Introduction to Physical Geology

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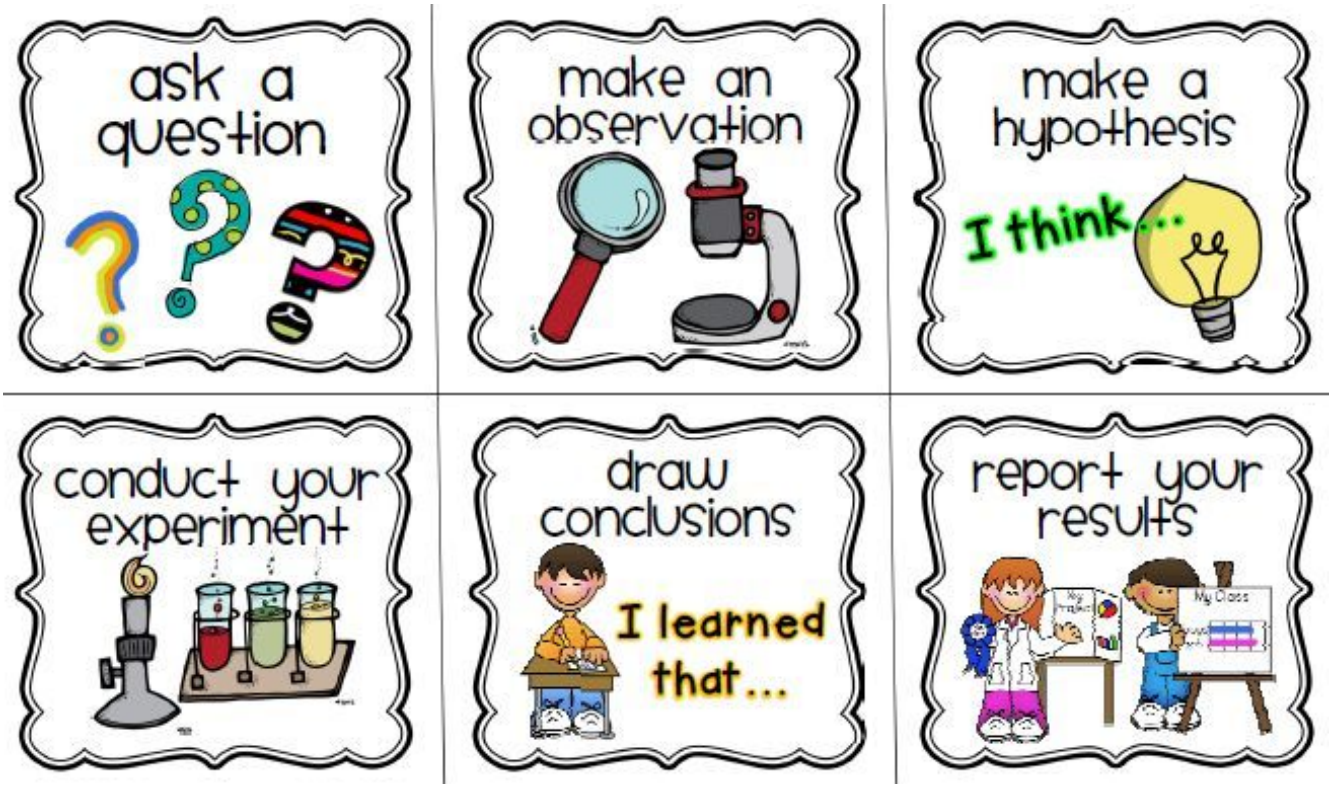
Practical Activity #1

The Scientific Method



Is Ohio Getting Wetter or Drier?

