# Spotted Lanternfly Host Preference in NYC

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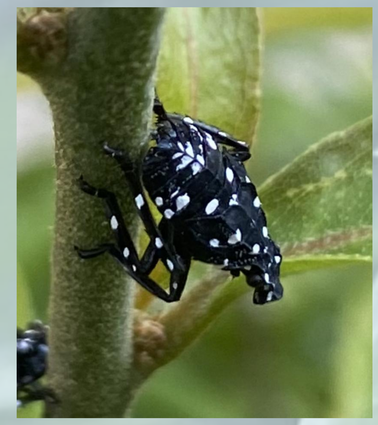
Woodlands Ecology Research Mentorship



## INTRODUCTION:

Spotted Lanternflies (SLF) are invasive insects that are spreading through the Northeastern U.S. These invasive bugs have no local predators, allowing for rapid population growth. The overpopulation of SLF leads to many plants being covered in them (Barringer and Ciafre 2020), which reduces plant fitness and can have severe economic impact on agriculture. In addition, the SLF produce a waste product, honeydew, that coats the leaves of trees they feed on as well as the understory, encouraging mold growth and preventing photosynthesis. The threat posed by SLF is well understood, but there are many questions that remain about the basic natural history of this invasive population. The purpose of this study was to analyze the life cycle of the SLF and their plant host preference in New York City, with particular interest on the preference of SLF nymphs. We found that although they are predominantly found on one species of invasive plant, tree of heaven (ToH), there are many other plant species that they will feed from, some of which are not reported in previous studies.

## METHODS:

18 parks and natural areas were surveyed across NYC for the presence of SLF. Their instars (life stage), location on plants, plant species, and abundance were recorded. GPS coordinates were also taken to record SLF location and distribution to monitor SLF presence and hotspots across NYC. Additionally, we recorded plant species that were not listed as hosts in the study of Barringer and Ciafre (2020) to determine whether the SLF are adapting to the U.S Northeastern habitat.We also recorded plants that lacked SLF presence to determine the species SLF find distasteful in hope to contribute to a control method.

## RESULTS:

We found a total of 6,839 Spotted Lanternflies through the course of our survey. 61.7% of the insects were found on the Tree of Heaven, with the next most popular plant, Sweet Briar, hosting only 11.8% of individuals (figure 1).
Of the 64 plant species we found SLF feeding from, 47 were species that have not been reported as SLF hosts. These plant species are listed in Table 1.

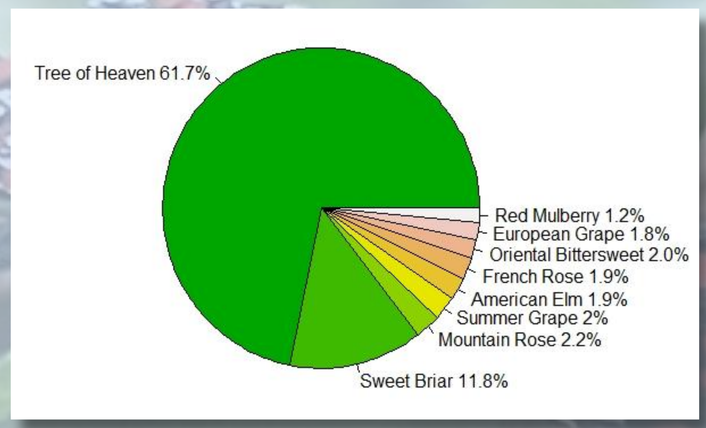



Figure 1: Top 9 host plant species and the proportion of SLF found on each.

