



# Spotted in the City: A Citizen Science Approach to *Lycorma delicatula* Population Dynamics

JOZSEF BALATONI



## Introduction



The spotted lanternfly, *Lycorma delicatula*, is an invasive planthopper that is currently wreaking havoc on the US agricultural sector, with millions of dollars in losses due to their voracious phloem feeding<sup>1</sup>. Through large campaigns in New York, *L. delicatula* has garnered an infamous reputation in the boroughs. This study had a twofold approach to visualizing the changes through citizen science: one focused on a content analysis of the most popular TikTok videos of *L. delicatula* and the relationship between the dominant themes observed in videos and the population fluctuations over the past three years in New York City. The second study uses iNaturalist to assess the population fluctuations of *L. delicatula* in Eastern US states, comparing it to data observed of the species in the Bronx Zoo in a July 2024 study.

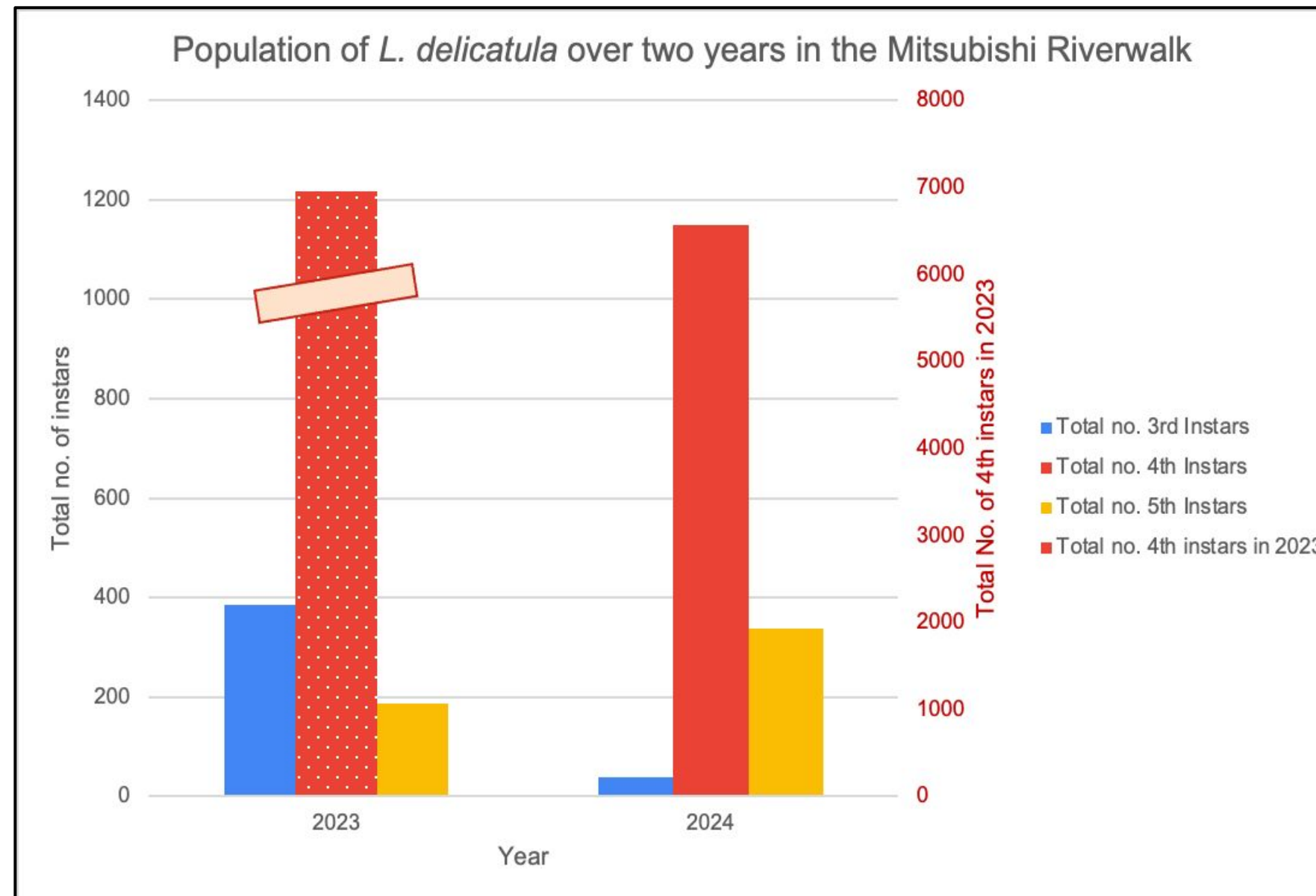


Figure 1: Bar graph displaying *L. delicatula* population over two years, separated by instar stage. In 2023, the bar is abbreviated to scale to compare to other instar abundances<sup>3</sup>.

