

# Reflection Section Answer Guide

**Note to Educator:** The purpose of the Reflection Section Questions is to encourage students to think critically about what they have read. The following “answers” are only suggestions to assist you in using these questions in the classroom.

## The Great Horned Owl in the Oxbow

### Introduction

What is the research question the student scientists wanted to answer? *Is the Oxbow a good habitat for the great horned owl?*

How would you determine if an area would provide a good habitat for the great horned owl? *You would need to see if the habitat had food for the owl and a place for the owl to live. You would also want to know if there was anything in the habitat that would hurt the owl population.*

### Method

Invasive species are plants or animals that overtake an area and cause harm to the native plants or animals that naturally live there. Do you think that all native plant or animal species are harmed by an invasive species? Why or why not?

*No, some native plant or animal species may benefit from an invasive species. For example, the great horned owl has more places to live because there are more dead trees due to the emerald ash borer. The emerald ash borer is an invasive species.*

How do you think the student scientists researched the food sources of the great horned owl? *The student scientists read books, encyclopedias, and searched the Internet.*

### Findings

When you improve the habitat for the great horned owl, do you think other animals benefit from the improvement also? Why or why not? *This is an individual question. Students’ answers should be supported with reasoning and logic.*

What are some benefits of attracting more great horned owls to the Oxbow? *There are several answers to this question. For example, great horned owls could be beneficial because they eat mice and other rodents. Encourage your students to come up with as many benefits as they can.*

### Discussion

Do you think it is a good idea to enhance the great horned owl’s habitat in the Oxbow? Why or why not? *This is an individual question. Students’ answers should be supported with reasoning and logic.*

Let’s say the student scientists were able to plant a wheat field where the horse pasture is now. How might the student scientists find out if planting the wheat field had any impact on the number of great horned owls living in the Oxbow? *The students could take an estimate of the number of owls before the field is planted and take an estimate again after the field has been planted.*

## Oxbow Soil Vitality: Is It Healthy?

### Introduction

What were the questions the student scientists wanted to answer? *How the soil has been affected by irrigation water? What is the overall status of the soil's health in the Oxbow?*

How do you think irrigation water could pollute a river? *Irrigation water can send chemicals from fertilizers and pesticides into the water. Waste products from animals can also be washed into the river. Irrigation also causes soil erosion which can cause pollution.*

### Method

Why did the student scientists have to modify the SQI? *The students had to modify the SQI because as students they did not have access to all the same equipment as the Forest Service scientists.*

Why did the student scientists focus on ash, hackberry, and cottonwood trees? *Because they are dominant in the Oxbow.*

### Findings

In your own words, summarize what the student scientists found through their study. *The student scientists found that the soil quality is not excellent but it is also not horrible. The soil fell in the middle of the scale. The soil pH is suitable for plants and plants that like a high potassium area to grow in would like the Oxbow as well.*

The SSQI value ranges from 33.33-66.67. The average is 50.00. Based on these findings do you agree with the students' assessment of their findings? Why or why not? *This is an individual question. Student answers' should be supported with reasoning and logic.*

### Discussion

The student scientists wished they could have measured more chemicals. If they had been able to do so, do you think they might have come to a different conclusion? Why or why not? *It is possible that they may have come to a different conclusion because the pollution from the irrigation may be from chemicals that the student scientists did not originally measure in the SSQI.*

The SSQI used 5 different measures to come up with an overall value. Think of a similar situation in your life where many different measures are combined in some way to produce one overall value. Explore this process of evaluation in a class discussion. What are its advantages and disadvantages? *This is an individual question. Student answers' should be supported with reasoning and logic. One example is grading in school.*

## The Emerald Ash Borer: An Ash Tree's Worst Enemy

### Introduction

From what you read so far, do you think the EAB problem will improve worsen, or stay the same? Why? *It sounds like the problem will worsen because the EAB has spread quickly and it doesn't sound like there is a way of stopping it from what I have read so far.*

What was the question the student scientists wanted to answer? *The scientists wanted to find out how soil properties are related to ash trees infested with EAB.*

## Method

What might be an advantage of taking 7 soil samples from under each tree, instead of taking just 1 or 2 samples? *If you only take one or two samples you could be getting incorrect information. By taking seven samples you are increasing the chance that you are getting reliable information.*

