Fish-ing Around

Discovering the Habitat Needs of the Pacific Fisher

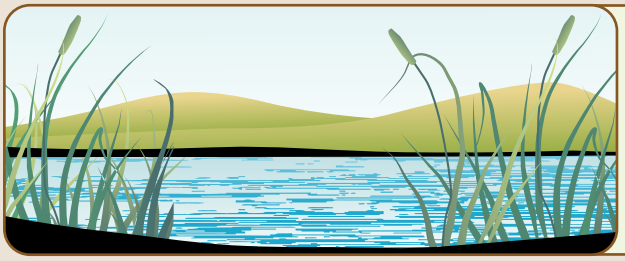
Adobe Stock photo.

Meet the Scientists

Courtesy photo from Eric Gese.

◀ **Eric Gese,** Wildlife Biologist: I love having the opportunity to conduct research on a variety of carnivores for the past 40 years with my group of dedicated graduate students in incredible places on this planet. I love to witness the "Aha!" moment when they see the importance of the research and the value of understanding these remarkable creatures in our natural world.

One of my favorite science experiences was tracking radio-collared jaguars in the Pantanal of Brazil. The area is unbelievable in the diversity of animals. I saw flocks of macaws flying overhead while hiking through the forest to investigate what the jaguars were killing and feeding on—mainly caiman (**kä** mən), feral hogs, javelina (hä və **lē** nə), and cattle. A caiman is similar to an alligator, and a javelina looks like a wild boar.



FUN FACT!

The Pantanal in South America is the world's largest tropical wetland!

Courtesy photo from Jennifer Kordosky.

◀ **Jennifer Kordosky,** Genomics Research Scientist: My favorite science experience was trapping mesocarnivores (see Fun Facts! sidebar on page 51) in the Sierra Nevada. Fishers make a faint chuckling noise while in the trap, so if you heard it when approaching, you knew you'd caught a target. Collaring and monitoring fishers was rewarding and exciting work.

All the animals in these photos were unharmed and released back into the wild by trained scientists. Never approach or handle wildlife.

Courtesy photo from Kathryn Purcell.

▲ **Kathryn Purcell,** Wildlife Biologist: My best day in the field ever was when I climbed to a fisher den and extracted two kits to be measured and marked for future identification. My arm just barely fit in the tree **cavity** and they tried to **evade** me, but I was able to pull them out one at a time and send them down to the crew on the ground. One was a female and the other was a male. They were at the stage where their eyes were just beginning to open. One had only the left eye open and the other had the right eye open, so it looked like they were winking at each other. When they were ready to be put back in the den cavity, they were no longer so shy and didn't want to let go of my hand. My arm got pretty scraped up, but it was worth it.

Courtesy photo from Craig Thompson.

▲ **Craig Thompson,** Wildlife Ecologist: I have worked with a variety of carnivores over the years, large and small, but one of my favorite research-related memories is being attacked by a northern grasshopper mouse. After I released it from a trap, rather than turn and run, it leapt at me and tried to bite me. I shouldn't have been surprised, considering that those mice hunt scorpions and act like miniature wolves, but having a creature the size of my thumb be willing to do battle like that gave me a profound respect and fascination for these animals and their spirit.

Glossary words are bold and are defined on page 60.

All the animals in these photos were unharmed and released back into the wild by trained scientists. Never approach or handle wildlife.

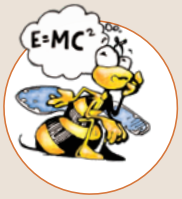
What Kind of Scientist Did This Research?

Genomics Research Scientist: A scientist who studies genes' effects on physical traits and how multiple genes and their interrelationships influence the growth and development of an organism.

Wildlife Biologist: A scientist who studies wildlife, including what they eat, how they reproduce, and how they use their habitat.

Wildlife Ecologist: A scientist who studies the relationship of different kinds of wildlife with each other and with their living and nonliving environment.

