DRAFT

Washington State Recovery Plan for the Fisher

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In 1990, the Washington Wildlife Commission adopted procedures for listing and de-listing species as endangered, threatened, or sensitive and for writing recovery and management plans for listed species (WAC 232-12-297, Appendix C). The procedures, developed by a group of citizens, interest groups, and state and federal agencies, require preparation of recovery plans for species listed as threatened or endangered.

Recovery, as defined by the U.S. Fish and Wildlife Service, is the process by which the decline of an endangered or threatened species is arrested or reversed, and threats to its survival are neutralized, so that its long-term survival in nature can be ensured.

This is the Draft Washington State Recovery Plan for the Fisher. It summarizes the historic and current distribution and abundance of fishers in Washington and describes factors affecting the population and its habitat. It prescribes strategies to recover the species, such as protecting the population and existing habitat, evaluating and restoring habitat, reintroduction of fishers into vacant habitat, and initiating research and cooperative programs. Interim recovery objectives are identified.

As part of the State's listing and recovery procedures, the draft recovery plan is available for a 90-day public comment period. Please submit written comments on this report by 15 August 2006 via e-mail to WILDTHING@dfw.wa.gov, or by mail to:

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EXECUTIVE SUMMARY

The fisher is a large, stocky dark brown member of the weasel family. It has a long bushy tail, short, rounded ears, short legs, and a low-to-the-ground appearance. Historically, fishers were widely distributed in Washington in dense, mesic forests at low to mid-elevations. The distribution of trapping reports and specimens confirms that fishers occurred throughout the Cascades, Olympic Peninsula, and parts of southwestern and northeastern Washington, although it does not appear that they were as abundant in Washington as in other parts of their range.

Fishers occur only in North America, and between the late 1800s and early 1900s populations were nearly extirpated over much of their former range in the United States and eastern Canada. The two most significant causes of the fisher's decline were over-trapping and loss and fragmentation of low- and mid-elevation late-successional forests. Trapping reduced populations quickly. Despite decades of protection from commercial harvest, fisher populations never recovered in Washington. Extensive logging of late-successional forests at low and mid-elevations and subsequent conversion of these forests to intensively managed forests and urban development, eliminated a large portion of the fisher's habitat in the state. Fishers use late-successional forest structures, such as large live trees, snags and logs for giving birth to and raising their young, as well as for rest sites. Foraging habitat is characterized by complex structural diversity on the forest floor, with high volumes of downed logs of all sizes and a shrubby understory. Travel among den and rest sites and foraging areas occurs under a dense forest canopy; large openings in the forest, such as clearcuts, are avoided. Forests with a more simplified structure that lack these habitat components replaced these late seral habitats as a result of commercial forestry. Fishers likely vanished from landscapes as remaining blocks of suitable habitat became smaller and more isolated and supported fewer fishers over time. Fishers are not likely to use extensive even-aged forest because it lacks the structure and complexity they need.

The fisher was listed as Endangered in Washington in 1998 by the Washington Fish and Wildlife Commission and is now considered likely extirpated from the state. In 2004, the U.S. Fish and Wildlife Service concluded that the West Coast fisher population constitutes a distinct population segment and that a federal listing of Endangered is warranted. However, the Service precluded listing the species because of pending proposals for other species of higher priority. The West Coast distinct population segment of the fisher is now on the federal list of candidate species.

A self-sustaining fisher population is not likely to become reestablished in the state without human intervention. There are no fisher populations close enough to Washington to establish a population through emigration. Reintroductions are the only means of recovery in Washington and have been successful in the recovery of fisher populations in other parts of the fisher's range. Federal lands (national parks and national forests) are the focus of fisher recovery in Washington. Federal lands have substantial areas of late-successional forest and additional fisher habitat is likely to become available in the future on the national forest land base as forests mature under guidelines established in the 1994 Northwest Forest Plan.

A reintroduction feasibility study was conducted for western Washington that identified three areas of suitable habitat that may support a fisher population. These included the Olympic Peninsula, the southwestern Cascades, and the northwestern Cascades. Olympic National Park was identified as the most suitable for the first reintroduction, followed by the southern and northern Cascades. Results from research and monitoring of the Olympic Peninsula population will guide future translocations in the Cascade Mountains and other parts of the state.

Recovery actions are needed to reintroduce and maintain fisher populations in Washington. The recovery plan outlines strategies that, when implemented, will likely restore viable fisher populations to Washington. The recovery plan identifies three recovery areas in Washington: the Olympic, Cascade, and Selkirk.

The current state of knowledge of fisher ecology in Washington does not allow for the development of population numbers or specific geographic distribution goals as recovery criteria. Instead, the recovery effort will focus on successfully reintroducing fishers at multiple locations in the state. Interim objectives will likely be modified as more is learned about the habitat needs and population dynamics of fishers in Washington. The interim recovery objectives of the fisher recovery plan are to:

1) Successfully reintroduce fishers to the Olympic Peninsula (Olympic recovery area) and Cascade Mountains (Cascade recovery area). Reintroduction success will be based on meeting the following criteria:

    - Evidence that fishers survive for extended periods in the wild,
    - Fishers establish home ranges, with spatially overlapping male and female home ranges,
    - Evidence of reproduction in the wild,
    - Recruitment of juveniles into the breeding population, and
    - Expansion of a reproductive population into unoccupied suitable habitat, AND

2) Develop agreements and/or have in place forest management plans for federal and state forest lands within the Olympic and Cascade recovery areas that ensure suitable habitat will continue to be managed in a way consistent with maintaining fisher populations.

Fisher recovery strategies include conducting reintroduction feasibility studies to evaluate potential reintroduction areas, conducting reintroductions in suitable landscapes, monitoring populations, establishing self-sustaining populations, protecting established fisher populations, conducting research on the needs and limiting factors of fisher populations in Washington, and developing a conservation strategy for providing fisher habitat at multiple spatial scales to maintain re-established populations. Long-term persistence of fishers in Washington will depend on federal land managers providing suitable habitat and habitat connectivity. Federal land managers are currently collaborating with scientists to develop a "Fisher Conservation Assessment and Conservation Strategy" for Washington, Oregon, and California. The assessment and strategy should provide guidance for management of forests on public lands throughout the region to provide fisher habitat and maintain connectivity. Achieving recovery will require cooperation and partnerships among, state, federal, and local agencies, tribes, timber industry, non-governmental organizations, and private citizens.

PART ONE: BACKGROUND

INTRODUCTION

The fisher (*Martes pennanti*) is listed as a State Endangered species (WAC 232-12-011) and has probably been extirpated from Washington. The two most significant causes of the fisher's decline were over-trapping by commercial trappers and loss and fragmentation of low to mid-elevation late-successional forests. Incidental poisoning from predator control programs and incidental capture were less significant factors (Powell and Zielinski 1994, Lewis and Stinson 1998). The combination of loss and fragmentation of the fisher's primary habitat and severe reductions in populations from overtrapping probably prevented recovery of populations once the species was protected from trapping (Aubry and Lewis 2003). Fishers probably could not recover because of their low numbers in isolated pockets of habitat and there were no fisher populations in close enough proximity to Washington to facilitate establishment of a population through emigration (Aubry and Lewis 2003, Weir 2003, Proulx et al. 2004). Mortality from incidental captures in traps set for other furbearers could have been frequent enough to prevent local recovery of populations or prevent reoccupation of suitable habitat (Lewis and Stinson 1998). Incidental trapping may have accelerated the decline of fishers in remnant patches of habitat (Aubry and Lewis 2003).

TAXONOMY

The fisher is a member of the order Carnivora, family Mustelidae, and subfamily Mustelinae. Its scientific name was given by Johann Erxleben in 1777 in honor of Welsh naturalist Thomas Pennant, one of the first people to describe the species in the scientific literature (Douglas and Strickland 1987). In 1765, Buffon provided the first scientific description of the species based on a specimen from a collection in Paris and gave the name *Pekan*. In 1771, Pennant provided a scientific description of what he described as the *Fisher*. Pennant was apparently unaware that his description and that of Buffon's *Pekan* were of the same specimen (Powell 1981, 1993). In the late 1800s, Allen, Baird, Coues, Rhoads, and Smith independently agreed upon the binomial *Martes pennanti* (Hagmeier 1956, Powell 1981). Three subspecies have been recognized: *M. p. pennanti* (Erxleben) of northeastern and northcentral North America; *M. p. columbiana* (Goldman) of central and western Canada and the northern Rocky Mountains of the United States; and *M. p. pacifica* (Rhoads) of southwestern British Columbia, Washington, Oregon, and California (Goldman 1935, Hall 1981). The validity of these three subspecies has been questioned (Grinnell et al. 1937, Hagmeier 1959, Coulter 1966). Recent genetic analyses reveal genetic structuring in fisher populations in North America similar to current subspecies designations but also consistent with an isolation-by-distance pattern (Kyle et al. 2001, Drew et al. 2003).

DESCRIPTION

The fisher is a large, stocky, dark brown member of the weasel family, and the largest member of the genus *Martes*. It is about the size of a large house cat. It has a long, bushy tail, short rounded ears, short legs, and a low-to-the-ground appearance. It is commonly confused with the smaller American marten (*M. americana*), which is lighter in color (cinnamon to milk chocolate color), has an irregular cream to bright amber throat patch, and has more pointed ears and a proportionately shorter tail. The fisher's pelage is dark brown on the snout, belly, legs, rump, and tail. It is often a lighter, grizzled brown (cinnamon to milk-chocolate) color on the top of its head, neck and shoulders. Fishers often have white markings on their chest, underarm region and abdomen (Powell 1993). Although the configuration of these markings remains the same on individual fishers, the color is known to vary from white to amber-yellow and back again over a period of a year. Females have finer, silkier fur than males, making females' pelts more valuable than those of males (Douglas and Strickland 1987). Fishers have a single molt that begins in late summer or early fall and ends by November or December (Powell 1993). Fishers exhibit dramatic sexual dimorphism. Females usually weigh 2.0 to 2.5 kg (4.4-5.5 lb) and measure 70 to 95 cm (28-37 in) in total length; males usually weigh 3.5 to 5.5 kg (7.7-12.1 lb) and measure 90-120 cm (36-47 in) total length (Powell 1993). The tail is slightly more than one third of the total body length in both sexes.

The fisher has partially retractable claws that allow it to climb and maneuver in trees; it can descend trees in a head-first position (Grinnell et al. 1937; Powell 1980, 1993). It has large feet with 5 toes and walks using its whole foot (plantigrade posture; Powell 1993) or just its toes (digitigrade posture; Strickland et al. 1982). The fisher runs with the undulating or bounding gait typical of weasels.

The fisher's dentition consists of 3 incisors, 1 canine, 4 premolars, and 1 molar bilaterally in the upper jaw; and 3 incisors, 1 canine, 4 premolars and 2 molars bilaterally in the lower jaw (Powell 1993). Males have a baculum, which becomes heavier and changes shape with age, and its characteristics can be used to distinguish juveniles from adults (Strickland et al. 1982, Frost et al. 1997). The skull of both males and females has a sagittal crest, but is much larger on adult males (Strickland et al. 1982).

DISTRIBUTION

North America

Fishers are found only in North America. Historically, the northern limit of its range coincided with tree line and extended from 60° north latitude in the West to just south of the southern tip of James Bay in the East (Powell 1993). Its range extended as far south as the Appalachians of Tennessee and North Carolina (Fig. 1; Hagmeier 1956, Gibilisco 1994). Prehistoric remains have been found as far south as Georgia, Arkansas, and possibly Alabama (Graham and Graham 1994). In the western United States, continuous peninsular extensions occurred historically from Canada south through the Rocky Mountains to Central Idaho, and south through the Cascade Range, Coast Ranges, and the Sierra Nevada (Gibilisco 1994).

Since European settlement of the continent, most of the fisher's range contraction has occurred within the United States, particularly south of the Great Lakes region. Between the late 1800s and early 1900s, fisher populations declined dramatically. Populations were nearly extirpated over much of their former range in the United States and eastern Canada (Powell 1993, Powell and Zielinski 1994). Over-trapping and alterations of forested habitats by logging, fire, and farming were the primary reasons for this dramatic population decline and range contraction (Douglas and Strickland 1987, Powell 1993, Powell and Zielinski 1994). Prior to the 1920s, unregulated trapping of fishers and high prices for their pelts, especially the silky, glossy pelts of females, resulted in heavy exploitation of fisher populations (Powell 1993, Powell and Zielinski 1994). During the same period that fishers were heavily trapped, their habitat was being destroyed. By the mid-1800s, clearing of forests from logging, agriculture and fires resulted in extensive forest loss over much of the northeastern United States (Powell and Zielinski 1994). Fires, particularly in the northern Rockies, resulted in the loss of well over 1 million acres of potential fisher habitat (Pyne 1982). Consequently, in the 1920s, 1930s and 1940s, many states and provinces closed trapping seasons on fishers to protect remaining populations and facilitate recovery (Powell 1993).

During the 1930s, remnant fisher populations in the United States were known to occur only in the Moosehead Plateau region of Maine, in the White Mountains of New Hampshire, in the Adirondack Mountains of New York, in the "Big Bog" region of Minnesota, and in scattered locations in the Pacific coastal mountains. In Idaho and Montana reliable reports of native fishers were last reported in the 1920s. In eastern Canada, the only remnant population was on the Cumberland Plateau in New Brunswick (Powell and Zielinski 1994).

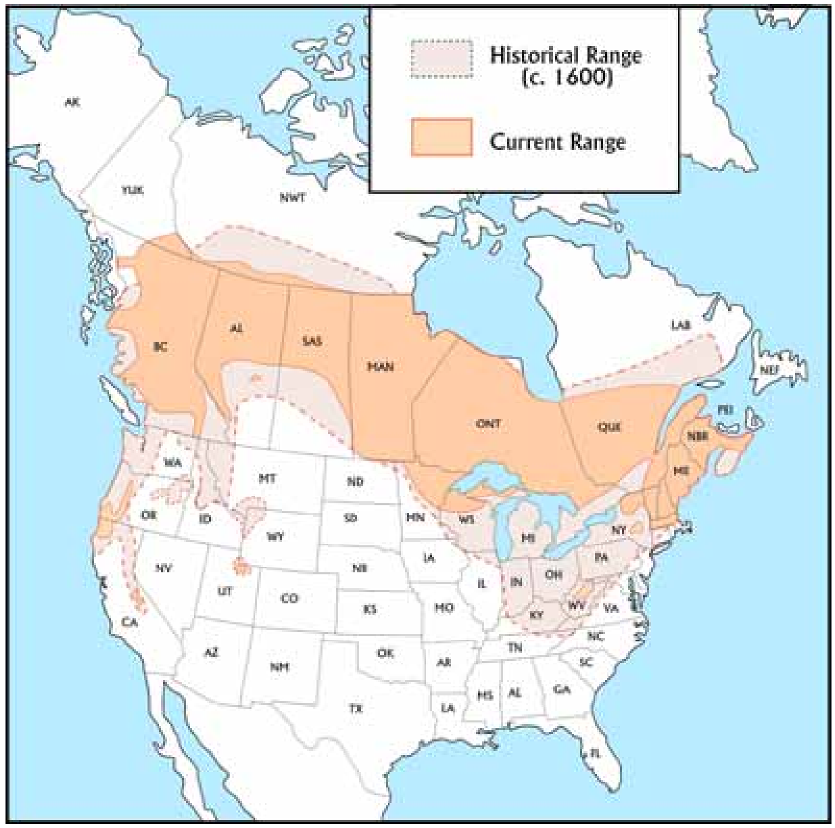

Figure 1. Historical and current range of the fisher in North America (modified from Gibilisco 1994).

Concurrent with legal protection during the 1930s, extensive logging came to an end in eastern North America and abandoned farms reverted to forest, allowing remnant fisher populations to begin to recover and reinvade their former range. Fishers were reintroduced in areas where trapping closures alone were unsuccessful in recovering fisher populations (Berg 1982, Powell 1993). During the 1950s and 1960s many states and provinces reintroduced fisher populations as a biological control of porcupines (*Erethizon dorsatum*)(Powell and Zielinski 1994). As a result, fishers expanded their distribution in eastern North America into areas where they had been extirpated during the early part of the century (Powell and Zielinski 1994). The current distribution of fishers includes much of the forested region of Canada, New England, New York, northern and southern Pennsylvania, West Virginia, northern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan (Gibilisco 1994, Proulx et al. 2004). In central North America, fisher populations are unlikely to return to Illinois, Indiana, or Ohio because of extensive loss of forests.

The fisher's range in the western states is now more fragmented and discontinuous than it was historically (Gibilisco 1994, Aubry and Lewis 2003, Proulx et al. 2004). Despite decades of protection from trapping and poisoning, fisher populations in Pacific states did not recover and their geographical distribution is limited to several relatively small, disjunct populations. These populations include a reintroduced population in the southern Cascade Range in Oregon, and indigenous populations in the Klamath-Siskiyou region of extreme southwestern Oregon and northwestern California and in the southern Sierra Nevada (Zielinski et al. 1995, Aubry and Lewis 2003, Aubry et al. 2004). The small fisher population in the southern Oregon Cascade Range is separated from the nearest extant population in southern British Columbia by a distance of over 650 km (M. Badry, pers. comm. *in* Aubry and Lewis 2003). The fisher's range in British Columbia has also contracted to the north. Most of the apparent range contraction is attributed to a better understanding of fisher habitat needs since the work of Banci (1989), but also to local extirpation. In southern British Columbia, fisher populations appear to have disappeared from the lower Mainland, parts of the Okanogan and Cascade Mountain ranges of the southern interior, and the southeastern portion of the province. These areas have been identified as having low habitat suitability and support low fisher harvests (Weir 2003, Proulx et al. 2004). Reintroductions have reestablished fishers in central Idaho and northwestern Montana, although fishers remain uncommon in this region (Gibilisco 1994, Proulx et al. 2004). Fisher populations in central Idaho are probably not large enough to provide dispersers to recolonize eastern Washington.

Washington

Early records. Archaeological deposits from sites in King, Okanogan, and Ferry counties suggest that the fisher has been present in Washington for at least 4,000 years (Lyman 1995, R.L. Lyman, pers. comm.). Based on habitat, the historical range of fishers in Washington probably included all the wet and mesic forest habitats at low to mid-elevations (Fig. 2). 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 (Suckley and Cooper 1860, Taylor and Shaw 1927, Scheffer 1938, 1957,1995; Booth 1947, Dalquest 1948, B. Adamire, pers. comm; Appendix A, B). The

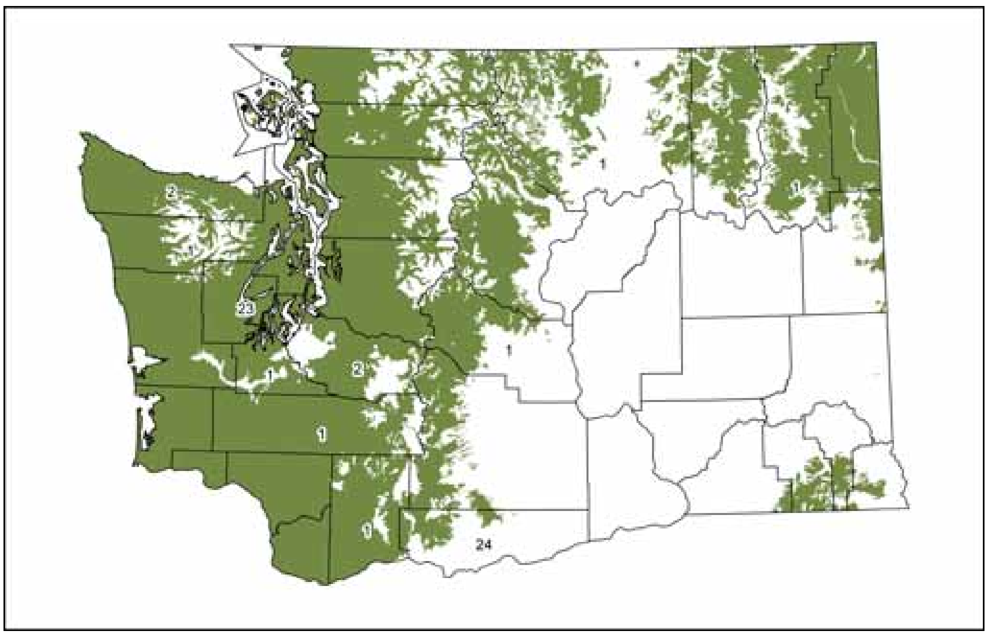

Figure 2. Probable historical distribution (circa 1800) of the fisher in Washington based on specimens (numbers indicated by county), trapping records, and forest zones associated with fisher records (Aubry and Houston 1992) (Forest zones [Cassidy 1997] shaded include: Western Hemlock types, Douglas-fir types, Grand Fir, Cowlitz River (zone), Willamette Valley (zone), Sitka Spruce, Interior Redcedar, Silver Fir, and Subalpine Fir).

species' historical occurrence in northeastern and southwestern Washington and the Blue Mountains is uncertain. Booth (1947) included all these areas as fisher range. Taylor and Shaw (1927) and Dalquest (1948) excluded these areas as historical fisher range but Dalquest stated, "a few may occur in northeastern Washington, the Blue Mountains, and the Willapa Hills." However, Suckley and Cooper

(1860:92,114) mention fishers in the Blue Mountains and two specimens were collected in the Blue Mountains in Oregon (Bailey 1936). Fur returns reported by the Hudson's Bay Company for the years 1836-1852 list 284 fishers from Fort Nez Perces at Walla Walla (Hudson's Bay Company Archives, Winnipeg). These fishers were probably trapped in the Blues in Washington and Oregon and in the Wallowa Mountains in northeastern Oregon. In northeastern Washington a large number of trapping records of fishers were reported from Fort Colville, which was near Kettle Falls. However, Fort Colville received furs from a part of southeastern British Columbia, northern Idaho, and western Montana, as well as northeastern Washington (Mackie 1997:250). For southwest Washington, Booth (1947) listed a specimen from Bay Center, Pacific County. Johnson and Cassidy (1997) excluded southwestern Washington because the Bay Center specimen listed by Booth (1947) is not among the other specimens of the Biological Survey Collection at the Smithsonian. The specimen either has been lost or never existed (R. Johnson, pers. comm.). In southwestern Washington, historical accounts indicate fishers were trapped near the Palix River, Pacific County in 1903, 1910, and 1913 (B. Adamire, pers. comm.), and 3 fishers were trapped near Seaview in 1930 (Scheffer 1957).