Look at the photos in figures 7-12. What is one common feature of all of these trees? *There could be several answers to this question. For example, they are all deciduous trees. Encourage your students to discuss this question and their answers.*

## Findings

Are you surprised at the student scientists' findings? Why or why not? *This is an individual question. Students should support their answers with reasoning and logic.*

What might you conclude about the EAB and soil properties from these findings? *The study is not conclusive, but it does seem like there should be more research done to determine whether EAB makes soil better for plants.*

If you had an opportunity to repeat this research, what might you do differently? *This is an individual question. Students should support their answers with reasoning and logic.*

## Discussion

What is another potential problem that might come from releasing another non-native species into EAB-affected areas? *Releasing another non-native species may cause problems because it may become a problem too since it will have no natural predators.*

Should scientists closely monitor the effect of the stingless wasps in EAB-infested areas? Why or why not? *Scientists should definitely monitor the effect of the wasp closely to make sure that the wasp populations do not get out of control and cause yet another problem.*

## Garlic Mustard: All Around and Down the Oxbow

### Introduction

State in your own words the question the student scientists wanted to answer. *How do minerals and pH level in the soil affect how much garlic mustard is in an area?*

Plants need nutrients like nitrogen, potassium, and phosphorus to grow. What things do you need to grow? *Humans need food, air (specifically oxygen), water, and shelter. Humans also need things like clothing and companionship to survive.*

### Method

Why do you think the student scientists collected two soil samples from each area instead of just one? *The more soil samples the better chance you have of obtaining accurate information about the soil.*

The student scientists used a very specific method to test the amount of nutrients in the soil. Do you think this is important? Why or why not? *The more specific and detailed your method is the better. It is easier for others to replicate your experiment this way and verify your findings. Additionally, a detailed method allows the scientists to more easily remember what they did when they explain their findings.*

## Findings

Based on the results of the amount of nutrients in the soil, do you think the nutrients have an effect on the amount garlic mustard present? *In areas with a high concentration of garlic mustard there were low levels of phosphorous, potassium, and nitrogen.*

A pH level of 7 is neutral. How do the pH results compare? *All the results are around 7. Where garlic mustard was present the pH levels were a little lower than areas without garlic mustard. The exception was the soil around cottonwood trees which had the lowest pH levels.*

## Discussion

The student scientists said that the original experiment they planned had to be changed. Do you think this happens to other scientists? Why or why not? *Scientists sometimes have to modify an experiment based on new things they learn or due to problems being able to conduct the experiment.*

Do you agree with the student scientists that more research needs to be done? Why or why not? *Yes, it is a good idea to do more research and conduct additional experiments. In science, it is important for others to be able to replicate your experiment and come to the same conclusions in order to verify what your research has found. Another advantage of additional experiments is that scientists may find out other information that is helpful in combating garlic mustard.*

## The Emerald Ash Borer: Invading Ash Trees in the Oxbow

### Introduction

In your own words and in the form of a question, state what the student scientists wanted to learn. *What are the effects of the emerald ash borer in the Oxbow?*

Based on what you have read so far about invasive species, what is one way you can help stop the spread of invasive species? *When traveling, be aware of what you bring back with you. Make sure firewood is not infected. Students may come up with other ways.*

### Method

The student scientists collected their data over a two-day time period. Do you think this was enough time? Why or why not? *This is an individual question. Students should use reasoning and logic to support their answer.*

Often scientists work in teams or have an expert provide information on a certain subject area. The student scientists had Toby help them with tree identification. Think of a time when someone helped you with your project. What are the advantages and disadvantages of having someone help you with a project? *This is an individual question. Students should use reasoning and logic to support their answer.*

### Findings

Look at Figure 6 again. What do you notice about the two trees that are dead compared to the other trees? *The two trees that were dead were also the only two trees with loose bark.*

Based on the student scientists' findings, do you think the five trees that are still alive will survive? Why or why not? *This is an individual question. Students should use reasoning, logic, and evidence from the figures to support their answer.*

### **Discussion**

Summarize in your own words, one possible solution for stopping the spread of EAB.

*One possible solution for stopping the spread of EAB is having parasitic wasps distributed in the area where the EAB are.*