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Assessment of the Negative Role Amur Honeysuckle has on Urban Forest Diversity

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Introduction

Amur honeysuckle (*Lonicera maackii*; Caprifoliaceae; Figure 1) is an invasive shrub species that out-competed native species in urban riparian zones for decades. Amur honeysuckle is native to Japan, Korea, and China, and was introduced to the United States in 1855. Amur honeysuckle out-competes native species due to its ability to receive more sunlight than the species below it (Orrock, et al. 2015). It also secretes an allelochemical from its leaves that negatively impacts the ecosystems by polluting watersheds and limiting resources to animals (McNeish and McEwan 2016). Overall, Amur honeysuckle leads to reduced species richness and density.

Research Questions:

How does Amur honeysuckle affect native plant species in the herbaceous understory?

Methods

- Five forest communities were sampled in Northwest Illinois (Figs. 2 & 3).
- Sites were separated into four different categories with Amur honeysuckle (*Lonicera maackii*, an invasive shrub) only, garlic mustard only, neither invasive species, and sites where both occur.
- In the honeysuckle and garlic mustard plots, the respective species was in the center of the plot.
- For the plots without garlic mustard and honeysuckle, neither species was present within a 0.5 m buffer in all directions.
- There were 12 sites for each of the four categories resulting in 48 total.
- Daubenmire 1 m² plots were placed haphazardly throughout the site, ensuring that the plots were at least 10 m apart from similar plot classes.
- For each site, total coverage percentage for every species within the quadrats was assessed.
- Native relative cover, Shannon's H, native richness, non-native relative cover, non-native Shannon's H, and non-native richness were assessed.



Figure 1. Left: Flowers of Amur honeysuckle, image by Paul Rothrock, <https://midwestherbaria.org/portal/taxa/index.php?taxon=89904&clid=5785>

Right: Fruits of Amur honeysuckle, image by Center for Earth and Environmental Science, Indiana University-Purdue University, Indianapolis, <https://www.lhprism.org/species/lonicera-maackii>



Figure 2: Map showing part of the Quad Cities, IA/IL; the star indicating the approximate location of Figure 3. <https://www.aaroads.com/guides/us-006-ii/#/lightbox/24c3112694df59a0e9/0>

