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# Public awareness of the impacts of the Emerald Ash Borer and its management in New York State

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**Public awareness of the impacts of the Emerald Ash Borer and its management in  
New York State**

**Mital Patel  
Union College  
Biology Honors Thesis  
2011-2012**

**Advisor: Jeffrey Corbin, Professor of Biology**

## Table of Contents

Introduction .....	Page 2
Methods .....	Page 9
Results .....	Page 10
Discussion .....	Page 12
Appendix A .....	Page 21
Works Cited .....	Page 33

## Introduction

The Emerald Ash Borer (EAB) (*Agilus planipennis fairmaire*) is a major threat to the American Ash Tree (*Fraxinus sp.*). It is a native beetle of China and was first discovered in North America in 2002. It originally infested Canada and quickly spread to the United States (Kovacs et al, 2010). Though it cannot be confirmed, it is suspected that the insect arrived in Canada in wood packing materials commonly used to stabilize cargo ships or ship consumer products ([www.nyis.info](http://www.nyis.info)). Since its discovery ten years ago near Detroit, Michigan, infestations have been confirmed in 14 different states across the U.S.A ([www.dec.ny.gov](http://www.dec.ny.gov)).

The EAB is a phloem-feeding bug, which has the potential to eradicate ash trees across North America. Though it is only possible to detect an infestation once the EAB reaches the adult stage, it is the larvae that live inside the bark of the tree and feed on the phloem, slowly starving and killing the host tree over a two to three year time period. Because of this time delay in detection, once an EAB is found in a region, it is very likely that the beetle has already done significant amount damage (MacFarlane and Meyer, 2003). Already, the EAB is responsible for the death of over 53 million ash trees across the United States alone. Because of the low genetic diversity across species of ash trees, this non-native species has the potential to spread and kill all ash trees (BenDor et al 2006).



**Figure 1:** The Emerald Ash Borer  
<http://www.forestryimages.org>



**Figure 2:** The Emerald Ash Borer is only about 4 mm in size, smaller than a penny.  
<http://www.forestryimages.org>

The loss of ash trees comes with large ecological and economic costs to society. Ash trees bear fruit and provide shade with their large canopy. Because they are able to

grow at a fast rate, ash trees are also an important type of succession tree as forests recover from disturbances (Kovacs et al, 2010). However, the loss of ash trees is also alarming when looking at the economic impacts. The strong, durable, yet elastic Ash wood is across a multitude of industries. It is the sole material used for Louisville Sluggers, the official bat company for Major League Baseball. Without White Ash, the MLB will have to switch materials, potentially impacting the sport (Poland and McCullough, 2006). Its elasticity also makes Ash the preferred wood for bows and arrows. Moreover, it is often used for tool handles, guitars, and furniture. Ash is one of the most important species for wood production in North America and is heavily used as firewood (Poland and McCullough, 2006). Because of its extensive use as firewood, it is often transported across neighborhoods, campgrounds, and state boundaries. Though counties across the US have varying containment strategies in place, the movement of firewood adds difficulty to these efforts ([www.dec.ny.gov](http://www.dec.ny.gov)).

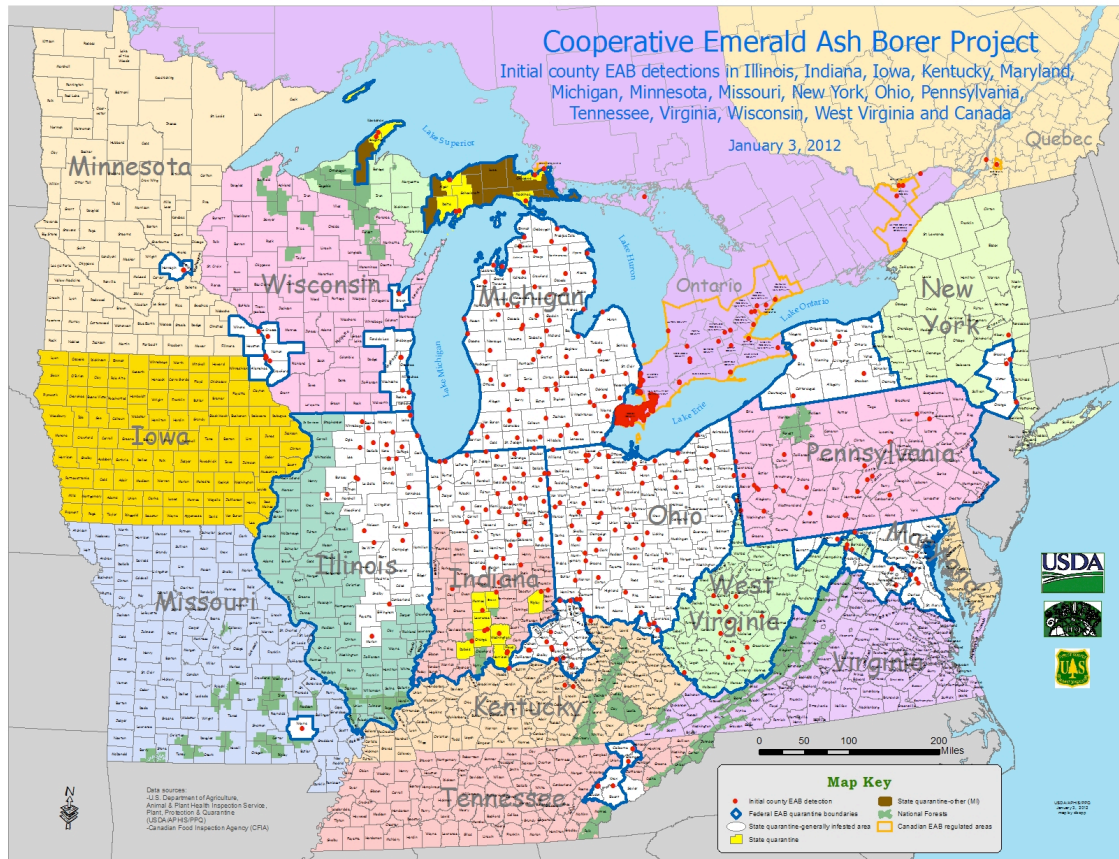
Most of the above mentioned uses of Ash wood, such as its role in the ecosystem and the added property value it provides, do not have easily calculable values. However, previous studies by Kovacs et al have estimated that the discounted cost for the treatment, removal, and replacement of Ash trees over the next ten year horizon surmount to 10.7 billion dollars (2010). This figure fails to include additional costs associated with aesthetic and ecological impacts. For example, having ash trees on one's property increases property value due to the added aesthetic appeal and shade. The EAB epidemic is also costly to municipalities, nursery operators, and forest product industries (Kovacs et al, 2010).

