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Washington Department of Fish and Wildlife

WIPE-ON HERBICIDE TRIAL: SCOTCH BROOM CONTROL IN A GRASSLAND

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Abstract

Scotch broom (*Cytisus scoparius*) (Figure 1) is one of the greatest threats to the biodiversity of South Puget Sound Prairies. The Nature Conservancy and the Washington Department of Fish and Wildlife began an herbicide trial for the control of Scotch broom on Scatter Creek Wildlife Area (SCWA) in south Thurston County. The trial was conducted to test late summer versus spring applications, two wipe on apparatuses, and two herbicides for controlling Scotch broom. The two wipe on applicators tested were the Weed/Sweep and Rotowiper. Roundup Ultra (glyphosate) and Garlon 4 (triclopyr ester) were applied with each applicator in late summer 2003 and spring 2004. Each applicator and herbicide achieved mortality rates above 50% in some tests. Garlon applied in the spring with the Rotowiper was the most effective with more than 90% mortality. However, the Rotowiper also caused 35% mortality in the native non-target *Festuca roemeri*, while the Weed/Sweep had no significant non-target mortality. The results of the trial indicate that the Rotowiper consistently achieves higher mortality rates with either herbicide but also causes mortality in non-target species. Each of the applicators control Scotch broom but neither is 100% effective. When used in in combination with other methods, both appear to be effective tools for controlling Scotch broom with minimal to medium non-target mortality.

Figure 1. Scotch broom flowers.

Background

Prairies in the Willamette Valley/Puget Trough/Georgia Straits ecoregion are critically imperiled (Floberg et al. 2004). Much of the recent biological degradation of the natural communities in South Puget Sound prairies is directly attributable to the invasion of Scotch broom. This species has severe negative impacts on habitat for a wide range of

prairie associated species (Dunn and Ewing 1997, Hays et al 2000). Restoration of degraded areas depends on successfully controlling this species. A variety of techniques have been researched and used to control the extent and spread of Scotch broom including mechanical control such as mowing or pulling (Ussery and Krannitz 1998), prescribed fire (Tveten and Fonda 1999), and chemical control through the use of herbicides.

Spraying a selective herbicide such as Garlon can be very effective in controlling Scotch Broom but it can also cause significant non-target effects on native vegetation particularly if applied when native species are not senescent. Finding an effective method for applying herbicide directly to Scotch broom with minimal damage to non-target species is a high priority for recovering prairies degraded by this invader. A wipe-on type applicator is an obvious choice for achieving this goal because Scotch broom is generally taller than the surrounding native prairie vegetation. Ideally this wipe-on application will allow herbicide application whenever Scotch broom can uptake the herbicide and not restrict application to late summer dry periods when native vegetation has senesced.

Methods

Three different aspects of herbicide application method were tested: season (spring and fall), wipe-on apparatus (Rotowiper and Weed/Sweep), and chemical (Garlon 4 (triclopyr ester) and Roundup Ultra (glyphosate)). Two towed wipe-on applicators were tested, using both in spring and fall application. These applicators are designed to tow through areas and wipe herbicide on the taller Scotch broom, while missing lower growing native species. Garlon 4 is a broadleaf herbicide and Roundup Ultra is a broad spectrum herbicide.

Figure 2. Weed/Sweep wipe-on applicator

Figure 3. Rotowiper wipe-on applicator.

The Weed/Sweep system (Figure 2) applies 100% herbicide concentrate. The viscous herbicide passes through a precision low flow pump and coats a “sandpaper” covered bar which is towed through the broom. As the herbicide is not diluted, only a small amount is needed to affect each plant. The Rotowiper is a roller covered in a heavy-duty carpet. The carpet is saturated with a fairly concentrated herbicide solution and pulled through the broom (Figure 3). The carpet roller rotates in the opposite direction of the wheels as it is pulled through the Scotch broom.

Both herbicides were applied at a rate of 4 liters/acre with each apparatus in August 2003 and April 2004. Each treatment was applied in a 10m by 100m plot. Scotch broom stem density, cover and height were similar across all the plots and the history of previous control on the plots was the same—each had been mowed repeatedly at an interval of 2-3years. Both applicators were set to wipe 35cm above the ground.

Mortality for 40 randomly selected Scotch broom plants in each application plot was assessed approximately nine months after chemical application. Plants were examined including at the base to assess the potential for re-sprout. Plants were only considered dead if there were no signs of live tissue. In addition, the percentage of each plant killed was estimated for the late summer application.

To monitor non-target effects, 20 *Viola adunca* and 20 *F. roemerii* were marked in one control plot and in each of the two Roundup Ultra plots in April 2004. The plants were relocated in the April of 2005 and mortality was recorded. All statistical comparisons were done using Minitab (2002) and Excel (2002) software.

