocks of forest with late seral structure that appear to be important for sustaining resident fisher populations, particularly for providing denning and resting sites.

In conclusion, the primary threats are the loss and fragmentation of habitat and further decline and isolation of the remaining small populations. Any of the key elements of fisher habitat (*see* Habitat section) may be affected by Federal and State management activities. Reduction of any of these elements could pose a risk to the fishers. Activities under Federal regulatory control that result in fisher habitat fragmentation or population isolation pose a risk to the persistence of fishers. A large proportion of forests within the range of the West Coast DPS for the fisher are managed under the NWFP or SNFPA. These regional planning efforts provide for retention and recruitment of older forests, and provide for spatial distribution of this type of habitat that will benefit late successional forest dependent species such as the fisher. The adequacy of these plans, however is uncertain, as evidenced in the FEMAT's own assessment of fisher viability under the NWFP.

Proposed changes to both the NWFP and SNFPA are in progress, which could weaken habitat measures that benefit the fisher. Even with these plans in place, timber harvest, fuels reduction treatments, and road construction may continue to result in the loss of habitat and habitat connectivity in areas, resulting in a negative impact on fisher distribution, abundance and recovery/recolonization potential.

The same potential risks apply to non-Federal forested lands as discussed for lands under Federal regulatory control. Protections provided under state regulation of forest practices are less than provided on Federal lands, where the NWFP and SNFPA provide greater consideration of late-successional forest and dependent species, and of forest management at larger geographic scales. Existing regulatory processes for non-Federal, non-Tribal timberlands in California and Washington do not include specific measures for management and conservation of fishers or fisher habitat. Regulations regarding late successional forest rarely provide protection of these forests on

commercial timberlands. This is largely because the regulations lack specific and enforceable conservation measures for these forests, and for most unlisted wildlife species, including the fisher. While the State regulatory process for these lands in all three States incidentally protects some fisher habitat via the Forest Practice Rules, the benefits are limited and do not include strategies which target either the fisher or key fisher habitat requirements. Existing habitat conservation plans for non-Federal timberlands provide some additional benefits to the fisher. These plans are focused on providing some level of protection for the habitat of spotted owls, marbled murrelets, and listed salmonids, which can protect important habitat elements for the fisher where habitat overlaps. However, many of these plans only protect occupied habitat, and harvest deferrals may be lifted if the mature stands no longer support listed species. Thus, benefits to the fisher from these HCPs may be ephemeral, especially in the case of listed species decline, like that of the spotted owl population occurring in Washington. HCPs only apply to a small part of the fisher's currently occupied range on non-Federal lands in California and Oregon, and the adequacy of the measures in these plans is uncertain. Because of the loss and fragmentation of low-elevation habitat, large geographic areas that were once occupied have become unsuitable, which poses a significant challenge for fisher genetic exchange across isolated patches of habitat.

In addition to the inadequacy of regulations to address fisher habitat requirements, current trapping regulations in Washington, Oregon, and California, while prohibiting intentional trapping of fishers, do not provide accurate reporting of the numbers of incidental captures of fishers, and appear inadequate to control such incidental trapping where fishers are present. Any source of additional mortality in small fisher populations could prevent recovery or reoccupation of suitable habitat (Lewis and Stinson 1998; Lewis and Zielinksi 1996).

It is uncertain whether current regulations will be effective in reducing the level of threat to the fisher. We therefore believe that existing regulatory mechanisms are not sufficient to protect the DPS as a whole from the acknowledged habitat pressures discussed under Factors A and E.

Factor E. Other natural or manmade factors affecting the continued existence of the species. Fisher populations in the West Coast DPS are small and isolated and may be threatened by numerous factors including inbreeding depression and unpredictable variation (stochasticity) in demographic or environmental characteristics. Other natural or anthropogenically-influenced factors, including urban development, barriers to dispersal, contaminants, pest control programs, non-target poisoning, stand-replacing fire, timber harvest, accidental trapping in manmade structures, decrease in prey base, and climate change may cause additional fisher declines. Because of small population size, accidental death is a threat.

Other Causes of Mortality

There have been several incidents of fishers being found dead in open water tanks. The remains of eight fishers were discovered in an abandoned water tank near a logging road in the northwestern California Coast Ranges (Folliard 1997). The tank had been used to store water for transferring into tank trucks to spread on roads for dust abatement during summer months. The fishers had entered the cylindrical 13-foot-long, 7.5-foot-deep tank from a lidless, 1.5-foot opening in the top. Fisher remains were the only species found inside. It was apparent from the carcasses' different stages of decay that the fishers had been trapped over a period of several years. In another instance of a manmade structure trapping fishers, Truex *et al.* (1998) reported that a 5-year-old female fisher died in the southern Sierra Nevada study area due to a combination of starvation and exposure after becoming entrapped in an uncovered, empty water storage tank. This source of mortality is cause for concern.

Population Size and Isolation

Preliminary analyses indicate West Coast fisher populations, particularly in the southern Sierra, may be at significant risk of extinction because of small population size and factors consequent to small population size such as isolation, low reproductive capacity, demographic and environmental stochasticity. A scarcity of sightings in Washington, Oregon, and the northern and central Sierra Nevada of California suggests that fisher is extirpated from most of its historical range in Washington, Oregon, and California (Zielinski *et al.* 1997b; Carroll *et al.* 1999; Aubry *et al.* 2000). The southern Sierra Nevada and northern California/Oregon Siskiyou populations are the only naturally-occurring, known breeding populations of fishers in the Pacific region from southern British Columbia to California that we have been able to identify (Zielinski *et al.* 1997b).

The current rarity of fishers in Washington brings their continued existence there into question. Eleven years ago, Thomas *et al.* (1993) stated that existing fisher populations in northern Oregon and Washington were at a medium to high risk of extirpation on National Forest lands within the next 50 years. According to FEMAT (1993), it was unknown whether the individual fishers that may exist in Washington could repopulate the State in the future. Recovery of the fisher in Washington will probably not occur without reintroductions (Lewis and Stinson 1998). Immigration of fishers into Washington from British Columbia, Idaho, or Montana is unlikely to provide significant demographic support to Washington's fisher population; fisher populations in adjacent parts of Idaho and British Columbia are small, the number of dispersing individuals is probably very low (Heinemeyer 1993), and the geographical separation is large. Reintroductions have apparently been successful in some, but not all other parts of the fisher's national range.

The introduced population in the southern Cascades of Oregon is small and isolated. It stems from the release of 28 fishers from British Columbia between 1961 and 1980, and an additional release of 13 fishers from Minnesota in 1981 (Aubry *et al.* 2002; Drew *et al.* 2003). Aubry *et al.* (in press 2003) concluded, "The high degree of relatedness among fishers in the southern Cascade Range (R = .56) is consistent with the hypothesis that this population is small and isolated.'' This reintroduced population is separated from the northwestern California/southwestern Oregon population by large expanses of non-forested areas, an interstate highway (Interstate 5), recreational developments, and densely populated areas. The isolation of these populations from each other in Oregon is further demonstrated by evidence indicating that there has been no genetic exchange between fishers in the northern Siskiyou Mountains and those in the southern Cascade Range (Aubry *et al.* in press 2003). Small size and isolation make the Oregon populations vulnerable to extirpation.

Because of the apparent loss of viable fisher populations from most of Oregon and Washington, and the northern contraction in the British Columbia populations, fishers in California are reproductively isolated from fishers in the rest of North America. This isolation precludes both immigration and associated genetic interchange, increasing the vulnerability of the California/southern Oregon populations to the adverse effects of deterministic

and stochastic factors. Wisely *et al.* (in litt. 2003) documented that fishers in northern California already have lower genetic diversity than other populations in North America. Drew *et al.* (2003) cite evidence of genetic divergence between the California and British Columbia fisher populations; since becoming isolated, the California populations have lost a genetic haplotype still found in British Columbia fishers. The genetic divergence of California populations from each other and from British Columbia fishers could be associated with adaptation to local conditions, but is more likely the result of reduction of population numbers with habitat loss (Drew *et al.* 2003). Isolation makes it unlikely that in the event of population decline, immigration from other populations could temporarily augment the population, rescuing it from extinction.

Genetic studies using mitochondrial and nuclear DNA sequencing indicate that California populations, in particular, differ strongly in haplotype frequencies from each other and from all other populations (Drew *et al.* 2003). These results are consistent with the conclusions of Aubry and Lewis (2003) that native populations in California and the reintroduced population in southwestern Oregon have become isolated from the main body of the species' range due to the apparent extirpation of fishers in Washington and northern Oregon. According to Drew *et al.* (2003), their findings suggest that gene flow once occurred between fisher populations in British Columbia and those in the Pacific states, but extant populations in these regions are now genetically isolated. The southern Sierra Nevada population is geographically isolated from others by approximately 420 km (260 mi) (Zielinski *et al.* 1995, 1997b). There is a low probability that it could be rescued through migration of individuals from other populations were it to decline, since the distance to the nearest population is almost four times the species' maximum dispersal distance of 66 mi (107 km) as reported by York (1996). The unexpected magnitude of Pacific states fishers' genetic structure and lack of gene flow indicates that intermediate distances may represent evolutionarily important barriers to movement that can facilitate rapid genetic divergence (Wisely *et al.* in litt. 2003). Truex *et al.* (1998) concluded that, "Recolonization of the central and northern Sierra Nevada may be the only way to prevent fisher extinction in the isolated southern Sierra Nevada population.''

Indications that extant fisher populations are small in size include the apparent reduction in the range of the fisher on the west coast, the lack of detections or sightings over much of its historical distribution, and the apparently high degree of genetic relatedness within some populations. Small fisher population sizes are cause for concern, particularly considering that the West Coast populations are isolated from the larger continental populations and may have high female mortality (Truex *et al.* 1998). Small populations are at risk of extinction solely from demographic and environmental stochasticity, independent of deterministic factors such as anthropogenic habitat loss (Lande and Barrowclough 1987; Lande 1993). Random fluctuations in gender ratio, fecundity, mortality, droughts, cold weather, heavy snow years and other temporal environmental changes can lead to declines that, in small populations, result in rapid extinction. These factors present threats to the long-term survival of isolated populations such as the southern Sierra Nevada population (Lamberson *et al.* 2000). Catastrophes, such as stand-replacing fire or severe storms, magnify risk of extinction further (Shaffer 1987; Lande 1993).

