

Lantern Fly Egg Scraper and Collection System

By Melodie Velez, Abdel Elgendy, and Will Levey
Advisor: Andrew Bachman



1A. Problem Identification

- The lanternfly can cause serious damage to trees and other plants
- When lanternflies feed they produce honeydew that encourages the growth of black mold



1B. Problem Identification

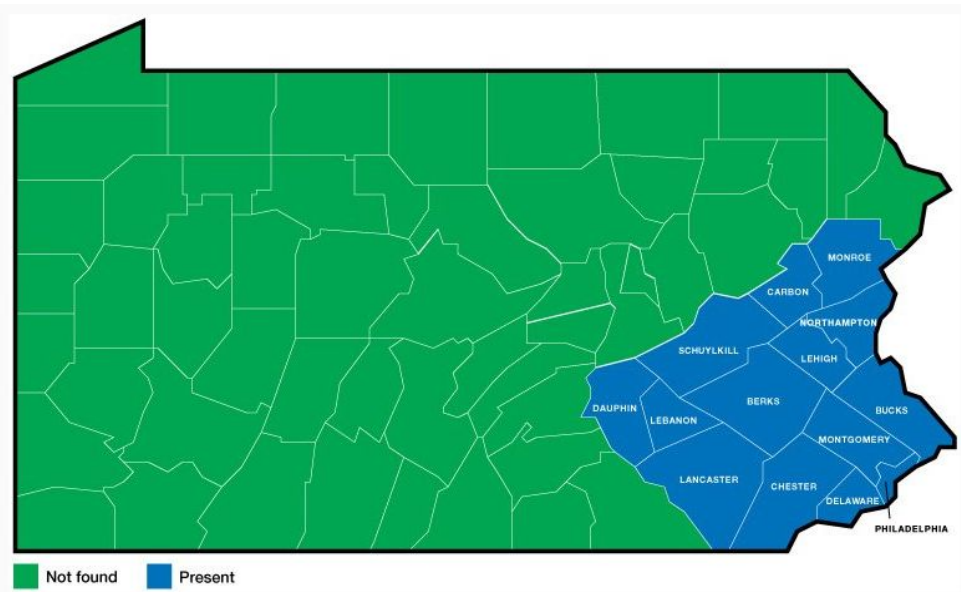
Penn State study: Spotted lanternfly spread could cost Pa. \$324 million, thousands of jobs [5]

<https://www.centredaily.com/news/local/education/penn-state/article239390088.html>

2. Research and Investigation

Scientists say the best way to get rid of the spotted lanternflies is to scrape the egg sacks off of the tree using a card.

This can be problematic because they fall on the ground and sometimes you can't reach high enough



[1]

3. Possible Solutions

- Ice Scrapers
- Bags
- Rubbing Alcohol Spray



[4]

4. Best Solution

- Combination
- Attachable to broom handle for extra height
- A flexible basket for the bag to go in
- Modeled after a paint roller and ice scraper



[5]

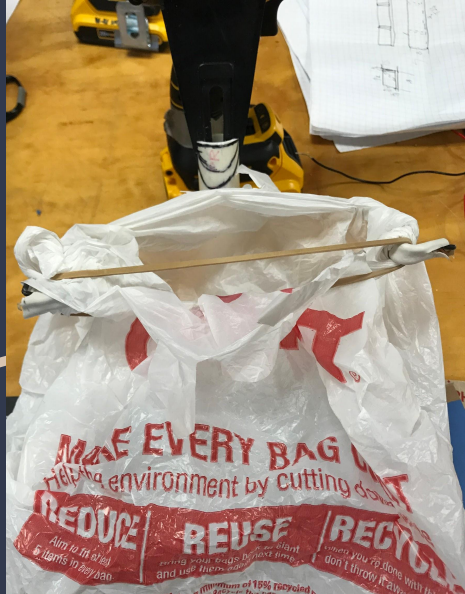
5. Developmental Work

- Iterative Process
- Poka Yoke
- FEA
- DFX
- DFA
- DFM

We had these 6 ideas in mind when we started construction

[Explanation Video](#)

Proof of Concept / Functional Model:



Handle and Blade “Key” & Handle Threads for Broomstick

FEA (Finite Element Analysis):

- Fit of Blade into Handle
 - Oops! Not enough clearance!
- Threads
 - Many iterations with varying thread pitch, geometry, thread depth

