

An Assessment of the Threat of Invasive Species on Reforestation Efforts within the Susquehanna Riverlands Lower Conservation Landscape

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Abstract

*The Susquehanna Riverlands Conservation Landscape is a greenway corridor along the east and west banks of the Susquehanna River that falls within York and Lancaster Counties. A greenway corridor consists of land of similar habitat types that are important ecological pathways for many native species of plants and animals. The Lancaster County Conservancy (LCC) currently owns and manages 28 preserves within the Conservation Landscape. This project will focus on two preserves, Reed Run and House Rock Nature Preserves, both within this conservation landscape. Within the two nature preserves, there are two invasive species threatening the current condition of these natural areas, that include, the Tree-of-Heaven (*Ailanthus altissima*) and the Spotted Lanternfly (SLF) (*Lycorma deliculata*) because of the trees' ability through potent biochemistry to establish itself very efficiently in a disturbed landscape and the newly-arrived non-native insect, the Spotted Lanternfly, which uses the Tree-of-Heaven as a host tree for reproduction. The purpose of this study was to assess these preserves for the distribution of Tree-of-Heaven and its impacts on native tree species in an effort to understand and reduce the populations and indirectly reduce the potential for SLF invasion into these preserves. Using population data previously collected, I measured the overall threat of the invasion of Tree-of-Heaven; soil, native tree measurements, and current degree of invasion using GPS location and mapping analysis software. The significance of this project is to provide an assessment of the level of threat from invasive species in this area to properly manage and preserve the landscape and minimize SLF infestations.*

Introduction

The Susquehanna Riverlands Lower Conservation Landscape (SRLCL) consists of 28 preservations that are currently managed by the Lancaster County Conservancy (LCC) and is located on the east and west banks on the Susquehanna River that flows through Lancaster and York Counties (Figure 1).

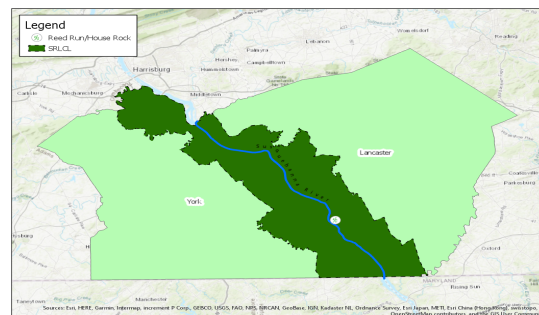


Figure 1. Map of Susquehanna Riverlands Lower Conservation Landscape

Invasive species create an environment that is not conducive to the health and growth of native species including key tree species which are a refuge for many native species of plants and animals. Tree-of-Heaven contains allelopathic chemicals, toxins which inhibit the growth and reproduction of an organism, in its composition. These allelopathic chemicals create difficulty for new and sprouting seeds.

A common invasive species in this region is Tree-of-Heaven, and has been documented in many of the LCC preserves under their management (Figure 2). This tree is native to Asia and is host tree for the newly arrived non-native insect, Spotted Lanternfly (*Lycorma deliculata*) (Pennsylvania Department of Agriculture, 2018).



Figure 1. Tree-of-Heaven (*Ailanthus altissima*) clipping

When an ecosystem is disturbed through human actions, the system becomes susceptible to the invasion of non-native species into these disturbed areas and threatens the surrounding native flora and fauna and ultimately alters the ecosystem (Small et al., 2010). The LCC has identified several areas (e.g., Reed Run and House Rock preservatons) already experiencing non-native species encroachment e.g., Tree-of-Heaven, and serious concerns have been raised with the invasion by other more recent non-native taxa, the Spotted Lanternfly within this landscape.

An effective way to assess the threat of an invasive species is by mapping the distribution and evaluating the potential for spreading by documenting factors such as land disturbance, tree health, soil parameters that facilitate dispersal (Bauman et al., 2013).

The purpose of this study was to assess the threat of the invasive Tree-of-Heaven, on native tree populations within the LCC Preserves and to apply management practices that mitigate invasive species distribution and furthermore, reduce the threat of the invasive species on native species.

Methods

To assess the threat of invasive species within the Lower Susquehanna Riverlands I will assess the distribution of Tree-of-heaven in two preservatons that lie within the SRLCL. Reed Run and House Rock preservatons lie along the riparian zone in Lancaster County that lies on the eastern bank of the Susquehanna River. The two preservatons contain multiple reforestation efforts which have a potentially high susceptibility to invasion by Tree-of-Heaven, due to the inherent disturbance of a reforestation area.

Species data is collected from within a 50 foot buffer surrounding the reforestation areas within Reed Run and House Rock. Trees are identified as Oak (sp.), *Ailanthus altissima*, or neither. If neither, no data is recorded. When an Oak sp. was positively identified, the location was marked on GPS and assessments of bark, bud, crown, and other health indicators were conducted. When Tree-of-Heaven is positively identified, locations were marked via GPS, indicators of tree health were noted, and the tree was inspected for insects.

Circumference was measured for all positively identified trees.

Coordinates of trees are georeferenced in ArcGIS, a popular mapping program, and assessed for proximity to Tree-of-Heaven. Oak health and size is compared to proximity to Tree-of-Heaven to assess threat of allelopathic chemicals released by Tree-of-Heaven.

Results

Findings indicate that Tree-of-Heaven produces alylchance, a byproduct of plant growth, which causes growth and regeneration barriers for native species, especially trees whose growth is facilitated by

Ecmycorrhizal Fungi (ECM). ECM are greatly impacted by alylchance (Small et al., 2010). After conducting a survey of the occurrence and distribution of Tree-of-Heaven, the resulting map shows that the presence of Tree-of-Heaven greatly impacts the native forest structure (Figure 3). Points on the map represent Tree-of-Heaven distributions within Reed Run and House Rock preservations. Tree-of-Heaven is known to establish itself very effectively in disturbed habitats both by vegetative growth and high levels of seed dispersal (Penn State Extension, 2018). In areas where alylchance has been established, there are very few new or established Oak trees. When Tree-of-Heaven is present, it is difficult for Oak trees to regenerate and populate a habitat therefore changing the population structure of the given habitat.



Figure 3. Map of Reed Run nature preserve and House Rock nature preserve with Tree-of-Heaven (*Ailanthus Altissima*) marked

Conclusion

Tree-of-Heaven (*Ailanthus altissima*) is highly effective at distributing itself and establishes well in disturbed areas. Reforestation areas are disturbed areas as they inherently create forest edge habitat types which are susceptible to invasion by non-native species. Reforestation areas are extremely important as they provide habitats for a wide range of species of native flora and fauna. *Ailanthus* has made an impact on the forest composition of the SRLCL as it not only inhibits growth of Oak trees but also Maple, Beech, and Birch trees (Bauman et al., 2013) which also make up a large population within the forests of Reed Run and House Rock. *Ailanthus* is also a vector for the invasive Spotted Lanternfly (Figure 4). As *Ailanthus* spreads, so will suitable habitats for the Spotted Lanternfly. Tree-of-Heaven and Spotted Lanternfly are currently being managed by the Lancaster County Conservancy and other conservation organizations.



Figure 4. Spotted Lanternfly (*Lycorma deliculata*)

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