Thinking About Science



Often in science research, scientists build and expand upon research that has already been done. When scientists begin researching a topic, they gather all previous research on the topic and review it. This process is called a literature review. The scientists use the information they have gathered to inform their research and help define the research question. In this article, the scientists had information from several previous studies that helped them narrow down their research question. Additionally, several of the scientists working on this research had worked on earlier research questions regarding this topic, so these scientists had a broad understanding of their research topic and could work together to learn even more about it.

Thinking About the Environment

Sometimes it is important to manage an area of land to help an animal or plant survive. When plants or animals are having difficulty surviving in their environment, they may be labeled a "species of concern" by local, State, or national agencies. Scientists then research ways to improve the situation for the plant or animal. Then, a management plan is designed to help support the plant or animal in its environment. The management plan can be used by land managers and others to help protect and improve the outcome for the plant or animal before it becomes endangered. In this research, scientists were interested in learning more about a particular animal that was listed as a species of concern. They wanted to learn specifically about its habitat needs so that they could help provide guidance and information about how to best help the animal. You will learn more about this animal and what the scientists found in the following article.

Introduction

The scientists in this study were interested in learning more about the habitat needs of the fisher (**figure 1**). The fisher is a rare mammal that lives in Canada and four areas of the United States: New England, the Great Lakes, the northern Rocky Mountains, and the Pacific States (**figure 2**).

Figure 1. Fishers are sometimes called "fisher cats," but they are not cats, nor do they fish. U.S. Fish and Wildlife Service photo.