Step 1: Make a prediction (hypothesis)

In order to make a prediction, you will need to make **preliminary observations** about the topic. Explore some of the files archived at the link below to find information that will help with your prediction:

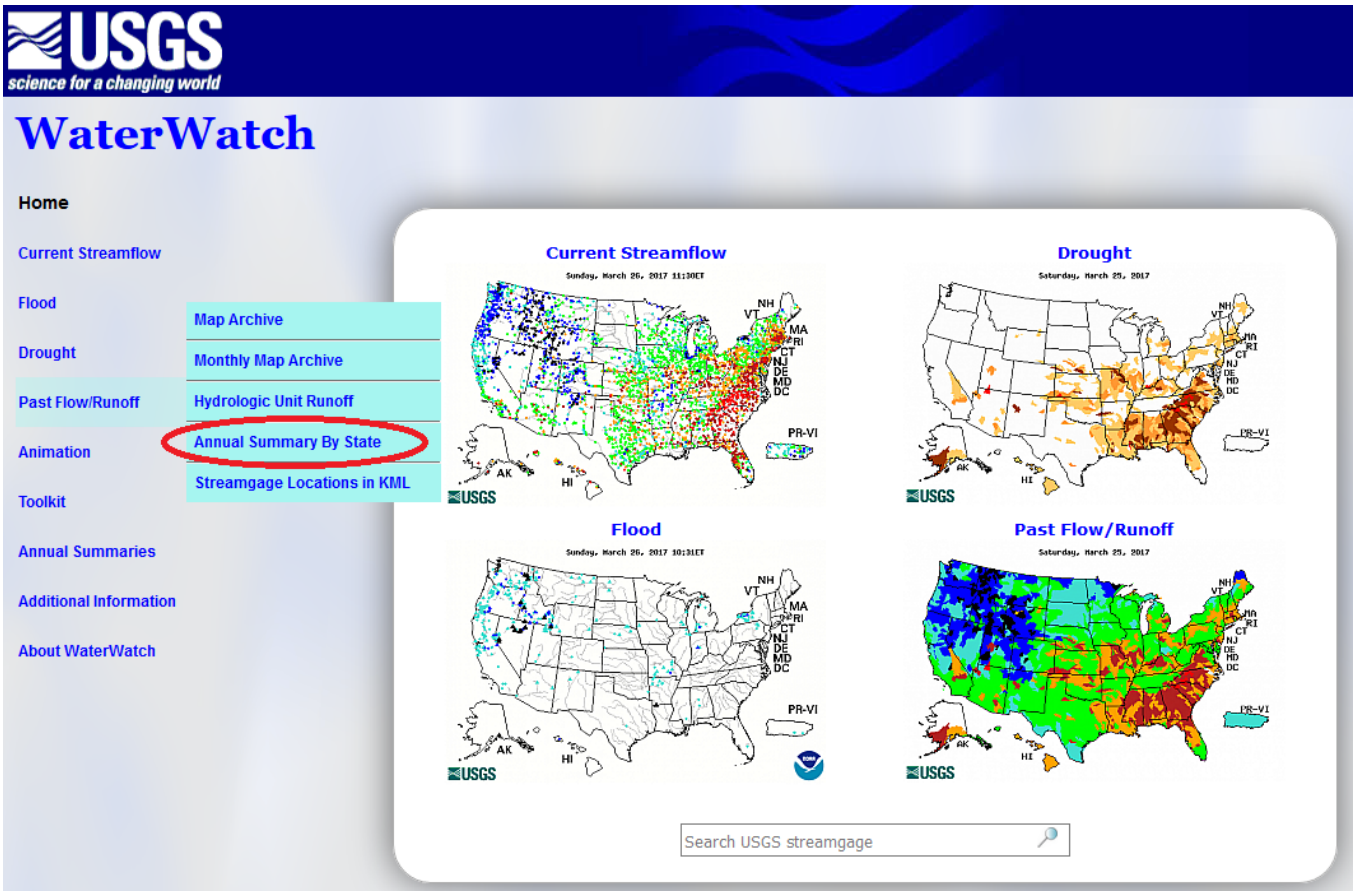
- https://osu.box.com/s/kdpf05jl1itd0du0r56kh6fff6dm6hhr

