

Effects of Wildfires on the Structure of Carnivore Communities in Northern California

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Objective - Determine the effect of fire on the occupancy of carnivores

Introduction

Wildfires are a habitat-altering ecological disturbance that can affect carnivore populations¹. The frequency and intensity of wildfires in the western United States have increased in recent years and it is critical to understand these effects on carnivores². We implemented a trail camera project three years after a wildfire burned in northern California to investigate how wildfires may affect carnivore communities.

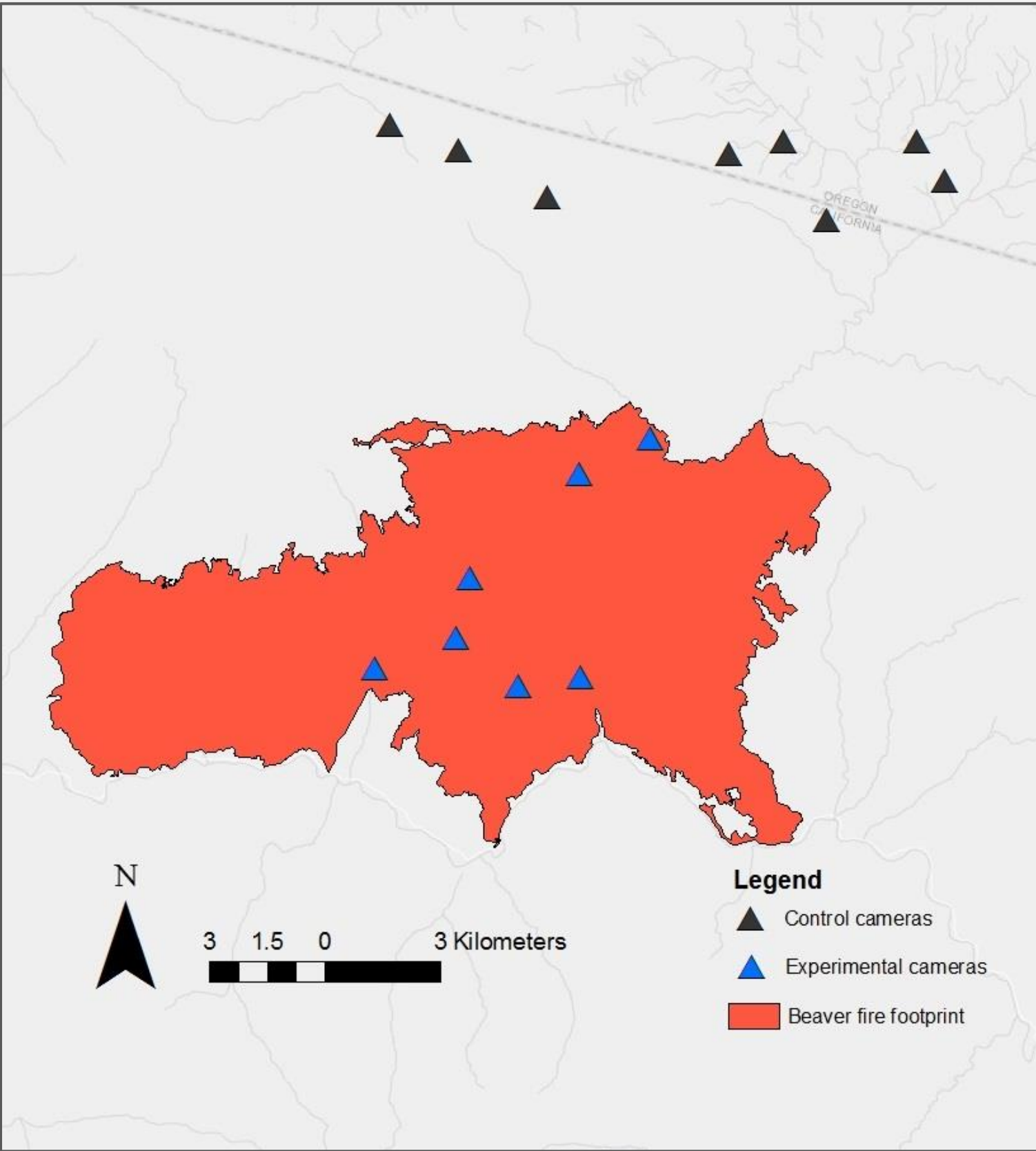


Fig. 1. Map of the study area and the fire footprint.

Methods

Our field study took place in the Klamath National Forest in northern California in fall 2017 at the site of a long-term study of fisher population demography. We developed a pilot trail camera program to investigate occupancy of carnivores.

We deployed 7 cameras in burned areas and 8 cameras in non-burned habitat that had similar elevation and canopy cover to the pre-fire condition of the locations of cameras in burned areas (Fig. 1). Unburned sites had over 60% canopy cover. We hypothesized that occupancy rates of generalist and specialist carnivore species would be influenced by habitat availability, interspecific competitive interactions, and prey availability, and that these effects could be apparent in the proportion of sites that are occupied in burned and non-burned areas.