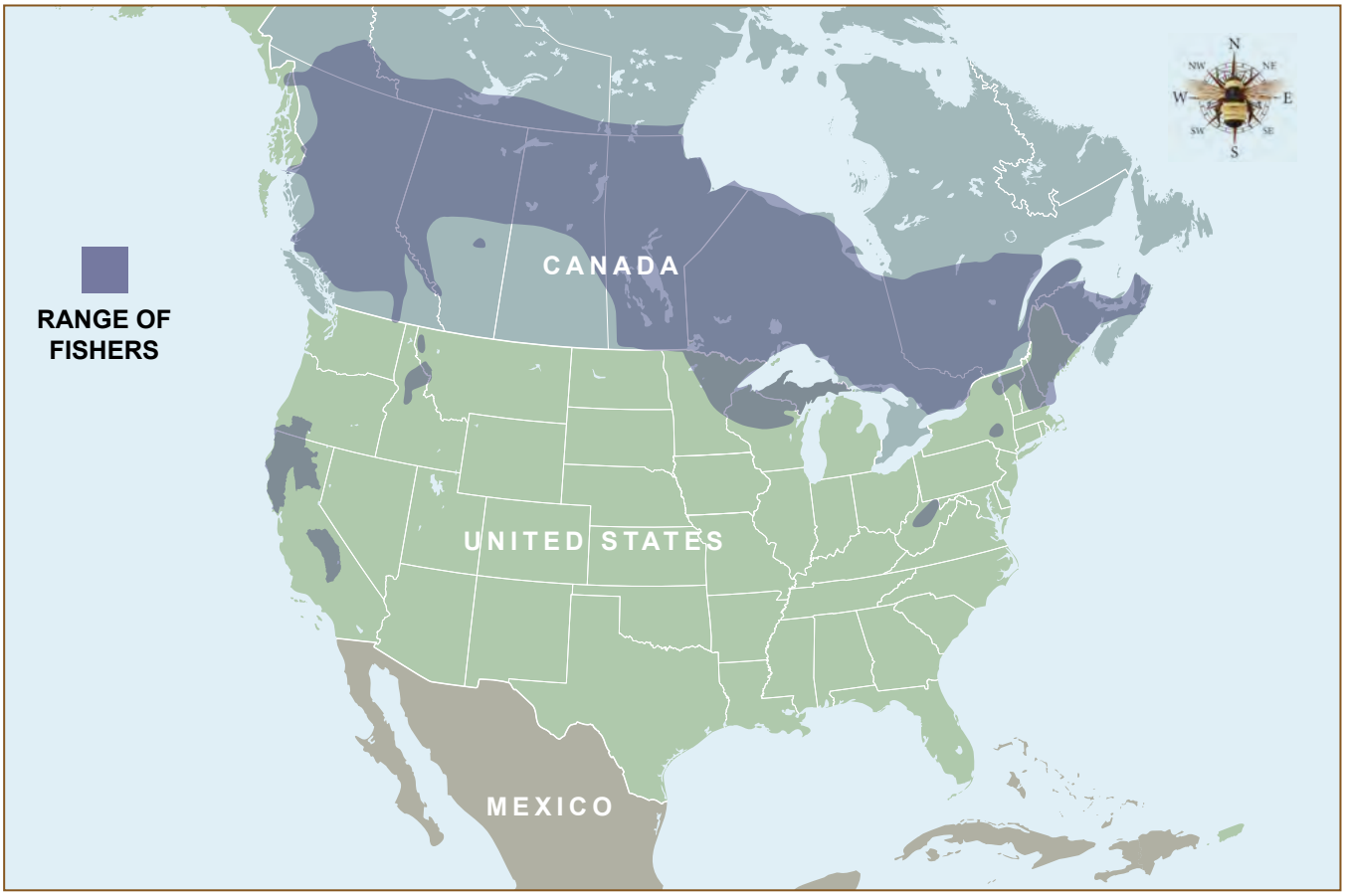


Figure 2. Examine the map to see where fishers can be found. Are any of these areas close to where you live? FIND Outdoors map by Leslie Shaw Design.

FUN FACTS!

Fishers are a medium-sized member of the weasel family. Contrary to its name, the fisher does not eat fish. Instead, it is a voracious hunter of other small animals. The fisher is considered a mesocarnivore, which means 50–70 percent of its diet is made up of meat from another animal. It has been known to prey upon porcupines. Very few animals are known to prey upon porcupines. One of the other known predators of porcupines is a cousin to the fisher—the wolverine. U.S. Fish and Wildlife Service photo by Bethany Weeks.

In California, the historic range of the fisher goes through the Sierra Nevada (**figure 3**). Since the 1940s, the fisher population in California has declined due to fur trapping, which almost brought the species to extinction. Trapping was banned in 1946 to help the population recover, and the fisher was listed a species of concern (see "Thinking About the Environment" on page 49). However, scientists note that the species has never fully recovered from that time. When this research was conducted, some populations of fishers, such as the West Coast Distinct Population Segment, were being reviewed for listing as an endangered species (see sidebar on page 52). The West Coast Distinct Population Segment in the southern Sierra Nevada had less than 300 adults. In addition to fur trapping, the fisher population is declining due to **habitat fragmentation**, development, and climate change (**figure 4**).