Step 2: Collect data and test your hypothesis

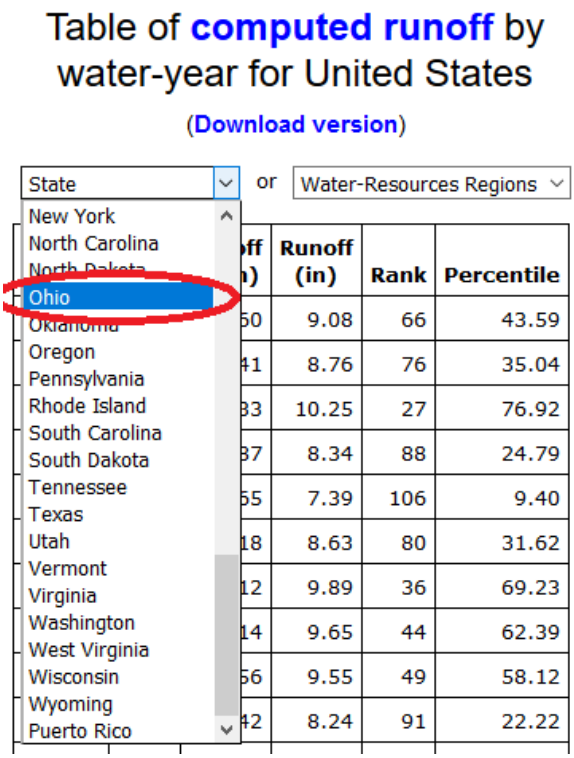
There are two main ways that you can gather data to test your hypothesis: (1) conduct experiments or measurements to collect your own data – this is also called **PRIMARY data**; (2) find sources of information that others have collected – this is also called **SECONDARY data**.

For this step, you will assemble **streamflow data** collected by the USGS (United States Geologic Survey) for Ohio between 1901 and 2016. Why streamflow? If the amount of rain increases, the amount of water flowing in streams will likely increase as well. Therefore, measuring streamflow is an ***indirect*** way of measuring precipitation!

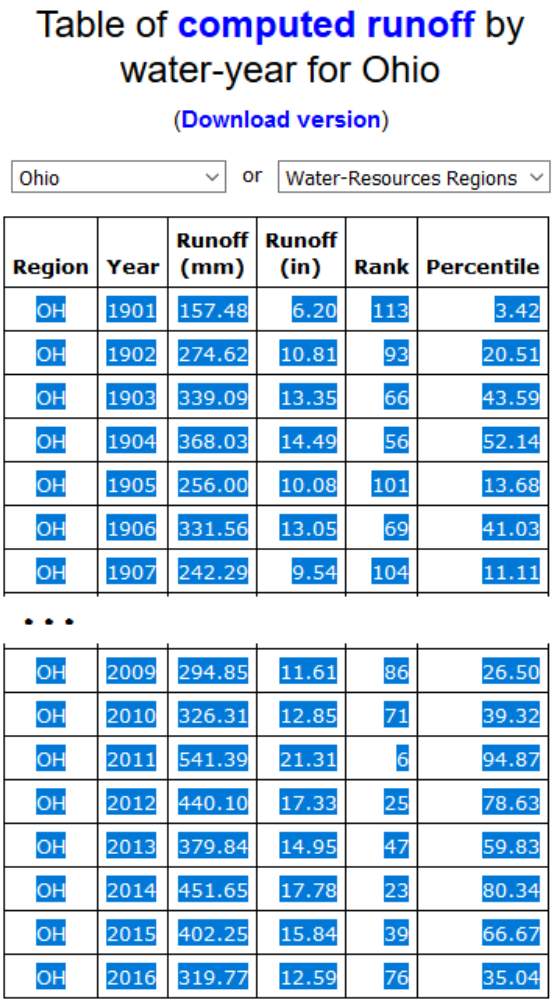
- Go to https://waterwatch.usgs.gov/ and select the option for **Past Flow/Runoff > Annual Summary By State** (see image below).



- Then choose ‘Ohio’ in the State drop-down box to show data for Ohio.



- Use your mouse to select all the data (from 1901 to 2016) and copy it to an empty Excel spreadsheet.

