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| **Following the Data:**  **Prairie Fens and the Decline of the Poweshiek Skipperling** |  |

## Objectives

Students completing this module will be able to do the following:

* Explain how researchers use data and evidence-based reasoning to create knowledge and understanding.
* Describe how new evidence and data, build on prior research and lead to the revision of scientific knowledge.
* Explain how biologists can answer research questions using different types of databases and large open data sets
* Explain how a change in one component of a system can impact other components
* Recognize gaps in our current understanding of a biological system and identify what specific information is missing.

**Introduction**

Prairie Fens are at-risk, highly diverse ecosystems found throughout the glaciated Midwest. These prairie-influenced wetland ecosystems are of high conservation concern, harboring over 35 state or federally listed plants and animals. One of these species is the Poweshiek skipperling butterfly (*Oarisma poweshiek*), a critically endangered species now found only in four Michigan prairie fens. This butterfly was historically abundant in prairies of the upper Midwest but has experienced sharp declines first noted in the late 1990s. Recent estimates place the total number of remaining individuals at less than 250.

The Prairie Fen Research Collaborative, working with the Biodiversity Literacy in Undergraduate Education Initiative (BLUE), and Science-Live, produced a film that provides a case study of research and science in action. The video provides insight into how researchers are looking at biodiversity in Michigan prairie fens to discover what is driving the high level of plant and animal biodiversity in these systems and what happened to cause a sharp decline of this butterfly. This 15-minute film showcases the process of science and the importance of data and data management. You will see how researchers from Central Michigan University and the Michigan Natural Features Inventory collaborate with conservation scientists from The Nature Conservancy and U.S. Fish and Wildlife Service. This project is an example of how collaborative science and open data can further our understanding of biodiversity, inform conservation efforts, and contribute to adaptive, research-informed, management strategies.

**Activity 1: Generate Hypotheses**

1. During surveys conducted in the mid-1990s, Poweshiek skipperling was the prairie specialist butterfly most often detected. Over the past 20 years, there has been a dramatic, range-wide decline in both the number and size of Poweshiek skipperling populations. In 2014, the United States and Canada classified the Poweshiek skipperling as Federally Endangered. Factors contributing to the decline remain unknown. Conservation biologist, land managers and researchers are trying to determine the best way to manage the Poweshiek skipperling to prevent extinction, but how can they manage for conservation of the species if they don’t know what is causing the decline? Hypothesize some possible causes for the decline in the once abundant Poweshiek skipperling populations. What could potentially be causing this rapid decline?
2. If you wanted to test your hypotheses about the cause of the Poweshiek decline, what kind of data and information would you need?

**Activity 2: Follow the Data**

1. **Watch the Video as a class:** <https://www.youtube.com/watch?v=o1CFh9KFlag>
2. Answer the discussion questions below.
   1. Three different researchers discuss their projects. What questions did each researcher ask? What conclusions could they reach? What data did they use to support their conclusions?

*Rachel Hackett*

Question:

Conclusions:

Data and resources used to support conclusions:

*Clint Pogue*

Question:

Conclusions:

Data and resources used to support conclusions:

*Michael Belitz*

Question:

Conclusions:

Data and resources used to support conclusions:

* 1. Each of these researchers built on the data and conclusions of prior researchers. In the space below draw a diagram that represents the way the scientists progressively built their knowledge about prairie fens and Poweshiek skipperlings. Include information and data inputs, research conducted, and research conclusions
  2. How are the researchers using digitized natural history collection data to inform research on Poweshiek skipperling?
  3. How are the researchers using citizen science data to inform research on Poweshiek skipperling?
  4. Why is it important that these scientists are making their data accessible in a public database?
  5. How will this research inform the conservation and management of the Poweshiek skipperling and the prairie fen ecosystems?
  6. You might have noticed from the video, that the researchers didn’t tell us the answer to the question of why the Poweshiek skipperling are declining. This research is still ongoing. What are the next possible steps in their research?

**Assessment:**

Read a scientific paper, of your choosing, that uses digital data resources to conduct research. Answer the questions below in complete sentences.

1. What was the research question driving the research?
2. What are the researchers’ conclusions?
3. What is/are the digital data resource/s used in this study?
4. Who gathered the digital data used in this research? Why would or should this matter for the science conducted?
5. Does this research build on the research of other scientists? How?
6. Did these researchers make their data open and available to other researchers? If yes, where did they publish their data? If no, why would they not share their data?
7. In your own words, explain the relevance of the science conducted and the research results.
8. Do questions remain relative to the original research question? What data would the researcher need to answer the unanswered questions?