1. In this lab, we will explore eagle population numbers over time and in relation to winter temperatures and salmon (food) abundance.
   1. You’ve seen in lecture how and why populations grow. What factors do you think might lead to an increase in eagle abundance? What factors might cause a decline in the eagle population?
2. Before we begin looking at the data, we need to learn to use Excel. Open the file I gave you. If you need a new copy, it is here: <http://www.hhmi.org/biointeractive/spreadsheet-tutorial-1-formulae-functions-and-averages>. At the bottom of an Excel window are the “tabs”. Tabs are like pages in a notebook. In fact we call each tab a worksheet in an Excel workbook. Make sure you have the “Read This First” tab open. Read it. Then move on to the basics tab. Then organize. Then format. Then ranges. Answer the following questions.
   1. What is an Excel “cell”?(Basics tab)
   2. Do we usually put data in columns (vertically) or in rows (horizontally)?(Organize tab)
   3. Describe the steps to show only the first two decimal places of pi. (Format tab)
   4. Describe how you would select two columns of data that are 10 rows long. (Ranges tab)
3. Open the “Eagle Data” Excel file now. On the “Before You Start” tab follow the instructions to make sure that the “Analysis Toolpak” is active.
4. Open the “Definitions” tab.
   1. What years are the data from?
   2. What age of salmon are being monitored?
   3. Where is the data being collected?
5. Open the “Exercise” tab. Look at the columns in the orange box. What do you notice looking at the data? Do numbers seem to be higher or lower in the early 2000s than the 1970s? Are there any exceptions?
6. Fill in the table below using the data in the Eagle Data file.

* r (growth rate) = b (birth rate) – d (death rate) OR r = (births-deaths)/total population
* G = rN (rate of growth times the starting population size)

|  |  |  |
| --- | --- | --- |
| Time Period | r (rate of growth) | G (population growth) |
| 1974-1984 |  |  |
| 1984-1994 |  |  |
| 1994-2003 |  |  |

1. Follow the directions (“TO DO”) to make a graph of peak eagle abundance over time (Steps 1-5). Copy and paste your chart below.

X-axes are horizontal – along the bottom – which information goes on the x-axis? Is this the dependent or independent variable?

Y-axes are vertical – along the side – which information goes on the y-axis? Is this the dependent or independent variable?

How has the eagle population abundance changed over time? Which trendline fit better (had a higher R2)? How does this compare to the eagle abundance graph we looked at to start class (US eagle population)?

1. Go back to the data and make a graph for either salmon or temperature as a predictor of eagle numbers. Copy and paste your new chart from Step 6 below.
2. After discussing statistical significance as a class, observe your graph and decided on the pattern you think you see in the graph, then answer the following questions.
   1. What is your observation from the graph of the data – what pattern do you see?
   2. What is your question?
   3. What is your hypothesis?
   4. What is your prediction?
   5. What is your independent variable?
   6. What is your dependent variable?
3. Go to the tab labelled “Regression” and analyze the fake data I gave you. What was the relationship between the x and y values? Was it significant?
4. Run the same analysis on your chosen relationship (between eagle abundance and temperature or salmon) back on the exercise tab.
   1. What relationship do you see in the graph?
   2. What value did you get for “Significance F”? Is it less than 0.05?
   3. Is this relationship you observed significant (is the value less than 0.05)?
5. What do you conclude based on your original question? Are you sure? What data would you like to have that I didn’t give you? Why? How would that data help?