Predicted effects of fire on wildlife

Species	Predicted Effect on Species Occupancy	Rational	Outcome
Fisher (<i>Pekania pennanti</i>)	negative	Fisher are a forest-obligate species that require canopy cover for hunting, rest sites and avoiding predation ³ . Thus, they are less likely to occupy a burned area because there will be less canopy cover compared to a non-burned area.	negative
Cougar (<i>Puma concolor</i>)	positive	Cougars will opportunistically use the burned habitat to prey upon deer, whose density increases after a fire ^{4,5} .	no change
Coyote (<i>Canis latrans</i>)	positive	Coyote are a generalist species that have a wide ranging diet. This includes small mammals and fawns, whose numbers would increase due to the alteration of vegetation communities after a wildfire ⁵ .	no change
Grey fox (<i>Urocyon cinereoargenteus</i>)	positive	Fishers have a negative effect on grey fox occupancy by out-competing them for resources ⁶ . Thus, if fishers are less likely to occupy a burned site, it opens up the site to grey foxes. Additionally, a post-burn increase of small mammal density after a wildfire could increase grey fox occupancy ⁵ .	positive
Black bear (<i>Ursus americanus</i>)	no change	Black bear are habitat generalists with an omnivorous diet ⁷ , making them a very adaptable species that would occupy both burned and unburned sites with no preference for either.	no change
Ringtail (<i>Bassariscus astutus</i>)	positive	Fishers have an indirect negative effect on ringtails ⁶ , so wildfires would create a chance for ringtails to colonize the area. Ringtails also prefer forests younger than 10 years old for rest sites compared to young forests (between 30-80 years old) and prefer live hardwoods, such as fire-dependent oaks, for rest sites ⁸ .	no change

