Spiders' Response to Fire and Fire Surrogate Treatments in the Southern Appalachians

Spiders (Araneae) are a key component within the woodland food web playing a critical role in controlling insect population, are predators on invertebrate decomposer organisms, and serve as prey for many bird species, mammals, and amphibians. The composition and abundance of their communities and web guilds serve as biological indicators of forest habitat, forest management practices, and the landscapes ability to respond to disturbance. The study site was located at the Green River Site in western North Carolina. Dr. Campbell is the lead author on a 2022 paper that was published in the journal *Forest Ecology and Management* titled, "***Prescribed fire and other fuel-reduction treatments alter ground spider assemblages in a Southern Appalachian hardwood forest***". examined three fuel reduction treatments 1) mechanical/thin only (M); 2) prescribed burn only (B); and 3) mechanical plus burn (MB), as well as untreated controls (C) to determine spider composition and abundance.

Study Site and Methods:

- *Site*: Oak-hickory forests on Green River Game Land. The shrub layer was dominated by mountain laurel and rhododendron.
- *Treatments*: The M and MB treatment consisted of chainsaw felling of shrubs and small trees (<4" DBH) in year 1; repeated in year 11 on only the M units. Prescribed burns were conducted on the B and MB treatments in years 2, 5, 11, and 14. Fires were mostly low to moderate intensity; however, on the MB units, the year 2 fires were moderate to high severity with significant overstory mortality due to greater fuel loads after the mechanical treatment.
- *Field sampling of spiders*: Spiders were collected through the growing seasons in years 13-15 using pitfall traps. Spiders were collected in colored pan traps placed on the forest floor and in the midstory (30' high). The sampling captured both major types of spiders, the hunting spiders and web builders.

Key Findings:

- 1,600 spiders were collected; 151 species. Common species were jumping spiders (Salticidae), wolf spiders (Lycosidae), and sheet weavers (Linyphiidae). One-quarter of the spiders were collected in the midstory traps.
- Long-term fuel reduction treatments led to significant differences in the abundance and species composition of spider communities by years 13-15, with greater abundance in fuel reduction treatments compared to the controls. The authors attributed this abundance to the more varied understory structure in the treated stands created more varied microhabitats for spiders.
- In the MB stands, where canopy openness reached 30%, a greater abundance of herbaceous plants and flowers attracted more insects (see reference below) that are potential prey for spiders potentially contributing to greater spider abundance.
- The authors note that the increased abundance of spiders in treated stands could benefit a variety of birds, mammals, and amphibians, for which spiders are an important food source.

Link to the paper:

Campbell, J.W., Grodsky, S.M., Milne, M.A., Vigueira, P., Vigueira, C.C., Stern, E. and Greenberg, C.H., 2022. Prescribed fire and other fuel-reduction treatments alter ground spider assemblages in a Southern Appalachian hardwood forest. Forest Ecology an

Other related papers:

Campbell, J.W., Vigueira, P.A., Viguiera, C.C. and Greenberg, C.H., 2018. The effects of repeated prescribed fire and thinning on bees, wasps, and other flower visitors in the understory and midstory of a temperate forest in North Carolina. Forest Science

Waldrop, T.A., Hagan, D.L. and Simon, D.M., 2016. Repeated application of fuel reduction treatments in the Southern Appalachian Mountains, USA: implications for achieving management goals. *Fire Ecology*, *12*(2), pp.28-47.

The lead author, Dr. Joshua Campbell, is a Research Ecologist with the USDA Agricultural Research Service located in Sidney, MT. His current research is on native bees and pollination in agroecosystems. While earning a PhD at the University of Georgia in 2005, he studied pollinator communities at the Green River FFS site, and continued research at the site on bees, wasps, beetles, ants, and spiders. "*Our study found numerous species of spiders (including two new species!) within different forest fuel-reduction treatments. Spiders are important bioindicators of forest health and our data emphasize how diverse and important southern Appalachian forests are for maintaining important components of the overall food web*." – Dr Joshua Campbell