According to Heinemeyer and Jones (1994), the greatest long-term risk to the fisher in the western United States is probably population extinction due to isolation of small populations. Fishers are known to be solitary and territorial with large home ranges. This results in low population densities as the population requires a large amount of quality habitat for survival and proliferation. Additionally, fishers are long-lived, have low reproductive rates, and small dispersal distances. Given the apparent reluctance of fishers to cross open areas (Coulter 1966; Kelly 1977; Powell 1977; Buck *et al.* 1994; Jones and Garton 1994), it is more difficult for fishers to locate and occupy distant, but suitable, habitat. These factors together imply that fishers are highly prone to localized extirpation, their colonizing ability is somewhat limited, and their populations are slow to recover from deleterious impacts. Isolated populations are therefore unlikely to persist.

Some fisher populations in northeastern North America have shown patterns of rapid density fluctuation consistent with those following cycles in prey numbers (deVos 1952; Rand 1944), or with changes expected for animals whose density-dependent feedback comes through changes in mortality rather than in reproduction, allowing them to recover into areas from which they had been extirpated. Western populations, however, do not appear to be recovering from early overtrapping and habitat degradation. Powell and Zielinski (1994) state:

> This pattern of rapid population increase has not been observed in western populations, many of which have failed to recover despite decades of protection from trapping (*e.g.*, northern Sierra Nevada, Olympic Peninsula), reintroductions (*e.g.*, Oregon), or both. Therefore, one or more major life requisites must be missing. Suitable habitat may be limited, colonization of suitable habitat may be limited due to habitat fragmentation, or some other factor or combination of factors may be involved.

Low fecundity retards the recovery of populations from declines, further increasing their vulnerability. As stated above, fishers have very low reproductive capacity. After 2 years of age, they generally produce only one to four kits per year, and only a portion of all females breed (Powell 1993; Truex *et al.* 1998; Lamberson *et al.* 2000). Truex *et al.* (1998) documented that of the females in the southern Sierra Nevada study area (one of three study areas that they analyzed in California), about 50 to 60 percent successfully gave birth to young. In the study area they analyzed on the North Coast, however, 73 percent of females gave birth to young in 1995, but only 14 percent (one of seven) did so in 1996, indicating fisher reproductive rates may fluctuate widely. Low survival rates for kits, coupled with low reproductive rates, would result in very low reproductive success rates. In their study on the west slope of the Cascade Range in southern Oregon, Aubry *et al.* (2002) radio-collared 13 females and monitored two to four adult females each year from 1995 to 2001. Although their data are preliminary at this point, they found that the average annual reproductive success was only 44 percent.

Female survival has been shown to be the most important single demographic parameter determining fisher population stability (Truex *et al.* 1998; Lamberson *et al.* 2000). Truex *et al.* (1998) documented a low annual survival rate, pooled across years, of 61.2 percent of adult female fishers in the southern Sierra Nevada from 1994 to 1996, 72.9 percent for females and 85.5 percent for males in their eastern Klamath study area, and 83.8 percent for both females and males in their North Coast study area. Addressing the southern Sierra Nevada population, Truex *et al.* (1998) conclude that, "High annual mortality rates raise concerns about the long-term viability of this population.'' Lamberson *et al.* (2000) used a model (deterministic, Leslie stage-based matrix) to gauge risk of

extinction for the southern Sierra Nevada population of the fisher and found that the population has a very high likelihood of extinction given reasonable assumptions with respect to demographic parameters. They concluded, "In our model population, growth only occurs when parameter combinations are extremely optimistic and likely unrealistic: if female survival and fecundity are high, other parameters can be relaxed to medium or low values. If female survival and fecundity are medium and all other parameters high, a steady decline toward extinction occurs.''

As with any small, isolated population, risks of extinction are enhanced by stochastic factors (Lamberson *et al.* 2000). Demographic stochasticity, the chance events associated with annual survival and reproduction, and environmental stochasticity, temporal fluctuations in environmental conditions, tend to reduce population persistence (Shaffer 1981; Boyce 1992). Habitat specificity coupled with human-induced habitat fragmentation may also contribute to the exceptionally low levels of gene flow (migrants per generation) estimated among populations of fishers (Wisely *et al.* in litt. 2003). Wisely *et al.* (in litt. 2003) found that populations of the fisher exhibit high genetic structure (FST = 0.45, SE = 0.07) and limited gene flow (Nm < 1) within their 994 mi (1,600 km) long peninsular distribution down through Washington, Oregon, and California. They state concerns about the future viability of the western fisher: * * * we found that * * * genetic diversity decreases from the base [British Columbia] to the tip [southern Sierra Nevada] of the peninsula, and that populations do not show an equilibrium pattern of isolation-by-distance. Genetic structure was greater at the periphery than at the core of the distribution and our data fit a one-dimensional model of stepping-stone range expansion. Multiple lines of paleontological and genetic evidence suggest that the fisher recently (<5000 ybp) expanded into the mountain forests of the Pacific coast. The reduced dimensionality of the distribution of the fisher in the West appears to have contributed to the high levels of structure and decreasing diversity from north to south. These effects were likely exacerbated by human-caused changes to the environment. The low genetic diversity and high genetic structure of populations in the southern Sierra Nevada suggest that populations in this part of the geographic range are vulnerable to extinction.

It is difficult for subpopulations to rescue each other when distributed in such a narrow, linear fashion north-south peninsular distribution. Even isolated from other threats, the north-south peninsular distribution of fishers in the Sierra Nevada is a risk factor for the southern Sierra Nevada population. Being at the southernmost extent of the genus' distribution, the population already exists at the edge of environmental tolerances. The loss of remaining genetic diversity may lead to inbreeding and inbreeding depression. Given the recent evidence for elevated extinction rates of inbred populations, inbreeding may be a greater general threat to population persistence than is generally recognized (Vucetich and Waite 1999).

Combinations of factors can interact to produce significant cumulative risk. Lamberson *et al.* (2000) give the following example: if demographic stochasticity results in lower than average recruitment of female kits into a population for three consecutive years, and this is followed by two heavy-snow winters and one large fire, the population may quickly become in jeopardy of local extinction. Wisely and others (in litt. 2003) "have demonstrated isolation among populations with limited exchange suggesting that populations on the Pacific coast have little demographic buffer from variation in the population growth rate. Immediate conservation action may be needed to limit further erosion of the unique genetic architecture found in this one-dimensional metapopulation.''

In summary, unregulated trapping for furs began in the 1700s; predator bounties began in the 1800s and extended to 1960; extensive, lethal predator control programs were used until the mid-1970s. These factors have likely impacted fishers for nearly two centuries and were exacerbated by loss and fragmentation of habitat from urban growth and development, forest management activities, and road construction. The remaining two populations are threatened with extirpation due to their size and isolation. There is substantial information indicating that the interaction of all the factors above may cause the populations of fishers in their west coast range to become significantly at risk of extirpation.

Conservation Activities

This fiscal year, the Pacific Region (Region 5) of the U.S. Forest Service is due to complete a conservation assessment for the fisher in the Sierra Nevada Mountains. This effort is part of the Sierra Nevada Framework planning document and is a collaborative effort including scientists from the State and Federal agencies. The assessment may be used to develop a conservation strategy for the Sierra Nevada fisher populations in California.

The timber industry and their representatives, including Sierra Pacific Industries, Simpson Timber Company and the California Forestry Association have indicated willingness to develop a conservation strategy to, if appropriate, conduct a reintroduction and/or relocation strategy in California. Their participation could include funding, staffing, and assistance with analysis and planning.

The State of Washington has completed a reintroduction feasibility study and has identified several sites in the Washington Cascades and the Olympic peninsula where sufficient potential habitat exists to support a fisher population. Reintroduction efforts and evaluation by the State are ongoing and would potentially compliment efforts to establish additional populations throughout the range of the fisher.

Finding

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species. We reviewed the petition, available published and unpublished scientific and commercial information, and information submitted to us during the public comment period following our 90-day petition finding. This finding reflects and incorporates information we received during the public comment period and responds to significant issues. We also consulted with recognized fisher experts and Federal and State resource agencies. On the basis of this review, we find that the West Coast population of the fisher constitutes a valid DPS, which is both discrete and significant under our DPS policy, and that listing the fisher in its west coast range is warranted but precluded by pending proposals for other species with higher listing priorities.

In making this finding, we recognize that there have been declines in the distribution and abundance of the fisher in its west coast range, primarily attributed to historical overtrapping and habitat alteration. Much of the fisher's historical habitat and range has been lost. There is substantial information indicating that the habitat of fishers continues to be threatened with further loss and fragmentation resulting in a negative impact on fisher distribution and abundance. Mortalities and injuries

from incidental captures of fishers may be frequent enough to prevent local recovery of populations, or prevent the re-occupation of suitable habitat. Removing important habitat elements such as cover could allow predation to become a significant threat. Other factors considered to be threats to the fisher include mortality from vehicle collisions, a decrease in the prey base, and increased human disturbance. Fisher populations are low or absent throughout most of their historical range in Washington, Oregon, and California. Because of small population sizes and isolation, fisher populations on the West Coast may be in danger of extirpation.

Federal, State, and private land management activities may affect key elements of fisher habitat; reduction of any of these key habitat elements could pose a risk to the fisher. Current regulations provide insufficient certainty that conservation efforts will be implemented or that they will be effective in reducing the level of threat to the fisher. We, therefore, believe that existing regulatory mechanisms are not sufficient to protect the DPS as a whole from habitat pressures.

We conclude that the overall magnitude of threats to the West Coast DPS of the fisher is high, and that the overall immediacy of these threats is non-imminent. Pursuant to our Listing Priority System (64 FR 7114), a DPS of a species for which threats are high and non-imminent is assigned a Listing Priority Number of 6. The threats occur across the range of the DPS resulting in a negative impact on fisher distribution and abundance. The threats are non-imminent as the greatest long-term risks to the fisher in its west coast range are the subsequent ramifications of the isolation of few, small populations. While we conclude that listing the West Coast DPS of the fisher is warranted, an immediate proposal to list is precluded by other higher priority listing actions. During Fiscal Year 2004 we must spend nearly all of our Listing Program funding to comply with listing actions required by court orders and judicially approved settlement agreements, which are now our highest priority actions. To the extent that we have discretionary funds, we will give priority to using them to address emergency listings and listing actions for other species with a higher priority. We expect that our discretionary listing activity in Fiscal Year 2004 will focus on addressing our highest priority listing actions.

There are currently efforts underway to implement a conservation strategy to reintroduce the fisher into its former range along the Pacific Coast. Additional populations of fishers will reduce the probability that a stochastic event would result in extirpation of these species. We will evaluate a completed conservation strategy in accordance with our Policy on Evaluating Conservation Efforts (68 FR 15100, March 28 2003) to determine whether it sufficiently removes threats to the fisher so that it no longer meets the definition of threatened under the Act.

We will add the West Coast DPS of the fisher to the list of candidate species upon publication of this notice of 12-month finding. We request that you submit any new information, whenever it becomes available, for this species concerning status and threats. This information will help us monitor and encourage the conservation of this species. Should an emergency situation develop with this or any of the candidate species, we will act to provide immediate protection, if warranted.

