



Spotted Lanternfly

Pest risk analysis summary



Image courtesy of Gregory Hoover.



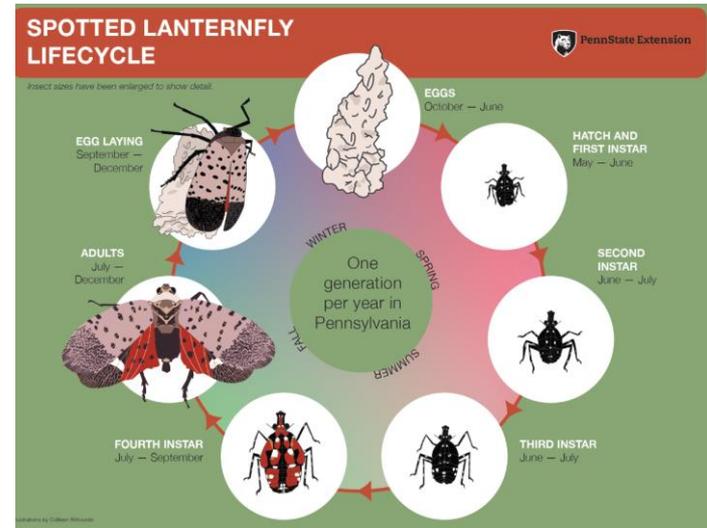
Spotted Lanternfly (SLF): Ministry for Primary Industries (MPI) Pest Risk Analysis



- This document assesses the biosecurity risks associated with SLF entering New Zealand via all likely entry pathways:
 - likelihood of entry
 - likelihood of exposure
 - likelihood of establishment and spread.
- The results of this work will support a review of the effectiveness of risk management on the main entry pathways for SLF:
 - sea containers and containerised goods
 - air containers and their contents
 - courier packages
 - nursery stock and cut flowers and foliage
 - personal effects and luggage
 - vehicles, machinery and equipment
 - forest products (wood packaging, sawn timber, poles piles rounds and sleepers)
 - vessels and aircraft.
- The analysis also considers surveillance, monitoring and management options.

Spotted Lanternfly (SLF) 101

- Native to China, Taiwan and Vietnam. Invasive in South Korea, Japan and more recently USA (Pennsylvania).
- 70+ hosts known to feed on. Kiwifruit is a host and SLF a pest in China and Korea. Host range is broadest during nymphal stages and narrow as adults.
- Overwinters as eggs - hitchhiker pest, usually as eggs. Entered Korea as egg masses on wood packaging and nursery stock and USA as eggs on paving stones.
- Key hosts for egg laying are tree of heaven, Korean evoidia and Amur cork tree. The first two are in New Zealand but scattered.
- Eggs laid on a smooth surface - usually under limbs and usually no more than 5m off ground.
- Largest impact reported is associated with sooty mould development from their honeydew excretions. Sooty mould also inhibits plant growth and facilitates wasp and ant population explosions.





Entry assessment summary

- No interceptions at the border (as at March 2020).
- The highest likelihood of entry is on inanimate pathways, forest products and associated with passenger personal effects.
- The life stage considered to be most likely to enter New Zealand is overwintering egg masses however temperature is a limiting factor for viable eggs. Egg hatching times vary with temperature. Eggs take 56 days to hatch at 15°C, 10-22 days at 25°C and 10 days at 30 °C. Hatching rates are very low to negligible at >30°C.
- However, given the hatching times at temperatures typically experienced on-board container ships, and the duration of journeys from countries where SLF is known to be present currently (2 week minimum from Asia), the likelihood of entry of viable unhatched eggs is considered low.
- Emerging nymphs are not expected to live longer than five days in the absence of suitable food. Adults are not expected to live more than three days without food.

