

The Effect of Emerald Ash Borers on Ash Trees in New York



Introduction

- Emerald ash borer (*Agrilus planipennis*, EAB) is an invasive species from China, arriving in Michigan in the 1990s
- Has grown to infest thirty-six states, spreading to New York in 2009
- Have killed millions of Ash trees, since their larvae feed underneath their bark, blocking water and nutrient transport across the tree.
- Widespread death of Ash trees has tremendous negative impacts ecologically and economically.

Question

How has the increase in invasive Emerald Ash Borer beetles impacted the number of observed Ash trees in New York?

Hypothesis

We suspect that there is a strong, negative correlation between the number of observed Emerald Ash Borer beetles and the number of observed Ash Trees.

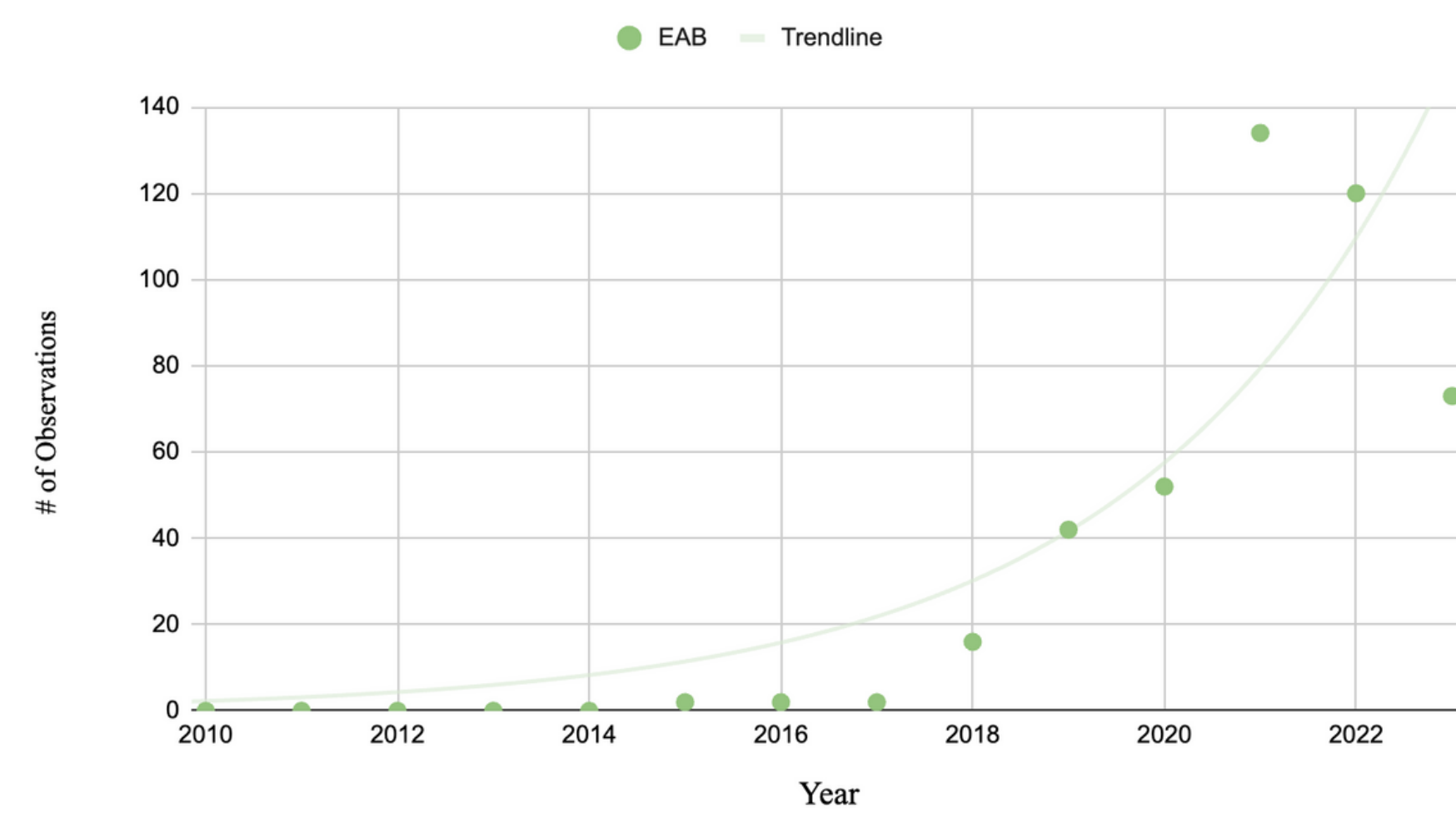
Methods



- **Independent Variable:**
 - Number of observed Emerald Ash Borer (EAB) beetles in New York
