

Science

FINDINGS

INSIDE

<i>It's All About Structure</i>	2
<i>Fisher Geography and Decline</i>	3
<i>Separating Fact From Fiction</i>	3
<i>What Can Genetics Tell Us?</i>	4
<i>Translocations and Conservation</i>	4

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"Science affects the way we think together."

Lewis Thomas

FISHER CONSERVATION IN THE PACIFIC STATES: FIELD DATA MEET GENETICS



Young fisher kits stay close to their maternal dens while their mother hunts.

*"The marten can overtake
the nimble red squirrel,
but the fisher can
overtake the marten."*

—Victor Cahalane, *Mammals
of North America*, 1947

We could see the story written out in the snow," says Keith Aubry, recalling a recent excursion with radio-collared

fishers in southwest Oregon. "There were tracks and blood over a large distance, and you could see that the fisher endured a long battle in order to kill and eat the porcupine."

For obvious reasons, porcupines can make for a difficult meal, but fishers are highly adapted to the challenge. They are one of the most agile and sure-footed predators in the forest. Fishers must repeatedly bite the

IN SUMMARY

Overtrapping of fishers in the early 1900s, combined with widespread habitat loss from clearcut logging, has resulted in the extirpation of this forest-dwelling carnivore throughout much of its former range in the Western United States. Poor dispersal abilities, low-density populations, and low reproductive rates all hinder the recovery of this little-known relative of weasels, minks, and otters. In the Pacific Northwest, the fisher occupies dense, lower elevation coniferous forests, and uses large live trees, snags, and logs for denning and resting.

In the last 15 years, three petitions have been submitted to list Pacific coast fishers under the federal Endangered Species Act, yet virtually no empirical information was available on the history, distribution, conservation status, or ecology of fishers in the Pacific Northwest. Due in part to research done by PNW scientists, the fisher's status as a threatened species in this region has recently been deemed "warranted" by the U.S. Fish and Wildlife Service.

Specifically, standardized surveys, field studies, and DNA analyses have shown that the once-continuous distribution of fishers in all three states along the Pacific coast has been reduced to a series of relatively small and disjunct populations. Remnant populations are found only from southwestern Oregon to the southern tip of the Sierra Nevada in California, each of which has alarmingly low levels of genetic diversity. Large expanses of uninhabited forests and natural and human-made barriers preclude interbreeding between most of these populations. In addition, translocations of fishers from British Columbia and Minnesota into Oregon have confounded the genetic affinities of remaining populations.

unprotected face of a porcupine, and with each thrust risk a mouth full of quills, or worse. When the porcupine is finally weakened and falls, the fisher seizes the opportunity and eviscerates it through the exposed belly.

Porcupines, however, make up only a portion of fisher diets, for fishers are generalist predators. They tend to feed most often on medium-size prey, such as squirrels, hares, and grouse, but will eat nearly anything that is abundant, and will readily take advantage

of unexpected food sources, too. In Oregon, Aubry found evidence that a fisher had killed and partially eaten a bobcat, and researchers in California have found truffles and lizards in fisher stomachs. And when all else fails, there are porcupines.

“Porcupines may serve as a fallback source of food in the winter,” says Aubry, who is a research wildlife biologist at the PNW Station in Olympia, Washington. “Our observations suggest that only when there are few prey items available will fishers accept the risk

and energy expenditure associated with hunting porcupines.”

Fishers are members of the weasel family (Mustelidae), but are somewhat stocky in appearance and have a long, thick tail; they are bigger than a marten but smaller than a wolverine. They’re not easy to spot, and some devious methods have to be used in the field to obtain solid evidence of their presence. Think hidden cameras and hair-grabbers.