Risk estimates of <i>Lycorma delicatula</i> on all pathways						
Risk assessment stage	Pathway	Considered to be:				
		Negligible	Very Low	Low	Moderate	High
Likelihood of entry	Inanimates					
	Air containers					
	Courier					
	Nursery stock					
	Cut Flowers and Foliage					
	Passenger Personal Effects					
	Forest Products					
	Vessels and Aircraft					
Likelihood of entry of specific life stages	Egg masses					
	Nymphs					
	Adults					

Negligible - Not worth considering; insignificant

Very Low - Close to insignificant

Low – Less than average, coming below the normal level

Moderate – Around the normal or average level

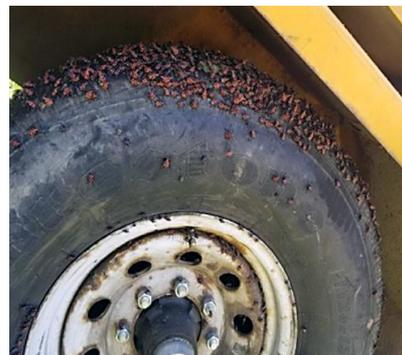
High – Extending above the normal or average level



Exposure assessment summary

- 70+ hosts recorded.
- For SLF temperature is only factor influencing egg hatching. Compared to Brown Marmorated Stink Bug (BMSB) which require a number of environmental cues for break diapause.
- High-risk period for overwintering SLF is Oct-May in New Zealand, and during this time, temperatures will be higher than the lower development threshold for eggs and nymphs (around 8 degrees).
- SLF overwinters as eggs, not adults. Adults die off during this time so we wouldn't expect to see live adults arriving at our borders in large numbers, unlike BMSB.
- If viable unhatched eggs were to arrive in New Zealand, the likelihood of exposure to suitable environmental conditions is considered:
 - moderate to high on vehicles
 - moderate on forest products and containers
 - low to negligible on other pathways.

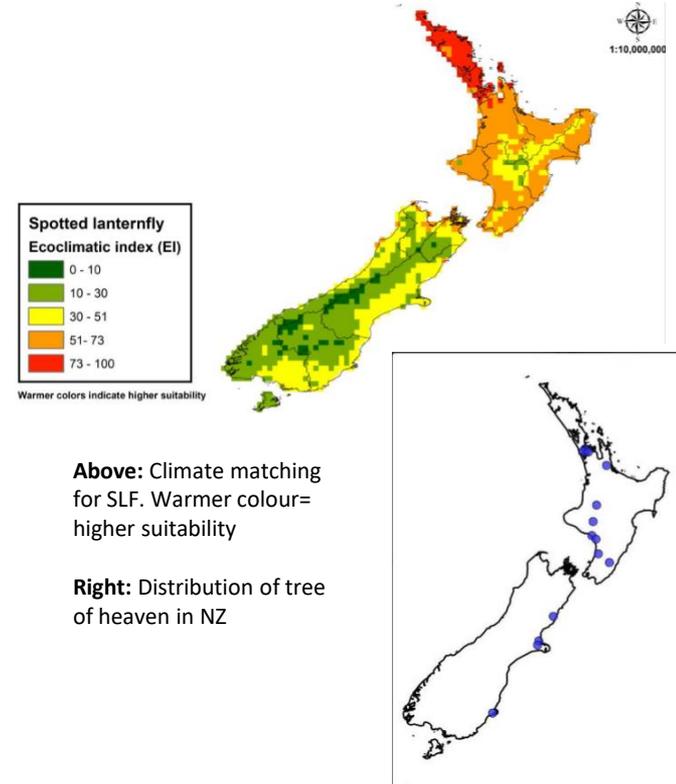
Risk estimates of <i>Lycorma delicatula</i> on all pathways						
Risk assessment stage	Pathway	Considered to be:				
		Negligible	Very Low	Low	Moderate	High
Likelihood of exposure	Inanimates					
	Air containers					
	Courier					
	Nursery Stock					
	Cut Flowers and Foliage					
	Passenger Personal Effects					
	Forest Products					
	Vessels and Aircraft					



