The effects of bushy honeysuckle removal on urban woodland vegetation

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Abstract. Bushy honeysuckle (*Lonicera mackii*) is a non-native shrub that has invaded eastern woodlands. Upon invasion, honeysuckle tends to limit light penetration and therefore growth of herbaceous and woody understory. Because of this, expensive measures are often taken to remove honeysuckle from infested areas. We examined the effects of honeysuckle removal on understory plant growth using line transects through areas containing honeysuckle and areas where it has been removed in a lowland forest on the Marian College campus, Indianapolis, IN during the spring and fall 2002-2004. We found that honeysuckle removal significantly increased total plant coverage in both the spring and fall of all years. However, non-native garlic mustard (*Alliaria petiolata*) and others made up a large portion (43% - 60%) of the total plant coverage in areas where honeysuckle was removed and native plant coverage was not greater in those areas until fall 2002. Native plant diversity was significantly greater in areas where honeysuckle was removed by fall 2002. Managers in urban natural areas need to monitor growth of other invasives such as garlic mustard after honeysuckle is removed

INTRODUCTION

Lonicera maackii, Amur honeysuckle, was introduced to the United States from northeast Asia as an ornamental 1896 and has since invaded many forests in the Eastern U.S. causing unfavorable consequences (Luken and Thieret 1996, Schmidt and Whelan 1999). Honeysuckle tends to out compete native understory vegetation due to its dense growth and early leaf-out (Deering and Vankat 1999; Woods 1993).

The invasive nature of honeysuckle has been well documented (Luken and Theiret 1996, Woods 1993, Luken and Goessling 1995). For example, herb cover, tree seedling density, and species richness of tree seedlings were negatively correlated to honeysuckle density among woodlots in southwest Ohio (Hutchinson and Vankat, 1997). The basal area of honeysuckle was also negatively correlated with native shrub species richness, native shrub basal area, and sapling density of sugar maples (*Acer saccharum*) within a single woodlot (Medley, 1997). Moreover, the richness of herbs and woody plants and richness and density of tree seedlings decreased with longer residence of honeysuckle in Ohio (Collier et al., 2002).

Several studies have used native plants transplanted into areas where honeysuckle has been removed and where honeysuckle is still dominant to examine the effects of honeysuckle on the growth and fecundity of native species. Miller and Gorchov (2004) found similar survival rates, but less growth and fecundity of three native perennial herbs grown in honeysuckle dominated areas versus areas where honeysuckle had been removed. Similarly, Gould and Gorchov (2000) found that three species of annuals planted under the cover of honeysuckle had a decreased fecundity compared to those grown where honeysuckle was removed. Honeysuckle removal has also been found to

increase mortality of planted native tree seedlings (Gorchov and Trisel 2003; Hartman and McCarthy 2004).

Because of the detrimental effects of Honeysuckle, significant funds and effort have been invested in honeysuckle removal. However, little is known about the effect of honeysuckle removal on the natural establishment of understory vegetation. Luken and others (1997) found that when gaps were cut within stands of honeysuckle, total herb density increased. In our study we removed honeysuckle and monitored understory richness and coverage compared to areas where honeysuckle was still dominant to assess the effects of honeysuckle removal on understory vegetation.

METHODS

Data were collected in the spring (May 15-30) and fall (Sept. 1-20) of 2002-2004 from an area where honeysuckle was dominant adjacent to an area where honeysuckle was removed from a young (~40 yrs.) lowland forest on the campus of Marian College, Indianapolis, Indiana. The honeysuckle removal was completed fall 2001, so we consider spring 2002 to be the first full growing season on the study area after honeysuckle removal. Removal was accomplished by cutting shrubs at the base, treating stumps with 18% glyphosate, and completely removing shrubs from the site.

We surveyed fifteen randomly placed 30.5 m transects that were centered on and perpendicular to the edge of the removal area such that half of the transect was in the honeysuckle removed area and the other half was in an area still dominated by honeysuckle. We recorded the species of all plants less than 1 m in height at 1200 equally spaced points along the transect to estimate coverage and species richness in the area where honeysuckle had been removed and where it was still dominant.

Because we were making paired observations along 2 halves of a single line (the transect), we used a paired t-test to compare coverage and species richness within years. All statistical analyses were done using Statview 5.0 (SAS Institute Inc.).