Many states and counties have already implemented various different management strategies in an effort to combat the spread of the EAB. Currently, there is ongoing research to develop the tools to control and eliminate the beetle. The most obvious method is to remove and replace all Ash trees. Though replacing Ash trees with a different species eliminates the EAB epidemic on a small scale, it only heightens the economic costs, as the loss of Ash wood is detrimental to the industries previously listed (Kovacs et al, 2010). Another option is to use insecticides. However, the success of insecticides against the EAB and the frequency of reapplication are highly debated. McCullough et al (2004) found that there were significantly lower densities of the EAB in Green Ash trees but not White Ash trees. However, further research still needs to be conducted regarding different types of insecticides and long-term success rates. Research into biological control methods is also in preliminary stages ([www.nyis.info](http://www.nyis.info)). The numbers of EAB in Asia are under control due to resistant host plants, climate control, and natural enemies. Currently, USDA scientists are investigating three parasitoids from China as potential biological control methods for the EAB in North America. However, research in this field is in introductory stages and thus biocontrol is not a viable method for the near future ([www.nyis.info](http://www.nyis.info)).

On the other hand, the implementation of firewood quarantines is a method of containment that is presently in place in most counties in and around infested regions ([www.dec.ny.gov](http://www.dec.ny.gov)). Because the average EAB can only fly about half a mile, its natural spread is severely limited (BenDor et al 2006). With the transport of firewood and other wood products by humans, EAB dispersal has extended beyond its natural spread (BenDor et al 2006). As seen in Figure Three, there is a natural dispersal pattern

extending downward from Ontario. However, satellite infestations, such as those in Minnesota, Wisconsin, and Tennessee, can be attributed to human intervention. Though firewood quarantines have been successful at slowing the distribution of the EAB, they are not a method that will eradicate the pest (BenDor et al 2006). The implementation of quarantines is also difficult due to people's lack of awareness and the high associated costs. Once quarantines are in place, local firewood sellers have monopolistic power and can thus increase prices. Therefore, campers and visitors have higher incentives to smuggle wood into and out of quarantined zones and quarantines are hard to implement (Kovacs et al, 2010). Though rangers in campgrounds enforce quarantines, it is not feasible to have search zones at county boundaries. Nevertheless, counties still have quarantines in place and organizations like the USDA and other local government agencies are attempting to increase awareness through publicity. It is clear that current eradication attempts are not only costly and unpopular, but they have a low success rate.





**Figure 3:** A map showing the spread of EAB infestations as of October 4, 2011.

Red dots represent initial county of EAB detection, blue lines represent federal quarantines, white and yellow areas represent state quarantines.

<http://www.emeraldashborer.info>

Early detection is another method implored to deter the spread of the EAB.

Girdled trees are population sinks and can therefore be used as the focal point of detection. Another way to quickly detect an infestation before it spreads within a region is to implement The Wasp Watchers Program (WWP). The program is heavily dependent on volunteers whose job it is to locate and monitor the nests of the *Cerceris fumipennis* wasp (<http://www.cerceris.info>). This stingless, ground nesting wasp preys on adult EAB

among other beetles. Once it kills its prey, the wasp brings its food back to its nest for consumption by the larvae. In the program, each group of volunteers, or citizen scientists, would adopt a colony and take a collection of food supply, keeping an eye out for EAB (<http://www.cerceris.info>). Because the *Cerceris fumipennis* does not sting, it is one of the most accurate sources of information for information on the spread of the EAB (Careless, 2009). All information on nest location and prey is kept on an online data base for all volunteers and the public to access. Though it is a time consuming volunteer activity, it is seasonal due to the fact that the wasps are only active during the summer months (Careless, 2009).

The purpose of this study was to better understand the awareness residents from infested areas within New York State have about the EAB's potential impact and management strategies. New York, one of fourteen infested states, currently has nine counties with confirmed EAB infestations. With the distribution of the EAB epidemic on the rise, it is important to understand whether or not residents comprehend potential impacts of the beetle. Such information has the potential help policy makes and local agencies make the appropriate decisions. Moreover, using the Wasp Watchers Program as a proxy, we explored people's willingness to participate in ecological volunteerism. Though altruism and volunteerism have been heavily studied by behavioral scientists, ecological volunteerism is largely ignored. However, with the lack of ecological volunteers and the difficulty of garnering interest in environmental topics by the general public, it is an issue in need of investigation.

**Methods**

In order to be considered an eligible subject, all participants had to reside in a county with a confirmed infestation in New York State. The counties include Cattaraugus, Erie, Genesee, Greene, Livingston, Orange, Steuben, and Ulster. Residents were randomly selected from the Reference USA Database and a mixed mode survey method was used. First, the selected residents were contacted via telephone calls. If they agreed to participate in the study, a survey was sent to the household with a pre-paid return envelope and cover letter explaining the purpose of the study. The survey was designed to explore New Yorkers' awareness and understanding of the EAB as well as their willingness to participate in ecological volunteerism (Appendix A). Residents were telephoned and ten agreed to participate in the study. Of the ten who were sent surveys, two were returned. With a low response rate and extremely small number of results, study participants should not be considered representative of all residents of New York State.

## Results

With two surveys returned out of the ten which were mailed, the study had only a 20% response rate. With the numerous rejected phone calls in the first step of the survey, it was clear that it would be very difficult to get the public to participate in an ecological survey. Before using the results of this study as a representation of the public, it is crucial to expand the size of this study to get a better understanding

Subject A is a forty-two year old female from Erie County. Subject B is a fifty-six year old male from Genesee County. Both are college graduates with annual household incomes between \$50,000 and \$74,999. Subject A is married, employed full time, and has lived at her current residence for four years. On the other hand, subject B is widowed, employed part time, and has lived at his current residence for eleven years. Though subject A stated she had no ash trees on her property, subject B was unsure of the species on his land. Therefore, both participants did not consider ash trees to be of value to them. Subject B had no prior knowledge of the EAB but

Subject A vaguely knew about the EAB's existence due to "the purple traps on trees." This was the only EAB control measure that she was aware of. Therefore, she believed that the loss of Ash trees would have an impact on her community. In the survey, she writes, "Though I am not sure of the specific impacts, there must be some reason as to why the purple traps are everywhere." This study participant's preferred method to combat the infestation on her property and in the county's public lands was the cutting and removal of infested trees and replacing them with new Ash trees. Though she accepted she did not know the value of Ash trees, she believed the loss of an entire

species would be “bad for the environment.” Moreover, subject A held that all associated costs should be shared by the county, state, and the federal government.