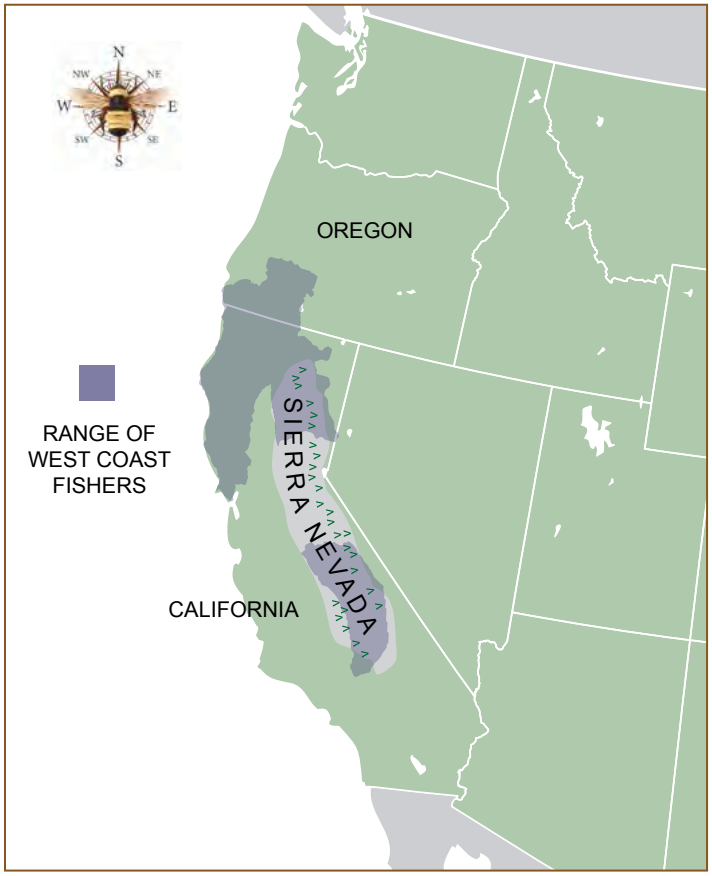


Figure 3. The Sierra Nevada are a major mountain range in western North America. The Sierra Nevada run along the eastern edge of California. FIND Outdoors map by Leslie Shaw Design.

Figure 4. As areas are developed, land is cleared for various purposes. In this photo, land is cleared for a shopping center. Courtesy photo by Babs McDonald.

Distinct Population Segment (DPS)

Sometimes a species may have several separate populations within its natural habitat. The fisher, for example, lives in several different areas of the United States (see **figure 2**, page 50). These fisher populations are geographically separate from one another and may have different **genetic** profiles, community behaviors, or challenges in their communities. The U.S. Fish and Wildlife Service calls these separate populations "distinct population segments," or DPS. Sometimes one DPS of a species may have more difficulty surviving in its current habitat than other populations. That particular DPS can be protected under the Endangered Species Act while the other populations of the species are not protected. In the case of fishers and during the time period the research took place, the West Coast Distinct Population Segment was the population being considered for endangered species status. However, in 2020, the U.S. Fish and Wildlife Service broke the West Coast Distinct Population Segment into two parts. The southern Sierra part of the segment has been listed as endangered. The northern California/southern Oregon part has not been listed as endangered.

The fisher has a home range. This home range is an area where the fisher engages in its normal activities like eating, resting, and caring for its young. Within the home range, scientists have identified a core area. This core area may be used more frequently than the rest of the home range. The core area may contain more dependable resources such as food. Scientists think that core areas may serve as refugia (ri **fyü** jē yə). Refugia are locations that support an isolated population by sheltering it from unfavorable conditions. The fisher population is isolated due to habitat needs, human development and habitat fragmentation, and climate change.

The scientists in this study were interested in figuring out which landscape characteristics were more abundant in the core areas of fisher habitat. The scientists **hypothesized** that the core area would contain more late-successional forest. A late-successional forest is an older forest with more mature trees and undergrowth (**figure 5**). Additionally, scientists hypothesized that there would be less tree **mortality**, less habitat disruption from humans, and less human presence in general.

