With this activity we can incorporate mathematics into science. Graphing and understanding trends in the data we collect on phenophases can help us to better understand the impacts of climate change. Here is an activity for you to try, which includes real data that has been collected in the Great Smoky Mountains National Park.

**Part 1: Observing and Understanding Graphs**

Q1. Which flower is described in this graph? Where did you find this answer?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q2. What type of graph is this?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q3. What is this graph illustrating?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q4. What are the key characteristics of the graph that allow you to identify what it is illustrating?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q5. What could we add to the graph to give us more information about the data?

Q6. What is a trend line? What will a trend line tell us about the Carolina Springbeauty?

**Part 2. Graph Interpretation and Data Analysis**

If we graph data for only 2011 of the Carolina Spring Beauty, we see:

Q7. What do you think the trend for this data looks like?

This is what the graph looks like when we add 2012 and 2013 data. As you can see we filled in many more days of the year in which there are blooms for the Carolina Spring Beauty.

Q8. Do you think this addition might change the trend?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q9. Why does this matter? Why does having multiple years of data give us more useful trends and information?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q10. Do you think that three years of data is enough to understand the impacts of climate change?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 3. How to Create a Graph and Trend Line**

Now that you have an understanding of graphs and trend lines, let’s try to create our own graph using data on different species from the Great Smoky Mountains National Park.

Q11. Where will the years go? On the x-axis or y-axis?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Now we want to plot our points. Take a look at the chart I gave you. We can plot the first two together.

Q12. In 1985, when was the first trillium blooms seen for this data?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q13. In 1986, when was the first trillium blooms seen for this data?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q14. In what years were the trilliums first seen blooming in the month of April?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 4. Creating a Graph and Trend Line**

Group 1. Spring Peeper

|  |
| --- |
| **Spring Peeper First Heard** |
| **Year** | **Calendar** |  |
| 1985 | 30-Apr |  |
| 1986 | 16-Mar |  |
| 1989 | 21-Feb |  |
| 1991 | 8-Feb |  |
| 1994 | 23-Feb |  |
| 1995 | 29-Feb |  |
| 1998 | 19-Mar |  |
| 1999 | 2-Feb |  |
| 2000 | 1-Mar |  |
| 2001 | 18-Feb |  |
| 2002 | 14-Mar |  |
| 2003 | 1-Mar |  |
| 2004 | 25-Feb |  |

Group 2. Black-throated Green Warbler

|  |
| --- |
| **Black-throated Green Warbler First Heard** |
| **Year** | **Calendar** |  |  |
| 1985 | 8-Apr |  |  |
| 1986 | 1-Apr |  |  |
| 1989 | 21-Apr |  |  |
| 1992 | 6-Apr |  |  |
| 1993 | 12-Apr |  |  |
| 1995 | 27-Mar |  |  |
| 1998 | 31-Mar |  |  |
| 1999 | 4-Apr |  |  |
| 2000 | 24-Mar |  |  |
| 2001 | 3-Apr |  |  |
| 2002 | 29-Mar |  |  |
| 2003 | 23-Mar |  |  |
| 2004 | 26-Mar |  |  |
| 2005 | 29-Mar |  |  |

For both of these sets of data we are graphing the time that the spring peepers or black-throated green warblers were first heard each year. Once again the years will be on the x-axis and the months will be on the y-axis.

Q15. Approximately at what date were the Spring Peepers first heard in 1986, 1998, and 2003?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q16. Approximately at what date were the Black-throated Blue Warblers first heard in 1985, 1995, and 2000?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q17. What was the trend of your graph?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_