IT’S ALL ABOUT STRUCTURE

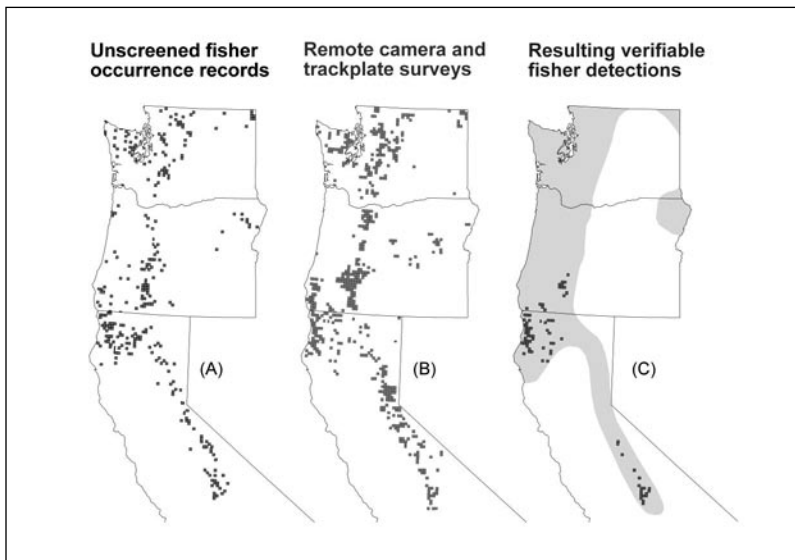
Fisher habitat divides into forest and structural components. The forest component is simple enough: essentially, fishers need continuous tree cover, meaning they don’t do well in open areas.

The structural component is markedly more specialized. Distinct habitat structures provide varying levels of protection throughout different stages of their life history. Although a variety of structural elements are used for denning and resting by fishers, the large legacy structures that are characteristic of old-growth forests provide the most suitable habitat conditions for fishers.

Tree cavities located far above the ground in large-diameter snags or decadent trees provide the first home, or “natal” den, for fisher kits, which are born blind, bald, and vulnerable in late March; they are nursed in these natal dens for about 8 weeks. Mothers must find a tree cavity that has an entrance big enough for her, but small enough to exclude male fishers, which are nearly twice as large and may pose a threat to young kits. Aubry and his colleagues made an entertaining video of a mother fisher squeezing herself—inch by inch—into a cavity opening about the size of a softball.

When the kits begin to move around, the risk of their falling from their high perch gets them moved to a “maternal” den closer to the ground. “Unlike natal dens, which are invariably located in cavities in large-diameter trees or snags, maternal dens are located in a variety of structures, such as hollow logs or root wads,” explains Aubry. The young remain in these dens, building muscle and agility, until mid to late summer; at this point, they are ready to hunt with their mothers.

A network of resting sites is the final structural element needed by fishers. These have the broadest ecological characteristics, and can be anything from down logs to a mistletoe broom. “We believe fishers use resting sites as much for thermal regulation as for protection from predators,” says Aubry. “In summer, fishers need a relatively protected place to cool down after hunting and in winter, they need a place to keep warm between hunts.”



Anecdotal information has led to overestimates of fisher populations (map A). Systematic sampling was done to obtain verifiable evidence of their presence (map B). The resulting information revealed a much smaller distribution (map C). The presumed historical range of fishers in the Pacific States is indicated with shading in map C.

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FISHER GEOGRAPHY AND DECLINE

Because fishers require so many structural components, they are considered one of the most habitat-specialized mammals in western North America. Even so, prior to European settlement, fishers are thought to have occupied most mid- to low-elevation coniferous forests in Washington, Oregon, and California.

“They once existed in a 1,000-mile peninsula of suitable habitat, stretching from British Columbia to the southern Sierra Nevada. In several places, however, this strip of habitat may have been only a few dozen miles wide,” explains Aubry.

The results of multiple surveys show that the range of fishers has contracted substantially since the late 19th century. “Fishers have been extirpated from Washington,” says Aubry. “In Oregon, they are restricted to two small and isolated populations in the southwestern corner of the state: one in the southern Cascade Range and one in the northern Siskiyou Mountains. And in California, fishers have been extirpated from the northern and central Sierra Nevada.”

The problem is that fisher habitat is also prime human habitat. It is at lower elevations, accessible at all times of the year, and contains large trees, which are a valuable commodity to both species. As a result, fishers were immediately affected by European settlement.

