



Introduction

Controlled burning of native land is an important tool at the disposal of landowners and land managers, particularly in areas where natural communities interface with landscapes altered for human use, and in areas where invasive species threaten the healthy function of naturally occurring communities. However, prescribed burning can have unintended consequences on native populations that co-occur along with the positive functions that are associated with controlled burns. Controlled burns work to reduce fuel load in areas prone to high-intensity fires and to restore the overall health of an ecosystem, either through the reduction of invasive species or by influencing the life cycles of plant communities that can be dependent on fire to remain healthy. On the other hand, controlled burns can be devastating to individual populations within the overall ecosystem when used improperly. In this study, we investigated the impacts of prescribed burning of prairie ecosystems on seasonal below-ground soil temperatures as well as its effect on above-ground space-use of ornate box turtles (*Terrapene ornata*).

Methods

Spring Burn

- 32 thermochrons (iButton) were placed for the spring burn at 16 sites within the area to be burned; 31 recovered.
- For the spring burn, thermochrons were buried at 4" and 6" at each site and recorded soil temperature every minute throughout the burn at a resolution of $\pm 0.1^\circ\text{C}$.
- Thermochrons were placed using a stratified random sampling approach (Fig 3.)

Summer Burn

- 12 thermochrons (iButton) were placed for the summer burn at 12 sites within the area to be burned; 12 recovered
- For the summer burn, thermochrons were buried at 4" at each site and recorded soil temperature every minute throughout the burn at a resolution of $\pm 0.1^\circ\text{C}$.

Data Analysis

- We examined temperature fluctuations, min, mean, and max temperatures throughout the burn period
- After the burn, we monitored whether the distribution of box turtles changed relative to what it was before the burn

Results

- The spring burn had little to no impact on below-ground temperature ranges at the 4" and 6" depths monitored (Fig 1).
- There was a difference in soil temperature ranges between the spring and summer burn at shallow depths (Fig 2). Absolute soil temperatures also differed.
- Four new turtles (M53, J58, F84, J85) were discovered due to the burn
 - F84 fled the fire, J58 was forced out of den, J85 fled the fire and sustained burns (see picture at far right), M53 sheltered in place
- M22, M30, F84 and M87 left the field
- F23 and M15 remained in the field after the burn

