# FIRE EFFECTS ON CHAPARRAL-ASSOCIATED MAMMALS: RESPONSES TO FIRE SEVERITY AND DISTANCE FROM UNBURNED EDGE


## Abstract

In October 2003, the Cedar Fire (Figure 1) burned ~280,278 acres in San Diego County, making it the largest wildfire recorded in California in over 100 years. Beginning ~13 months post-fire, we sampled mammal species (rodents, carnivores, bats) at sites varying in burn severity (including unburned) and distance from unburned edge. Within each taxon, we noted differences in overall community composition between burned and unburned habitat. Other responses varied within and among taxa. Some rodent species showed differences related to burn severity, while only pocket mice showed a response to distance from edge. Carnivores also showed differences due to distance from edge, but no clear effects were evident for bats. Our results indicate a complex suite of post-fire responses among chaparral-associated mammal species. Despite these differences, most species were detected in burned as well as unburned habitat, indicating a positive prognosis for post-fire recovery. Additional years of monitoring will be required to observe the complete recovery process.


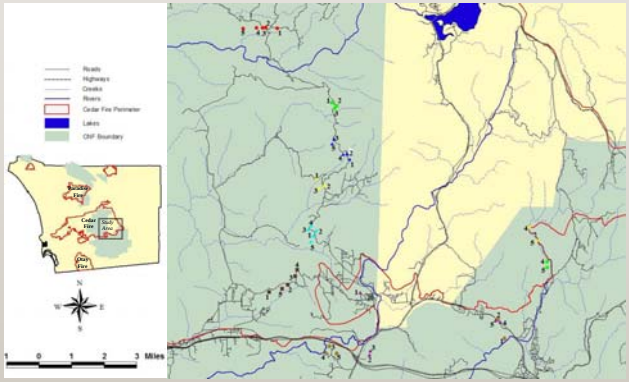

**Figure 1**. The 2003 Cedar Fire and study location.


*Funded by USDA/USDI Joint Fire Science Program*


## Study Goals

- Track wildfire-related changes in:
  - -Community composition
  - -Species distribution or abundance
- For chaparral-associated mammals:
  - -Rodents, Bats, Carnivores
- As functions of:
  - -Time since fire
  - -Fire severity (rodents only)
  - -Distance from unburned edge

## Methods

### Rodents

- 40 trapping grids
  - -30 burned plots
    - •located near edge to ~8 km into burn interior
    - •covering range of burn severities
  - -10 unburned plots
- Sampled spring & fall
  - -30 Sherman live traps per plot
  - -5 consecutive nights
- Data analysis
  - -Hierarchical generalized linear modeling (presence)
  - -Hierarchical linear modeling (abundance)

### Bats

- 36 passive ultrasonic monitoring stations
  - -12 burn edge, 12 burn interior, 12 unburned
- 3 driving survey transects
  - -Burn edge, burn interior, unburned
  - -Sampled each summer
  - -3 consecutive nights

### Carnivores

- Game-Vu camera & gypsum track stations
  - -11 burn edge, 10 burn interior, 11 unburned
- Sampled winter, spring, & fall
  - -8 consecutive nights
- Data analysis
  - -Logistic regression

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## Results: Rodents

- Community composition varied with burn status (Figure 2a)
- Species distributions varied with burn status and time (Figure 2b)
- Species abundances varied with burn status, time, and fire severity or distance (Figure 2c)