On the other hand, subject B had no knowledge of Ash trees or the EAB infestation. Therefore, he had no knowledge of any control measures being taken to manage the EAB. His preferred action against this issue was to cut and remove all Ash trees with the replacement of other tree species because he believed that in the long run, new Ash trees would also be killed by the EAB. In his opinion, the county, state, and federal government should pay for the management strategy jointly.

The second aspect of the survey focused on ecological volunteerism and the Wasp Watchers Program (WWP) specifically. Neither subject had been involved in the program nor had they heard of it in any regards prior to the study. Subject B was not willing to participate in such a program where as subject A was not sure if she would. Similarly, subject A was willing to contribute a one-time monetary donation of \$20 to the institute implementing the WWP. Though she accepts this is a small donation, she states that the program seems like more of a viable solution than the others previous stated. On the other hand, subject B was not willing to make a monetary contribution due to the fact that he already donates to other charities, which he is more involved with.

Both study participants have volunteered in the past. Subject A has volunteered at a day care center, a children’s hospital, and at blood drives. Subject B has been a volunteer with various children’s organizations. However, neither subject has ever volunteered with an environmental group or organization.

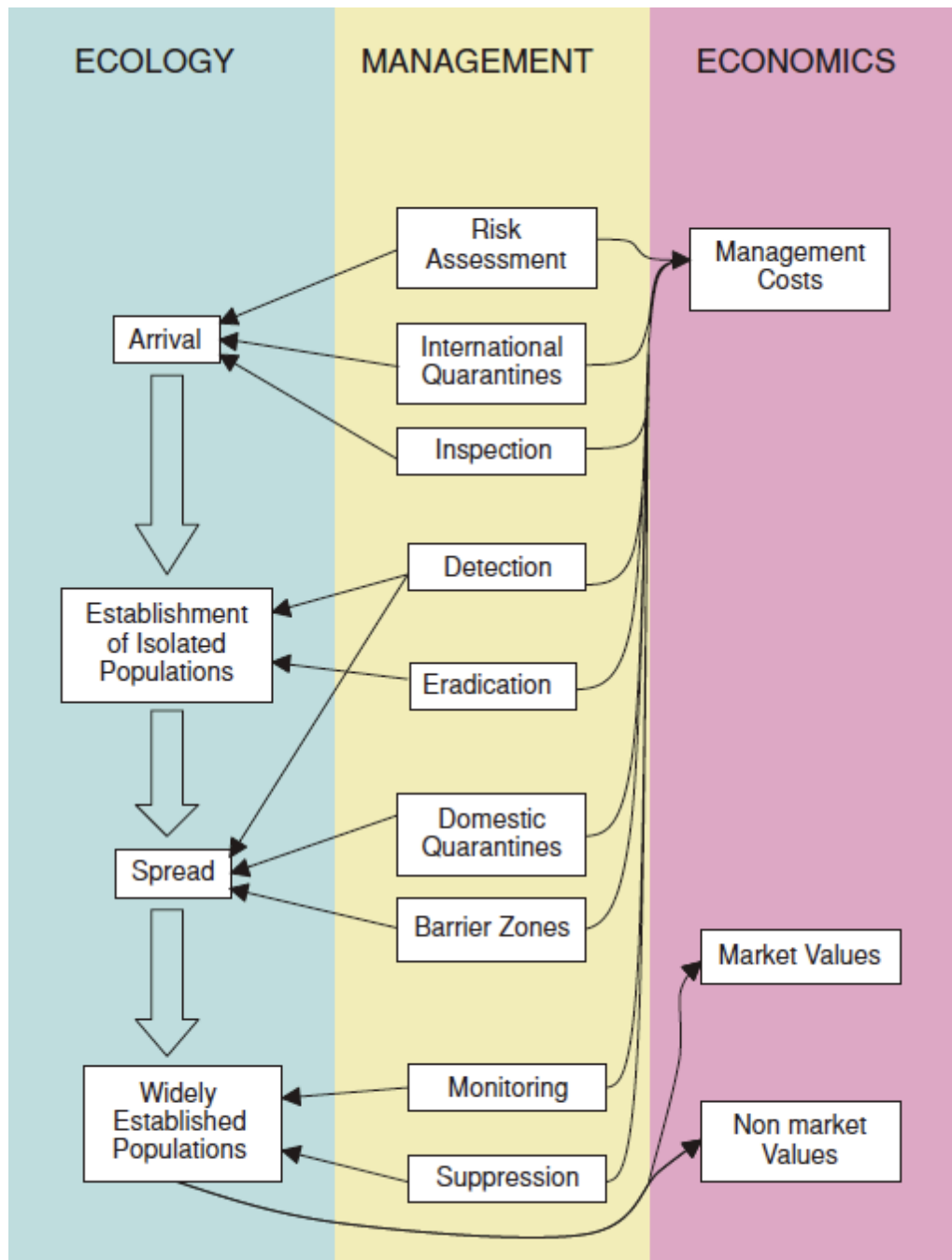
## **Discussion**

It is clear that the two subjects in the study were not aware of the EAB infestation prior to the study. Though they share some similarities, the two represent different demographics and have varying opinions about the same problem. Therefore, we cannot take these observations to hold true for the general population. They can, however, give us some insight on what to expect when the study is expanded.

Both observations show us that there is a lack of EAB awareness, even in already infested counties. Though subject A knew of one management strategy, her knowledge of it was very vague. The study triggered her memory of the purple prism traps. The traps, however, provided no information about the EAB epidemic or what role Ash trees play, and therefore, she did not know much about their purpose. The participant believed there was a value to Ash trees based on the sole fact that there are purple traps up to save them and thus, must have some value associated with it. If this trend is seen with more observations, it is important to increase awareness as increased awareness leads to a more educated public. Though subject A simply states it will “be bad for the environment” as a justification for attempting to save a specie, it is clear she has an underlying appreciation for biodiversity. Increased educational outreach can play a large role for those who have a minute understanding of the role biodiversity plays in a sustainable world. Subject B had no knowledge of the beetle, ash trees, or management methods, and also did not believe Ash trees had any value to him. Though it cannot be said for certain due to the lack of observations, there appears to be a correlation between the amount of information one has about a topic and the value the Ash trees have to someone.