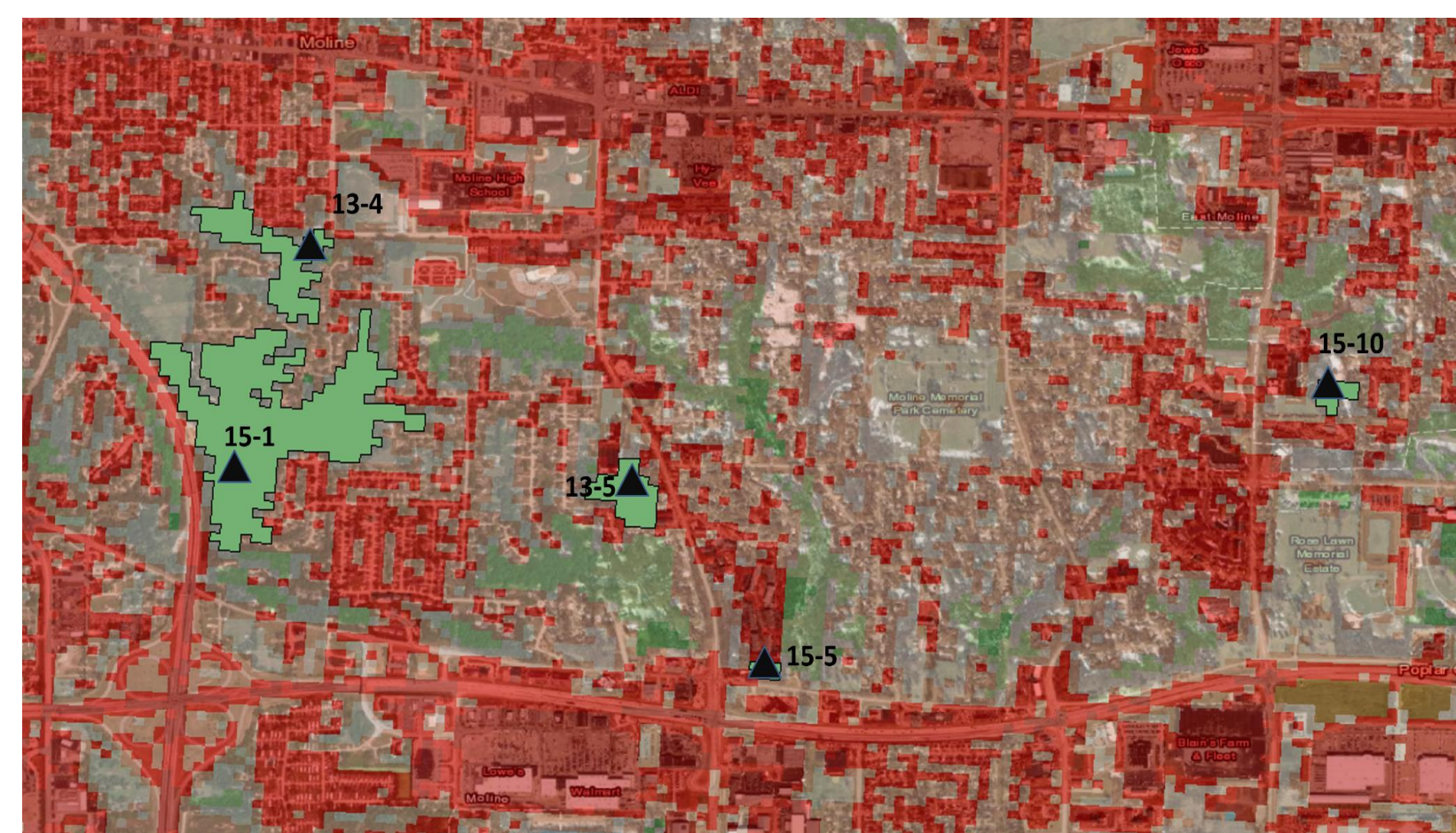


Figure 3: Map of our five study sites (black triangles with solid green polygons). Red shaded areas indicate urban development, green shaded areas indicate forested landscape.