- **Dependent Variable:**
 - Number of observed Ash trees in New York.
- We acquired data of EAB and Ash Trees observations from iNaturalist, filtered by state (New York) and research grade from the years 2010 and 2023. Graphs were created via Google Sheets.
- **Graph 1**
 - Looked at number of EAB observations per year
 - Fit a trendlines to approximate the increase
- **Graph 2**
 - Tracks # of EAB and Ash Tree observations per year as a visual comparison
- **Graph 3**
 - Plots # of EAB observations as compared to Ash Tree Observations
 - Fit a trendline to examine the correlation and derive an R-value

Results

EAB Observations by Year



Graph 1

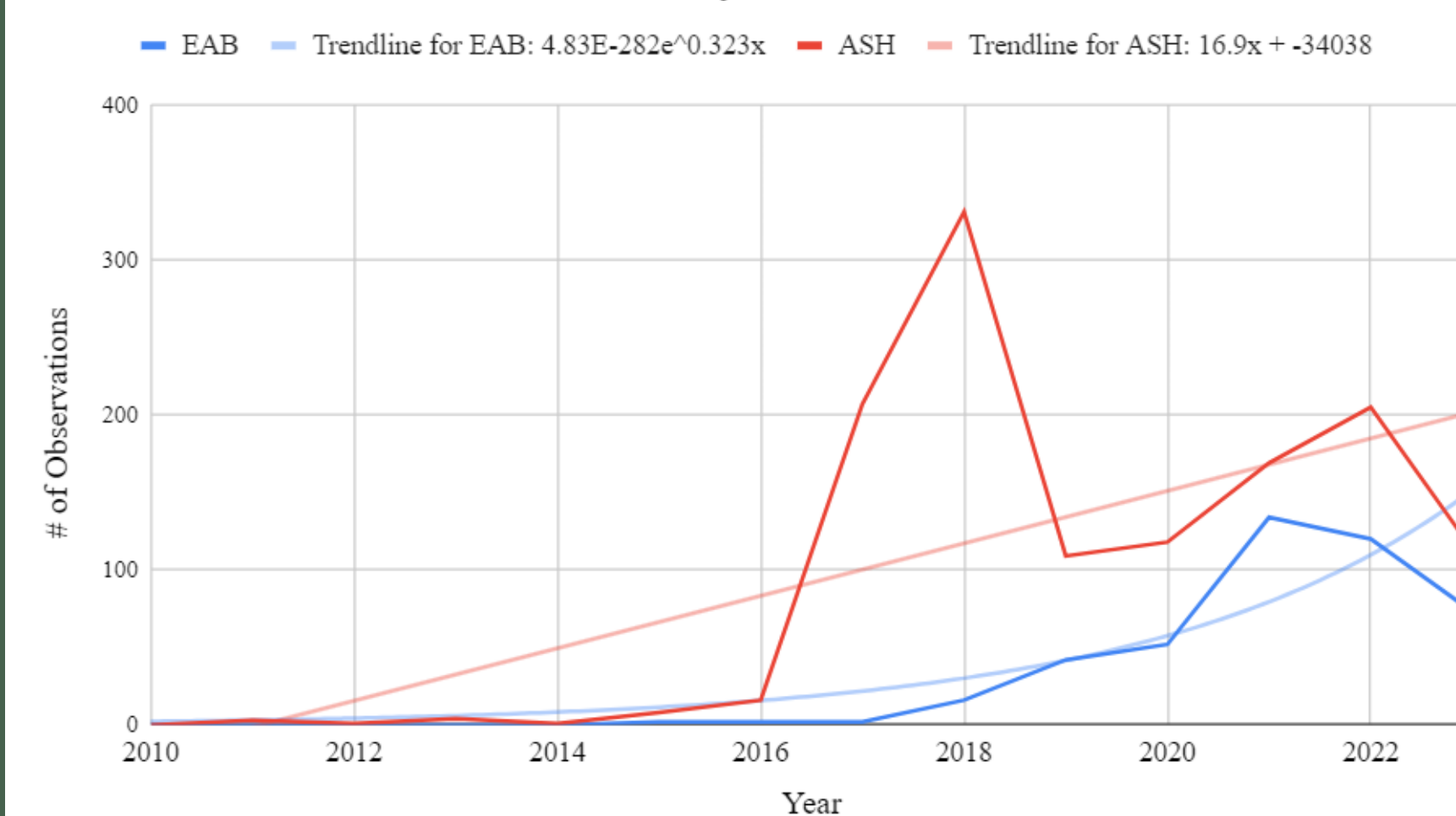
This graph shows the increase in Emerald Ash Borer observations from 2010 to 2023. There is a clear exponential increase in the number of observations over time, reflecting that the EAB population is growing in NY.

