



SPOTTED LANTERNFLY

Survey Protocol

AT A GLANCE

- The invasive Spotted Lanternfly (*Lycorma delicatula*) is an impressive and colourful insect that feeds on more than 100 species of trees and plants.
- The preferred hosts of this sap-sucking insect are tree of heaven, and wild and cultivated grapes.
- Prioritize inspection of host material around vineyards and campgrounds near border crossings.
- Host trees are inspected for signs and symptoms of the egg, nymph and adult stages.
- Overwintering “muddy grey” egg masses can be found on any hard surface near or on host trees.

1. Background and Objectives

The spotted lanternfly, *Lycorma delicatula*, (Hemiptera: Fulgoridae) called here SLF, is a colourful planthopper native to southeastern Asia. It's first known North American establishment was in Berks County, Pennsylvania, USA in September 2014 within a wooded area containing the non-native tree of heaven (*Ailanthus altissima*). Since that time, SLF has spread to 19 states and has proven to be a serious pest to grapes (both cultivated and wild) and can also attack hops, as well as wooded and residential areas with black walnut, maple, tulip, poplar, and black cherry. These insects are also efficient hitchhikers; the adults have been known to fly into open windows of cars, into picking bins and into the back of trucks while they are being loaded. As well, the females can lay eggs on any hard surface, making it easy to travel on camping gear, patio furniture, recreational vehicles, building materials, etc. Both nymphal and adult stages of SLF feed by inserting their specialized mouthparts directly into the phloem of plants, extracting the sugary sap and excreting large quantities of excess sugar (honeydew). This excreted sugar acts as a growth medium for sooty mold and encourages secondary invaders. The stress caused by an infestation could weaken a tree's defences and make it more vulnerable to attack from insects or pathogens. Due to its impressive dispersal abilities, wide host range, and feeding/excretion damage, it has been recognized as a high-risk pest in Canada. The survey strategy outlined below reflects current knowledge and is expected to evolve over time.