Fishers probably did not occur historically on islands in Puget Sound. A bone found during excavation of a village site on Whidbey Island is the only known fisher record, and it may have been caught elsewhere (Bryan 1963). San Juan County was not included in the historical range, though Booth (1947) listed a specimen in the personal collection of Walter Dalquest from Blakely Island. However, Walter Dalquest has no recollection of such a specimen and did not believe fishers were ever found on the islands (F. Stangle, pers. comm.). Dalquest (1948), and Johnson and Cassidy (1997) did not include San Juan County within the historical fisher range.

Scheffer (1938, 1957, 1995) reported that fishers were trapped in low elevation forests of the Olympic Peninsula in the early 1900s, but by the 1930s the fisher was "... concentrated chiefly in the wild and roadless portions of the Olympic Mountains, but has been reported along the Cascades and as far east as the Okanogan Valley" (1938:8). Based on all the records and reports with good location information, Aubry and Houston (1992) reported that fishers on the west side of the Cascades were primarily (87% of records) found below 1,000 m in elevation. They attributed the complete absence of fisher records above 1,800 m west of the Cascade crest to the deep snow pack. However, on the east side of the Cascades, 18% of reliable records were within the 1,800-2,200 m elevation range and 30% occurred below 1,000 m.

Recent records. Aubry and Houston (1992) compiled fisher records and sighting reports from 1955-1991 for Washington. Fisher sightings and track reports must be interpreted with caution, because other species, including martens and river otters (*Lontra canadensis*), can be mistaken for fishers, and large marten tracks are similar to female fisher tracks (Zielinski and Truex 1995). Aubry and Houston (1992) evaluated all fisher records and reports and assigned them to categories of reliability. Their summary suggested that the fisher is no longer found in the southern Coast Range, the Kitsap Peninsula, along the eastern edge of Puget Sound, the southernmost Cascades, and the Blue Mountains (Aubry and Houston 1992). We report early trapping records and observations rated 1-3 by Aubry and Houston (1992) in Appendix B. The only verifiable records (specimens or photos) in recent years include: a female found dead in a trap near Orting, Pierce County, in 1990; a fisher trapped, photographed, and released on Fort Lewis, Pierce County in 1992; and a radio-collared fisher from Montana that was recovered in Stevens County in 1994. However, the recent records from Orting and Fort Lewis were likely escapees from captive wildlife facilities. From the mid-1980s through 1990s the National Park Service, U.S. Forest Service and Washington Department of Fish and Wildlife (WDFW) conducted extensive surveys using standard survey protocols but failed to detect any fishers (Lewis and Stinson 1998, Aubry and Lewis 2003). During the winters of 2001-04 the National Park Service conducted forest carnivore surveys, using standardized survey protocols, in Mount Rainier (2001-02), Olympic (2003-03) and North Cascades (2003-04) National Parks. No fishers were detected (Happe et al. 2005, J. Schaberl, pers. comm.). The absence of reliable observations of fishers in recent years, and lack of detection on federal lands based on standardized surveys implemented over several years, suggests that fishers are extremely rare or have been extirpated from the state.

NATURAL HISTORY

Reproduction

Fishers have a relatively low reproductive capacity. Although females attain sexually maturity and can breed for the first time at 12 months, they don't give birth for the first time until age 2 because of delayed implantation of the fertilized ovum (Powell 1993, Frost et al. 1997). Moreover, not all adult females produce litters every year. In a heavily trapped population in Maine, Paragi et al. (1994*a*) reported an average of 63% (range = 0.33-1.00) of females raised litters to weaning each year. Factors that may influence reproductive success include age, physical condition during fall and winter, and prey availability (Paragi 1990, Arthur and Krohn 1991, Mead 1994). Productivity of females appears to peak at 4-5 years of age (Douglas and Strickland 1987, Paragi 1990). Like females, males are sexually mature at 12 months of age (Wright and Coulter 1967, Leonard 1986, Frost et al. 1997) but are not effective breeders until age 2 (Douglas and Strickland 1987). The baculum in yearling males may not be sufficiently developed to induce ovulation in receptive females (Douglas and Strickland 1987).

Fishers, like all other *Martes* species, exhibit delayed implantation. Following fertilization of the egg, cleavage of the embryo proceeds to the "blastocyst" stage, after which further development is suspended (Mead 1994). For fishers, embryos remain dormant in the blastocyst stage for 10-11 months before implantation occurs in the spring (February-March). Implantation of blastocysts is under hormonal control and is triggered by increasing photoperiod (Frost et al. 1997). After an active gestation period of about 36 days, between 1-4 kits are born sometime in late March or early April (Powell 1993, Mead 1994). Females mate 3-10 days after parturition (Hall 1942). Mating may occur during several hours on one day, or a similar amount of time on several days (Powell 1993).

Wright and Coulter (1967) reported that trapped females typically had 3 or 4 embryos in their uteri. However, Mead (1994) found that litter size was typically 2-3 and Paragi et al. (1994*a*) reported a mean litter size of 2.2. These data suggest that fetus reabsorption, abortion, or post-partum mortality commonly occur (Powell 1993). Frost et al. (1997) reported a decline in average litter size from 2.7 at birth to 2.0 seven days postpartum. Kits open their eyes at about day 45-50 and attempt to walk at 6-8 weeks (Powell 1993). Kits are weaned at about this time and the mother begins provisioning them with prey. At age 10 weeks they can walk and climb awkwardly (Paragi 1990, Powell 1993), and will roam around outside the den entrance (K. Aubry, pers. comm.). Kits become independent of their mother in late summer and early fall (Arthur and Krohn 1991, Aubry and Raley 2002).

Males make extensive forays from established home ranges during the breeding season in March and April (Leonard 1986, Arthur et al. 1989*a*). Males apparently attempt to mate with as many females as possible. Fighting and other aggressive interactions between males may be common at this time (Leonard 1986, Arthur et al. 1989*a*). Breeding season forays outside their home range could provide males with additional breeding opportunities (Powell 1993).

Mortality and Survival

Maximum life span of wild fishers is approximately 10 years (Kohn et al. 1993, Powell 1993). Where trapping of fishers is permitted, it is typically the largest source of fisher mortality (Douglas and Strickland 1987, Krohn et al. 1994). In Maine, Krohn et al. (1994) found that human-related causes accounted for 94% of the 50 deaths of radio-collared fishers with trapping accounting for 80%. During the trapping season in Maine, juveniles had the lowest survival rate (0.38), whereas adult survival rates differed by sex with males having a significantly lower survival rate (0.57) than females (0.79). During the non-trapping season survival was higher for both adults (0.89) and juveniles (0.72) (Krohn et al. 1994). Paragi et al. (1994*b*), reported a mean annual survival rate of 0.65 for adult females ($\geq$1 year old), and 0.27 for juveniles of either sex for Maine fishers. Other sources of mortality include vehicle collisions, predation, fighting, disease, infections, starvation, poisoning, accidents, and debilitation from porcupine quills (Douglas and Strickland 1987, Proulx et al. 1994). Male fisher pelts commonly (40-50%) show scarring from intraspecific fighting (Douglas and Strickland 1987). Among males, fighting may account for a significant percentage of natural mortality. There are few data on fisher predation. Douglas and Strickland (1987) stated that hawks, great horned owls (*Bubo virginianus*), red foxes (*Vulpes vulpes*), bobcats (*Lynx rufus*), lynx (*L. canadensis*), and black bears (*Ursus americanus*) are potential predators, especially of kits. They also reported a fisher killed by dogs (*C. familiaris*). In Montana, Roy (1991) documented predation by mountain lions (*Puma concolor*), coyotes, wolverines (*Gulo gulo*), golden eagles (*Aquila chrysaetos*), and lynx for fishers translocated from Minnesota.

Population Cycles

Fisher populations that rely heavily upon snowshoe hares (*Lepus americanus*) for food reflect the cyclic abundance of this prey species. Total fisher harvests (and presumably the fisher population) for all of Canada exhibit a cycle that lags 3 years behind the snowshoe hare cycle (Bulmer 1974, 1975). This cycle is not evident in all parts of Canada; Keith (1963) reported that the fisher population in British Columbia does not cycle, and Leonard (1986) found no evidence of a cycle in southern Manitoba. In Washington and other areas in the southern part of the hare's range, hare populations do not have a pronounced cycle (see Koehler 1990, Koehler and Aubry 1994). In Minnesota, fishers consumed more small mammals (e.g., voles, mice, and shrews) and deer carrion in response to a decline in hare abundance, and showed no decline in reproductive success or condition (Kuehn 1989).

Behavioral Characteristics

Fishers are solitary except when rearing young (done only by the female), breeding, or fighting. During the non-breeding period, adult fishers maintain intrasexual territories (Leonard 1986, Arthur et al. 1989*a*, Weir 1995). However, during the breeding period (generally March-April) intrasexual spacing mechanisms in adult males break down as males search for receptive females (Leonard 1986, Douglas and Strickland 1987). Males and females apparently locate each other by investigating other fisher tracks and marking elevated scent posts with urine, musk and scats (Leonard 1986). Male-female interactions, other than breeding and detecting scent marks, are probably incidental to other activities. Defending territories using confrontation may be relatively rare (Powell 1993).

Scent-marking with urine, feces, and glandular secretions on logs, stumps, and snow piles is used presumably as a means of communication. Plantar glands on the hind feet become larger in the breeding season and may deposit scent during normal locomotion (Frost et al. 1997). Leonard (1986) documented fishers investigating tracks of the opposite sex during the breeding period, as well as scent marking rocks and stumps with urine, musk and scats. Fishers have been observed marking deer carcasses by dragging their abdomens over the carcass and marking with urine (Pittaway 1984). Rest sites are also scent marked with feces and urine (Powell 1993). An abdominal scent gland is present in American martens and wolverines, but has not been described for fishers (Pittaway 1984).

Diet and Foraging

While a number of fisher food habit studies have occurred in New England (Arthur et al. 1989*b*, Giuliano et al. 1989, Powell et al. 1997*a*), Minnesota (Kuehn 1989) and southeastern Manitoba (Raine 1987), few fisher food habits studies have occurred in western North America. Initial studies were from California (Grenfell and Fasenfest 1979) and the Pacific coastal states (Ingles 1965), with later studies from California (Zielinski et al. 1999), Idaho (Jones 1991), Montana (Roy 1991), and British Columbia (Weir et al. 2005) (Table 1). Ingles (1965) reported principal food items in the Pacific coastal states to include porcupines, squirrels, woodrats (*Neotoma* spp.), mice, marmots, mountain beavers (*Aplodontia rufa*), quail, and grouse. In the early 1900s, trappers on the Olympic Peninsula found mountain beaver and squirrel remains in fisher stomachs. Scats collected along trails in summer contained huckleberries (*Vaccinium* sp.) and salal berries (*Gaultheria shallon*) (Scheffer 1995). This is the only information on food habits for fishers in Washington. Most food habits studies conducted in western North America provide information on the winter diet (Table 1). This is due to the readily available source of carcasses provided by trappers during the legal trapping season, or collection of scats during winter reintroductions. A single study conducted in the Sierra Nevada Mountains of California provides information on seasonal food habits of fishers in western North America (Zielinski et al. 1999).

Winter diet. The most important prey species in the winter diet of fishers from British Columbia (Weir 2005), Idaho (Jones 1991), and Montana (Roy 1991) were snowshoe hares, red squirrels (*Tamiasciurus hudsonicus*) and small mammals (Table 1), based on frequency occurrence of food items in scats or stomachs. Weir et al. (2005) aggregated prey species found in fisher stomachs (*n* = 215) into 7 food groups based on similarity in niches and body sizes. The top 3 food groups were small mammals (mice, voles, shrews and squirrels; 41.2%), followed by snowshoe hares (15.2%), and aquatic mammals (beavers [*Castor canadensis*] and muskrats [*Ondatra zibethicus*]; 14.0%). Porcupines occurred with greater frequency in prey remains in British Columbia (19.5%, Weir et al. 2005) than in Montana (6%, Roy 1991) or Idaho (6%, Jones 1991). Ungulate carrion is also an important winter food item (Table 1). In the southern Sierra Nevada of California, the most commonly occurring winter foods were squirrels (20.8%), cricetids (41.7%), ungulate carrion (25%), birds (25%), and insects (41.7%)(Zielinski et al. 1999). Analysis of eight fisher carcasses collected in the Trinity National Forest in northern California, included remains of ungulate carrion (25.0%), small mammals (12.5%), western gray squirrels (*Sciurus griseus*; 12.5%), leporids (12.5%), and beetles (25.0%) (Grenfell and Fasenfest (1979).

Table 1. Percent occurrence of food items in fisher scats and gastrointestinal tracts from western North America.

	Season								
	Winter						Spring	Summer	Fall
Prey	B.C.[1]	Mont.[2]	Id.[3]	Id.[4]	Calif.[5]	Calif.[6]	Calif.[6]	Calif.[6]	Calif.[6]
Mammals									
Peromyscus maniculatus	16								
Peromyscus leucopus			14						
Peromyscus spp.		14			25	8	6	16	
Clethrionomys gapperi	23		29	6					
Unident. voles				28					
Microtus spp.	8	3				13	6	5	
Reithrodontomys megalotis					13				
Neotoma cinerea	2	7							4
Zapus princeps				6					
Marmota flaviventris			14	6					
Tamiasciurus hudsonicus	34		14	22					
Tamiasciurus douglasii						4	11	6	4
Tamius spp.		3		6				1	8
Glaucomys sabrinus	8							1	
Sciurus griseus					13	8	2	4	4
Spermophylus beecheyi							6	4	4
Spermophylus spp.				6					
Thomomys bottae							6	6	4
Thomomys spp.				6					
Castor canadensis			29	6					
Erethizon dorsatum	20	6	6						
Unident. rodents		6							
Sorex spp.	15						1	3	4
Scapanus latimanus					13		4	2	
Lepus americana	39	49	29	50					
Sylvilagus bachmani					13				
Martes pennanti	10								
Martes americana	11	7							
Martes spp.		6				8	28	15	35
Unident. Mustelids				6			2		
Spilogale putorius									4
Odocoileus spp. (carrion)	10	3	14	11	25				
Cervus elaphus (carrion)			29	6		25	4		
Alces alces (carrion)	15		14	11					
Unident. ungulate (carrion)			29	22					
Birds									
Galliformes	9								
Unident. birds			14	17		25	32	51	27
Reptiles							38	20	4
Insects				22	25	42	53	62	50
Fruit[7]	tr					tr		tr	tr
Seeditors				17					

[1]Weir et al. (2005), *n* = 215 stomachs; [2]Roy (1991), *n* = 80 scats; [3]Jones (1991), *n* =7 gastrointestinal tracts; [4] Jones (1991), *n* = 18 scats; [5]Grenfell & Fasenfest (1979), *n* = 8 gastrointestinal tracts; [6]Zielinski et al. (1999), *n* = 201 scats; [7]*Vaccinium* spp. or *Ribes* spp. berries.

Spring, summer, and autumn diet. In the only study of seasonal food habits in the Pacific states, Zielinski et al. (1999) found little seasonal variation in the diet of fishers in the southern Sierra Nevada. The most common prey in scats during spring, summer and autumn periods were sciurids (15.4-24.5%), including California ground squirrel (*Spermophilus beecheyi)*, western gray squirrel, and Douglas' squirrel (*Tamiasciurus douglasii*); murids (7.7-26.5%) (*Peromyscus* spp. and *Microtus* spp.); birds (26.9-51%); and reptiles (3.8-37.7%). Reptiles were important during spring (37.7%) and summer (20.4%) periods, especially the alligator lizard (*Elgaria* sp.). Insects were consistently common foods during spring (52.8%), summer (62.2%), and autumn (50.0%) periods, with beetles (Coleoptera) and social wasps (Vesidae/Eumenidae) most prevalent. Predictably, fruit became more important in the diet during fall and winter. The fact that no single family of plant or animal group occurred in more than 22% of feces attests to the diversity of the fisher diet in California. Further, a study in the southern Oregon Cascade Range also indicates that the fisher is a dietary generalist. Prey remains collected over several years at den sites and resting sites in southern Oregon included hares, rabbits, squirrels (California ground squirrel, Douglas squirrel, northern flying squirrel [*Glaucomys sabrinus*], western gray squirrel, golden-mantled ground squirrel), woodrat (*Neotoma* spp.), shrews (*Sorex* spp.), shrew-mole (*Neotrichus gibbsii*), mole (*Scapanus* spp.), pika (*Ochotona princeps*), chipmunks (*Tamias* spp.), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), porcupine, bobcat, deer (*Odocoileus* spp.), elk (*Cervus elaphus*), birds (Stellar's jay [*Cyanocitta stelleri*], pileated woodpecker [*Dryocopus pileatus*], hairy woodpecker [*Picoides villosus*], northern flicker [*Colaptes auratus*], western screech owl [*Megascops kennicottii*], ruffed grouse [*Bonasa umbellus*], blue grouse [*Dendragapus obscurus*], mountain quail [*Oreotyx pictus*], turkey [*Meleagris gallopavo*]), reptiles (*Elgaria* spp.), insects, and fruit (Pacific blackberry [*Rubus ursinus*]) (K. Aubry and C. Raley, U.S. Forest Service, Pacific Northwest Research Station, unpublished data).

While there is little information available on the food habits of fishers in Washington (Scheffer 1995), an evaluation of bobcat food habits in western Washington could provide insight into fisher diet. In regions of North America where bobcats and fishers are sympatric, their diets are similar (Litvaitis 1984, Litvaitis et al. 1986, Arthur et al. 1989*b*, Giuliano et al. 1989). Schwartz and Mitchell (1945) identified food items in 6 stomachs and 99 scats of bobcats collected during 1935-38 from the Elwha, Hoh, Queets, and Quinault drainages. The most common prey were snowshoe hares (44%) and Douglas squirrels (18%). Mountain beaver remains were detected in only 2 of 105 (1%) scats. In contrast, Young (1958) reported mountain beavers to be the dominant food of bobcats in Washington during spring and summer periods. Sweeney (1978) found that mountain beavers were the most common prey in bobcat scats (56.6%) during the winter in western Washington. Snowshoe hares were second in importance (39.5%), followed by small mammals (15.7%), and squirrels (Douglas' squirrel, northern flying squirrel; 9.2%). Black-tailed deer (*Odocoileus hemionus*) and possibly elk were less important in the diet (6.6%)(Sweeney 1978). Knick et al. (1984) also reported mountain beavers and snowshoe hares to be the primary prey of bobcats during fall through winter in western Washington (42% and 26%, respectively). Mountain beavers and snowshoe hares combined occurred in 68% of stomachs and accounted for 83% of the weight of all food items. Knick et al. (1984) speculated that the greater importance of mountain beavers in recent studies, compared to Schwartz' and Mitchell's study may be attributed to changes in availability of mountain beaver habitat. Logging and burning in western Washington had increased the proportion of forests in early successional stages, the preferred habitat of mountain beavers (Knick et al. 1984).

Regional differences in bobcat diets in the Coast and Cascade Ranges of Washington and Oregon may also indicate differences in fisher diets. Sweeney (1978) compared food habits of bobcats for the Coast Range and Olympic Peninsula with the western Cascades in Washington. Bobcat stomachs from the coastal region (Coast Range and Olympic Peninsula) contained primarily mountain beavers (39.2%) and snowshoe hares (27.5%), with trace amounts of deer (2.9%). On the western slope of the Cascade Range, bobcat stomachs contained proportionally fewer mountain beavers (25%) and snowshoe hares (16.7%) and proportionally more deer (16.7%), although the sample from the Cascades was small (*n* = 7 stomachs). Nussbaum and Maser (1975) also compared the diet of bobcats in the Coast Range (*n* = 143 scats) and western Cascade Range (*n* = 34) in Oregon. In both the Coast Range and Cascade Range, leporids (52.5% and 70.6%, respectively) and small mammals (56.7%, 58.7%) occurred with the greatest frequencies. However, in contrast to Washington, leporids occurred with greater frequency in scats from the western Cascade Range (70.6% snowshoe hare) compared to the Coast Range (52.5%; 44.1% brush rabbit [*Sylvilagus bachmani*], 8.4% snowshoe hare). Mountain beavers occurred less frequently (8.4% and 2.9%) in this study, although they were the most common prey species in bobcat scats during spring (84.0%), summer-fall (73.7%) and winter (62.2%) months in the Coast Range of southwestern Oregon (Witmer and deCalesta 1986). In a study of the seasonal diet of bobcats in the western Cascades of Oregon, Toweill and Anthony (1988) also found snowshoe hares (30%), black-tailed deer (22%), and mountain beavers (12%) to be the most common food items in bobcat scats (*n* = 494). Snowshoe hares and black-tailed deer dominated the diet throughout the year, whereas mountain beavers occurred with greatest frequency in spring and summer periods. Cricetid rodents occurred in 23% of scats, varying from 9% in winter to 37% in spring. Fruit was an important food item during summer months (24%).

Reintroduced fishers are likely to consume a diversity of prey species from a variety of habitat types. Some prey species, like Douglas squirrels, northern flying squirrels and red-backed voles, are likely to be more common in mature forests, whereas snowshoe hares, mountain beavers and some small mammals are likely to be more common in early successional forests that occur in canopy gaps, burns, riparian areas, and recently logged areas. As a habitat specialist in late seral forests of the western United States, it may be adaptive for the fisher to be a dietary generalist and prey on an array of species that it encounters in and near mature conifer forests. This appears to be the foraging strategy of fishers in the southern Sierra Nevada (Zielinski et al. 1999).

Territoriality and Home Range

Home range size of fishers varies widely for individuals and by region (Table 2). Powell and Zielinski (1994) reported that there is no clear pattern in home range sizes, although the largest have been recorded in western states and provinces. Typically, male home ranges are two to three times the size of female home ranges. Sex-specific differences in home range size may be a result of differential resource use (i.e., males seek access to females, while females seek access to food)(Arthur et al. 1989*a*, Powell and Zielinski 1994). The home ranges of males often overlap more than one females's home range. There appears to be very little intrasexual overlap of adult home ranges, with the exception of males during the breeding season (Powell 1993). Data on home range size that includes breeding season data often include extra-territorial excursions by males (Powell and Zielinski 1994).

Activity Patterns, Movement and Dispersal

Fishers are primarily terrestrial, but climb trees to reach den and resting sites or to reach prey. Fishers can travel from tree to tree, but their arboreal activities have been exaggerated in the popular literature (Grinnell et al. 1937, Powell 1980). Female fishers, due to their smaller size, seem to be more adept at climbing (Powell 1977, Pittaway 1978).

Table 2. Estimated home range sizes (km^2) for fishers in nine studies in western North America.