Graph 2

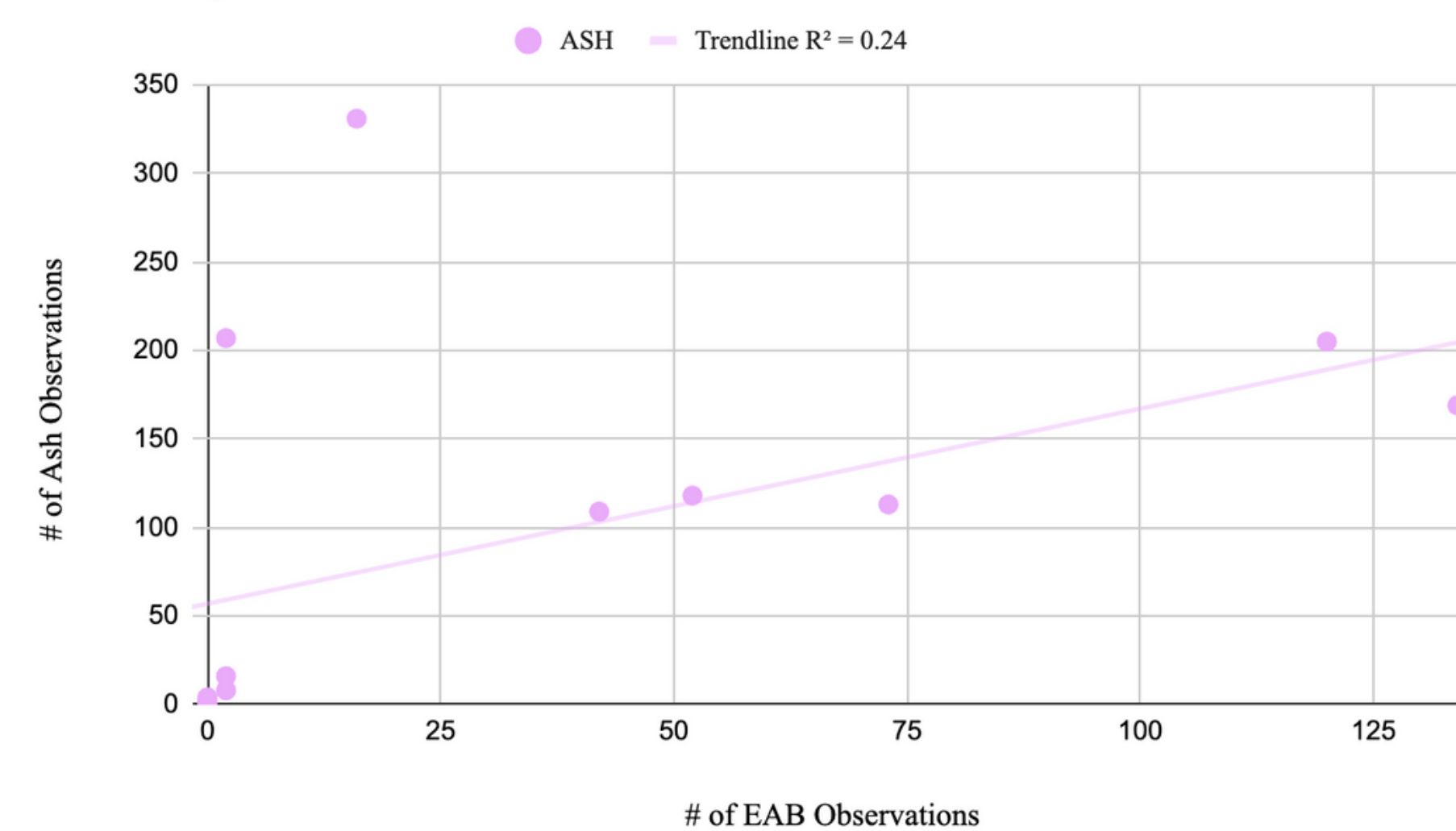
This line graph enables us to compare the number of observations of EAB and Ash trees per year.

