

Forestry Institute Teaching Unit
Angie Kerr - Midland Public Schools

Target Grade and Subject

This unit is targeted to High School Biology classes. In Midland Public Schools this class services all high school grade levels, 9-12.

Unit Overview

This unit will include many topics but be focused on two, the development of a scientific experiment and classification practice. My hope is that with the use of information about forest health, pest and insect disease, monitoring and trapping principles and management practices, the students will be able to utilize their knowledge to test an experimental question and derive data. This unit will connect with current curriculum through the scientific method. It will provide students with a practical, hands on experience with designing and performing a scientific experiment. Typically, we walk kids through the procedure using classroom readings. This activity will not only increase their knowledge base about healthy forests, but also engage them in “doing science.”

Books/ Sources Consulted

The instruction will utilize the information and PowerPoint presentations given by:
Dr. Andrew Storer at the Forestry Institute on July 12-17, 2004.

Other resources include:

Diagnosing Injury to Eastern Forest Trees.1987. Penn State College of Agricultural Sciences, 1987
Woodland Stewardship: A Practical Guide for Midwestern Landowners. 1993. Baughman, Alm, Reed, Eiber and Blinn. University of Minnesota Extension Service.

Objectives

At the end of this unit, students will be able to:

1. Design a scientific investigation with forest insects
2. Classify pest utilizing a field classification books
3. Understand the basic principles of a healthy forest
4. Be able to identify the characteristics of a healthy forest
5. Identify common pests and insect disease
6. Define common disease terminology
7. Utilize methods for monitoring&/or trapping insect populations

Michigan Content Standards

Science content standards.

- Strand I. Constructing new scientific knowledge
- Strand III. Using scientific knowledge in life science
- Strand III.2 Organization of living things with classification systems

Mathematics content standards.

- Standard III.1 Collection, organization and presentation of data

General Overview of the Lesson Days and Goals

(See Section: Teaching Methods and Materials for more specifics)

Day One

Goals:

1. What is a healthy forest?
2. Review key terminology in forest health
3. Investigate some of Michigan's key pests
4. Lab work: Identification of common of Michigan pest. Detect their similarities and difference through visual observation.

Day Two

Goals:

1. Finish Day One work. Also complete powerpoint on insect sampling methods.
2. Students will be assigned one Michigan pest from the samples to research for homework. (See **PEST HOMEWORK RUBRIC**)
3. Make observations of insects inhabiting a snag.

Day Three:

1. Take kids to forest plots and have them survey the area and list all the insects they see. (I will mark 10 plots so that kids can work with one plot in teams of three students)
2. Team will begin to formulate a field scientific question
3. Complete powerpoint on Methods for Monitoring Insect Populations
4. Issue **Scientific Question Lab Rubric**

Day Four

Goals

1. Students will begin to develop their field scientific question with regards to insects/pest in their forest plot.
2. Students will complete the lab worksheet / checklist which will guide them through the steps of the scientific methods in preparation for their field/lab work

Day Five

Goals

1. Students will begin work on their scientific experiment at their plots

Day Six

Goals

1. Students will collect data from their plot. (This might require two data collection days at their plots.)
2. Students will classify the insects they have collected

Day Seven

Goals

1. Computer lab research time to compile results and report

The Specific Details

Teaching Materials and Procedures

Day One:

1. **Pre writing topic:** “What is a healthy forest?” Give the students 5-10 minutes to free write a response to the questions. Collect, discuss or pair up and share responses.
2. **Pre quiz.**
 - a. T or F A healthy forest is one that does not have any disease.
 - b. T or F Healthy forest are productive, sustainable, and contain many diverse living organisms.
 - c. T or F Biodiversity is measured in the number of species and the population of each species.
 - d. T or F Healthy forests require proper abiotic factors, high resistance to change and diversity in habitats for animals to live.
 - e. T or F Saplings in a forest have a negative impact on the overall forest health.
 - f. List three potential forest stressors:
 - g. Which Michigan forest pest was most significant in its destruction of forest acres? (Gypsy moth or forest tent caterpillar). Circle one.
 - h. Matching.

