

When the fisher's away, the mice will play: The effects of mixed-severity wildfire on small mammal occupancy in northern California and southern Oregon



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Introduction

- Wildfires play a major role in the structure and composition of landscapes and the general ecology of the Pacific Northwest (Perry et al. 2011).
- The western U.S. is experiencing an increase in the frequency, scale, and intensity of wildfires in recent years (Westerling et al. 2006).
- Understanding the effects of wildfires on small mammal communities is an important, yet understudied, aspect of the response of wildlife to wildfires.
- We used data from a long-term study of mesocarnivore occupancy and abundance to determine the effects of wildfire on small mammal community composition.

Methods

- Annual surveys for small mammals and mesocarnivores occur each fall since 2006 as part of the Klamath-Siskiyou Carnivore Project.
- Two wildfires in the summer of 2014 burned areas on and adjacent to the Klamath-Siskiyou study area. Thus, we have eight years of survey data before the fires occurred and four years following them.
- Each year 100 track plate stations are placed throughout a 465 km² study area from September through November (Fig.1; Green et al. 2018). Each station has toner ink and contact paper that subjects walk over in order to get to the bait (i.e., a can of cat food and a raw chicken drumstick; Fig. 2).
- After data collection was completed, each track plate was analyzed to determine the presence of three species: dusky-footed woodrat (*Neotoma fuscipes*), northern flying squirrel (*Glaucomys sabrinus*), and Douglas squirrel (*Tamiasciurus douglasii*; Figs. 3-5).
- Here, we analyzed track-plate data from 2013 to 2017 investigating small mammal occupancy one year before the fires and the four years following the fires.
- We fit a multi-species occupancy model using Bayesian analysis in JAGS with R. v. 3.2.3 (Plummer 2003; R Core Team 2017).