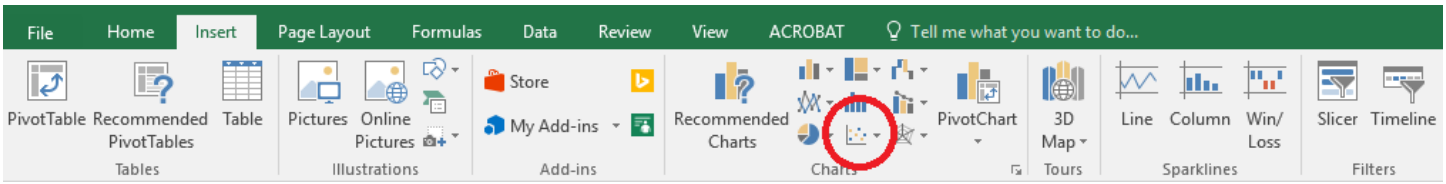


Step 3: Create graphs/visual representations of the data

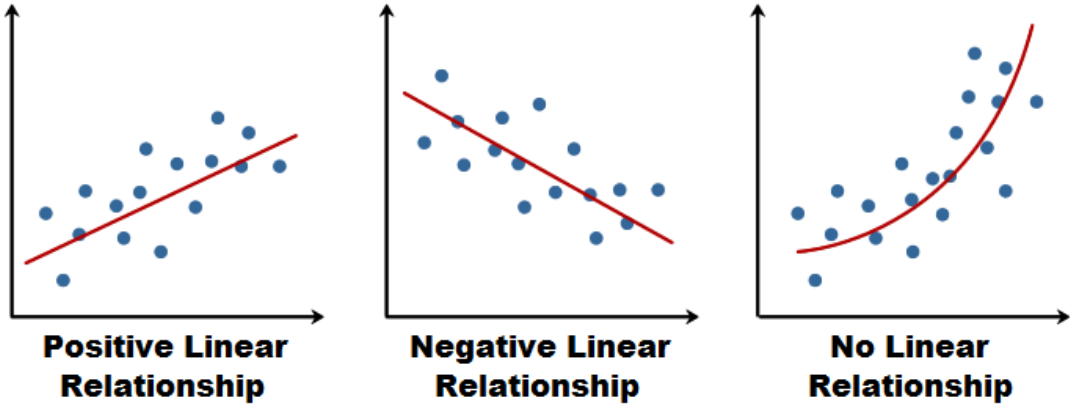
- On the Excel spreadsheet, select the columns for 'year' and 'runoff' …

	A	B	C	D	E	F	G
1	Region	year	runoff (mm)	runoff (in)	rank	percentile	
2	OH	1901	157.48	6.2	113	3.42	
3	OH	1902	274.62	10.81	93	20.51	
4	OH	1903	339.09	13.35	66	43.59	
5	OH	1904	368.03	14.49	56	52.14	
6	OH	1905	256	10.08	101	13.68	
7	OH	1906	331.56	13.05	69	41.03	
8	OH	1907	242.29	9.54	104	11.11	
9	OH	1908	663.78	26.13	1	99.15	
10	OH	1909	340.34	13.4	65	44.44	
11	OH	1910	392.37	15.45	44	62.39	
12	OH	1911	424.33	16.71	33	71.79	
13	OH	1912	577.27	22.73	2	98.29	
14	OH	1913	562.79	22.16	5	95.73	
15	OH	1914	266.04	10.47	97	17.09	
16	OH	1915	291.34	11.47	87	25.64	