We intend that any proposed listing action for the West Coast DPS of the fisher will be as accurate as possible. Therefore, we will continue to accept additional information and comments from all concerned governmental agencies, the scientific community, industry, or any other interested party concerning this finding.

References Cited

A complete list of all references cited is available on request from the Sacramento Fish and Wildlife Office (see **ADDRESSES** section, above).

Author(s)

The primary author of this document is the Sacramento Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT** section).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: April 2, 2004.

Steve Williams,

Director, Fish and Wildlife Service.

[FR Doc. 04–7941 Filed 4–7–04; 8:45 am]

BILLING CODE 4310–55–P

Attachment 2. Historic distribution of fishers, additional information

Powell 1979

> During the past century, fisher populations have been reduced to near extermination in the U.S. by overtrapping and habitat destruction due to logging. A few populations of fishers have since recovered due to protection, habitat recovery, and man-assisted reintroductions. (p. 149)

Douglas and Strickland, 1987

> By the early 1900s, particularly in the southern part of their original range, the removal of forests through logging, fire, and settlement reduced the fisher's occurence. This habitat loss, along with trapping and the use of strychnine as a harvest and predator control method, severely reduced or eliminated fishers from much of their readily accessible range. Protective legislation, habitat improvement, and reintroductions into areas where the species had been extirpated have since resulted in the restoration of viable fisher populations throughout much of their primordial range. (p. 512)

Powell and Zielinski 1994

> At the same time that fishers were heavily trapped, their habitat was being destroyed... Either trapping or habitat destruction by itself could have dramatically reduced fisher populations; together, their effect was extreme. During the 1930's, remnant fisher populations in the United States could be found only on the Moosehead Plateau of Maine, in the White Mountains of New Hampshire, in the Adirondack Mountains in New York, in the "Big Bog" area of Minnesota, and in the Pacific States. (p. 41)

IDFG 1995

> Generally, fisher populations have not markedly recovered from population reductions in the western habitats. Populations of fisher have remained at low numbers or are absent throughout much of their historical range in Washington, Oregon, California, Idaho, and Montana. The fisher population in British Columbia has also been at low numbers (Banci, pers. comm.). In the western United States, fishers appear most common in the southern Sierra Nevada of California, in northwestern California, in northern Idaho, and northwestern Montana. (p. 4)

Zielinski et al. 1995

> 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. (p. 104)

Williams et al. 2000

> During the early 1900s, extensive unregulated logging and trapping caused drastic population declines and widespread extirpation of fishers throughout much of the United States... As a result, the only remaining viable populations of fishers in the United States occurred as remnants in remote regions. (p. 896)

Vinkey 2003

> The historic distribution of fisher in the northern Rockies is poorly understood. Weckworth and Wright (1968) stated that fishers were present historically, but were extirpated by the 1920s.

It is difficult to establish the historic distribution of fisher in Montana, but the lack of historic records and the genetic distinctiveness of native animals may indicate that fisher were never widespread and have been isolated from Canadian populations for a long time. (91, emphasis added)

Attachment 3, Fisher distribution in Montana

Weckwerth and Wright 1968

> Thirty-six live fishers (*Martes pennanti*), caught in central British Columbia, were released at three sites in western Montana in 1959 and 1960 in an effort to reestablish the species where it had been extirpated. Seven of these animals were recaptured at various intervals as long as 73 months after release. Analysis of the carcasses showed evidence of normal reproduction. Fourteen untagged animals, which probably represent progeny of the transplanted animals, have also been caught. Tentatively, it appears that at least one of the transplants was successful. (p. 977)

Johnson 1996

> History of Fisher in Montana: Historically, fishers range extended throughout the mountainous portions of Montana. Unregulated trapping and habitat destruction during the 19th and 20th centuries significantly reduced fisher populations throughout the west. During the 1950's the Montana Department of Fish and Game conducted statewide furbearer surveys and was unable to authenticate any fisher sightings or captures in the state since the 1920's. In 1959, nine fishers were transplanted from Central British Columbia to the Pine Creek Drainage in Lincoln County, Montana. An additional release of 15 fisher was made at Holland Lake in Missoula County and in 1960, 12 fisher were released at Moose Lake, Granite County, Montana. Based on the incidental trapping of fisher in sets for other species, Weckwerth and Wright believed that the releases at Pink Creek and Holland Lake had been most successful. Fisher trapping was closed in Montana until the 1983-84 trapping season, when a quota of 20 animals was placed on the harvest. Another fisher transplant was conducted between 1988 and 1991, when 110 animals from Minnesota and Wisconsin were released in the Cabinet Mountains of the Kootenai National Forest. (p. 2)

Vinkey 2003

> [**Fisher introductions**]
> The current range of fishers in Montana has been influenced by three state-led introduction efforts in the region—one in Idaho (Williams 1962) and two in Montana (Weckworth and Wright 1968, Roy 1991, Heinemeyer 1993). On the basis of fur returns, Weckworth and Wright (1968) concluded that the translocation of 36 fishers from British Columbia to three Montana ranges: the Pintler, Swan, and Purcell during 1959 and 1960 resulted in successful reproduction. Between January of 1989 and March of 1990, Roy (1991) moved 32 fishers from Minnesota into the Cabinet Mountains of northwestern Montana. Heinemeyer (1993) continued this translocation effort with the release of 78 Wisconsin animals during the next year and a half. Monitoring of the Cabinet introduction ceased in 1991 and the ultimate success of the effort is unknown. (9)
>
> Two introduction efforts have occurred in Montana. Thirty-six fishers from central British Columbia were released at three sites in western Montana between 1959 and 1960 (Hawley 1959, Hawley 1960). Weckwerth and Wright (1968) noted that both marked and unmarked individuals were trapped in the vicinity of the releases subsequent to the translocation. On the basis of these returns, they concluded that at least one transplant was successful. Between 1989 and 1991, 110 fishers were live-trapped in Minnesota and Wisconsin, transported to Montana, and released in a

cooperative effort between the Montana Department of Fish, Wildlife & Parks, the University of Montana, and the Kootenai National Forest (Aderhold 1988, Foresman 2001). Many of these animals perished after their release, but Roy (1991) found evidence of reproduction and Heinemeyer (1993) observed that some individuals established home ranges. The translocation succeeded in establishing a small population of fisher in the region (Chapter 1, this thesis). (46-47)

The timing, proximity, and quantity of fishers trapped from 1960 to 1989, strongly suggests that the 1960s transplants were successful. Twenty-one fishers, seven tagged and 14 untagged, were harvested from 1960 to 1968 (Hawley 1968). An additional 122 verified fisher records exist from 1968 to 1989. (57-58)

[**Current range, Cabinet Mountains**]

Most marten, fisher and wolverine detections occurred in the West Cabinets, suggesting that this area encompasses important carnivore habitat with a high conservation value. (24)

Our survey data in tandem with harvest, tracking, and sighting records (Figure 5) show that the Cabinet region provides most of the verified records of fishers in northwestern Montana. Fisher records are clustered around the Cabinet translocation and in the Whitefish range approximately 20 km northeast of Pink Creek where nine fishers from British Columbia were released in 1959 (Newby and Hawley 1959). The proximity of records, in space and time, to the release sites demonstrates that translocations into northwestern Montana have shaped extant populations.(29)

Prior to 1991 there were no verified records of fisher in the Cabinets study area, but shortly after the release a pulse of captures began that continues to the present (Figure 6). Montana Fish, Wildlife, and Parks records 24 fishers harvested in northwestern Montana since 1991, all of these animals, except for two dispersers from translocations, came from the Cabinet region. (30)

[**Current range, Montana**]

We collected all available records pertaining to the species' distribution in the state to compare the geographic extent of fisher in Montana prior to and following translocation efforts. Information was derived from existing databases, publications, reports, unpublished documents, agency files, and notes. Both 'historic' records, which we define as records prior to the introduction of fisher in 1959, and contemporary records (1968-2003) were gathered. Because Weckwerth and Wright (1968) reported data on fisher distribution for the period 1960-1968, we elected to not include these already published records in our dataset. Our dataset begins in 1968. (48)

Occurrence data document fisher along the western fringe of the state- throughout the Bitterroot range, as far north as the Purcell range, and from south of Roger's Pass to the northern end of the Whitefish range. A juvenile male fisher was harvested just outside of Glacier National Park to the north of Two Medicine Lake on January 27, 1989. (52)

Unverified records from Glacier include 64 tracks and 5 sightings from within the Park's boundaries. A remotely triggered camera photographed a fisher in the Beartooths near Republic Creek on January 9, 1995 (Gehman 1995). Snow track

surveys by Gehman and Robinson (2000) document fisher within Yellowstone National Park (n=12) and on the Gallatin National Forest (n=10). (52)

The Bitterroot region possesses the most verified records both before and after 1989, and appears to be the stronghold of fisher populations in Montana. (57, emphasis added, here and thereafter)

Oddly, there are few verified records of fisher in the Mission/Swan, Sapphire, or Whitefish range after 1989. This may reflect sampling effort, perhaps there are fewer trappers in these areas now, or actual distribution. Recently established populations may have vanished as a result of habitat alteration, direct mortality, random demographic and environmental events, or a combination of these factors. In the Mission/Swan there is some evidence to suggest that extensive logging and/or trapping may have adversely impacted the population. Twenty-six fishers were harvested in the area prior to 1989, but only three have been taken since 1989. Researchers conducting snow track surveys in the valley since 1998 found fisher tracks on only five percent of their transects (Parker 2003). (58)

Based on our research, it is apparent that occupied fisher habitat is considerably more limited than potential habitat as outlined by previous researchers (Hagmeier 1956, Heinemeyer and Jones 1994, Hart et al. 1998). These authors suggest that fishers inhabit (or have the potential to inhabit) a relatively uniform band of forested habitat throughout western Montana, but neither fisher habitat nor distribution is continuous across the western portion of the state. The contemporary distribution of fisher in Montana has been shaped by the availability of quality habitat (closed canopy mature coniferous forest- Buskirk and Powell 1994), the history of translocations, and by the presence of remnant populations (Chapter 3, this thesis)". (60)

Multiple, recent verified occurrence records indicate that fishers occupy the Bitterroot, Coeur D'Alene, Mission, Swan, Cabinet, and Whitefish ranges. A handful of verified records exist in the Sapphires, Purcells, Garnets, Flathead range, on Glacier's East front, along the Continental Divide near Lincoln, and on the Beartooth Plateau, but we are unable to verify the presence of self-sustaining populations in these areas. Fisher presence in the Pioneers, the Gallatin, and Madison ranges has not been confirmed and we found no credible records in the dry forests of the Rocky Mountain Front, the Salish, or Flint mountains. (60-61)

