Planning a Spongy Moth (LDD) Management Program

Integrated Pest Management (IPM)

The IPM framework is a decision-making process that determines what actions are needed to keep pest populations below levels that cause significant damage.

An IPM approach to developing a management program for spongy moth, also known as *Lymantria dispar dispar* (LDD) or Gypsy moth is recommended.

IPM uses cultural practices such as watering trees and proper pruning to decrease the need for pest management. It incorporates knowledge of the pest and its lifecycle along with current monitoring data to set thresholds and select treatment options to effectively and economically manage pest populations while causing the least amount of harm to the environment.

Spongy Moth Integrated Pest Management Considerations

Lifecycle and Growth

The spongy moth lifecycle has four distinct stages[1]. Control strategies are designed to target spongy moth at a specific life stage and must be timed appropriately for optimal results. Unlike most invasive species, spongy moth is considered naturalized [2] and has natural controls that help limit outbreaks[3]. Management strategies that incorporate multiple techniques across different life stages and consider native predator dynamics are most effective at managing spongy moth populations long term.

Tree Species

Healthy deciduous trees are typically resilient to pressures. They can survive 2 to 3 years of moderate to severe defoliation by drawing on stored energy to re-grow leaves [4]. Coniferous trees store their energy in their needles [5] and are less likely to survive a single year of severe defoliation [6].

Location

Location affects tree survival. Long-term impacts of spongy moth populations on the tree canopy vary between urban and natural forested areas since trees experience different conditions and pressures [7,11]. Management strategies and thresholds for action should be applied based on local conditions.

Spongy Moth Across the Region

2021 Impacts

Oak trees were heaviest hit, especially those found in warmer areas, higher elevations, forest edges and parks.

There was noticeable mortality of caterpillars due to nuclear polyhedrosis virus (NPV) and *Entomophaga maimaiga* fungus.

Egg masses were smaller and less abundant than in previous years and were were heavily impacted by parasitic insects and natural controls.

2022 Forecast

Severe infestations in the GTA are expected to be patchy or sporadic.

Cold winter temperatures should cause some egg mass mortality.

NPV, fungus, parasitic insects and predators are expected to play a large role in spongy moth mortality again.

Spongy Moth Management Tactics

Tactic and Timing	Pros	Cons	When/Where to Use	When/Where Not to Use
Egg Mass Scraping October to early May	• Materials are inexpensive and readily available • Does not require specialized tools or licenses	• Very labour intensive • Not efficient for woodlots or large areas • Some egg masses are too high in the tree to be reached safely	• For protection of individual backyard, boulevard, street and park trees • For use by residents, landowners, volunteer groups, municipal and conservation staff • In combination with tree banding and other tactics	• As the primary tactic in forests or large natural areas • When egg masses are primarily located on upper branches
Tree Banding/ Caterpillar Trapping May to July	• Materials are inexpensive and readily available • Very few off target impacts when applied correctly • Does not require specialized tools or licenses	• Very labour intensive (caterpillars need to be removed daily) • Only captures caterpillars that descend to lower part of tree (or trunk) • Can cause damage to trees if not applied properly using appropriate materials	• For protection of individual backyard, boulevard, street and park trees • For use by residents, landowners, volunteer groups, municipal and conservation staff • In combination with egg mass scraping and other tactics	• As the primary tactic in forests or large natural areas • When bands cannot be checked and emptied/replaced daily • Sticky products are not recommended at any time as they can impact native insects and wildlife [12]
Foliar Spray of Btk (Biological Insecticide) from the ground Two applications May to June	• Very effective • Safe for use around humans, mammals, birds and most other insects	• Expensive to apply and timing window is narrow • May be difficult to source product or licensed contractors • May not be able to reach top of large trees from ground or bucket truck • Will kill other native caterpillars present at the time of spray • Not efficient for woodlots or large areas	• Targeted application that can be applied to street or park trees in high-risk neighbourhoods for protection of individual backyard, boulevard, street and park trees • Following multiple years of severe/complete defoliation or where trees are subject to compounding pressures	• As the primary tactic in forests or large natural areas • In sites with difficult terrain or limited access to equipment • Near documented populations of lepidoptera Species at Risk
Tree injections (TreeAzin Insecticide) May to June	• Effective • Safe for use around humans, mammals, birds and most other insects • Protects the entire tree canopy	• Very expensive to apply and timing window is narrow • Risk of damaging or girdling trees with repeated application • Will kill other native leaf eating insects • Not efficient for woodlots or large areas	• For protection of individual backyard, boulevard, street and park trees • Following multiple years of severe/complete defoliation or where trees are subject to compounding pressures • In sites with difficult terrain or limited access to equipment	• As the primary tactic in forests or large natural areas • Where trees may be susceptible to secondary infection through injection wounds (eg: oak wilt) • Near documented populations of lepidoptera Species at Risk
Aerial Spray of Btk by Helicopter Two applications May to June	• Very effective for large areas • Safe for use around humans, mammals, birds and most other insects • Protects the entire tree canopy	• Expensive to apply and timing window is narrow • May be difficult to source product or licensed contractors • Will kill other caterpillars present at the time of spray • Widespread application of Btk can impact food availability for local wildlife (eg: breeding birds) • Requires long term intensive planning (6 months average lead time)	• For coverage of large swaths of forest, parks, or residential neighbourhoods • Following multiple years of severe/complete defoliation or where trees are subject to compounding pressures • To protect ecological integrity of rare/valuable forest communities or habitat for rare species • Where ground-based methods would be too extensive or cost prohibitive to apply	• Near documented populations of lepidoptera Species at Risk • For small areas, scattered sites, or when only a small portion of the forest will be impacted • In central urban neighbourhoods where trees are sparse • Where trees are healthy and have not been severely/ completely defoliated for multiple years • Where spongy moth can be effectively managed through ground methods (to reduce pesticide use)