Location	Male		Female		Season	Method	Source
	n	Mean ± SE	*n*	Mean ± SE			
Alberta	6	24.3 ± 11.1	10	14.9 ± 3.5	annual	MCP[1]	Badry et al. 1997
British Columbia	1	46.5	5	26.4 ± 9.2	annual	90% AK[2]	Weir 1995
" "	3	122.1 ± 66.5	8	33.0 ± 10.7	summer	90% AK	Weir 1995
" "	-		3	32.3 ± 18.3	autumn	90% AK	Weir 1995
" "	1	73.9	6	25.0 ± 2.6	winter	90% AK	Weir 1995
" "	1	59.1	2	27 ± 3.1	annual	90% AK	Fontana et al. 1999
Idaho	6	79 ± 14.3	4	32 ± 11.5		90% HM[3]	Jones 1991
Oregon	1		7	~25	annual	95% MCP	Aubry and Raley 2002
" "	4	~62		-	non-breeding	95% MCP	Aubry and Raley 2002
" "	3	~147		-	breeding	95% MCP	Aubry and Raley 2002
California	2	58.1 ± 29.6	7	15.0 ± 2.2	annual	100% MCP, Coastal Mtns.	Zielinski et al. 2004*b*
" "	4	30.0 ± 7.8	8	5.3 ± 0.6	annual	100% MCP, Sierra Mtns.	Zielinski et al. 2004*b*

[1] MCP = minimum convex polygon, [2] AK = adaptive kernel, [3]HM = harmonic mean.

Activity patterns of fishers vary with time of day, season, and reproductive status. During all seasons, periods of greatest activity occur shortly before sunrise and after sunset and the least activity occurs during midday when fishers are typically resting (Kelly 1977, Arthur and Krohn 1991). Peak activity periods may be attributed to times when they are hungry and when their prey is more available (Powell 1993). Fishers generally have 1-3 activity periods per day lasting 2-5 hours each (Powell 1993). Amount of activity is not different between sexes during any season (Arthur and Krohn 1991) but both sexes are more active during summer than winter (Kelly 1977, Arthur and Krohn 1991). Cold temperatures or greater snow depths may explain reduced winter activity (Arthur and Krohn 1991). During spring, denning females are more active than females without young, but overall activity is not different between these two groups during summer and winter; however, during summer, denning females are more active during the day (Arthur and Krohn 1991, Paragi et al. 1994*a*).

Age and sex of fishers affects movement of fishers within seasons. During autumn, juvenile females travel shorter distances than juvenile males (Arthur and Krohn 1991). During spring, both juvenile and adult males move greater distances than non-denning adult females (Arthur and Krohn 1991). Greater movement by adult males during this season probably is a result of their attempts to locate receptive females. Adult males travel beyond their established home range during spring, and suggests they are attempting to mate with several females (Arthur et al. 1989*a*). Adult males and non-denning adult females move similar distances during summer andjuvenile and adult males and adult females move similar distances during winter (Arthur and Krohn 1991). Adult males move greater distances during spring than other seasons, and non-denning females move similar distances during all seasons. Juvenile males move similar distances during autumn, winter and spring periods (Arthur and Krohn 1991).

Based on snow tracking, fishers in Michigan typically travel about 5 km each day (Powell 1993). In Wisconsin, Kohn et al. (1993) found average minimum daily movements of 2.25 and 1.25 km (1.4 and 0.8 mi) to be typical of males and females, respectively (straight line distance using telemetry). Fishers occasionally make long-distance movements in short periods, especially males during the breeding season. Reintroduced fishers typically travel >50 km after being released (Weckwerth and Wright 1968, Pack and Cromer 1981, Roy 1991, Heinemeyer and Jones 1994, Proulx et al. 1994, Weir 1995).

Rivers and roads may create barriers to movement. Kelly (1977) and Coulter (1966) reported that large rivers restricted movements and dispersal, but Weir (1995) and Fontana et al. (1999) reported fishers in crossing large rivers and lakes in British Columbia. In Massachusetts, two fishers crossed and recrossed a large river, but may have used bridges (York 1996). Seton (1929), and deVos (1952, cited in Heinemeyer and Jones 1994) indicate that fishers do not hesitate to swim when it is advantageous. In Oregon, unpaved logging roads do not seem to impede fisher movements, but wide paved roads do. Fishers did not maintain home ranges on both sides of paved roads in a study area in the southern Cascades of Oregon (K. Aubry, pers. comm.). In Maine, fisher home ranges spanned both sides of paved roads where forest was intact to the road edge (Arthur et al. 1989*a*). In areas where human development (i.e., non-forest, such as farms) was adjacent to major roads, the roads corresponded to home range boundaries (T. Paragi, pers. comm.). In Massachusetts, a fisher that maintained a home range on both sides of a highway was killed by a vehicle (York 1996).

In most mammals, males disperse from their mother's home range, but females remain nearby (Greenwood 1980). Male-biased dispersal is consistent with predictions of a polygynous mating system and intrasexual territoriality in fishers. Consistent with these predictions, Aubry and Raley (2002) reported average dispersal distances for juvenile males and females to be 29 km and 6 km, respectively. Two females did not disperse and established home ranges adjacent to their mothers. Moreover, adult females were more closely related to each other in the study area than were adult males, which is consistent with a social structure established by male-biased juvenile dispersal and female philopatry (Aubry et al. 2004). In contrast, two studies in New England found juvenile dispersal distances that did not support these predictions. In a heavily trapped fisher population in Maine, Arthur et al. (1993) found no significant difference in juvenile dispersal between males (n = 8, mean = 10.8, range = 4.1-19.5 km) and females (n = 5, mean = 11.3, range = 5.0-18.9 km). Similarly, York (1996) found no significant difference in juvenile dispersal distances between males and females in a central Massachusetts population that had a greater density but lower trapping mortality. Mean dispersal distance for males and females combined was 33 km. Trapping mortality is likely to disrupt spacing patterns and dispersal in fisher populations and therefore may explain the similar dispersal distances in New England. In Idaho, two 1-year-old males moved 26 and 42 km before establishing home ranges (Jones 1991).

Ecological Function

Fishers may serve important ecological functions in western coniferous forests by affecting the demography of their prey and competitors, as agents of seed dispersal, and serving a role in the life cycles of pathogens and parasites. Fishers prey on a broad array of species and appear to take prey opportunistically. Thus, fisher predation is likely to have minimal impact on the population dynamics or community structure of their prey in western coniferous forests (Aubry et al. 2003). Competitive interactions between fishers and martens do not appear to have an important influence on their populations; the two species appear to co-exist at the regional scale by partitioning habitat based on elevation and snow depth and may co-exist at local scales by partitioning food resources (Aubry et al. 2003). Fishers may be important agents for long distance dispersal of propagules and may serve as hosts for a variety of parasites in western coniferous forests (Aubry et al. 2003). Fishers use witches' brooms, caused by dwarf mistletoes (*Arceuthobium douglasii*), as rest sites and maternal dens. Fishers use these structures during the summer period when mistletoe seeds are forcibly ejected from their fruits. Large spatial requirements and use of a variety of forest structures within their large home ranges may therefore facilitate long distance dispersal of dwarf mistletoe seeditors and other propagules (Aubry et al. 2003). Fishers may also harbor host specific parasites, as the American marten, and may serve a role in completing or disrupting life cycles of parasites.

HABITAT REQUIREMENTS

General

Fishers use forests with a high percentage of canopy closure, abundant large woody debris, large snags and cavity trees, and understory vegetation (Buck et al. 1983, Arthur et al. 1989*b*, Jones 1991, Powell 1993, Seglund 1995). Coues (1877) and Seton (1929) noted that fishers seem to prefer forest near swamps, especially swamps with large overstory trees. Riparian habitats are used extensively by fishers, especially as travel corridors and rest sites (Buck et al. 1983, Jones and Garton 1994, Seglund 1995).

Within Stand-Level Structures

Den sites. In western North America, fishers appear to be highly selective of large, live, decadent or dead trees for natal den sites, where females give birth to their young and nurse them until weaning at about eight weeks of age (Seglund 1995, Aubry and Raley 2002, Weir and Harestad 2003). In British Columbia, natal dens occur in branch-hole cavities in decadent cottonwood trees (*Populus* spp.) that average 103 cm dbh (range = 89.2-122 cm) and 25.9 m in height (range 17.7-30.0 m)(Weir and Harestad 2003). Den trees are the largest diameter trees in the immediate area and occur infrequently in fishers' home ranges. In California, Seglund (1995) located two natal dens belonging to the same female; one was located in a cavity of a 78 cm dbh ponderosa pine (*Pinus ponderosa*) snag and the other was in a hollow lateral limb of an 88 cm dbh live black oak (*Quercus kelloggi*). In southern Oregon, females use cavities in snags (n = 6) or live trees (n = 8) that average 93 cm dbh (range = 61-138 cm) and 16 m in height (range = 4 - 46.5 m) above the ground (Aubry and Raley 2002). Access to hollows created by heartwood decay is mostly (57%) provided by holes excavated by pileated woodpeckers. In Montana, Roy (1991) found a natal den in a hollow log 11 m long with a 30 cm diameter cavity. Although Weir's findings of fisher use of deciduous trees as natal dens are consistent with studies in eastern North America (Arthur 1987, Paragi 1990, Powell et al. 1997*b*), recent data from the Pacific states indicates that a variety of large conifer tree species meet this denning requirement (Aubry and Raley 2002). Availability of large den trees is likely a limiting factor for fishers in landscapes dominated by short-rotation (<50-60 years) forestry in which large snags are removed and forest succession is truncated.

Maternal dens are used by adult females and kits after weaning and during the period in which kits remain dependent on the adult female for food (Aubry and Raley 2002). Kits are moved from natal dens to maternal dens at about 8-10 weeks of age and utilize these structures until about five months of age (late August or early September) (Paragi 1990, Seglund 1995). Maternal den structures are more variable than natal dens, and are typically closer to the ground. Adult females and kits used cavities in lower parts of live and dead trees, large (>50 cm dbh) hollow logs, mistletoe brooms, and rodent nests (Aubry and Raley 2002).

Rest sites. Fishers use rest sites between periods of activity. Rest sites are typically used for only a single resting or sleeping bout, but the same site may be used for many days when weather is severe or a large food item has been cached nearby (Powell and Zielinski 1994). Rest structures used by fishers in western North America include mistletoe and rust brooms, large lateral limbs and limb clusters in the canopies of live trees, rodent or raptor nests, cavities in snags or logs, ground burrows, or beneath piles of cull logs (Buck et al. 1983, Jones 1991, Seglund 1995, Aubry and Raley 2002, Weir and Harestad 2003, Weir et al. 2004, Zielinski et al. 2004*a*).

Fishers typically rest in live trees (Table 3) and the most common resting platforms are bird stick nests, large lateral limbs (Seglund 1995) and brooms (Jones 1991, Weir 1995, Aubry and Raley 2002, Weir 2003, Weir et al. 2004). In the Coast Range of northwestern California, rest sites are typically located in stick nests (30%) or on large lateral limbs or limb clusters (30%), but mistletoe brooms are used infrequently (9%) (Seglund 1995). In the same area, Zielinski et al. (2004*a*) found fishers resting most frequently in cavities and broken tops of live trees (50%), followed by snags (26%), platforms (mistletoe brooms, and nests; 18%), and logs (5%). Fishers use mistletoe or rust brooms more frequently than any other type of rest site in British Columbia (Weir 1995, 2003; Weir et al. 2004), Idaho (Jones 1991), and Oregon (Aubry and Raley 2002). Females use witches' brooms more frequently than males (Seglund 1995).

Table 3. Structures used by male and female fishers for denning and resting in western North America (adapted from Lewis and Stinson 1998).

	Trees		Snags		Ground			
Location	*n*	%	*n*	%	*n*	%	Total	Source
California	6	67	2	22	1	11	9	Buck 1982
California	80	63	34	27	13	10	127	Zielinski et al. 1995
California	76	67	23	20	15	13	114	Seglund 1995
Idaho	134	78	13	8	25	15	172	Jones 1991
Oregon	414	63	90	14	149	23	653	Aubry and Raley 2002
Total	*710*	*66*	*162*	*15*	*203*	*19*	*1075*	

Fishers appear to require rest sites in large diameter trees that are usually the largest and tallest within the immediate area (Buck et al. 1983, Seglund 1995, Weir 1995, Zielinski et al. 2004*a*). In British Columbia the most common rest sites are in trees that average 46.3 cm (18.5 in) in diameter (Weir 1995). In Idaho, fishers rest in trees that average 56.1 cm (22.4 in) in diameter and 16.4 m (54 ft) in height (Jones 1991). Snags and logs used for resting average 86.4 cm (34.5 in) and 53.3 cm (21.3 in) in diameter, respectively. In the Coast Range of California, rest structures in live hardwood trees, live conifer trees, snags, and trees with platform structures average 87.6 cm (35.1 in), 124.7 (49.9 in), 119.0 (47.6 in), and 68.1(27.2 in) in diameter, respectively (Zielinski et al. 2004*a*). Logs average 95.1 cm (38.0 in) in diameter. In earlier studies in the same area, Buck et al. (1983) found rest sites in trees that averaged 114.3 cm (45.7 in) in diameter, and Seglund (1995) reported rest sites in trees and snags that averaged 105 cm (42 in) and 119 cm (47.6 in) in diameter, respectively. Most rest sites were in live or decadent trees (Seglund 1995).

Rest sites are typically in conifer trees. In Idaho, fishers rest primarily in Engelmann spruce (*Picea engelmannii*) where witches' brooms are most common (Jones 1991), and in British Columbia they use hybrid white spruce (*P. engelmannii x glauca*) with rust brooms (Weir 1995). In southern Oregon, female fishers rest primarily in large, live Douglas-fir trees (*Pseudotsuga menziesii*), and secondarily in Douglas-fir or White/grand fir (*Abies concolor/ A. grandis*) snags. Males also rest in live trees, but use western hemlock (*Tsuga heterophylla*), Douglas-fir and white/grand fir about equally. Douglas-fir snags are used secondarily (Aubry and Raley 2002). Fishers in northwestern California rest predominantly in Douglas-fir trees (Seglund 1995, Zielinski et al. 2004*a*).

Type of rest sites used varies seasonally. In the West, fishers rest predominantly in the canopies of live trees in both winter and summer (Jones 1991, Buck et al. 1994, Seglund 1995). The greater vertical layering of vegetation and greater conifer canopy cover in mature and old-growth forests provide a range of cooler and moister microclimates below the forest canopy. Convective heat loss would be greater for fishers that use rest sites in the upper canopy and may prevent thermal stress for fishers during the prolonged heat and desiccation during the dry season (Zielinski et al. 2004*a*). During periods of colder temperatures, fishers typically seek out large pieces of coarse woody debris or burrows. Fishers rest more frequently in logs during winter in Idaho (Jones 1991). Similarly, fishers in British Columbia rest in large pieces of coarse woody debris during colder temperatures compared to when they use branch and cavity structures (Weir et al. 2004). Ground dens are used more frequently during periods of extreme cold (Arthur et al. 1989*b*, Weir 1995). Female fishers in the Coast Range of northwestern California use snags more frequently in winter, whereas males primarily rest in the canopy of live trees during both summer and winter (Seglund 1995). Because of their smaller body size, females may require warmer micro-sites than males. Moreover, rest site selection may be influenced by proximity to areas of high prey availability. These findings suggest that fishers select rest sites with suitable microclimate to reduce thermal stress (Jones 1991, Wier et al. 2004, Zielinski et al. 2004*a*).

Individual resting structures are infrequently reused (Jones 1991, Kilpatrick and Rego 1994, Seglund 1995, Zielinski et al. 2004*a*). Zielinski et al. (2004*a*) suggested that infrequent reuse of resting structures indicated that fishers do not limit use of their home range to a few central locations, and instead require multiple resting structures distributed throughout their home range. Martens forage sequentially over their home range, using rest sites in snags in close proximity to foraging areas and recent kill sites (Marshall 1951). The pattern of rest site use by fishers indicates that they do the same. Zielinski et al. (2004*a*) suggested that the low reuse of rest sites could be a strategy to minimize travel time between resting locations and kill sites, which are distributed throughout the home range.

Fishers select resting structures in patches of forest characterized by greater structurally complexity. In the Coast Range of northwestern California, rest sites are more structurally diverse than random sites. Rest sites are characterized by a greater number of vegetation layers, higher percentage of dead and down woody material, and a greater percentage of shrub cover than random sites (Seglund 1995). Zielinski et al. (2004*a*) characterized forest structure around rest sites in the same area. A univariate analysis revealed that rest sites contained significantly greater maximum tree dbh, greater standard deviation of dbh, small standard deviation of canopy closure, and a greater number of large conifer snags than random sites. A resource selection function included greater canopy closure, larger maximum tree size, steeper slopes, and at least one large conifer snag as significant variables in the model for the Coast Range. Resting sites not only are characterized by a large resting structure, but are also in close proximity to other large trees and occur in areas with denser canopies. In addition, topographic position is an important factor, with rest sites located on steep slopes. Resting sites have greater structural variability (i.e., a diversity of sizes and types of structural elements) but less variable canopy cover than random sites (Zielinski et al. 2004*a*). Fishers in British Columbia also demonstrate selection for greater forest structural complexity at rest sites, particularly in stands characterized by more simplified structure (Weir and Harestad 2003). During summer months, fishers in Idaho use sites characterized by greater densities of trees >47 cm dbh, snags 14-52 cm dbh, and logs 14-54 cm diameter than sites 50 m distant (Jones 1991). Fishers also select more decadent patches of forest during winter, choosing sites that have greater densities of large trees (>47 cm dbh), snags (24-34 cm dbh and >52 cm dbh), and logs (≥47 cm diameter). These findings suggest that fisher rest sites are located in more structurally complex forest, typical of mature and old-growth forest conditions.

Stand-Level Characteristics

Fisher selectivity for continuous overhead cover and structural complexity at the patch level is also evident at the stand level for resting and foraging activities. In Idaho, fishers use the 61-80% canopy class significantly more for resting, whereas more open (21-40%) and denser (≥81%) canopy classes are used for hunting (Jones 1991). Fishers in California occur more frequently in stands with high canopy closure. Buck (1982) reported that fisher locations were most common in forest stands with 40-70% canopy closure. In the southern Sierra Nevada, stands of high canopy closure (60-100%) comprise the greatest proportional area (66%) of fisher home ranges (Zielinski et al. 2004*b*). Weir (1995) reported fisher selectivity for stands with a mean coniferous canopy closure between 21-60% in winter, and no selectivity for coniferous canopy closure during summer or autumn months. During summer, fishers avoid stands with no deciduous canopy component, but prefer stands with 21-40% deciduous canopy cover.

Fishers demonstrate selection for structurally complex forest stands. They may select mature closed-canopy forest because the microclimate provides warmth in winter and prevents overheating during summer (Buck 1982, Seglund 1995), and the greater structural complexity of the forest floor provides habitat for prey and winter resting structures (Weir 1995). In the Coast Range of northwestern California, fishers prefer mature, closed conifer forest, especially multi-species stands (Buck 1982). Fishers in British Columbia also demonstrate selectivity for stands with greater structural diversity, particularly stands with high volumes of coarse woody debris, during summer and winter months (Weir 1995, Weir and Harestad 2003). During summer, fishers in Idaho prefer mature and old-growth stands and avoid non-forest, pole-sapling, and young forest stands (Jones 1991, Jones and Garton 1994). Forest stands used in summer have greater densities of large diameter (≥34 cm) trees, snags and logs compared to available habitat. During winter, fishers prefer young forest, use mature and old-growth stands in proportion to availability, and avoid nonforest and pole-sapling stands. Fishers select stands with greater densities of 11.4-34.3 cm and >62.2 cm dbh trees, greater densities of all size classes of snags, and a dense understory of Pacific yew (*Taxus brevifolia*). Availability of snags is also an important factor in winter site selection. Buck (1982) also found fishers using young regenerating stands in winter that had high overhead canopy cover (>80%) and vegetation between 1.5 and 3.0 m in height. Fishers seem to prefer more structurally complex forest for both resting and hunting, but will use stands with more simplified structure (ie, pole-sapling and young forest) for hunting. Other researchers have suggested that fishers are more selective of resting compared to foraging habitat (Arthur et al. 1989*b*, Buskirk and Powell 1994). Although fishers demonstrate selection for younger forests in winter, these stands were naturally regenerated following fire and contained large live trees, snags and logs characteristic of older forests (Jones 1991).

Fishers may prefer to forage in more structurally complex forest stands because they encounter a greater abundance and diversity of prey. Douglas' squirrels are more abundant in older, more structurally complex forest stands compared to younger, managed forests (Buchanan et al. 1990). Squirrels may prefer older forest stands because these habitats provide a more abundant, perennial, and diverse source of food (e.g., conifer seed and hypogeous fungi). Older forests have a greater diversity of older trees and hence greater cone production, and greater amounts of coarse woody debris in later stages of decomposition that are associated with greater abundance and diversity of hypogeous fungi (Buchanan et al. 1990, Carey 1991, Luoma et al. 2003). The cool, mesic conditions in older forests preserve cone caches and facilitate growth of truffles beneath well-decayed coarse woody debris that retains water during the prolonged dry summer months (Luoma et al. 2003). Small mammals may be associated with coarse woody debris for cover, nesting sites, or associations with food (McComb 2003), such as hypogeous fungi (Rhoades 1986). Southern red-backed vole (*Clethrionomys gapperi*) abundance and activity is positively correlated with coarse woody debris (Ucitel et al. 2003). While small mammal communities are structurally similar in naturally regenerated Douglas-fir forests in the southern Washington Cascade Range, abundance is greater in old-growth than in young forests, and is likely attributed to the greater structure and productivity of the forest floor environment (West 1991). In the Western Hemlock Zone of the Olympic Peninsula, composition of small mammal communities in naturally regenerated and clearcut-regenerated young forests is similar to those found in old-growth. However, old-growth forests support a greater abundance and biomass of small mammals than managed forests (Carey and Johnson 1995). Many of these small mammal species exhibit numerical responses to the amount of coarse woody debris and shrub cover in the forest floor environment. Mountain beavers are also found on sites with greater availability of sword fern (*Polystichum munitum*), shrubs and ferns, greater volumes of coarse woody debris, and mesic conditions (Hacker 1991, Carraway and Verts 1993, McComb 2003). Fishers are likely to encounter mountain beavers in old-growth forests with a well-developed vegetative understory (Hacker 1991). Fishers may also encounter greater numbers of cavity nesting birds (e.g., woodpeckers, sapsuckers) in older forests while exploring snags as possible rest and den sites.