Michele Vitolo  
*Searching for Spotted Lanternflies with Citizen Science*

"Spotted lanternfly (*Lycorma delicatula*) is an invasive planthopper insect native to East Asia that has been present in eastern North America for ten years. What is not well understood about this insect is how its populations in the states that it is present in changed over recent years due to its spread.<sup>2</sup> A survey from May to August of 2024 sought to measure the change in the population of *L. delicatula* at the Bronx Zoo. This study aimed to determine whether their findings relate to population trends in different states in proximity to the Bronx Zoo or to the origin of *L. delicatula* expansion. To do this, *L. delicatula* observations were collected from iNaturalist, a citizen science database where people can submit pictures of organisms to contribute to the database. These sightings were controlled for by each state and a three month period from May to August to align with the Bronx Zoo survey. The populations of *L. delicatula* in New Jersey and Pennsylvania experienced a net decrease in sightings from 2022 to 2024, while in New York and Connecticut, the populations increased during the same time period. While the population in New York decreased from 2023 to 2024, Connecticut only experienced increases during all three years of observations. This suggests that as *L. delicatula* spreads to different areas, the populations experience increases in population before stabilizing. Further research should look into whether public awareness of the dangers of *L. delicatula* affect the number of sightings."

These two projects further the scientific inquiry from the summer as both aim to visualize the trends of iNaturalist observations in comparison to novel perspectives – one around social media, and the other around population dynamics as it relates to our summer findings.

## Synopsis of Summer Research

In July and August 2024, our research aimed to assess the behavioral interactions of predators. with the goal of considering them as biological control agents for *L. delicatula* through all instar (growth) stages. Through continuous ethograms of various cone traps in the Mitsubishi Riverwalk, this study also continued an overall population assessment of *L. delicatula* in the Bronx Zoo starting in 2023<sup>2</sup>. We found that there was a 132% decrease in the population of lanternflies since 2023. Our ethogram studies indicate wasps and ants as the primary arthropods that exhibit interspecific agonistic behaviors towards *L. delicatula* (Figures 1 and 2).

