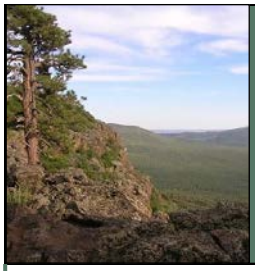

Ecological Restoration Institute

Fact Sheet: *Soil Seed Banks in a Mature Coniferous Forest Landscape: Dominance of Native Perennials and Low Spatial Variability*

February 2014

NORTHERN ARIZONA UNIVERSITY
Ecological Restoration Institute

Soil Seed Banks in a Mature Coniferous Forest Landscape: Dominance of Native Perennials and Low Spatial Variability

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INTRODUCTION

Viable seeds stored in soil (soil seed banks) are important features of plant communities that contribute to site potential for restoration and recovery from disturbance (events that disrupt an ecosystem such as fire or logging). Seed banks typically contain few seeds of late-successional species. Rather, forest seed banks are normally dominated by early successional species, often short-lived (e.g., annual) and "ruderal" (weedy) species with abilities to rapidly colonize disturbed areas. When disturbance reduces the tree overstory, these species recruit, produce seed to replenish seed banks, and then often become sparse or absent aboveground as forest canopy increases. On the other hand, aboveground species of a late-successional forest often do not rely on soil seed banks. Instead, these species are usually long-lived, rendering persistent seed banks of minimal importance to their population dynamics. As a result, seed banks of late-successional forests are generally dominated by species other than those of the existing mature vegetation.

Soil seed bank samples were collected on the east side of the Spring Mountains in southern Nevada (Figure 1, page 2). We used a network of Terrestrial Ecological Unit Inventory (TEUI) sites established by the U.S. Forest Service to characterize variability in environmental gradients and vegetation across the landscape. These sites were established in the centers of mapping units defined on the basis of similarity in climate, soil parent material and vegetation. With much of the study area roadless and in designated wilderness, human disturbance at the sites over the past 50–100 years is not extensive. Sample sites encompassed broad environmental and vegetation gradients across the landscape, ranging in elevation from 7,039 feet to 10,798 feet in forest types that included pinyon–juniper, pinyon pine, ponderosa pine, mixed conifer and bristlecone pine.

RESEARCH FINDINGS

- Native perennial species dominated the seed bank (67% of the species that emerged). Sixty two percent of species were forbs.
- Only four exotic species emerged, with only one species — prickly lettuce (*Lactuca serriola*) — emerging from more than one site.
- Seed density among sites ranged from 22 to 1,163 seeds per square foot.
- Soil silt was the environmental variable most strongly correlated with seed-bank measures. Median seed-bank density and species richness did not differ among forest types.
- A pinyon forest site contained the highest seed-bank density among sites, but this forest type also contained sites with some of the lowest seed densities.
- A high proportion (62%) of species in the seed bank also occurred in aboveground vegetation.
- Soil seed banks in these forests are dominated by late successional forest species that are also dominant in the aboveground vegetation, which was unexpected, and are nearly exclusively dominated by native plant species.

Management Implications

Soil seed banks are a central consideration for ecosystem management strategies and forecasting potential plant recruitment after disturbance. Land managers have considered fuels and fire potential to be hazardous on the study landscape, and thus are thinning trees to decrease fuel loads. This also creates opportunities for understory plant recruitment. Results suggest that while the seed bank is not large, more than half of the species detected in the seed bank are present in existing vegetation and the seed bank may be important following tree thinning.

The seed bank was especially rich in perennial species, which was an unexpected finding, and contained seeds that represented a range of grass, forb, and shrub growth forms. The general structure of the seed bank (forb- and shrub-dominated with a component of grasses and sedges) was similar to the plant community growing aboveground. This mirroring of the aboveground vegetation in the soil seed bank could have important implications for disturbance itself, especially fire. We would expect the plant community following fire to be similar to the contemporary community, since the vegetation aboveground is similar to the plants that will emerge from the soil seed bank following disturbance. An additional important finding of this study was that exotic species were sparse in the seed bank, which may be viewed as a positive result. However, the number of non-native seeds in the soil seed bank cannot reliably predict whether a site will be invaded following restoration treatments. Sample sites were not located along roadsides, on wildfires, or on other heavily disturbed sites, which might have potential to contain greater exotic seed bank densities. Much of the landscape, however, is currently in a relatively undisturbed state, represented by our sample sites where exotic species in the vegetation were also sparse. Results showed that soil seed banks were dominated by native perennial species characteristic of late-successional coniferous forests.

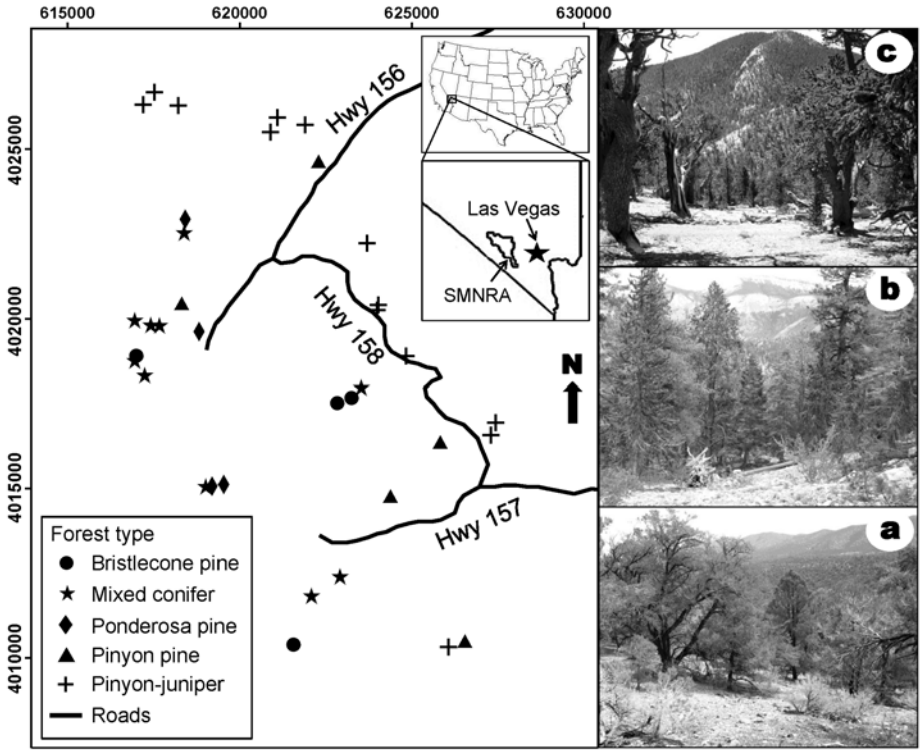

Figure 1. Location of study sites classified to forest type in the Spring Mountains National Recreation Area (SMNRA) of southern Nevada, USA. Photos illustrate the range of forest types sampled: (a) pinyon–juniper site at an elevation of 8,101 ft., (b) mixed conifer at 9,269 ft., and (c) bristlecone pine at 9,997 ft. Site locations are measured in Universal Transverse Mercator, or UTMs.

This Fact Sheet summarizes information from the following publication:

Abella, S.R. and J.D. Springer. 2012. Soil seed banks in a mature coniferous forest landscape: dominance of native perennials and low spatial variability. *Seed Science Research*, 22, 207-217. http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASHbb15.dir/doc.pdf

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This research was funded by a grant from the USDA Forest Service.