Landscape-Level Characteristics

Fishers appear to be sensitive to fragmentation of their preferred habitat. In Douglas-fir forests in northwestern California, fishers are less likely to occur in stands of increasing insularity and decreasing stand area (Rosenberg and Raphael 1986). Fishers also avoid nonforest cover types (Jones 1991, Roy 1991, Weir 1995). Jones (1991) suggested that management of fisher habitat at a landscape level should include a mosaic of early- and mid-successional forest seral stages to provide a diversity of prey species, and mature and old-growth forest to provide key resting habitat. Patches of resting habitat should be connected by closed canopy forest to facilitate travel between patches. The proportion of each of these seral stages necessary to support fishers in a landscape is not known.

Riparian areas. Fishers are primarily associated with cool, mesic forests (Buskirk and Powell 1994) and this may explain their disproportionate use of riparian areas in some western states where habitats are hotter and drier (e.g., Jones 1991, Seglund 1995). Proximity to water does not appear to influence rest site selection in the cooler and moister forests in the Coast Range of the Pacific Northwest (Zielinski et al. 2004*a*).

POPULATION STATUS

Past

No reliable estimates of historical fisher populations in Washington exist, and there are only a few statements specifically about fisher abundance in the early literature. The fur trade began in the Pacific Northwest soon after 1779, when it was discovered that sea otter (*Enhydra lutris*) pelts obtained during the last voyage of Captain James Cook commanded a high price in China (Gibson 1992:22). American Indians used fisher pelts for quivers and were already involved in trading furs to white fur traders in 1804 (Suckley and Cooper 1860, Gibson 1992).

Evidence from archaeological sites suggest that fishers may have been less numerous than martens during the last several thousand years (R.L. Lyman, pers. comm.). This is consistent with historical trapping records that indicate that, though a significant number of fishers were taken, they were not as abundant in Washington as in other parts of their range. Notes for 1833, purportedly from the Fort Nisqually account books, record 23 fishers (Anonymous undated). Hudson's Bay Company (HBC) records indicate that for the period 1836-1852 a total of 6,551 (average 385/yr) fishers were obtained at forts in present-day Washington (HBC Archives, Winnepeg)(Table 4). However, most of these (88%) were collected at Fort Colville, the most convenient post for an area that included the southeast corner of British Columbia, northern Idaho, and Montana west of the Continental Divide, as well as northeastern Washington. Additional fishers were probably also obtained at Neah Bay on the Olympic Peninsula by the S.S. *Beaver* during this same period (Gibson 1992, Mackie 1997). The total is modest considering that >150,000 fishers were taken in North America during that period (Obbard et al. 1987). The total returns from Washington posts is also low compared to modern returns from other parts of the fisher's range. For example, for the period 1969-1979, trappers took an average of 2,000/year in Maine, and over 3,000/year in Ontario (Strickland and Douglas 1981). The total for North America during 1980-1984 was 20,000/year (Obbard et al. 1987).

Fishers, and furbearers in general, were not abundant in Washington's coastal forests, and mammal populations were reduced quickly by trapping. As early as the 1820s the Hudson Bay Company was disappointed with the lower Columbia River fur trade (Mackie 1997). Fort Vancouver fur returns declined steadily from 1833-1843 (Mackie 1997). Fort Vancouver averaged only 7.6 fishers/year, and Fort Nez Perces averaged only 19.5 fishers/year, for 1836-1852. The Puget Sound fur trade was also very modest, and in 1840 George Simpson, who managed the Hudson Bay Company's affairs west of the Rockies, stated: "fur trade almost extinct in that quarter" (Mackie 1997). Though interior districts were generally more productive, in 1841, Simpson noted of Fort Okanogan: "few or no furbearing animals in the surrounding country" (Mackie 1997:88). The fur trade further north, and especially inland,

Table 4. Number of fisher obtained in trade at Hudson's Bay Company posts in Washington, 1836-1852 (Hudson's Bay Company Archives).

Year	Fort Vancouver	Fort Nisqually	Fort Nez Perces[a]	Fort Colville[b]	Total
1836	1	29	23	197	250
1837	8	21	-	395	424
1838	14	20	16	514	564
1839	16	44	16	615	691
1840	23	35	9	302	369
1841	4	28	10	237	279
1842	10	14	27	206	257
1843	11	19	30	229	289
1844	15	10	24	295	344
1845	-	21	30	263	314
1846	4	10	38	261	313
1847	8	9	31	328	376
1848	1	14	7	508	530
1849	1	6	4	411	422
1850	2	17	3	351	373
1851	1	23	2	345	371
1852	10	12	14	349	385
Total	*129*	*332*	*284*	*5,806*	*6,551*

[a] Fort Nez Perces received furs from an area that included northeastern Oregon
[b] Fort Colville received furs from an area that included parts of present-day British Columbia, Idaho, and Montana, as well as northeastern Washington.

was more productive for the Hudson Bay Company. During explorations from 1853 to 1857, Suckley and Cooper (1860) obtained 53 fishers at Fort Dalles and 45 at Steilacoom. Suckley (p. xi, 92), who spent a year collecting in the Cascades, reported that fishers were found “quite plentifully” in the thickly wooded areas of the Cascades; but Cooper (p. 76), who traveled separately and spent more time in southwestern and eastern Washington, indicated fishers “do not seem to be common” (Suckley and Cooper 1860). Coues (1877) quoted Newberry, who stated that fishers were “rare in Oregon, but less so in Washington.”

Fisher populations were probably greatly reduced in some parts of Washington by 1900. C.H. Merriam reported that fishers were rare in the Nisqually Valley in 1897, but that a few were caught each year (Taylor and Shaw 1927). Only 6 fishers were caught in 30 years near Bumping Lake, Yakima County, with tracks last seen in 1915 (Scheffer 1938). The last reports of significant numbers of fishers are from the Olympic Peninsula and the Cascades (Scheffer 1957,1995; Dalquest 1948). Scheffer (1938, 1957, 1995) provided a number of accounts of fishers being trapping was prohibited in 1934 as well as accounts of fishers being incidentally captured in traps set for other species in the Cascades, the Olympic Peninsula, and southwestern Washington. For the Olympic Peninsula, he reported accounts of 2 trappers taking 37 fishers in 1920 near the Queets River, and 2 other trappers capturing 20 fishers in 1921 near the Quinault River (Scheffer 1995). By 1938, fishers on the Olympic Peninsula were largely restricted to the “wild and roadless portions of the Olympic Mountains” (Scheffer 1938). Scheffer (1938) included a Forest Service game estimate for the fisher on the national forests in 1937: Chelan 4, Columbia 20, Mount Baker 30, Olympic 100, Snoqualmie 40, and Wenatchee 40. These estimates are probably only guesses, but they are indicative of the fisher’s rarity at that time.

Sighting and trapping reports give no indication of recovery in recent decades. Most information on furbearing mammal populations is obtained through trapping data; but fisher seasons were closed in most of the western states before harvest records were kept. Trapping was prohibited in Washington in 1934, and seasons were closed in Oregon and Wyoming in 1936, Idaho and Montana sometime in the 1930s, and California in 1946. Yocum and McCollum (1973) obtained only 9 records of fishers in Washington from the National Park Service and the Forest Service for the years 1955-73; 7 from the Olympics, 2 from the northern Cascades. These were among the total of 41 highly reliable fisher records that Aubry and Houston (1992) compiled for Washington for the years 1955-79.

Present

Incidental captures in traps, sighting reports, and systematic surveys from 1980 to present indicate fisher populations have not recovered in Washington.

Incidental captures. Fishers are relatively easy to trap, and where they are present, they occasionally get caught in traps set for other species, especially bobcats, martens, and coyotes. Incidental capture data depends on trappers reporting the capture, which, though required by law, may impose serious inconvenience in remote areas, so compliance may vary widely. These ‘incidental captures’ are, therefore, not a reliable method to estimate populations, but they may be useful as an indicator of the presence and relative abundance of fishers. There are 3 reports of incidental capture of fishers in Washington since 1980 (1 each in 1987, 1990, and 1992; Appendices A, B). WDFW obtained a photo or carcass for 2 of these fishers.

Sighting reports. Aubry and Houston (1992) compiled a list of sighting reports for Washington and ranked them by reliability. From 1980 to 1991, only 46 sightings of fishers were judged highly reliable (Aubry and Houston 1992). However, the majority of these earlier sightings were not verifiable based on a photograph, track, or specimen. Countless individuals hunt, trap, hike, and work in Washington forests, yet fewer than 4 reliable fisher sightings per year were compiled from 1980-1992 (Aubry and Houston 1992).

Fishers are susceptible to collisions with vehicles (Proulx et al. 1994, Zielinski et al. 1997), but no road kills have ever been reported in Washington.

Systematic surveys. Several different survey methods have been investigated for detecting forest carnivores. Camera stations consist of placement of cameras that are triggered by tripping a string or breaking an infrared beam when an animal investigates bait. Track plates are sooted sheets that record animal tracks at bait. Both track plates and camera stations are effective at detecting fishers (Zielinski and Kucera 1995, Foresman and Pearson 1995, Zielinski et al. 1997). In 1984, Keith Aubry of the USDA Forest Service conducted sooted track-plate surveys in 45 old-growth forest stands on the Wind River District of the Gifford Pinchot National Forest (K. Aubry, pers. comm.). The same year, Olympic National Park and Forest Service biologists attempted to detect fishers in the Elwha River drainage by using 6 line-triggered cameras, track plates, and live traps (Aubry and Houston 1989). No fishers were detected in 241 trap-nights and 130 plate-nights. In 1986, the Park Service and Forest Service conducted live-trapping (252 trap nights) and snow tracking in the Skokomish and Hamma Hamma River drainages (Aubry and Houston 1989). No fishers were detected.

In 1990 and 1991, Aubry (with the help of Roger Powell in 1991) used live traps and line-triggered cameras in several attempts to detect fishers where they had been reported on the east side of the Olympic Peninsula. This included using urine of estrous female fishers, among other lures and strong-smelling bait (Powell 1991). No fishers were detected during these efforts; it appears that fishers were either absent or extremely rare in the areas sampled. On 1 August 1990, Forest Service personnel obtained what was believed to be a fisher track on a sooted track plate in the Leavenworth Ranger District, Wenatchee National Forest, Chelan County. However, it is uncertain whether it was a fisher or marten track. Male marten tracks are extremely similar to small female fisher tracks, and techniques for distinguishing the two species were only recently developed (Zielinski and Truex 1995).

In the early 1990s the Forest Service conducted extensive surveys for forest carnivores (Fig. 3). In 1991, the Forest Service conducted extensive camera surveys in 4 study areas (Central Cascades, North Cascades, Olympic Peninsula, and Puget Trough), as part of a marten research project. More than 1,000 line-triggered camera stations were operated for a total of over 9,000 camera nights. Twenty-eight species were detected, including 39 martens, but no fishers were detected (Jones and Raphael 1991).

In 1992, WDFW and the U.S. Forest Service conducted camera station surveys (Fig. 3) to determine the current distribution of martens in the state (Sheets 1993). The surveys sampled 15 areas in the Olympic, Mt. Baker-Snoqulamie, and Gifford Pinchot National Forests using 197 line-triggered camera stations (110 mm) for a total of over 3,000 camera nights. Stations were located in patches of at least 780 ha of contiguous mature timber, near riparian areas, at elevations above 720 m. Seven species were detected, including 4 martens, but no fishers were detected.

In 1994, camera surveys were conducted on the Mineral Tree Farm, Lewis County, for Murray Pacific Corporation (Beak Consultants, Inc. 1995). Infrared and line-triggered cameras at 27 stations were placed

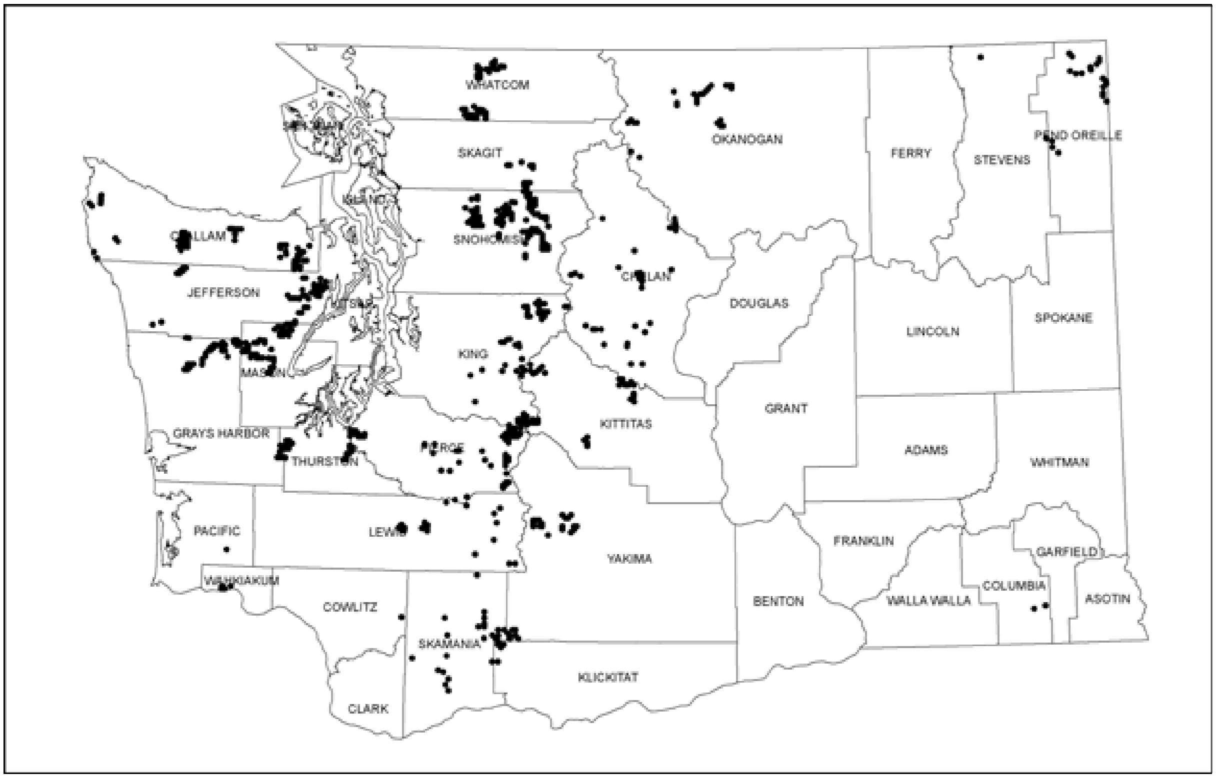

Figure 3. Locations of camera and track-plate stations in Washington, 1990-97. (The 647 plotted locations represent 1088 of the survey stations during surveys conducted by WDFW, USFS and Beak Consultants, Inc. (1995)).

in mature timber for a total of 260 camera nights (Fig. 3). Seven species were detected, but no martens or fishers.

From 1995-97, WDFW conducted carnivore surveys using camera stations in potential fisher habitat throughout the state (Fig. 3). Zielinski and Kucera (1995) developed a standard survey protocol to detect carnivores, which uses 2 camera stations or enclosed track-plate stations in each survey "sample unit" (4-square-mile block or 4 sections). The 1995-97 surveys varied from this protocol in order to cover a larger area with the available staff and cameras. Most of the sampling (90.5%) was done in winter (Nov-Mar), when bears are inactive and bait may be more effective for fishers (Kucera et al. 1995). The stations were operated an average of 31.0 ($\pm$12.4) sample nights; surveys totaled approximately 5,000 operational camera nights. No fishers were detected.

During the winters of 2001-04, the National Park Service conducted forest carnivore surveys, using standard survey protocols, in Mount Rainier (2001-02), Olympic (2002-03, 2,193 camera nights), and North Cascades (2003-04, 2,178 camera nights) National Parks. Fishers were not detected in any of the parks, however martens were detected in North Cascades and Mount Rainier National Parks (Christophersen et al. 2005, Happe et al. 2005, J. Schaberl, pers. comm.). On the Okanogan-Wenatchee National Forest, martens were detected but no fishers during sooted track plate surveys in wet and dry forests within LSRs in 2003-04 (Munzing 2005).

Fishers were detected by these survey techniques in California, Montana, and Oregon (Foresman and Pearson 1995, K. Aubry, pers. comm., Zielinski et al. 1997). Zielinski and Stauffer (1996) reported that fishers were detected at 67.5% of 40 track-plate sample units in the Klamath eco-province of northwestern California. Fishers were detected after a mean of only 3.4 days at 23% of 221 stations using track plates or line-triggered cameras in the historical range of the fisher in California (Zielinski et al. 1997). The number of days (latency) to detection was about 12 in a smaller survey on commercial timberlands in California (Zielinski et al. 1997), and 9 days in Montana (Foresman and Pearson 1995). During the WDFW carnivore surveys, approximately 92% of stations were operated for more than 12 sample days.

Survey effort expended in Washington from 1990 to 2004 to detect fishers and other forest carnivores was extensive (Fig. 3). Combined surveys included ~1500 sample stations and totaled over 17,000 camera/track plate nights between 1990-97. The lack of detections of fishers given these and previous efforts indicates that fishers are extremely rare if not extirpated from the state (Aubry and Lewis 2003).

Future

Despite substantial effort to detect fishers over an extensive area of federal landownership in recent years, not a single fisher has been detected. This suggests that fishers are either extremely rare a or they have been extirpated from the state. 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. In British Columbia, fisher populations have become extirpated from the Cascade and Okanogan mountain ranges of the southern interior and the Columbia and Rocky mountain ranges in the last 15 years (Weir 2003). Fisher populations are also low in adjacent parts of Idaho, and the number of dispersing individuals is probably very low (Heinemeyer 1995). Immigration of fishers into Washington from British Columbia, Idaho, or Montana has not successfully reestablished fishers in Washington and does not seem likely to in the future. A viable fisher population is not likely to become reestablished in the state without human intervention.

HABITAT STATUS

Past

Prior to European settlement, natural disturbance processes resulted in extensive areas of homogeneous forest that was mostly comprised of old trees (Bolsinger and Waddell 1993). These old forests had abundant large woody structures as potential den and rest sites for fishers and downed logs that provided habitat for their prey. The amount of old-growth forest that existed prior to the arrival of Europeans in Washington is unknown. The first systematic surveys of forests in the state were conducted between 1933 and 1936. At that time, there was a total of 3.7 million ha (9.1 million ac) of old-growth forest that comprised 40% of productive forestland in Washington (Bolsinger and Waddell 1993). Washington's forests were heavily exploited between the 1800s and early 1900s. It's estimated that the volume of sawtimber in the Douglas-fir region was being depleted at four times the growth rate (Bolsinger et al. 1997). Therefore, the amount of old-growth and its relative composition was greater before the 1933-36 forest inventories because human activities that altered the landscape, such as logging, clearing of forests for agriculture and pastures, and the building of cities, occurred before this first forest inventory (Bolsinger and Waddell 1993).

Intensive forest harvest continued to change the species composition and age classes of forests after the first forest inventory in the early 1930s. Between 1933 and 1992 the estimated volume of sawtimber in western Washington declined 67% (244 to 80 billion board feet) (Bolsinger et al. 1997). Extensive areas of high-volume timber were converted to urban areas, agriculture, and "stump-pastures" after cutting, especially near Puget Sound. Between 1933-36 and 1992, the area of old-growth forest declined by 70%, from >3.7 to 1.1 million ha. Loss of old-growth forest was similar between western (72%; 2.9 to 0.8 million ha) and eastern (68%; 0.77 to 0.24 million ha) Washington (Bolsinger et al. 1997). Forest composition also changed during this period. In western Washington between 1933 and 1992, the proportional volume (trees ≥16 inches dbh.) of Douglas-fir increased from 41% to 51%, while western hemlock, Sitka spruce (*Picea sitchensis*), western redcedar (*Thuja plicata*), and true firs (*Abies* spp.) decreased. In eastern Washington, the proportional sawtimber volume of Douglas-fir increased from 27 to 42%, true firs increased from 10 to 15%, while ponderosa pine decreased from 41 to 22% (Bolsinger et al. 1997). Between 1967 and 1991 forest inventories in the Puget Sound and Olympic Peninsula areas demonstrate changes in forest species composition. Western hemlock comprised the highest percentage of growing-stock volume in 1967, but declined across all ownerships by 1991. The percent growing-stock volume of Douglas-fir increased from 24 to 33% on industry lands and 20.7 to 44.4% on public lands other than national forests during that period (Bolsinger et al. 1997).

The distribution of old-growth forests has changed with land ownership. Between 1933 and 1993 private ownership of old-growth forest declined from 95% to 5% while federal and state ownership increased to 95% in western Washington (Bolsinger et al. 1997). The extensive areas of old-growth forests that early European settlers found in the low hills and valleys have been replaced by young forests managed by the private timber industry, housing tracts, roads and industrial complexes. Remaining old-growth forest stands occur in the less productive sites at higher elevation and occur primarily in federal ownership (Bolsinger et al. 1997).

Present

Of the 1.1 million ha of old-growth remaining in 1992, most is above 600 m in elevation in national forests and national parks and on steep or poorer sites (Table 5) (Bolsinger and Waddell 1993, Bolsinger et al. 1997). Most of the low elevation, late-successional forest that was suitable fisher habitat has been converted to short-rotation tree plantations or non-forest uses. Outside national forests, late-seral stands (100+ years old) comprise only 3% of the forest in western Washington, and 15% in eastern Washington (Bolsinger et al. 1997:19). As a result of human activities, Washington's forest landscapes today are much more fragmented than in the past, comprised of small patches of different ages, interspersed with recently logged areas (Bolsinger and Waddell 1993). Highways, railroads, canals, power lines, and residential development further fragment forests (Bolsinger and Waddell 1993).

Industry-owned forest accounts for 29% of the state's timberland and is dominated by short-rotation Douglas-fir less than 50 years old (Bolsinger et al. 1997). Outside of national forests, stands less than 50 years old comprise 51% of the timberland in western Washington and 15% in eastern Washington (Bolsinger et al. 1997:19). Intensive timber management has resulted in forests that have few large snags and downed logs as compared to historical levels, and those that remain are in the later stages of decay (Cline et al. 1980, Spies and Cline 1988, Spies et al. 1988, Hansen et al. 1991). Short rotations can prevent the formation of large-diameter trees needed to produce cavity trees, snags, and logs that fishers use for den sites (Cline et al. 1980, Mannan et al. 1980). Although young stands may support relatively high numbers of snowshoe hares, young managed forests support lower numbers of some fisher prey, including squirrels and forest-floor small mammals (Buchanan et al. 1990, Carey 1995, Carey and

Johnson 1995). Lyon et al. (1994:132) wrote that a landscape of mostly early successional stands and small patches of mature forest is unlikely to provide suitable habitat for fishers. Western hemlock and Pacific silver fir (*Abies amabilis*) in managed forests have decreased (Bolsinger et al. 1997). Douglas-fir, which dominates most managed forest stands, may not provide as reliable a seed source for seed-eating mammals (Douglas' squirrels, deer mice, and shrews) as western hemlock, which produces some seed every year (Buchanan et al. 1990, Carey and Johnson 1995).