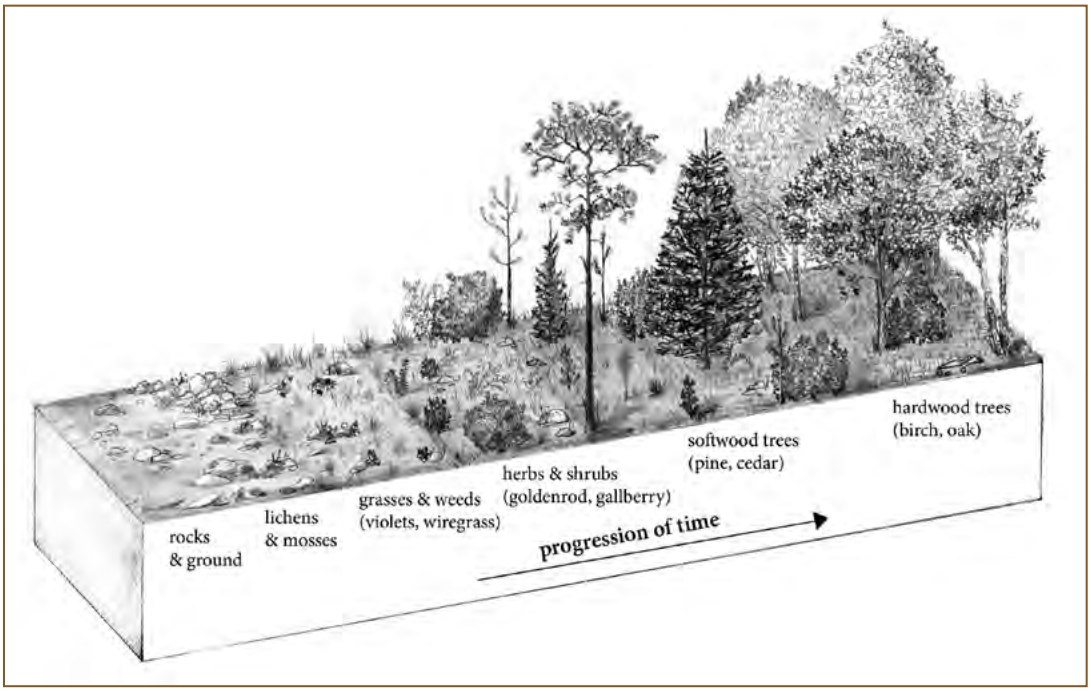


Figure 5. Forest succession is the change from one plant community to another within a forest. Late-successional forests are the forests at the end of the progression. Look at how the type of vegetation changes over time. What do you notice about late-successional forests? FIND Outdoors illustration by Stephanie Pfeiffer Rossow.

Reflection Section

- In your own words and in the form of a question, what did the scientists want to learn?
- Some of the challenges facing fisher populations include habitat fragmentation, climate change, and human presence. Why do you think each of these may influence the fisher habitat?

Methods

The study was conducted in the Kings River Fisher Project area (KRFP) and the Sierra Nevada Adaptive Management Project area (SNAMP). Both areas are located in the Sierra Nevada in California. Specifically, the scientists gathered information from the Bass Lake and High Sierra Ranger Districts of the Sierra National Forest (**figure 6**).