| Species | Common name | Field studies + number | Percentage | Origin | Invasive? |
|---|---|---|---|---|---|
| Acer platanoides | Norway maple | Instar 1-2 (3), instar 4 (1) | 0.06% | Europe, Asia | Yes |
| Alnus viridis | Green alder | Instar 3 (10) | 0.15% | USA | No |
| Juniperus virginiana | Red cedar | Instar 3 (50), instar 4 (1) | 0.76% | USA | No |
| Fraxinus uhdei | Shamel ash | Instar 4 (1) | 0.01% | Central America | No |
| Morus rubra | Red mulberry | Instar 3 (3), instar 4 (81) | 1.23% | USA | No |
| Asclepias syriaca | Common milkweed | Instar 3 (4), instar 4 (17) | 0.31% | North America | Yes |
| Paeonia lactiflora | Common garden peony | Instar 1-2 (6), Instar 3 (4) | 0.15% | Southern Europe | No |
| Wisteria macrostachya | Kentucky wisteria cultivar | Instar 1-2 (2) | 0.03% | USA | Yes |
| Rosa virginiana | Virginia rose | Instar 1-2 (4) | 0.06% | USA | No |
| Momordica charantia | Bitter gourd | Instar 4 (40) | 0.58% | Africa, Australia | No |
| Vitis vinifera | European grape | Instar 1-2 (25), instar 3 (75), instar 4 (3) | 1.5% | Europe | Yes |
| Campsis radicans | Common trumpet creeper | Instar 1-2 (20) instar 3 (50), instar 4 (6) | 1.11% | North America | Yes |
| Tilia × europaea | European lime | Instar 1-2 (2), instar 3 (8), instar 4 (1) | 0.16% | Europe | No |
| Hydrangea quercifolia | Oakleaf hydrangea | Instar 4 (1) | 0.01% | North America | No |
| Phytolacca americana | American pokeweed | Instar 3 (4) | 0.06% | North America | Yes |
| Collinsonia canadensis | Richweed | Instar 4 (2) | 0.03% | North America | No |
| Ulmus americana | American elm | Instar 3 (22), instar 4 (111), adult (1) | 1.95% | USA | No |
| Ulmus glabra | Wych elm | Instar 3 (6), instar 4 (10) | 0.23% | Europe | No |
| Lonicera tatarica | Bush honeysuckle | Instar 4 | 0.03% | North America | Yes |
| Vitis rotundifolia | Muscadine grape | Instar 3 (45), instar 4 (10) | 0.80% | North America | No |
| Rosa wichuraiana | Wichura's rose | Instar 1-2 (1), instar 3 (18), instar 4 (6) | 0.37% | Asia | No |
| Forsythia viridissima | Greenstem forsythia | Instar 3 (1), instar 4 (1) | 0.03% | China | Yes |
| Rosa rubiginosa | Sweet briar | Instar 3 (131), instar 4 (674) | 11.77% | Europe, Asia | No |
| Angelica sinensis | Chinese angelica | Instar 3 (1), instar 4 (11) | 0.18% | Asia | No |
| Ipomoea hederifolia | Scarlet creeper | Instar 4 (2) | 0.03% | North and Central America | No |
| Gleditsia triacanthos | Honey locusts | Adult (17) | 0.25% | USA | No |
| Ampelopsis cordata | Heartleaf peppervine | Instar 3 (1), instar 4 (14), adult (1) | 0.23% | USA | No |
| Gymnocladus dioicus | Kentucky coffee tree | Instar 4 (5), adult (1) | 0.09% | USA | No |
| Maesa indica | Wild berry | Instar 1-2 (3) | 0.04% | Asia | No |
| Wisteria frutescens | American wisteria | Instar 1-2 (2) | 0.03% | USA | No |
| Rosa foetida | Austrian copper rose | Instar 1-2 (6) | 0.09% | Asia | No |
| Ixuchera villosa | Hairy alumroot | Instar 3 (4) | 0.06% | North America | No |
| Eurybia macrophylla | Bigleaf aster | Instar 3 (2) | 0.03% | North America | No |
| Parthenocissus tricuspidata | Boston ivy | Instar 3 (31) | 0.45% | Asia | No |
| Calystegia sepium | Great bindweed | Instar 3 (2) | 0.03% | Europe and Aisa | No |
| Cornus kousa | Cornus kousa | Instar 3 (2) | 0.03% | Asia | No |
| Quercus phellos | Willow oak | Instar 3 (21), instar 4 (2) | 0.34% | USA | No |
| Juniperus sabina | Savin | Instar 3 (4) | 0.06% | Europe and Aisa | No |
| Paeonia sect. moutan | Tree peony | Instar 3 (4) | 0.06% | Asia | No |
| Euonymus japonicus | Japanese spindle | Instar 3 (10) | 0.15% | Asia | Yes |
| Viburnum trilobum | American cranberry bush | Instar 3 (11) | 0.16% | North America | No |
| Rosa canina | Dog rose | Instar 3 (3) | 0.04% | Europe, Africa, Aisa | No |
| Helianthus tuberosus | Jerusalem artichoke | Instar 4 (1) | 0.01% | North America | Yes |
| Lilium michiganense | Michigan lily | Instar 4 (1) | 0.01% | North America | No |
| Chaenomeles japonica | Japanese quince | Instar 4 (1) | 0.01% | Asia | No |
| Silphium integrifolium | Whole leaf rosin weed | Instar 4 (35) | 0.51% | North America | No |

Table 1: List of SLF plant host species that are not reported as hosts in Barringer and Ciafre (2020), their popularity, and origin.

## DISCUSSION:

The Tree of Heaven (ToH) is known to be a preferred host plant for the SLF (Derstine et al. 2020). However, to our knowledge this is the first study to quantify this preference in the New York area. We found that an astonishing 61.7% of all SLF individuals were located on the ToH. Most of our surveys took place while the SLF were in their nymph stage, which may indicate that this tree is especially important for the development of this species. If this is the case, removal of the ToH may be an even more effective method of SLF control that previously thought (Mason et al. 2020).
However, we also found SLF nymphs on many other species, both invasive and native. In time, or in the absence of ToH, the SLF may exploit these other species to a greater degree. Persistent monitoring of the invasive SLF population as it becomes established in this region is needed in order to understand their impact, predict their damage, and design effective management strategies.

## LITERATURE CITED:

Barringer, L., & Ciafré, C. M. (2020). Worldwide feeding host plants of spotted lanternfly, with significant additions from North America. *Environmental Entomology*, *49*(5), 999-1011.

Derstine, N. T., Meier, L., Canlas, I., Murman, K., Cannon, S., Carrillo, D., ... & Cooperband, M. F. (2020). Plant volatiles help mediate host plant selection and attraction of the spotted lanternfly (Hemiptera: Fulgoridae): a generalist with a preferred host. *Environmental Entomology*, *49*(5), 1049-1062.

Mason, C. J., Walsh, B., Keller, J., Couture, J. J., Calvin, D., & Urban, J. M. (2020). Fidelity and timing of spotted lanternfly (Hemiptera: Fulgoridae) attack patterns on ornamental trees in the suburban landscape. *Environmental entomology*, *49*(6), 1427-1436.

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