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Summer 2006

Methods for *Euonymus fortunei* Removal

Introduction

Native phytodiversity is a keystone condition for the overall health and diversity of an ecosystem. A major threat to many native North American habitats is invasive plant species. Native plant species are often displaced by invasive species that grow extremely fast, have highly efficient dispersal methods, and tolerate a wide range of environmental conditions (Hoffman & Kearns 1997). Invasive plants' wide niche occupation greatly reduces the amount of phytodiversity in a natural habitat, which in turn reduces the resources available to native wildlife (Ibid).

The Litzinger Road Ecology Center (LREC) struggles to control many invasive plant species such as bush honeysuckle, garlic mustard, Japanese hops, and *Euonymus fortunei* or wintercreeper. *E. fortunei* is a woody evergreen vine that can spread for some distance, and in high density, vegatatively across the ground. *E. fortunei* must grow vertically, usually up a tree, before it can flower and produce berries that are eaten and dispersed by native birds. The plant can tolerate full sun to heavy shade in a range of soil conditions and is able to invade relatively undisturbed habitats (Czarapata 2005). Originally introduced from Japan as an ornamental groundcover, wintercreeper escaped into native forests throughout the Midwestern United States where it smothers any low growing plants and inhibits seedling growth and survival. *E. fortunei* is the most widespread invasive plant at LREC. In fact it is the most widespread plant in the LREC woodland. *E. fortunei* grows in over 75% of the 78 1/4m^2 woodland survey plots and covers more area of the plots than any other plant (Slagle 2004). In some areas of Litzsinger *Euonymus* has been controlled by spraying large clumps of it with glyphosate, but it remains a problem in the majority of the woodland region especially in the southern woods and across Deer Creek. Since Litzsinger is such a large area being managed by so few, it is important to use restoration methods that are highly effective and efficient in terms of resources used as well as man-hours. My research will focus on the best methods of

removal for *Euonymus fortunei*.

Methods

E. fortunei removal research plots are located in the LREC woodland east of Deer Creek and south of the bridal trail crossing. The area the plots are located was recently the site of a previous intern's research project focused on the removal of bush honeysuckle. Honeysuckle plants were cut and the stumps were treated with either 21% or 41% glyphosate concentrations (Harlan 2005). The recent removal has left the woodland understory relatively open with a high tree canopy and a dense layer of *E. fortunei* covering the floor.

There are three large plots 4 m by 10 m (A, B, C) that are evenly split up into ten 2 m by 2 m subplots. The thirty subplots were randomly assigned one of the six treatments so that each treatment will be conducted on five subplots. Each subplot had the percentage of area covered by *E. fortunei* recorded prior to the beginning of treatments and again two weeks after treatment in order to determine the rate at which the *Euonymus* died or, in the case of the weed whacked plots, grew back.

Plots A6, A9, B2, B3, and C6 were the control plots where no treatment was applied.

Plots A1, A3, A10, B9, and B10 were plots in which the *E. fortunei* was weed whacked. It was used as a control reference for Plots A4, A8, B1, C7, and C8 that were weed whacked and then sprayed with 3% Roundup® (a generic version was used). During the spraying of weed-whacked plots there was an active effort made to try and spray the cut ends of stems. Each of the ten weed whacked plots had their *E. fortunei* cover recorded the day after treatment as well as two weeks later to see the rate at which the wintercreeper grew back if at all. This collection technique would safe guard against misleading data because the weed whacked plots would show a significant decrease in *Euonymus* cover even though the plant may survive. The weed whack and spray technique is an adaptation of the widely recommended cut and paint technique for controlling *E. fortunei* (Czarapata 2005).

Plots A2, A7, B6, C1, and C9 were all sprayed with a 3% concentration of glyphosate created by mixing 9.6 oz of Glystar® and 118.4 oz of water. The 3% concentration was based off my colleague Malinda Slagle's experiments in which she found 3% being the lowest concentration that still resulted in a 100% *E. fortunei* kill (Slagle 2004).

Plots B4, B5, C4, C5, & C10 were sprayed with a 3% concentration of glyphosate and a 1.5% concentration of Synurgize®, a chemical that promotes the absorption of the herbicide through a plants cuticle. *E. fortunei* has a particularly thick waxy cuticle. The concentration was made by mixing 9.6 oz of Glystar®, 2 oz of Synurgize®, and 116.4 oz of water.

Plots A5, B7, B8, C2, & C3 were sprayed with Rodeo®, a formulation of glyphosate lacking the ionic surfactant used in Roundup® that is biologically devastating to amphibious life. An alternative non-ionic surfactant, Cide-Kick® was supplemented with for the Rodeo®, to create a 3% glyphosate concentration. The abundance of amphibious life that depends on Deer Creek makes the use of herbicides with non-ionic surfactants an important management consideration.

A major consideration for data collection in this experiment is the history of *E. fortunei's* response to herbicide. It can take several months before *E. fortunei* shows any significant effects from herbicide spraying (Solodar, 2005). While the time constraints on this internship demand results of relatively immediate data collection, this study will certainly continue to be pursued by myself as well as other LREC staff.

Results

All the plots that were only sprayed with herbicide along with the controls showed no change for the percentage of *E. fortunei* cover. The day after weed whacking plots A1, A3, A10, B9, & B10 had a significant drop in *E. fortunei* cover from a mean cover of 95.8% to a mean cover of 2%. Plots A4, A8, B1, C7, & C8 which were weed whacked and sprayed showed similar results the day after treatment, dropping from a mean *E. fortunei* cover of 89.4%, down to a mean cover of 2.8%. After two weeks the weed whacked plots had an average regrowth of *E. fortunei* cover of 6%, while the weed whacked and sprayed plots had no regrowth (Fig. 1). After a month the weed whacked plots had a mean regrowth of 30%, while the weed whacked and sprayed plots continued to have no regrowth (Fig. 1).