Table 5. Area (ha) of old-growth forests in Washington on reserved and unreserved lands by ownership, 1992[a] (Bolsinger and Waddell 1993).

Owner/Administrator	Reserved	Unreserved	Total	Percent
National forests	250,787	540,629	791,416	68.9
National parks	280,453	0	280,453	24.4
U.S. Fish & Wildlife Service	121	0	121	0.01
State parks	3,591	0	3,591	0.3
State forests	9,308	18,363	27,671	2.4
Tribal	12,017	13,598	25,615	2.2
Private	0	19,830	19,830	1.7
Total	*556,277*	*592,420*	*1,148,698*	*100%*

[a]Date of compilation. Actual dates of classification range from the early 1980s to 1992.

Fishers can probably utilize mid-successional forest, provided it contains sufficient canopy closure and structural elements, such as large trees and snags for den and rest sites, and structural complexity on the forest floor in the form of woody debris and a shrub understory. Excluding ponderosa pine and west-side high elevation types (mountain hemlock, Engelmann spruce, subalpine fir [*Abies lasiocarpa*]), there is <3 million ha of timberland with sawtimber-sized (>23 cm or 9 in dbh) trees (Bolsinger et al. 1997:78-79). The amount of forest that contains contiguous canopy cover, and sufficient structure for den and rest sites is not known, but would likely be far below this total.

Habitat assessment. The association of fishers in the western United States with late-successional forests and the concentration of these forests on federal lands in the state (Table 5) suggests that federal lands may be the most suitable habitat for fisher recovery. An assessment of the amount and distribution of suitable fisher habitat in western Washington and the eastern Cascades was conducted in 2004 (Lewis and Hayes 2004). A simple model of fisher habitat was developed using four variables: (1) % vegetative cover, (2) % conifer cover, (3) quadratic mean diameter, and (4) elevation. Using this model, 901,107 ha of suitable fisher habitat was identified on the Olympic Peninsula, western Cascades and eastern Cascades (Fig. 4). Based on assumptions of how fishers may move through forest landscapes to access blocks of suitable habitat (Fig. 5), a connectivity analysis identified the three largest blocks of interconnected fisher habitat: one on the Olympic Peninsula, one in the northwestern Cascades, and one in the southwestern Cascades (Fig. 6). The Olympic Peninsula had the greatest amount of suitable habitat, followed by

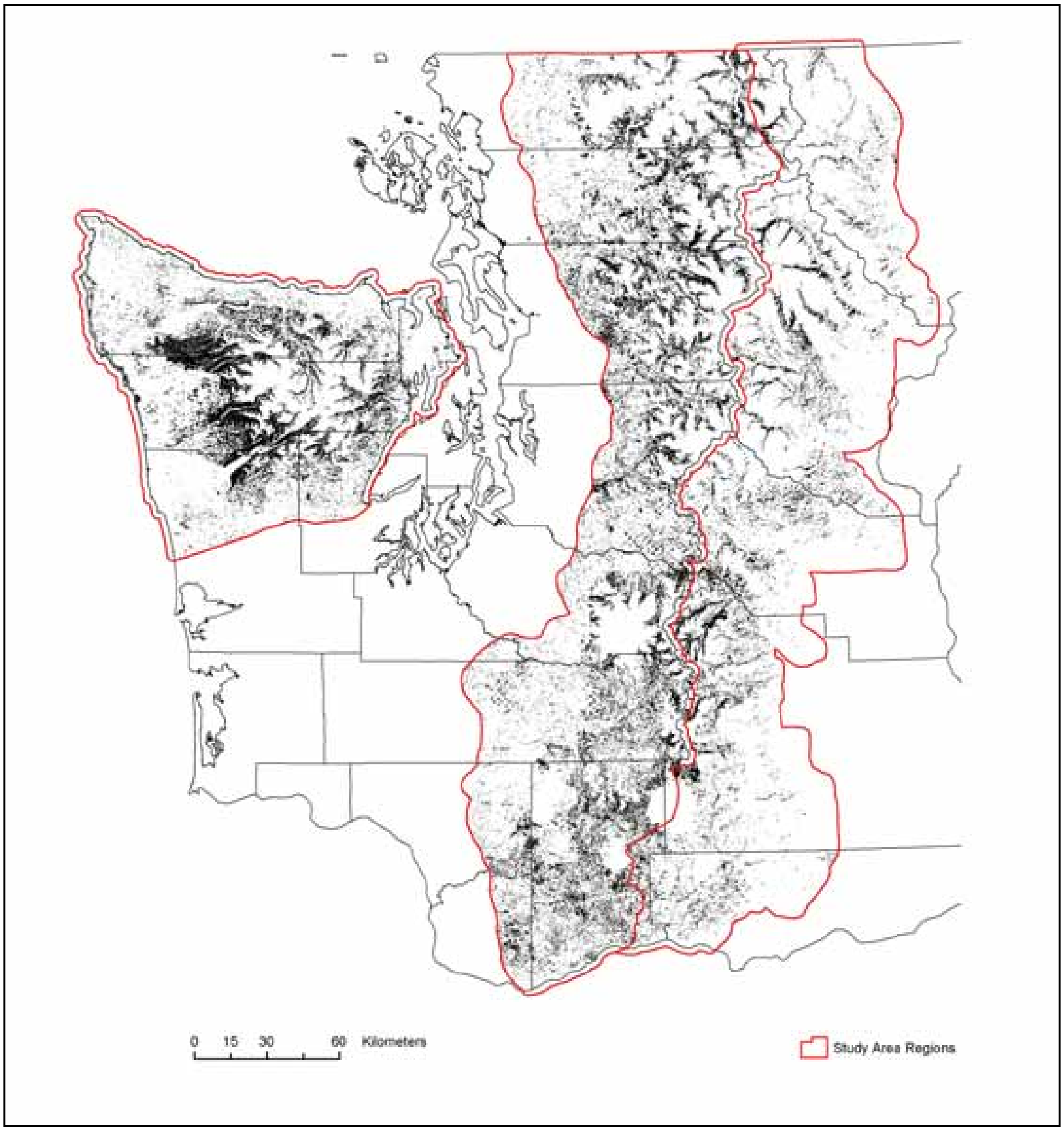

Figure 4. Suitable fisher habitat (in black) identified by a fisher habitat model in the Cascade Mountains and Olympic Peninsula of western Washington.

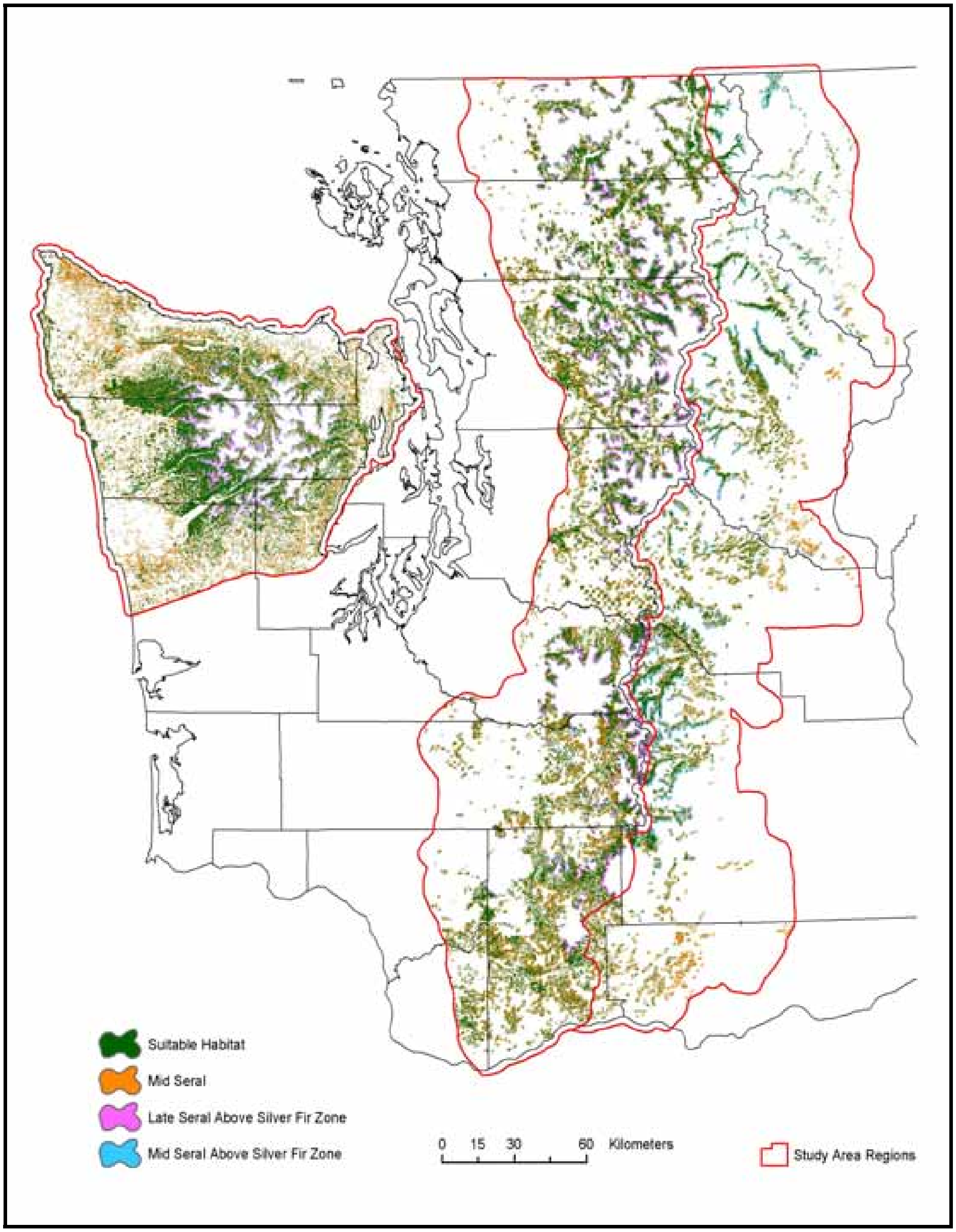

Figure 5. Potential fisher travel and foraging habitat (mid-seral, late and mid-seral above Pacific silver fir zone) within 500 m of large patches of suitable habitat in western Washington.

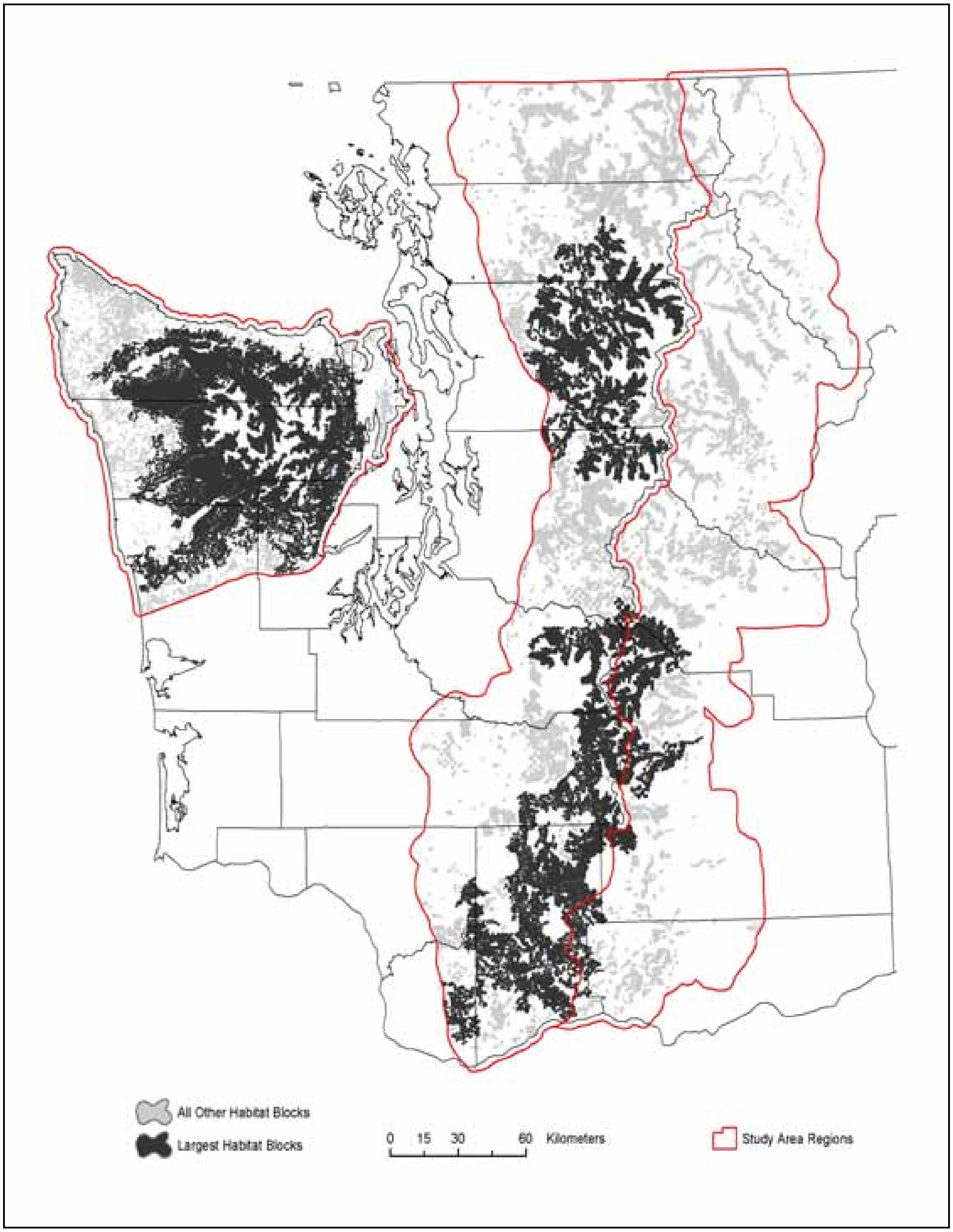

Figure 6. Largest blocks of interconnected fisher denning, resting, foraging and travel habitat in western Washington.

the southwestern Cascades, and northwestern Cascades (Table 6). Suitable fisher habitat occurs primarily on public lands (U.S. Forest Service, National Park Service and the Washington Department of Natural Resources) (Table 6). On the Olympic Peninsula, 93% of the suitable habitat is on public land (85% federal, 8% state), with 88% of federal lands occurring in the Olympic National Park and the Olympic National Forest. Eighty-seven percent of the suitable habitat in the northwestern Cascades is on public land (74% federal, 13% state), and 91% of the suitable habitat in the southwestern Cascades is on public land (85% federal, 6% state). Suitable habitat is more concentrated on the west side of the Olympic Peninsula, and more fragmented in the Cascades (Fig. 7).

Table 6. Characteristics of the total area and suitable fisher habitat within three potential reintroduction areas in Washington.

	Olympic Peninsula		Northwestern Cascades		Southwestern Cascades	
Characteristics	Total area	Fisher habitat	Total area	Fisher habitat	Total area	Fisher habitat
Area (ha)	930,496	229,376	557,807	129,722	949,640	212, 496
Mean elevation (m)	1,201		1,552		1,253	
(range)	(0.3048-2403)		(35-3,070)		(17-,2,488)	
Major roads (km)	346		94		121	
Road density (km/km^2)[1]	1.22		1.17		1.41	
Land ownership in hectares[2] (%)						
USFS	249,888 (27)	74,662 (33)	396,772 (71)	96,570 (74)	677,644 (71)	169,270 (80)
NPS	350,291 (38)	120,284 (52)			56,547 (6)	11,265 (5)
Private	163,229 (18)	11,160 (5)	93,700 (17)	14,496 (11)	127,551 (13)	11,748 (6)
WDNR	112,222 (12)	19,208 (8)	58,989 (11)	16,727 (13)	60,540 (6)	13,559 (6)
Tribal	51,418 (6)	3,830 (2)			25,717 (3)	6,321 (3)
Other	3,448 (<1)	232 (<1)	8,346 (1)	1,929 (1)	1,641 (<1)	333 (<1)

[1] Total length (km) of road categories from major highways to unimproved logging roads, divided by the total land area (km^2).
[2] USFS = U.S. Forest Service, NPS = National Park Service, WDNR = Washington Department of Natural Resources. Other lands owned by the Bureau of Land Management, the U.S. Department of Defense, U.S. Fish and Wildlife Service, Washington State Parks, Washington Department of Fish and Wildlife, counties, or cities.

Future

In 1992, about 0.76 million ha (1.9 million ac; excluding ponderosa pine) of Washington forests were in reserves, such as parks and wilderness areas (Bolsinger et al. 1997). Where fire and other natural disturbances are infrequent, these areas would be expected to maintain or produce, late-successional forest.

Trends toward landscape management across large ownerships (national forests, Washington Department of Natural Resources land, large timber companies) may help reduce fragmentation of suitable habitat and increase forest structure in future forests, improving the value of these lands for wide-ranging carnivores such as fishers (Holthausen et al. 1994). The ecosystem management approach embodied in the Northwest Forest Plan should provide substantial benefits to fisher recovery on U.S. Forest Service and BLM lands west of the Cascade Range in Washington. The proportion of late-successional forests is expected to increase over time as young-even-aged forests in reserves (e.g., LSRs, riparian) mature. The frequency of large, severe disturbances, like fire, will also determine future amounts of old forest on the landscape.

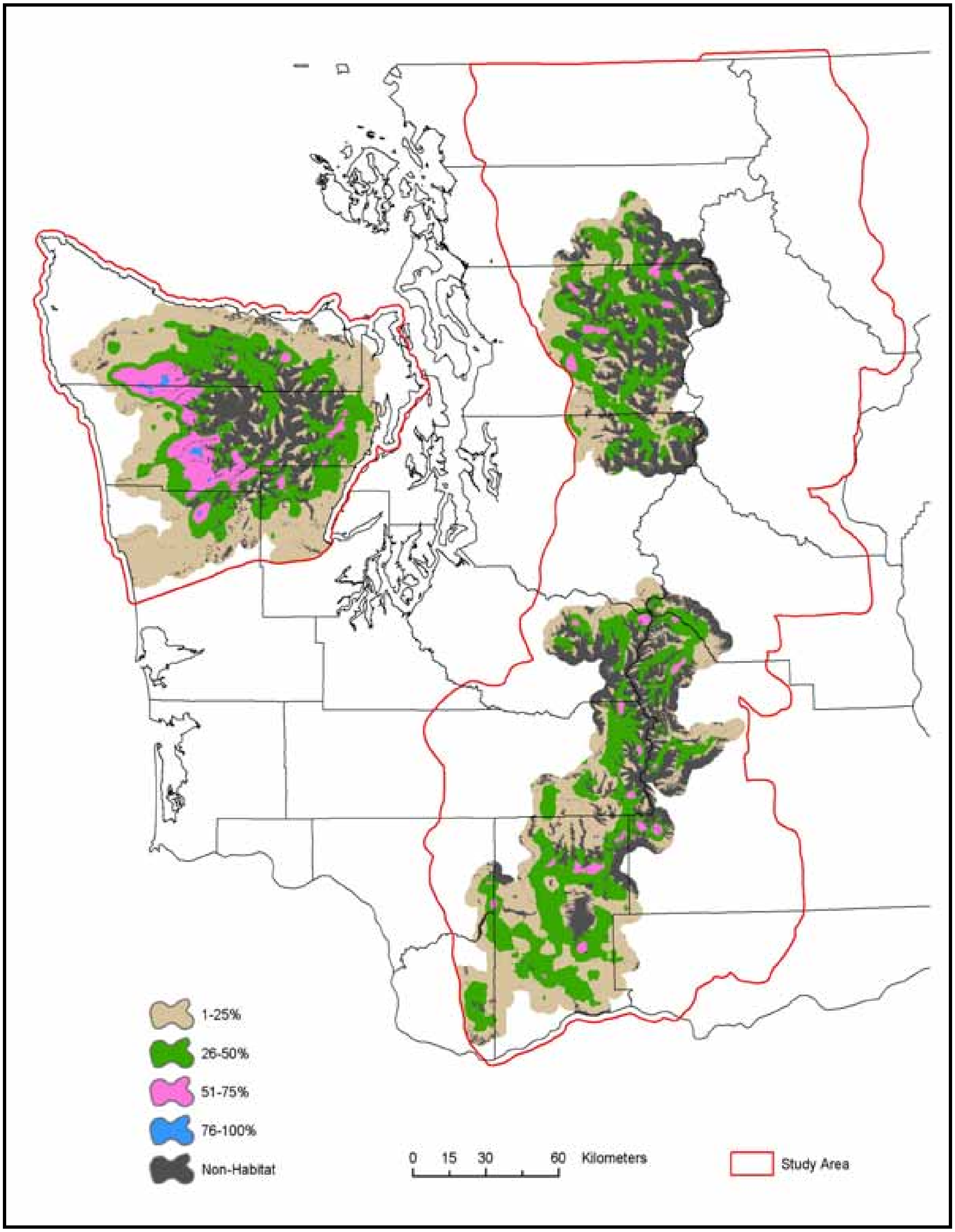

Figure 7. Percent concentrations of suitable fisher habitat within potential fisher reintroduction areas in western Washington.

Forests in short-rotation, even-aged management are unlikely to support fisher populations without specific steps to retain and recruit create large live trees, snags and logs. Most of the large (>100 cm) woody debris that remains in managed forests are legacies of the original old-growth stand. The number of large snags, logs, and stumps will continue to decline, except in riparian management areas and other sites where they are deliberately grown or created (Lewis 1998). The amount of non-industrial private timberlands is expected to continue to slowly decline because of conversion and urbanization (Bolsinger et al. 1997).

CONSERVATION STATUS

Legal Status

Washington. Fisher trapping has been prohibited in Washington since 1934. The species was identified by the Washington Department of Wildlife (WDFW) as a "species of concern" in 1978, and was considered a sensitive species by WDFW policy from 1985-1991. In 1991, Washington Administrative Code 232.12.297 established the status of "Sensitive" by regulation and outlined the procedures for listing species as Endangered, Threatened, or Sensitive. The species became a Candidate for listing in 1991 and was listed as Endangered in Washington by the Washington Fish and Wildlife Commission in 1998.