Results

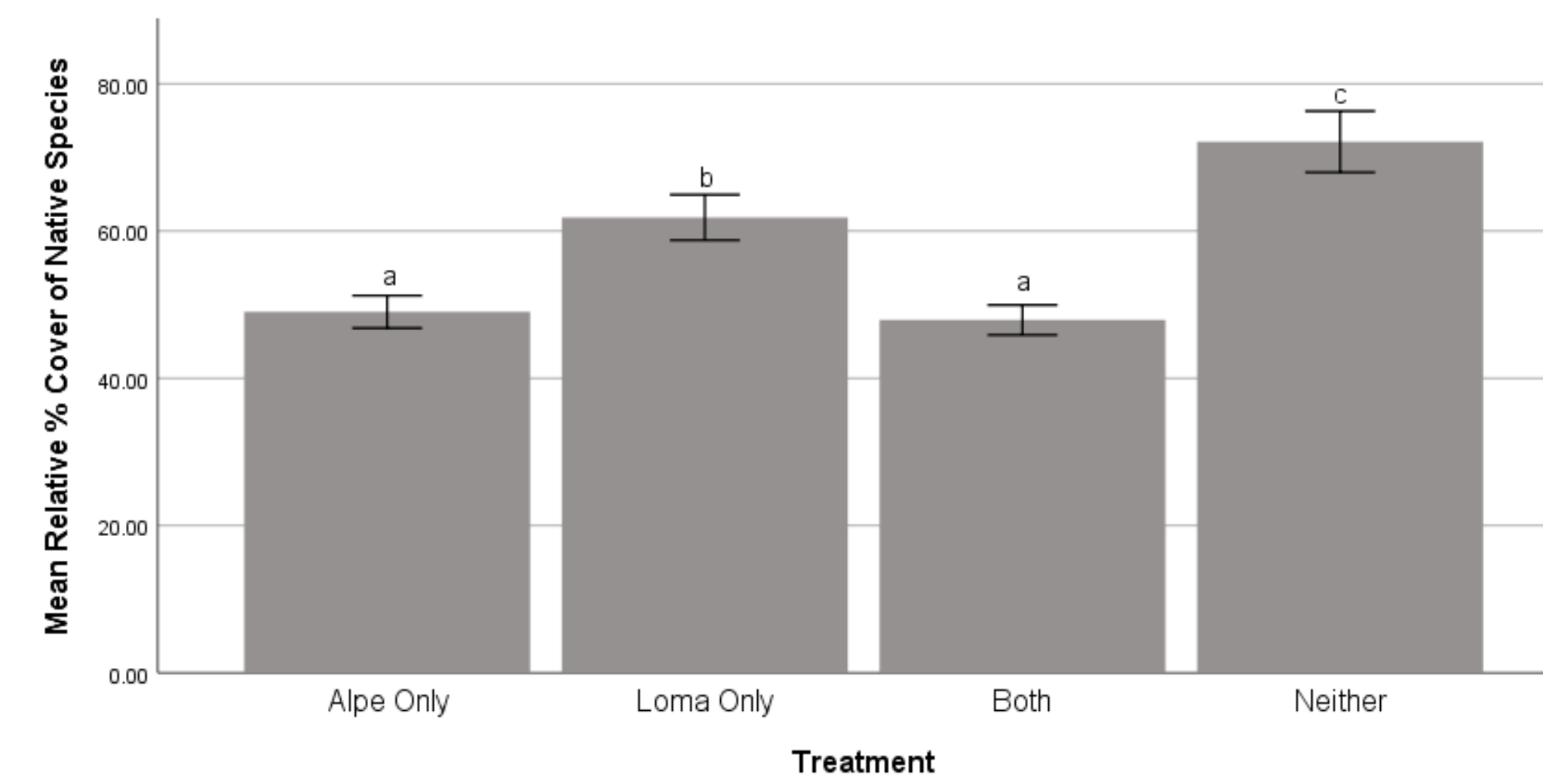


Figure 4. Native Relative Cover across treatments and sites (error bars are 1 standard error, lowercase letters denote Bonferroni adjusted differences $p < 0.05$). Native relative cover was greatest in the absence of invasives (ANOVA F-stat = 2.480, P value = .005). Alpe = Garlic mustard, Loma = Amur honeysuckle.