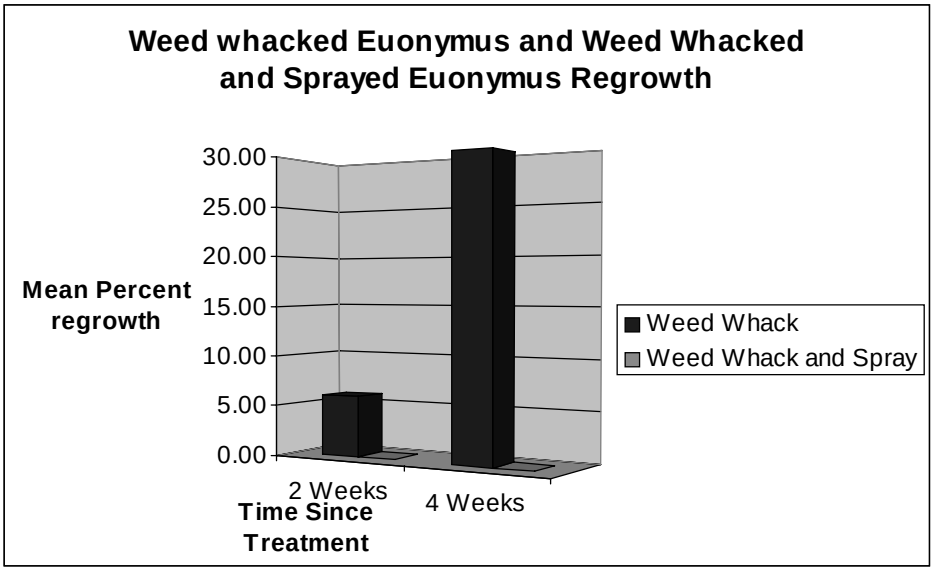

Figure 1

The number of non-target species in each plot were also recorded before and two weeks after each treatment. While the Control plots showed no change in the mean number of species per plots, all the other treated plots showed a drop in the mean number of non-target species per plot (Fig. 2).

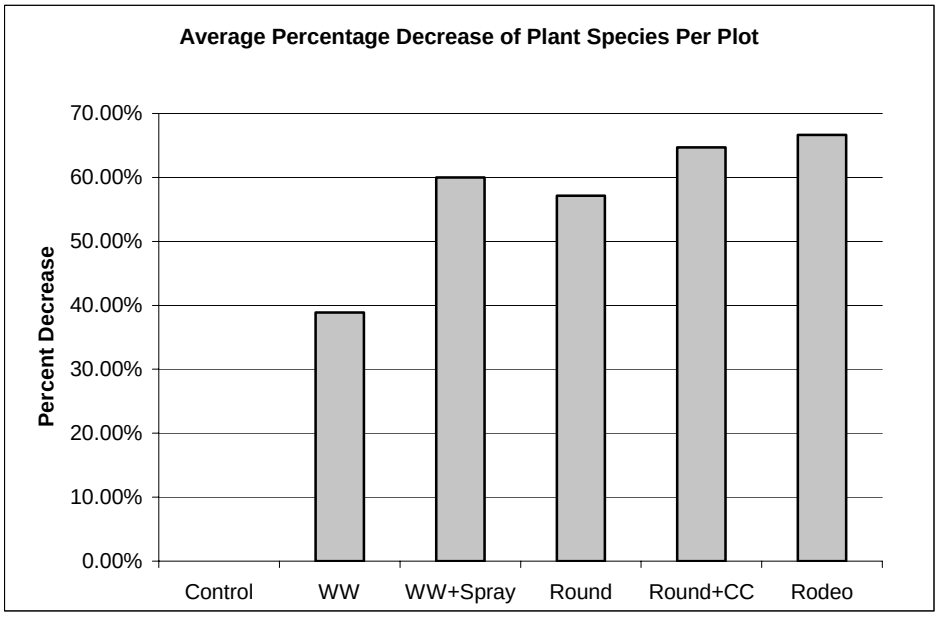

Figure 2

The weed whacked plots lost an average of 40% of their non-target species per plot. The weed whacked and sprayed plots along with the plots sprayed with Roundup® had an average species decrease

of 60% per plot. The Roundup Pro® and Synergize® sprayed plots along with the Rodeo® sprayed plots both lost an average of about 65% of their non-target species (Fig. 2).

Discussion

Previous works on *E. fortunei* removal suggest that it may take several months before evidence of effective glyphosate spraying is apparent (Solodar 2005). This demands that this research project continue through data collection. However, with the data observable at this time it appears that weed whacking and then spraying *Euonymus* with a 3% concentration of glyphosate is the most effective method of control. While nearly identical plots that were only weed whacked grew back at an impressive rate, the weed whacked and sprayed plots saw absolutely no regrowth. The nature of weed whacking would also make manual reseeding fairly successful as it exposes the area weed whack's bare ground. Weed whacking and then spraying *E. fortunei* appears to be an effective control method, but the lack of research done on this species control causes concern. Research in to invasive species control seems to be an area in restoration ecology that demands more attention.

Another restoration concern that arose from this research was the evidence indicating that not only an invasive species but also the removal of an invasive species can be damaging to a habitat. Herbicidal treatment can be especially devastating, even if care is taken to avoid non-target species. Areas that lose natives to herbicide can be reseeded, but the genetic value lost with involuntarily killed remnant natives is something that can never be regained. Invasive plants are a major threat to the small amount of native land left in this country. While widely agreed upon removal methods exist, all too often it is up to the individual ecologist to figure out effective and environmentally sound ways to control invasive species. This is a research area that demands much more attention.

Works Cited

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