Lesson Plan one (Ants, Butterflies, Carrion Beetles and Tiger beetles)

Overview: This exercise will promote student awareness of invertebrates and their habitat requirements. Also, it reminds students that humans are not the only species with basic survival needs, such as food, water, shelter, and space.

Audience: This activity is designed for use with middle school students in grades 5-8.

Background:

Habitat loss is the number one reason for species extinction. Humans are the biggest contributor to habitat loss. The rates of extinction are increasing causing many scientists to fear that humans are causing the loss of 50% of known biodiversity in the next 50 years. The best way to increase conservation is through education. Students need to understand the relationships that occur between an organism and its environment. The observed relationships should remind them that we (humans) are not the only species with basic survival needs, such as food, water, shelter, and space. Also, knowledge of the benefits that some organisms, like insects, provide should strengthen student's desire to preserve or restore natural habitats. Together, we hopefully will create chances to decrease habitat loss and increase diversity.

The diversity of an ecosystem is enhanced by the number of available niches (may want to refer to vocabulary). Therefore, if a certain niche is not available a species that is adapted to that niche would not be able to live there. This concept illustrates why some insects inhabit some parts of Nebraska, but are unable to live in other parts. Many researchers have found that it is easier to describe the level of diversity of an ecosystem by surveying the diversity of certain bioindicators. There are specific families of insects that are better suited for this use than others. The identification of these bioindicators and their natural habitats is crucial in evaluating the overall health of the habitat and its diversity.

Before conducting this lesson plan, it is advised that the teacher browse the website and read the "Importance" page to familiarize themselves with the layout and content of the website.

Time requirements: This activity can be completed in, two 50 minute class sessions with a take home assignment to be due at a later date at the teachers discretion.

Objectives: After completing this exercise students will be able to:

1. Describe general habitat requirements for ants, butterflies, carrion beetles and tiger beetles.
2. Explain why some species live in a niche that is not suitable for other closely related species.
3. Explain the importance of habitat conservation.

National Science Education Standards:

Unifying concepts and processes in science

- •Systems, order, and organization.
- •Evidence, models, and explanation.
- •Evolution and equilibrium.

•Form and function.

Science as inquiry

•Skills necessary to become independent inquirers about the natural world.

Life science

•Interdependence of organisms

•Matter, energy and organization in living systems

•Behavior of organisms

Science in personal and social perspectives

•Environmental Quality

•Natural and human-induced hazards

Materials:

-Individual computers with access to the internet and a web browser, such as Internet Explorer or Netscape

-Fill-in worksheets (2 species/genera basic description for each family)

Anticipatory Set:

Present the students with a picture or specimen of *Speyeria idalia* (regal frittilary) and this scenerio: A farmer has always enjoyed watching these pretty butterflies (numerous enough that many sighting occur over the summer) come visit his family's vegetable garden in search of food. One year he notices that there were fewer butterflies. The next year he decides to keep an eye out for them (maybe he just wasn't paying enough attention the year before) and is only able to sight a couple of them. This concerns the farmer because he knows that the decline of some important insect species is an indicator of something wrong or changed in the environment. However, he doesn't know enough about this species of butterfly. What could the farmer do to find out? What might be causing the decline? Is it important to understand the decline?

After sufficient discussion, tell the students that this endangered/threatened/rare (depending on where you are located) species only reproduces on various violet plants, which are often found in meadows. The destruction of habitats with these plants removes the possibility of reproduction for this species of butterfly. Although we do not know the repercussions of losing this species, it is important to maintain diversity of all life forms because of the intricate web of life. Diversity is often dependent on the habitat conditions of that ecosystem. Therefore, this exercise will focus on insect diversity, habitat requirements, and habitat health.

Procedure and Guided Practice:

1. Direct students to the Ants, Butterflies, Carrion Beetles and Tiger Beetles of Nebraska website at http://unk.edu/ (http://cgi.unk.edu/mcgahansj/index.htm). Students should read the "Importance" page for an introduction into the site and why invertebrates are investigated.

2. Ask students questions pertaining to the invertebrates/insects, diversity, habitat conservation, bioindicator species. Some examples follow: Why it is important to understand the relationships between organisms and the environment? Do the same rules apply to humans? Do we have the same basic needs? How are insects important to humans and the environment? Are there benefits to preserving or restoring habitats? These are to get the students thinking and realizing

the importance of even the smallest organisms in our ecosystems. There are no right or wrong answers to these questions.