i. Disease	1. organism in or on which a parasite lives
ii. Pathogen	2. change in function or form of plant
iii. Pest	3. organism that causes disease
iv. Host	4. species that interferes with human activities, property or health or is objectionable
3. Utilize Dr. Andy Storer PowerPoint presentation notes titled: Forest Resources & Environmental Sciences (Forest Health: Insects and Disease). Topics: Definition of a healthy forest and Key Terminology.
4. Lab work to include real samples of Gypsy moth, Forest tent caterpillar, white pine weevil, bark beetles, pine engraver, Carpenter ants and Emerald ash borer. Collect samples from the Midland Conservation District. Set the samples throughout the lab room. Have the students move in teams of two to each station, noting the physical similarities and differences in each of the organisms. Compile their results on the front board for class discussion.

Day Two:

1. Finish any lingering discussion or observations of the Michigan pest.
2. Students will be assigned to one specific pest (listed above). They will research their pest for homework, creating a poster that teaches the following requirements: **PEST RUBRIC**
 - a. Specific trees/plants that their pests attacks (1 point)
 - b. Frequency of outbreaks / Timeline of attack (5 points)
 - c. Life cycle of pest (5 points)
 - d. Symptoms of disease in trees. (5 points)
 - e. Management options. Be specific. (5 points)

- f. Surveying techniques used in the field for their pest. List and explain at least two surveying techniques that are currently being used. (5 points)
3. Field observation in the classroom. I will bring in a snag or fallen tree for student observation. This will begin to introduce potential habitats for insects.

Day Three:

1. We will visit the pre-assigned and pre-marked forest plots (10 in all). The kids will sit in their team plot and make observations of insect movements, marks or nests. They will compile their quiet observations in a list. **See List Record Sheet below.**
2. I will utilize Dr. Andy Storer PowerPoint presentation notes for Methods of Monitoring Insect Populations. My presentation will be limited to: visual inspection, netting, knockdown, trapping, pitfall trapping, sticky trapping.
3. After a grounds “tour and inspection”, my students will be challenged to formulate an insect question which will be tested through a scientific experiment.

Scientific Experiment Lab RUBRIC

- a. Clearly stated question. (1 point). Examples might include: What insects use the sugar maple to access the canopy and understory? What insects inhabit the understory in our plot? What types of flying insects inhabit our plot? Is the red pine limbs infected with insects?
- b. Clearly stated hypothesis. (1 point)
- c. The team must research information necessary about the surveying technique that the team has chosen to use. They must include proposed drawings (sketches) of the surveying method, proposed site for sampling, time schedule for sampling checks, rational for methods of sampling chosen. (10 points)
- d. Procedure. The team must create a procedure (replicable) with specific details of their scientific methods, including a timeline. (10 points)
- e. Materials list. Include all materials necessary to complete this lab. (10 points)
- f. Data Collected. Students will classify the insects collected including their common name and number collect. This must be shown in a data table, appropriate graph (digital pictures are optional and extra credit). (10 points). I will provide a classification guide of common Mid-Michigan insects
- g. Conclusion. By referencing the data collected, students will respond to their initial question and hypothesis.
 - i. Answer generally their scientific question (1 point)
 - ii. Was their hypothesis true or false based on data (1 point)
 - iii. What insects were discovered in their surveying? (5 points)
 - iv. Were the insects found considered a “pest”? (1 point)
 - v. What were potential experimental errors in their procedure that might have affected the results? (5 points)
 - vi. What are suggested management practices for one of the more common insects that discovered in their surveying? (5 points)
 - vii. What are their suggestions for future studying with regards to this site? (5 points)

Day 4. Forest Plot Team Pre-Lab Checklist

What is your specific question about insects in your forest plot?	Ex. What insect is most numerous in the understory?
What is your hypothesis? (Write this as a statement.)	Ex. Ants are the most numerous in the understory.
What technique for sampling/trapping or observation will you use?	
What site in your plot will you monitor? Specifically.	
Sketch the technique you will use.	
How many times will you check for insects in your traps? (Once or twice a week)	
List a brief procedure of steps your experiment will follow.	
List the materials your team will need to bring to complete your experiment.	
How will you record you data?	