Though both subjects had varying levels of knowledge, both agreed that funding for EAB management should come from the county, state, and federal level. It is clear that the EAB epidemic has stretched past state boundaries and thus required the attention of the federal government. However, management strategies have proven to be most successful at a local level and therefore need the cooperation of county leadership (MacFarlene and Meyer, 2003). Not surprisingly, neither of the participants believed that funding should come from an individual's pocket, especially if government funding is an option.

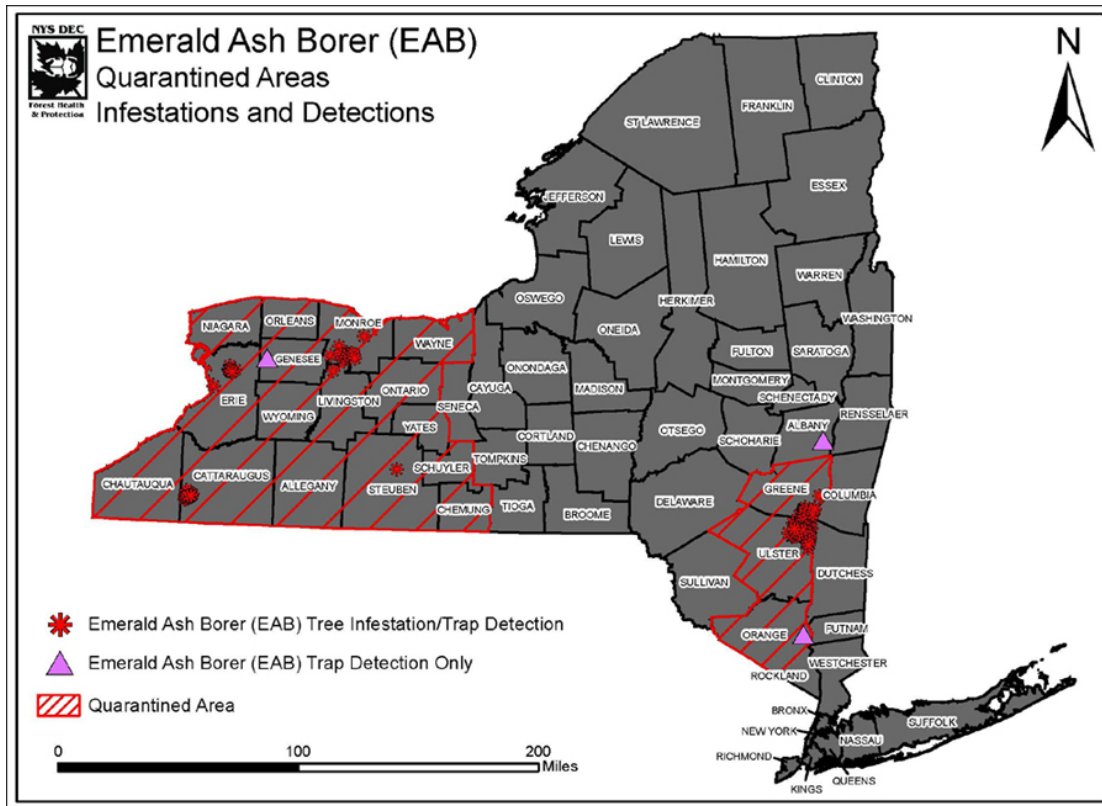
A study done by Kovacs et al (2010) found that if all trees were replaced at once, the cost would surmount to \$25 billion, which in it of itself justifies substantial investment to slow the spread of the EAB at all levels. The study suggests enforcing quarantines to restrict the movement of ash wood, conducting surveys to detect additional infestations, and increasing outreach for public awareness. As seen in Figure Four, there are four invasion stages, each with a unique management strategy and economic implications. However, the EAB has reached the 4<sup>th</sup> stage of infestation in some regions and requires as many management strategies and funds.



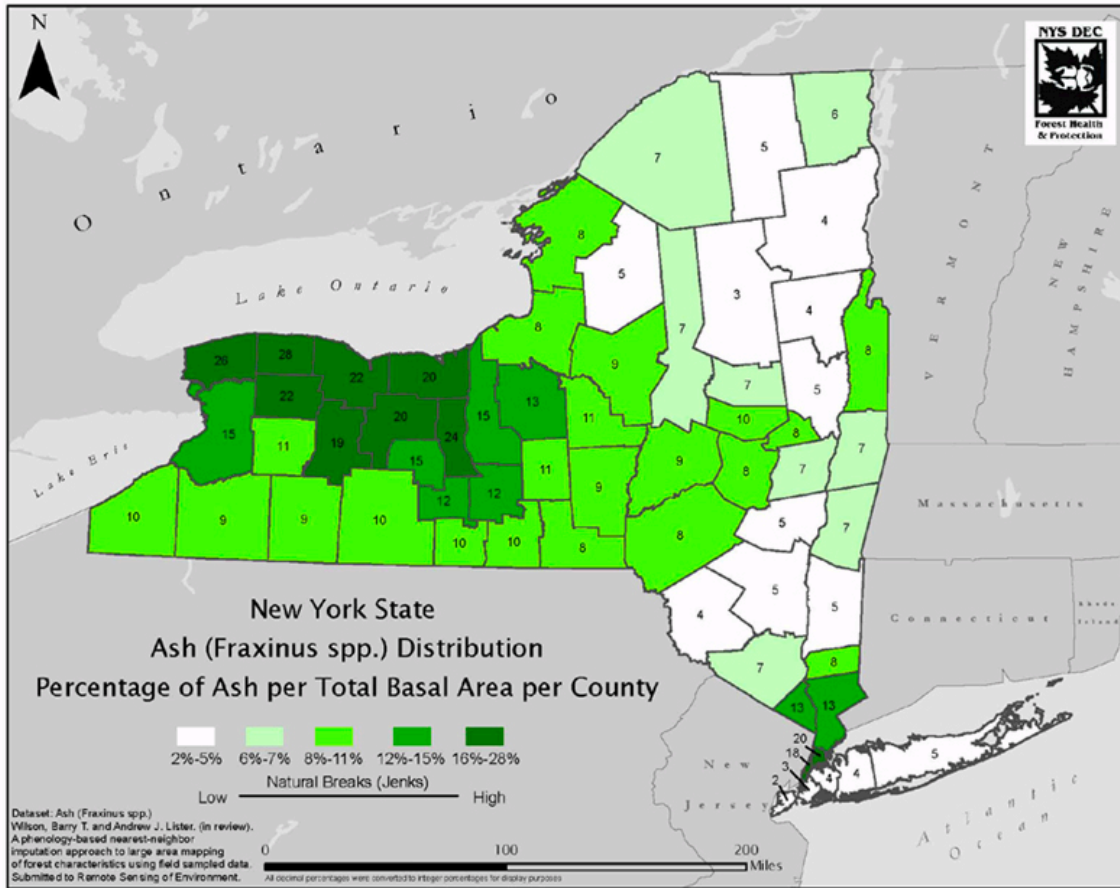
**FIGURE 4:** The stages of a biological invasion are linked to management actions that can be applied at each stage; each of these management actions has economic implications. Because the EAB has widely established populations, it is important to enforce all management strategies. (Holmes et al, 2009)