3. Have students browse the site and fill in the worksheet for its requirements. This is to help them become familiar with the layout of the site and to provide some information that will be useful for their research paper. Ask questions concerning why not all species/genera are found in the same area and why. Are there any species/genera that are harmed by disturbance or benefit from it and why? Introduce the concept of niches. This may take up most of a normal 50 minute class period.

4. Handout outline for research paper and explain expectations (could assign groups to work on this together). They may not use any of the species/genera chosen for the fill-in worksheet. Discuss what components make up a habitat/ecosystem (water, food, shelter, space, grass, trees, soil, weeds, flowers, etc).

5. A simple example could include ideas such as a prairie with native grasses that has a stream running through it. More details would be included in order for all the organisms to live there. The justification for the organisms could be that the ant genera *Myrmic*a would live in the grassland area, while the tiger beetle lives on the stream banks. There is a certain type of grass or flower there that the butterfly needs for reproduction. A list of mammals or rodents that live there that die to provide the needed resources for carrion beetles.

6. Allow the students to begin on the project (either for the rest of that class period and the next day) and/or assign as a take-home assignment that will be due at a later date or your choice.

Follow-up and Discussion Suggestions:

1. Discuss with the class the importance of this project and what they have learned.

2. Did anyone find anything especially interesting, funny or "cool"?

3. What can they as individuals or as a class do to help preserve the natural habitats that these species/genera currently live in?

4. Were they surprised that some groups (genera) have more species than others?

5. In your county, do the species (according to the websites distribution maps) present make sense given the known habitats there?

Extensions:
This paper could be expanded by including a section describing the effects of a disturbance (human or naturally caused). Tell the students to create a disturbance that changes their habitat. Then, they can write about the how the changes affect their designated species. Also, the website provides excellent distribution information about the organism's ranges within

Nebraska. The students could include their thoughts about these distributions and if they make sense to them. This portion could be expanded into an entire paper itself.

Habitat Vocabulary (may be helpful in discussion)

Adaptation: An alteration of adjustment in structure of habitat, often hereditary, by which a species or individual improves its condition in its environment.
Biodiversity: Variety of life.
Biota: The animal and plant life of a region; flora and fauna.
Community: The plants and animals within a certain habitat.
Diversity: The variety and abundance of species, their genetic composition, their communities, and the ecosystems and landscapes of which they are a part. Biodiversity refers to native biological diversity; therefore, increases in species diversity resulting from the introduction of nonnative species would not constitute an increase in biodiversity.
Ecosystem: A community plus the nonliving environment.
Entomologist: One who engages in the scientific study of insects.
Eradication: To remove, destroy.
Exotic: From another part of the world or region; not native to the habitat.
Habitat: A place where living things naturally grow and live.
Insect: Small arthropod animals of the class Insecta, having an adult stage characterized by three pairs of jointed legs, a body segmented into head, thorax, and abdomen, and usually having two antennae.
Niche: Organism's role, or job, in its habitat which it is physically, physiologically and/or behaviorally adapted to.
Population: The number of individuals representing a species in a given area.
Prey: An animal that is hunted and eaten by a predator.
Reproduction: The natural process by which new individuals are generated and the species perpetuated.
Species: A group of living things of the same kind that can reproduce with one another.
Survival: The process of ensuring that a species, or individual, will live to maturity and reproduce.
Taxonomy: The science of identifying, classifying and naming organisms.

Student worksheet Name:

Ant Genus	Description	Habitat Requirements	Additional comments
Butterfly Species	**Description**	**Habitat Requirements**	**Additional comments**
Carrion Beetle Species	**Description**	**Habitat Requirements**	**Additional comments**
Tiger Beetle Species	**Description**	**Habitat Requirements**	**Additional comments**

Outline for Ant, Butterfly, Carrion Beetle, and Tiger Beetle Habitat Research Paper
*expected 4-5 page paper

I. Introduction

   a. A brief description of each species (4 total: one from each family)

II. Habitat description

   a. Soil, plants, general weather, water sources, other predators and prey

III. Justification of each species niche

   a. How and where specifically in your habitat will they reside, does this overlap with the other three species

IV. Conclusion

   a. Importance of habitat niches

   b. Reasons to save diversity

   c. What you learned