Overtrapping in the late 1800s and early 1900s was the primary initial cause of the population decline. “During that period, fishers were among the most valuable of all terrestrial fur-bearers; in the early 1920s, prime skins were reportedly worth \$150 each,” says

SEPARATING FACT FROM FICTION

Do you think you’ve seen a fisher in the wild? Aubry doubts it. But don’t take it personally; he says it happens all the time, even to well-trained biologists. He knows this because he has spent several years comparing the differences between anecdotal and verifiable information on the distribution of forest carnivores.

“People want to see rare carnivores,” he says. “And often, after seeing an unknown mammal run across the road, they will go home and check their field guide, find a rare carnivore that fits with what they saw and occurs in that habitat-type, and say ‘Ah-ha, this must be it.’”

Aubry. “In addition, their curious nature and generalist diet make them very easy to trap.”

The next blow to fishers likely resulted from clearcut logging, which has been widespread in Douglas-fir/western hemlock forests of western Washington and Oregon. Clearcutting removes both of the required components of fisher habitat—continuous canopy cover and large legacy structures, such as snags and down logs. Accordingly, in portions of southwestern Oregon and in California, where mixed-conifer forests dominate and selective logging is preferred, fisher populations have hung on.

This sequence of events has led to a lot of false assumptions about the distribution and abundance of rare forest carnivores, such as the fisher. “There is some utility in the anecdotal information,” Aubry says. “For instance, it can tell us where to begin doing the hard work of systematic sampling to obtain verifiable evidence of their presence. However, it should not be used when it comes to conservation decisionmaking.”

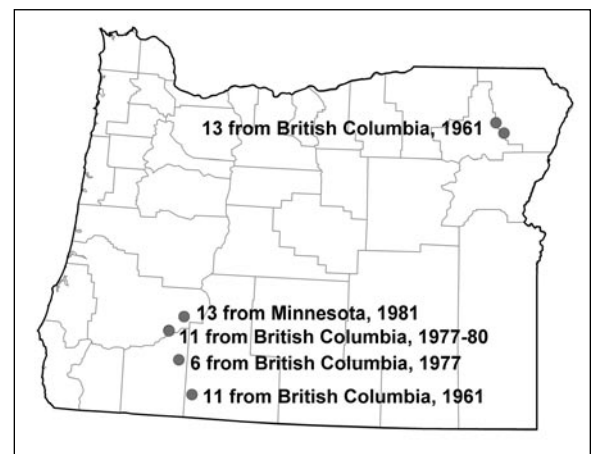
Unfortunately, until recently, anecdotal accounts were the basis

KEY FINDINGS

- Results of standardized surveys conducted in Washington, Oregon, and California during the last decade provide strong empirical evidence that fishers have been extirpated from Washington. In Oregon, fishers are restricted to two small and isolated populations in southwestern Oregon: one in the southern Cascade Range, and one in the northern Siskiyou Mountains. In California, fishers have been extirpated from the northern and central Sierra Nevada.
- Several lines of evidence demonstrate that fishers occurring in the southern Cascade Range in Oregon represent a reintroduced population descended from fishers translocated from British Columbia and Minnesota between 1977 and 1981. Fishers in the northern Siskiyou Mountains are believed to represent the last remnant of indigenous fisher populations in Oregon.
- Genetic studies have shown that fishers have relatively poor dispersal capabilities and exhibit correspondingly high levels of population genetic structure, even in their core range in central Canada. Because of the peninsular nature of the fisher’s distribution along the Pacific coast, however, population structure increases and genetic diversity decreases even further as one moves southward along that distribution.
- Human activities have substantially reduced and fragmented the fisher’s primary habitat and resulted in the extirpation of fisher populations in many portions of their former range in the Pacific States. Most of the populations that have persisted are genetically isolated from each other. Consequently, remaining populations are particularly vulnerable to extirpation, especially those at the southernmost extent of their range.

Fishers have low reproductive rates and exist at low densities under the best of circumstances; therefore, even small increases in mortality above natural levels may lead to local extirpations, Aubry explains. Not surprisingly, impacts from trapping, logging, and development have hit fishers particularly hard.