RESULTS

Total plant coverage in areas where honeysuckle was removed was significantly greater than in areas where honeysuckle was still pervasive in both fall and spring for all three years following honeysuckle removal (fig. 1). However, the native plant coverage was not significantly greater until the first fall (2002; fig. 2). Exotics made up a large portion of the total plant coverage throughout the three year study: 56% in 2002, 60% in 2003, and 43% in 2004. Exotic species coverage was significantly greater until the last fall of the study (2004; fig.3). Native species richness was significantly greater in areas where honeysuckle was removed beginning in fall 2002 (Fig. 4).

Mean native plant coverage where honeysuckle was removed went from 9.3% in spring 2003 to 18% in spring 2004. Mean native species richness per transect went from 3.5 species to 8.0 species during the same time.

DISCUSSION

The removal of Amur Honeysuckle resulted in an increase in richness and coverage of native understory vegetation in the EcoLab. As expected, this was the opposite of what others have found regarding the effects of honeysuckle invasion (Woods 1993, Hutchinson and Vankat 1997, Medley 1997, Collier et al. 2002). Apparently, when the dense canopy of honeysuckle was removed, native species in the seedbank were released. This positive effect may be limited by the initial quality of the seedbank and the length of

time since honeysuckle invasion, assuming time degrades seedbank quality (Collier et al. 2002).

Although total plant coverage was positively affected by honeysuckle removal, a large portion of that coverage was exotics – primarily garlic mustard (*Alliaria petiolata*). The removal of honeysuckle provided prime conditions for garlic mustard: young lowland forest, reduced canopy, urban seedbank, and few established native perennials for competition (Meekins and McCarthy 2001). This will no doubt be a major problem for others attempting honeysuckle removal in similar situations.

In our study, as with others, very few plants were able to survive under the canopy of honeysuckle. This effectively stops succession and leads to a loss of forest character and perhaps function. Our study indicates, however, that with the removal of honeysuckle and the monitoring of other exotics, forest character and function can be restored. By the spring of the third year following honeysuckle removal, native plant coverage and richness were double what they were where honeysuckle was still dominant. Overall, Honeysuckle removal favorably affects the diversity, abundance, and richness of native understory vegetation.

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LITERATURE CITED

Collier, M.H., J.L. Vankat, and M.R. Hughes. 2002. Diminished plant richness and abundance below *Lonicera maackii*, an invasive shrub. American Midland Naturalist 147:60-71.

Gorchov, D. L. and D. E. Trisel. 2003. Competitive effects of the invasive shrub, *Lonicera maackii* (Rupr.) Herder (Caprifoliaceae), on the growth and survival of native tree seedlings. Plant Ecology 166:13-24.

Gould, A.M.A. and D.L. Gorchov. 2000. Effects of the exotic invasive shrub *Lonicera maackii* on the survival and fecundity of three species of native annuals. American Midland Naturalist 144:36-50.

Hartman, K. M. and B. C. McCarthy. 2004. Restoration of a forest understory after the removal of an invasive shrub, amur honeysuckle (*Lonicera maackii*). Restoration Ecology 12:154-165.

Hutchinson, T.F. and J.L. Vankat. 1997. Invasibility and effects of Amur honeysuckle in southwestern Ohio forests. Conservation Biology 11:1117-1124.

Luken, J.O. and N. Goessling. 1995. Seedling distribution and potential persistence of the exotic shrub *Lonicera maackii* in fragmented forests. American Midland Naturalist 133:124-130.

Luken, J.O., L.M Kuddes and T.C. Tholemeier. 1997. Response of understory species to gap formation and soil disturbances in *Lonicera maackii* thickets. Restoration Ecology 5:229-235.

Luken, J.O., J.W. Thieret. 1996. Amur honeysuckle, its fall from grace. BioScience 46:18-24.

Medley, K.E. 1997. Distribution of the non-native shrub *Lonicera maackii* in Kramer Woods, Ohio. Physical Geography 18:18-36.

Meekins, J. F. and B. C. McCarthy. 2001. Effect of environmental variation on the invasive success of a nonindigenous forest herb. Ecological Applications 11:1336-1348.

Miller, K. E. and D. L. Gorchov. 2004. The invasive shrub, *Lonicera maackii*, reduces growth and fecundity of perennial forest herbs. Oecologia 139:359-375.

Schmidt, K. A. and C. J. Whelan. 1999. Effects of exotic *Lonicera* and *Rhamnus* on songbird nest predation. Conservation Biology 13:1502-1506.

Woods, K. D. 1993. Effects of invasion by Lonicera tatarica L. on herbs and tree seedlings in four New England forests. American Midland Naturalist 130:62-74.