One of the major management strategies suggested by Holmes et al (2004) is a domestic quarantine. With the spread of the EAB on the rise, quarantines are one of the main techniques local governments have been relying on. As seen in Figure Five, quarantined zones include counties, which have yet to be declared infested. Enacting quarantine laws not only increases awareness, but also significantly slows the spread of invasive species ([www.dec.ny.gov](http://www.dec.ny.gov)). However, as previously mentioned, quarantined zones lead to increased prices of firewood since all firewood transport is banned. As a result, campers and other wood product users disobey the laws in place. This disregard for the law leads to an increase in satellite populations, such as those in Greene and Ulster counties. These satellite infestations will spread all across Eastern New York if quarantines are not heavily enforced. It is interesting to note that Ulster and Green counties have a low density of Ash trees yet they are still infested (Figure Six). This suggests that the EAB does not only reside in areas, which are rich in Ash trees. It is evident that EAB awareness is low but the success of any management strategies relies on the cooperation of all county residents and visitors. Therefore, it is crucial that New York State strictly enforces the current rules in place in order to avoid detrimental costs to the economy in the future.



**Figure 5:** New York State has a quarantine in place in over nineteen counties in an attempt to slow down the spread of the EAB. ([www.nyis.info](http://www.nyis.info))



**Figure 6:** New York State Ash distribution per county  
 (<http://www.dec.ny.gov/animals/71542.html>)

Not only are people unaware of the EAB epidemic, but also people are reluctant to volunteer for ecological causes. This is not a concern specific to this study but rather for environment agencies and organizations as a whole. The Wasp Watchers Program (WWP) was chosen as the model volunteer organization because it does not require any monetary contributions from participants. The program asks for a seasonal time commitment and training. There have been many studies done on volunteerism and altruism by behavioral scientists and psychologists. However, environmental activism and volunteerism is an extremely under studied area. We can use the information on volunteerism to make inferences about ecological volunteers specifically.

A study done by Donald (1997) found four key categories of variables which influence decisions on volunteering. The categories include socioeconomic variables such as gender, length of residence in the community involved, level of education, and race, socio-psychological variables, such as knowledge about the issue, sense of control about what happens, available leisure time, sense of confidence in skills, and attachment to neighborhood, benefit variable such as increased political influence, increased personal growth, increased status, chance to make relationships, and increased educational experience, and the opportunity cost of participation beyond just economic terms. A study done by Ryan et al (2001) also found benefit variables and opportunity costs to be significant variables on whether or not one chose to engage in volunteerism. Both studies found effective leadership, engagement with other volunteers, knowing the volunteer effort is getting cooperation from relevant agencies, and an opportunity to see direct, tangible results impacted the success of a volunteer organization as well.

Though this study did not have enough observations to make generalizations, neither subject was willing to participate in the WWP. Moreover, the WWP has been struggling to find volunteers in areas it is active ([www.cerceris.info](http://www.cerceris.info)). Using the results from the McDonald and Ryan et al studies, we can make inferences as to why the program, though very promising, is having difficulties engaging the community and other volunteers. A study done by Still and Gerhold (1997) found that those aged 35-50, were college educated, and employed with an income of \$50-99,000 were the most likely demographic to volunteer. The WWP should streamline their search to counties with the stated demographics and have been living in the area for several years because they will have a deeper attachment to the environment. The marketing of the program will also

make a huge impact on its success. If people perceive it to be a program, which the community and the individuals can gain a lot from while giving back to the environment, people will be more interested. The program should provide opportunities for the volunteers to engage with one another because studies have found that attachment to the group leads to long-term volunteerism. The training aspect of the program should have a large educational component since many volunteers are looking for an educational experience. The WWP can also lower the opportunity cost by making the program a summer family activity. Families can adopt a wasp colony and monitor it together and by doing so, volunteers no longer have to give up time with loved ones during the summer.

However, there are some factors, which influence participation in volunteering program, which the WWP can never be able to achieve. For example, it will never provide an opportunity to see direct, tangible results from volunteers' efforts. Because the program is a management and early detection technique, it does not provide a solution to the problem. In actuality, if an EAB is found at a site, it means there are tough times ahead for the community and so in reality, finding nothing of importance is the best. Environmental agencies, which are aimed towards saving marquee and poster species, or glamorous animals, find it much easier to gain support since volunteers see a tangible result from their efforts (Small, 2011). For example, the joint US-Canada recovery plan for the Whooping Crane will cost the US a total of \$6.1 million dollars a year and \$125 million through 2035. On the other hand, the quillwort fern, which are globally rare, have only received \$20,000 of federal funding (Small, 2011). Small states, "Aesthetic and commercial standards have become the primary determinants of which species in

the natural world deserve conservation.” Since the Ash Tree is clearly not a “poster species,” the battle for its conservation will be ongoing. However, if we can tailor volunteer programs, such as the WWP, to meet the needs of volunteers, we may be able to slow down Ash mortality until the government recognizes the importance of the species economically and ecologically.

