Ecological Restoration Institute

Fact Sheet: *Ecology of Rusby's Milkvetch (*Astragulus rusbyi*), a Rare Endemic of Northern Arizona Ponderosa Pine Forests*

February 2014

Ecology of Rusby's Milkvetch (*Astrgulus rusbyi*), a Rare Endemic of Northern Arizona Ponderosa Pine Forests

By Judith Springer, ERI Research Specialist, Sr.

INTRODUCTION

Astragulus rusbyi (Rusby's milkvetch). *Photo by Max Licher, Southwest Environmental Information Network*

Astragalus rusbyi (Rusby's milkvetch) grows primarily in ponderosa pine forests and in aspen groves, but it also may be found in mixed-conifer forests. Populations are mainly concentrated on basaltic soils in two areas in northern Arizona: around the San Francisco Peaks (primarily on the southern and western sides of the Peaks) and also in the vicinity of Kendrick Mountain. It is ranked "vulnerable" (G3) by NatureServe, a non-profit conservation organization, and is on the U.S. Forest Service sensitive species list for Region 3 (Southwestern Region). Some of its habitat has been subjected to large wildfires over the last few decades. Other areas have undergone ecological restoration treatments (tree thinning and prescribed burning), and much of its range is slated to undergo such treatments in the near future. This fact sheet summarizes findings from previous research conducted within its habitat and range.

RESEARCH FINDINGS

- Fisher and Fulé (2004) found *A. rusbyi* to be an indicator species for ponderosa pine forest. Six of the 14 ponderosa pine indicator species were nitrogen fixers, including *A. rusbyi*.
- Laughlin and others (2008) found *A. rusbyi* to be an indicator species of both thinned treatments and treatments that involved thinning plus burning, meaning that it exhibited a positive response to either type of treatment.
- *A. rusbyi* was also found to be an indicator species of remnant grass patches (small open areas consisting of native grasses and forbs) (Laughlin et al. 2008).
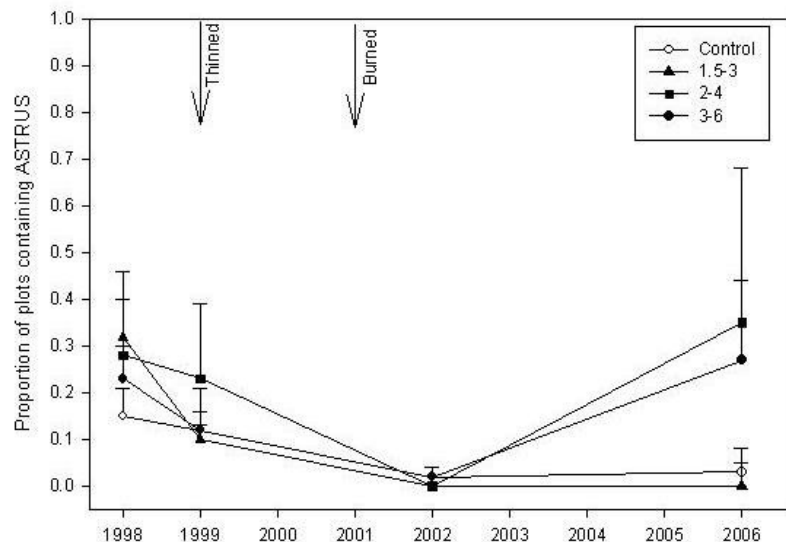

Figure 1. Proportion of permanent monitoring plots through time containing *A. rusbyi* at an ecological restoration study area near Flagstaff, AZ. Treatments were randomly assigned within each block and include a) no thinning, no burning (control), b) high-intensity thinning, c) medium-intensity thinning, and d) low-intensity thinning. All treatment units were thinned in 1999 and subsequently treated with prescribed fire in spring 2000 and spring 2001.

- Stoddard (in Springer et al. 2012) observed no significant effects, either positive or negative, with various levels of tree thinning combined with prescribed burning treatments, and there was no correlation found between the presence of *A. rusbyi* and trees per acre, pine basal area, or canopy cover. Although there was no significant effect on plant density from the ecological restoration treatments, there was a sharp decline in 2002, a year of extreme drought (Figure 1).

- Surveys conducted in 2008 within an area of *A. rusbyi* habitat northwest of the San Francisco Peaks slated for fuels reduction treatments revealed high levels of tree mortality, especially quaking aspen (*Populus tremuloides*), and numerous populations of *A. rusbyi*, varying in size from a few to several hundred plants, were noted in these areas (Coconino National Forest, unpublished data).

- Laughlin et al. (2010) found that, on average, *A. rusbyi* has relatively high specific leaf area, and high nitrogen and phosphorous concentrations in foliar tissue (4.4% and 0.18%, respectively). Correspondingly, it has a relatively high net photosynthetic rate. On average, it also has lower leaf dry matter content and foliar C:N mass ratio (11). The combined trait data place it in the category of a competitive ruderal species.

MANAGEMENT IMPLICATIONS

Rigorous long-term demographic monitoring will be valuable in determining population baselines and is essential for understanding the ecology and conservation and habitat needs of this species. Such monitoring can also reveal patterns that relate to precipitation fluctuations. Current knowledge indicates that *A. rusbyi* appears to show positive to neutral responses to tree thinning and prescribed burning.

REFERENCES

Fisher, M.A. and P.Z. Fulé. 2004. Changes in forest vegetation and arbuscular mycorrhizae along a steep elevation gradient in Arizona. *Forest Ecology and Management*, 200: 293–311.

Laughlin, D.C., J.D. Bakker, M.L. Daniels, M.M. Moore, C.A. Casey, J.D. Springer. 2008. Restoring plant species diversity and community composition in a ponderosa pine-bunchgrass ecosystem. *Plant Ecology*, 197:139-151.

Laughlin, D.C., J.J. Leppert, M.M. Moore, and C.H. Sieg. 2010. A multi-trait test of the leaf-height-seed plant strategy scheme with 133 species from a pine forest flora. *Functional Ecology*, 24:493-501.