Biological Diversity Field Study: Grand River Grasslands

Next Generation Science Standards:

- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Overview:

Students will explore and describe biodiversity of the Grass River Grasslands (in Rinngold County, IA, and Harrison County, MO) by joining one of the following field trip project groups: insects, plants, and the life around and in a pond. By also exploring the biodiversity of their school grounds and in the countryside they will be able to understand how humans impact biodiversity.

Duration: (this is flexible; we could do all or just a subset of these visits)

- One 1- or 2-hour pre-trip lesson at the classroom and school site

- One half-day field study at the Grand River Grasslands

- One half-day follow-up visit

Objectives: At the end of this lesson, the students will be able to:
- Understand both what biodiversity is and how biodiversity of an ecosystem depends on many interconnected factors and that an effect on one factor can influence all the others.
- Describe biodiversity and the benefits it provides.
- Compare the biodiversity of the Grasslands to the biodiversity of their school site and be able to answer the question, "How do humans impact biodiversity?"

Background:

The biodiversity of an ecosystem is often used as a measure of the health of an ecosystem. The more diverse, the better chance the ecosystem has of adapting to the inevitable changes that impact the system. Every plant and animal has a job or niche for which it is best suited. The interconnectedness of species plays a role in the

health and survival of each individual species. Humans can impact biodiversity both negatively and positively.

Materials Needed:

- **iNaturalist:** A citizen science app available for free on smartphones and tablets. This program allows users to upload photographs of organisms to the iNaturalist website where they can be tagged and identified by any person with internet access, thus allowing for extensive documentation of biodiversity while drawing on diffuse knowledge to identify species. Grand River Grasslands research team can provide at least three devices. Students can also use their own devices.

Vocabulary:

- **Biodiversity:** The variety of life, ecosystems, and genes found in any area, from a backyard to the whole earth.

- **Diversity Index:** A measure that reflects how many different types of something (e.g., types of species) there are within a habitat.

- **Ecosystem:** A group of organisms (plants, animals, bacteria, etc.) and non-living things (soils, rock, water, nutrients, etc.) occupying and interacting with each other in a particular environment.

- **Habitat:** The collection of resources in the environment that an animal, plant, or other organism uses to survive (or, an organism's natural home).

Pre-visit Lesson:

Step 1:   **Introduce the Investigation Question for the Project**

- "How does the biodiversity of our school yard compare to that of the Grass River Grasslands**?**

- Introduce the concept of biodiversity. Show a picture that depicts an ecosystem/habitat that has little biodiversity and one that has abundant biodiversity. Introduce the rest of the terms within the context of the pictures and discussion.

- How could we design an investigation that would allow us to find an answer to our question? (Collect and analyze data from the two different sites)

- What data could we collect? (introduce iNaturalist)

Step 2: **Complete a (quick) Field Study of the School Site.**

- Divide into groups and collect data using iNaturalist

- Come back inside and analyze data through discussion. Look for patterns. (e.g., I saw a grasshopper. How many also saw a grasshopper?). Record a summary on a whiteboard.

- Calculate a diversity index using the summarized data.

Ask the following questions:

- Is your schoolyard a biologically diverse place? Explain.

- Predict whether their schoolyard or the Grand River Grasslands is more diverse. Record student predictions. Why do you think so?

- How do the benefits of biodiversity in a grassland ecosystem compare with the benefits of biodiversity in the schoolyard and town?

- Is biodiversity a good or a bad thing? What is good or bad about it? (trying to get at trade-offs/negative and positive impacts)

- Prep students for the field study at the Grass River Grasslands. Have students select their top two study topics (insects, plants, or the life around and in a pond).

- Make groups if you have time, trying to give everyone their top choice if possible.

Step 3: **Field Study at Grass River Grasslands**

- Divide students into their project groups.

- Travel to study site and collect data using iNaturalist. Make sure each team leader explores the benefits of biodiversity throughout the visit.

- Have all groups come back to a central location. It would be best if all groups could make a swing through examples of the other groups' study sites on the way back. Take time to compare each site if possible.

Step 4: Analyze Field Study Data

- Either at the central location at the Grasslands, or back at the school site during a follow-up visit, analyze the collected data through discussion again and look for patterns. Complete a diversity index following the same procedure as before.

- Discuss the following questions:

  - Was your Grass River Grasslands site a biologically diverse place? Explain. (make sure students to use evidence from the data analysis step)

  - Review student predictions about which site was going to be more diverse. Were your predictions correct or not? Explain and discuss.

  - Formally answer the investigation question with the class.

  - How do the benefits of biodiversity in an ecosystem compare with the benefits of biodiversity in our schoolyard and community?

  - Is diversity a good or a bad thing? What is good or bad about it? (trying to get at trade offs/ negative and positive impacts)

  - How can we all positively impact the biodiversity of the Grand River Grasslands?