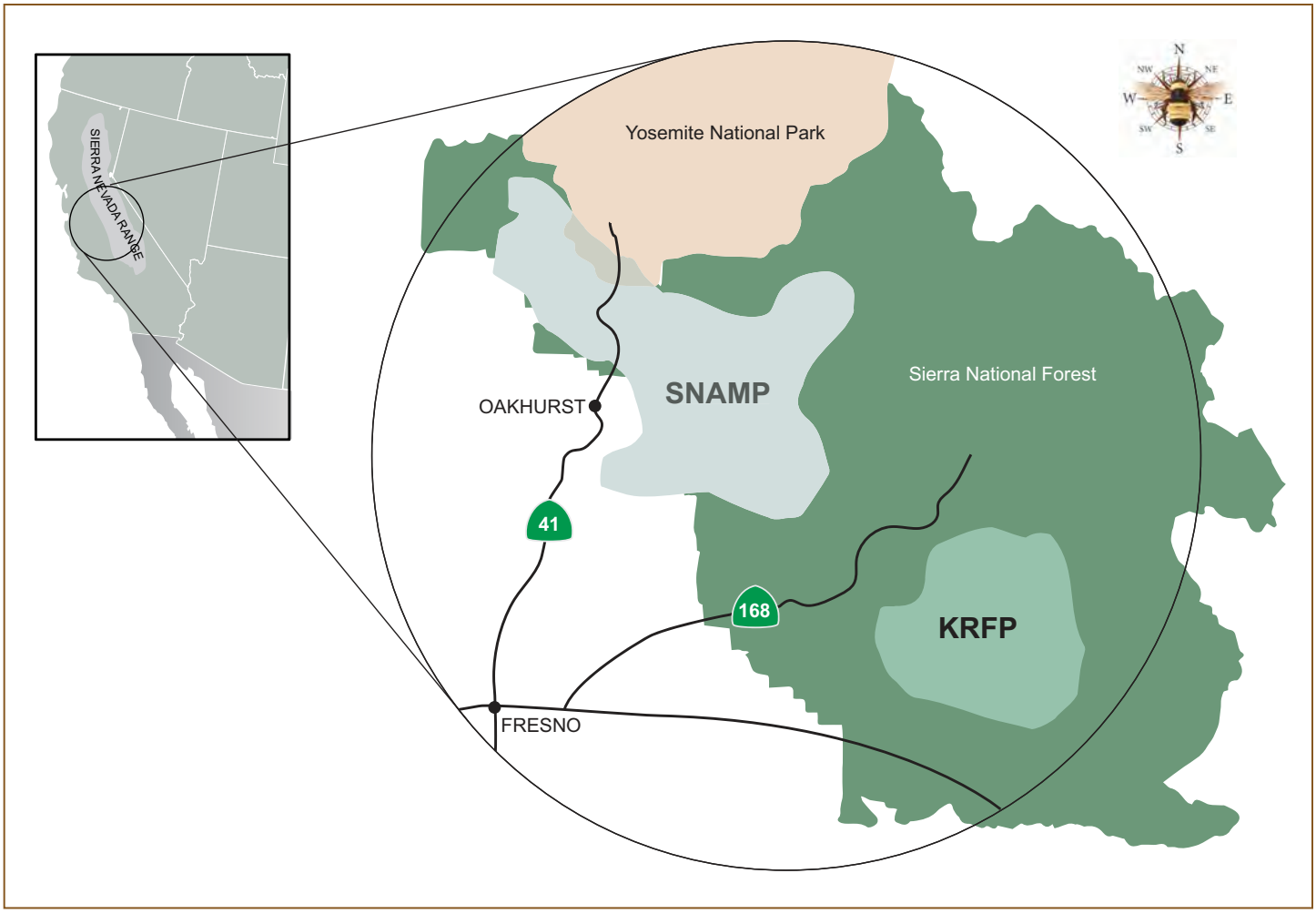


Figure 6. The project areas for this study (SNAMP and KRFP) are both located in the Sierra Nevada. FIND Outdoors map by Leslie Shaw Design.

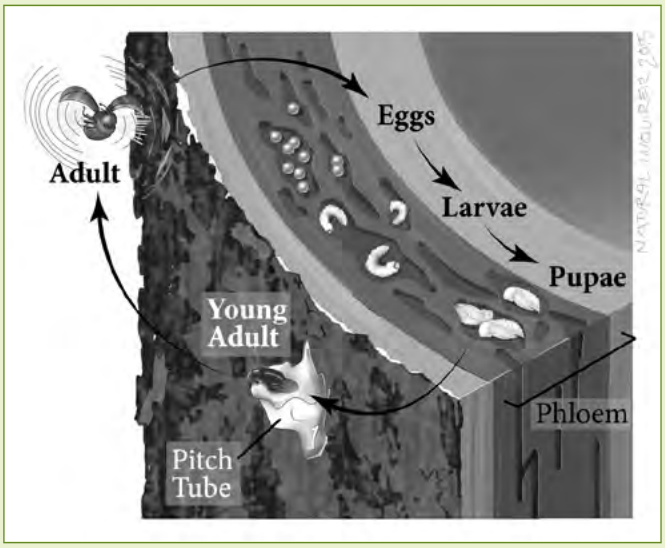
During the summer months, very little precipitation fell in the area. The temperatures ranged from 9 degrees Celsius (°C) to 23 °C. Snow cover was typical from November to April with temperatures ranging from -4 °C to 7 °C. Both areas were impacted by a severe 4-year drought from 2012 to 2015. This drought is thought to be one of the most severe droughts in that region in the past 1,200 years. The drought, combined with a mountain pine beetle infestation, caused a significant loss of trees in the area.

Number Crunch

- What was the summer temperature range in degrees Fahrenheit (°F)? What was the winter temperature range in Fahrenheit?

  Hint: The formula is °F = (°C × 9/5) + 32.

What Is a Mountain Pine Beetle Infestation?



FIND Outdoors illustration by Stephanie Pfeiffer Rossow.