Results

The results of these applications indicate that the Spring/Rotowiper/Garlon combination killed significantly more Scotch broom (90%) than any other combination. The second highest mortality (70%), using the Spring/Rotowiper/Roundup combination, was significantly lower (Figure 4). Late summer and spring comparisons between treatment combinations were similar but spring mortality was higher overall (64% spring mortality, 49% fall mortality mean of all treatments) but this difference was not significant. When the total percentage of Scotch broom plant material killed was measured instead of mortality, the same pattern emerges with in the late summer application. The late summer Garlon/Rotowiper combination killed significantly more plant biomass than any other late summer combination (Figure 5).

Non-target effects are significant for some treatments. There was no significant difference between mortality in the Weed/Sweep Roundup Ultra treated areas and untreated controls for measured forbs, but Rotowiper Roundup application appears to cause significantly higher mortality (Table 1) and this is consistent with field observations.

Table 1. Native forb mortality one year after Roundup application. n=20 * indicates significant difference from control. (Two tails Fisher Exact Probability = 0.0042)

	Control	Weed/Swee p	Rotowipe r
Viola adunca	**2**	**2**	**6**
Festuca roemeri	**0**	**1**	**7***

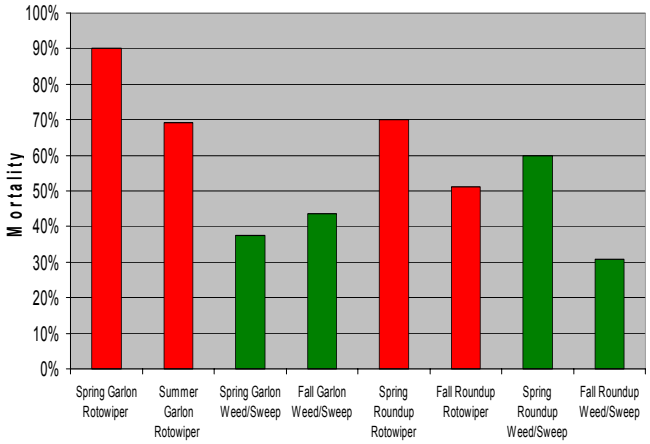

Figure 4. Comparison of Scotch broom mortality between treatments are significant at $\alpha = 0.05$ ($\chi 2$ contingency table, Bonferroni's adjustment = 0.00625).

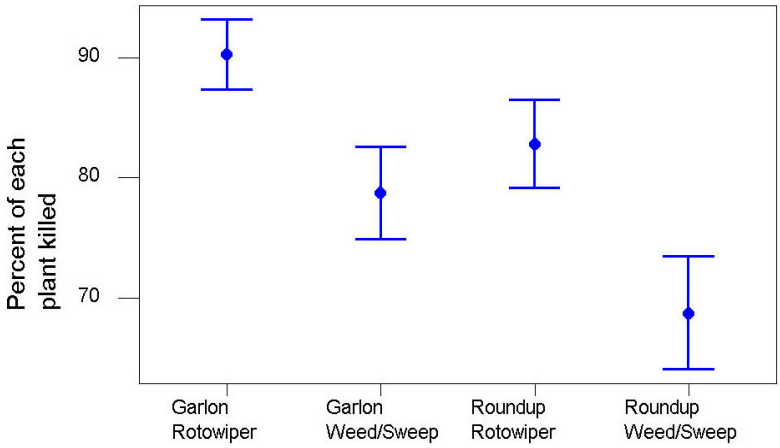

Figure 5. Comparison between late summer applications.
Treatments significantly different (one way ANOVA p = 0.001). Error bars ±1 SE.

Discussion

This trial was conducted in order to determine which of the applicators was the most effective in applying herbicide to Scotch broom while minimizing damage or mortality of non-target species. Although the results indicate that the most effective method in the trial was Garlon 4 applied with the Rotowiper in the spring, more consideration is needed to determine the most appropriate method in the field. It is important to consider field

conditions and time of year when deciding which application method and herbicide to use.

The Rotowiper appears to work better than the Weed/Sweep in dense broom areas. This is because the herbicide is not replenished quickly enough on the Weed/Sweep bars. Alternately, in areas with a more diffuse broom population, the Weed/Sweep may be a more appropriate choice, as it does not drip herbicide as rapidly as the Rotowiper, and it is likely to have an improved efficacy rate, compared to the trial plots, as each plant will receive a greater dose in a more diffuse broom population.

Finally, the herbaceous community in the under story should be considered. There was no significant difference in the mortality of herbaceous plants between the control plot and the Weed/Sweep plot. In areas where any non-target mortality is a large concern the Weed/Sweep may be more appropriate than the Rotowiper. However, in areas of low to moderate quality prairie the Rotowiper might be the most effective choice and mortality to non-target grasses would be minimized by the use of a broadleaf herbicide like Garlon 4.

Figure 6. Garlon 4 applied with Rotowiper plot nine months after application

Acknowledgements

We would like to thank Dave Hays, Patrick Dunn, Scott Pearson, and Ron Pratt for their help. Funding for this work was provided by The Washington Department of Fish and Wildlife and The Nature Conservancy.

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