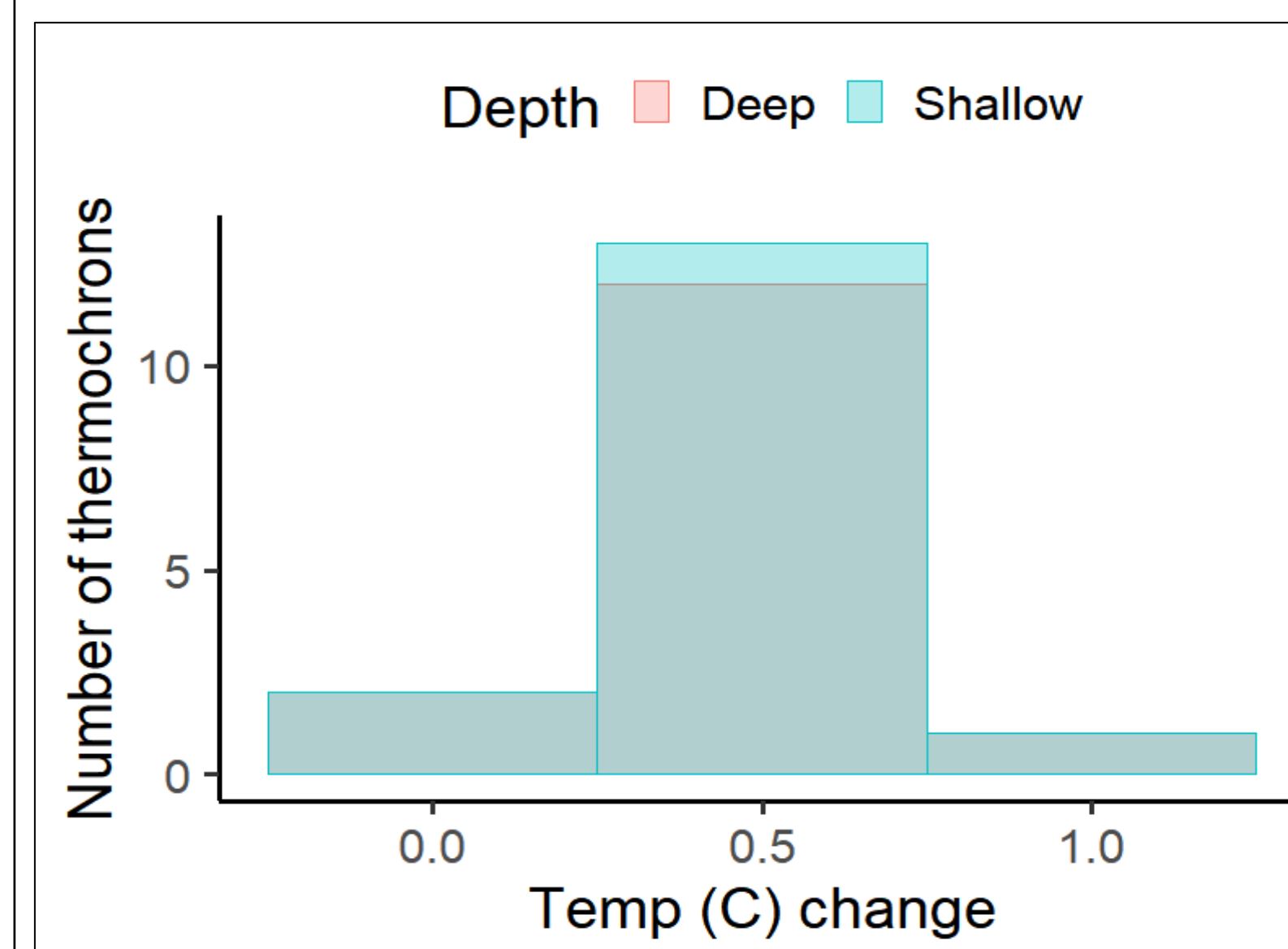


Fig 1. Temperature range distribution of thermochrons buried at 4" and 6" during the spring 2020 burn. There was no significant difference in the temperature ranges measured by the thermochrons during the burn at either depth ($t=0.03$, $df=29$, $p=0.98$).

