

## ADJOINT 2023 Project Description

### "Ticks, Fire and Control: Implementing prescribed fire and control measures at ticks invasion front"

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In recent times, ticks have been expanding their habitat ranges due to climate change, among other factors, leading to increased tick-borne illness risks in the United States. Thus, it is important to find a practical and cost-efficient way of controlling and managing ticks. Prescribed burns are intentional fires used for land and forest management; they are time and cost efficient, since they can be applied across large amounts of land. They can also be effective in controlling tick populations.

When ticks are introduced into a new environment and left undisturbed, the ticks propagate across the domain (see Figure 1 (a)). However, when prescribed fire is implemented in the patch of introduction (the  $10 \times 10$  grid) — say every 5 years for 20 years — there is some level of disruption in tick propagation across the domain as observed in Figure 1 (b). However, when prescribed fire is implemented more often — say every year for 20 years — the propagation of ticks across the domain is much slower (see Figure 1(c)). Figures 1 (b) and (c) shows that prescribed fire can reduce the tick population, but it cannot totally eliminate it. Furthermore, notice that the invasion front of the traveling waves in Figures 1(a) - (c) are the same.

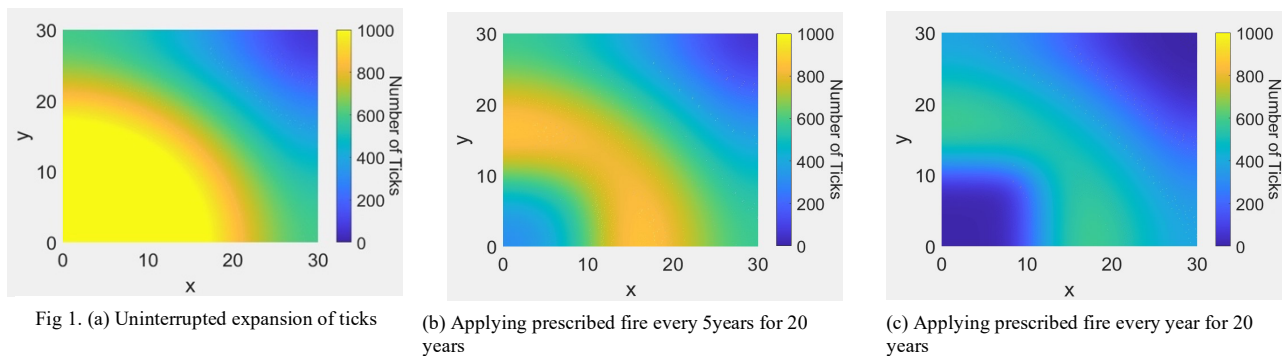


Figure 1 (c) shows that there is a need to pair prescribed fire with other ticks control measures. And this posits the question and goal of this program: what other control strategies should we use in addition to prescribed fire? Where should we place these other controls measures? Is it at the patch of introduction (the grid), or at the leading edge of the invasion?