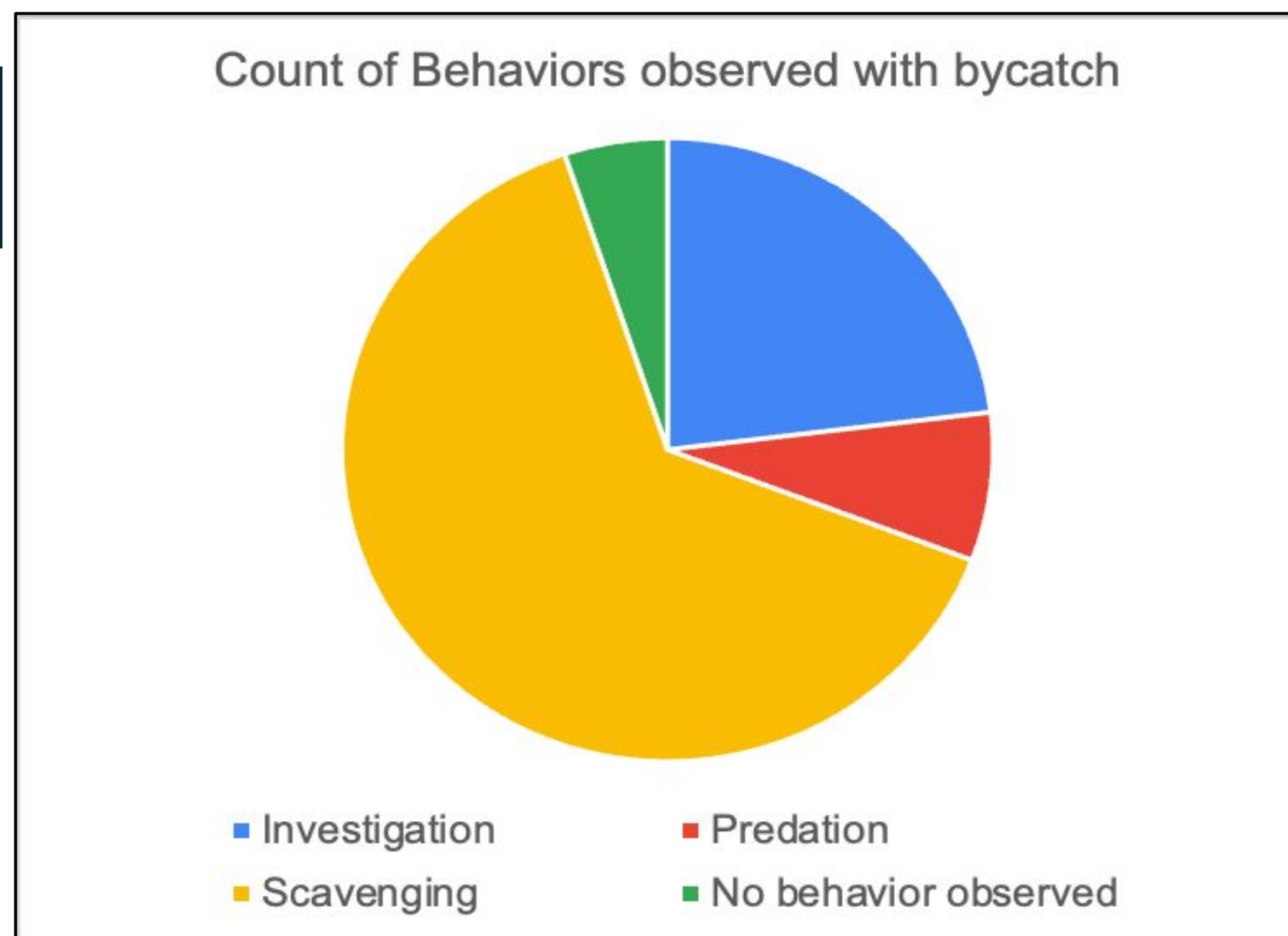


Figure 2: Target behaviors observed during ethograms of cone traps<sup>3</sup>.

Diannely Castillo, Ashley Martinez, Denasia Stewart  
*Tick Tock: An Observation of Population Percentages of Spotted Lanternflies in New York City Through Social Media*

"The Spotted Lanternfly (*Lycorma delicatula*) is an invasive plant hopper native to East Asia. TikTok, being one of the most popular informational apps in the world, is filled with an abundance of sources that could potentially be utilized for a variety of studies such as assessing the influence a certain species has in an area, and how the public might react to the actions of this species. In our research, we utilized TikTok in order to compare content about spotted lanternflies to iNaturalist data of spotted lanternflies in New York City throughout the years of 2022-2024. Our research consisted of overviewing the populations of spotted lanternflies within a given year, and how they correlated with our selected themes on TikTok (positive, neutral, and negative). To further confirm our collections of data, lanternfly abundance information was collected through iNaturalist. Through using iNaturalist, we were able to view the number of observations of spotted lanternflies in all 5 boroughs of New York City during the past 3 years. A total of 5,457 lanternflies were documented in 2022, 3936 in 2023, and 3581 in 2024. Understanding that these observations came from local citizens on iNaturalist, it confirmed our hypotheses regarding how videos on Tik Tok can correlate to trends observed with actual lanternfly observations."

## Acknowledgments

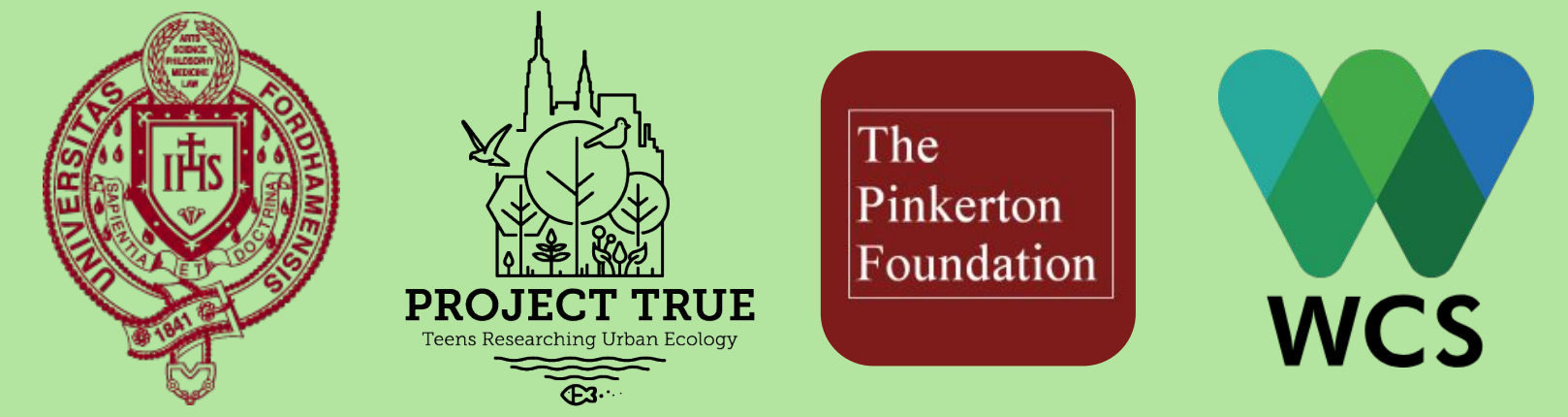
We would love to thank Max Falkenberg and Dr. Lowell Iporac for their unyielding counsel and guidance, Tess Levinson for her instruction and insight on citizen science, and our friends and family for their love and support.