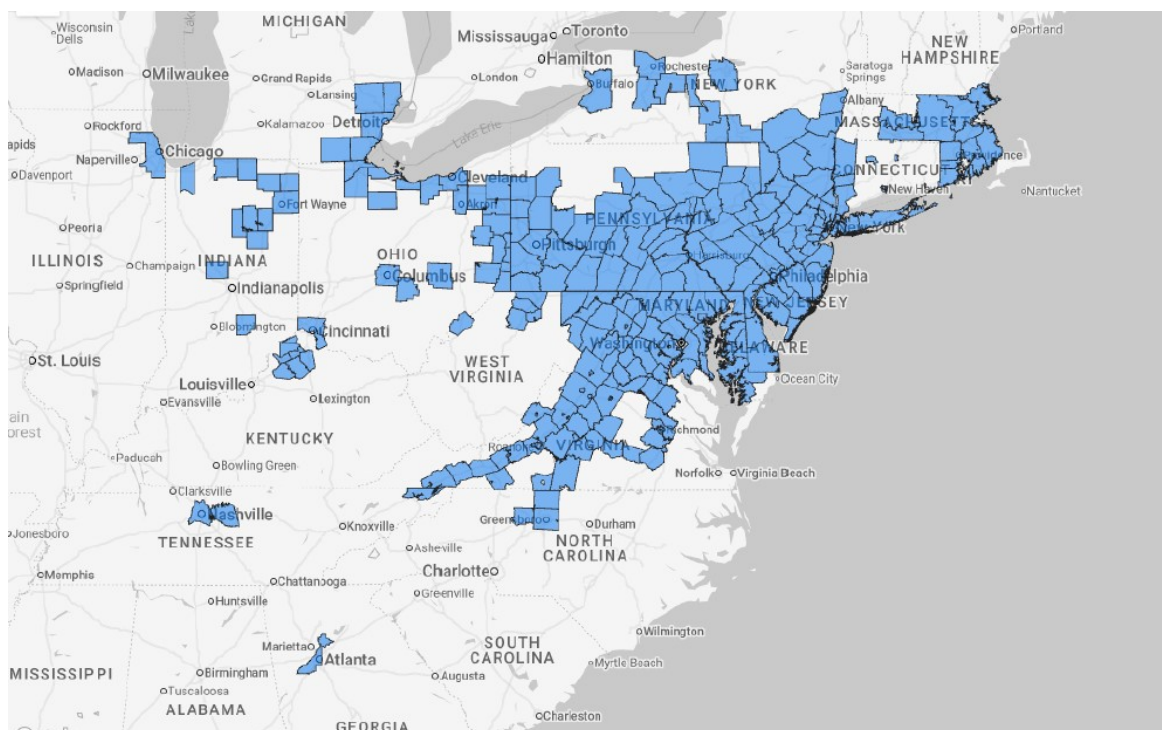


Figure 1. Spotted lanternfly in the United States (Credits: New York State Integrated Pest Management Program)

2. Target Life Stages

Spotted lanternfly has one generation per year. There are 4 nymphal stages which ultimately develop into adults; it overwinters within egg masses. Eggs hatch in May and June and the first instar nymphs disperse in search of a host. As this is a true bug, the SLF molts to progress between stages. Molting for second and third instar nymphs occurs over June and July. The first three nymphal stages are approximately ¼” long and black with white spots, while the fourth instar nymphs take on a red color and can be up to ¾” long. This stage can be found from July to September. All nymphal stages will feed from a wide range of plant species including grape (*Vitis*), apples (*Malus*), plums (*Prunus domestica*), cherries (*P. avium*), peaches and nectarines (*P. persica*), apricots (*P. armeniaca*), pine (*Pinus*), oak (*Quercus*), walnut (*Juglans*), hops (*Humulus*), maple (*Acer*) and poplar (*Populus*). The nymphs use their specialized mouth parts to pierce through plant tissue and suck sap directly from the phloem of leaves, stems, branches, and trunks.

Adult SLF also feed by sucking sap from the phloem of plants, but their mouth parts are stronger than the nymphs, which allows them to feed directly on older tissue. Although this insect does have a wide host range, the adults prefer to feed and lay eggs on the tree of heaven. The adults are active from July to December and are very noticeable. They are roughly an inch long and ½” wide at rest and have pinkish, tent-shaped forewings. The anterior 2/3 of the forewings are black spotted and the posterior 1/3 has a brick like pattern. When startled, or about to take flight, the wings spread about 2 inches wide to reveal the red hindwings with black spots and the yellow abdomen with horizontal black stripes. It’s unique coloration, as well as it’s tendency to congregate in large numbers, either at the base of the tree or in the canopy, make infestations easy to notice. They are easiest to locate at dawn and dusk when they are migrating up and down the tree.

Eggs are laid from September to November on any smooth host plant or non-plant surface adjacent to host plants, including bricks, stones, lawn furniture, vehicles, and other structures. Females can lay one or two egg masses, each containing 30-60 eggs, which appear like seeds arranged in 4 to 7 vertical rows. The female covers the egg masses in a grey, waxy coating that becomes darker and cracks as it dries, leading it to resemble a splotch of mud.

Feeding damage from SLF appears as “weeping wounds”. Weeping wounds are caused by excess sap being discharged from puncture site, and debris and honeydew excreted by the adults. These wounds appear as grey or black streaks along the stems, branches or tree trunks. These secretions can also prompt fungal growth and lead to mould patches occurring at the base of the tree which may give off a fermented odor and appear yellowish-white in color.



Figure 2. Lifecycle of the spotted lanternfly

3. Target Hosts

The non-native tree of heaven is the preferred host for adult feeding and egg laying. However, early instar nymphs do not show a significant preference for feeding on tree of heaven. Therefore, emphasis should be placed on other key hosts in the absence of tree of heaven, including but not limited to grape (wild and cultivated), walnut, hops and maple, a preferred late season host.

Ongoing emphasis should be placed on observing tree of heaven records in your region using the [Record your observations](#) feature in iNaturalist. **This data will assist in determining where to survey for SLF.**

4. Timing and Duration

If there are competing operational resources, SLF surveys can be conducted year-round as some signs and symptoms are present. However, as the visual survey primarily targets nymphs and adults try to complete the survey between June and October.

5. Target Areas and Site Selection

This survey should target known infestations of the non-native tree of heaven and where there is travel/tourism from United States, including but not limited to railyards, campgrounds, conservation areas, provincial parks, rest stops, forests near the U.S.-CAN border, particularly those in proximity to major transportation corridors and rail lines. In the absence of tree of heaven, other preferred hosts

should be examined. Vineyards or orchards near the border should be targeted, **especially if adjacent or close to US infestations**.