Fishers occur in many mountain ranges in the western part of the state and possibly within the Greater Yellowstone Ecosystem. Populations appear to be descended from introduction efforts, but there is also evidence of a distinct, remnant population in the west-central part of the state. (91)

Translocations from British Columbia and the upper Midwest have been successful in establishing fisher in some locales, but fishers remain scarce in the state. Occurrence records are associated with releases at Moose Lake, Holland Lake, Pink Creek, and in the Cabinets; however, it is unclear if introductions in these localities will persist in the longterm. There are few records from the Sapphires, the Mission/Swan, or Whitefish Range in the last decade, and survey work in the Cabinets suggests that the population there is very limited. The apparent stronghold of fisher populations in Montana is on the border with Idaho in the Bitterroot Mountains. Analysis of mtDNA haplotypes suggests that this population is

descended from British Columbia transplants to Idaho's Selway-Bitterroot Wilderness and from remnant native populations. (91, emphasis added)

Attachment 4, Fisher population densities

Heinemeyer 1994

> [I]t will be assumed that refugia within core populations should support at least 14 adult females and 7 adult males. Within the Northern Rocky physiographic region, this size is estimated to be 600 km2. (p. 33)

IDFG 1995

> The reduction of habitat quality and connectivity due to natural or anthropogenic factors may result in larger spatial requirements of individual fishers, and an overall decrease in density and productivity of the population. Fisher home ranges in north-central Idaho were 2 to 11 times greater than home ranges reported in other regions (Jones 1991), even when using the same analysis technique (Heinemeyer 1993). This may indicate that present habitats support lower density fisher populations as compared to other regions. (p. 10)
>
> The low densities of fishers in general, and possibly of northern Rocky Mountain population in particular, may make populations more sensitive to natural or anthropogenic caused increases in mortality and habitat alteration. Low density populations are also more susceptible to extinction processes. (p. 15)

Powell and Zielinski 1994

> Fisher population densities vary with habitat and prey, and density estimates in the northeastern United States have ranged from 1 fisher per 2.6 km2 to 1 fisher per 20 km2... (p. 43)

Rand 1994

> There is evidence indicating that if animals become too scarce, they are biologically unable to increase in numbers. We do not know what this point is for the fisher, but let us see to it that the fisher does not reach this probable danger point. (p. 80)

Strickland 1994

> Populations of fishers and American martens that have been reduced to low levels by excessive harvest may take years to recover, and long-term loss of genetic variation may result. Fecundity may be altered... Low-density populations are the least resilient and the most difficult to assess, and only well-established populations should be harvested. (p. 151)

Attachment 5, Fisher home range sizes

Buskirk 1992

> [T]he habitat area requirements of both species are enormous; home ranges of the American marten and fisher are about 50 times that predicted on the basis of body size (Buskirk and McDonald 1989; Powell, in press). Thus, their huge areal requirements may make martens and fishers useful umbrella species for the protection of temperate coniferous forests; habitat loss limited to that which can be tolerated by these species should provide protection for virtually all other vertebrates. (p. 319, emphasis added)

Freel 1991

> Home range size appears directly related to habitat quality. (p. 1)

IDFG 1995

> The reduction of habitat quality and connectivity due to natural or anthropogenic factors may result in larger spatial requirements of individual fishers, and an overall decrease in density and productivity of the population. Fisher home ranges in north-central Idaho were 2 to 11 times greater than home ranges reported in other regions (Jones 1991), even when using the same analysis technique (Heinemeyer 1993). This may indicate that present habitats support lower density fisher populations as compared to other regions. (p. 10)

Powell 1994a

> [H]ome ranges were smallest in old-age forest when prey populations were high and largest in recently logged forest when prey populations were low. (p. 110)

Powell and Zielinski 1994

> The mean home range size for adult male fishers is 40 km2... nearly three times that for females... because the territories of male fishers are large, hundreds of square kilometers of suitable habitat may be necessary to maintain sufficient numbers of males to have viable populations... managed areas in the West may need to be at least 600 km2 in California... to 2000 km2 in the Rocky Mountains... of contiguous, or interconnected, suitable habitat. (57-58, emphasis added)
>
> ... home ranges overlap little between members of the same sex but overlap is extensive between members of opposite sexes... (p. 59)
>
> Fishers, especially males, have extremely large home ranges and the largest ranges may occur in the poorest quality habitat. The management of areas large enough to include many contiguous home ranges will probably have the best chance of conserving fisher populations. (p. 60)

Teske 1997

> Fisher movements [from British Columbia] into Montana have occurred west of the Yaak River drainage 1-7 miles south of the border, and 12 miles south of the Bloom Cr. drainage by 3 fisher (2 males and 1 female). Only one male fisher has consistently used the West Yaak River area. The other two fishers primarily utilize habitats within the study area. (p. 3)

Teske 1998

> Growing season (May - October) home range size of 1 adult male is 12,470 ha (n=15), while growing season home ranges of 2 adult females (without kits) is 3399

ha (n=19) and 1403 (n=18), respectively. This data corresponds well with home range data documented in Weir (1995). (pp. 3-4)

Weir 2003

Powell (1994a) summarized the reported sizes of home ranges of Fishers from across North America and derived a mean home range size of 38 km2 for males and 15 km2 for females. Estimates of home range sizes from Idaho (Jones 1991) and Montana (Heinemeyer 1993) suggest that the home ranges of Fishers are larger in western regions than in eastern and southern areas, possibly because of lower densities of prey. Badry et al. (1997), however, found that translocated Fishers in Alberta had home ranges of 24.3 km2 and 14.9 km2 for males and females, respectively, which were similar to home range sizes of Fishers in eastern North America.

Weir et al. (in press *a*) described the size and spatial arrangement of annual and seasonal home ranges for 17 radio-tagged resident Fishers in two areas of central British Columbia. The annual home ranges of female Fishers (x– = 35.4 km2, SE = 4.6, n = 11) were significantly smaller than those of males (x– = 137.1 km2, SE = 51.0, n = 3). Minor overlap was observed among home ranges of Fishers of the same sex, but there was considerable overlap between home ranges of males and females. Home ranges that they observed in central British Columbia were substantially larger than those reported elsewhere in North America, particularly for males. Weir et al. (in press a) hypothesized that the home ranges of Fishers in their study areas were larger than elsewhere in North America because the density of resources may have been lower. They also speculated that home ranges in their study areas were widely dispersed and occurred at low densities because suitable Fisher habitat was not found uniformly across the landscape. (pp. 6-7, emphasis added).

Attachment 6, Fragmentation of fisher populations and habitats

Williams et al. 2000

> Significant heterozygotic deficiencies were detected for statewide populations and regional populations within states, suggesting that breeding biology of the fisher, presumably among females, is creating levels of fine-scale genetic structure within populations. (Abstract, emphasis added)

Kyle et al. 2001

> [F]isher populations revealed much more genetic structuring than two closely related mustelids. Further investigation is needed to determine if fishers are more philopatric than martens and wolverines or if barriers to dispersal explain the levels of structure identified in this study. (Abstract, emphasis added)
>
> [T]he expectation would be that martens would have more structure than fishers. Martens, however, are not limited by heavy snowfall, as are fishers. Furthermore, fisher populations may be exposed to stronger anthropogenic influences (human development, transportation corridors, loss of suitable habitat) than the marten populations from the Yukon and Northwest Territories sampled in Kyle et al. (2000). These potential anthropogenic influences may act as barriers to dispersal for fishers. The combination of these factors may explain why fishers display much more structure than northern martens, although further study on the dispersal characteristics of this species in various environments will be needed to discern which influences have a greater impact on their population genetic structure. (p. 2346, emphasis added)

Drew et al. 2003

> Populations in Oregon and in Montana and Idaho received several translocations and each showed greater similarity to the populations where translocations originated than to adjacent populations. (Abstract)
>
> Whether or not Goldman's (1935) subspecific designations are valid taxonomically, however, it is clear that population subdivision is occurring within the species, especially among populations in the western USA and Canada. (p. 59, emphasis added)

Wisely et al. 2004

> Evolutionary processes can be strongly affected by landscape features. In vagile carnivores that disperse widely, however, genetic structure has been found to be minimal. Using microsatellite DNA primers developed for other mustelids, we found that populations of a vagile forest carnivore, the fisher (Martes pennanti), exhibit high genetic structure (FST ¼ 0.45, SE ¼ 0.07) and limited gene flow (Nm , 1) within a .1,600-km narrow strip of forested habitat; that genetic diversity decreases from core to periphery; and that populations do not show an equilibrium pattern of isolation-by-distance. Genetic structure was greater at the periphery than at the core of the distribution and our data fit a 1-dimensional model of stepping-stone range expansion. Multiple lines of paleontological and genetic evidence suggest that the fisher recently (<5,000 years ago) expanded into the mountain forests of the Pacific coast. The reduced dimensionality of the distribution of the fisher in western coastal forests appears to have contributed to the high levels of structure and decreasing diversity from north to south. These effects were likely

exacerbated by human-caused changes to the environment. The low genetic diversity and high genetic structure of populations in the southern Sierra Nevada suggest that populations in this part of the geographic range are vulnerable to extinction. (Abstract, emphasis added)

Our measures of genetic diversity were lower than those reported in the core of the fisher's range by Kyle et al. (2001); our estimates of heterozygosity were less than half of those within the core. (p. 643)

Considering the results from Kyle et al. (2001), Drew et al. (2003), and this study, it appears that genetic diversity declines from the center of the fisher's range toward its southwestern periphery (British Columbia), then decreases further along the Pacific distributional peninsula to its southern tip. These findings suggest that losses of genetic diversity in a peripheral distributional peninsula are additive to those from the center to the periphery of the fisher's core geographic range. (p. 643)

Measures of genetic structure for fishers within the Pacific coast distributional peninsula are among the highest reported for a mammalian carnivore. (p. 644)

The ecology of fishers likely compounds the effects of a peninsular and peripheral distribution on genetic diversity. The fisher is regarded as a habitat specialist in the western United States (Buskirk and Powell 1994), occurring only at mid- to lower elevations in mature forests characterized by dense canopies and abundant large trees, snags, and logs (Powell and Zielinski 1994). Buskirk and Powell (1994) noted that fishers seem even more inclined than American martens to avoid areas lacking overhead cover. Such habitat barriers could contribute to the strong population genetic structure we observed. Habitat specificity explains similarly high genetic structure found in swift foxes, kit foxes (*Vulpes velox*—Mercure et al. 1993), and black-footed ferrets (*Mustela nigripes*—Wisely et al. 2002). Habitat specificity might also contribute to the exceptionally low levels of gene flow (migrants per generation) estimated among populations. (p. 644, emphasis added)