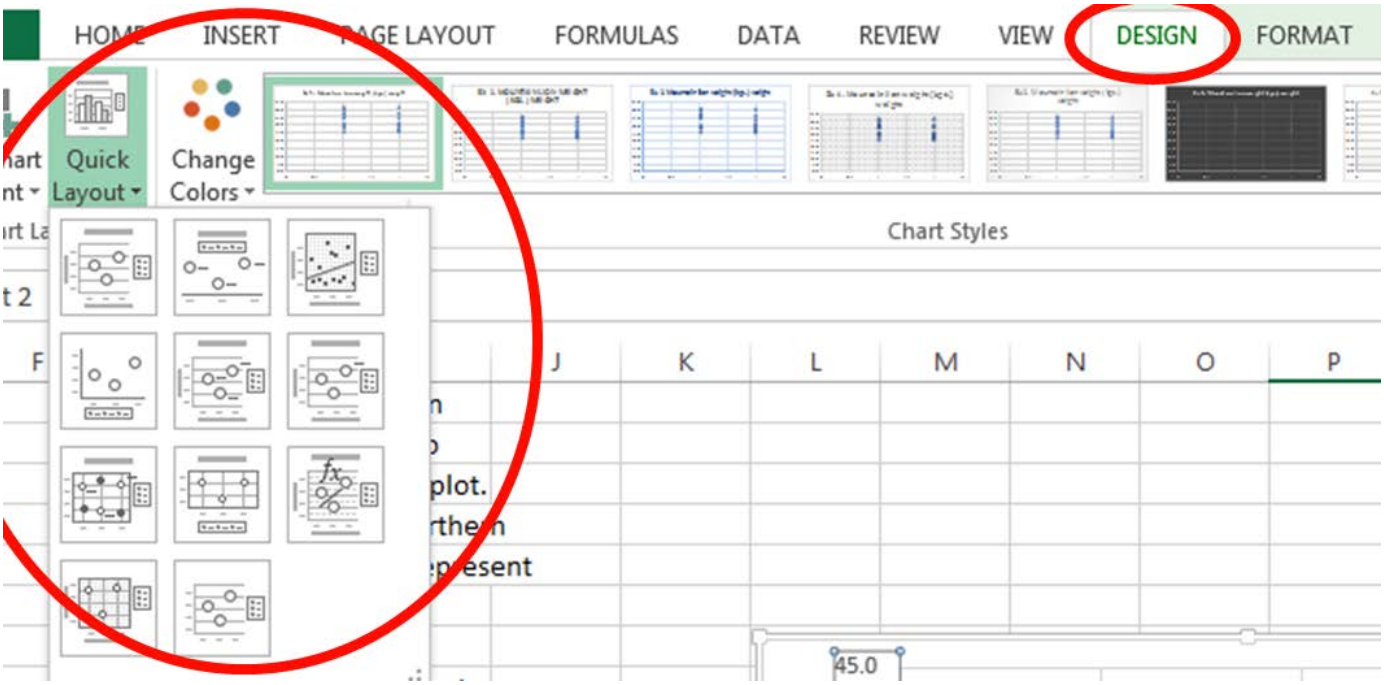
- … and create a scatter plot (see below).



The scatter plot you create will show all the points for annual runoff (streamflow) values between 1901 and 2016. However, from looking at the graph it will NOT be clear if precipitation has increased or decreased (or remained the same) during this period. In order to figure out what the TREND is, you will need to use Excel to calculate a TRENDLINE for the data points. Depending on the trendline you find, you will be able to draw a conclusion about your question: "Is Ohio getting wetter or drier over time?"



One of the ‘quick layouts’ allow you to add a trendline to your scatter plot (see below).



Step 4: Compile your conclusions, evaluate your hypothesis, and create a report

For this last step, you will create a report containing the following information:

- An **INTRODUCTION** section where you will justify the importance of understanding trends in precipitation. In this section of the report, you will tell **WHY** anybody should bother with this question, WHY it is important for us to know this. What are the implications (for agriculture, for industry, for cities, for people) if Ohio is getting wetter or drier?
- A **METHODS** section where you will describe **HOW** you answered the question and found out if precipitation in Ohio is increasing, decreasing, or staying the same. You need to include as much information as possible so that somebody reading your report will be able to **replicate** (reproduce) exactly what you did. Tell them about the data you used, where did you get it, and how did you analyze it (in this section, there is no need to say “what” you’ve found – this will come on the next section: “results”).
- A **RESULTS** section where you will describe **WHAT** you discovered, i.e., the results of your analysis. Make sure that you include in this section a copy of your graph (or graphs).
- A **CONCLUSION** section where you will summarize what you learned and what are the future implications of this find. Here you can also list other questions that may have surfaced while you were doing your research.

Do not forget to upload your report to the lab dropbox on Canvas.