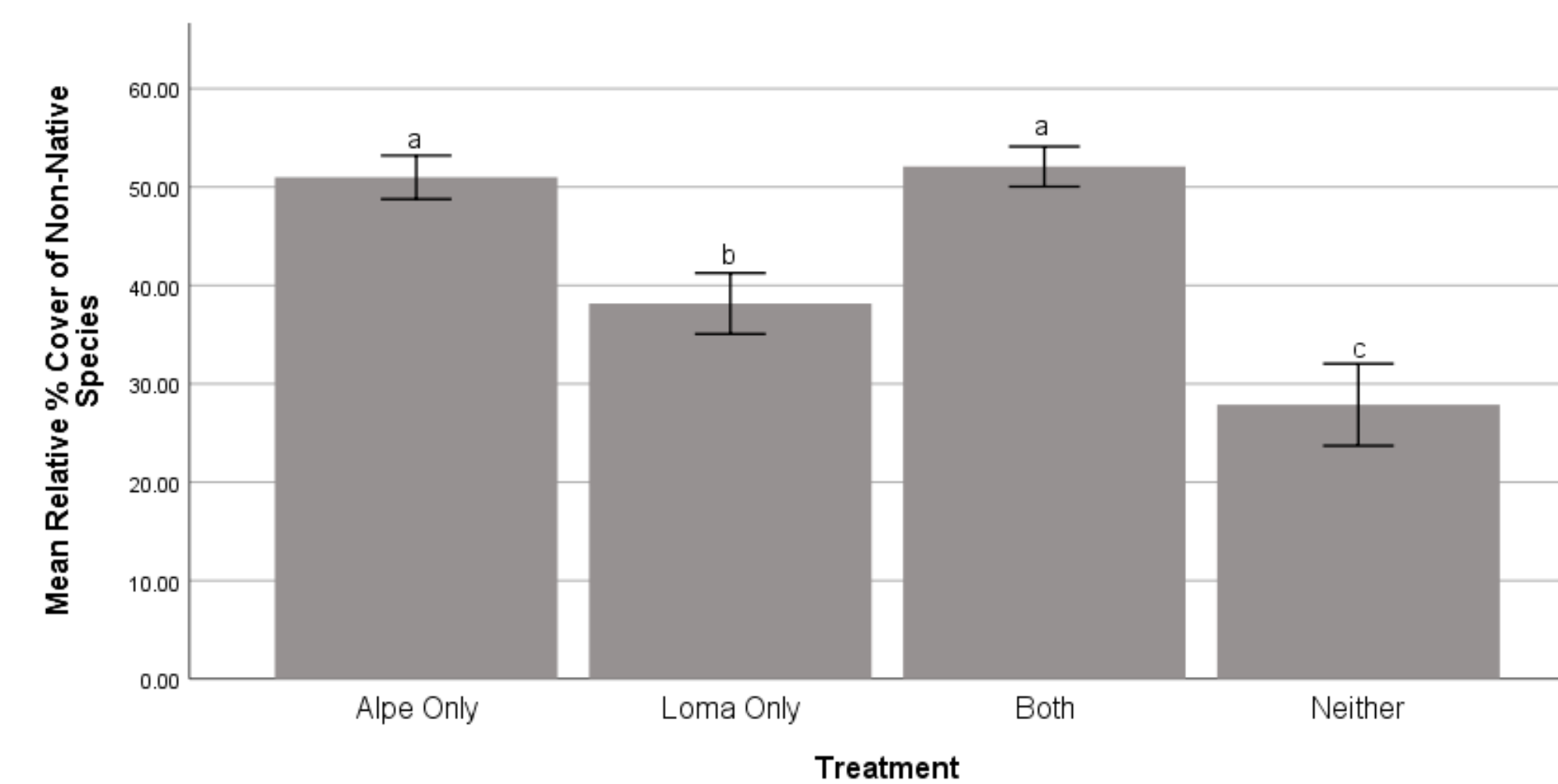


Figure 5. Non-Native Relative Cover across treatments and sites (error bars are 1 standard error, lowercase letters denote Bonferroni adjusted differences $p < 0.05$). Non-native relative cover was greatest in the presence of both invasives (ANOVA F-stat = 2.480, P value = .005). Alpe = Garlic mustard, Loma = Amur honeysuckle.

Native Shannon's H had a significant difference by site, but did not have a significant difference by treatment. (Site ANOVA F-stat = 4.770, P value = .001) (Treatment ANOVA F-stat = .426, P value = .735) (Site by treatment ANOVA F-stat = 1.296, P value = .222).