Patterns of genetic diversity and structure in fisher populations within the Pacific coast distributional peninsula are consistent with reduced dimensionality of the geographic range, and with the loss of genetic diversity along a distributional peninsula as fishers expanded south towards the periphery of their distribution. Paleontological and genetic evidence suggest that expansion likely occurred <5,000 years ago. The magnitude of genetic structure and lack of gene flow we found was unexpected given the relatively recent colonization of the peninsula and the fisher's large spatial requirements and long dispersal distances. For the fisher, home ranges are as large as 79 km^2 (Powell 1994) and dispersal distances as long as 100 km (York 1996). It appears, however, that even for some apparently vagile carnivores, intermediate distances might represent evolutionarily important barriers to movement that can facilitate rapid divergence. Human-induced habitat fragmentation likely increased isolation of extant populations in recent times. (p. 646, emphasis added)

Attachment 7, Fisher habitat needs

Buskirk 1994

> Understanding spatial requirements can contribute to successful population management, including establishing conservation areas of the proper size. The more successful management schemes include conserving unharvested areas to retain as source populations from which dispersing animals can repopulate harvested areas (Strickland, this volume). (p. 7, emphasis added)
>
> The association of the boreal forest martens and the fishers with late-successional forests has long been recognized; Ernest Thompson-Seton (1925) referred to the American marten's preference for the 'glooms of firs' and to their adept use of the 'brakes and tangles of this labyrinthine retreat.' These mustelids specifically need overhead tree cover and physically complex structure at or near ground level (Buskirk and Powell, this volume). Old growth provides both. (pp. 9-10, emphasis added)

Buskirk and Powell 1994

> American martens and fishers appear to be among the most habitat-specialized mammals in North America. We believe that changes in habitat availability, more than any other factor, will affect the geographic distributions of these species over the next several decades… Do American martens and fishers require particular forest types--for example, old-growth conifers--for survival? We think they do. (p. 296, emphasis added)

DeVos 1951

> The amount of cover is certainly an important factor governing the level of survival of both species, and in that respect the later successional stages are most suitable. These stages also provide more denning holes in trees. Limiting factors undoubtedly differ in various regions. (p. 500, emphasis added)
>
> The fisher and the marten are either absent, or practically so, from extensive recently logged and burned-over areas. The amount of cover in an important factor governing the level of survival of both species. (p. 505, emphasis added)

Powell and Zielinski 1994

> Fishers occur most commonly in landscapes dominated by mature forest cover and they prefer late-seral forests over other habitats... In the Pacific states and in the Rocky Mountains, they appear to prefer late-successional coniferous forests... and use riparian areas disproportionately more than their occurrence... Everywhere they exhibit a strong preference for habitats with overhead tree cover . (p. 52, emphasis added)
>
> It is unlikely that early and mid-successional forests, especially those that have resulted from timber harvest, will provide the same prey resources, rest sites, and den sites as more mature forests. (p. 52)
>
> Buskirk and Powell (1994) hypothesized that physical structure of the forest and prey associated with forest structures are the critical features that explain fisher habitat use, not specific forest types. Structure includes vertical and horizontal complexity created by a diversity of tree sizes and shapes, light gaps, dead and

downed wood, and layers of overhead cover. Forest structure should have three functions important for fishers: structure that leads to high diversity of dense prey populations, structure that leads to high vulnerability of prey to fishers, and structure that provides natal and maternal dens and resting sites. (p. 53, emphasis added)

Fishers appear to be restricted to areas with relatively low snow accumulation... On the Olympic Peninsula and on the west slope of the Cascade Range... where snowfall is greatest at highest elevations, fisher sightings in the past 40 years have been confined to low elevations... Fishers in Idaho and Montana select flat areas and bottoms and avoid mid-slopes. (p. 54)

The fishers in all three Rocky Mountain studies... selected riparian areas, which have relatively gentle slopes, dense canopy, and perhaps protection from snow. (p. 55, emphasis added)

Attachment 8, Fisher denning and foraging habitats

Denning habitat

Aubry and Houston 1992

> Relatively few natal dens of *M. pennanti* have been described, but all have been located in cavities in either dead or living trees at heights generally exceeding 6 m (Powell 1982, Paragi 1990)... Obviously, only relatively large trees can provide cavities of adequate size for a female *M. pennanti* and her kits. (p. 76, emphasis added)

Johnson 1996

> The characteristics of two fisher natal dens in the Western United States have been published. One den, found on the Kootenai National Forest, was located in a hollow log, 11 m (36 ft) long and 30 cm (12 in) in diameter... Another natal den, found in California, was located in a ponderosa pine snag with a d.b.h. of 89 cm (35 in)... cavities in either live or dead trees are the most common natal den sites for fishers. (p. 2)

Powell and Zielinski 1994

> [F]emale fishers in eastern North America and in the Rocky Mountains are highly selective of habitat for resting sites... they are probably highly selective of habitat for natal and maternal den sites as well… (p. 47)
>
> Female fishers will use 1-3 dens per litter and are more likely to move litters if disturbed. …Kits are often moved from natal to maternal dens at 8 to 10 weeks of age (p. 47)
>
> All natal and maternal dens in the West were found in large diameter logs or snags. These habitat elements may be reduced in stands that have been intensively managed for timber. (p. 48, emphasis added)

Roy 1991

> Snags and deadfalls are important as denning sites (Leonard 1986).

Foraging habitat

Powell and Zielinski 1994 (emphasis added)

> 1. Snowshoe hares are a major prey item almost everywhere fishers have been studied, including the Rocky Mountains. If this is confirmed from studies elsewhere in the West, managing for hare habitat might benefit fishers if it is not at the expense of denning and resting habitat.
> 2. In late-successional coniferous forests the presence of high densities of snowshoe hares or porcupines indicates the potential for a fisher population. (p. 52)

Zielinski et al. 1999 (emphasis added)

> Fishers (*Martes pennanti*) in the mountains of California's Sierra Nevada occur at the southwestern margin of their distribution and inhabit different forest types with different potential prey than elsewhere in their range. Two typical fisher prey, the snowshoe hare (Lepus americanus) and the porcupine (Erethizon dorsatum), are

absent from our Sierra Nevada study area. We characterized the diet of fishers in the southern Sierra Nevada by analyzing the content of 201 feces..." "The fisher is reputed to be a habitat specialist in the late-seral mixed conifer-deciduous forests of the western United States. Perhaps it is for this reason that our data depict the species as a dietary generalist, for whom it may be necessary to forage on many of the animal, plant, and fungal species that occur in and near mature coniferous habitat. (p.961)

[U]nderstanding the diet of fishers in the southern Sierra Nevada has acute conservation importance because this population is isolated by >400 km from the nearest population to the north." "Like many other carnivores, fishers probably exploit foods that are temporally ephemeral, spatially patchy, and difficult to capture and subdue. Fishers switch prey in response to availability." "This information will help define the range of dietary plasticity in fishers and also will inform us of the prey species and the habitat that may be necessary to conserve populations of fishers in California. (p. 962)

Most food remains were mammalian but a substantial quantity came from other terrestrial vertebrate classes, with the exception of the Amphibia. No fish scales or bones were discovered in our sample." "The fact that no single family of animal or plant group was identified in more than ca. 22% of feces attested to the diversity of the annual diet. Seasonal variation among food groups was no profound. (p. 964)

[F]ive foods were reported repeatedly as important components of the diets of fishers...snowshoe hares, porcupines, deer, passerine birds, and vegetation. (p. 965)

Attachment 9, Impacts to fishers from timber production

Aubry and Houston 1992

> We predict the available habitat for fishers would be enhanced by minimizing forest fragmentation, maintaining high forest-floor structural diversity, preserving snags and live trees with dead tops, and protecting swamps and other forested wetlands.
>
> *Martes pennanti*... clearly prefers dense, lowland forests with an extensive, continuous canopy (Powell 1982). (74)
>
> Our data suggest that widespread clearcut logging, which resulted in the removal or fragmentation of once-extensive forest canopies at lower elevations, may have reduced or eliminated suitable habitat for M. pennanti in the northwestern Cascade Range. (p. 75)

Buck et al. 1994

> [Fishers were studied concurrently at two sites in the coastal mountains of Shasta-Trinity National Forest in northwestern California, one where timber was heavily harvested, and the other lightly harvested.]
>
> The effects of presalvage or selective logging are less apparent than those of clear-cutting, but these practices may have a greater impact on fishers over time, especially if the harvest involves large areas. (p. 375)
>
> If our hypotheses prove correct, timber management practices that result in open stands, an abundance of hardwoods, and xeric conditions over large areas create conditions unsuitable for the maintenance of fisher populations. For fisher populations to be maintained, extensive clear-cutting of mature closed conifer forest should be minimized and selective cutting conducted so that adequate habitat is provided for all fisher age and sex classes. (p. 375)

Buskirk 1992

> The boreal forest martens show consistent close associations with mesic coniferous forests that have complex physical structure, most often in old, uneven-aged stands. In winter, when they are energetically limited, sables and American martens (Buskirk et al. 1988) specialize on small bird or mammal prey and rest in sites beneath the snow, often in association with coarse woody debris. They survive winter by highly selective use of stand ages and types, preferring those with dense and complex structure near the forest floor. This structure, including living branches, logs, and other coarse woody debris, is important because it provides protection from predators, access to spaces beneath the snow where prey animals live, and protected sites where martens can minimize energetic costs while resting. Where complex physical structure is lacking, either at the scale of the stand or the landscape, boreal forest martens and fishers tend to be scarce or absent. Major retrogressional habitat change, especially cutting of temperate and boreal coniferous forests, has interfered with natural forest dynamics, especially structural and vegetational heterogeneity. Intensive wood-production programs involving short rotation times generally provide little of either. (p. 318)

Carroll et al. 1999

Fisher distribution was strongly associated with landscapes with high levels of tree canopy closure. Regional gradients such as annual precipitation were also significant. At the plot level, the diameter of hardwoods was greater at sites with fisher detections. A comparison of regional fisher distribution with land-management categories suggests that increased emphasis on the protection of biologically productive, low- to mid-elevation forests is important to ensuring the long-term viability of fisher populations. (abstract)

Current land-use strategies that incorporate short timber harvest rotations may isolate remnant areas of fisher habitat. Regional or landscape-level thresholds of habitat value, area, or connectivity may exist below which population viability is compromised due to an imbalance between immigration and emigration (Lande 1987; Noon & McKelvey 1996). Maintaining viable and well-distributed fisher populations may require increased levels of canopy closure and retention of large hardwoods on managed lands, especially in areas that appear from habitat analyses to be plausible regional habitat linkages. Conservation planning for nonfederal lands-for example, through development of habitat conservation plans-should prioritize surveys to validate the .areas of potential habitat identified in regional-scale analyses. (p. 1357)