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# Searching for Spotted Lanternflies with Citizen Science

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## Introduction

The spotted lanternfly (*Lycorma delicatula*), which will be referred to as *L. delicatula* from this point on, is an invasive planthopper insect that feeds on tree sap, is native to East Asia, and has been present in Eastern North America since 2014<sup>3,4</sup>. Ever since its introduction, it has caused widespread negative impacts on the native ecology of these areas due to its feeding habits<sup>4</sup> (Image 1) and a lack of predators in this new environment. During a three month period from May to August 2024, a survey was conducted to research the population of *L. delicatula* at the Bronx Zoo. The results that were found during this survey suggested a decrease in the *L. delicatula* population compared to the same timespan in 2023. According to our research, observations of *L. delicatula* at the Bronx Zoo decreased by 132% from 2023 to 2024. Since this decrease in *L. delicatula* was observed, it prompted the question of whether a similar decrease in population was taking place at a larger scale and in other states during the same time period. This research project aimed to answer how the populations of *L. delicatula* changed in New York, New Jersey, Pennsylvania, and Connecticut, chosen due to being close to either the Bronx Zoo or the origin point of the spread of *L. delicatula* across the Northeast using iNaturalist.



Image 1: Spotted lanternflies feed on the sap of trees<sup>5</sup>

## Abstract

Spotted lanternfly (*Lycorma delicatula*) is an invasive planthopper insect native to East Asia that has been present in eastern North America for ten years. What is not well understood about this insect is how its populations in the states that it is present in changed over recent years due to its spread.<sup>2</sup> A survey from May to August of 2024 sought to measure the change in the population of *L. delicatula* at the Bronx Zoo. This study aimed to determine whether their findings relate to population trends in different states in proximity to the Bronx Zoo or to the origin of *L. delicatula* expansion. To do this, *L. delicatula* observations were collected from iNaturalist, a citizen science database where people can submit pictures of organisms to contribute to the database. These sightings were controlled for by each state and a three month period from May to August to align with the Bronx Zoo survey. The populations of *L. delicatula* in New Jersey and Pennsylvania experienced a net decrease in sightings from 2022 to 2024, while in New York and Connecticut, the populations increased during the same time period. While the population in New York decreased from 2023 to 2024, Connecticut only experienced increases during all three years of observations. This suggests that as *L. delicatula* spreads to different areas, the populations experience increases in population before stabilizing. Further research should look into whether public awareness of the dangers of *L. delicatula* affect the number of sightings.

## Research Questions & Hypotheses

**Question:** How has the number of *L. delicatula* observations changed over three years in different US states compared to the Bronx Zoo in a similar time period?

**Hypothesis:** The populations of *L. delicatula* in these four states would follow the same downward trend in population as they did at the Bronx Zoo.