In conclusion, though this study cannot provide any concrete insight into New Yorkers’ awareness of the EAB infestation, it does exemplify people’s apathy towards environmental issues. However, this does not justify being unresponsive to such issues. Rather, it implores ecologists and environmentalists to change their methods. By catering programs to the needs and wants of the public, it is possible to have more successful programs, increased awareness, and potentially, save species which would otherwise be extinct. The Ash tree plays an important role in New York State and America as a whole and we must, therefore, increase the public awareness. The EAB is a species with the ability to profoundly alter invaded areas, affecting ecosystem processes and ultimately human societies.

## Appendix A: Survey sent to study subjects

### QUESTIONNAIRE FOR THE PROJECT:

#### **‘Public awareness of the impacts of the insect Emerald Ash Borer and its management in New York State’**

**GENERAL INFORMATION** – This questionnaire is being used to collect data for the project ‘Public awareness of the impacts of the insect Emerald Ash Borer and its management in New York State’, funded and conducted by a research team from Union College (<http://www.union.edu/>), Schenectady County, New York State. The main goal of the project is to understand the awareness that people living within areas infested by the Emerald Ash Borer insect in New York State have about the damage this insect causes to ash trees and the strategies that may be used to manage the insect.

The results of the project will be confidential and for academic purposes only. The research team will report the results in a report that will be distributed in the appropriate governmental offices in each county included in the project. Counties included in the project are those in which the Emerald Ash Borer insect has been detected, according to the New York Department of Environmental Conservation (DEC): Greene, Ulster, Orange, Steuben, Cattaraugus, Genesee, Monroe, Erie, and Livingston.

The population to be surveyed is referred to all the adult residents (18 years old or older) in each county considered in the project. We need to randomly contact a specific number of people per county from that survey population. To do that, we prepared in a random way a per-county telephone numbers database to call and contact in every household the adult person with the most recent birthday. You have received this survey because you indicated a willingness to complete the survey.

If you have any questions regarding any aspect of the project, please contact Professor Jeffrey Corbin, [corbinj@union.edu](mailto:corbinj@union.edu) or 518-388-6097, from Union College, Schenectady NY.

#### **DIRECTIONS TO COMPLETE THE SURVEY**

In order for the results of this survey to accurately represent all adults in each county, it is important that this questionnaire be completed by the adult (18 years or older) currently living at this address who had the most recent birthday (e.g. in the past) and who agreed to complete the questionnaire during the recent telephone conversation. *It*

*is important that the person completing the questionnaire answers the questions in the order in which they appear, and not by reading the whole survey before answering.*

This study will not analyze data to identify a specific household. All information gathered in this questionnaire is only for academic purposes and it will remain confidential. We will use statistical techniques to consider all the answers in a scientific way to provide local and state decision-makers accurate information with respect to the topics covered in the questionnaire. There will be no reporting of individual households' opinions or answers.

Once the person finishes answering the survey, please send it using the pre-paid envelope to the following name and address:

Professor Jeffrey D. Corbin  
Department of Biological Sciences, Union College, Schenectady, NY 12308.

**COMPLETE THE FOLLOWING INFORMATION**

Date: \_\_\_\_\_ County of residence: \_\_\_\_\_

Gender: \_\_\_ Male \_\_\_ Female

Age: \_\_\_\_\_

1. Do you have ash trees on your property?

\_\_\_\_\_ YES. Go to question 2 \_\_\_\_\_ NO. Go to question 3

\_\_\_\_\_ I am not sure/I do not know. Go to question 3

2. If you have ash trees on your property, can you tell us how many trees or acres do you have?. If you cannot provide an accurate number, please provide an estimate in round numbers or percentage of your property that has ash trees.

I have \_\_\_\_\_ ash trees in my property (in exact or round numbers) and / or \_\_\_\_\_ (percentage) of the trees on my property of \_\_\_\_\_ acres are ash trees.



3. Do you consider ash trees to be important or to have a value to you?.

\_\_\_\_\_ YES. Go to question 4 \_\_\_\_\_ NO. Go to question 5

\_\_\_\_\_ I am not sure/I do not know. Go to question 5

4. If your answer to question 3 was 'YES', can you provide us with some reasons why you think ash trees are important or valuable for you?

Reason

1: \_\_\_\_\_

\_\_\_\_\_

Reason

2: \_\_\_\_\_

\_\_\_\_\_

Reason

3: \_\_\_\_\_

\_\_\_\_\_

5. Emerald Ash Borer (EAB, henceforth) is an insect like a beetle that is currently infesting and killing North American ash species, including green, white, black, and blue ash. The insect is not native to the United States, but instead came from its native habitat in Asia. The insect is now present in several States, including Minnesota, Wisconsin, Michigan, Pennsylvania, Indiana, Illinois, Kentucky, Maryland, Missouri, Ohio, and New York. Its presence and the damage it causes to trees have created environmental problems in the areas where ash trees are present that have local, regional, and even national implications.

According to the New York State Department of Environmental Conservation, this insect is present in the county where you live. Once the insect infests an ash tree, it can cause different kinds of tree damage – including bark splitting, destruction of trees' vascular tissues, and thinning foliage – leading, eventually, to the death of the tree within 2 to 4 years of becoming infested.

Did you know something about this insect before reading this survey?

YES.     Go to question 6                             NO.     Go to question 7

\_\_\_\_\_ I am not sure/I do not know. Go to question 7

6. If your answer to question 5 was 'YES', can you tell us how did you get information about this insect?. You can choose more than one option.

\_\_\_\_\_ Via the internet

\_\_\_\_\_ Via television

\_\_\_\_\_ Via radio  
agency meeting

\_\_\_\_\_ At a municipal/governmental

\_\_\_\_\_ At a school/University class or meeting

\_\_\_\_\_ In other place(s)/media(s), namely:

7. Do you think the loss of ash trees in your property and/or county due to this insect could generate impacts or consequences that will affect yourself, and/or your property, and/or your county?

       YES.     Go to question 8                             NO.     Go to question 9

\_\_\_\_\_ I am not sure/I do not know. Go to question 9

8. If your answer to question 7 was 'YES', can you describe what, specifically, would be the impact(s) or consequence(s), that will affect yourself, and/or your property, and/or your county?

9. Do you know if any municipal, governmental office or private, non-governmental group has started any actions to control the damage caused by the presence of the EAB insect in the county where you live?