Adjacent States/Provinces. In British Columbia, the fisher is classified as a furbearer and has a status rank of S2S3 (vulnerable)(R. Weir pers. comm.). Fishers in Idaho are classified as a furbearer with a closed season. In Oregon, the fisher is classified as a protected non-game species and is listed as Sensitive by the Oregon Department of Fish and Wildlife (U.S. Fish and Wildlife Service 2004).

U.S. Fish and Wildlife Service. Currently the fisher is not listed as Endangered or Threatened by the U.S. Fish and Wildlife Service and therefore receives no federal protection. In 1990, a petition to list the fisher as Endangered in the Pacific States was submitted to the Fish and Wildlife Service and received a negative 90-day finding because it did not provide evidence sufficient to warrant listing. The fisher met the criteria for "species" under the Act based on the criterion of a distinct population that interbreeditors (U.S. Fish and Wildlife Service 1991). In 1994, the fisher was petitioned for listing as Threatened, this time throughout the western United States (U.S. Fish and Wildlife Service 1996). This petition also received a negative 90-day finding because the U.S. Fish and Wildlife Service contended that no evidence was provided to indicate that fisher populations occurring in the western United States were disjunct from fishers in the remainder of the species' North American range. Populations in the Pacific states and the Rocky Mountains were considered continuous peninsular extensions from Canada (U.S. Fish and Wildlife Service 1996). Moreover, with respect to the international border, the petition did not address differences between Canada and the western United States populations concerning control of exploitation, management of habitat, conservation status or regulatory mechanisms. The finding was, in part, based on a policy change that stopped listings based on the status of a species within political boundaries unless it included all the species' range in the lower 48 states (U.S. Fish and Wildlife Service 1996). In December of 2000, a petition to list a distinct population segment of the fisher in the Pacific states and to designate critical habitat was submitted to the U.S. Fish and Wildlife Service. On July 12, 2003 the U.S. Fish and Wildlife Service published a 90-day finding in the Federal Register that the petition presented "substantial information that the West Coast population of the fisher may be a distinct population segment (DPS) for which listing may be warranted" (Jones 2003). This finding prompted a 12-month status review. On April 8, 2004 the Fish and Wildlife Service published its finding in the Federal Register that the petitioned action was warranted but precluded by higher priority actions (U.S. Fish and Wildlife Service 2004). Upon publication of the 12-month petition finding, the West Coast DPS of the fisher was added to the list of federal Candidate species (U.S. Fish and Wildlife Service 2004). The Center for Biological Diversity and five other conservation groups filed a 60-day notice of intent to sue the U.S. Fish and Wildlife Service in 2004 to list the fisher as an Endangered species.

USDA Forest Service. The fisher is listed as a Forest Service Sensitive species in Washington (B. Naney, pers. comm.). In project planning, if fisher habitat occurs in the planning area it is taken into consideration. The recent designation of the fisher as a Federal Candidate species by U.S. Fish and Wildlife Service provides no additional protections for fisher habitat on Forest Service lands in Washington.

Management Activities

Harvest and season closures. The fisher has not been commercially trapped in the western United States for most of this century. Montana re-opened a limited season in 1983. At present, the fisher season in Montana occurs from 1 December to 15 February, and there is a statewide quota of 7 fishers per season; two districts, the northwest and the west-central, have separate fisher quotas of 2 and 5, respectively. Both districts previously had quotas of 10 fishers each; however, variable detection rates of fishers from snow-track surveys prompted a conservative approach to harvest, and quotas have been reduced accordingly (B. Giddings, pers. comm.). Montana trappers are required to turn in fishers incidentally captured after the quota is reached. Idaho Fish and Game paid $5 for fishers found dead after being incidentally captured in traps set for other species (Melquist 1997). British Columbia closed its trapping season for fishers in 2004 (R. Weir, pers. comm.).

Reintroductions. The fisher is one of the most frequently and successfully reintroduced carnivores (Berg 1982, Reading and Clark 1996, Breitenmoser et al. 2001). Since the 1940s, wildlife managers have translocated fishers as a means of re-establishing a valuable furbearer, a natural predator of the porcupine, and a native carnivore (Table 7, Berg 1982). Translocation efforts began in Nova Scotia in the 1940s and became commonplace in the 1950s and 1960s throughout the species' range (Table 7, Berg 1982). There have been at least 35 fisher translocations attempted throughout their range in the United States and Canada from 1947 to 2004 (Table 7). Of the 35 translocations, 27 (77%) were reintroductions, 6 (17%) were augmentations, and 2 (6%) were introductions. Thirty-one of the 33 reintroductions and augmentations have been completed for over 8 years and could be evaluated for success or failure. Of these 31, 23 (74%) were considered successful (i.e., fisher populations persisted) and 8 (26%) were considered failures or their outcomes unknown.

Although fishers have not been translocated in Washington, translocations have occurred elsewhere in the Pacific Northwest and have been successful at re-establishing fishers. During the late 1950s and early 1960s, fishers were translocated to Montana, Idaho and Oregon. Additional translocations occurred in the late 1970s and early 1980s in Oregon and Alberta, and during the late 1980s and 1990s in Montana, Alberta, and British Columbia (Table 7). Recent research indicates that a native fisher population still occurs in Montana and Idaho, and therefore several translocations to these states were actually augmentations (Vinkey et al. 2006).

Table 7. Fisher reintroductions in North America (modified from Roy 1991).

Release location[1]	Source location[1]	Year	Number released	Sex ratio M:F	Status[2]	Source
NS	Unknown	1947-48	12	6:6	S	Benson 1959
ON	ON	1956	25	Unknown	U	Berg 1982
ON	ON	1956-63	97	37:60	S	Berg 1982
WI	MN, NY	1956-63	60	36:24	S	Petersen et al. 1977
MT	BC	1959-60	36	16:20	S	Weckworth & Wright 1968
VT	ME	1959-67	124	19:16, 89 Unknown	S	Berg 1982
OR	BC	1960	11	5:6	F	Aubry and Lewis 2003
OR	BC	1960	13	5:8	F	Aubry and Lewis 2003
MI	MN	1961-63	61	42:19	S	Brander and Brooks 1973, Irvine et al. 1964
ID	BC	1962-63	39	20:19	S	Williams 1962, 1963
NS	ME	1963-66	80	29:51	S	Dodds & Martell 1971
WI	MN	1966-77	60	30:30	S	Petersen et al. 1977
NB	NB	1966-68	25	10:15	S	Drew et al. 2003
WV	NH	1969	23	6:10, 7 Unknown	S	Pack & Cromer 1981
MN	MN	1968	15	Unknown	F	Berg 1982
ME	ME	1972	7	4:3	U	Berg 1982
MB	MB	1972	4	Unknown	F	Berg 1982
NY	NY	1976-79	43	19:24	S	Wallace & Henry 1985
OR	BC, MN	1977-81	30	15:15	S	Aubry and Lewis 2003
CO	Unknown	1978	2	1:1	F	J. Apker, pers. comm.
ON	ON	1979-81	55	23:32	S	Kyle et al. 2001
ON	ON	1979-82	29	15:14	S	Kyle et al. 2001
AB	AB	1981-83	32	16:16	F	J. Jorgenson, pers. comm.
MT	MN, WI	1988-91	110	47:63	S	Roy 1991, Heinemeyer 1993
MI	MI	1988-92	189	88:101	S	R. Earle, pers. comm.
CT	NH, VT	1989-90	32	13:19	S	P. Rego, pers. comm.
AB	ON, MB	1990	17	6:11	S	Proulx et al. 1994
BC	BC	1990-91	10	Unknown	F	R. Weir, pers. comm.
BC	BC	1990-92	15	2:13	S	R. Weir, pers. comm.
NS	NS	1993-95	14	8:6	S	Potter 2002
MB	MB	1994-95	45	24:21	S	Baird & Frey 2000
PA	NY, NH	1994-98	190	87:97, 6 Unknown (kits)	S	Serfass et al. 2001
BC	BC	1996-98	60	24:36	F	Fontana et al. 1999, Weir et al. 2003
NS	NS	1999-2004	Unknown	Unknown	O	M. O'Brien, pers. comm.
TN	WI	2001-03	40	20:20	O	Anderson 2002

[1]AB = Alberta, BC = British Columbia, CO = Colorado, CT = Connecticut, ID = Idaho, ME = Maine, MI = Michigan, MN = Minnesota, MT = Montana, NB = New Brunswick, NH = New Hampshire, NY = New York, NS = Nova Scotia, ON = Ontario, OR = Oregon, PA = Pennsylvania, TN = Tennessee, VT = Vermont, WI=Wisconsin, WV = West Virginia
[2]S – Successful (fishers persisted for >10 yrs.), F – Failed, U – No evaluation, O – On-going.

Research and surveys. Until recently, there had been very little study of the fisher in the Pacific Northwest and northern Rockies. Research was conducted in Idaho from 1985-1988, when Jones (1991) studied habitat use, movements and diet of fishers in the northcentral part of the state. This population was the progeny of animals transplanted from British Columbia in 1962-63. In Montana, research on activities and movements, habitat use, and diet were conducted for a population reintroduced into the Cabinet Mountains in the northwestern part of the state over a 4-year period (1988-1991)(Roy 1991, Heinemeyer 1993). From 1995-2001 the USDA Forest Service, Pacific Northwest Research Station, conducted a fisher research study on the west slope of the Cascade Range in southern Oregon. The study is the first radio-telemetry study of fishers in Oregon and is an investigation of food habits, movements, den and rest site characteristics, and the effects of forest management on fisher habitat at stand and landscape scales (Aubry et al. 1997, Aubry and Raley 2002, Aubry et al. 2004). In British Columbia, a study of diet, spatial organization and habitat relationships of fishers was conducted between 1990 and 1993 in the central interior of the province (Weir 1995, Weir and Harestad 2003, Weir et al. 2005). In 1996-98 fishers were translocated from the Williams Lake area and reintroduced into the East Kootenay Trench in the southeastern part of the province (Fontana et al. 1999). Thirty-seven radio-collared animals provided information on movements, seasonal home range size, and habitat selection. A follow-up study in 2003 evaluated whether the 1995-98 reintroduction in the Cranbrook area was successful in establishing a resident population (Weir et al. 2003). A public outreach program to increase public support for the Kootenay reintroduction program was also an objective of this study. Another study of fishers in the more mesic conifer forests near Williston, British Columbia is in the data analysis stage (Weir 2003).

Survey techniques were developed in recent years to improve assessments of the status of rare forest carnivores in the West (Zielinski and Kucera 1995). These techniques, and variations thereof, have been used to assess the status of fishers. WDFW, in cooperation with the USDA Forest Service, conducted marten surveys in 1992 and forest carnivore surveys in 1995-97 that would detect the presence of fishers. The National Park Service conducted forest carnivore surveys during winter months from 2001 to 2004 in Olympic, North Cascades, and Mount Rainier National Parks. No fishers were detected in any of these surveys. The Forest Service also conducted surveys for forest carnivores on national forests in Oregon. Although most surveys failed to detect fishers, they were detected on the Rogue River and Umpqua National Forests.

Population and habitat management. In 1991, the Western Forest Carnivore Committee, an interagency group of managers and scientists, was created to address the needitors of martens, fishers, lynx and wolverines. In the same year, the first major conference on the biology of martens and fishers occurred (Buskirk et al. 1994). In 1994, the Forest Service published a conservation assessment for these four forest carnivores (Ruggiero et al. 1994) and produced an extensive literature review and proposed adaptive management strategy for fishers in the western United States (Heinemeyer and Jones 1994). These documents resulted from greater attention to the conservation, research and monitoring of forest carnivores. The second, third and fourth international *Martes* symposia occurred in 1995 (Proulx et al. 1997), 2000 (Harrison et al. 2004) and 2004 (Santos-Reis et al. 2005). The British Columbia Ministry of Environment published a bulletin, *A Fisher Management Strategy for British Columbia* that includes an annotated bibliography (Banci 1989). Proulx (2004, 2005) developed and field-tested a winter habitat use model for fisher in the sub-boreal biogeoclimatic zone of British Columbia. The distribution of tracks corresponded well with predicted high quality fisher habitat characterized as late-successional mixed conifer forest stands with complex stand structure and 30-60% canopy closure. This predictive model of fisher distribution in winter could be a valuable tool in forest management plans for the region. WDFW, in partnership with Conservation Northwest, conducted a feasibility assessment for reintroducing fishers to Washington (Lewis and Hayes 2004).

FACTORS AFFECTING CONTINUED EXISTENCE

Incidental Mortalities

Trapping. When trapping seasons are closed for fishers, they often are incidentally captured in traps set for other species (Luque 1984, Lewis and Zielinski 1996). Following closure of the trapping season for fishers in British Columbia, incidental harvest increased (Banci 1992). Over a two year period (1991-92 and 1992-93) when a trapping closure on fishers was in effect, 302 fishers were incidentally captured in British Columbia (Banci 1992, Weir 2003). Incidental captures are not illegal provided the animal is released when possible; but these captures often result in crippling injury or mortality (Strickland and Douglas 1984, Lewis and Zielinski 1996). Banci and Proulx (1999) classified furbearers in Canada along a gradient of resiliency, which is the capability of a species to recover from a reduction in their population. Fishers were classified as an intermediate resilient species capable of sustaining harvest rates of <30% of the pre-trapped population, depending on environmental conditions and population characteristics. The significance of incidental captures in Washington for population recovery is unknown, but any source of mortalities in very small populations can have significant negative effects. Powell (1979) reported that as few as 1-4 additional mortalities per year due to trapping over a 100 km^2 area could cause a decline in a mid-western fisher population. Mortalities from incidental captures could be frequent enough to prevent local recovery of populations or the re-occupation of suitable habitat.

Passage of Initiative 713 by Washington voters in 2000 banned the use of body-gripping traps to capture furbearers, prohibited the sale of commercially valuable furbearer pelts that were obtained by body-gripping traps, and directed that a permit system be utilized to capture only animals involved in nuisance or damage activity on private land (Koenings et al. 2003). Furbearers may be captured using live traps. As a result of restrictions in use of trap types in I-713, total furbearer harvest in Washington declined by 80%, and trapper numbers declined by 60% (Koenings et al. 2003). Legislative proposals seeking to amend Initiative 713 have been developed, but have not passed. However, if I-713 is overturned and a commercial harvest of furbearers is reinstated, fishers reintroduced to Washington could be at-risk to incidental capture. Initiative 713 does not apply to trapping by members of Washington treaty tribes.

Vehicle collisions. Though not as important a source of mortality as trapping, fishers are struck and killed by vehicles (Proulx et al.1994; York 1996; Zielinski et al. 1995, 1997). The potential for vehicle collisions increases with the density of open roads in suitable habitat. Vehicles caused the death of 2 of 50 (4%) radio-collared fishers in a Maine study (Krohn et al. 1994), and 3 of 97 (3%) fishers in Massachusetts (York 1996). Though no road-kills have been reported in Washington, vehicle collisions could be a significant mortality factor for any small fisher population, particularly following a reintroduction. The I-90 lane expansion project in the Cascades provides for wildlife crossings. Whether fishers will use these crossings is unknown. Therefore, the I-90 corridor could be a barrier to dispersal, and thus genetic exchange, between fishers reintroduced north and south of the highway.

Habitat Loss, Alteration, and Fragmentation

Forest management. Fishers are among the most habitat-specialized mammals in western North America (Buskirk and Powell 1994) because of their association with closed-canopy forests and forest structures typical of late-successional forests. Habitat availability is the primary factor influencing fisher distribution (Bull et al. 2001). Extensive logging of late-successional forests at low- and mid-elevations and subsequent conversion of these forests to intensively managed forests and urban development eliminated a large portion of the fisher's habitat in the state (Powell and Zielinski 1994). Clearcutting, selective logging and thinning may degrade fisher habitat by removing part of the insulating canopy and exposing the site to drying effects of sun and wind; removing large conifers, which reduces vertical structural diversity; removing snags, which reduces the number of den and rest sites; removing large volumes of coarse woody debris from the forest floor, which reduces foraging habitat; and increasing the relative abundance of hardwoods in the understory (Spies et al. 1988, Buck et al. 1994, Ohmann et al. 1994, Bull et al. 2001). Many harvest units in the Northwest are replanted with ponderosa pine. At a regional scale this practice changes vegetative species composition from a mesic closed forest of firs to a drier open forest dominated by ponderosa pine; conditions likely unsuitable for fishers (Buck et al. 1994). In other areas, harvest units are replanted with Douglas-fir. Carey and Johnson (1995) reported that western hemlock seeds are a more abundant and reliable food source than Douglas-fir seeds for small mammals. Thus, conversion of mixed-species stands to Douglas-fir plantations may affect prey populations negatively. Timber harvesting also fragments fisher habitat. Fishers typically avoid areas with low canopy cover and large openings in the forest, such as clearcuts (Buck et al. 1983, Arthur et al. 1989*b*, Powell 1993, Buskirk and Powell 1994, Jones and Garton 1994, Weir 1995). In California, fishers were detected in larger forest stands with high connectivity, suggesting that fishers were sensitive to fragmentation (Rosenberg and Raphael 1986). Remaining late-successional forests at low elevations occurs in small islands surrounded by cutover areas. On federal lands, late-successional forests are distributed in a highly fragmented mosaic, surrounded by younger forest stands that were previously logged or burned (Forest Service and USDI Bureau of Land Management 1994*a*:3&4-29). Most contiguous landscapes of late-successional forests on federal lands occur at high elevations and these areas may be less suitable for fishers in areas of deep snowpacks (Aubry and Houston 1992, Holthausen et al. 1994).

Little is known about the affects of uneven-aged management on fisher habitat quality. Buck et al. (1994) speculated that timber harvests that produced more open stands and thus more xeric conditions over large areas would be detrimental to fishers in coastal California. However, light harvests, or small patch cuts may increase habitat diversity, thus prey diversity, and have little negative impact on fishers where adequate late-successional forest are available (Arthur et al. 1989*b*, Jones and Garton 1994). Buck (1982) found 3 of 8 fisher rest sites in timber harvest units in which <20% of the canopy was removed. Fishers will use forest stands where a majority the mature timber has been removed but still contains patches of residual forest and high volumes of large coarse woody debris and advanced regeneration (R. Weir, pers. comm.). In southwestern Oregon, fishers occur in uneven-aged, intensively managed forest; the area contains many roads and selectively harvested stands but snags, logs, and cavity trees are relatively abundant (K. Aubry, pers. comm.). Radio-collared fishers sometimes hunted in areas with low to moderate canopy closure, and one female denned in residual trees in a heavily harvested stand (K. Aubry, pers. comm.). In Maine, a radio-collared female denned in a residual snag within a 3-acre clearcut, but close to the forest edge and dense hardwood regeneration (T. Paragi, pers. comm.).

Research is needed to define and quantify the specific amounts and types of large live trees, snags and down logs (coarse woody debris) or other stand features that are required to provide adequate structure for fishers (e.g., Payer and Harrison 2004). Different silvicultural regimes (e.g., partial overstory removal), including both even-aged and uneven-aged management, may be consistent with maintenance of fisher populations if harvests provide for retention and recruitment of coarse woody debris and some mature-forest overstory characteristics.

Fire, wind, forest insects and tree disease. Wind, fire, forest insects and tree disease are agents of natural disturbance that create forest structures used by fishers. Wind, tree disease and forest insects can create finer scale disturbances, whereas fire is the primary agent of disturbance at the landscape scale (Spies and Franklin 1988, Agee 1991). Finer scale disturbances accelerate the change in stand development from young to old-growth condition by increasing: 1) inputs of woody debris to the stand, 2) vertical and horizontal heterogeneity, and 3) proportion of shade-tolerant tree species (Spies and Franklin 1988). Thus, over time measures of tree decadence are much higher in old-growth compared to younger aged stands (Spies and Franklin 1991).

While fire does contribute to the destruction of some late-successional forest types, it also is responsible for their creation and maintenance (Agee 1991). Insect outbreaks and stand replacement fires can convert mature forests over large areas to early successional forests that are unsuitable as fisher habitat. However, poor silvicultural practices created the conditions for unnatural stand replacement fires. Policies to protect forests by suppressing fires interrupt natural fire regimes and change the composition and structure of forests. For some forest types, the understory becomes overcrowded and a vertical continuity of fuels develops that allow fires to develop into understory or crown fires (Agee 1994). Similar structural changes occur in other forest types, but can be accompanied by a shift to shade-tolerant species. These shifts in species composition can result in increased duration and intensity of outbreaks of forest pests. Thus, successful fire seclusion can result in changes in the vertical and horizontal structure of forest types. When fires do occur, the fuel buildup and "ladder" fuels allow fires to reach the canopy and result in more high-severity fires than occurred naturally and can burn greater areas of forest (Agee 1993, 1994). Late-successional forests embedded in a matrix of fire-suppressed, managed forests are also at greater risk to loss by stand replacing fires (Agee 1991). Salvage or thinning operations that remove dead or decadent trees or coarse woody debris on the forest floor reduce structural features of forests that are important as denning, resting and foraging sites. Management activities for improving forest health, such as thinnings, fuels reduction, and prescribed fire, also introduce other human disturbances to the landscape that could be detrimental to fisher recovery (Bull et al. 2001).

Forest landscape planning. Management of federal lands in Oregon and Washington within the range of the northern spotted owl is expected to provide substantial conservation benefits to the fisher (USDA Forest Service and USDI Bureau of Land Management 1994*b*, Holthausen et al. 1994). The Washington Department of Natural Resources (WDNR) and several companies that own large blocks of timberland in Washington have developed Habitat Conservation Plans with the U. S. Fish and Wildlife Service, as outlined under Section 10 of the Endangered Species Act. These landowners have committed to long-term (50-100 year) plans to protect selected species of birds and mammals. Some of these plans offered habitat management provisions likely to benefit any remnant or reintroduced fisher populations. The WDNR indicated in their habitat conservation plan that habitat provisions for spotted owls, marbled murrelets, forest riparian habitat and large legacy trees would help conserve habitat for fishers (WDNR 1996).

Genetic, Demographic, and Environmental Risks to Small Populations

Any small population of fishers that exists or became established in Washington would be vulnerable to random demographic events (e.g., variation in sex ratios, reproduction, and survival) and environmental events (e.g., severe weather, fire, volcanic eruption) and their indirect effects (Shaffer 1987). Disease does not seem to be a significant mortality factor in fisher populations (Powell 1993); however, in small populations, the loss of a few reproductive females could affect local population stability. In small populations, multiple random factors are more likely to interact to affect the population negatively than in larger populations. The ability to find mates may be reduced in small or sparse populations, potentially resulting in a loss of productivity. Known as the Allee effect, this can be caused by density-dependent mating success or social interactions (Lande 1988).