Establishment and spread summary

- Climate matching with SLF known native and invaded distribution indicates a 70-80% similarity with New Zealand's climate.
- Given the broad host range of SLF and the presence of many of these hosts in New Zealand, including species indicated to be associated with egg laying, the likelihood that lack of hosts would be limiting to the establishment of SLF is considered very low.
- Broad host range, the climatic suitability of New Zealand, that females produce large numbers of eggs and given there is an absence of any effective surveillance tools for SLF, establishment of SLF is considered moderate to high.
- SLF is not a strong flyer, typically travelling no more than 40 metres in a single flight. SLF tends to fly into the wind and launches itself from higher in a tree for dispersal. So, natural spread considered slow.
- Human mediated spread is required for long distance spread, usually as egg masses.
- Spread from a small county in Pennsylvania in 2013 to 13 counties in 2017 - covering more than 15,000km²

Risk estimates of <i>Lycorma delicatula</i> on all pathways						
Risk assessment stage	Pathway	Considered to be:				
		Negligible	Very Low	Low	Moderate	High
Likelihood of establishment	Adults					
	Egg masses					
	Nymphs					
Likelihood of spread	Established populations					





Surveillance options

- Monitoring - no commercially available monitoring tools.
- Recent (2019) work looking into plant volatiles of tree of heaven and grapevines (preferred hosts) as attractants:
 - methyl salicylate was attractive to all stages and;
 - field trial proved a 2 fold increase in captures.
- Monitoring is reliant on visual inspection mostly.
- Light traps - experimentally attracted to blue light more but field tests are inconclusive.
- Adhesive bands around tree trunks - nymphs and adults walk up trees.



Management options



- Biological control
 - a native parasitic wasp, *Anastatus orientalis* up to 69%
 - a native nymphal parasite attacking 2nd and 3rd instars is part of a classic biocontrol research programme in the USA.
- Chemical control - broad spectrum pyrethroids. Talstar is most effective but SLF repopulates areas soon after insecticide sprays.
- Repellents - lavender oil reported to have significant repellent effect on adults.
- Host removal i.e. tree of heaven.
- Egg removal - scraping of overwintering eggs.
- Sticky Banding.

Northern hemisphere adjusted months

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Destroy egg masses												
Use sticky bands to capture spotted lanternfly												
Registered insecticides can be effective ¹												
Avoid moving gravid (fertilized) females ²												
Avoid moving viable egg masses ²												
Treat most tree-of-heaven (<i>Ailanthus altissima</i>) trees with herbicide ^{1,3}												
Treat tree-of-heaven "trap" trees with systemic insecticides ^{1,4}												





Summary of assessment

- The most likely life stage to enter New Zealand is considered to be overwintering egg masses that may be associated with a number of inanimate pathways including containers and their contents, vehicles machinery and equipment, forest products and personal effects.
- However, the likelihood of entry is considered low, based on a combination of egg development time, hold temperatures and life expectancy of nymphs in the absence of food.
- Should SLF arrive in New Zealand, climate matching with its known distribution indicates that climate is unlikely to be a barrier to establishment.
- In addition, many of SLF known hosts, including its preferred host, the tree of heaven, are present in New Zealand. The likelihood of establishment is therefore considered moderate to high.

BS1847: Spotted lanternfly, *Lycorma delicatula* (White 1845) review: biology, ecology and pest management with reference to kiwifruit

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Additional research from Innovation portfolio: Chinese translations of SLF impacts and Plant & Food Research report

- 6 Chinese publications of SLF causing impacts to kiwifruit.
- SLF was noted as a significant kiwifruit pest reducing vine vigour and in severe cases, causing vine death as well as sooty mould issues.
- Both adults and nymphs cause damage - nymphs can be seen in 100s on a single kiwifruit plant.
- Visual surveys for presence and monitoring of populations.
- Management
 - avoid planting preferred species (i.e. tree of heaven)
 - remove infested canes and egg masses in spring and winter pruning
 - chemical control.



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