

<b>Science</b>	<b>SCI.III.5.6</b>	<b>Grade: 10<sup>th</sup></b>
<b>Strand III: Using Scientific Knowledge in Life Science</b>		
<b>Standard 5: Ecosystems - All students will explain how parts of an ecosystem are related and how they interact; explain how energy is distributed to living things in an ecosystem; investigate and explain how communities of living things change over a period of time; describe how materials cycle through an ecosystem and get reused in the environment; and analyze how humans and the environment interact.</b>		
<b>Benchmark 6: Explain the effects of agriculture and urban development on selected ecosystems.</b>		
<b>Constructing and Reflecting:</b>		
SCI.I.1.1 – Ask questions that can be investigated empirically.		
SCI.I.1.2 – Design and construct scientific investigations.		
SCI.I.1.5 – Discuss topics in groups by making clear presentations, restating or summarizing what others have said, asking for clarification or elaborating, taking alternative perspectives and defending a position.		
SCI.II.1.1 – Justify plans or explanations on a theoretical or empirical basis.		
SCI.II.1.2 – Describe some general limitations of scientific knowledge.		
SCI.II.1.3 – Show how common themes of science, mathematics and technology apply in real world contexts.		
SCI.II.1.4 – Discuss the historical development of key scientific concepts and principles.		
SCI.II.1.5 – Explain the social and economic advantages and risks of new technology.		
SCI.II.1.6 – Develop an awareness of and sensitivity to the natural world.		
<b>Vocabulary</b>	<b>Context</b>	
Common factors that influence ecosystems:		
<ul style="list-style-type: none"> <li>• Pollution of ecosystems <ul style="list-style-type: none"> <li>➤ Fertilizer</li> <li>➤ Insecticide</li> <li>➤ Other chemicals</li> </ul> </li> <li>• Land management</li> <li>• Biodiversity</li> <li>• Sustainability</li> <li>• Loss of habitat</li> <li>• Algae blooms</li> <li>• Biodegradable</li> <li>• Nonbiodegradable</li> <li>• Biological magnification</li> <li>• Crop rotation</li> <li>• Contour plowing</li> <li>• Erosion</li> <li>• Terracing</li> <li>• No-till farming</li> <li>• Land banks</li> </ul>	Common factors that influence ecosystems: <ul style="list-style-type: none"> <li>• Pollution of ecosystems from: <ul style="list-style-type: none"> <li>➤ Agriculture</li> <li>➤ Industry</li> <li>➤ Urban development</li> </ul> </li> <li>• Restoration of habitats</li> <li>• Effects of wastewater where phosphates negatively affects plant growth (ex. history of Lake Erie)</li> </ul>	

## Knowledge and Skills

Students will:

- Identify and analyze the impact of agriculture, manufacturing, recreation, and urban development on ecosystems.
- Analyze how decisions that impact the environment are made.
- Debate the value of protecting the environment vs. the economic impact of those decisions. Discuss how natural resources can be protected and at the same time used.

## Resources

Coloma Resources:

[www.bdol.glencoe.com](http://www.bdol.glencoe.com)

Glencoe Biology Text – CH 5 Section 1

Other Resources:

- Scope Unit – Creating A Sustainable Environment
- Michigan Teacher Network –  
<http://mtn.merit.edu/mcf/SCI.III.5.HS.6.html>
- <http://www.aqua.org/education/teachers/chesapeake.html> “Human impact”
- Science Olympiad event “Water Quality”
- Decisions, Decisions, the Environment  
Tom Snyder Productions (free trial available)
- Science Expo and Science Fair projects
- 4-H
- Department of Environmental Quality
- Berrien County Solid Waste Committee
- Berrien County Waste Recovery
- Engineering firms: Abonmarche, etc
- MI State Agricultural Extension
- Tour of a wastewater treatment plant  
or using staff members for guest speakers
- Wastewater Treatment Simulation Lab (See appendix)
- Local, state, and federal legislations that determine the health of the environment (ex. EPA)

### Instruction

- Have the students develop an experiment to determine the impact of a pollutant on a population. Summarize and discuss the results. Relate the results to a local ecosystem. **Corresponds to standard I.1.2**
- Example: Predict how Duckweed will grow in different concentrations of phosphate detergents and liquid fertilizer high in nitrogen. Run an experiment, testing how different concentrations of nitrates and phosphates affect the growth of Duckweed. Count the number of leaflets in the population at the beginning and the end of the experiment. **Corresponds to standard I.1.2**
- Extension – Try used motor oil concentrations on the duckweed populations. Dispose of oil carefully
- (Reindeer moss can also be used for similar experiments to duckweed).
- Wastewater Simulation Lab (See Appendix). **Corresponds to standard I.1.2**

