



Research Brief for Resource Managers

Release:
May 2014

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Oak Barrens Management and Understory Plant Recovery

Jeffrey L. Ralston and James Cook. 2013. Impact of Prescribed Fire, Timber Removal, and the Seed Bank on Understory Plant Diversity and Canopy Cover in an Oak-Pine Barrens, Central Wisconsin, USA. Ecological Restoration 31:395-411

This study focuses on the continuing, long-term restoration work at a large, 1900 hectare site in central Wisconsin, dominated by oak and jack pine and where understory diversity tends to be low, with Pennsylvania sedge (*Carex pensylvanica*) often the dominant species. The site is typical and representative of former oak and pine barrens habitats throughout the Upper Midwest that have converted to closed-canopy forests following European settlement. **Common restoration treatments include reintroduction of fire as well as canopy thinning and removal.**

These researchers used the portion of the site owned by The Nature Conservancy (TNC) to measure treatment effects, and used the DNR owned portion (1200 hectare) as a control. They found that seven decades of fire suppression have left a depauperate pool of species in the seed bank, and that the *coverage* of barren indicator species declined universally, in all units, although barren species richness (number of species per unit) did not.

This botanical resurvey was conducted in June of 2010 replicating methods used in 1991 and 1994. The authors used three sources to develop a list of 40 "barrens indicator species" for this region for use as a metric on restoration progress. This study uses 5 units where management began in

Management Implications

- Consider site history, the length of time since canopy closure, and the importance of the seed bank prior to treatment.
- Locate a high quality reference site nearby on which to base recovery efforts.
- Be prepared to develop a seed list and reseed if seed bank shows low diversity
- Remove timber first. The best recovery of barrens species occurred with the greatest reduction in canopy cover along with prescribed fire.
- More research is needed to fully understand the best approach.

1994. All units (except the control) had prescribed fire although the fire return interval varied. Management included one unit with planned timber removal, as well as one unit where both timber removal in 2000, and a tornado in 2004, reduced the canopy cover of trees. There were no treatment units where only canopy removal occurred. This would have been preferable, especially in this study where fire may have affected the seed bank.

In the **unburned control unit, tree cover increased and, perhaps surprisingly, Pennsylvania sedge decreased** significantly. Red maple, the species most likely to shade out oak seedlings and understory species, has high coverage only in the control unit.

The results of **this study could, alarmingly, imply that prescribed fire management, when used without canopy removal, has actually damaged this system** by encouraging seed bank germination while leaving the young sprouts to die in the shade. Seed bank samples were not separated by management unit. If they were, perhaps differences could be noted between unburned and burned units.

Given that many oak barrens are in a similar state of long-term fire suppression, or have been burned but not thinned, **restoration plans should anticipate and budget for the need to interseed or plant plugs as part of long-term restoration effort**. The role of a reference site in excellent condition could play a crucial role in informing restoration efforts.

These findings reinforce those of the TPOS Research Brief “Comparison of restoration techniques in a Midwest oak barren.”

Pros: excellent use of prior survey data, experimental sample units, inclusion of seed bank work, and a very good appendix.

Cons: limited list of indicator species.



Photo from Quincy Bluff taken by TPOS staff in 2013. Although this photo does not necessarily represent a research plot from this study, it is an example of the vegetation on the site.