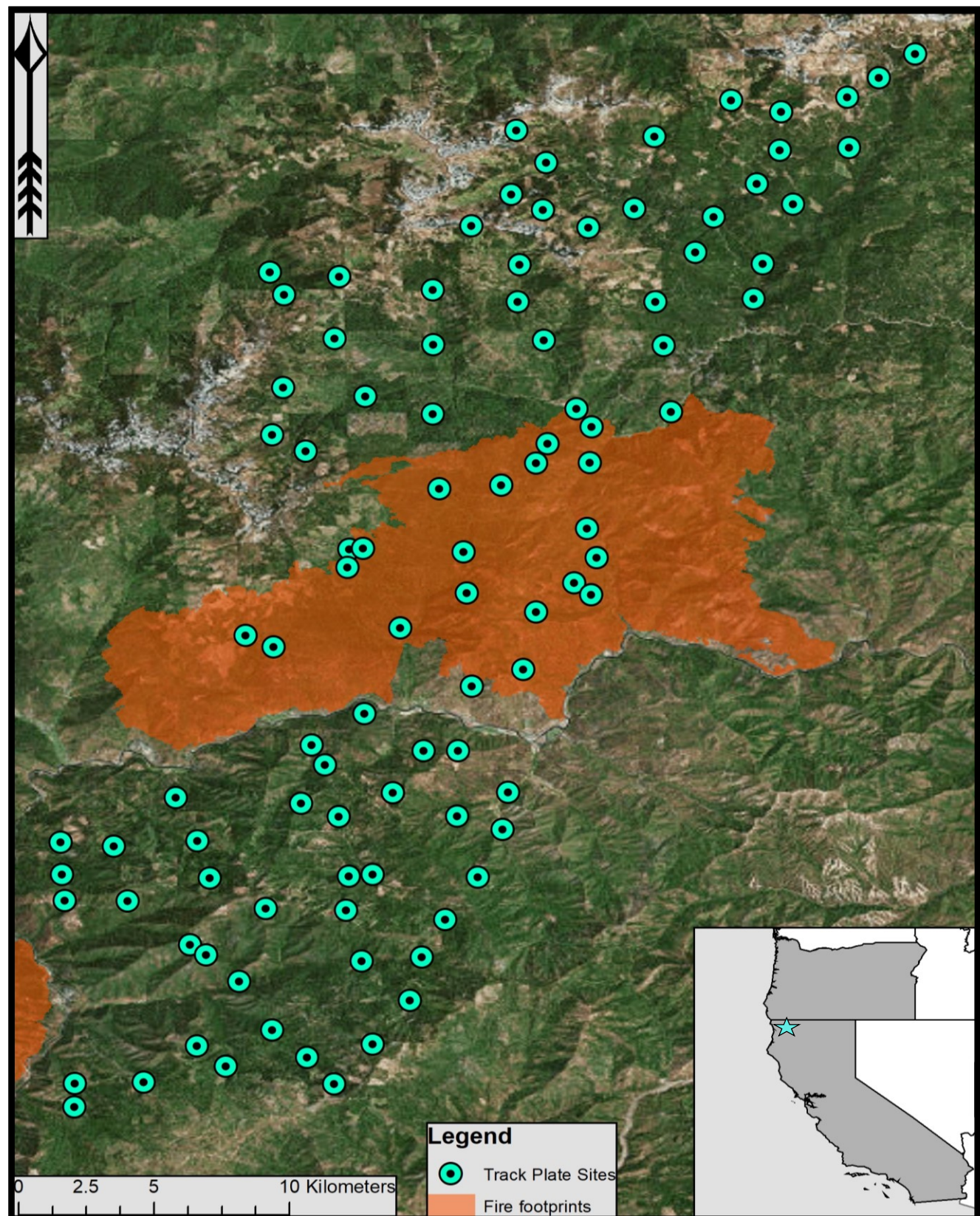


Fig. 1: Map of Klamath track plate stations and fire footprints. Klamath study area is marked with a star in the inset map. Klamath is southwest of Mt. Ashland and west of Interstate 5



Fig. 2: Track plate station with cat food and chicken

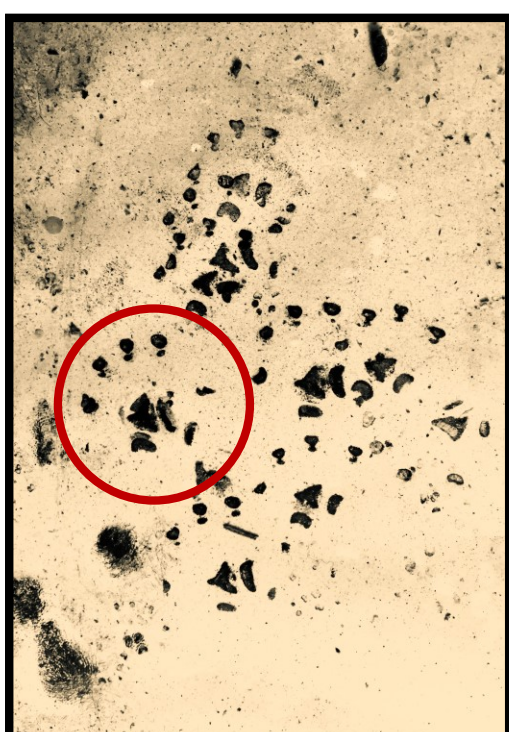


Fig. 3: *Neotoma fuscipes* print

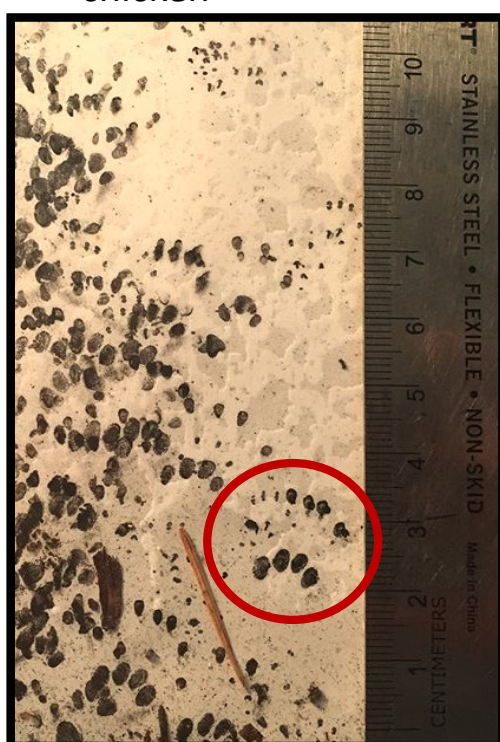


Fig. 4: *Glaucomys sabrinus* print



Fig. 5: *Tamiasciurus douglasii* print

Results



Fig. 6: Northern flying squirrel (*Glaucomys sabrinus*); illustration by: Burroughs, John [Public domain], via Wikimedia Commons



Fig. 7: Dusky-footed woodrat (*Neotoma fuscipes*); photo credit: Peterson B Moose, U.S. Fish and Wildlife Service