### Assessment

**Required Assessment – Multi-sensory study of an ecosystem (attached).**

#### Optional Assessment

- Create a comic book, illustrating the effects of a selected pollutant on a habitat in your area. **Corresponds to standard II.1.1**  
(Evaluation rubric available on MI-CLiMB)

The book should include (One point each):

- Source of the pollutant (farm, sewer system, power plant etc.)
- Mechanism of dispersion for pollutant (e.g. wind, ground water, etc.)
- Short term effects on one organism.
- Long term effects on one organism.
- Short term effects on the entire habitat.
- Long term effects on the entire habitat.
- Social issues and implications for humans.
- Economic issues and implications for humans.

Criteria	Apprentice	Basic	Meets	Exceeds
Completeness of contents	Answers with fewer than three correct responses from list above.	Answers with three correct responses from list above.	Answers with four correct responses from list above.	Answers with more than four correct responses from list above.
Accuracy of concepts	Conveys concepts inaccurately.	Conveys some concepts accurately.	Conveys all concepts accurately.	Conveys all concepts accurately, with creativity and quality.

#### Teacher Notes:

**Focus Question:** What is the impact of pollution on an ecosystem?

### **Explain how parts of an ecosystem are related and how they interact.**

It is important for students to learn about many ecosystems, but they need to begin with those that have the closest connection to them. Very young children think in terms of organisms that are around them such as pets, animals in zoos, and houseplants. At a young age, many children think humans help to feed wild animals. As they mature, children begin to understand the concept of populations of organisms in the wild. The concept of populations is most clearly understood in terms of food chains and food webs.

In elementary school, students should be introduced to food chains and learn about some of the organisms involved. Early in this time, students may only be able to understand the relationship between two organisms. Later, students should be able to identify the organisms involved in both food chains and food webs and the feeding relationships that occur. Interestingly, children in elementary school may not believe that food can be a scarce resource in a food web. They think that all animals are more like people in that animals can change what they need to eat whenever they want according to what is available. Students in these grades should be able to describe all of the basic requirements needed for all living things to exist.

As students progress through the upper elementary grades and go into middle school they should become more aware of different interactions between organisms, besides food. For example, there are mutually beneficial relationships like plants depending on animals for pollination. There are also competitive relationships in which different animals with similar environmental requirements compete for the same resources. In the middle school, students should be made aware of the relationships between organisms in which neither could survive without the other. By high school, students should be able to describe common ecological relationships between and among species and their environments. They should understand the difficult concepts of competition, territory, and carrying capacity among others.

### **Explain how energy is distributed to living things in an ecosystem.**

Students misunderstand the concept of energy. Young children think about food as something that they eat. They do not think about food being converted into a useable form of energy. As middle school students, they start to understand the idea of converting energy, but not into anything in particular. It is just converted. They also have trouble understanding the role of plants and the process of photosynthesis. Students often think that anything taken in by plants is food. Even when they start to understand photosynthesis, most students still believe that plants still take in some kind of food for themselves. Soon they start believing that the food the plant makes is for animals, including humans, not the plant itself.

Students should be able to describe how organisms acquire energy directly and indirectly from sunlight. They should also be able to explain how energy flows through ecosystems. The arrows that we use in food chains and food webs to model energy flow are also confusing for students. Even when it appears that students understand food webs and food pyramids, additional questioning shows that students do not understand the crucial role of solar energy and photosynthesis. Even at the high school level, students believe that higher order consumers can survive without plants if there is enough prey and they keep reproducing. The misunderstanding becomes even greater when students study aquatic environments because they do not understand what a plant really is and because their experiences with aquatic environments are very limited.

**Investigate and explain how communities of living things change over a period of time.**

Students in elementary school generally have experiences growing particular plants and animals. They also have opportunities to see examples of other ecosystems both managed (farms and gardens) and unmanaged. As students move to middle school they are more prepared to see the effects that changes in one population may have on another. This interdependence is also discussed in the previous benchmark. Students should be able to describe the predictable succession of an ecosystem over time. They should describe the general factors that regulate population size in ecosystems. Students should describe how an ecosystem responds to events that cause it to change. It is important to note that ecosystems can change dramatically and have rapid fluctuations. Over the course of time, the system is fairly stable.