Douglas and Strickland 1987

[Fisher's] choice of habitat is probably governed mostly by food availability, but other factors, such as large areas of continuous overhead cover and the availability of denning sites, are also important. Although largely untested, optimal conditions...include: more than 50% closure of the tree canopy; an average dbh of overstory trees of more than 25 cm (10 inches); two or more stories in the tree canopy; and an overstory of more than 50% deciduous trees." "Severe and extensive disturbances of the forest by logging or fire may seriously reduce its habitat value, especially during winter, this is probably because it does not provide adequate overhead cover and permits a greater accumulation of ground-level snow. Less severe disturbances may improve habitat values by increasing the density of prey and the number of den sites." "In addition to maternal dens, which are found most often in large deciduous trees, fisher use a variety of temporary shelters and resting sites such as hollow loges and tree cavities, brushpiles, rockpiles, burrows and dens of other animals, and snow dens. (p. 518)

Freel 1991

Preferred habitat is characterized by dense (60 - 100% canopy) multi-storied, multi-species late seral stage coniferous forests with a high number of larger (> 30 inch dbh) snags and downed logs. These areas also include close proximity to dense riparian corridors and saddles between major drainages or other landscape linkage patterns used as adult and juvenile dispersal corridors, and an interspersion of small (<2a.) opening with good ground cover used for foraging. Numerous and heavily travelled roads are not desirable to avoid habitat disruption and/or animal mortality. Occasional one or two lane forest roads with moderate levels of traffic should not limit marten and fisher movements. (p. 2)

In high quality habitat, 6,000 acres would be the size of year round home range where 70-80% of the stand structure is mature closed conifer. Riparian areas would be < 1/4 - 1/2 mile from the denning habitat and live tree snags for dens would be

>6 per acre and >44dbh. [This information and more is in the table on Pages 4 & 5]

Jones 1991

Habitat structure required to maintain quality summer and winter fisher habitat.

Variable	75% Quantile
Canopy Cover	79%
Live Trees	
1.3-11.4 cm dbh	1475/ha
11.4-21.6 cm dbh	188/ha
21.6-34.3 cm dbh	240/ha
34.3-47.0 cm dbh	106/ha
47.0-62.2 cm dbh	54/ha
>62.2 cm dbh	27/ha
Snags	
14.0-24.1 cm dbh	69/ha
24.1-34.3 cm dbh	44/ha
34.3-52.1 cm dbh	20/ha
>52.1 cm dbh	10/ha
Logs	
14.0-21.6 cm diameter	40 m3/ha
21.6-34.3 cm diameter	76 m3/ha
34.3-47.0 cm diameter	57 m3/ha
47.0-54.6 cm diameter	0 m3/ha
>54.6 cm diameter	35 m3/ha

Jones and Garton 1994

The process of recovery of a clear-cut stand, from the standpoint of fisher habitat, could be accelerated by the following practices:

1. Retaining of an abundance (>= 12.3 trees/ha) of cull grand fir trees for future den logs. The objective would be to have trees at least 45.7 cm dbh that would begin to fall 80-100 years after logging.
2. Retaining at least 54 but no more than 109 metric tons/ha of large-diameter logs. An abundance of logs should aid the recovery of southern red-backed voles, providing prey that fishers may begin to use once the regenerated stand has reached the pole stage.
3. Retaining decks of cull logs and a few slash piles for potential fisher resting sites and for habitat for snowshoe hares. (p. 386)

Heinemeyer 1994

Subdrainage Guidelines (pp. 38-39)]

- High Quality Subdrainage: maintain 65-75% mature/old forests, 10-25% young and pole/sapling classes; at least 80% of patches interconnected by travel corridors of closed canopy forest (i.e., >40% canopy cover); Mature and old-growth should be at least 50 ha (125 ac) with at least 75% of their perimeter adjacent to forest (pole stage or older, >40% canopy cover).
- Moderate Quality Subdrainage: maintain at least 40% mature/old forests; at least 60% of patches interconnected by travel corridors of closed canopy forest

(i.e., >40% canopy cover); Mature and old-growth should be at least 32 ha (80 ac) with at least 50% of their perimeter adjacent to forest (pole stage or older, >40% canopy cover).
- Low Quality Subdrainage: maintain 30-40% mature/old forests; at least 40% of patches interconnected by travel corridors of closed canopy forest (i.e., >40% canopy cover); Mature and old-growth should be at least 24 ha (60 ac) with at least 30% of their perimeter adjacent to forest (pole stage or older, >40% canopy cover).

[Stand Guidelines: (pp. 40-41)]
- Only uneven-aged management should be permitted in fisher habitat... openings should not exceed 0.4 ha (1 acre)
- Retain large diameter trees as rest sites
- Stands within riparian areas, including any stands within 30 m (100 ft) of water should only be treated using uneven aged silvicultural prescriptions... groups of trees taken should be no larger than 0.1-0.2 ha; at least 70% canopy cover should be retained
- With uneven-aged management:
  - Retain at least 12 trees/ha, greater than 46 dbh...
  - Retain >50-100 tons/ha of large diameter logs
  - Retain log decks and some slash piles (1 per 2 ha)
- Do not precommercially thin more than 60% of regenerated stands; leave patches (at least 1 ha) distributed throughout the unit.

Powell and Zielinski 1994

Fishers avoid nonforested areas... Fishers have avoided areas 25 m across and less in the Midwest... Large forest openings, open hardwood forests, recent clearcuts, grasslands, and areas above timberline are infrequently used in the West... (p. 55)

The canopies of, or cavities within, live trees are the most commonly used rest sites reported in eastern and western studies... In the published western studies, logs were of secondary importance, followed by snags... the average diameters of trees used as resting sites were 55.8 cm in Idaho... 114.3 cm in California... (56)

Resting sites reported in studies in the western United States tend to occur predominantly in closed canopy stands. Jones (1991) analyzed canopy closure at 172 resting sites in Idaho and found that fishers preferred to rest in stands that exceeded 61 percent canopy closure during summer and winter, and avoided stands with less than 40 percent closure. Canopy closure at 34 rest sites in northcentral California averaged 82%... (56)

Because the types of forests that normally contain resting and denning sites may be more limiting than foraging habitat within the fisher range in the West, they should receive special consideration when planning habitat management. (p. 57)

1. In the western mountains, fishers prefer late-successional forests (especially for resting and denning) and occur most frequently where these forest include the fewest large nonforested openings. Avoidance of open areas may restrict the movements of fishers between patches of habitat and reduce colonization of unoccupied but suitable habitat. Further reduction of late-successional forests, especially fragmentation of contiguous areas through clearcutting, could be detrimental to fisher conservation.

2. Large physical structures (live trees, snags, and logs) are the most frequent fisher rest sites, and these structures occur most commonly in late-successional forests. Until it is understood how these structures are used and can be managed outside their natural ecological context, the maintenance of late-successional forests will be important for the conservation of fishers. (p. 57)

Fishers are capable of moving long distances, but movements may be restricted in landscapes with large nonforested openings. The maintenance of contact between individuals and subpopulations and the recolonization of unoccupied habitat may be facilitated by reducing the size of openings. (p. 61)

It is our opinion that the precarious status of the fisher population in Washington and Oregon is related to he extensive cutting of late-successional forests and the fragmented nature of these forests that still remain. (p. 64)

The extensive, clearcut logging done during the 1800's and early 1900's, together with trapping, decimated fisher populations all over the continent. Because fishers are associated most frequently with relatively unfragmented, late-successional forests, recent clearcut logging continues to affect fisher populations today through its profound effects on forest landscapes. Large nonforested areas are avoided by fishers, especially during the winter, and the fact that extensive areas of the Pacific Northwest have been recently clearcut... may be the reason fisher populations have not recovered in some parts of this region... (p. 64)

Provided there are large patches of late-successional conifer habitat nearby, fisher populations should be able to tolerate incidents of stand replacement disturbances. Small patch cuts interspersed with large, connected, uncut areas should not seriously affect fisher populations. In fact, these small-scale disturbances may increase the abundance and availability of some fisher prey. Large clearcuts and numerous, adjacent, small clearcuts of similar age should seriously limit resting and foraging habitat for fishers during the winter. This, in turn, may limit fisher population size... Forestry practices aimed at maximizing wood production and minimizing rotation times will probably have detrimental effects on fisher populations. (p. 64)

Roy 1991

Optimum fisher habitat in the eastern United States is characterized by: (1) greater than 80% canopy closure, (2) 50-90% of the overhead cover comprised of coniferous trees, (3) at least 3 levels of vertical stratification, and (4) an average diameter at breast height (dbh) of overstory trees > 38 cm (Allen 1983). However, Arthur et al. (1989b) found that fishers do well in diverse habitats, and that fishers often hunt in brushy second growth coniferous areas. Similarly, Jones (in press) found that fishers in Idaho hunted in young to medium age stands during winter." (p. 13)

Teske 1998

Fisher were located within a variety of habitats ranging from clear-cuts to mature forest habitats. Fisher were located most often (51%) within forested habitats with greater than 40% canopy closure. Open dry forests were used 21% of the time, while riparian habitats were utilized 12% of the time. Open subalpine forests and open forested burns were used 2% and 1% of the time, respectively. Shrub habitats, such as wetlands, and avalanche chutes, were used marginally at 1%. All other open habitats (i.e. open burns, clear-cuts) were utilized 2x more this year than last year

during the same period. Clear-cuts were utilized 7%, and open burns 5% of the time. (p. 4)

Teske 1997

Fisher were located most often (57%) within mature forests >121 years old. Ingrowth forests, between 61 and 120 years old, were used 35% of the time, while immature habitats <60 years old were used by fisher only 8% of the time. (p. 4)

Attachment 10, The threat to fishers posed by direct and incidental trapping

The scientific literature is replete with data that indicate that trapping was a major factor in the decline of the fisher historically, and it remains a serious mortality risk for fishers in many areas today, including recommendations to reduce the risk of trapping that have not been implemented in the Northern Rockies region (emphases added).

Intentional trapping of fishers represents a major threat.