\_\_\_\_\_ YES  
sure/I do not know

\_\_\_\_\_ NO

\_\_\_\_\_ I am not

10. The following actions have been conducted in several States to monitor the presence of this insect, to regulate its spread, and to control its damage to ash trees. If you know or have heard about any of these actions, please check it. You can check more than one.

\_\_\_\_\_ Implementation of 'Do-not-move-firewood' regulations

\_\_\_\_\_ Cutting and removal of infested ash tree(s)

\_\_\_\_\_ Installation of purple traps in the foliage of ash trees to monitor the presence of this insect

\_\_\_\_\_ Application of chemical products (insecticides) to the soil next to infested ash trees, or to their trunks

\_\_\_\_\_ Release of beneficial insects to the environment that will be able to kill the insect Emerald Ash Borer

\_\_\_\_\_ Implementation of programs to monitor the presence of the insect, mainly based on volunteers' work

\_\_\_\_\_ I do not know/ I do not have heard about any of the listed actions

11. The following list includes the most common actions that have been implemented in several counties to control the damage caused by the insect in ash trees, with varying levels of efficiency and success. If the EAB insect would have infested ash trees on your property, which of the following actions would you be most likely to support in order to control it?. Choose only one.

\_\_\_\_\_ I do not have ash trees in my property. Go to question 12.

Actions:

\_\_\_\_\_ Cutting and removal of infested ash tree(s), with no replacement of the removed trees

\_\_\_\_\_ Cutting and removal of infested ash tree(s), replacing the trees with ash trees

\_\_\_\_\_ Cutting and removal of infested ash tree(s), replacing the trees with other tree species

\_\_\_\_\_ Application of chemical products (insecticides) to the soil next to infested ash trees, or to their trunks

\_\_\_\_\_ Release of beneficial insects to the environment that will be able to kill the insect Emerald Ash Borer

\_\_\_\_\_ None

11.1 Can you explain why did you choose that option?

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11.2 Which of the following arrangements do you think is the appropriate source for funding the action you chose in question 11 to control the damage of the insect in your property?. Choose only one:

\_\_\_\_\_ Since the damage is on my property, I should pay for any cost involved in taking that action

\_\_\_\_\_ Costs should be paid for using existing County funding sources

\_\_\_\_\_ Costs should be paid for using County funding sources and charging a one-time special fee on County citizens

\_\_\_\_\_ Costs should be shared by the County, State, and the Federal Government

\_\_\_\_\_ Another arrangement such as (please, describe):  
\_\_\_\_\_

12. The following list includes the most common actions that have been implemented in several Counties to control the damage caused by the insect in ash trees located in public spaces, with varying levels of efficiency and success. If the environmental officers in your County decide to start a control program for this insect in the County where you live, which of the following control measures would you be most likely to support?. Choose only one.

\_\_\_\_\_ Cutting and removal of infested ash tree(s), with no replacement of the removed trees

\_\_\_\_\_ Cutting and removal of infested ash tree(s), replacing the trees with ash trees

\_\_\_\_\_ Cutting and removal of infested ash tree(s), replacing the trees with other trees' species

\_\_\_\_\_ Application of chemical products (insecticides) to the soil next to infested ash trees, or to their trunks

\_\_\_\_\_ Release of beneficial insects to the environment that will be able to kill the insect Emerald Ash Borer

\_\_\_\_\_ None

12.1 Can you explain why did you choose that option?

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12.2 Which of the following arrangements do you think is the appropriate source for funding the action you chose in question 12 to control the damage of the insect in the county where you live?. Choose only one:

\_\_\_\_\_ Costs should be paid for using county existing funding sources and no additional special fee

\_\_\_\_\_ Costs should be paid for by a one-time special fee for every citizen in your County

\_\_\_\_\_ Costs should be paid for using a combination of County funding sources and by charging a one-time special fee on citizens

\_\_\_\_\_ Costs should be shared by the County, State, and the Federal Government

\_\_\_\_\_ Other arrangement such as (please, describe): \_\_\_\_\_

13. Experts agree that one of the best ways to manage the spread and damage of the insect Emerald Ash Borer (EAB) is early detection and monitoring. Once experts know EAB locations and the degree of infestation the insect has generated in that area, they can recommend management and control measures that fit best to that specific situation.

Several States have started a program called Wasp Watchers Program for early detection and monitoring of this insect. The program is conducted by local environmental officers and volunteers to develop field work to locate and monitor the nests of a ground-nesting wasp that feeds on the EAB insect. The wasp behaviors in the following way: the wasp catches the adult beetle-like stage of the EAB; then the wasp carries the EAB insect to its nest located in the ground, via a circular entrance hole.

People engaged in the program usually work on their free time, for example on weekends, during the summer, mainly July and August. People are assigned with a specific geographic area in their counties and receive training, the required supplies, and coverage of the transportation expenses necessary to conduct the field work. The specific actions involved in the field work are:

- To review their assigned area to locate the wasp nests
- Once a nest is found, the nest is monitored for a specific length of time to see whether a wasp arrives with the EAB insect as prey
- The wasp arrives to the nest and puts the insect on the ground to introduce it through the entrance hole to its nest. That is the moment when people monitoring the nest must collect the EAB insect. The program provides specific supplies to manage and collect the EAB. *Neither the EAB nor the wasp stings humans so people need not worry about handling them.*

Information on nests location and the amount of the EAB insect collected must be sent constantly to the institution in charge of the Wasp Watchers program, so that presence of the EAB insect can be confirmed for the nest's location.

Considering the information we have provided on the Wasp Watchers Program, please answer the following 6 questions (13.1 through 13.6):

13.1 Have you ever been involved in a Wasp Watchers Program?

\_\_\_\_\_ YES

\_\_\_\_\_ NO

13.2 Do you know or have you ever heard something about the Wasp Watchers Program?

\_\_\_\_\_ YES. Go to question 13.3

\_\_\_\_\_ NO. Go to question 13.4

\_\_\_\_\_ I am not sure/I do not know. Go to question 13.4

13.3 If you answered 'YES' to the prior question, can you tell us where did you get information about the program?. You can choose more than one option.

\_\_\_\_\_ Via the internet

\_\_\_\_\_ Via television

\_\_\_\_\_ Via radio

\_\_\_\_\_ At a municipal/governmental agency meeting

\_\_\_\_\_ At a school/University class or meeting

\_\_\_\_\_ In other place(s)/media(s), namely:

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13.4 Would you be willing to participate as a volunteer in a Wasp Watchers Program with the same features and activities described above in question 13, to detect EAB infestations in your County?

