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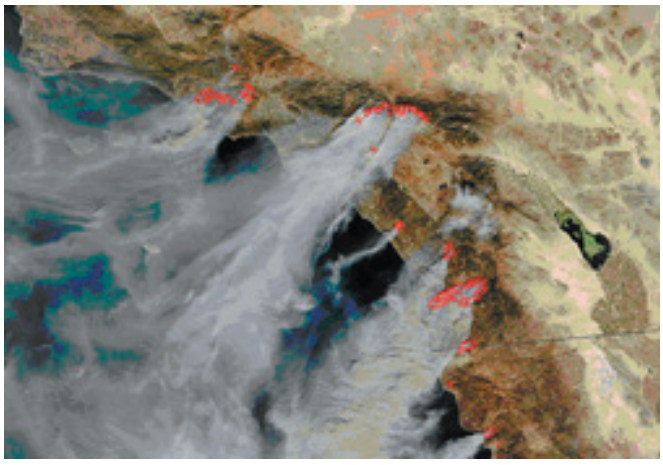
Response and Recovery of Plants and Animals to the 2003 San Diego County Wildfires

Fire can have both negative and positive impacts on the flora and fauna of southern California. The native vegetation communities have evolved with the regional fire regime and have adapted various survival strategies in response. However, as fire-return intervals decrease to more frequent than historic levels, the trend is for shrublands, whether chaparral or coastal sage scrub, to be vegetation type-converted to grasslands. Just as fires alter the composition and structure of vegetation communities, animals may experience similar shifts in community structure and species occurrence. With the type-conversion of vegetation communities, we may expect a concomitant shift and potential biodiversity loss in faunal populations. Fire may cause direct mortality or loss of habitat and food resources that result in the decline of some species. Other species that survive the fire and prefer open or disturbed landscapes may benefit, thereby increasing in numbers.



Satellite imagery of the massive Santa Ana-driven 2003 southern California wildfires (Image courtesy of Jacques Descloitres, MODIS Rapid Response Team at NASA GSFC).

The U.S. Geological Survey is investigating how plant and animal communities are responding and recovering from the massive 2003 San Diego County wildfires. The taxa being investigated include plants, invertebrates (selected terrestrial macro-invertebrate taxa and ants) and vertebrates (reptiles, amphibians, small mammals, birds, bats, and carnivores). Investigations include comparisons of post-burn conditions to pre-burn baseline conditions and comparisons of responses of the various taxa between burned and unburned control sites based on available pre-burn data and data collected over the five-year study. The goal of this study is to provide scientifically based information to aid in land management planning and reserve design. These conservation and monitoring decisions should include considerations of the effects of large wildfires on structure and function of the biological community. Many of the species documented during these efforts are covered in the habitat conservation plan of San Diego, the Multiple Species Conservation Program (MSCP).

Methods

Taxon specific methods have been applied and coordinated with other researchers in the area to insure that data collected from this study can be compared across studies. All of the data collected are being transmitted to the California Department of Fish and Game – Biogeographic Information & Observation System (BIOS) database for long-term storage and access by other researchers and managers. The focus of this summary document is to report the results from the first two years of the five-year post-burn studies and determine what responses are found within these different taxa (ants, reptiles, amphibians, birds, small mammals, and bats).

Example of post-fire succession at a pitfall trap array in the Santa Ysabel Open Space Preserve burned during the Cedar Fire. Photos above taken approximately 18 months prior to fire, one month after the fire, and 18 months after the fire.

Results

We recorded or detected the following numbers of species by taxa and total observations from 1995 – 2006:

Ants — 62 species; 34,396 individuals
Reptiles and amphibians — 36 species; 6,475 captures
Birds — 107 species; 6,962 observations
Small mammals — 16 species; 4,444 captures
Bats — 15 species; 920 capture, observations, or recordings

This represents 236 species and over 50,000 captures or observations.

Preliminary findings by taxonomic group

- There was a net decrease in ant diversity at burned plots versus unburned plots across the study sites. The harvester ant (*Messor andrei*) showed an increased capture rate within the burn plots. This increase could be related to increased seed availability due to increased grasses and other fire followers in the first several years post-burn. The acrobat ant (*Crematogaster californica*), which is a preferred food for hatchling horned lizards, showed a post-fire decrease.

- We detected a loss in species diversity of reptiles and amphibians and a shift in community structure at burned sites within coastal sage scrub and chaparral habitats. There were increases in the capture rates of certain herpetofauna, such as the orange-throated whiptail and coast horned lizard (MSCP-covered species), at burn sites relative to the same sites before the fires. Salamanders and some snake species in particular showed decreases in post-fire chaparral habitats.

- There was a change in composition of bird species at low-elevation coastal sage scrub and chaparral habitats after the fires. There were increases in the detection rates of certain birds, such as the lazuli bunting, spotted towhee, and

phainopepla, and decreases in others, such as Anna's hummingbird, at burned sites relative to the same sites before the fires.

- Small mammals showed a change in community structure following the fires. Above-ground nesters declined with the exception of the harvest mouse, which increased. This species might take advantage of the increased seed set following fires and may be more flexible in the use of nesting opportunities.

- Bats tended to not show many patterns, but it appears that their detections were lower at burn sites than post-fire unburned or pre-burn sites.

Management implications

Lower-vagility groups (ants, reptiles, amphibians, and small mammals) showed greater changes in species composition and post-burn increases in specific species then did higher-vagility groups (birds and bats). Within the lower-vagility groups, species that could take advantage of the increased seed resources post-burn (harvest mice and harvester ants) increased greatly, as did certain lizards (orange-throated whiptail, coastal horned lizards). Other species (salamanders, some snakes, most above-ground-nesting small mammals, acrobat ants) showed a decrease in the burn areas.

These studies need to be continued to determine if recovery of the habitat and species does occur and how long it takes for the low-vagility groups. The repeated burning of much of the 2003 fire footprints during the 2007 firestorms may greatly impact recovery time over much of the landscape. Monitoring the new burn and re-burn areas should remain a priority.

Citations from this project to date

Backlin, A., Stokes, D., Brehme, C., Rochester, C., & R. Fisher. 2008. Effects of large-scale wildfire on bats in southern California. U.S. Geological Survey draft report prepared for SanDAG.

Clark, D., Brehme, C., Rochester, C., & R. Fisher. Manus in review. Effects of large-scale wildfires on rodents in southern California. To be submitted to: Journal of Mammalogy.

Fisher, R., Rochester, C., Brehme, C., Clark, D., Stokes, D., & S. Hathaway. Manus in review. Reptile and amphibian responses to large-scale wildfires in southern California. To be submitted to: Journal of Herpetology.

Matsuda, T., Turschak, G., Brehme, C., Rochester, C., & R. Fisher. Manus in review. Effects of large-scale wildfires on ground foraging ants (Hymenoptera: Formicidae) in southern California. To be submitted to: Environmental Entomology.

Mendelsohn, M., Brehme, C., Rochester, C., Stokes, D., Hathaway, S., & R. Fisher. Manus in review. Effects of large-scale wildfires on breeding birds in southern California. Submitted to: Fire Ecology.

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