## Results & Figures

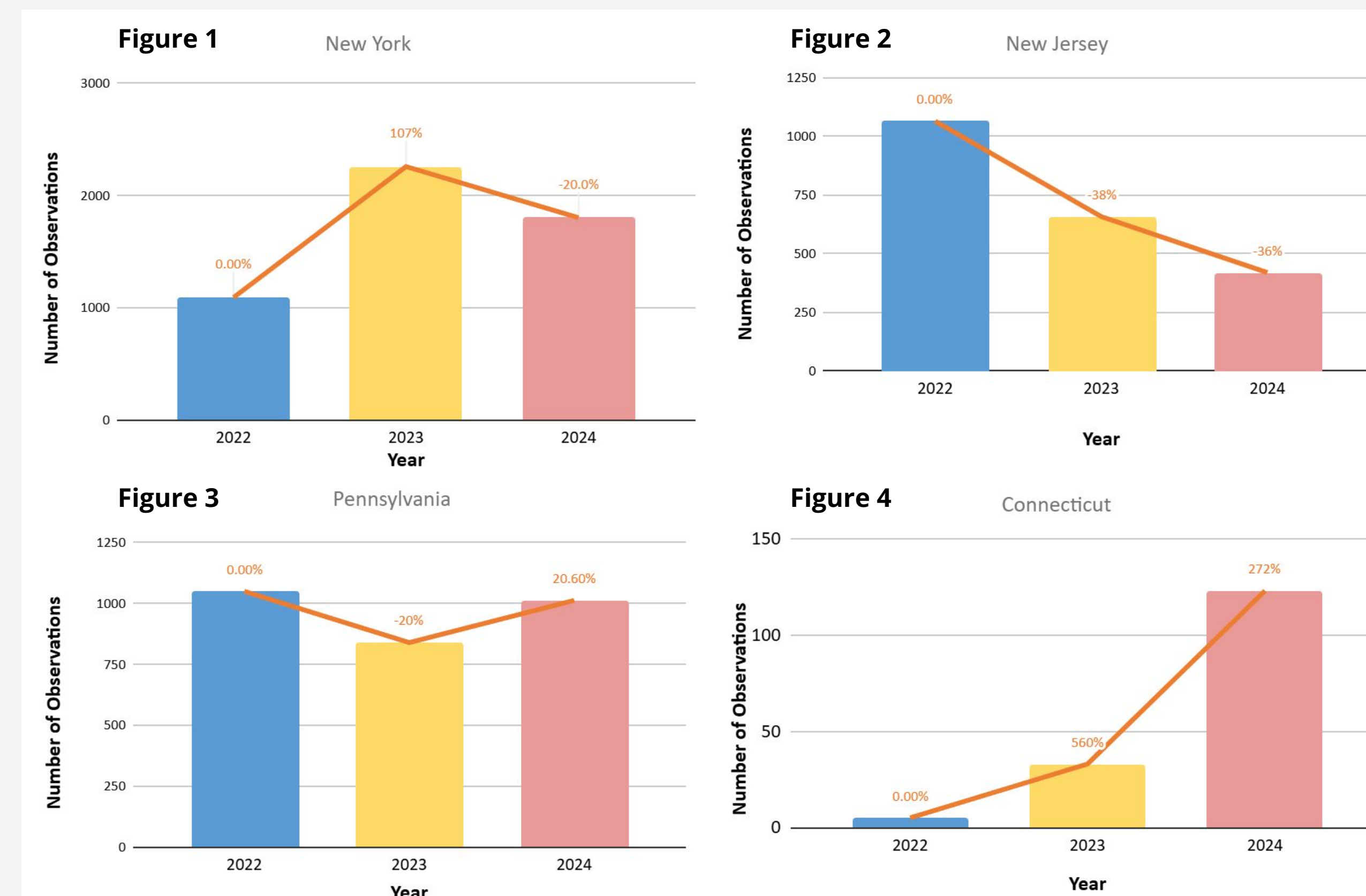


Figure 1: iNaturalist observations in New York State. Figure 2: iNaturalist observations in New Jersey. Figure 3: iNaturalist observations in Pennsylvania. Figure 4: iNaturalist observations in Connecticut. The orange trend line indicates percent change of *L. delicatula* populations in each state, while the bars are the raw number of observations.

## Discussion

The results show that the decline seen at the Bronx Zoo was not as widespread as our hypotheses proposed. Though the *L. delicatula* population decreased steadily in New Jersey and significantly in New York, it was stable in Pennsylvania and grew rapidly in Connecticut. Surprisingly, the percent change of the population increased the most in the state where the fewest lanternflies were present: Connecticut, while the state with the highest amount of *L. delicatula*, New York, experienced a decrease in population from 2023 to 2024. Due to the extreme irregularity of the spread of *L. delicatula*, my hypotheses that populations in all four states would only decrease from 2022 to 2024 was not supported by my data (Figures 1-4).

The populations of *L. delicatula* could change in different states due to then stabilizing after becoming established in certain states. Pennsylvania, where *L. delicatula* has been present for the longest time, maintained similar numbers of sightings from 2022 to 2024. Since iNaturalist is a citizen science database, however, the number of observations doesn't necessarily relate to the population of *L. delicatula*. Also, there can be a lack of reporters of *L. delicatula* in certain states due to there not being many iNaturalist users present there to document these populations. Future research should analyze how public awareness of spotted lanternfly in different states affects the number of sightings of *L. delicatula* on citizen science platforms such as iNaturalist. Future research should also investigate if the trends in local zoos and green spaces differs from the state as a whole, as seen in the Bronx Zoo versus New York state. This research has the potential to bolster previous research on the population dynamics of *L. delicatula* as it relates to citizen sciences.

