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Long-term evaluation of Leafy Spurge biological control at Richmond, Utah

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Introduction

Leafy spurge (Euphorbia esula) is an aggressive introduced weed that has been successfully reduced in many areas in western North America through the introduction of natural predators (insects that eat the weed). A complex of flea beetles (Aphthona spp) has been credited with causing the most significant damage to the weed via larval feeding on spurge root tissue. Unfortunately, studies monitoring the long-term effects of Aphthona release on leafy spurge populations are sparse.

This study addressed the long-term effects of Aphthona release at a area formerly dominated by spurge at the Richmond Wildlife Management Area (RWMA) in Richmond, Utah. With the perspective of land management in mind, the composition of the vegetation and the soil, and the abundance of spurge and flea beetles were assessed. During the study, another introduced agent, the long-horned beetle (Oberea erythrocephala) was found important to consider for spurge control at this particular site as well.

Methods

1. Weekly during May-Aug 2013, leafy spurge abundance was determined in four plots at RWMA (20.1 m² quadrats/plot)
2. Once each in June and July, vegetation was cut in 20 quadrats per plot at RWMA and separated into categories (spurge, forbs [native, non-native], grasses [native, non-native]). Samples were weighed and compared with similar samples from 1995. Dominant plant species were noted.
3. 100 leafy spurge plants marked in May were censused weekly through August to document numbers of each beetle species and their feeding damage.
4. Weekly from May-August, 5 sweeps (180 degrees) with a net were taken per plot at RWMA to determine beetle numbers.
5. In June, soil was sampled in each of 4 plots to assess soil composition at RWMA (10 top and 10 bottom core subsamples each)

Results

(left) All flea beetle species have decreased in numbers since 2001 from n=1154 to n=104 (p<0.0001). Aphthona flavus was most abundant flea beetle in July of 2001, whereas both A. flavus and A. nigriscutus were present in very small numbers throughout 2013. Relatively strong persistence of A. lacertosa is thought to be associated with high levels of clay in the soil—this is consistent with the soil texture at RWMA (silty, clay, loam).

(right) The mean (±se) biomass of leafy spurge dropped from 17.98 (+6.34) g in 1995 to 1.86 (+3.77) g in 2013 (p<0.0001). Grasses and forbs increased in biomass from 1995 to 2013 (p<0.0001). The dominant plants in 2013 were introduced grasses: smooth brome, tall oatgrass, and quackgrass.

Conclusions

• The Aphthona spp complex is effective at controlling leafy spurge populations over the long-term in dry habitats.
• The leafy spurge population at RWMA has significantly decreased since the Aphthona releases in the 1990s, and accompanying this change, the Aphthona population has significantly decreased.
• A. lacertosa is the most persistent flea beetle species in this particular case, supporting conclusions of Nowierski et al. (2002) and Joshi and Olson (2009) that A. lacertosa tends to survive in a wider range of soil habitats high in clay.
• High presence and substantial spurge damage from the long-horned beetle (Oberea) suggests an unexpected role of Oberea in long-term leafy spurge control.
• Non-native grass species replaced leafy spurge as the dominant vegetation over time at RWMA, consistent with previous findings in similar habitats (Butler & Wacker, 2010).

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