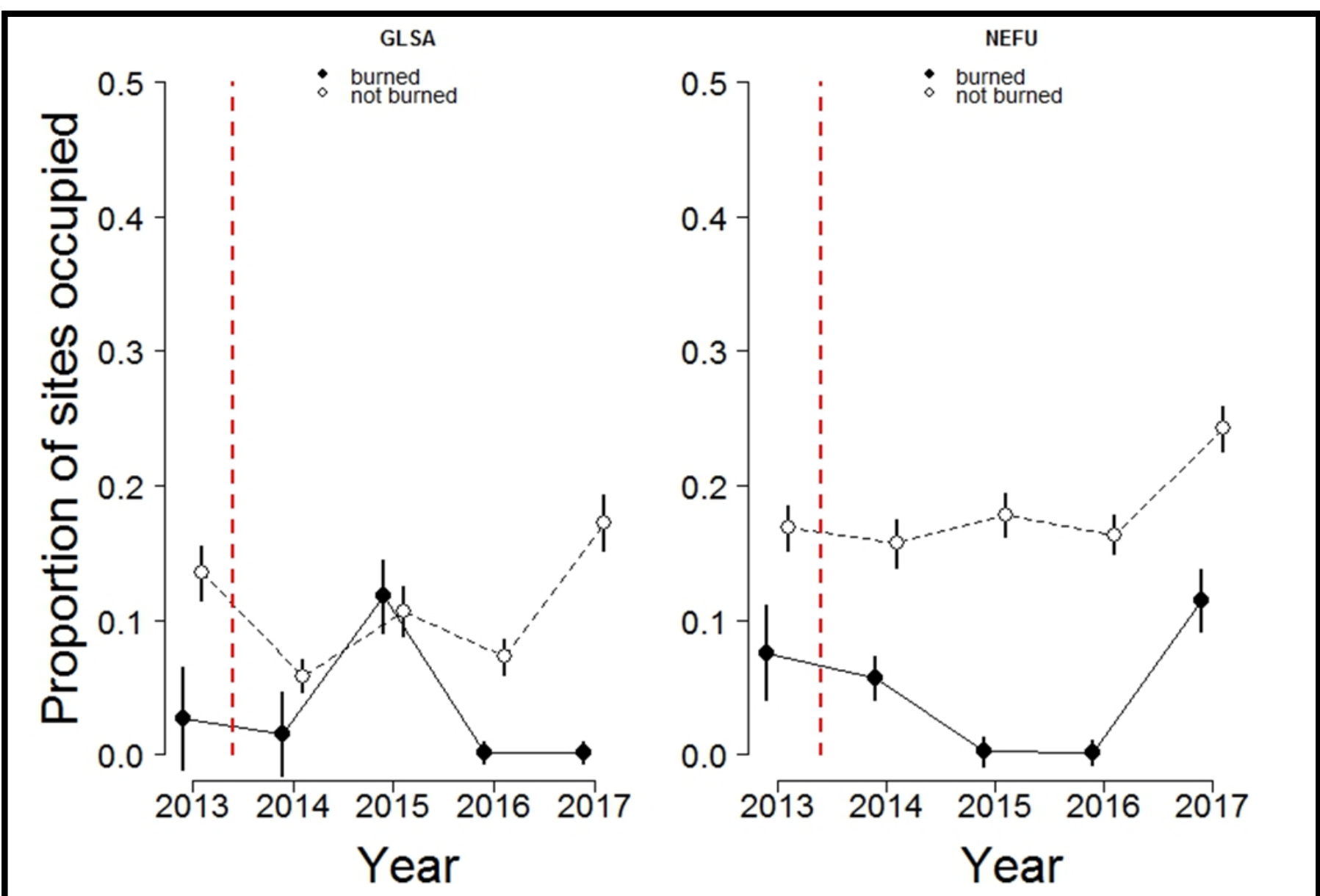


Fig. 8: Occupancy results for *Glaucomys sabrinus*- GLSA and *Neotoma fuscipes*- NEFU. We present the mean proportion of sites occupied \pm standard Deviation for track-plate stations that were in areas that were burned (filled circles) or not burned (open circles).

Discussion

Within our study area, the effects of wildfire appear to be species specific. *G. sabrinus* (Figs. 6,8) does not seem to be highly affected by wildfire disturbance, although there did appear to be an increase in the proportion of sites in the fire footprint that they occupied the first full year following the fires in 2015. *N. fuscipes* (Figs. 7,8) is immediately and negatively affected by wildfire disturbance, but does appear to return to pre-fire levels of occupancy 3 years following the fires (2017). Unfortunately, we had too low of detection probability for *T. douglasii* to model their occupancy patterns (mean \pm SD weekly probability of detection GLSA = 0.31 ± 0.04 ; TADO = 0.09 ± 0.02 ; NEFU = 0.37 ± 0.03 (Fig. 8).

Other research has shown that fisher (*Pekania pennanti*; Fig. 9,10) numbers declined and that gray fox numbers (*Urocyon cinereoargenteus*; Fig. 11,12) increased in the fire footprint (Green et al., 2018). A large reduction in predators following a fire could account for *N. fuscipes* to repopulate at a faster rate whereas it takes mesocarnivores longer to recover. This research provides information about the effects of wildfire disturbance on rodent and mesocarnivore populations.