Detecting incipient infestations in a non-urban environment is very difficult. To focus your search in campgrounds and holiday destinations, determine if it is common for guests to come from the United States, particularly states with known infestations of SLF (Figure 1). If there are currently guests from infested States, begin by requesting to inspect the exterior of their vehicles or camping equipment.

6. Survey Methodology

6.1 Detection Survey

6.1.1 Visual

- A total of 30 preferred host trees/plants with emphasis on tree of heaven if present and surrounding objects should be inspected per site, extending the search up to 200 m from survey point.
- Ensure that the host trees inspected are randomly chosen and well distributed throughout the site.
- Around vineyards, balance a portion of inspection between the first 15 m of production and edges of neighbouring forest stands.
- Completely walk around the entire host plant/tree, scanning as much of it as possible; sooty mold often occurs along the trunk. Scan the ground as dead/alive nymphs and adults may be present. Scan the canopy with binoculars.
- Beating sheets maybe used to randomly sample foliage for nymphs during the nymphal period.

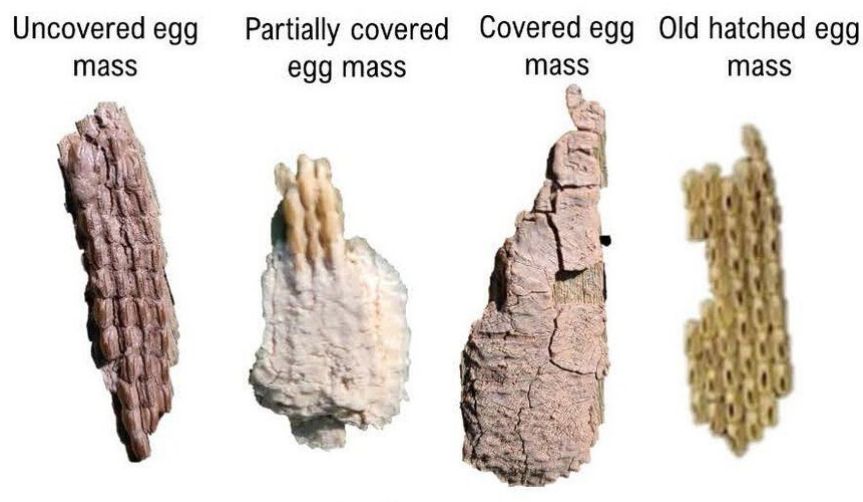


Figure 3. Variations in spotted lanternfly egg masses including color (yellow, grey, brown) and covering. Photos: Heather Leach.

6.1.2 Trapping

Trapping can be an effective detection strategy for SLF, specifically nymphs and to some extent adults. The BugBarrier Tree Band® is uniquely designed to provide an unobtrusive method to trap insects such as SLF that climb up the trunk of host trees in order to reach the canopy. The inward-facing adhesive minimizes by-catch and limits debris and dirt that can reduce detection efficacy. Traps can be deployed at a portion of your planned survey sites based on key risk factors. Traps can be established at select sites as follows:

- In preparation for the survey, the batting within the trapping kit can be cut in half along the horizontal plane.
- Trapping should occur between May and July to align with the nymphal emergence and feeding period
- Tree of heaven along the edges of woodlots/forest stands in proximity to high-risk areas is the primary trapping target. When tree of heaven is not present, traps may be established on black walnut, maple or oak.
- Wrap the batting around the trunk of the tree once at approximately 1-2 m above ground with a 2" overlap.
- Using the batting for reference, unroll the required amount of banding plus an additional 3"
- Cut the banding to size and remove the edge of the protective backing so it can be affixed to the batting
- Slowly remove the backing from the banding and affix it to the batting, sticky side in so that the top of the banding aligns with the top of the batting. Continue to remove the backing until the band is wrapped tightly around the batting.
- There should be some overlap at the end
- Make final adjustments to ensure the banding is not touching the surface of the tree
- Complete a mid-season trap check if resources permit by carefully removing the band and thoroughly inspecting the batting and inner band for any suspect SLF life stages. Ensure the band is thoroughly inspected during trap collection in late September.
- Visually inspect plant material and surfaces in the vicinity of the trap for SLF life stages before leaving the site.