**Describe how materials cycle through an ecosystem and get reused in the environment.**

Carbon and soil nutrient cycling are critical to understanding how communities change over time. High school students need support in understanding that when organisms die they do not simply "rot away" but that the matter is converted into other materials in the environment. Students need to be reminded that microorganisms are responsible for the decay. High school students frequently think about matter as being created or destroyed rather than it cycles through the ecosystem to be reused in a different form.

**Analyze how humans and the environment interact.**

Students need to learn the role that animals play in design of systems managed by humans. Students should describe the positive and negative effects that humans have on the environment. They should understand the systems that best encourage the growth of plants and animals and then can be managed by humans. Finally, they should describe more positive and negative effects that humans have on the environment. Students in middle school should be able to explain how humans benefit from the use of plant and animal materials. In middle school, students should be able to describe ways in which humans change the environment. In high school, they should be able to explain the effects that agriculture and urban development have on ecosystems.

## **APPENDIX -- Life Science**

### **Hawks and Mice Population Simulation Game**

#### **BACKGROUND:**

In this population simulation game students will see how populations in an ecosystem interact to influence each other. Students will graph the populations of each species over a 10-year period and use the graph they make to explain the relationships between the populations of these hawks and mice in this simulated ecosystem.

#### **MATERIALS NEEDED:**

100 - 150 cut-out pieces of brown or gray construction paper about 3 inches long by 2 inches wide, representing the mice.

70 - 5 inch squares of cardboard, representing the hawks

6 foot x 6 foot square of tape to mark the border of the "ecosystem" where the hawks and mice live.

#### **PROCEDURE:**

1. Construct a class data table to record populations of hawks and mice over a 10 year period (or more if you wish). Students will record information from the data table to convert to a line graph tracking populations over the time period.
2. Scatter thirty mice in the 6 foot by 6 foot square. Thirty is the starting population for mice at the beginning of Year 1. Record in class data table.
3. Give three students a hawk. Three is starting population for hawks for beginning of Year 1. Record in data table
4. Standing outside the square, students with hawks toss their cardboard squares into the ecosystem, trying to catch mice. If a mouse is touching the hawk, the hawk catches the mouse. Hawks have five swoops (tosses) to catch three mice. If hawks catch at least three mice, they survive the year. If they fail to catch at least 3 mice, they must leave the ecosystem - either they die or they must migrate elsewhere for food. The five swoops represent the hawks' hunting for one year in the ecosystem. Remove all captured mice from the ecosystem. (Students must show that they actually caught the mice.)
5. Every surviving hawk has one offspring. Give a new hawk piece to another student for each surviving hawk. Every surviving mouse has 2 offspring. Have a student volunteer in charge of counting and restocking mice in the ecosystem. You may want to give them a calculator to expedite.
6. Count up the new numbers of mice and hawks. Record the new mice and hawk populations in class data table for the beginning of Year 2.
7. Play a new round for Year 2. Follow same procedure in steps 4 - 6
8. Continue playing for 10 more years. You may have to improvise some rules if, for example, the mice start to get out of hand. A devastating fire or other catastrophe may come in handy. Or, if one population hits zero, discuss what will happen to the other population and insert data in the table based on the discussion. For example, if the mice are all caught by hawks, then reasonably the hawk population will decline the next year. This game is not easily predictable, and you will have some improvising in most games you play. This, however, offers opportunity for good class discussion and predictions.
9. At the end of 10 or more years, end the game. Have class examine the data table and discuss in small groups any patterns that can be detected. Have groups report in whole class discussion.

**CLASS ASSIGNMENT:**

Take data table information and construct a line graph that tracks populations of hawks and mice over the time periods. You should grade on correct construction of all elements of a graph - title, labels, spacing for years and populations totals. You may need a review or lesson on graph construction.

Students must also write a summary statement that identifies patterns of the populations and how they affect each other. (You should notice rises and falls in each population.) The peaks and valleys will happen at the same time for both populations; however, one population will lead the other. Mice will rise then hawks will follow. As mice decline, hawks may continue to rise and they will fall.)