Small populations are more likely to suffer negative genetic effects as a result of the loss of genetic diversity and the potential for inbreeding depression (Allendorf 1983, Haig and Wagner 2001). Genetic diversity is lost primarily through random genetic drift, which increases inbreeding and decreases effective population size (Haig and Wagner 2001). Random genetic drift, the result of random changes in gene frequency from one generation to the next, is the mechanism for loss of genetic diversity, and effective population size is the way to measure this rate of loss (Haig and Wagner 2001). Inbreeding is defined as the mating of close relatives, and this can lead to inbreeding depression, which is the loss of fitness resulting from inbreeding (Haig and Wagner 2001). Inbreeding may reduce fertility, thus making a population less able to recover from periods of low recruitment and greatly increase the probability of extirpation. Also, small populations can suffer genetic "bottlenecks," in which the descendants of remaining individuals exhibit little genetic variation and may be more susceptible to diseases or be less able to adapt to new conditions (Schonewald-Cox et al. 1983). In establishing a new population it is important to include unrelated individuals in the founding population (to mitigate the effects of genetic drift) and to increase population size as quickly as possible (to minimize the effect of a bottleneck) (Haig and Wagner 2001). Genetic analyses indicate that British Columbia would be the best source populations for translocations to Washington, followed by western Alberta (Warheit 2004).

CONCLUSIONS

The fisher is a state endangered species that is likely extirpated from the state. Overtrapping, and loss and fragmentation of low and mid-elevation, late-successional forest were the primary factors in the decline of fisher populations. Logging of old conifer forests at low and mid-elevations likely had the greatest impact on fisher habitat. Complex structural diversity of late seral forests provided suitable fisher habitat. Large live trees, snags, and logs provided seasonal denning and resting sites, and a forest floor characterized by large volumes of dead and downed logs and a dense shrubby understory provide foraging habitat. The multi-layered canopy provided overhead cover for travel to access prey and resting structures. Logging replaced these forests with a more simplified forest structure that is lacking one or more of these habitat components. In addition to habitat loss, logging also fragmented fisher habitat. Fishers likely vanished from landscapes as remaining blocks of suitable habitat became smaller and more isolated and thus supported fewer fishers over time. Despite decades of protection from commercial harvest, fisher populations never recovered. Reintroduction has been successful in reestablishing fisher populations in other parts of North America and is the only means of fisher recovery in Washington. A habitat assessment was conducted for western Washington that identified three areas of suitable habitat that may support a fisher population. Forests within Olympic National Park and Olympic National Forest are most suitable for the first reintroduction, and additional suitable habitat for reintroductions has been identified on federal lands in the southern and northern Cascades. Fisher recovery will require cooperation among Washington Department of Fish and Wildlife, the National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, state and local agencies, tribes, timber industry, non-governmental organizations, and private citizens.

PART TWO:RECOVERY

RECOVERY GOAL

The goal of the fisher recovery plan is to re-establish self-sustaining populations of fishers in the Olympic, Cascades, and Selkirks recovery areas (Fig. 8). Achieving this goal will require collaboration and partnerships among state, federal, and local agencies, tribal governments, and non-governmental organizations. The Recovery Plan outlines strategies which, when implemented, should lead to re-establishment of fisher populations in the Olympic, Cascade and Selkirk Mountains.

INTERIM RECOVERY OBJECTIVES

The interim recovery objectives of the fisher recovery plan are to:

1) Successfully reintroduce fishers to the Olympic Peninsula (Olympic recovery area) and Cascade Mountains (Cascade recovery area). Reintroduction success will be based on meeting the following criteria:

    - Evidence that fishers survive for extended periods in the wild,
    - Fishers establish home ranges, with spatially overlapping male and female home ranges,
    - Evidence of reproduction in the wild,
    - Recruitment of juveniles into the breeding population, and
    - Expansion of a reproductive population into unoccupied suitable habitat, **AND**

Figure 8. Fisher recovery areas in Washington.

2) Develop agreements and/or have in place forest management plans for federal and state forest lands within the Olympic and Cascade recovery areas that ensure suitable habitat will continue to be managed in a way consistent with maintaining fisher populations.

Rationale

The current state of knowledge of fisher ecology in Washington does not allow for the development of population numbers or specific geographic distribution goals as recovery criteria. Instead, the approach taken here is to focus on successfully reintroducing fishers at multiple locations in the state. Concurrent research studies on fisher demography, habitat use and selection at multiple spatial scales, and dispersal patterns will provide the empirical data needed to develop recovery criteria in the future. Interim objectives focus on successfully reintroducing fishers in the Olympic and Cascade recovery areas.

Long-term persistence of fishers in Washington will depend on federal land managers providing suitable habitat and habitat connectivity. Federal land managers are currently collaborating with scientists to develop a "Fisher Conservation Assessment and Conservation Strategy" for Washington, Oregon and California. The assessment and strategy should provide guidance for management of forests on public lands throughout this region to provide fisher habitat and maintain habitat connectivity. Fisher recovery in the Selkirk Mountains will require cooperative conservation planning efforts that span the borders of Washington, Idaho, and southern British Columbia.

Fisher recovery areas (Olympic, Cascades, and Selkirk, Fig. 8) occur on federal and state lands and delineate the general areas where the greatest potential exists for fisher conservation. As new knowledge is gained on fisher habitat use patterns, recovery area boundaries may be modified. Federal and state ownerships provide the greatest quantity, quality, and spatial pattern of fisher habitat on the landscape likely to support viable fisher populations in Washington. Federal lands also provide the greatest opportunities for managing fisher habitat at the spatial scales (i.e., landscape and regional) necessary for a wide-ranging carnivore that occurs at low population densities.

The Olympic and Cascades recovery areas are considered the historical core range of the fisher in Washington based on forest types available to fishers in the past, specimens collected, sightings, and trapping reports. The Selkirk recovery area was delineated based on the historical distribution of fishers, presence of suitable habitat on federal lands, and potential barriers to dispersal. Mature and old growth cedar/hemlock forests and forested riparian types in the southern Selkirk Mountains likely provide fisher habitat in northeastern Washington. The Kettle Mountains may provide suitable fisher habitat, but connectivity with habitat in the Selkirks is questionable due to management of intervening lands.

The Olympic recovery area is centered on the Olympic Peninsula and is comprised of Olympic National Park, Olympic National Forest and Department of Natural Resources land ownerships. The Cascade recovery area is comprised of national forests and national parks in the Cascade Range and may be large enough to support both a northern and southern population. The Selkirk recovery area is comprised primarily of the Colville National Forest.

The Selkirk recovery area was identified as a separate recovery area based on historic distribution of fishers in this area, the presence of late-successional forests, and the potential of federal lands to support fishers. Mature and old-growth cedar/hemlock forests and forested riparian types (Jones 1991) in the southern Selkirk Mountains likely provide fisher habitat in northeastern Washington, but a formal fisher habitat assessment has not been conducted. Moreover, suitable fisher habitat likely occurs in the Kettle Mountains and along the Pend Oreille River, but whether there is enough to support a population will need to be investigated. As new knowledge is gained on habitat use patterns, recovery area boundaries may be modified.

RECOVERY STRATEGIES AND TASKS

1. Reintroduce fishers and establish a breeding core of individuals.

Reintroductions are the only means of recovering fisher populations in Washington. Limited dispersal of fishers from Idaho into the Selkirks of northeastern Washington is unlikely to result in a self-sustaining population unless fishers are translocated to this region.

1.1. Evaluate the feasibility of fisher reintroductions.

1.1.1. <u>Conduct feasibility studies to identify potential reintroduction areas.</u>

A feasibility assessment for reintroducing fishers in western Washington was conducted in 2004 (Lewis and Hayes 2004). The assessment identified three potential reintroduction areas: the Olympic Peninsula, the southwestern Cascades, and the northwestern Cascades. If post-release monitoring of fishers on the Olympic Peninsula indicates substantial differences in the definition of suitable habitat that was used in the 2004 feasibility assessment, it may require re-running the assessment for the Cascades Mountains prior to selection of reintroduction areas.

A habitat feasibility study has not been conducted for northeastern Washington. A habitat assessment will be needed for the Kettle Mountain Range and southern Selkirks to evaluate whether sufficient amounts and suitable configurations of fisher habitat exist, and to identify and address any factors that might impede recovery (e.g., commercial trapping in transboundary areas outside Washington).

1.1.2. <u>Create a fisher recovery team to assist WDFW with recovery of fishers in Washington.</u>

Stakeholders representing federal, state, and tribal governments, non-governmental organizations, industry, and academia with experience in fisher ecology, conservation biology, genetics, biometry, and public outreach should be represented on the recovery team. The team can assist the Department with implementing recovery strategies.

1.1.3. <u>Identify source populations genetically suitable for reintroductions.</u>

Survival of individuals is likely to be greater when animals from similar forest types are used in translocation due to adaptive genetic and behavioral factors. Historically, gene flow occurred among fisher populations along the Pacific coast from British Columbia down to California. Recent genetic studies have found that the best source population for fisher reintroductions in Washington is British Columbia. The next best source population would be from California or the western-most regions of Alberta.

1.2. Develop an implementation plan for fisher reintroductions.

In 2005-06, the U.S. Fish and Wildlife Service funded WDFW to develop an implementation plan for a proposed fisher reintroduction on the Olympic Peninsula. The plan will be completed in July 2006. The plan will evaluate previous fisher reintroductions for factors associated with reintroduction success. Factors to evaluate may include: 1) number of fishers released, 2) number of consecutive years that fishers were released, 3) age and sex ratio of founder populations, 4) "hard" versus "soft" release techniques, 5) time of year when releases occurred, and 6) protection of reintroduced populations from trapping. Based on this information, release protocols will be developed using factors thought to maximize survival of individual fishers, and will be evaluated the first year post-release. An assessment of the fates of fishers released under the different release protocols used in year one will be used to modify release protocols in subsequent years.

The implementation plan will also address procedures for capturing, holding and transporting fishers for reintroduction, permitting requirements, selection of release areas, captive care of fishers (i.e., vaccinations, husbandry), and techniques for monitoring of fishers following releases. Multiple techniques may be needed in remote, backcountry areas with limited road access and where weather often inhibits aerial surveys for weeks at a time. At a minimum, monitoring will need to determine survival, home range establishment, reproduction, recruitment, and population expansion. The plan will also outline potential research projects that could be undertaken, if funding is available, to investigate multi-scale habitat use and selection, home range and movements, demography, and food habits of the reintroduced population.

The plan will also detail how a reintroduction advisory team will provide recommendations, and outline how contingency plans and adaptive management will respond to problems encountered. The implementation plan will be peer-reviewed. Additional implementation plans may be developed in the future for reintroductions in the Cascades and Selkirks.

1.3. Reintroduce fishers in the Olympic recovery area.

1.3.1. <u>Work with the National Park Service and Olympic National Park to conduct needed environmental analyses for a potential fisher reintroduction into Olympic National Park.</u>

Follow National Environmental Policy Act guidelines for evaluating a proposed reintroduction of fishers in Olympic National Park. Provide stakeholders, including federal, state, and local agencies, tribes, interest groups, trappers, and private citizens opportunities to participate in the evaluation process.

1.3.2. <u>Obtain funding to conduct the reintroduction and monitoring of fishers in Olympic National Park.</u>

Apply for grants to fund the reintroduction. The high costs of fisher reintroduction and monitoring will require collaborative partnerships among WDFW, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, tribes, WDNR, and interested non-governmental organizations and citizens. Look for opportunities to cost-share and to use citizen science participation in the project.

1.3.2. Use the implementation plan to conduct releases in Olympic National Park.

Obtain fishers from British Columbia, if possible, or from Alberta. Transport and release fishers at selected areas within the park. Work with Olympic National Park and the Olympic National Forest to keep the public informed on the progress of the recovery effort and status of released fishers.

1.3.3. Conduct post-release monitoring of fishers to evaluate the progress and success of the reintroductions.

Short-term monitoring will determine fisher locations and survival. These results should be used to determine if mid-course adjustments to release protocols are needed to improve the likelihood of success. Determine if the reintroductions are succeeding by evaluating critical biological measures of the reintroduced population. These include survival, sources of mortality, home range establishment, reproduction, recruitment, and population expansion. The monitoring program should determine if fishers are surviving, if they are reproducing, whether kits born in the wild become breeding adults, and whether individuals establish home ranges. Once fishers establish home ranges, more emphasis could be placed on refining descriptions of habitat use, food habits, and movement patterns. Monitoring should also be used to determine long-term success of reintroduction efforts.

1.3.4. Establish a fisher reintroduction advisory team to evaluate project success.

Use the advisory team to evaluate progress and provide recommendations for adaptively managing the reintroduction based upon ongoing monitoring efforts. Release and monitoring approaches are likely to be modified throughout the course of a reintroduction based upon the findings of monitoring efforts and available funding.

1.4. Reintroduce fishers in the Cascade recovery area.

Use fishers from British Columbia, Alberta, and the Olympic Peninsula (if sufficient numbers are available) to translocate to the Cascade recovery area. Information on survival, habitat use and movements of fishers gained from post-release monitoring in the Olympic recovery area can be used to maximize success of fisher reintroductions in the Cascade Mountains.

1.4.1. Identify and prioritize core release areas.

1.4.2. Coordinate with federal, state, and local agencies, tribal governments, and non-governmental organizations on recovery activities.

1.4.3. Translocate fishers from the Olympic Mountains and/or suitable out-of-state sources.

1.4.4. Conduct post-release monitoring of fishers to evaluate progress and success of reintroductions.

1.4.5. Expand the distribution of fishers in the Cascade Mountains and connect distant populations using a "stepping stone" approach to reintroductions.

Fishers should be released at multiple core release areas throughout the Cascade recovery area to expand the geographic distribution of occupied habitat, facilitate gene flow among subpopulations, and encourage home range establishment.

1.5. Reintroduce fishers in the Selkirk recovery area.

If fishers become established in the Olympic and Cascade recovery areas, translocations to the Selkirk recovery area would expand the geographic range of fishers and approach the historical distribution in Washington. Establishment of a fisher population in northeastern Washington would also "spread the risk" so that a single catastrophic event would be unlikely to decimate the species from the state.

1.5.1. Determine if fishers are present in northeastern Washington.

1.5.2. Coordinate surveys with Idaho and British Columbia to determine if fishers are occupying habitat in or adjacent to the Washington portion of the Selkirk Mountains.

1.5.3. Determine the feasibility of reintroducing fishers to the Selkirk Mountains.

Conduct a feasibility study to determine if an adequate amount and configuration of suitable habitat is available to support a fisher population in this region. The habitat assessment should encompass federal, provincial, and state lands within the Selkirk Mountains of northern Idaho and southern British Columbia to assess connectivity with fisher populations from these jurisdictions. Information on survival, habitat use and movements of fishers gained from post-release monitoring in the Olympic and Cascade recovery areas and research on fisher habitat use and movements from other parts of the Pacific Northwest that occur in similar forest types can be used to evaluate the feasibility of a successful reintroduction in the Selkirk Mountains.

1.5.4. Proceed with reintroduction planning if the reintroduction is deemed feasible and funding is available.

1.5.5. Develop an implementation plan for a Selkirk reintroduction and identify and prioritize core release areas.

1.5.6. Coordinate with federal and state agencies, tribal governments, and non-governmental organizations on recovery activities.

1.5.7. Translocate fishers from within Washington and/or from suitable out-of-state sources.

1.5.8. Conduct post-release monitoring of fishers to evaluate reintroduction success.

2. Increase public awareness and support of fisher recovery in Washington.

2.1. Develop outreach strategies to engage the public in fisher recovery.

Conduct public information meetings near fisher recovery areas to respond to the public's interest in fisher recovery. Provide background information on fisher biology, ecology, management, conservation and reintroduction feasibility and progress. Involve interested citizens and groups in the project where possible.

2.2. Create and maintain a webpage on the WDFW website with updates on the status of fisher recovery.

2.3. Collaborate with the media on the status of fisher recovery to increase public awareness of the project.

3. Coordinate and cooperate in recovery activities with landowners, non-governmental organizations, and public agencies.

3.1. Coordinate with the National Park Service, U.S. Forest Service, Department of Natural Resources, non-governmental organizations, and donor sources in the planning and implementation of fisher reintroductions and post-release monitoring.

3.2. Provide assistance to landowners, if requested, if they are developing fisher conservation plans or agreements (e.g. Candidate Conservation Agreements with U.S. Fish and Wildlife Service).

Conservation measures that could be taken for fishers might include actions such as protecting fishers from trapping or incidental capture in traps set for other species, protection of known fisher den sites, and providing access for monitoring and research activities.

3.3. Review and comment on revisions to Habitat Conservation Plans and Forest Service management strategies.

3.4. Establish and maintain relationships for information exchange on fisher issues with agencies in adjacent states and British Columbia.

3.5. Provide updates to the scientific community on the implementation and progress of fisher reintroductions.

4. Protect fisher populations.

4.1. Work with trappers to reduce chances of incidental capture of fishers in traps set for other species.

Fishers are protected from trapping in Washington and the use of body-gripping traps for trapping other species is prohibited. Tribes are allowed to use body-gripping traps. Work with trappers to minimize incidental capture of fishers in traps set for other species. Create and distribute information on reintroductions to inform trappers and the general public about fisher ecology and recovery.

4.2 Address conflicts with predation if they occur.

In rare cases, fishers might prey on pets. If a conflict occurs, it should be addressed through the problem wildlife management program conducted by the WDFW enforcement branch and would involve trapping and transplanting problem individuals.

5. Survey and monitor established fisher populations.

Once fishers have been established, long-term monitoring will need to be conducted to determine presence and geographic distribution of fishers and progress toward achieving recovery. Because federal lands are the focus of fisher reintroductions and provide the greatest opportunity for recovery in Washington, coordination and partnerships with federal land management agencies on monitoring will be essential.

5.1. Employ standardized protocols to document the presence and geographic distribution of fishers within recovery zones.

Track plates, hair-snares, and remote cameras are likely to be the most cost-effective techniques to document the presence of fishers (Raphael 1994, Gese 2001, Belant 2003) and change in distribution (Zielinski and Stauffer 1996, Zielinski and Mori 2001). WDFW, U.S. Forest Service, and National Park Service should seek funding to develop and implement a sampling protocol to monitor fisher recovery on federal lands in Washington.

5.2. Collaborate and develop partnerships among state and federal agencies, tribal governments, forest industry, and non-governmental organizations in seeking logistical and financial support for fisher monitoring.

Implementation of a fisher monitoring plan would be most efficient if all suitable habitat at various elevations and on various ownerships could be sampled. Collaboration and partnerships would be needed to meet the logistical and financial goals of such an extensive monitoring program. Stakeholders would achieve individual benefits of site-specific information on fishers and other forest carnivores on their lands, as well as contributing to a more extensive monitoring program that increases the knowledge of fisher distribution and habitat requirements in Washington.

5.3. Conduct periodic surveys to determine population persistence and distribution.

WDFW, U.S. Forest Service, and National Park Service should coordinate the implementation of a standardized survey protocol to monitor presence and change in distribution of fishers in recovery areas.

6. Manage habitat to improve conditions for fishers over time.

The large home range size of individual fishers suggests that in order to re-establish and maintain viable fisher populations in the state, landscape-scale habitat management will need to occur. Federal and state lands will be the cornerstone of fisher recovery. Cooperation among adjacent management jurisdictions in British Columbia and Idaho will be necessary to maintain connectivity (i.e., gene flow) among fisher populations.

To determine whether actions prescribed in the Northwest Forest Plan and Columbia Basin Plan are beneficial to fishers and fostering the reoccupation of its historical range, multi-scale habitat models are needed for regional and local planning across multiple ownerships. Landscape scale habitat models provide the knowledge needed for long-term and large scale conservation planning (Mladenoff et al. 1995; Carroll et al. 1999, 2001).

6.1. Develop a conservation strategy for the Pacific fisher on federal and state lands that emphasizes management priorities at spatial scales specific to the ecology of the fisher.

An interagency effort was initiated in fall 2005 to develop a fisher conservation assessment and strategy for federal lands in the Pacific states. Completion of the assessment and strategy is expected by June 2007. Lyons et al. (1994) provide general guidelines on considerations of spatial scale for habitat and population management of fishers in the western United States. They suggest that habitat management occur at both forest stand and landscape scales. At the stand level, management should emphasize maintaining structural diversity, such as providing large trees, snags, and logs. Large live and decadent trees and snags should provide denning and resting structures while managing for high canopy cover and structural diversity on the forest floor can provide travel cover and foraging habitat, respectively. At the landscape level, management should result in aggregations of forest stands that facilitate occupancy, reproduction and gene flow over time. Washington-specific data is needed for both stand (denning, resting, foraging habitat) and landscape-level (multiple home ranges) models. This information will be developed in the future through monitoring and research associated with reintroductions. These models will be useful for refining the fisher conservation strategies in the future.

6.2. Manage habitat on federal lands to improve conditions for fishers over time.

The interagency conservation strategy for the Pacific fisher is expected to provide guidance to the U.S. Forest Service for the management of fisher habitat on federal lands. This guidance would be expected to be incorporated into future land management planning efforts. Ecosystem management objectives embodied in the Northwest Forest Plan (USDA and USDI 1994a) provide a suitable framework for fisher conservation on federal lands. Development of late-successional and old growth forests in reserves should contribute substantially to fisher recovery on federal lands in western Washington. Conservation measures identified for 11 forest carnivore species, including fishers, in the Columbia Basin should contribute to fisher recovery (Witmer et al 1998).

7. Conduct research necessary to conserve fisher populations.

There is no empirical information on habitat use patterns, food habits, or demography of fishers for Washington. Answers to basic biological and ecological questions will be important for managing and conserving fisher populations and fisher habitat in Washington. Reintroduced fishers will provide opportunities through research and monitoring to obtain this data for Washington. Implementing these research studies will be contingent on funding and will require cooperation and partnerships between WDFW, National Park Service, U.S. Forest Service, and other interested cooperators.

7.1. Conduct research studies in the Olympic and Cascade recovery areas on habitat use, movement patterns, and food habits.

7.1.1. Determine seasonal home range characteristics, landscape-scale habitat selection, and food habits of fishers in Washington

Investigate fisher habitat use and selection at landscape, home range, stand, within stand, and rest/den site scales. Where possible, habitat use and selection should be investigated across land ownerships. This research will provide land managers with an understanding of how to provide and maintain suitable habitat within recovery areas, forests, and forest stands. Lacking population size information, home range size can provide a coarse indication of population densities within a recovery area. An assessment of seasonal food habits of fishers in different recovery areas will help define habitat suitability across different recovery areas and will contribute to our understanding of potential competition with other species.