## Acknowledgements

I would like to thank Jozsef Balatoni for his mentoring and tutelage, Max Falkenberg and Dr. Lowell Iporac for their constant guidance and mentoring, and my friends and family for their unwavering support and love.

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- Image from <https://www.pwcva.gov/department/construction-operations/spotted-lanternfly>
- iNaturalist community. Observations of *Lycorma delicatula* from New York, Pennsylvania, New Jersey, Connecticut, U.S.A. observed between 2022 and 2024. Exported from <https://www.inaturalist.org> on 23 Nov. 2024.

## Methodology

To conduct this experiment, sightings of *L. delicatula* were collected on the citizen science database iNaturalist, where users can submit image observations of various different organisms to find the numbers of observations in different states at different times.<sup>1</sup> States were chosen based on their proximity to either the Bronx Zoo or the epicenter of the spread of *L. delicatula*: New York, New Jersey, Pennsylvania, and Connecticut were selected. Population of lanternflies in each state was counted by sightings on iNaturalist. In order to align with the 2024 survey at the Bronx Zoo, the sightings used as data were taken from search filters on iNaturalist that controlled for each state and a three month period from May 1 to August 31 of 2022, 2023, and 2024 (Image 2). Each sighting was counted as one unit, regardless of the number of lanternflies present in each picture. Using the population between each year, percent change was calculated. With these four variables, four different combination charts, each representing the population change in a certain state, were created.

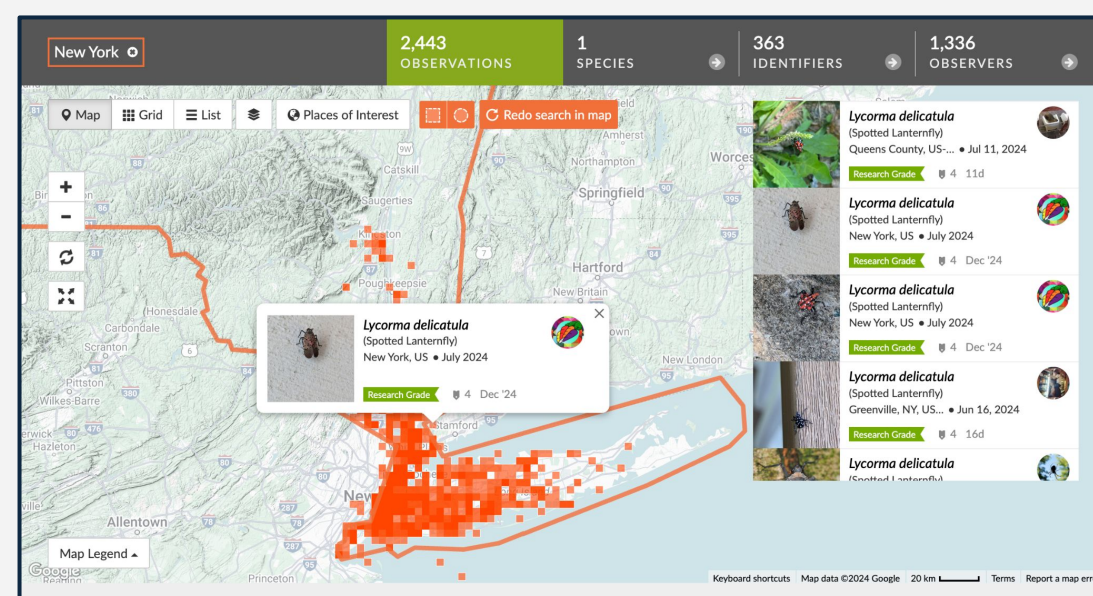


Image 2: A screenshot of iNaturalist's observation of the spotted lanternfly in New York from 2024.

# Tick Tock: An Observation of Population Percentages of Spotted Lanternflies in New York City Through Social Media

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## Introduction

Spotted lanternflies (*Lycorma delicatula*) are an invasive species native to East Asia that are a detriment to the environments of New York City. The spotted lanternflies that roam our environments today were opportunistically transported from East Asia to Pennsylvania as their egg mass was attached to a cargo ship. They feed on the inner-vascular sap produced by trees, ultimately affecting tree health and entire ecosystems. *L. delicatula* have also destroyed \$7.9 millions of dollars worth of grape vines utilized for wine production upon their arrival to Pennsylvania alone (Urban, J. M., & Leach, H. 2024). Spotted lanternflies were first reported in New York City in 2020 (NY Dept. of Agriculture).

