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FIRE EFFECTS ON CHAPARRAL-ASSOCIATED MAMMALS: PROGRESS ON A MULTI-YEAR STUDY FOLLOWING THE CEDAR FIRE

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INTRODUCTION

We present a progress report on a multi-year study of the October 2003 Cedar Fire's effects on chaparral-associated mammal species, with a focus on the effects of fire severity and distance from unburned edge on species distributions and recovery the first few years following the fire. As field work is ongoing and not all data have been analyzed, the analyses we present are preliminary and should be interpreted with caution.

METHODS

Beginning in November 2004 (13 months post-fire), we repeatedly sample the mammal species assemblage using a combination of small mammal trapping grids, bat echolocation

monitoring, remotely triggered camera stations, and baited track stations. Rodents are sampled twice per year (spring and fall) using 30 baited Sherman live traps, at 7x15-m inter-trap spacing and set for 5 consecutive nights, at each of 30 burned plots and 10 unburned plots. Plots are spaced at least 300 m apart for independence. Burn plots vary in burn severity and range from the burn edge to ~12 km inside the perimeter. Unburned plots sample sites outside the fire's perimeter that were similar in pre-fire vegetation condition to burned plots.

Bats are sampled during summer using a combination of fixed (passive) ultrasonic monitoring stations (UMS) and roving (active) surveys. A UMS consists of an ANABAT detector coupled with a CF ZCAIM for storing the data. It detects most bat echolocation calls issued within ~50 m of the UMS for later identification. The 36 passive sample sites are >1.5 km apart for independence, with 12 sites in interior (>3.5 km inside burn perimeter), 12 in burn edge (<3.5 km inside perimeter), and 12 in unburned locations. Six UMS (two each in interior, edge, and unburned locations) are run simultaneously for three consecutive nights and then rotated to sample six new sites until all 36 locations are sampled. The active surveys use a UMS coupled with a GPS on a vehicle traveling 5 mph along 4-km-long road transects, with one each in interior, edge, and control locations. The road transects are sampled between sunset and 2400 h, and transect order is rotated between nights to eliminate temporal biases.

Carnivores are sampled three times per year (fall, winter, spring) using Game-Vu camera stations and gypsum track stations at 10 burn interior (>4 km inside burn perimeter), 11 burn edge (<3 km inside perimeter), and 11 unburned control plots. Each station is run continuously for 8 nights during each sample period, or 24 nights per year..

Vegetation is sampled each summer at mammal sample plots using point-intercept methods. Fire severity was quantified using diameter of the smallest remaining stems of burned chamise (*Adenostoma fasciculatum)* skeletons (Keeley 1998; Moreno and Oechel 1989).

To date, only preliminary analyses have been performed on species richness and relative species abundance (number of unique individuals captured) as functions of time since fire, distance inside burn perimeter, and fire severity indices.

RESULTS AND DISCUSSION

Small mammal species richness has not differed significantly between burned and unburned sites, and has generally increased since fire in both conditions. However, patterns of richness over time have differed slightly for burned versus unburned plots: Richness on unburned plots peaked 24 months post-fire and then declined slightly by 30 months, during which period richness on burned plots continued to rise. Fire severity did not significantly affect richness patterns through time, but plots far from the burn perimeter had lower richness than those near unburned habitat, at least during the first sample session (13 months post-fire). Over time, richness has increased more on plots far from the edge than on those near the edge, as they started with fewer species and have accumulated more new species over time.. This may reflect a wave of reoccupation by certain species, gradually moving out from unburned edge into more interior areas over time.

Although small mammal richness did not vary significantly between burned and unburned plots, community composition did. Unburned plots were more frequently occupied by species associated with older, denser chaparral, while burned sites were dominated by species favoring disturbed or grassy habitat. Brush mice (*Peromyscus boylii*) and California mice (*Peromyscus californicus*) occurred in higher than expected proportions on unburned plots in all sampling sessions, while woodrats (*Neotoma lepida* and *N. macrotis*), which build above-ground nests from woody stems, occurred in higher than expected proportions on unburned plots 13 and 30 months following fire. Dulzura kangaroo rats (*Dipodomys simulans*), which are associated with open or young chaparral communities, have been consistently higher on burned than unburned plots, and have increased in abundance over the study period (from 13 to 30 months post-fire). In contrast, pocket mice (*Chaetodipus fallax* and *C. californicus*) occurred in higher than expected proportions on unburned plots 18 months after fire. Finally, deer mice (*Peromyscus maniculatus*), a generalist species known for its exploitation of disturbed habitats, occurred in higher than expected proportions on burned plots 13 and 30 months after fire.

Six species of bats have so far been detected in burned interior sites, four species in burned edge sites, and six species in unburned sites. Two bat species (*Eptesicus fuscus* and *Pipistrellus hesperus*) account for the vast majority of detections at both burned and unburned sites. Although the number of species detected during a session is the same between burned interior sites and unburned sites, the number of calls recorded is higher in unburned sites, indicating higher bat activity or abundance there than in burned sites.

Carnivores are detected across all plot types, with no clear patterns yet established between detections and burn severity or distance from unburned edge. Future multivariate analyses that control for season, vegetation structure, small mammal richness, and proximity to urban edge are yet to be performed and may reveal some patterns in carnivore post-burn occupancy. Gray fox (*Urocyon cinereoargenteus*) have been detected most frequently, followed by coyotes (*Canis latrans*). Bobcats are detected infrequently.

SUMMARY AND CONCLUSIONS

These preliminary results are beginning to paint a picture of how various species and the overall mammal assemblage respond in the years following a large chaparral fire. More comprehensive analyses that correct for differential detection probabilities and consider trends over time as multivariate functions of time, space, fire severity, and vegetation recovery, will hopefully paint a more complete picture in the future.

LITERATURE CITED

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