“The loss and fragmentation of the fisher’s primary habitat probably prevented fisher populations in the Pacific Northwest from recovering after the species was protected from trapping in the 1930s,” says Aubry.



Fishers have been released into Oregon several times as a means of restoring a predator of the porcupine.



Technicians use tracking devices to follow radio-collared fishers.

of most information about fisher populations. And such reports were all policymakers had to go by. In fact, the second time the fisher was petitioned for listing under the Endangered Species Act, the U.S. Fish and Wildlife Service cited the widespread sightings and the lack of empirical evidence to the contrary, in their statement denying the fisher protected status.

The disparity between anecdotal and verifiable estimates encouraged Aubry to adopt and advocate the use of standardized sampling methods for forest carnivores. These include remote cameras that are triggered by motion detectors or pressure plates, hair-snagging devices that collect samples for identification based on DNA analysis, and sooted track-plate boxes that preserve the footprints without any deterioration so they can be verified later in the lab. These meth-

ods provide unequivocal evidence of a species' presence and, if protocols are followed properly, a reasonable level of assurance about their absence.

"We know these techniques are effective. Therefore, after we have spent several years sampling in a region, we can feel confident about both our positive and our negative results. If we haven't found evidence of a species after a widespread and rigorous sampling effort, we know that species is either locally extinct or is so rare that it is in danger of being extirpated," explains Aubry.

Now, based upon Aubry and his colleagues' findings, it is clear that fishers are not nearly as abundant and widespread as the anecdotal information suggested, and the U.S. Fish and Wildlife Service is taking another look.

WHAT CAN GENETICS TELL US?

The field protocols are effective in determining the size and whereabouts of fisher populations—but that is still not the whole picture. Aubry has combined his field data with genetic analyses on radio-collared study animals. "Combining research techniques has led to important insights about dispersal processes and spacing patterns of fishers, and it has enabled us to study aspects of fisher population biology that would not otherwise have been possible," he notes.

By analyzing the sequence of genes in individuals from remaining populations in the Pacific States, it is possible to determine the degree to which these populations are related. This is how Aubry and his colleagues confirmed that the ancestors of Pacific coast fishers were from British Columbia, which is in the western portion of the fisher's "core" distribution across central Canada.

Several other important findings were derived from genetic analyses. For example,

Pacific coast fisher populations exhibit a pattern of decreasing genetic diversity as you move south, away from the source population. To a degree, this pattern is a natural occurrence, but it is still problematic. High genetic diversity makes populations resistant to disease and allows them to adapt to changing environmental conditions. Consequently, fisher populations in the southern Sierra Nevada, with the lowest genetic diversity, are especially vulnerable to extirpation.

In addition, DNA analysis showed increasing genetic structure along the same southerly gradient. Genetic structure is a measure of how connected populations are. In other words, how often individuals disperse from one population to another. High genetic structure is associated with low dispersal, as well as inbreeding within populations.

"It's a bit of a double-whammy that the southern-most fishers have such low genetic diversity and such high levels of genetic

structure," says Aubry. "These patterns would have existed naturally, owing to the narrow, peninsular shape of available habitat; however, human impacts have certainly made the future more precarious for those populations."

The measures of genetic structure are striking, and are among the highest reported for a mammalian carnivore. Exemplifying this are the genetic differences between the two fisher populations in the southern Sierra Nevada that are separated by less than 60 miles. "Genetic evidence suggests that these populations exchange, on average, only 1 migrant every 50 generations," explains Aubry. "We expected a higher level of dispersal given the short distance. However, we now believe that the Kings River, which separates these populations, constitutes a barrier of previously unrecognized magnitude."

As it turns out, the name fisher is a misnomer, and a river is something to be avoided.

TRANSLOCATIONS AND CONSERVATION

In southern Oregon, the genetic data has confirmed what Aubry and his colleagues had suspected with regard to the two remaining fisher populations. They are not related at all.