Results

Occupancy estimates

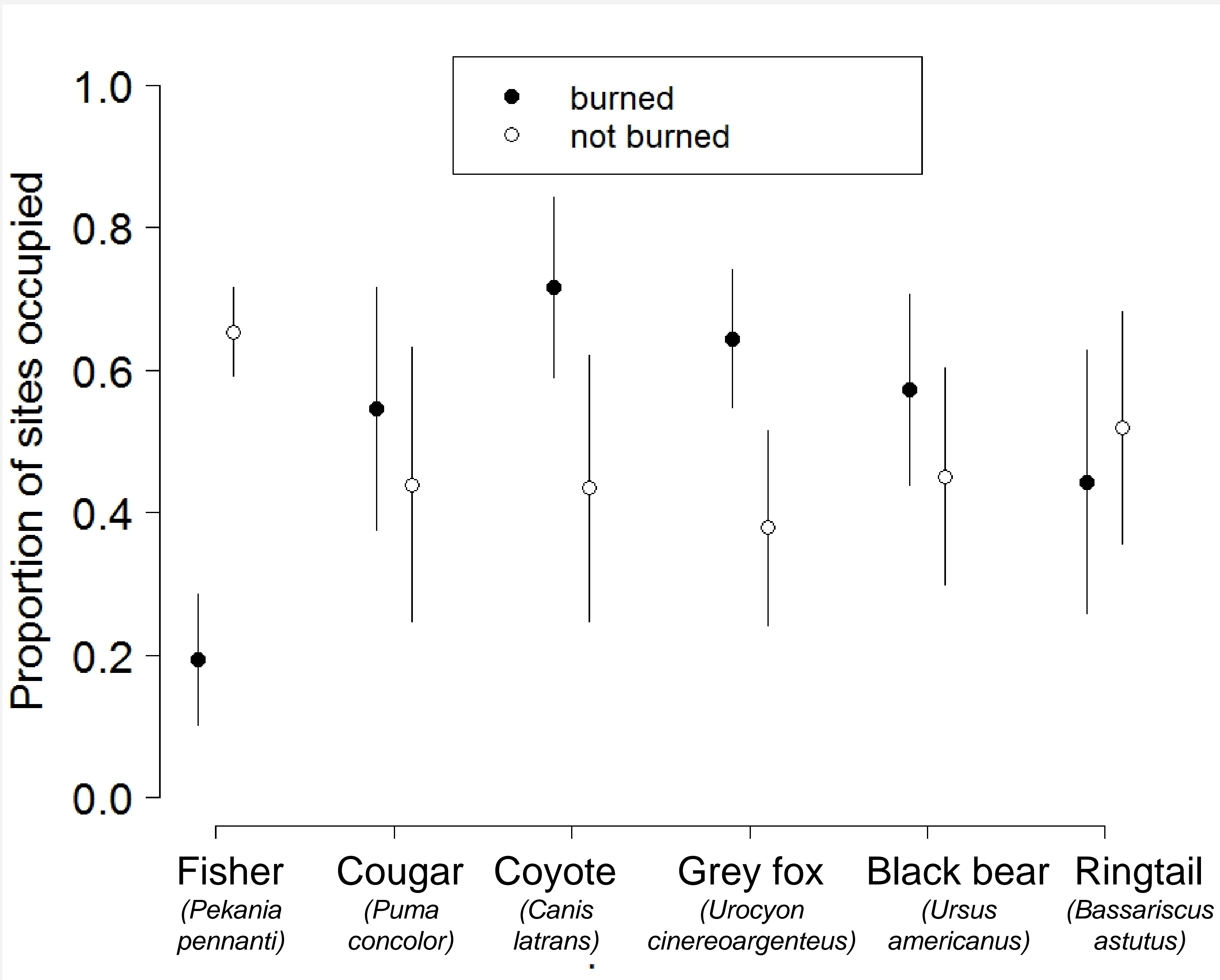


Fig. 2. Estimated median and 95% credible intervals of the occupancy of forest carnivores in burned and non-burned sites. There was a significant difference in the number of sites occupied by fishers in burned areas compared to non-burned areas.

Conclusions

Grey fox and coyote occurred at a greater proportion of sites occupied in burned areas compared to unburned areas (Fig. 2). Fisher occurred at a smaller proportion of sites occupied (Fig. 2), which was potentially due to needing high levels of canopy cover to hunt and to avoid predation. Research indicates that fishers limit grey fox occupancy, therefore grey foxes that can survive in burned landscapes are less likely to be outcompeted by fishers. It appears there was no strong effect on ringtails, black bears, and cougars between burned and unburned areas (Fig. 2).

There was a wide variation in occupancy estimates, in part due to our small sample size. Additional factors that could be influencing the estimates are low detection probabilities and low densities of these species in the study area. While these are preliminary findings, they begin to paint a picture of how post-fire landscapes are affecting carnivore community structure (Fig. 3).

Future Directions

- Reproduce the study with more cameras over a larger area
- Tease out the relationships between community composition and fire occurrence
- Assess the detectability rates of large carnivores in burned and unburned landscapes

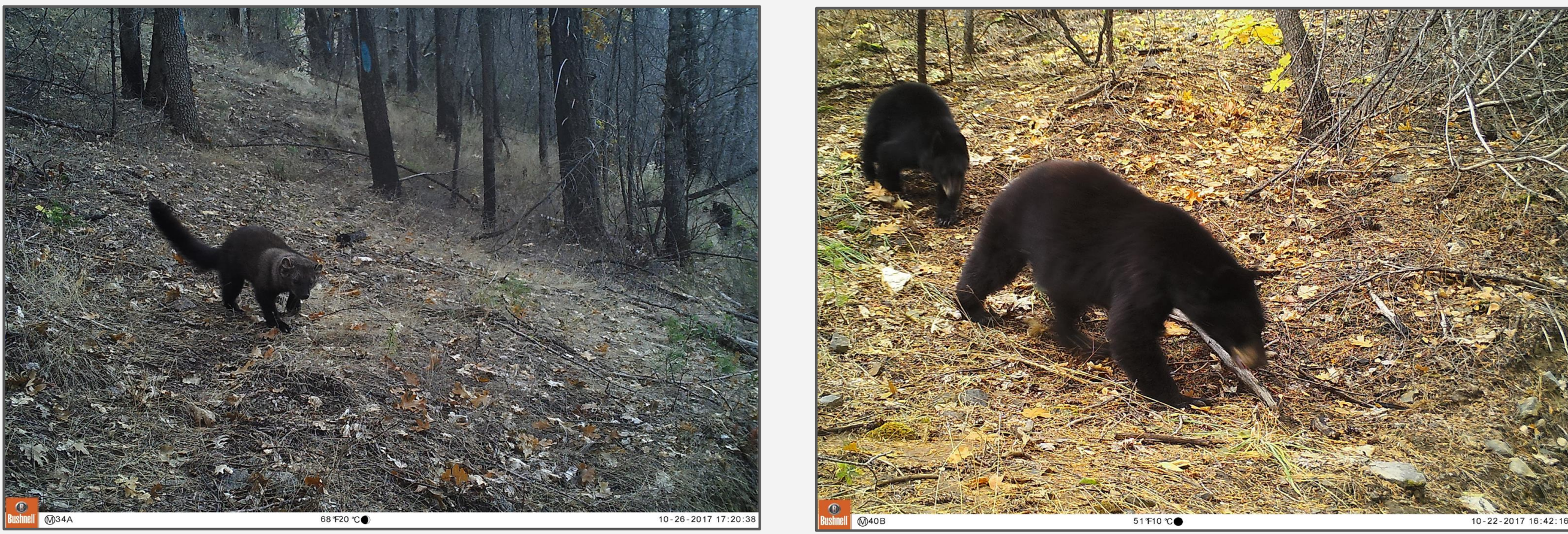


Fig. 3. Remote camera trap photos of a fisher and black bears in post-fire landscapes

Acknowledgements

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