**HAVE STUDENTS ANSWER THESE EXPLICIT QUESTIONS:**

1. What patterns do you see?
2. Do rise and declines in populations occur simultaneously or are there lags.
3. Why do you think this is so?
4. How did these two populations affect each other over the time period?

**NOTE:**

You want the students to appreciate that populations affect each other. It is not a simple matter of "hawks eat mice." Rather, the mice play a role in affecting hawk population also.

## **Life Science**

### Cellular Respiration Lab Using Yeast

#### **BACKGROUND:**

This is a micro lab - you only need tiny test tubes because the amounts are so small.

#### **MATERIALS NEEDED:**

Make a mixture of yeast and water. Put one package of yeast in with 1 cup warm water.

Milk

Bromothymol Blue

5 Test tubes

#### **PROCEDURE:**

1. Put 5 ml of the yeast in 5 test tubes
2. Put one drop of bromothymol blue in each test tube
3. Put 7 mls of milk in one test tube as well as 3 mls of water
4. Put 5 mls of milk and 5 mls of water in one test tube
5. Put 3 mls of milk and 7 mls of water in one test tube
6. Put 10 mls of milk in one test tube
7. Put 10 mls of water in one test tube.

Observe the test tubes after a half hour or so. The bromothymol blue loses its color when oxygen in the tube is used up. The test tube with the most milk should change color the quickest (it becomes a light blue - milky white color). The test tube with the water only should stay blue for a long time.

#### **NOTE:**

This shows that when yeast eat food (in this case milk sugar); their rate of respiration is quicker.

#### **CLASS ASSIGNMENT:**

Have student rank the test tubes using decreasing color change. For example, 1<sup>st</sup> would be the milk-only test tube, then the tube with 7 mls milk and 3 mls water, then 5 mls milk and 5 mls water, etc...

## Life Science

### Trophic Levels Relay Game

**BACKGROUND:**

Use this activity to demonstrate how energy is passed along a food chain and is lost as it travels from one trophic level to another.

**MATERIALS NEEDED:**

1 Large trash bag  
Enough popped popcorn to fill the large trash bag

**PROCEDURE:**

1. Divide class into four or five teams.
2. Challenge each team to create a unique food chain in which each team member represents an organism in that food chain. Be sure to include a producer, three or four consumers, and a decomposer. (As an extra challenge, you may designate certain ecosystems for each food chain, such as wetland, marine, desert, rainforest, etc...).
- 3 Students write their organism name on a sign or name tag to be displayed on their person during the relay race.
- 4 The teacher should approve each food chain for accuracy.
5. Go outside and have the team's line up in the correct order for their food chain, starting with the producer and ending with a decomposer.
6. The boundaries for the relay race should be established. and rules should be explained at this time.
6. Distribute a like amount of popcorn to the producer of each relay team. Explain that the popcorn represents "energy" in their ecosystem. The team that retains the MOST popcorn at the end of the relay is the winner!
8. On the teacher's signal, the producers set off to race. When they return to the line they transfer their "energy" to the primary consumer in their food chain. The relay continues until all team members have had the opportunity to obtain and use the "energy".
9. You may use time as a factor in judging the winner, as well as measuring the amount of popcorn that they retained.

**NOTE:**

Students will invariably want to eat some of the popcorn as a treat! You may choose to reward the winning team with homework passes, or some sort of extra credit as an additional incentive. For a closure activity, students are encouraged to write a summary about their experience in the food chain with an emphasis on energy transfer and trophic levels.

## Life Science

### The Voyage of the Nitrogen Atom

#### **BACKGROUND:**

This is an activity for students to gain a better understanding of the nitrogen cycle as a whole, and its various steps.

#### **MATERIALS NEEDED:**

3 X 5 index card

7 stations set up as locations in the Nitrogen Cycle.

The stations are as follows:

1. Bacterial protein
2. Plant protein
3. Animal protein
4. Ammonia
5. Nitrogen Gas
6. Nitrate
7. Nitrite

#### **PROCEDURE:**

At each of the stations above, write 4 or 5 scenarios that might take place during that phase of the nitrogen cycle. For example, at the Animal Protein station one scenario could be: "The animal you lived in died, and the nitrogen in its body has been returned to the soil. Proceed to the Plant Protein stations." The student then writes this scenario down on his/her index card and proceeds to the next station. At that station, they repeat the procedure, drawing one scenario, reading it and writing it down. For example, "The bean plant absorbs free nitrogen from the soil, and nitrogen fixation occurs in the nodules of the roots. The plant then uses this new form of nitrogen to assemble amino acids. Proceed to Bacterial Protein." Each scenario either leads to a new station, or directs the person to remain at the current station and draw another card. (Some phases of the nitrogen cycle take longer than others).