Urban Versus Natural Areas and Thresholds for Action

Urban Park and Street Trees

Conditions

- Existing pressures include drought, soil compaction, salt, heat, pollution, pests and disease
- Hot, dry environments result in better tasting leaves for spongy moth[8]
- Spongy moth populations are typically more abundant at forest edges and in areas used by humans[9]
- Individual trees are more costly to replace/regrow
- Aesthetics and human health impacts from spongy moth may affect use of backyards and public spaces

Thresholds for Action

- There have been multiple years of heavy defoliation and/or there are significant other pressures
- Trees provide critical ecosystem services or recreational benefits
- There are a limited number of mature trees in the neighbourhood
- Concerns from residents

Trees in Natural Areas

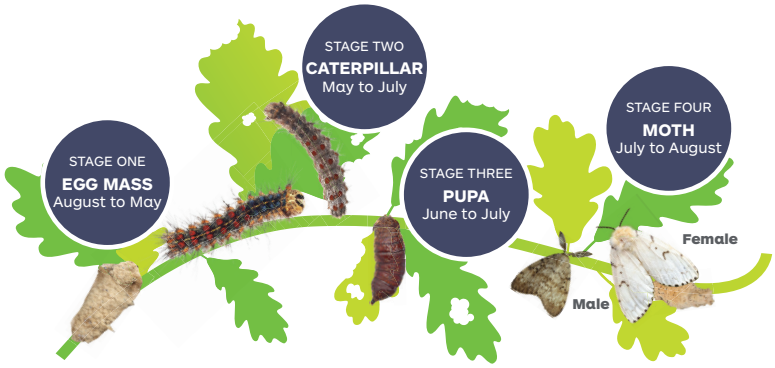
Conditions

- Existing pressures include drought, competition, pests and disease
- Natural areas are home to many predators of spongy moth caterpillars and their egg masses (birds, small mammals and parasitic insects)[10]
- Species composition and topography play a large role in which areas are impacted (eg. oak dominated stands on south and west facing slopes)
- Aesthetics and human health impacts from spongy moth may affect use of trails and public spaces

Thresholds for Action

- There have been multiple years of heavy defoliation and/or there are significant other pressures
- Area is a rare forest community type or provides food/habitat to rare species
- Area provides critical ecosystem services

Spongy Moth Life Cycle



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Prioritizing Treatment Areas

When establishing areas for active treatment consider:

- Amount of defoliation experienced in last 2 years
- Forecast level of spongy moth defoliation predicted for the coming year
- Species composition, elevation, proximity to other priority areas
- Additional pressures present (disease, soil compaction, drought)
- Ecosystem services provided (habitat, flood control, shade, etc.)
- Available funds and accessibility to professionals/ staff and equipment for management
- Potential impacts on non-target species

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References

1. Sadof, C. (2018, July 17). Will my trees recover after losing their leaves? Purdue Landscape Report. Retrieved February 16, 2022, from https://www.purduelandscapereport.org/article/will-my-trees-recover-after-losing-their-leaves/#:~:text=Healthy%20trees%20that%20have%20lost,likely%20to%20survive%20repeated%20defoliation.

2. Foster, J. R., Townsend, P. A., & Mladenoff, D. J. (2013). Spatial dynamics of a gypsy moth defoliation outbreak and dependence on habitat characteristics. Landscape Ecology, 28(7), 1307–1320. https://doi.org/10.1007/s10980-013-9879-8.

3. University of Wisconsin-Madison. (n.d.). Population cycle. Gypsy Moth (Lymantria dispar) in Wisconsin. Retrieved January 28, 2022, from https://fyi.extension.wisc.edu/gypsymothinwisconsin/life-cycle-and-biology-3/population-cycle/.

4. Sadof, C. (2018, July 17). Will my trees recover after losing their leaves? Purdue Landscape Report. Retrieved February 16, 2022, from https://www.purduelandscapereport.org/article/will-my-trees-recover-after-losing-their-leaves/#:~:text=Healthy%20trees%20that%20have%20lost,likely%20to%20survive%20repeated%20defoliation.

5. Davidson, Christopher B.; Gottschalk, Kurt W.; Johnson, James E. 1999. Tree mortality following defoliation by the European gypsy moth (Lymantria dispar L.) in the United States: a review. Forest Science. 45(1): 74-84.

6. Parry, D., & McCullough, D. G. (2004). Entomology | foliage feeders in temperate and boreal forests. Encyclopedia of Forest Sciences, 107–112. https://doi.org/10.1016/b0-12-145160-7/00031-4.

7. Safford, H.; Larry, E.; McPherson, E.G.; Nowak, D.J.; Westphal, L.M. (August 2013). Urban Forests and Climate Change. U.S. Department of Agriculture, Forest Service, Climate Change Resource Center. https://www.fs.usda.gov/ccrc/topics/urban-forests.

8. Mattson, W. J., & Haack, R. A. (1987). The Role of Drought in Outbreaks of Plant-Eating Insects. BioScience, 37(2), 110–118. https://doi.org/10.2307/1310365.

9. Bellinger, R. G., Ravlin, F. W., & Mcmanus, M. L. (1989). Forest edge effects and their influence on gypsy moth (Lepidoptera: Lymantriidae) egg mass distribution. Environmental Entomology, 18(5), 840–843. https://doi.org/10.1093/ee/18.5.840.

10. McManus, M., Schneeberger, N., Reardon, R., & Mason, G. (1989) Gypsy Moth. Forest Insect & Disease Leaflet 162. U.S. Department of Agriculture Forest Service. Accessed from: https://books.google.ca/.