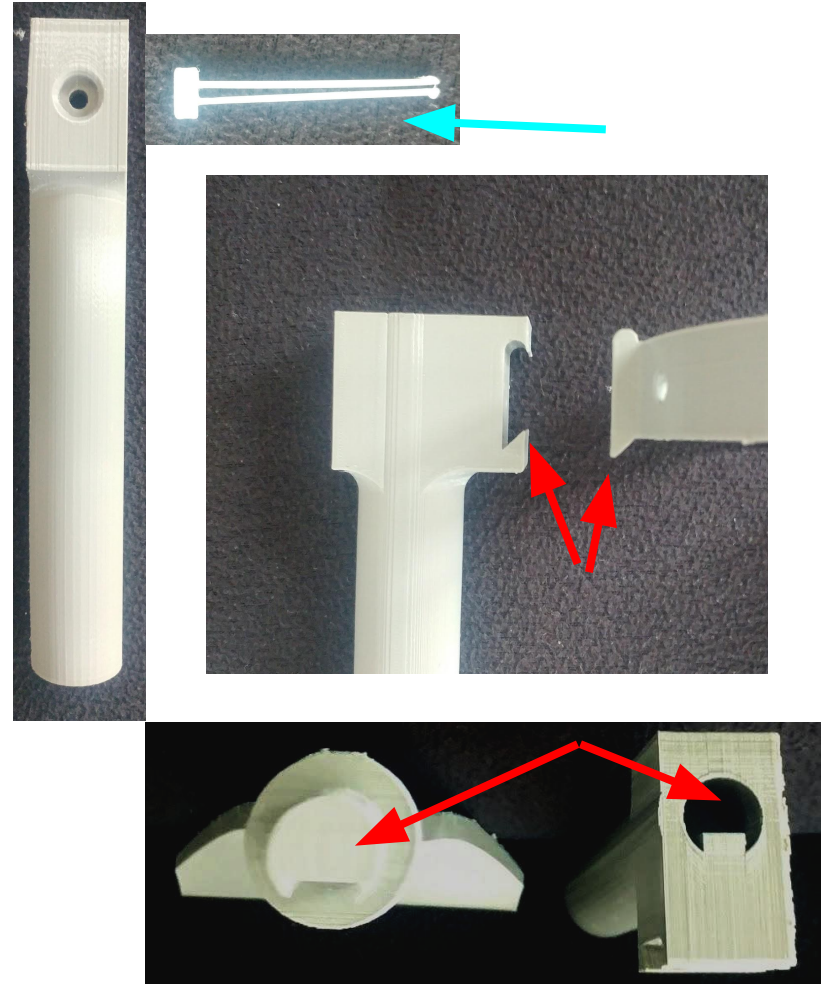
DVA (Dimensional Variation Analysis) for Handle and Blade

- Design had 0.02” difference
- When printed, the fit was too tight.
- Needed to increase to 0.04”



Design for Assembly (DFA):

- Poka Yoke “Mistake Proofing” for Assembly
- “Keyed” so there is only 1 way to assemble
- Pin locks all parts together and is easy to remove



Iterative Process/FEA:

Fence:

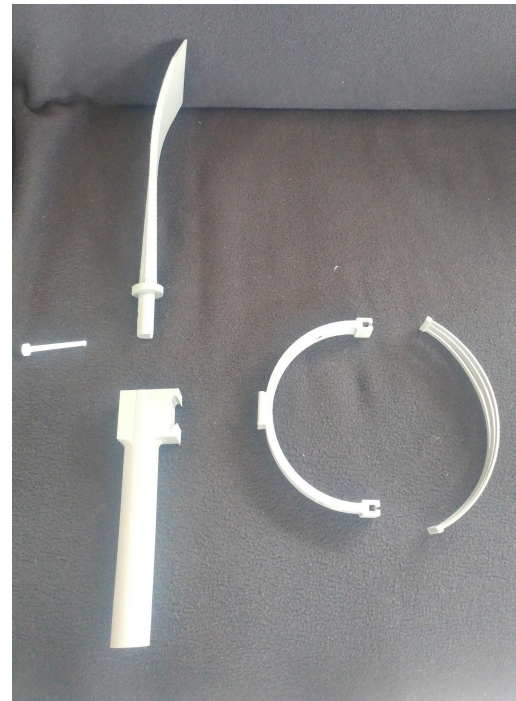
- Top:
 - **Too thick** = Not Flexible
 - **No slots** = cannot secure grocery bag
- Bottom:
 - **Thinner** = flexible
 - **Slots** = can weave bag to secure



6 A. Prototype Components: Orthographic Projection



Assembly View:



6B. Prototype

- 5 Assembled Parts
- 3D-Printed Separately

[Assembly Video](#)



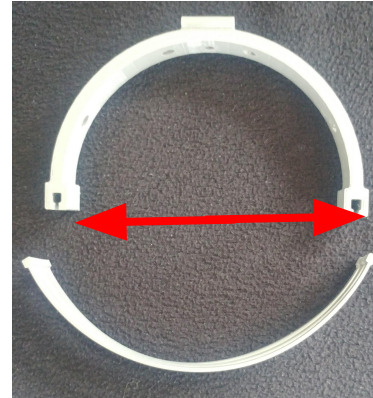
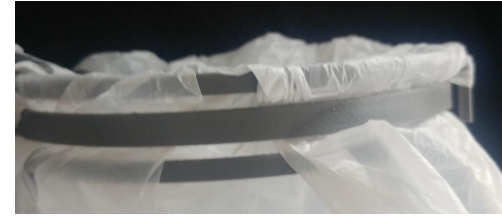
7A. Test and Evaluate:
More Testing Needed (If Given
More Time)

Securing Bag to Basket:

- Holes v. Slots to secure bag

Basket Size:

- **Larger Basket** effects Reach Angle
- **Larger Angle** = Cannot reach high and must be further from tree trunk



7B. Test and Evaluate



Product Demonstration

[Demo Video](#)

Video of this Presentation

<https://drive.google.com/open?id=171-O50ouCqEIYR8LNYLbW0qRWjZ3TcEE>

Works Cited

[1]

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[2]

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[3]

<https://www.inquirer.com/science/spotted-lanternfly-eggs-kill-trees-insect-invasive-20190925.html>

[4]

<https://www.amazon.com/AmazonBasics-Snow-Brush-Ice-Scraper/dp/B071F6W896>

[5]

<https://www.centredaily.com/news/local/education/penn-state/article239390088.html>