7.1.2. Determine the demographic characteristics of reintroduced and re-established fisher populations.

Monitor survival and fecundity to assess reintroduction success, population trend and stability, and to make comparisons of population performance among reintroduction areas and recovery areas. Identify specific causes of mortality (disease, predation, starvation) and estimate seasonal survival rates of fishers.

7.1.3. Determine movements and dispersal patterns of reintroduced fishers.

Movements of released fishers can be extensive and increased risk of mortality is associated with extensive movements and dispersal. Dispersal of juvenile fishers is expected to be an important means of reestablishing fishers throughout reintroduction areas and recovery areas. Monitor released fishers and juveniles to determine movement and dispersal patterns (e.g., timing, distance, and sex-specific survival) and eventual establishment of home ranges. Empirical data on juvenile dispersal may be used in conservation planning to determine the spacing of local fisher populations to ensure connectivity and gene flow.

8. Maintain a fisher database.

8.1. Provide a central depository for fisher surveys and detections.

WDFW will maintain a centralized database in its Wildlife Resource Data System (WRDS) for fisher recovery for all survey data collected by agencies, groups, and interested parties, including WDFW, U.S. Forest Service, National Park Service, Washington DNR, and tribes. Individuals conducting forest carnivore surveys should coordinate to ensure that data is collected and recorded in a standardized format. This will enable the data to be used in a centralized database of verifiable records for Washington and Oregon http://maps.fs.fed.us/wo_jsp/pnw/carnivore/mpa.jsp

IMPLEMENTATION RESPONSIBILITIES AND COST ESTIMATES

The outline of strategies and tasks on the following pages identifies co-managers, WDFW involvement, task priorities, and estimates of annual expenditures (Table 8). The following conventions are used:

Priority 1	First priority actions include those necessary to prevent further decline or extirpation, or to reestablish species in Washington. These actions include: preventing further habitat loss or decline in habitat quality, monitoring of populations, evaluating the feasibility for species reintroduction, and conducting reintroductions and associated post-release monitoring as well as research necessary to aid additional reintroduction activities.
Priority 2	Second priority actions are those necessary to increase populations and expand their range such as additional reintroductions, and assessment, restoration, and acquisition of habitat.
Priority 3	All other actions necessary to meet objectives, such as interagency coordination, education activities, and research activities.

Acronyms:

WDFW	Washington Department of Fish and Wildlife
DNR	Washington Department of Natural Resources
FWS	USDI, Fish and Wildlife Service
FS	USDA, Forest Service
NPS	National Park Service

Table 8. Prioritization of recovery tasks for implementation of the Washington State Fisher Recovery Plan.

Priority	Recovery task	Responsible Agency
1	1.1 Evaluate the feasibility of fisher reintroductions	WDFW
1	1.2 Develop an implementation plan for fisher reintroductions	WDFW
1	1.3 Reintroduce fishers in the Olympic recovery area	WDFW, FS, NPS, DNR
1	1.4 Reintroduce fishers in the Cascade recovery area	WDFW, FS, NPS, DNR
1	2.1 Develop outreach strategies to engage the public in fisher recovery	WDFW, NPS
1	2.2 Create and maintain a webpage on the WDFW website with updates on status of fisher recovery	WDFW
1	2.3 Collaborate with the media on the status of fisher recovery to increase public awareness of the project	WDFW, NPS
1	3.1 Coordinate with NPS, USFS, DNR, NGOs and donor sources in planning and implementation of fisher reintroductions and post-release monitoring	NPS, FS, DNR, NGOs
1	3.5 Provide updates to scientific community on implementation and progress of fisher reintroductions	WDFW
1	4.1 Work with trappers to minimize incidental capture in traps set for other species	WDFW
1	5.2 Collaborate and develop partnerships among state and federal agencies, tribal governments, forest industry, and NGOs in seeking logistic and financial support for fisher monitoring	WDFW, FS, NPS, tribes, NGOs
1	6.1 Develop a conservation strategy for the Pacific fisher on federal and state lands	FS, NPS
1	7.1 Conduct research studies on habitat use, movement patterns, and food habits	WDFW
2	1.5 Reintroduce fishers in the Selkirk recovery area	WDFW, FS
2	4.2 Address conflicts with predation, if they occur	WDFW
2	6.2 Manage habitat on federal lands to improve conditions for fishers over time	FS, NPS
2	8.1 Provide a central depository for fisher surveys and detections	WDFW, NPS, FS, DNR
3	3.2 Provide assistance to landowners in developing fisher conservation plans or agreements (Candidate Conservation Agreements)	WDFW, USFWS
3	3.3 Review and comment on revisions to HCPs and U.S. Forest Service management strategies	WDFW, USFWS, FS
3	3.4 Establish and maintain relationships for information exchange on fisher issues with agencies in adjacent states and British Columbia	WDFW, IDFG, ODFW, FS, NPS, provincial agencies
3	5.1 Employ standard protocols to document presence and distribution within recovery areas	WDFW, FS, NPS
3	5.3 Conduct periodic surveys to determine population persistence and distribution	WDFW, NPS, FS

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Appendix A. Fisher specimens collected in Washington.

No.	Location	County	Date	Year	Collector/Citation[a]	Museum No.[b]
1	S. base of Mt. Adams, near Trout Lake	Klickitat		1894	C. Wegstein	USNM #63907
2	S. base of Mt. Adams, near Trout Lake	Klickitat	11 Dec.	1894	D. Kaegi	USNM #69972
3	Mt. Adams, Trout Lake	Klickitat		1894	C. Wegstein	USNM #64758
4	S. base of Mt. Adams, near Trout Lake	Klickitat		1894	C. Wegstein	USNM #63908
5	Mt. Adams, Trout Lake	Klickitat		1894	C. Wegstein	USNM #64759
6	Base of Mt. Adams, near Trout Lake	Klickitat	17 Jan.	1895	D. Kaegu	USNM #70541
7	Mt. Adams, Trout Lake	Klickitat	22 Dec.	1895	D. Kaegi	USNM #76616
8	S. base of Mt. Adams, near Trout Lake	Klickitat	2 Mar.	1895	D. Kaegi	USNM #70928
9	S. base of Mt. Adams, near Trout Lake	Klickitat	Feb.	1895	D. Kaegi	USNM #70927
10	Olympic Peninsula, Lake Cushman region	Mason		1895	R. Harps	USNM #268769
11	Mt. Adams, Trout Lake	Klickitat	5 Dec.	1896	P. Schmid	USNM #81843
12	Mt. Adams, Trout Lake	Klickitat	23 Mar.	1896	D. Kaegi	USNM #77873
13	Mt. Adams, Trout Lake	Klickitat	2 Jan.	1896	D. Kaegi	USNM #76615
14	Mt. Adams, Trout Lake	Klickitat	29 Dec.	1896	P. Schmid	USNM #81951
15	Lake Cushman	Mason	18 Jan.	1896	T. Hayes	USNM #78410
16	Mt. Adams, Trout Lake	Klickitat	15 Jan.	1897	P. Schmid	USNM #87084
17	Mt. Adams, Trout Lake	Klickitat	31 Dec.	1897	P. Schmid	USNM #92113
18	Olympic Mtns., Barnes Cr., Solduck Trail	Clallam	13 Oct.	1898	D. Elliot	FMNH #6342
19	Olympic Mountains, Solduck Trail	Clallam	9 Oct.	1898	D. Elliot	FMNH #6341
20	Mt. Adams, Trout Lake	Klickitat	17 Jan.	1898	P. Schmid	USNM #92770
21	Lake Cushman	Mason	29 Jan.	1899	T. Hayes	USNM #96581
22	Lake Cushman	Mason	17 Feb.	1899	T. Hayes	USNM #96582
23	Lake Cushman	Mason	9 Feb.	1899	T. Hayes	USNM #96580
24	Mt. Adams, Trout Lake	Klickitat	20 Jan.	1900	P. Schmid	USNM #99457
25	Mt. Adams. Trout Lake	Klickitat	10 Mar.	1900	P. Schmid	USNM #99652
26	Mt. Adams. Trout Lake	Klickitat	26 Jan.	1901	P. Schmid	USNM #107624
27	Hoodsport	Mason	6 May	1901	H. Finch	USNM #116653
28	Mt. Adams. Trout Lake	Klickitat	8 Mar.	1901	P. Schmid	USNM #108213
29	Mt. Adams. Trout Lake	Klickitat	24 Feb.	1902	P. Schmid	USNM #116480
30	Olympic Mts., Skokomish R.	Mason	20 Apr.	1902	K. Robbins	USNM #119959
31	Mt. Adams, Trout Lake	Klickitat	25 Feb.	1902	P. Schmid	USNM 116481
32	Olympic Mts., Skokomish R.	Mason	9 Mar.	1902	K. Robbins	USNM #119960
33	Mt. Adams, Trout Lake	Klickitat	12 Apr.	1902	P. Schmid	USNM #116766
34	Olympic Mts., Skokomish R.	Mason	19 Mar.	1902	K. Robbins	USNM #119958
35	Olympic Mts., Skokomish R.	Mason	22 Nov.	1902	K. Robbins	USNM #119961
36	Olympic Mts., Skokomish R.	Mason	28 Mar.	1902	K. Robbins	USNM #119957
37	Hoodsport	Mason		1907	T. Rule	USNM #170607

Appendix A. Fisher specimens collected in Washington (Cont'd)

No.	Location	County	Date	Year	Collector/Citation[a]	Museum No.[b]
38	Hoodsport	Mason	Mar.	1907	T. Rule	USNM #170606
39	Hoodsport	Mason		1908	T. Rule	USNM #17069
40	Hoodsport	Mason		1908	T. Rule	USNM #170608
41	Hoodsport	Mason	5 Dec.	1909	T. Rule	USNM #170610
42	Hoodsport	Mason	16 Dec.	1909	T. Rule	USNM #170611
43	Hoodsport	Mason	30 Dec.	1909	T. Rule	USNM #170612
44	Hoodsport	Mason	10 Feb.	1910	T. Rule	USNM #170615
45	Hoodsport	Mason	22 Jan.	1910	T. Rule	USNM #170613
46	Hoodsport	Mason	24 Mar.	1910	T. Rule	UNSM #170616
47	Hoodsport	Mason	29 Jan.	1910	T. Rule	USNM #170614
48	Olympic Ranger Stn., Glacier Cr., 2 mi SE of Hoh R.	Jefferson	Dec.	1919	W. Taylor	USNM #241949
49	Vance, 27 mi SW of Iron Cr.	Skamania	5 Sept.	1923	W. Scalf	USNM 3243790
50	Near Olympia	Thurston	Unknown	<1947	G. Gibbs	USNM #3379
51	Iron Cr.	Lewis	Unknown	1947	Booth 1947	USFWS
52	Lilliwaup Swamp area, T23NR4WS11	Mason	Jan.	1969	G. Gray	UPSMNH #14784
53	3 mi W of Orting, T19NR4ES34	Pierce	11 Dec.	1990	D. Robertson	UWBM #37530
54	Ft. Lewis T18NR02ES13	Pierce	Fall	1992	G. Sovie	WDFW-NHDB[c]
55	Calispell Peak T34NR42ES9	Stevens	25 May	1994	S. Zender	WDFW-NHDB[d]

[a]see bibliography for Booth (1947).

[b]Museum and source acronyms include: USNM = U.S. National Museum of Natural History (Smithsonian Inst.); FMNH = Field Museum of Natural History, Chicago; USFWS = Bird and Mammal Collection, Fish and Wildlife Service, Washington, D.C.; UPSMNH = University of Puget Sound Museum of Natural History; UWBM = University of Washington Burke Museum; WDFW-NHDB = Washington Department of Fish and Wildlife, Natural Heritage Database records.

[c]Photograph of trapped animal is on file at WDFW.

[d]Carcass of fisher identified by ear tag as animal released in Montana reintroduction project.

Appendix B. Reliable sightings, tracks, and trapping reports of fishers in Washington based on reliability rankings of 1-3 in Aubry and Houston 1992.

Location	County	Date	Year	Type[a]	Reported by	Rel.[b]	Reference[c]
Olympic N.P., T25NR5WS19	Jefferson	-	1896	Trapping	F. Reid	2	Aubry & Houston 1992
Mt. Rainier N.P., Nisqually Valley	Pierce	-	1897	Trapping	C. Merriam	3	Aubry & Houston 1992
Palix or Nemah River watershed	Pacific	-	1903	Trapping	J. Prior	-	B. Adamire
Mt. Rainier N.P., below Longmire	Pierce	-	1904	Trapping	C. Stoner	3	Aubry & Houston 1992
Cosmopolis, Water Reservoir T17NR9WS23	Grays Harbor		1909	Trapping	L. Fairbrother	2	Aubry & Houston 1992
Lower Elwha Dam	Clallam	-	<1910	Trapping	B. Everett	-	B. Adamire
Palix or Nemah River	Pacific	-	1910	Trapping	J. Prior	-	B. Adamire
Stream near Neah Bay	Clallam	-	1910s	Trapping	J. Cowans	-	B. Adamire
Mt. Rainier N.P.	Pierce	-	1912	Trapping	S. Estes	-	Taylor & Shaw 1927
Olympic N.F., T24NR5WS36	Mason	Jan.	1912	Trapping	R. Harps	1	Aubry & Houston 1992
Mt. Rainier N.P.	Pierce	-	1912	Trapping	C. Stoner	-	Taylor & Shaw 1927
Palix River or Nemah River watershed	Pacific	24 Mar.	1913	Trapping	J. Prior	-	B. Adamire
Wenatchee N.F., Hyas Lake, T24NR14ES17	Kittitas	-	1915	Trapping	M. Nordrum	2	Aubry & Houston 1992
Bumping Lake	Yakima	-	1915	Tracks	J. Nelson	-	Scheffer 1938
Okanogan N.F., T38NR20ES9	Okanogan	-	1917	Trapping	H. Mason	2	Aubry & Houston 1992
Queets River W. of Clearwater, narrow spit below Copalis	Jefferson	Winter	1919	Trapping	Cantwell	-	Scheffer 1995
Near the town of Tieton	Yakima	-	1919	Trapping	H. Beebe	2	Aubry & Houston 1992
Crooked Cr., E. side of Lake Ozette	Mason	-	1920s	Trapping	Arbriter	-	B. Adamire
Hoko River	Clallam	-	1920s	Trapping	S. Iverson	-	B. Adamire
Near old coal mine along beach in Pysht area	Clallam	-	1920s	Trapping	Fernandez	-	B. Adamire
Lake Sutherland	Clallam	-	1920s	Trapping	O. Hansen	-	B. Adamire
Wolf R. and Grand Cr. T28NR4WS18	Clallam	-	1915-1925	Trapping	A. B. Cameron	-	B. Adamire
N. of Gold Mt. T24NR1W	Kitsap	-	-	Trapping	H. Dahl	-	B. Adamire
Oak Ponds S. of Hintzville, T24NR2W	Kitsap	-	-	Trapping	Carlson	-	B. Adamire
E. Fork of Quinault R.	Grays Harbor	-	1921	Trapping	E. & I. Olson	-	Scheffer 1995
Crooked Cr. Between Lake Ozette & Dickey Lake	Clallam	-	1925	Trapping	G. Fargo	2	Aubry & Houston 1992

Appendix B. Reliable fisher sightings, tracks and trapping records (Cont'd)

Location	County	Date	Year	Type[a]	Reported by	Rel.[b]	Reference[c]
Trout Lake	Klickitat	-	1925	Trapping	D. Smith	-	Scheffer 1957
Clallam Bay	Clallam	-	1926	Trapping	C. Keller	-	Scheffer 1995
Big Creek	Jefferson ?	-	1929	Tracks	J. Alloid	-	Scheffer 1938
Seaview	Pacific	-	1930	Trapping	J. Petit	-	Scheffer 1957
Methow Valley just S. of Canadian border	Okanogan	-	1933	Trapping	R. Johnson	-	Scheffer 1938
Lake Wenatchee River, above Lake Wenatchee	Chelan	-	1936	Tracks	L. Dickinson	-	Scheffer 1938
Queets River	Jefferson	Winter	1937	Tracks	T. Anderson	-	Scheffer 1995
Olympic Mts.		18 April	1939	Trapping	J. Allen	-	Scheffer 1957
Dragoon Cr. T29NR42ES34	Spokane	Nov/Dec.	1946	Trapping	J. Berry	-	J. Berry
Hoh R. road, T26NR11WS30	Jefferson	2 Aug.	1949	Sighting	M. Johnson	3	Aubry & Houston 1992
Olympic N.P., Klahhane ridge, T29NR6WS29	Clallam	Jun.	1969	Sighting	Unknown	3	Aubry & Houston 1992
Near Sultan, T28NR9ES6	Snohomish	Winter	1971	Trapping	R. Akers	2	Aubry & Houston 1992
Olympic N.F., T23NR11WS1	Grays Harbor	-	1973	Sighting	M. Miller	3	Aubry & Houston 1992
Wenatchee N.F., T16NR11WS8	Yakima	Nov.	1975	Sighting	R. Beaman	3	Aubry & Houston 1992
Mt. Rainier N.P., T17NR10ES31	Pierce	5 Aug.	1975	Sighting	J. Van Horn	3	Aubry & Houston 1992
Elwha River Valley, T30NR7WS32	Clallam	-	1975	Sighting	G. Kish	3	Aubry & Houston 1992
Makah Indian Res., T33NR15WS15	Clallam	Aug.	1982	Sighting	M. Tupper	3	Aubry & Houston 1992
Olympic N.P., T24NR11WS20	Jefferson	29 Oct.	1983	Sighting	H. Beecher	3	Aubry & Houston 1992
Olympic N.F., T24NR4WS21	Mason	30 May	1983	Sighting	D. Spiker	3	Aubry & Houston 1992
Olympic N.P., Boundary, T24NR11WS22	Jefferson	4 Nov.	1983	Sighting	D. Busco	3	Aubry & Houston 1992
Colville N.F., T65NR44ES30	Pend Oreille	3 Feb.	1984	Sighting	R. Fosback	3	Aubry & Houston 1992
W. Branch Wynoochee R., T23NR7WS21	Grays Harbor	July	1985	Sighting	J. Webster	3	Aubry & Houston 1992
N. Cascades N.P., Macallister Camp	Skagit	May	1987	Sighting	A. Morke	3	Aubry & Houston 1992
Peterman Hill, S. of Morton, T12NR4ES10	Lewis	-	1987	Trapping	S. Curry	2	Aubry & Houston 1992
Lundimo Meadows, T39NR33ES29	Ferry	20 Oct.	1989	Sighting	M. Thorniley	3	Aubry & Houston 1992
W. of Orting, T19NR4ES34	Pierce	11 Dec.	1990	Trapping	Brittell	-	WDFW-NHDB

Appendix B. Reliable fisher sightings, tracks and trapping records (Cont'd)

Location	County	Date	Year	Type[a]	Reported by	Rel.[b]	Reference[c]
Mt. Baker/Snoqualmie N.F., T22NR10ES3	King	25 Aug.	1990	Sighting	A. Riley	3	Aubry & Houston 1992
Wenatchee N.F., T13NR11ES1	Yakima	11 Mar.	1991	Sighting	L. Caruso	3	Aubry & Houston 1992
Hwy. 112 W. of Joyce, T31NR9WS35	Clallam	16 May	1991	Sighting	D. Byrne	3	Aubry & Houston 1992
Tornow Branch of Satsop R., T20NR7WS26	Mason	8 Jan.	1992	Sighting	A. Larson	3	Aubry & Houston 1992
Granite Creek, Kaniksu N.F., T37NR45ES02	Pend Oreille	29 Sep.	2001	Sighting	D. Penny	-	WDFW-NHDB

[a] Type: Trapping indicates a report of a trapped animal with no accompanying specimen or photo; Sighting indicates a visual observation by observer listed; Tracks indicates the observation of tracks that the observer believed to be made by a fisher.

[b] Reliability of observations in Aubry and Houston's (1992) is based on a scale from 1(highest reliability) to 6 (lowest), where:

1= museum specimens and photographs

2= observations are first person trapping accounts

3= observations are detailed visual sightings by an observer of known qualifications

[c] References include: published literature; Aubry and Houston = Aubry and Houston (1992 and database provided to WDWF);; Washington Department of Fish and Wildlife- Natural Heritage Database (WDFW-NHDB) records; personal communications with individuals (e.g., B. Adamire); and museum specimens (acronym for the museum and a specimen number. Museum acronyms include: USNM = U.S. National Museum of Natural History (Smithsonian Inst.); FMNH = Field Museum of Natural History; UPSMNH = University of Puget Sound Museum of Natural History; UWBM = University of Washington Burke Museum).

Appendix C. Washington Administrative Code 232-12-297. Section 11 addresses recovery plans.

WAC 232-12-297 Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or sensitive.

DEFINITIONS

For purposes of this rule, the following definitions apply:

2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.

2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.

2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the forseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.

2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.

2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long term survival of the population in Washington.

LISTING CRITERIA

3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.

3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.

3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.

3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available.

4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

5.1 Any one of the following events may initiate the listing process.

5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.

5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.

5.1.4 The commission requests the agency review a species of concern.

5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

6.1 Any one of the following events may initiate the delisting process:

6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

6.1.2 The agency receives a petition from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

6.1.3 The commission requests the agency review a species of concern.

6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section 3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

7.1.1 Historic, current, and future species population trends.

7.1.2 Natural history, including ecological relationships (e.g., food habits, home range, habitat selection patterns).

7.1.3 Historic and current habitat trends.

7.1.4 Population demographics (e.g., survival and mortality rates, reproductive success) and their relationship to long term sustainability.

7.1.5 Historic and current species management activities.

7.2 Except in an emergency under 5.1.3 above, the agency shall prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.

8.1.1 The agency shall allow at least 90 days for public comment.

8.1.2 The agency will hold at least one Eastern Washington and one Western Washington public meeting during the public review period.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.

9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.

10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.

10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.

10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.

10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.

10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:

11.1.1 Target population objectives.

11.1.2 Criteria for reclassification.

11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and property rights. The plan will specify resources needed from and impacts to the department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.

11.1.4 Public education needs.

11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.

11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.

11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within five years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.

11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.

11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department of the initiation of recovery plan development.

11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:

12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.

12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.

13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended. [Statutory Authority: RCW 77.12.020. 90-11-066 (Order 442), §232-12-297, filed 5/15/90, effective 6/15/90.]