This might come as a surprise, given that fishers in the southern Cascade Range are less than 50 miles from those in the northern Siskiyou Mountains. Still more surprising

might be the fact that the southern Cascade population is more closely related to fishers in British Columbia and Minnesota than to fishers in the Siskiyou. That is, unless you know the history of fisher translocations during the 1970s and 1980s.

"In the 1950s and '60s, porcupine populations had become unusually dense in southern Oregon and were causing severe damage

to forest plantations," explains Aubry. "To supplement other control efforts, the Oregon State Game Commission and a group of local timber companies, reintroduced fishers on three occasions between 1977 and 1981, as a means of restoring a natural predator of the porcupine." And the fishers they released came from British Columbia and Minnesota.

WRITER'S PROFILE

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Fishers use large snags, live trees, and logs year-round for resting sites.



Wildlife biologists remove a porcupine quill from an anesthetized fisher.

This helps explain some of the physical differences between individuals in the two populations. It also raises some interesting questions with regard to fisher conservation strategies. For example, since the Cascade population is nonnative and the Siskiyou fishers are the last indigenous population in Oregon, should we encourage interbreeding? What if interbreeding could have a positive effect on long-term fisher health by introducing additional diversity into the gene pool?

Aubry acknowledges this is a very tough question. “Management activities that facilitate the movement of fishers from the Cascades to the Siskiyou could have detrimental effects on the conservation of native fishers in the Pacific States,” he says. “Furthermore, it is unclear what sort of protected status, if any, would be granted to the Cascade population under current policies.”

Nonetheless, Aubry does see hope in future translocations of fishers in the Pacific States. “Fishers are one of our national success stories for species reintroductions, though most of that history has occurred in the Eastern United States.”

But he suggests that serious consideration be given to the genetics of the source populations. Aubry sits on a scientific advisory committee for the state of Washington, which is conducting a feasibility study for reintroducing fishers onto the Olympic Peninsula. Unfortunately, there are so few fishers in the

Pacific States that potential source populations as far away as Alberta are being considered.

The experience gained in Washington may soon be used to inform future fisher conservation efforts throughout the west coast states. Just this year, the U.S. Fish and Wildlife Service, after twice denying fishers protected status under the Endangered Species Act, owing largely to a dearth of reliable scientific information, has recently granted Pacific States’ fisher populations a “warranted but precluded” status. This essentially puts fishers on a waiting list for the benefits of official threatened or endangered status.

This decision demonstrates a high level of conservation concern for the fisher in the Pacific Northwest, Aubry notes. But, given the success with fisher conservation and reintroduction efforts elsewhere in the United States, there is reason to hope that fishers will soon return to their role as the most agile carnivore in Pacific Northwest forests. Porcupines beware.

“I suppose the secretiveness of the fisher has been a factor in my interest: a rare and exceedingly beautiful animal that is relatively unknown can be almost irresistibly fascinating.”

—Roger Powell



LAND MANAGEMENT IMPLICATIONS



- Currently, populations of native fishers in the Pacific States occur only in southwestern Oregon and in portions of California. These remnant populations represent extremely important reservoirs of native genetic diversity in Pacific coast fishers. Because of their unique conservation value, it may be appropriate to give special attention to these populations in forest management plans.
- Management activities that facilitate or constrain the movements of fishers from one region to another may affect the conservation of native genetic diversity in the Pacific Northwest. For example, the movement of fishers from the Cascades to the Siskiyou could result in the mixing of nonnative genes into the last remaining indigenous population in Oregon, whereas the isolation of Siskiyou fishers from populations in northwestern California may increase their vulnerability to extirpation.
- Visual observations, tracks, and other anecdotal accounts are inherently unreliable indices of species’ presence. Assessments of current distribution for conservation purposes should be based solely on unequivocal evidence, and standardized methods are now available to obtain such information across broad geographic areas.
- Continued survey and monitoring efforts are needed to refine our understanding of the current distribution of fishers in the Pacific States, to monitor the status of remaining populations over time, and to determine if those populations are expanding their range and reoccupying extirpated areas.

FOR FURTHER READING

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