This research aims to uncover any correlation or relationship with *L. delicatula* population over the course of time through information provided through social media. The purpose of this study is to assess TikTok videos that speak on spotted lanternflies in New York City, the context in which the videos are made, and the comments left on these videos. Social media was used in this study as a convenient way to provide wide range of different perspectives and fresh information. We included iNaturalist to collect data on spotted lanternfly observations and relative populations in New York City. The combination of the two platforms are essential to draw out conclusions that determine if there is any relationship between TikTok content and the change in spotted lanternfly populations from 2022 to 2024.

## Methodology

Our utilized the top twenty most liked "lanternfly NYC" Tiktok videos based upon the filter feature in the search tab. Within each video, we coded the content in reference to a codebook (Figure 1). We placed the videos in one of three categories: positive, neutral, and negative. Through iNaturalist, we were able to observe *L. delicatula* populations in specifically New York City annually. We placed our focus specifically on 3 years of spotted lanternfly population numbers due to the first public announcement explaining the invasiveness of spotted lanternflies being published in 2021. (NY Agriculture, 2021). Our research is positioned one year after this post to visualize the effects of the initiative in full swing.

Category	Criteria
Positive	<ul style="list-style-type: none"> <li>The language used in the Tiktok is not hostile, without warnings of extermination.</li> <li>Context of the video suggests for the defense of the spotted lanternfly.</li> </ul>
Neutral	<ul style="list-style-type: none"> <li>The content in the Tiktok does not actively promote the extermination nor the defense of the lanternfly.</li> <li>Educational videos centered around solely understanding them, biological terms and definition.</li> </ul>
Negative	<ul style="list-style-type: none"> <li>Hostile actions towards the lanternfly in the video, directly killing them or testing methods of extermination.</li> <li>Derogatory language used against the lanternfly, specifically "pest".</li> </ul>

Figure 1: Codebook outlining positive, negative, and neutral content, with defining features for each category that all videos were subject to.

## Abstract

The Spotted Lanternfly (*Lycorma delicatula*) is an invasive plant hopper native to East Asia. TikTok, being one of the most popular informational apps in the world, is filled with an abundance of sources that could potentially be utilized for a variety of studies such as assessing the influence a certain species has in an area, and how the public might react to the actions of this species. In our research, we utilized TikTok in order to compare content about spotted lanternflies to iNaturalist data of spotted lanternflies in New York City throughout the years of 2022-2024. Our research consisted of overviewing the populations of spotted lanternflies within a given year, and how they correlated with our selected themes on TikTok (positive, neutral, and negative). To further confirm our collections of data, lanternfly abundance information was collected through iNaturalist. Through using iNaturalist, we were able to view the number of observations of spotted lanternflies in all 5 boroughs of New York City during the past 3 years. A total of 5,457 lanternflies were documented in 2022, 3,936 in 2023, and 3,581 in 2024. Understanding that these observations came from local citizens on iNaturalist, it confirmed our hypotheses regarding how videos on Tik Tok can correlate to trends observed with actual lanternfly observations.

## Research Question and Hypothesis

**Question:** What is the relationship between social media comment engagement levels and SLF abundance within the past three years in NYC?