Forest Plot Insect Scientific Experiment Rubric

Teacher Scoring

Student Checklist

- | | | | | |
|---|---|---|---|--------------------------|
| 0 | 1 | 1. Clearly stated question about insect in the plot. Ex. might include: What insects use the sugar maple to access the canopy and understory?
What insects inhabit the understory in our plot?
What types of flying insects inhabit our plot?
Is the red pine limbs infected with insects? (1 pt) | <input type="checkbox"/> | |
| 0 | 1 | 2. Clearly stated hypothesis . (1 point) | <input type="checkbox"/> | |
| 0 | 5 | 10 | 3. The team must research information necessary about the surveying technique that the team has chosen to use. They must include proposed drawings (sketches) of the surveying method, proposed site for sampling, time schedule for sampling checks, rational for methods of sampling chosen. (10 points) | <input type="checkbox"/> |
| 0 | 5 | 10 | 4. Procedure . The team must create a procedure (replicable) with specific details of their scientific methods, including a timeline. (10 points) | <input type="checkbox"/> |
| 0 | 5 | 10 | 5. Materials list . Include all materials necessary to complete this lab. (10 points) | <input type="checkbox"/> |
| 0 | 5 | 10 | 6. Data Collected . Students will classify the insects collected including their common name and number collect. This must be shown in a data table, appropriate graph (digital pictures are optional and extra credit). (10 points). I will provide a classification guide of common Mid-Michigan insects | <input type="checkbox"/> |
| | | | 7. Conclusion . By referencing the data collected, students will respond to their initial question and hypothesis. | <input type="checkbox"/> |
| 0 | 1 | | a. Answer generally their scientific question (1 point) | |
| 0 | 1 | | b. Was their hypothesis true or false based on data (1 point) | |
| 0 | 3 | 5 | c. What insects were discovered in their surveying? (5 points) | |
| 0 | 1 | | d. Were the insects found considered a "pest"? (1 point) | |
| 0 | 3 | 5 | e. What were potential experimental errors in their procedure that might have affected the results? (5 points) | |
| 0 | 3 | 5 | f. What are suggested management practices for one of the more common insects that discovered in their surveying? (5 points) | |
| 0 | 3 | 5 | g. What are their suggestions for future studying with regards to this site? (5 points) | |

Michigan Pest/Insect Homework Rubric

- a. Specific trees/plants that this pest attacks (1 point)
- b. How often does this insect attack? (5 points)
- c. Explanation or sketch of the life cycle of pest (5 points)
- d. Symptoms of disease seen in the plants. (5 points)
- e. Pest management options. Be specific. (5 points)
- f. Surveying techniques used in the field for their pest. List and explain at least two surveying techniques that are currently being used. (5 points)

Name _____

Create a reasonable, best effort response to the prompt. Be sure to write in complete sentences and fill seven lines

Prompt: **“What is a healthy forest?”**

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Pre quiz on Healthy Forest Knowledge

1. T or F A healthy forest is one that does not have any disease.
2. T or F Healthy forest are productive, sustainable, and contain many diverse living organisms.
3. T or F Biodiversity is measured in the number of species and the population of each species.
4. T or F Healthy forests require proper abiotic factors, high resistance to change and diversity in habitats for animals to live.
5. T or F Saplings in a forest have a negative impact on the overall forest health.
6. List three potential forest stressors:
7. Which Michigan forest pest was most significant in its destruction of forest acres? (Gypsy moth or forest tent caterpillar). Circle one.
8. **Matching.**

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b. Pathogen	2. change in function or form of plant
c. Pest	3. organism that causes disease
d. Host	4. species that interferes with human activities, property or health, or is objectionable