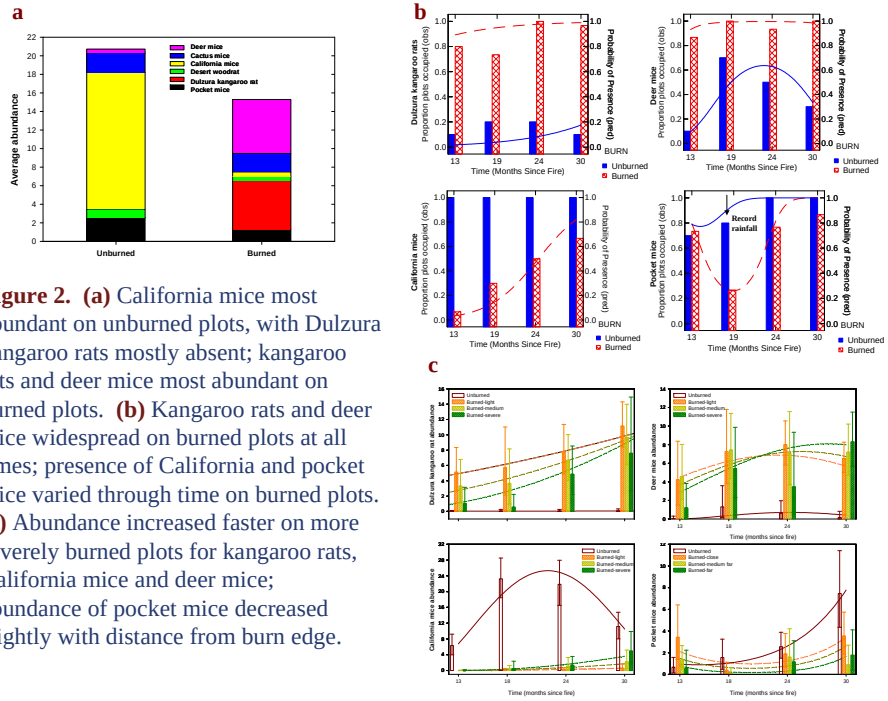



**Figure 2.** **(a)** California mice most abundant on unburned plots, with Dulzura kangaroo rats mostly absent; kangaroo rats and deer mice most abundant on burned plots. **(b)** Kangaroo rats and deer mice widespread on burned plots at all times; presence of California and pocket mice varied through time on burned plots. **(c)** Abundance increased faster on more severely burned plots for kangaroo rats, California mice and deer mice; abundance of pocket mice decreased slightly with distance from burn edge.

## Results: Bats

- Community composition varied with burn status (Figure 3)

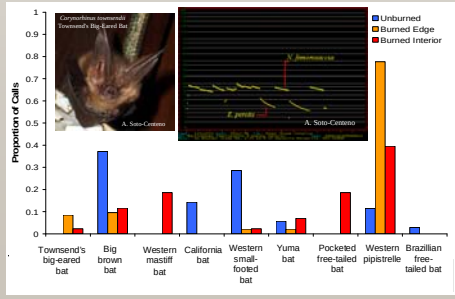


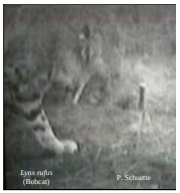

**Figure 3.** Big brown bat and western small-footed bat calls most abundant in unburned habitat; California and Brazilian free-tailed bats only detected in unburned habitat. Western pipisterelle calls most abundant in burned habitat; Townsend's big-eared, western mastiff, and pocketed free-tailed bats only detected in burned habitat

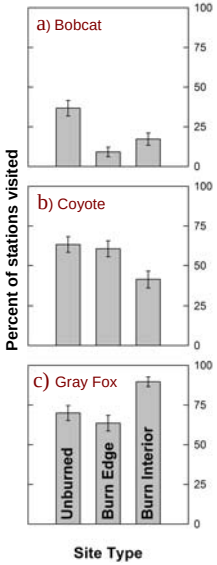
## Results: Carnivores

- Community composition varied with burn status (Figure 4a-c)
- Species' distributions varied with distance from unburned edge (Figure 4b & c)

**Figure 4**

**(a)** Bobcats uncommon in burned habitat
**(b)** Coyotes detected less often far from the burn edge.
**(c)** Gray fox detected more often in burn interior.




## Conclusions

- Mammals showed differential responses to fire both within and among taxa.
- Compared to carnivores, rodents and bats showed weaker responses to distance from unburned edge, but responses may become stronger through time.
- For rodents, burn status (burned/unburned) may be more important than fire severity, but severity responses may become stronger over time if vegetation recovery is substantially slower on more severely burned sites.
- Four years after fire, and the final year for which this study was funded, trends in mammal recovery are still developing; additional years of monitoring will be required to document the complete recovery process.