\_\_\_\_\_ YES

\_\_\_\_\_ NO

\_\_\_\_\_ I am not sure/I do not know

13.5 To implement a Wasp Watchers Program for early detection of the EAB insect in different areas of your County requires coordinated work of environmental institutions and volunteers to develop the same activities described in question 13. Therefore, it is

necessary to supplement the funds provided by the government with a one-time voluntary monetary contribution made by County citizens. Regardless of your answer to Question 13.4, and considering your level of income; considering all the expenses you currently have, and considering that if you make a donation you will not use that money for any other purposes:

Would you be willing to donate a voluntary monetary contribution per one-time to be transferred to the institution in charge of the Wasp Watchers Program in the fashion you like the most?.

\_\_\_\_\_ YES.      How much money would you be willing to donate? : \$ \_\_\_\_\_

\_\_\_\_\_ NO

13.6 Can you explain why did you provide the answer 'YES' or 'NO' in the prior question?

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14. Have you ever been involved in any type of voluntary program? (at church, at your work, etc.)

\_\_\_\_\_ YES

\_\_\_\_\_ NO

15. Have you ever been a member of any formal or informal environmental group or organization?.

\_\_\_\_\_ YES

\_\_\_\_\_ NO

16. How long have you lived at your current residence?: \_\_\_\_\_ years

17. What is your current marital status?

\_\_\_\_\_ Single

\_\_\_\_\_ Married

\_\_\_\_\_ Widowed



\_\_\_\_\_ Divorced/Separated

\_\_\_\_\_ Other: \_\_\_\_\_

18. What is the highest level of education you have completed?

\_\_\_\_\_ Elementary school

\_\_\_\_\_ High school

\_\_\_\_\_ College degree

\_\_\_\_\_ Masters or professional degree

\_\_\_\_\_ Ph.D. or postdoctoral work

19. What is your expected household income for 2012?

\_\_\_\_\_ Under \$25,000

\_\_\_\_\_ \$25,000 - \$39,999

\_\_\_\_\_ \$40,000 - \$49,999

\_\_\_\_\_ \$50,000 - \$74,999

\_\_\_\_\_ \$75,000 - \$99,999

\_\_\_\_\_ \$100,000 - \$124,999

\_\_\_\_\_ \$125,000 - \$149,999

\_\_\_\_\_ Over \$150,000

20. What is your current employment status?

\_\_\_\_\_ Employed full time

\_\_\_\_\_ Employed part time

\_\_\_\_\_ Student

\_\_\_\_\_ Retired

\_\_\_\_\_ Other, please describe: \_\_\_\_\_

**THANK YOU VERY MUCH FOR YOUR TIME AND ANSWERS!**

We really appreciate your participation in this project.

As a way to improve future questionnaires related to this or other topics, we would like to know your opinion about the wording and clarity of the questions included in this questionnaire.

Please, feel free to comment on any difficulties you may have found when completing the questionnaire, including wording, clarity of explanations, ideas presented, or any other topics about which you may want to comment:

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Remember, if you have any questions about the project, please contact Professor Jeffrey Corbin by email, [corbinj@union.edu](mailto:corbinj@union.edu), or by telephone: 518-388-6097.

When you have completed the questionnaire, please return it using the pre-paid envelope to the following name and address:

Professor Jeffrey D. Corbin  
Department of Biological Sciences  
Union College  
Schenectady, NY 12308.

**THANK YOU VERY MUCH FOR YOUR TIME AND ANSWERS!**

## Works Cited

- Bendor, T., S. Metcalf, L. Fontenot, B. Sangunett, and B. Hannon. "Modeling the Spread of the Emerald Ash Borer." *Ecological Modeling* 197.1-2 (2006): 221-36. Print.
- Careless, Philip David Stratford. "Biosurveillance Utilizing a Beetle Hunting Wasp (Cerceris Fumipennis, HymenopteraCrabronidae) to Detect Infestations of Emerald Ash Borers (Agrilus Planipennis, ColeopteraBuprestidae)." Thesis. University of Guelph, 2009. Print.
- "Emerald Ash Borer (EAB)." *Emerald Ash Borer*. NYS Dept. of Environmental Conservation. Web. Mar. 2012.  
<<http://www.dec.ny.gov/animals/7253.html>>.
- Holmes, Thomas P., Juliann E. Aukema, Betsy Von Holle, Andrew Liebhold, and Erin Sills. "Economic Impacts of Invasive Species in Forests." *Annals of the New York Academy of Sciences* 1162.1 (2009): 18-38. Print.
- Kovacs, Kent F., Robert G. Haight, Deborah G. McCullough, Rodrigo J. Mercader, Nathan W. Siegert, and Andrew M. Liebhold. "Cost of Potential Emerald Ash Borer Damage in U.S. Communities, 2009–2019." *Ecological Economics* 69.3 (2010): 569-78. Print.
- Langenfeld, Catherine. *The Value of Ecological Restoration Volunteer Programs a Case Study in Western Washington State*. Thesis. Evergreen State College, 2009. Evergreen State College, 2009. Print.

Macfarlane, D., and S. Meyer. "Characteristics and Distribution of Potential Ash Tree Hosts for Emerald Ash Borer." *Forest Ecology and Management* 213.1-3 (2005): 15-24. Print.

Meyer, Michelle. "Rationality, Law & Public Policy." IDM 108. Schenectady. 30 Apr. 2012. Lecture.

Poland, Therese, and Deborah McCullough. "Emerald Ash Borer: Invasion of the Urban Forest and the Threat to North America's Ash Resource." *Journal of Forestry* (2006): 118-24. Print.

Small, Ernest. "The New Noah's Ark: Beautiful Animals Only, Please!" *Biodiversity, Official Publication of the Tropical Conservancy Organization* 13.1 (2012): 37-53. Print.

Spears, Tom. "Too Cute to Die? Experts Say We're Too Selective about Species We Choose To protect." National Post, 23 Apr. 2012. Web. May 2012.  
<<http://news.nationalpost.com/2012/04/23/too-cute-to-die-experts-say-were-too-selective-about-species-we-choose-to-protect/>>.

Teerling, Colleen. "Working with *Cerceris Fumipennis*." *Working with Cerceris Fumipennis*. Web. Apr. 2012. <<http://www.cerceris.info/protocol.html>>.