Douglas and Strickland 1987

> We believe that fishers are highly susceptible to excessive trapping and that care must be taken to preclude overharvesting...only well-established and wide-spread fisher populations should be trapped. (p. 524, emphasis added)

IDFG 1995

> In addition to habitat loss, trapping is though to have been the major factor leading to the historic declines in fisher populations. Fisher populations are sensitive to even light trapping pressure and populations such as the limited, low density populations that may occupy Idaho may be even more sensitive to any factor which increases mortality. Although fisher trapping seasons are closed in Idaho, incidental trapping mortality may limit populations in the state. (p. 6, emphasis added)
>
> Although there is little data, density and natality rates may be lower and mortality rates may be higher for fishers in some western habitats than in habitats elsewhere in North America (reviewed in Heinemeyer and Jones 1994). Consequently, fishers populations in western habitats may be even more sensitive to the increased mortality cause by trapping. (p. 13)

Garant and Crete 1997

> Most Fisher (Martes pennanti) populations in North America are moderately to heavily trapped. Trapping may reduce density and can indirectly affect spacing patterns of solitary terrestrial carnivores by creating vacant territories. From 1991-1993, we studied home ranges of radio-collared fishers in Gatineau Park (Quebec) where trapping had been prohibited for > 20 years. (p. 359)
>
> Trapping affects more than population size; it has repercussions on other population attributes (e.g., age structure, sex ratio) that we should consider for sound management of this furbearer. (p. 363, emphasis added)

Powell 1994a

> [Fisher] harvesting affects more than population size. It affects population dynamics, age structure, sex ratio, spacing patterns, and probably mating patterns and foraging costs. All these changes must be considered in management programs. Unharvested populations of *Martes* exhibit marked fluctuation in size, sometime in excess of an order of magnitude, in response to fluctuation in prey populations. (p. 101, emphasis added)

> A common goal of managing furbearing wildlife, including *Martes* populations is to stabilize population sizes...Stable populations are easier to manage because small changes in numbers can be monitored and modestly understood...Such harvested populations obviously cannot exhibit natural population dynamics or population structure. (p. 102)

Powell 1979

> Trapping success greater than 1-4 fishers per 100 km2 per year may be all that is needed" to exterminate the population of fisher. (p. 153, emphasis added)

> My recommendation is that only well-established and widespread populations should be trapped. Michigan does not have such a population at present (1979). (p. 153)

> Trapping quotas and seasons should be reevaluated regularly, especially following unexpected increases or decreases in trapping returns or following changes in returns markedly out of phase with snowshoe hare cycle. A recurrence of the widespread fisher extermination of the first quarter of this century is possible. (p. 154)

Powell and Zielinski 1994

> Trapping has been one of the two most important factors influencing fisher populations...
> Mathematical models for the fisher community in Michigan indicated that small increases in mortality due to trapping could lead to population extinction. (p. 44, emphasis added)
> [T]rapping may affect the abilities of fisher populations to respond to increasing prey populations. (p. 45)

Incidental take — fishers killed in traps set for other animals — is also a significant threat to fishers.

Heinemeyer 1994

> Fishers are susceptible to trapping... and are frequently trapped in sets made for other furbearers... In Idaho, where fishers are protected, Luque (1983) estimated that at least 163 animals were inadvertently trapped over a 5-year period in sets made for marten, coyote and possibly bobcat. In Montana, approximately 10% of radio-tagged reintroduced fishers were killed in traps set for coyote and marten (Roy 1991, Heinemeyer 1993, emphasis added).

> Fisher populations are sensitive to trapping pressure, as even light trapping pressure may cause local extinction (Powell 1972, 1982)... Jones (1991) speculated that in Idaho, incidental captures in sets designed for other furbearers may be limiting population growth. (p. 11)

IDFG 1995

In Idaho, where fishers are protected, Luque (1983) estimated that at least 167 animals were inadvertently trapped over a 5-year period in sets made for marten, coyote and possibly bobcat. (p. 12)

The fisher is protected by law in both Wisconsin and Michigan. However, they are vulnerable to traps which are baited or scented to take such species as coyote, bobcat, and fox. (p. 311)

Lewis and Zielinski 1996

[W]hen the closure of the fisher season was being considered in California...the common opinion at the time [was] that closing the season would have little effect because fishers were so frequently taken in sets for other species. (p. 291)

[B]ecause [fishers] are not legal quarry their capture and condition at release are rarely reported. Moreover, fishers frequently receive serious injuries in leg-hold traps (Cole and Proulx 1994) and even low rates of additive mortality from trapping have been predicted to affect fisher population stability (Powell 1979). Fisher conservation may be hindered by the lack of information on the amount and effects of incidental capture. (p. 291, emphasis added)

If the number of licenses sold measures overall trapping effort for terrestrial carnivores, it would appear that the number of legally trapped fishers in California was affected more by generalist trapping effort than by the price paid for fisher pelt. Consequently the decline in the number of fishers harvested during the period 1919-1946 reflects either a decline in the number of fishers or the decline in the number of licensed trappers (CDFG, unpubl. data). Overtrapping by specialists (Grinnell et al. 1937) may have played some role in the decline but our analysis suggests that harvest by trappers who were not specifically seeking fishers was another important factor. (p. 294, emphasis added)

Using data collected during a year when the fisher season was closed in New York, Parsons (1980) estimated that incidental fisher captures amounted to 30% of the annual harvest when the fisher season was open... Clark (1980) stated that in Maine, "fisher are captured in all types of land traps; therefore any individual who sets a land trap can be classified as a potential fisher trapper." (p. 295, emphasis added)

If fishers that are unintentionally captured were always released unharmed the frequency of incidental captures would be of little concern. However, as evidenced by our sample of California trappers... this is not always the case. (p. 295)

The subsequent survival of incidentally captured and released fishers (assumed to be 50% by Douglas and Strickland 1987) may negatively affect existing populations or prevent the recovery or establishment of others. Powell (1979) predicted that the removal of as few as one to four fishers per 100 km2 via trapping would result in a decline of a midwest population. (p. 295)

Although the population of trappers may be on the decline and traps are less likely to injure captured animals, the potential effects of legal trapping of other species on protected fisher populations should not be ignored, especially when considered in conjunction with habitat loss (Powell and Zielinski 1994) and other sources of mortality (e.g., roadkills). (p. 296)

> Trapping regulations should require the reporting of (and providing specific information about) incidental captures of fishers and other protected carnivores, and trappers should be compensated for this information. (p. 296, emphasis added)

Powell and Zielinski 1994

> Fishers are also easily trapped in sets for other furbearers... Where fishers are scarce, the populations can be seriously affected by fox and bobcat trapping. (p. 44, emphasis added)

> Fishers are easily trapped and can frequently be caught in sets for bobcats, foxes, coyotes, and other furbearers. To protect fisher populations, trapping using land sets may need to be prohibited. Incidental trapping of fishers in sets for other predators may slow or negate population responses to habitat improvement. (p. 45, emphasis added)

> Because fishers are easily trapped, where fisher populations are low they can be easily jeopardized by the trapping of coyote, fox, bobcat, and marten... Wisconsin designated fisher wildlife management areas... where lands sets for all furbearers were prohibited... During the two years that British Columbia closed the fisher season the incidental capture of fishers exceeded the legal capture the preceding year... The closure of all commercial marten trapping where their range overlaps that of the fisher in Washington and Oregon has been recommended by the [Forest Service]... Where commercial trapping of terrestrial carnivores occurs, the threat exists that fishers will be trapped and that their populations could be negatively affected. (pp. 63-64, emphasis added)

Weckwerth 1968

> The trapped animals were taken in traps set for mink, wolverine, bobcat, and lynx. …fishers are vulnerable and should receive maximum protection after being transplanted. (p. 979)

Attachment 11, The effects of fragmentation on fishers

Overview of the Fragmentation problem

Heinemeyer 1994

> The greatest longterm risk to the fisher in the western United States is probably population extinction due to isolation of small populations. (p. 24, emphasis added)
>
> The continuation of current forest management practices will likely result in further fragmentation of mature and older forests and increased isolation of smaller parcels of potential habitats within a matrix of unsuitable and/or unproductive habitats across the landscape... As forest management activities proceed, the landscape is increasingly fragmented by roads. Consequently, trapping access and efficiency is improved, and the proportion of the landscape and fisher populations relatively secure from trapping decreases. (p. 26, emphasis added)

Heinemeyer and Jones, 1994

> In the western U.S., fishers are limited to the peninsular mountain ranges of the Pacific Coast and Rocky Mountains, forming the southern margins of a larger continental distribution. The peninsular populations may be acutely susceptible to extinction because of their location at the margins of their geographic distribution. (p. iv, emphasis added)
>
> Fishers have been shown to selectively use habitats; it is likely these habitats are patchily distributed in modern landscapes and extant populations of fishers are widely-spaced and fragmented. Little is known of the dispersal and colonization capabilities of fishers, or the degree in which present populations are inter-related. (p. iv)

IDFG 1995

> Isolation of populations reduces demographic and genetic exchange, increasing the susceptibility of the population to extinction processes, and decreasing the probability of recolonization. Successful colonization of vacant, suitable habitats is unlikely when suitable habitats are highly dispersed across a mosaic of unsuitable or hostile habitats, without the presence of travel corridors. Anthropogenic barriers to dispersal include habitat alteration by forest practices, urban and agricultural development, and major roadways. Loss of forested riparian habitats is a particularly important impact affecting fisher persistence because of the importance of this habitat to fisher movement, foraging, and resting. (p. 8, emphasis added)
>
> Longterm fisher persistence may be threatened by habitat modifications resulting in isolation or fragmentation within and between regional populations. (p. 9)
>
> These subpopulations face not only the threats inherent to their small size and isolation, but the threats inherent to their geographic penisulearity as discussed above. (p. 17, emphasis added)

Powell and Zielinski 1994

"Population densities of fishers are low, relative to other mammals, and can undergo fluctuations that are related to their prey. These fluctuations make small or isolated populations particularly prone to extirpation." (p. 45, emphasis added)

Rosenberg and Raphael 1986

Those animals showing greatest sensitivity" to forest fragmentation "included [the] fisher, gray fox, spotted owl. …Perhaps, the most critical problem facing forest wildlife worldwide, is the systematic shrinking and fragmentation of their habitat." (p. 263, emphasis added)

Most medium and large-sized mammals occurred less frequently in more insular stands or in 1000-ha blocks that were more fragmented. In particular, we found the presence of fishers to be more highly correlated with stand insularity...than with any other habitat measure. …Occurrences of fisher, gray fox... were... positively associated with stand area. … Fishers... decreased sharply in frequency of occurrence in stands <100 ha. (p. 267, emphasis added)

Among the species suspected of being most sensitive to forest fragmentation in our study, only the fisher and spotted owl were also associated with old-growth forests. (p. 271, emphasis added)

Fragmentation at the local scale

IDFG 1995

Loss of preferred habitat or habitat connectivity within a fisher home range would reduce the availability of resting, foraging, and denning sites, and may require individuals travel further and through unsuitable or hostile habitats to meet life requirements. (p. 12, emphasis added)

Heinemeyer 1994

1. Minimize human-induced barriers to dispersal in sensitive-linkage zones.. [includes mortality factors and habitat-alteration activities]
2. Conduct genetic studies to establish the variability within and among identified metapopulations...
3. Identify and prioritize potential recolonization or augmentation areas...
4. Maintain the potential for dispersers to move across sensitive-linkage zones... allow for the successful dispersal of at least one individual every 2 years to maintain genetic diversity... limit road densities (accessible to trappers) to 0.2 km/km2 (0.3 mi/mi2) or less. This would approximate one open road bisecting the entire length of an average size male homerange in Idaho. An alternative to open road management would be to restrict furbearer trapping within the linkage zone, at least during the dispersal period (i.e., October through March).
5. Prevent (or mitigate for) the creation of induced ecological barriers. Clearings (i.e., <30% canopy cover) greater than 500 ft wide should not bisect sensitive-linkage zones. If clearings must bisect a sensitive zone, then mitigate by managing a stepping-stone "bridge" of cover patches consisting of trees >5 m tall. Cover patches should be at least 0.2 ha in size and be within 30 m of each other. These habitat "bridges" should be established at the frequency of at least one per mile. (p. 30)

Physical barriers identified include large water bodies, greater than 460m (500 ft) [sic] wide, that remain unfrozen throughout the winter... Using the Columbian and Snake Rivers as two physical barriers, in conjunction with ecological barriers identified on the habitat map, 7 potential metapopulations in the western United

States were identified... Twelve sensitive-linkage zones were also identified at this scale [listed by name]. (pp. 31-32).