Mountain pine beetles live for only 1 year. Most of the year is spent "chilling out" in a condition scientists call supercool. Because they live in high mountain environments where it is very cold, they spend most of their short life span being supercool. That does not give them much time to lay eggs and reproduce. When these beetles reproduce, they lay eggs in the **phloem** of pine trees. These eggs become the larvae that live in the phloem during the cold months. In late summer, pupa become adults and emerge from the pine trees. As adults, the beetles must bore holes in other pines trees so they can lay their eggs. When they bore holes in the trees and lay eggs, the beetles usually kill the tree. Pine trees produce resin to repel the beetles. To successfully lay their eggs, the beetles must work as a team. They bore holes in pine trees in large numbers. To learn more about mountain pine beetles, read the "Beetles Are Supercool!" monograph.

The scientists trapped the fishers with live traps. They covered the traps with natural materials and baited the traps with chicken and bait lure. Fishers were handled with a canvas sleeve and a metal handling cone. The fishers were **sedated**, and dosages of the sedation medicine were based on the size, age, and whether it was a male or female fisher (**figure 7**). The scientists measured the following things:

- Body length
- Body mass
- Tail length
- Canine length (the canine is a type of tooth that is usually used for tearing food)
- Reproductive status (scientists examined them for indications that they had reproduced)

The fishers were fitted with a handmade, breakaway radio collar (**figure 8**). The fishers were also injected with a passive radio transmitter. The collar enabled the scientists to track the fishers' movements within their home ranges. The passive transmitter allowed them to identify an animal later if it slipped out of the collar, like the way some people microchip their dogs and cats. All animals were captured and handled under authorization from the USDA Forest Service and local agencies. None of the animals were harmed, and all were released back into the wild.

Figure 7. Fishers are sedated and handled with care while scientists take measurements and record their observations. This photo was taken during another study of fishers' ranges in Oregon conducted by the Forest Service and the Bureau of Land Management. Bureau of Land Management photo.

Figure 8. (A) The breakaway radio collar enables the scientists to track fisher movement. **(B)** A scientist uses a computer and an antenna to track the fisher's radio collar. These photos were taken during another study of fishers' ranges in Oregon conducted by the Forest Service and the Bureau of Land Management. Bureau of Land Management photos.

The scientists collected information on home ranges for a year. They analyzed both male and female home ranges separately. The scientists also obtained data on where different silviculture treatments had occurred. Silviculture is the art and science of managing the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society. These needs and values could be wildlife habitat, timber, water resources, restoration, and recreation on a sustainable basis. Silviculture treatments include logging, thinning, burning, and **regeneration** (**figure 9**). The locations of buildings and roads were obtained from the Forest Service. This information was used to analyze the amount of human activity in these areas.

The scientists also collected information on habitat characteristics such as **canopy** cover and habitat type. They identified six habitats (**figure 10**):

(1) Conifer forests (forests composed largely of evergreen trees or cone-bearing, needle-leaved trees; in this study, mainly ponderosa pine, sugar pine, white fir, and incense cedar)

(2) Hardwood forests (forests that mainly have deciduous trees, which are trees that periodically shed their leaves; examples include California black oak and canyon live oak)

(3) Developed lands (lands with human development such as buildings and houses)

(4) Shrubland (areas dominated by shrubs such as manzanita (man zə **nē** tə), whitethorn ceanothus (sē ə **nō** thəs), and bear clover/ mountain misery)

(5) Sparse cover (areas with granite or little shrub cover)

(6) Open water

The scientists noted that canopy cover or canopy density is the one characteristic that has been widely associated with the presence of fishers. Dense canopy is defined as greater than 60 percent cover and helps with **foraging**, rest site opportunities, and refuge from large predators (**figure 11**).

The scientists also obtained tree mortality data. Both an extensive drought that occurred from 2012 to 2015 and a mountain pine beetle infestation greatly increased the amount of tree mortality. There were many dead trees in all the home ranges of these fishers.

Figure 9. Thinning trees from a forest is a silviculture technique used to help manage forest fires. Photo by Cecilio Ricardo.

Figure 10. Scientists categorized land into six habitat types for their study on fisher home ranges. These habitat types are: **(1)** conifer forest; **(2)** hardwood forest; **(3)** developed land; **(4)** shrubland; **(5)** sparse cover; and **(6)** open water. Photos by (1) Molly Simonson; (4) Jim Frazier; (5) Paul Wade; and (6) USDA Forest Service photo. Adobe Stock photos (2) and (3).