Ash Observations for Oct 2017 and Sept 2018 appear to be outliers with unusually high numbers of observations, causing the spike.

EAB and Ash Tree Observations by Year



Relationship Between # Observations of EAB to Ash Trees



Graph 3

This scatterplot shows the relationship between EAB observations and Ash tree observations. The R value comes out to $\sim +0.5$, meaning there is a moderately strong, positive correlation between EAB and Ash tree observations.

Conclusion

- We aimed to answer if the increase in invasive Emerald Ash Borer beetles impacted the number of observed Ash trees in New York.
- Our hypothesis was not supported by our data
- The data we analyzed shows that there is a moderately strong, positive correlation (+.5 R value) where we expected a strong, negative correlation.
- It is important to consider that iNaturalist data is affected by many secondary factors, for example the level of difficulty of finding a large tree versus a small beetle to an amateur observer.
- Another factor is that iNaturalist data is limited in age, it has slowly become more popular since the early 2010s which means more observations are being made every year, potentially showing an increase in populations that are not truly present.
- The data has certain limitations and drawing conclusions based on it is not ideal. Future research should include more historical data to more accurately determine New York's ash tree population. More studies can also be done to determine the impact of EAB on planted trees in NYC. Using a tree census other than iNaturalist would be needed as iNaturalist focuses on uncultivated trees.



Emerald Ash Beetles are about the size of a grain of rice



The patterns on the Ash tree are from the larvae eating under the bark of the tree, causing the bark to shed and reveal the S-shaped patterns

References

- Haack, R. A., Baranchikov, Y., Bauer, L. S., Poland, T. M., & Van Driesche, R. G. (2015). Emerald ash borer biology and invasion history. *Biology and Control of Emerald Ash Borer*; Van Driesche, RG, Reardon, RC, Eds, 1-13.
- Knodel, Janet G, et al. "Emerald Ash Borer: Biology and Integrated Pest Management in North Dakota." NDSU Agriculture, 7 June 2023, www.ndsu.edu/agriculture/extension/publications/emerald-ash-borer-biology-and-integrated-pest-management-north-dakota.