#### **CLASS ASSIGNMENT:**

Once the student has written 10 steps on their index card, they are done with the activity. Have them turn in their cards for some sort of credit or grade, and return them for future reference.

## Biology Required Assessment for Ecology



Students will conduct a detailed, multi-sensory study of an ecosystem and use the recorded data to create a profile of a plot of land showing relationships and predicting the effects of change on the ecosystem.

This is a long-term project and includes elements such as photography, collection of specimens, and journaling.

## Ecosystem Study Plot Guidelines

**Directions:** Select an area for your observation which has little or no direct influence by people. Your area should be about 200 square feet. You should make as many visits as possible to observe changes as they effect your ecosystem. Try to make your observations during different times of day and night so that you ca..'1 observe the maximum amount of wildlife. Careful and sensitive observations will be necessary, . so plan on spending some time in your area, getting to know it and appreciating it. Do more than just look, . . . listen, probe, observe, and record as many visual and sensory stimuli as you can.

Your report will contain the following things:

**a/b. Ecological Description (and pictures): (20 points)**

Your description should include: Terrains, vegetation, physical features, interrelationships in your area, and special observations. Include pictures of the area. These pictures should be taken once each week from the same perspective to show change (8 pictures minimum).

**c. Map of the Study Plot:**

Make a general map of the area showing the major vegetation, and any land forms or special terrains. Include a key of your area for the different trees, plants, and animal habitats. Identify where your picture site was located.

**d. Log of Visits:**

Each and every time you visit the site you have chosea, record any observations of the time spent there. These observations should be written up like a journal and include the date you went, what time of day, weather conditions, and what you observed. Use scientific language as much as possible. You are required to visit a minimum of once each week for eight weeks. Underline biological terms you use (a minimum of five different terms in eight journals). Journals need to be at least five sentences long.

**e. Observations of Animal Habitat:**

(i.e. bird nest, animal burrow, ant hill, rotting log, spider web) Identify a site where a living organism is residing (habitat). Over several weeks observe it carefully noting such things as changes, what they eat, movement into and out, and interaction with other organisms. Take at least one picture of the habitat (optional).

**f. Identification of Plants and Animals:**

Do not settle for the plants and animals that can be seen easily above the ground, Take time to dig, poke, pick up logs, look under logs, and under leaf litter for different organisms that you would not ordinarily see. List the plants and animals in categories (i.e. mammals, insects, fish. etc). You may include any animals which you have found by indirect evidence of their presence (i.e. droppings, feathers, bones, etc.). Your textbook and identification books will be helpful in identifying the organisms and categorizing them.

**g. Food Chain of Ecosystem:**

Make up three food chains of plants and animals found and identified in your ecosystem (i.e. aquatic and terrestrial food chains). Include five different organisms in each food chain and show energy transfer correctly..

**h. Food Web:**

The food web is constructed by listing a broad sampling of organisms which are used as food by others. Your diagram will show arrows drawn from the prey to the predator and will resemble a web when completed. (Include a minimum often different organisms).

i. **Food Pyramid:**

The food pyramid should be accurately representative of the organisms in your ecosystem. It should represent numbers as well as biomass. Levels should begin with primary producers at the bottom and work up to primary consumer, secondary consumer, etc.

j. **Listening Experience:**

The purpose of this activity is to use the sense of hearing which is often overlooked when using our eyes only. Position yourself in a comfortable spot where you will not be moving and close your eyes for several minutes and listen to every little sound you can. Record what it feels like to rely on this sense alone as well as identifying the sounds you heard. (You only need to do this activity once within the eight week study.) Record separately from your journal.

k. **Collection of Plants:**

Collect and press fifteen herbaceous (soft-stemmed) plants and leaves to include in your report. The more you have, the better the project. Put each type of plant/leaf on separate pages. Include a label in the bottom right hand corner of the page with the following information:

- o Common name
- o Scientific name (Genus species)
- o Date of collection
- o Do not cover the specimens with plastic or wax paper. They should be glued or taped to the page.

l. **Insect Collection (optional):**

Collect and display insects found in your ecosystem. Identify common name, scientific name, place and date collected.

m. **What I Learned:**

Include a written conclusion covering the following: .