Figure 11. The scientists in this study classified the tree canopy cover into three categories: dense cover, moderate cover, and low cover. This figure shows examples of **(A)** dense, **(B)** moderate, and **(C)** low tree canopy cover. Adobe Stock photos.

Reflection Section

- Why do you think scientists gathered information on tree mortality? How might tree mortality influence fisher populations?
- The scientists identified six habitats (see **figure 10**, page 57). Based on what you have learned about fishers so far, which habitat areas do you think would be more likely for fisher habitat? Why?

Findings

From 2014 to 2016, scientists trapped 41 female fishers and 23 male fishers. Sixty-eight home ranges were identified for females. For the male fishers, the scientists had trouble distinguishing a home range because they did not appear to have regular spots that they visited frequently. Instead, they identified 32 "areas of use" for male fishers. Scientists used the term "area of use" to refer to all the areas that a male fisher used.

The main difference between males and females is that males use a larger space and do not use den sites. Den sites are used to raise the young (**figure 12**). Females raise the young independently.

For female fishers, building density and percentage of low canopy cover were significantly lower in their core areas (**box 1**). The percentage of hardwood habitat, percentage of sparse cover, and percentage of moderate canopy cover were also lower in the core area compared to the entire area. The percentage of dense canopy cover was significantly higher in core areas. Percentage of conifer forests was also higher in core areas.

For male fishers, the scientists found a significantly lower portion of developed land in their core areas compared to their whole area of use (**box 2**). Building density, percentage of shrubland, and percentage of low canopy cover were also lower in the core areas than in the entire area of use. Like female fishers, males' core areas had a higher percentage of conifer forest habitat and dense canopy cover.

Figure 12. A fisher kit looks out from its den. Adobe Stock photo.

Box 1. Characteristics of female fishers' core areas.

Female core areas had more:	Female core areas had less:
• Dense canopy cover	• Building density
• Conifer forest habitat	• Low canopy cover
	• Moderate canopy cover
	• Hardwood habitat
	• Sparse cover habitat

Box 2. Characteristics of male fishers' core areas.

Male core areas had more:	Male core areas had less:
• Dense canopy cover	• Building density
• Conifer forest habitat	• Developed habitat
	• Shrubland habitat
	• Low canopy cover

Reflection Section

- Look at the findings for the female and male fishers. What characteristics do they have in common?
- Based on what you have read so far and the findings, what would you recommend to land managers if they were trying to help support fisher habitat?

Discussion

Female home ranges had lower amounts of building density, percentage of hardwood forests, percentage of sparse cover, and percentage of low canopy within the core. The female home ranges also had a higher amount of conifer forests and dense canopy within the core.

Like the females, male fisher areas of use had lower building density, shrubland, developed areas, and areas with low canopy. Males also had higher amounts of conifer forests and dense canopy in their core areas. The scientists think that males may position their core areas to avoid developed habitat with low canopy cover.

Because fisher habitat is deteriorating due to development, wildfires, past logging, and other issues, the core area appears to provide a more suitable habitat for the fishers. Both male and female fishers seem to prefer being farther from human development and having the protection of denser canopy cover. This finding suggests that it may be important to help protect these core areas for species of concern such as the fisher.

The scientists also found evidence that fishers were able to adapt to small changes to the core habitat. Overall, the scientists recommended that managers conserve areas of dense canopy cover that are about 2 square kilometers (km^2) in size. Ideally, the patches should contain conifers and have very few roads or buildings.

Reflection Section

- Recall what the scientists wanted to learn from this study. Look back at the "Introduction" section if you need to refresh your memory. In your own words, what is the answer to their research question?
- Do you think research like this is important to conduct? Why or why not?

Adapted from Kordosky, J.R.; Gese, E.M.; Thompson, C.M.; Terletzky, P.A.; Purcell, K.L.; Schneiderman, J.D. 2021. Landscape use by fishers *(Pekania pennanti):* core areas differ in habitat than the entire home range. Canadian Journal of Zoology. 99(4): 289–297. https://doi.org/10.1139/cjz-2020-0073.