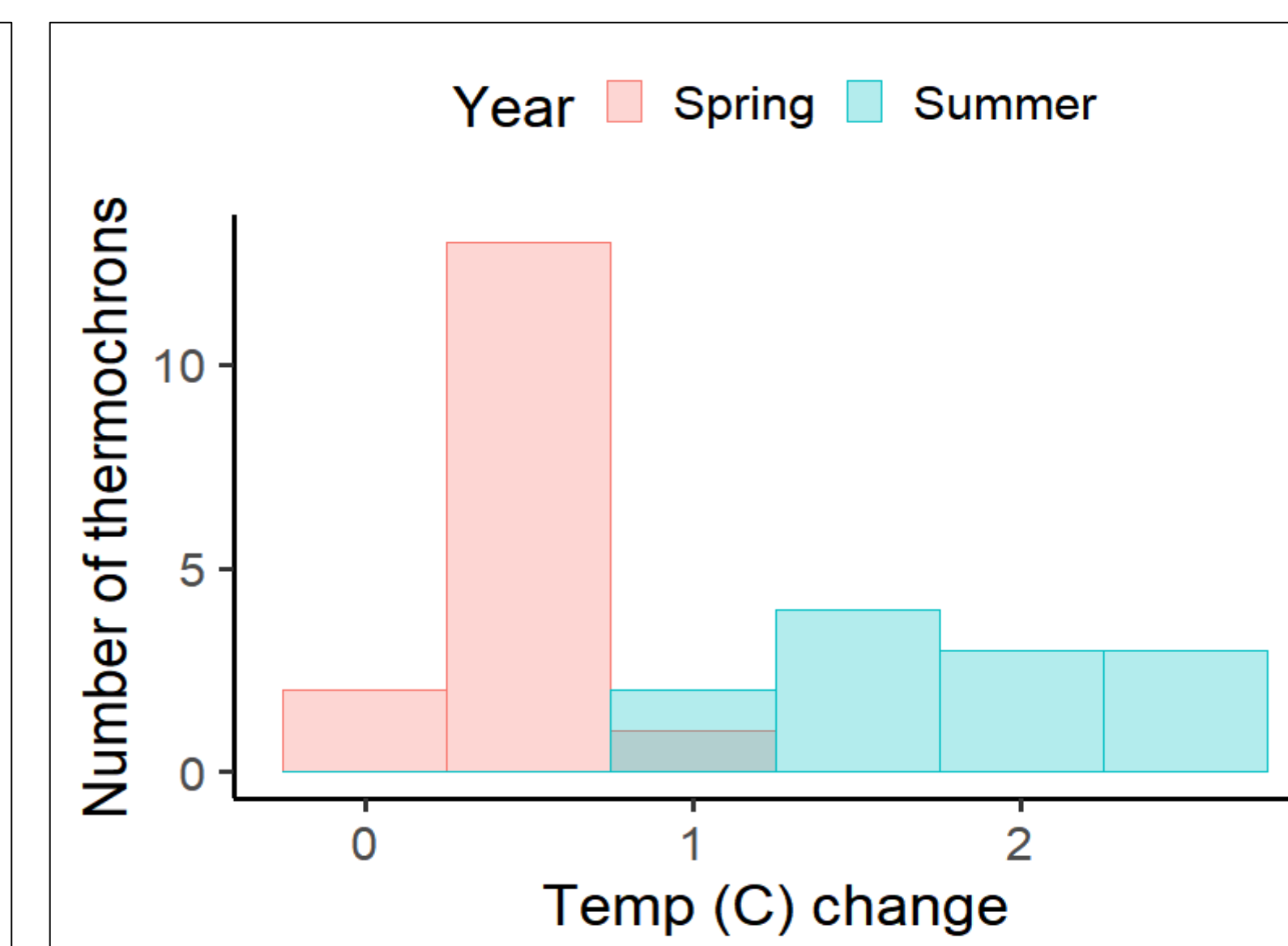


Fig 2. Temperature range distribution of thermochrons buried at 4" during the spring and late summer 2020 burns. There was a significant difference in the temperature ranges measured by the thermochrons during each burn period ($t=8.87$, $df=26$, $p<0.01$).



Fig 3. Overlay of thermochron locations for both Spring 2020 (3-21-20; South of tree row) and Summer 2020 (9-23-20; North of tree row) burns.

Discussion

- We found that underground temperatures in both spring and summer burns at the depths tested were unaffected by localized fire conditions.
- Space-use in the post-summer burn environment of *T. ornata* was affected, suggesting that controlled burns during the active season for *T. ornata* is likely to have detrimental effects on populations, either through direct contact with fire or through altering space use.
- In instances where local animal populations are of major concern in the ecosystem, these types of effects must be considered when planning controlled burns, and communities may be best served by burning when populations of concern are at the lowest risk.
- Although we found a significant difference of 1.32°C in ground temperature changes between the spring and late summer burns, this difference may not necessarily be ecologically relevant for many species.



Looking Forward

- Investigate the impact of prescribed fires on turtle susceptibility to flesh fly parasites.
- Continued data collection of subsequent yearly fires for previous burn sites in order to carry out site-specific comparisons.
- Tracking the effect of fires on range-shifting of turtles.



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