7. Biosecurity Precautions

When visiting areas that are infested with SLF, staff must take the necessary precautions to ensure that the risk of spread is mitigated.

- Avoid placing survey equipment on or near the ground or near host plants/trees as SLF stages may hitch a ride.
- Examine clothing and equipment before getting into your vehicle to ensure you are not inadvertently moving life stages.
- Use lint rollers to ensure debris and potential hitchhikers are removed from clothing before leaving the site.
- Vehicles should be parked away from host plants/trees. Walk around and examine the car surface for life stages before departing.

8. Sample Handling and Laboratory Submission

8.1 Sampling Procedures

If Spotted Lanternfly signs are encountered during the survey, a digital photograph of the sign or symptom should be taken. If a nymph or adult is suspect, capture the suspect. Record the GPS or nearest street address of the location of the suspect. **Contact your local CFIA office** <http://www.inspection.gc.ca/about-the-cfia/offices/eng/1313255382836/1313256130232> or Area Survey Biologist cfia.surveillance-surveillance.acia@inspection.gc.ca.

8.2 Collaborative Data Management

Survey activities conducted for a regulated pest in accordance with the established CFIA survey protocol should be captured so that all collaborative efforts can be reported. Data for each site can be entered in a new Survey123 Site Form (Appendix 1). Alternatively, an Excel spreadsheet containing latitude and longitude coordinates and address for the site surveyed, host tree (for trap), organization details and coordinates for any suspect trees can be submitted to the CFIA cfia.surveillance-surveillance.acia@inspection.gc.ca. Possible suspects should always be reported in real time.

9. Supplies

- SLF pest cards and fact sheets for distribution.
- Utility knife
- Pruning shears and sanitizer
- HB pencils
- Permanent markers
- Maps
- GPS unit
- Flagging tape
- Rubber gloves
- Hand lens
- Binoculars
- Vials with leak-proof stoppers
- Paper labels that contain cotton (25-30% is ideal but any percentage is good)
- CFIA contact information sheets
- Protective footwear
- Sunscreen
- Drinking water
- Insect repellent
- Disinfectant
- First aid kit
- Hat
- Tick Removal Kit (e.g., <https://canlyme.com/product/tick-removal-kit/>)
- Beating sheet

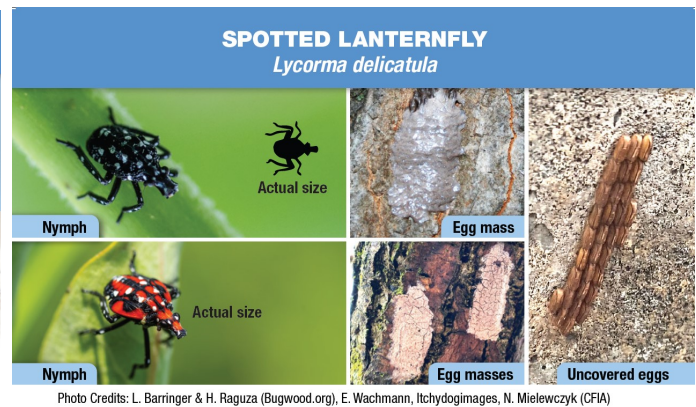
- BugBarrier Tree Band® kit
- Scissors

10. Supporting Documents and Additional Information

Spotted Lanternfly Information and Policy Documents:

<https://inspection.canada.ca/plant-health/invasive-species/insects/spotted-lanternfly/eng/1612895045716/1612895046419>

Spotted Lanternfly Pest Card



Appendix 1. Survey123 Access

1. Review [signs and symptoms](#) of SLF.
2. Download the free Survey123 app from iTunes or Google Play onto your mobile device. (you won't need an account to enter data - select *Continue without signing in*)



3. scan the following QR Code to the Community Science survey form on your mobile



4. When you are at popular tourist destinations, travelling from US back into Canada or just spending time outdoors, please look for SLF and record your findings on the Survey123 form.
5. If you think you have seen SLF or its egg masses, take a photo or video, catch the insect or scrape the egg masses, and put into a sealable container. Report it to CFIA immediately with the Survey 123 form and by reaching out.