**Hypothesis:** The number of negative Tik Tok videos will increase as the iNaturalist observations will decrease.

## Results & Figures

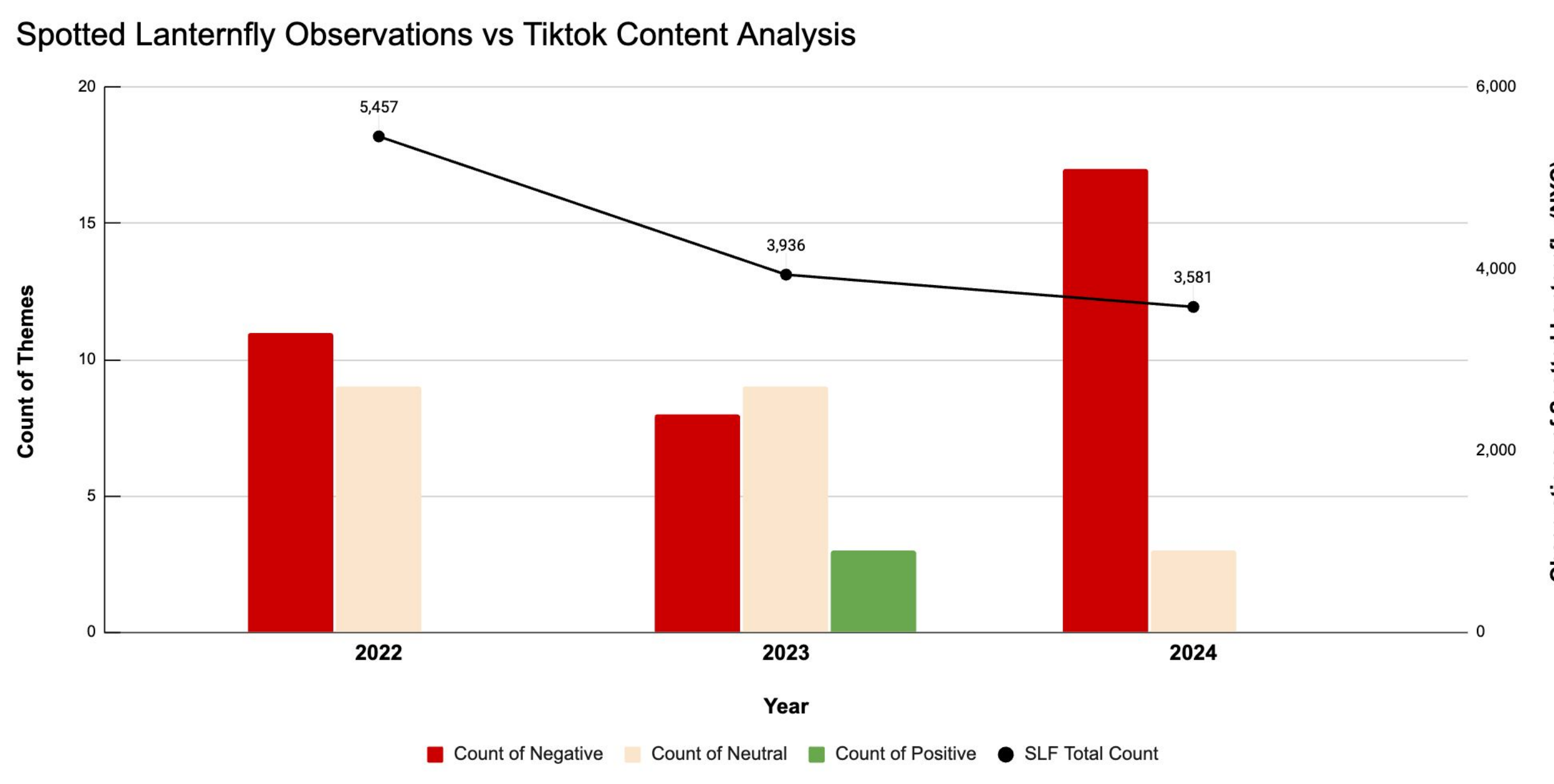


Figure 2: A combination graph displaying an increase in negative Tik Tok content about the Spotted lanternfly in NYC from 2022 to 2024. The bars represent the count of the themes, while the line on the secondary axis represents the iNaturalist observations.

## Results

Through analyzing spotted lanternfly content on TikTok and connecting these observations with data from iNaturalist, our main findings showed a spike of negative TikTok content from 2023 to 2024 (Figure 2). We found that the large quantities of negative TikTok videos initiated the decline of spotted lanternfly populations during the beginning of 2023 (the population number being 3936). By 2024, negative content had dominated the top videos on TikTok, and the spotted lanternfly population observed in NYC fell from 5,457 in 2022 to 3,581 in 2024 (as of November 16th, 2024).

## Discussion

Our findings indicate that negative or urgent messaging regarding spotted lanternfly correlated with the decreasing observations of spotted lanternflies, contributing to population control. This supports our hypothesis because over the course of three years, the population of spotted lanternflies began to decline. We witnessed this through the informational TikTok videos informing the public of the damage spotted lanternflies cause, possibly having them consider killing spotted lanternflies in order to reduce their negative impact on the city's environment (Figure 3). These findings confirm the usefulness of TikTok in informing public audiences of real-world issues.



Figure 3: Screenshots of Tiktok videos that were categorized as negative based on the codebook.

## Acknowledgements

This study was made possible because of Jozsef Balatoni for his immense support for our project and for us as well. We would also like to thank Max Falkenberg and Dr. Lowell Iporac from the Wildlife Conservation Society for their direction and instruction. And lastly, we would like to thank our families for their love and support.

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Please access additional references, including TikTok videos used, here.