1. Maintain the short-term viability... of 80% or more of all subpopulations within a single metapopulation.
2. At least 80 percent of all subpopulations should be linked to other subpopulations by a functional corridor. Subpopulations should be within 29 km (18 miles; 75% of the maximum dispersal distance... of each other)...
3. Manage a central 'core' or 'reservoir' subpopulation...
4. Establish a refuge within the core subpopulation protected from direct or incidental trapping mortality. (p. 32)

Corridors longer than 10 km should provide the resources to allow for temporary residency and should contain some preferred resting and foraging habitats. Generally, the longer the linkage zone, the wider it should be. (p. 32)

Absolute barriers probably exist if unsuitable habitat patches exceed 300 m wide, or if avoided habitats exceed 2.5 km wide. Semipermeable barriers may exist when suitable, but avoided habitats are greater than 100 m, but less than 2.5 km wide. Major highways having right-of-ways greater than 60 m wide would also be considered a semipermeable barrier. Temporal barriers consist of early-successional stages... avoided by fishers of suitable forested habitats exceeding 100 m wide. (pp. 33-34)

Guidelines (p. 34):
- "linkages less than 16 km long should be at least 2.5 km wide; linkages more than 16 long should be at least 5 km wide;
- linkages should follow drainage bottoms;
- no more than 25% of the linkage should be an opening (i.e., <30% canopy cover);
- road densities within linkages open to trappers should be no more than 0.2 km/km2 (0.3 mi/mi2) if linkage is longer than 5 km;
- trapping of furbearers should be prohibited within fisher refugia;
- ~65-75% of fisher refugia should be late-successional forest (120 years and older), the remainder should contain 10-25% young forest, and 10-25% pole/sapling or younger (less than 50 years)."

All major watersheds should be interconnected by functioning corridors comprised of habitat suitable for travel. The dendritic pattern of forested stream courses provides preferred travel networks, and are used extensively by fishers... Forested saddles, linking adjacent major drainages, may serve as potential travel routes, and may be especially important for fisher movements. A canopy cover of at least 40% should be maintained in critical saddles. Gaps (i.e., areas having less than 30% canopy cover) within potential travel corridors should not exceed 100 m. (p. 38, emphasis added)

Jones 1991

I believe it is crucial that preferred resting habitat patches be linked together by closed-canopy forest travel corridors. ...These corridors should ideally be located along streamside riparian areas. (p. 112)

Powell and Zielinski 1994

[I]in areas where there has been extensive, recent logging that fragments forests extensively, fisher populations have not recovered, perhaps because fishers appear sensitive to forest fragmentation. (p. 42)

Aversion to open areas has affected local distributions and can limit population expansion and colonization of unoccupied range... An area of farmland in Upper Peninsula Michigan delayed expansion of the population to the north by at least 15 years... and the Penobscot River delayed expansion of fishers to eastern Maine for over a decade. (p. 55)

Fishers can travel long distances during short periods of time but travel, about 5-6 km per day on the average. (p. 60)

In Idaho, two 1-year-old males established ranges after moving 26 and 42 km, respectively. (p. 60)

Buck et al. (1983) thought that forested saddles between drainages were important linkages for fisher movements (has not been studied)... Large open areas retard population expansion. (p. 61)

It is possible that forest fragmentation may affect predation on fishers by other predators. If fragmentation causes fishers to travel long distances through unfamiliar habitat (especially unpreferred habitat) in search of mates, the fishers might be subject to predation. (p. 62, emphasis added)

Fragmentation at the regional scale

Carroll et al. 1999

Our study further documents the discontinuous distribution of fishers in the Pacific coastal states. If the metapopulation concept is applicable here, as has been proposed (Heinemeyer & Jones 1994), the isolation of fisher populations in the western United States from one another and from the more continuous populations in northern Canada and the eastern United States may be of concern… Because little low-elevation forest is contained within existing protected areas, conservation of forest carnivores such as the fisher may depend on multi-ownership cooperative management at the regional scale (Mladenoff et al. 1995). (p. 1357, emphasis added)

Freel 1991

National Forests will be contributing to the maintenance of viable populations. It may not be possible for a forest to sustain a population by itself. Therefore, the maintenance of old growth and mature habitat management areas will be coordinated between adjacent forests and other land management agencies to provide connection of suitable habitat in areas to ensure interaction between individuals and maintain viability throughout their range. (p. 2, emphasis added)

Gibilisco 1994

Traditionally we have connected the dots, so to speak, to establish the perimeter of a species' distribution, even though it has always been understood that within such a boundary, animals are rarely equally distributed either in time or in space. But it may be more appropriate now than ever before to look more carefully between the

dots as growing human populations and resulting land use changes affect the forests used by American martens and fishers in North America. (p. 70, emphasis added)

Heinemeyer 1994

For all practical purposes, the Pacific and Rocky Mountain populations may have been (and still are) genetically isolated by geographic distance, and probably by physical and ecological distances (see Chesser 1983 for definitions). Presently, the two populations are undoubtedly genetically and demographically distinct since fishers have been extirpated in southern British Columbia. (p. 29, emphasis added)

Jones 1994

We currently lack the information needed to develop a conservation plan for fishers in the northern Rockies. Therefore, adequate management of fishers and their habitats may require the adoption of a landscape-based approach. Two advantages of a broader strategy are that it has the ability to maintain the integrity of ecological systems and that it can operate with relatively little information (Hunter 1991). Applying such an approach would require land managers to adopt a long-term large-scale plan (Thompson and Harestad, this volume), one that would mimic natural landscape patterns and processes. This in turn would involve management that would keep certain proportions of a forest in various successional stages, together with a specific frequency distribution of various patch sizes and linkages across the landscape. Such an approach would help insure the viability of fisher populations within a managed landscape. (p. 387, emphasis added)

Powell and Zielinski 1994

[T]he fisher population in the southern Sierra may be doing well, but it appears to be isolated from the population in northwestern California. (p. 42)

If remnant populations in the Pacific Northwest and Rocky Mountains are reduced in number and sufficiently separated they may not be capable of recolonizing depopulated areas. (p. 45, emphasis added)

Zielinski et al. 1995

Detection survey results suggest that the population [of fishers] 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. (p. 104, emphasis added)

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, 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. (p. 111, emphasis added)

Fragmentation between the U.S. and Canada

Heinemeyer 1994

> At the largest, or continental landscape unit, the overall goal of the management strategy is to demographically and genetically link the Pacific and Rocky Mountain populations to the Canadian population. (pp. iv-v, emphasis added)

The fragmentation effects of highways

Bill Ruediger, former Threatened, Endangered and Sensitive Species Program Leader for the Northern Region of the U.S. Forest Service, describes the current threat to the fisher and other forest carnivores due to landscape fragmentation (Ruediger et al. 1999):

> The best opportunity for management of a functional carnivore community in North America is the Northern Rocky Mountains of the United States and the Southern Rocky Mountains of Canada. It may be the last place in the lower 48 states where this opportunity exists. The areas extends from the Wyoming Range in Wyoming north to Jasper National Park in Canada (Paquet, 1995). One of the major issues in conservation of carnivores in this area is the expanding highway and railroad system. Another is strip development as humans expand out from towns and cities…
>
> As the highway system (and railroad) grows in size, traffic volume and total miles, its impacts on wildlife will grow. The impacts on low density carnivores like grizzly bears, wolves, lynx, wolverine and fisher will be more severe than most other wildlife species. This is due to their large home ranges, relatively low fecundity, and low natural population density. The adverse effects of highways to rare carnivores and other wildlife include serious habitat fragmentation, mortality, direct loss of habitat, displacement from noise and human activity and secondary loss of habitat due to human sprawl…
>
> When traffic volume increases, there is an evolution of highways from gravel roads to paved two lane roads, and from two lane highways to more problematic four land highways and "super highways" like the Interstate system. The eventual result of such a progression in the highway system on rare carnivores is the slow strangulation of viability due to population isolation, loss of habitat, mortality of individuals and a decline in potential population size. All of these factors are primary causative agents in the decline and extirpation of wildlife worldwide. (pp. 1-2, emphasis added)

Ruediger et al. (1999) assesses the current landscape fragmentation problem in Montana and Idaho specifically:

> The [land] ownership pattern is particularly problematic in western Montana, where mountain ranges are largely National Forest land, but the surrounding valley bottoms are mostly private lands. The private land is increasingly subject to subdivision, suburban sprawl and other uses incompatible to the long-term maintenance of wildlife habitat connectivity. Once the private lands are fully developed, western Montana will have only three large areas of carnivore refugia (Greater Yellowstone Area, Selway-Bitterroot Mountains and the Bob Marshall Wilderness-Glacier Park areas), with the remaining public land habitat in between

these areas existing as "island" mountain ranges surrounded by developed private land.

… In northern Idaho from Coeur d'Alene north, key linkage areas between the Selkirk Mountains, Cabinet Mountains and the Bitterroot Mountains are at risk and will require restoration. In western Idaho, linkage to the Wallowa and Blue Mountains in Oregon and Washington is at risk or absent. In eastern Idaho, Interstate 15 provides a formidable barrier between the Greater Yellowstone area and Bitterroot Mountains. (pp. 5-6, emphasis added)