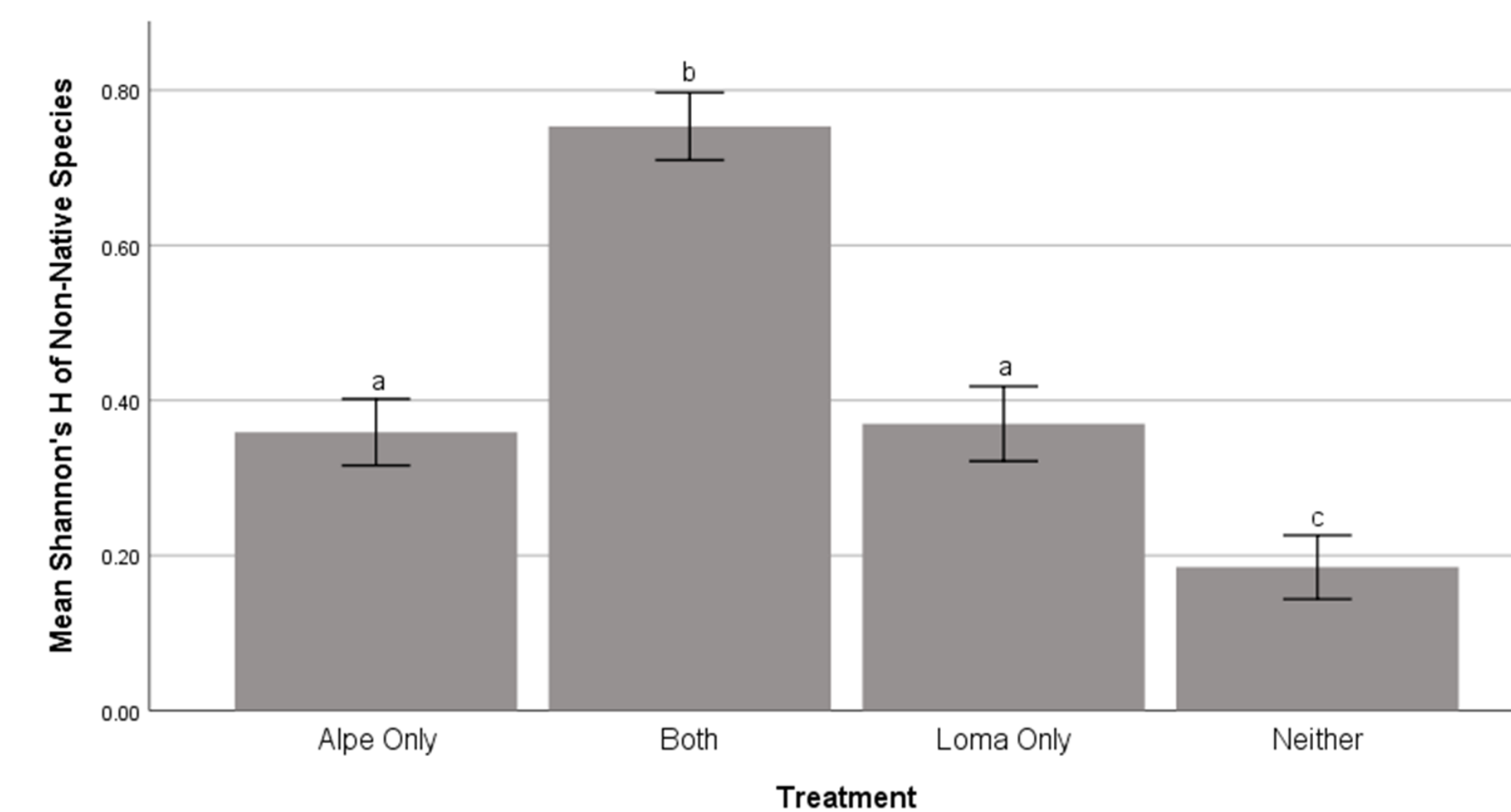


Figure 6. Non-Native Shannon's H across treatments and sites (error bars are 1 standard error, lowercase letters denote Bonferroni adjusted differences $p < 0.05$). Non-native Shannon's H was highest in the presence of both invasives (ANOVA F-stat = 3.010, P value = .001). Alpe = Garlic mustard, Loma = Amur honeysuckle.

Results

Native Richness had a significant difference by site, but did not have a significant difference by treatment. (Site ANOVA F-stat = 6.358, P value = <.001) (Treatment ANOVA F-stat = 1.999, P value = .115) (Site by treatment ANOVA F-stat = 1.423, P value = .157).

