FIRE AND GLOSSY BUCKTHORN MANAGEMENT IN UPPER MICHIGAN

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Prescribed fire is one proposed method for managing some invasive plant species, although its efficacy and that of other treatment methods are not always tested. Glossy buckthorn (*Frangula alnus*), an invasive shrub originating from Eurasia and northern Africa, poses a threat to wetland ecosystems in the Midwest. When present, glossy buckthorn competes with native plant species and often forms a dense homogenous monoculture. Glossy buckthorn prefers wet edges, often residing between upland and wetland areas, and reproduces by abundant seed crops and stump sprouting. Management of glossy buckthorn has included a range of treatments, including the cutting of live stems followed by the application of a 20% active ingredient (ai) glyphosate solution as well as spraying adult plants with herbicide solutions of anywhere between 1.25% to 5% ai. To test these and other treatments (including scorching by flame torch as a surrogate for prescribed fire) experiments were conducted at Seney National Wildlife Refuge (NWR) from 2003-2011 to compare the efficacy of different treatments in reducing glossy buckthorn resprouts and seedlings. Treatments tested included herbicide application of glyphosate or triclopyr at varying concentrations, and scorching with a propane torch.

From 2003-2004, treatments were done to adult plants previously not treated to test the efficacy of glyphosate relative to scorching (and controls) in reducing the number of glossy buckthorn resprouts and seedlings. Three experiments were performed using: 1) single treatment applications, 2) treatments one year after cutting and applying 20% ai glyphosate to stumps, and 3) treatments for reducing seedlings after the removal of overstory plants. Experiment 1 was performed in the summer of 2004 and included one of three treatments after cutting stems: control (no treatment), herbicide (20% ai glyphosate applied to cut stumps), or scorching (30 seconds of blue flame per stump complex). Resprouts were counted from 2004-2006. Initially, there was a significant reduction of sprouts from stumps treated with herbicide. However, by 2005, no significant


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MANAGEMENT IMPLICATIONS

1) Herbicide treatments (using varying concentrations and methods) were more effective than scorching in reducing glossy buckthorn stump resprouts in both single applications and one-year follow-up applications.

2) Glyphosate and triclopyr both showed efficacy in reducing glossy buckthorn resprouts at concentrations as low as 1.25% ai within four weeks of treatment.

3) Rotating the herbicides used in treating glossy buckthorn is suggested to reduce the likelihood of resistance developing.

4) Overall, prescribed fire would likely be most effective in managing glossy buckthorn when preceded by herbicide treatments.

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difference was found in the number of sprouts between any treatments.

Experiment 2 quantified one-year follow-up treatments to glossy buckthorn that had been cut and stumps treated with 20% ai glyphosate. The year after the initial treatment, resprouts were either treated as a control (no treatment), with low-volume broadcast application of 5% ai glyphosate, or with scorching (30 seconds of blue flame per stump complex). Resprouts were monitored at the end of the 2004 growing season and in 2005. This experiment found that when compared with control or scorched treatments, stumps treated with 5% ai glyphosate had significantly fewer sprouts than other treatments.

Experiment 3 investigated treatment effects on seedlings with one of three treatments randomly assigned to plots: control (no treatment), 5% ai glyphosate low-volume broadcast spraying, or scorching (30 seconds of blue flame per quadrat).The number of seedlings were counted within each quadrat prior to treatment, at 14 days, 60 days, one year, and two years following treatment. The application of herbicide significantly reduced the number of seedlings, while there was no significant reduction with the scorch treatment or controls. Within 14 days of the treatment, herbicide-treated seedlings were reduced by 99% and this effect persisted at least 60 days.

Additional experiments were done in 2006 and in 2011 to determine if glyphosate or other herbicides would be effective at concentrations lower than 5% for treating resprouts or seedlings. It is also of interest to look into the use of herbicides other than glyphosate due to concern over resistance developing to glyphosate if used repeatedly. In 2006, resprouts from previously cut and treated plants were divided into four treatment groups and treated with 0% (tap water), 1.25%, 2.5%, or 5% ai glyphosate; resprouts were then monitored once a week for four weeks, then biweekly the following year. By the fourth week all plants treated with glyphosate, regardless of concentration, were dead and no new growth or change in their condition was observed the following year. Similar results were also observed in an experiment using triclopyr. These studies suggest that low concentrations of both of these herbicides may be used effectively to kill glossy buckthorn up to 3 inches in diameter. Additionally, to reduce the likelihood of glossy buckthorn developing resistance to glyphosate, it is possible to rotate the type of herbicide used from year to year.

This experimental approach at Seney NWR demonstrates the utility of herbicide treatments to glossy buckthorn, the importance of follow-up treatments, and the efficacy of using a low herbicide concentration. It also shows that burning is ineffective as a sole treatment after cutting glossy buckthorn, as a one-year follow-up treatment of resprouts, and in reducing seedlings. Prescribed fire treatments may be more effective for glossy buckthorn management when preceded by the glyphosate treatments described here. It should be emphasized that potential geographic variation and site-specific characteristics make these results relevant for some areas but not necessarily others.

References

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