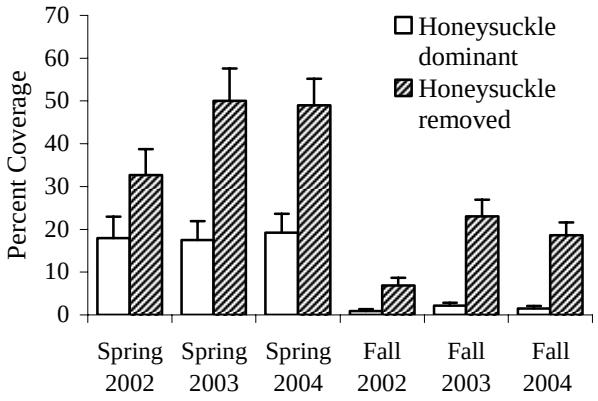

Fig. 1: Percent coverage of native and exotic understory vegetation in areas where honeysuckle was removed by fall 2001 and where honeysuckle is still dominant in an urban lowland forest in Indianapolis, IN. All honeysuckle removed versus dominant comparisons (paired t-test) are significant ($P < 0.05$).

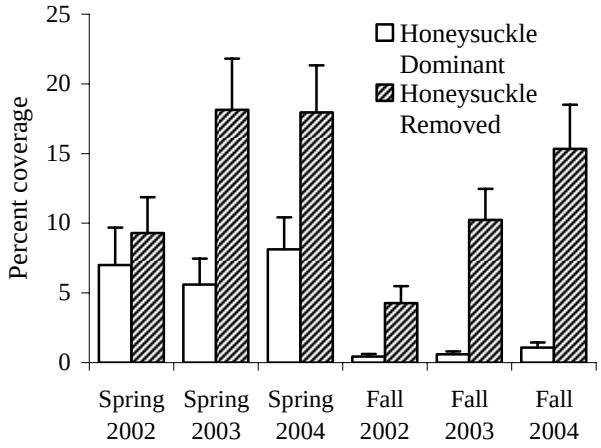

Fig. 2: Percent coverage of native understory vegetation in areas where honeysuckle was removed by fall 2001 and where honeysuckle is still dominant in an urban lowland forest in Indianapolis, IN. All honeysuckle removed versus dominant comparisons (paired t-test) are significant ($P < 0.05$) except spring 2002.

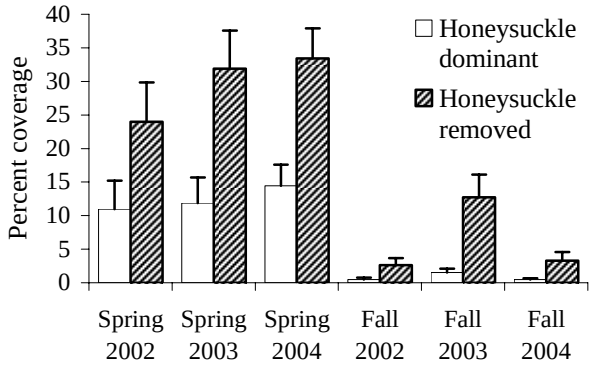

Fig. 3: Percent coverage of exotic understory vegetation in areas where honeysuckle was removed by fall 2001 and where honeysuckle is still dominant in an urban lowland forest in Indianapolis, IN. All honeysuckle removed versus dominant comparisons (paired t-test) are significant ($P < 0.05$) except fall 2004.

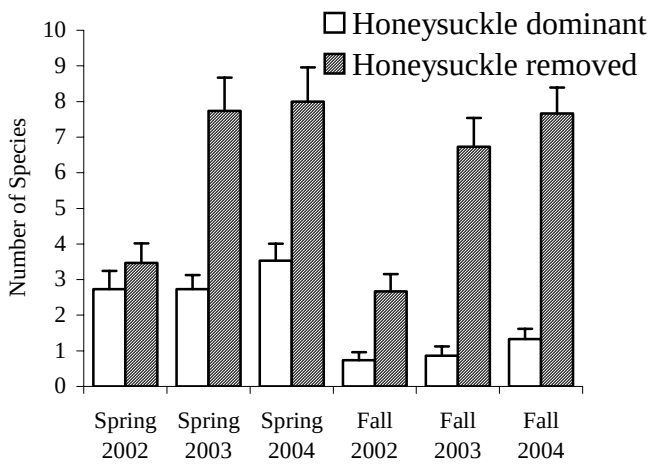

Fig. 4: Species richness of native understory vegetation in areas where honeysuckle was removed by fall 2001 and where honeysuckle is still dominant in an urban lowland forest in Indianapolis, IN. All honeysuckle removed versus dominant comparisons (paired t-test) are significant ($P < 0.05$) except spring 2002.