Fig. 9: Fisher, *Pekania pennanti*; photo credit: Institute for Natural Resources, Oregon State University



Fig. 10: Fisher, *Pekania pennanti* print



Fig. 11: Gray fox, *Urocyon cinereoargenteus*; photo credit: ODFW



Fig. 12: Gray fox, *Urocyon cinereoargenteus* print

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Future Work

- Expanding this dataset by identifying species tracks dating back to 2006 could be prove to be beneficial by increasing our sample size.
- Increasing our study area to include other burned areas in the Pacific Northwest and observe whether there is a similar correlation with wildfire disturbance and wildlife population regarding these same species will give us a clearer picture of the effects of wildfire on small mammals.
- Data for *Tamiasciurus douglasii* were inconclusive in the current study; collection of genetic information or placing camera traps to determine *T. douglasii*'s presence since track plates were not an effective method could help in the future.
- Whether or not a correlation exists between the presence of fishers and *N. fuscipes* and how they affect each other could be determined by a collection method similar to the one used in this research (Fig. 13).

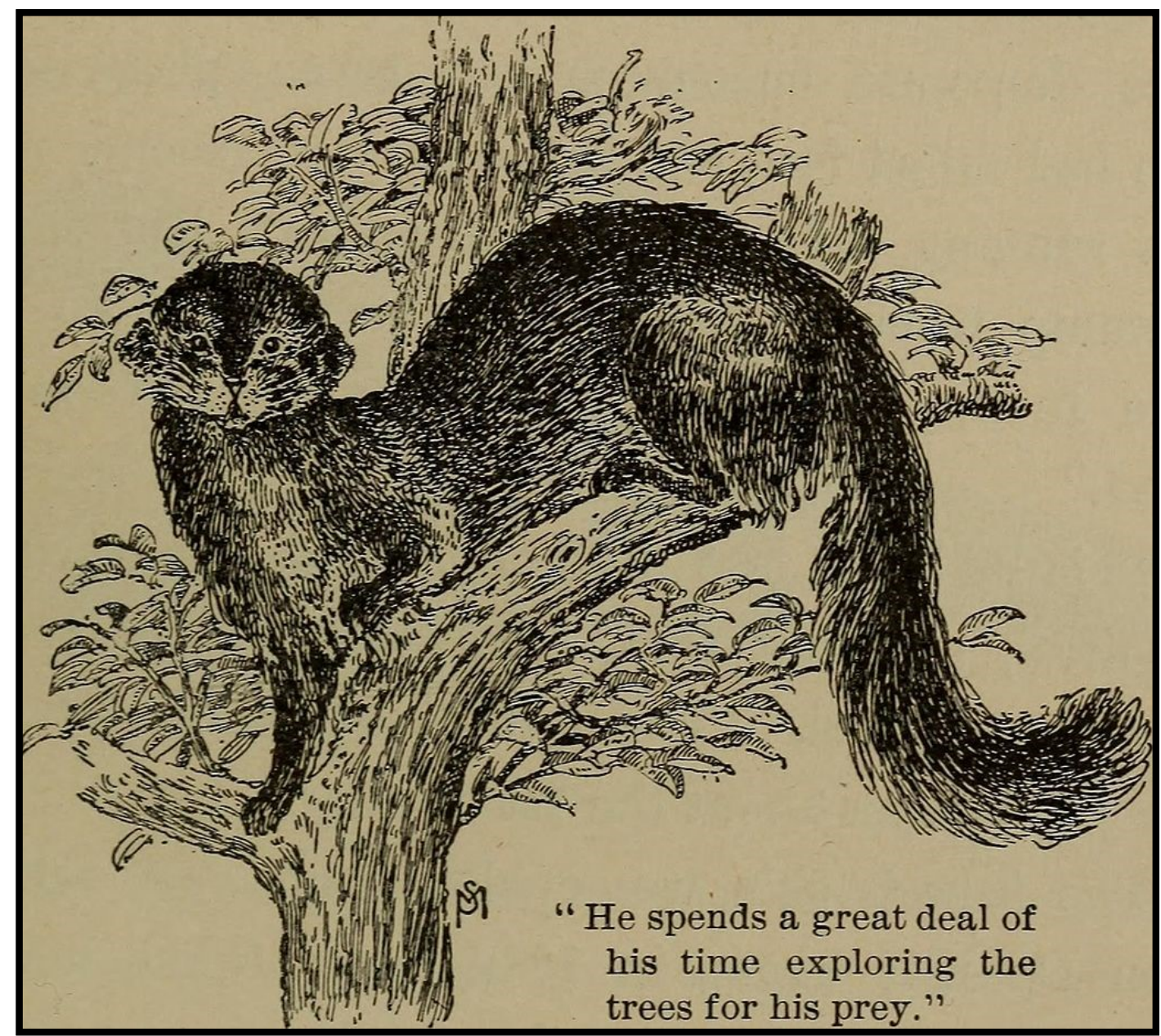


Fig. 13: Illustration from *Familiar life in field and forest; the animals, birds, frogs, and salamanders* by Schuyler and Underwood, 1868



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