1. Summary of common ecological relationships among species in your collection.
2. Summary of how energy flows through your ecosystem.
3. Summary of how factors may influence population size within your ecosystem.(examples: weather, disease, predation, migration)
4. Summarize responses an ecosystem may have to the effects of human activities (i.e. agricultural, pollution, destruction, development). Use specific examples in your ecosystem and/or predict what will happen when and if any of these occur.
5. Overall opinion of the project - what you did and did not like, how you would make improvements.

n. **Miscellaneous:**

Organize your final ecosystem study in an attractive 3-ring binder or folder. Neatness and creativity will be taken into account. Take time to get to know nature. Enjoy!

## Ecosystem Project Rubric

	(Points Earned)		
	Self	Peer	Teacher
<b>A . Ecological Description</b>			
1. Included plants in area (0-3)	_____	_____	_____
2. Included physical features & terrain (0-3)	_____	_____	_____
3. Interrelationships in your area (0-3)	_____	_____	_____
4. Exact location is disclosed (0-3)	_____	_____	_____
<b>B. Pictures or Videography</b>			
1. Number taken (0-8)	_____	_____	_____
2. Neat & organized display (0-3)	_____	_____	_____
3. Pictures/video covers 6-8 weeks (0-3)	_____	_____	_____
<b>C. Map of Plot</b>			
1. Neat map of site (0-5)	_____	_____	_____
2. Key for trees, plants, & animal habitats (0-3)	_____	_____	_____
3. Map is marked where photos taken (0-1)	_____	_____	_____
<b>D. Log of Visits</b>			
1. Each log gives date, time, weather (0-3)	_____	_____	_____
2. Biological terms used and a minimum of eight were underlined (0-8)	_____	_____	_____
3. Minimum of 8 entries (0-8)	_____	_____	_____
4. Logs show careful observations (0-5)	_____	_____	_____
5. Entries are a minimum of 5 sentences each (0-3)	_____	_____	_____
<b>E. Observations of Animal Habitat</b>			
1. Detailed descriptions of habitat (0-3)	_____	_____	_____
2. Characteristics of animal recorded (0-3)	_____	_____	_____
3. Picture(s) of animal habitat (optional)	_____	_____	_____
<b>F. Identification of Plants &amp; Animals</b>			
1. Plants are separated into categories (0-3)	_____	_____	_____
2. Animals are separated into categories (0-3)	_____	_____	_____
3. Attempt at scientific names (optional)	_____	_____	_____
<b>G. Food Chains of Ecosystem</b>			
1. A minimum of three food chains with a least five different organisms represented (0-3)	_____	_____	_____
2. Food chain shows accurate energy relationships (arrows go from prey predator (0-3)	_____	_____	_____
3. Food chains show creativity/neatness (0-3)	_____	_____	_____

**H. Food Web of Ecosystem**

- 1. Food web contains a minimum of 10 different organisms in the ecosystem with arrows correctly drawn from prey to predators (0-10)

\_\_\_\_\_

**I. Food Pyramid of Ecosystem**

- 1. Shows accurate representative organisms in an ecosystem starting with producer and working up to herbivore, carnivore, etc. (0-6)
- 2. Energy loss numbers are given (0-4)

\_\_\_\_\_

**J. Listening Experience**

- 1. Describes impressions felt (0-3)
- 3. Identifies sounds heard (0.3)

\_\_\_\_\_

**K. Collection of Plants**

- 1. At least 15 plants collected and pressed (0-15)
- 2. Plants are mounted neatly (0.5)
- 3. Plants are identified correctly (0-15)
- 4. Scientific names are given (0-15)
- 5. Labels are filled out completely (0-5)

\_\_\_\_\_

**L. What I Learned**

- 1. Summary of ecological relationships (0-2)
- 2. Summary of energy relationships (0-3)
- 3. Summary of influences on population dynamics (0-3)
- 4. Summary/prediction of effects of human interaction within the population (0-3)
- 5. Overall opinion of the ecosystem study plot project (0-3)
- 6. Comparison of the ecosystem to a different ecosystem in the area (0-5)

\_\_\_\_\_

**M. Miscellaneous**

- 1. Report is organized (0-5)
- 2. Neat and attractive (0-5)
- 3. Shows creativity (0-5)

\_\_\_\_\_

Total Points Earned

Comments by Mrs. Glisson