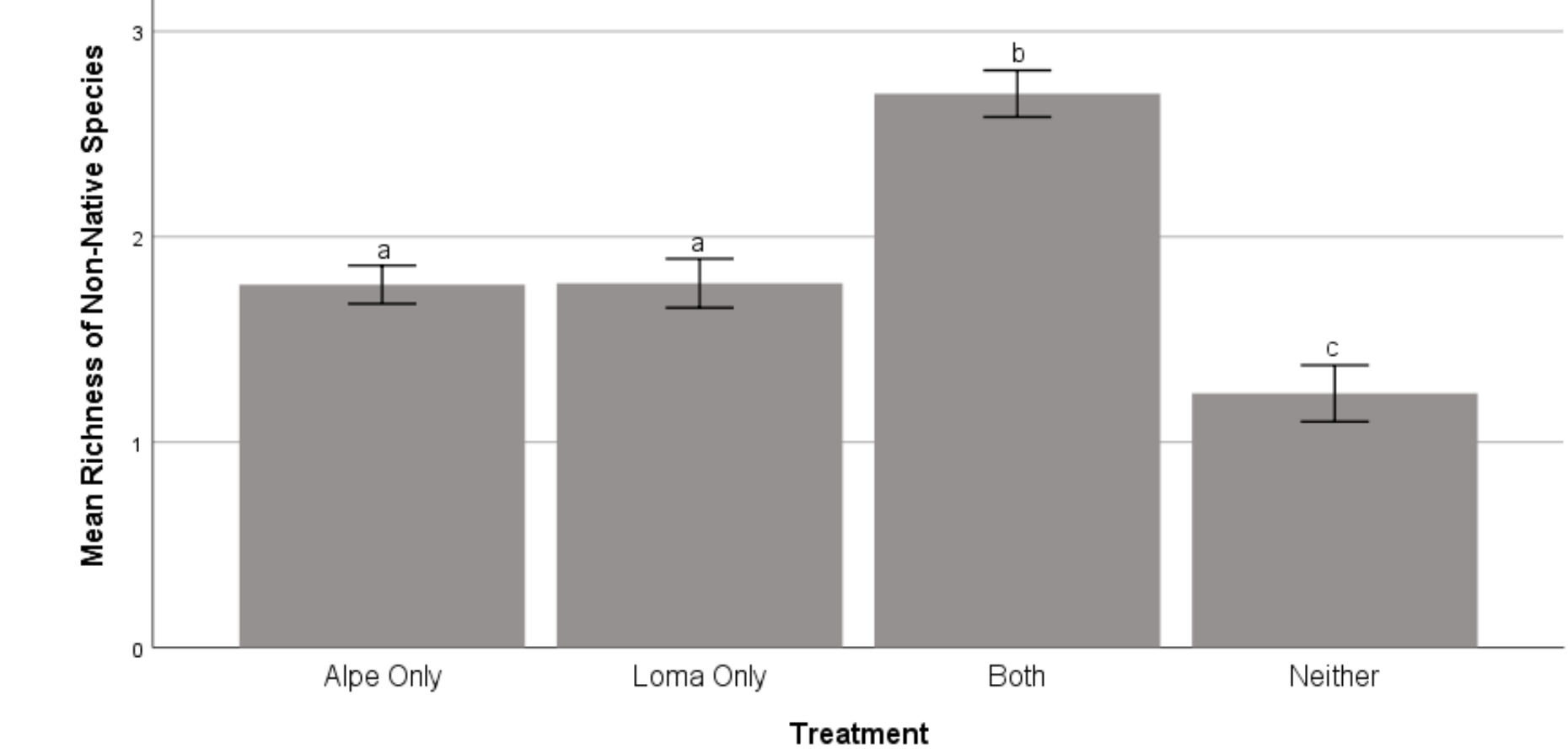


Figure 7. Non-Native Richness across treatments and sites (error bars are 1 standard error, lower case letters denote Bonferroni adjusted differences $p < 0.05$). Non-native richness was highest in the presence of both invasives (ANOVA F-stat = 3.327, P value = <.001). Alpe = Garlic mustard, Loma = Amur honeysuckle.

Discussion

- From our research question of how does Amur honeysuckle affect native plant species in the herbaceous understory, we conclude that honeysuckle affects total relative cover, Shannon's H diversity, and species richness of forested communities.
- There were site by treatment interactions for native and non-native relative cover, non-native Shannon's H, and non-native richness. There were also site interactions for native Shannon's H and native richness.
 - This is most likely due to the different levels of urbanization and development around the smallest of the sites. Therefore, edge effects play a larger role at these sites.
- Overall, our data are consistent with the literature, as the presence of invasive species causes native species cover to decrease while non-native diversity and richness will increase.
- Ecologically, a decrease in native species diversity, richness, and abundance harms the integrity of ecosystems.
- The dominance of invasive species can harm the conservation of healthy forested communities and reduce the efficacy of these ecosystems.

Literature Cited

- McNeish, Rachel E., and Ryan W. McEwan. "A Review on the Invasion Ecology of Amur Honeysuckle (*Lonicera Maackii*, Caprifoliaceae) a Case Study of Ecological Impacts at Multiple Scales." *The Journal of the Torrey Botanical Society*, vol. 143, no. 4, 2016, pp. 367–385.
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