Effects of habitat usage by herpetofauna due to recent wildfire

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Introduction

In October 2017, northern California was devastated by a series of wildfires that burned over 245,000 acres. Pepperwood Preserve, a 3,200 acre ecosystem located in the Mayacamas Mountains, was heavily impacted with over 95% of the preserve burning (Fig. 7) in the Tubbs fire. This research aims to understand the preliminary effects this natural disaster had on several Northern California herpetofauna species and their habitat usage. These key indicator species provide insight into the overall health of the ecosystem. By comparing community composition data collected pre-fire and post-fire, preliminary impacts on lizards due to the wildfire can be identified.

Figure 1. From left to right: Southern Alligator Lizard (*Elgaria multicarnata*), Western Skink (*Plestiodon skiltonianus*), Slender Salamander (*Batrachoseps attenuatus)*

Research Questions

1. Did the Tubbs wildfire have a significant effect on the habitat usage by *Elgaria multicarnata*, *Plestiodon skiltonianus* and *Batrachoseps attenuatus*?
2. Did the Tubbs wildfire have a significant effect on the abundance of *Elgaria multicarnata*, *Plestiodon skiltonianus* and *Batrachoseps attenuatus*?

Research Site

Turtle Pond and Double Pond, ephemeral ponds located within Pepperwood Preserve, were used for this research. All three species are found at both ponds and both ponds were affected by wildfire.

Figure 3. From left to right: An aerial view of Pepperwood Preserve, an aerial view of Turtle Pond, an aerial view of Double Pond - Photos courtesy of Google Earth

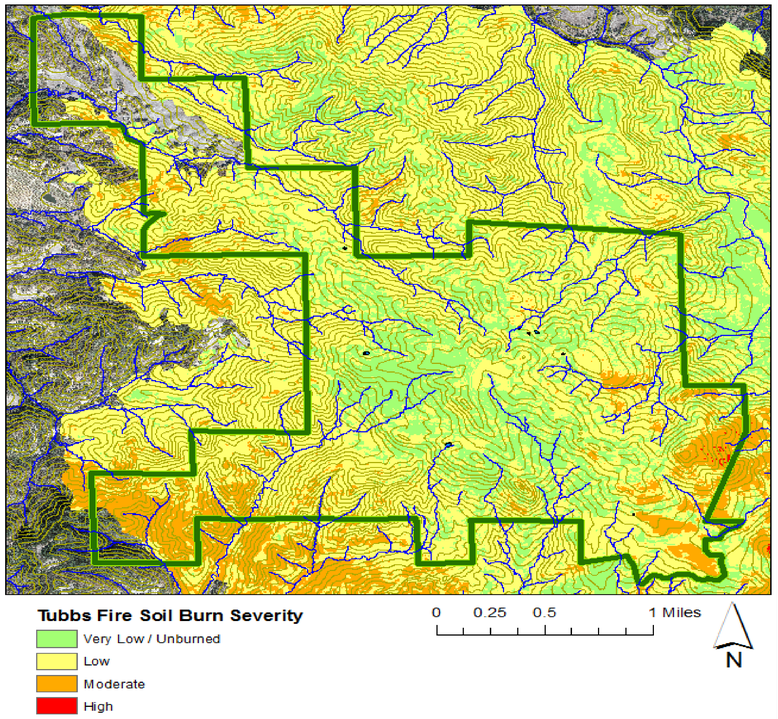

Figure 7. Pepperwood Preserve burn severity map

Methods

•36 ½” x 24” x 48” plywood cover boards were established at each pond in three different habitat types surrounding the ponds (Grassland, Canopy Edge and Forest) – 12 boards in each habitat
•Cover boards were surveyed every other week from December through July starting December 2015
•Species diversity and richness were recorded based on what was found beneath each cover board
•Data was analyzed using JMPpro 13.0 to run a general linear model with habitat and fire as full factorial fixed effects and site as random effect. LS Means Student T tests were run post-hoc to determine specific effects.

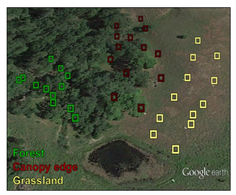

Figure 2.
Clockwise from top left: An aerial view of the coverboard layout at Double Pond, a burned coverboard, researcher handling herpetofauna, Pepperwood Preserve wildfire

Preliminary Results

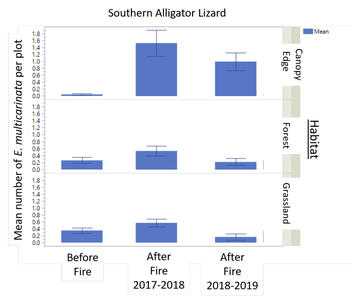

Figure 4. *E. multicarnata* showed an increase in usage of all habitats in the 2017/18 post-fire season, reducing in prevalence in the 2018/19 season. Specifically, this species showed a significant increase in usage of the canopy edge compared to the other habitats ($F_{1,2}$ = 18.0937, p < 0.0001).

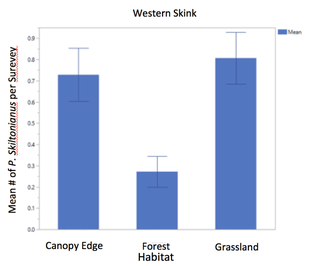

Figure 5. *P. skiltonianus* showed a significantly higher prevalence in grassland and canopy edge compared to forest habitat ($F_{1,2}$ = 7.2894, p = 0.0008) but no difference between grassland and canopy edge. There was no difference in habitat use or abundance in response to the fire.

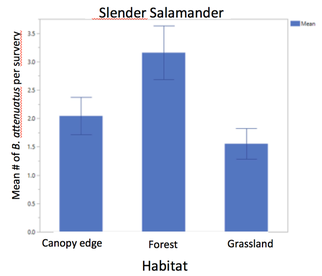

Figure 6. *B. attenuatus* showed a significantly lower prevalence in grassland and canopy edge compared to forest habitat ($F_{1,2}$ = 5.0767 , p < 0.0067) but no difference between grassland and canopy edge. There was no difference in habitat use or abundance in response to the fire.

Discussion

• Preliminary data indicated that there was a significant increase in overall abundance as well as a difference in pattern of habitat use in *E. multicarnata* directly after the wildfire. With the largest shift happening in the Canopy edge habitat.

•The abundance in *E. multicarnata* returned to pre-fire levels in both the forest and grassland habitats during the second year after the fire (2018-2019), but the canopy edge habitat still showed significantly higher levels of abundance than pre-fire, although these levels were lower than 2017-2018.

•The pattern of habitat use by *P. skiltonianus* and B. *attunuatus* did not appear to be altered when comparing the pre/post fire data.

•We recommend that cover board surveys continue to be conducted for the foreseeable future with results compared to climatic data (i.e. soil moisture, ambient temperature, soil salinity, etc.) for these and additional herpetofauna species.

Acknowledgements

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