Short-term effects of removing the non-native, invasive Amur honeysuckle (Lonicera maackii (Rupr.) Herder) on spring-flowering forest forbs in Indiana Joshua M. Shields, Michael A. Jenkins, and Michael R. Saunders



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Introduction

- · Amur honeysuckle is a non-native, invasive shrub that has caused decline native plant taxa throughout many forests in the U.S.
- Because Amur honeysuckle expands its leaves early in the year, it may b direct competition with native forest species that otherwise take advantage of leafless forest canopy in early spring
- The objectives of this study were to:
- Examine the short-term effects of removing Amur honeysuckle and other non-native shrubs on the diversity and richness of native forest forbs that flower primarily in the spring (e.g., spring ephemerals)
- 2. Examine the response of the invasive forest forb garlic mustard [Alliaria petiolata (M. Bieb.) Cavara & Grande]), which is known to react strongly to the removal of other invasive species

Methods and Materials

- Sampled ground-layer vegetation using a series of fixed-area plots placed al transects in six mixed-hardwood forests/woodlots in Indiana where Amur honeysuckle was the dominant invasive shrub
- Each forest/woodlot contained a ~80m x ~80m removal area and a ~80m x ~80m reference area
- In removal areas, Amur honeysuckle and all other non-native shrubs were removed in fall/winter of 2010/2011 (no treatment was implemented in refere areas)
- In each removal and reference area we estimated aerial percent covers of herbaceous and woody vegetation in 12, 2 m x 2 m quadrats in May 2010 (before removals) and May 2011 (after removals; n = 24 quadrats per study



Cutting Amur honeysuckle, applying herbicide, and dragging slash; photos by Joshua Shie **Brian Bailey**



Amur honeysuckle in removal area at Purdue Forestry and Natural Resources (FNR) Farm p removal treatment (left photo) and after removal treatment (showing removal area boundary wall of Amur honeysuckle in background; right photo); left photo by Joshua Shields, right p by Michael Jenkins

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	Data Analyses
es in be in	 We calculated Shannon's diversity (H') and taxonomic richness (S primarily in the spring; calculations were done for each quadrat and calculated by reference/removal area and study site
of the	 We also calculated differences in H', S, and percent cover of garlic quadrat-level estimates in 2010 from estimates in 2011
	 Permutation tests (assuming a paired design with quadrats stratified iterations per test were used to test whether mean values of quadra to 2011 were significantly different from zero; removal areas and re- separately
	Results and Discussion
	 Mean H' and S differed across study sites but in general, more promeasures from 2010 to 2011 occurred in the removal areas (Figure)
	 For H' and S, mean differences were positive in both removal and permutation test p values were < 0.05), but magnitude of difference areas (Figure 2)
long	 Mean differences in garlic mustard percent cover between 2010 ar both reference areas and removal areas (Figure 2)
	 For garlic mustard, neither permutation test was significant (p > 0.0 between 2010 and 2011 were greater in removal areas (Figure 2) a this year suggests that garlic mustard has continued to spread at a areas than in reference areas
ence	 Our results suggest that woody invasive control effort honeysuckle is the dominant invasive species may least spring-flowering forest forb communities, at least in the term recovery, however, will depend on the re-invasion
site)	honeysuckle as well as the response of other invasiv garlic mustard) that may quickly capture growing spa efforts
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lds and	
	0.4
	b) d)
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
	0.2 0 Ross FNR Farm Fowler Park Hawthorn Pursell Pfizer Inc. Biological Park Woodlot Rifle Range Reserve Woodlot Reserve
with whoto	Figure 1. Mean (±1 SE) Shannon's diversity (H') by study site in a) reference areas and b) removal areas, and mean taxonomic richness (S) by study site in c) reference areas and d) removal areas

6) for native taxa that flower d mean values were

mustard by subtracting

ed by study site) using 2,000 at-level differences from 2010 eference areas were analyzed

nounced changes in these

reference areas (all e was greater in removal

nd 2011 were also positive in

05); however, differences and anecdotal evidence from much faster rate in removal

rts where Amur ead to the recovery of the short term. Longon potential of Amur ve species (such as ace following control



Recovery of several native, spring-flowering forest forbs after honeysuckle removal at Purdue FNR Farm—bloody butcher (Trillium recurvatum Beck), mayapple (Podophyllum peltatum L.), bulbous bittercress (Cardamine bulbosa (Schreb. ex Muhl.) Britton, Sterns & Poggenb.), and Virginia springbeauty (Claytonia virginica L.); photos by Michael Jenkins



Garlic mustard in removal area at Purdue FNR Farm in Spring 2012, the second growing season following the removal treatment; photos by Michael Jenkins

