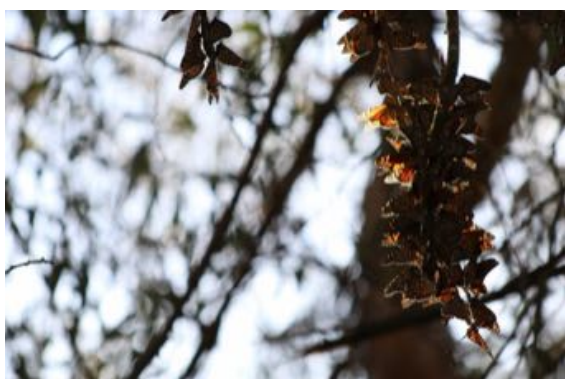


Counting a population you cannot count

Grades 6 to 8, ages 11 to 14. One or two 50-minute sessions.

Nobody counts monarchs individually. They measure the area of forest the clusters occupy and the count of butterflies at coastal groves. Students work with the real numbers, calculate percentage change, and argue about what the data can and cannot show.



Pacific Southwest Region USFWS from Sacramento, US. Public domain. Wikimedia Commons.

What students will be able to do

- Calculate percentage change and interpret a noisy time series.
- Distinguish a proxy measurement from a direct count.
- Identify a confounding variable and say why correlation is not enough.

Materials

- The overwintering area figures published each year by WWF Mexico
- The Western Monarch Count totals
- Graph paper or a spreadsheet

How it runs

1. Explain the eastern method: surveyors measure the hectares of fir forest occupied by clusters, because the butterflies are far too many and too packed to count. Ask what assumption that makes.
2. Explain the western method: volunteers count butterflies directly at overwintering groves over the Thanksgiving period. Ask what that method gets right and what it misses.
3. Have students plot both series. The shapes are different and both are noisy.
4. Calculate the change from the 1990s to the most recent year for each population.
5. Introduce the milkweed data: a large decline in Midwestern milkweed over the same period, driven by herbicide-tolerant row cropping.
6. Argue it out. Does the milkweed decline explain the monarch decline? What else changed? What evidence would settle it?

Discussion questions

- A single bad year can be a storm rather than a trend. How many years do you need before you believe a decline?
- The two populations are measured completely differently. Is it fair to put them on the same graph?
- If you had a budget to help one population, which would you choose, and what would you spend it on?

Taking it further

Have the class contribute their own observations to Journey North or iNaturalist, and discuss what makes volunteer data useful or useless.

Safety

None.

NGSS alignment

Code	Performance expectation
MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations 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.

<https://milkweedusa.com/learn/counting-a-population/>