

**Does purple loosestrife affect biodiversity in Maine? Collect and analyze existing data
(1 to 2 class periods)**

Students will collect print outs of existing data from along a mock transect inside the school building. They will compare results, first in this small dataset organized in graphs created by hand and then in a large online database, to determine whether purple loosestrife has an impact on biodiversity in this mock investigation. Use this sequence as a stand-alone lesson in data analysis or as preparation for collecting data out in the field.

Research question: Does purple loosestrife affect biodiversity in Maine?

Learning objectives: Students will be able to...

- Identify important data to be collected in the field
- Describe and explain variability between two data points and within a larger dataset

Standards Alignment:

MLR	CCSS	NGSS
B1 – The Skills and Traits of Scientific Inquiry: Students plan, conduct, analyze data from, and communicate results of investigations, including simple experiments.	CCSS.MATH.CONTENT.6.SP.B.4: Display numerical data in plots on a number line, including dot plots, histograms, and box plots. CCSS.MATH.CONTENT.6.SP.A.2: Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	MS-LS 2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Materials/preparation:

1. This sequence presumes some background knowledge of invasive species and biodiversity. If students are unfamiliar with these concepts, we recommend starting with Biodiversity Jenga (<http://vitalsignsme.org/biodiversity-jenga>) and/or a research Jigsaw on purple loosestrife (<http://vitalsignsme.org/research-jigsaw>).
2. Print the purple loosestrife observations attached to the curriculum bank post
3. Lay the observations along a 25m transect on the floor in the hallway (you can create a transect with masking tape set on the floor with marks from 1 to 25).
4. Write numbers 1 through 25 on separate index cards.
5. Set up two dot plots, both with biodiversity on the x axis, numbered 1 through 20 (one will be for “found” data and the other for “not found”)

If you are unfamiliar with creating and analyzing dot plots, watch this Kahn academy video: <https://www.khanacademy.org/math/ap-statistics/quantitative-data-ap/frequency-tables-dot-plots/v/frequency-tables-and-dot-plots>

6. Print or share the student handout
7. Print, cut out, and fold the challenge cards to guide students through using CODAP (one set per 4 to 8 students).
8. Preview the datasets that students will work with:
http://bit.ly/loosestrife_VS_dataset_081618 and
http://bit.ly/loosestrife_class_set_081618

Sequence:

Part 1: Data collection:

- 1) Introduce the research question by showing the Mission: Purple loosestrife page: <http://vitalsignsme.org/mission-purple-loosestrife>.
- 2) Explain that you are going to practice data collection and then analyze real existing data.
- 3) Point out the transect on the floor and explain that each observation is one that was collected by other students in Maine. Students are going to pretend that they are the ones collecting the data.
- 4) Have each student draw a card to determine where along the transect they will go to “collect their data”
- 5) Instruct students to find their data at their spot on the transect and bring it back to their desk to look over.
- 6) Give students a minute to read over their observation. Have them find the following information from the observation and transcribe it on to a post-it note:
 - a. Purple loosestrife was FOUND or NOT FOUND
 - b. Diversity of species
 - c. Canopy cover
 - d. Soil moisture

Part 2: Data analysis:

- 1) Have students get into small groups of 2 to 4 and share observations of their data-- what was the site like? How many species were there? Have students identify similarities and differences in the plants as well as the location the observations took place. Students should take notes on the handout.

- 2) Once students have shared, help them place their post-it notes along a distribution showing the diversity of species of all observations.
- 3) As a class, describe what you notice:
 - a) Look at the shape of the distribution-- are the points spread out or clustered together? Where are the clusters of the data?
 - b) Are there any interesting gaps or clumps in the data?
 - c) Are there any outliers or suspicious data points?
 - d) What is the range of the data like?
 - e) Where would students place the center of the data? Why?
 - f) Extension: introduce the mean, median, and mode, and mark them on the graph.
- 4) Next, have students help you divide the distribution into "FOUND" versus "NOT FOUND" observations.
- 5) Challenge students to look closely at the two distributions (in the same way you did in step 3) to determine are the distributions the same or different? Have students use the questions in the handout to help them.

Part 3: Explore the data in an online application.

- 1) Explain to students that the same data they just looked at has been entered into an online application so that they can explore it more fully.
- 2) Open up the dataset: http://bit.ly/loosestrife_class_set_081618
- 3) Demonstrate how to create a graph by clicking on the graph icon in the upper left corner and dragging attribute headings into the x and y axes.
- 4) Assign students to groups of two to four to work with the data.
- 5) Tell students that their first challenge is to become familiar with the tool. Pass out the challenge cards. Give students 20 minutes to complete as many challenges as they can.
- 6) After 20 minutes, have students find a new partner that they can show any new tricks or tools that they have discovered.
- 7) Have students go back to their original partners. Explain to students that they are going to use their new skills to explore an even larger dataset, which includes *all* of the observations of purple loosestrife that have ever been posted to Vital Signs. Show the larger dataset: http://bit.ly/loosestrife_VS_dataset_081618
- 8) Pass out the "Answer a question" challenge cards. Give students 20 minutes to work through as many questions as they can.

- 9) After students have had time to explore the data, remind them of the big question, “Does purple loosestrife affect biodiversity in Maine?”
- 10) Have students create a snapshot of a graph that they think addresses the research question (reminding them of the graphs they created by hand) and use the handout to record observations of the data.
- 11) Optional: Have students take a snapshot of the graph and create a caption with a tentative claim and some observations of the data to turn in with their handout.