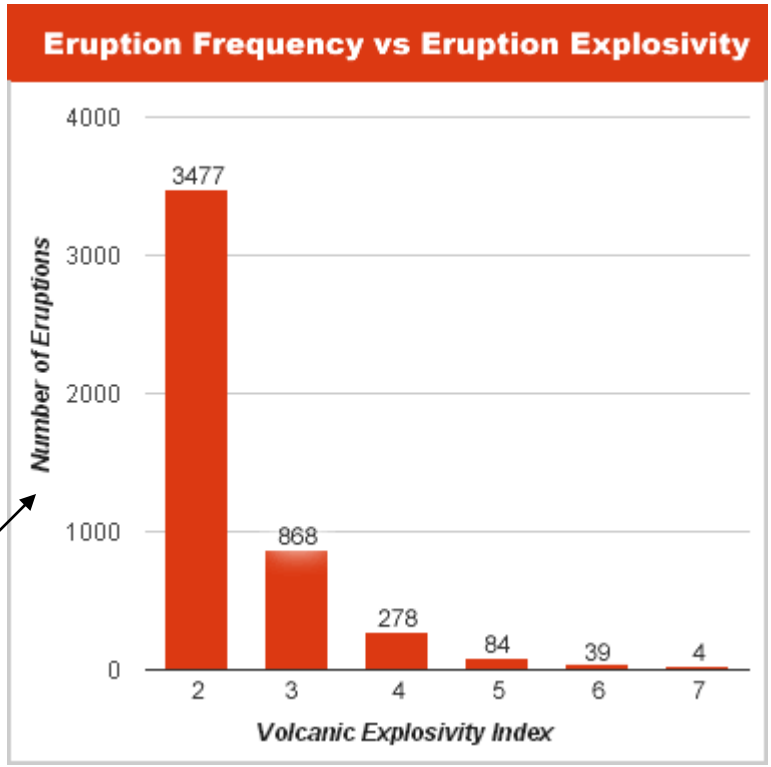
Bar charts

Bar charts are used to display and compare the number, frequency, or any other measure (e.g., mean, median, standard deviation) of *discrete, distinct categories* that are qualitative in nature.

The *x-axis* (or horizontal axis) discrete group types. The *y-axis* records the measure for each of these group types, so it consists of scale based on the unit of measurement. The axes can sometimes be reversed, where the categories appear along the vertical axis and the length of the bar corresponds to the categorical measurements.

Below is a simple example of a vertical bar chart:

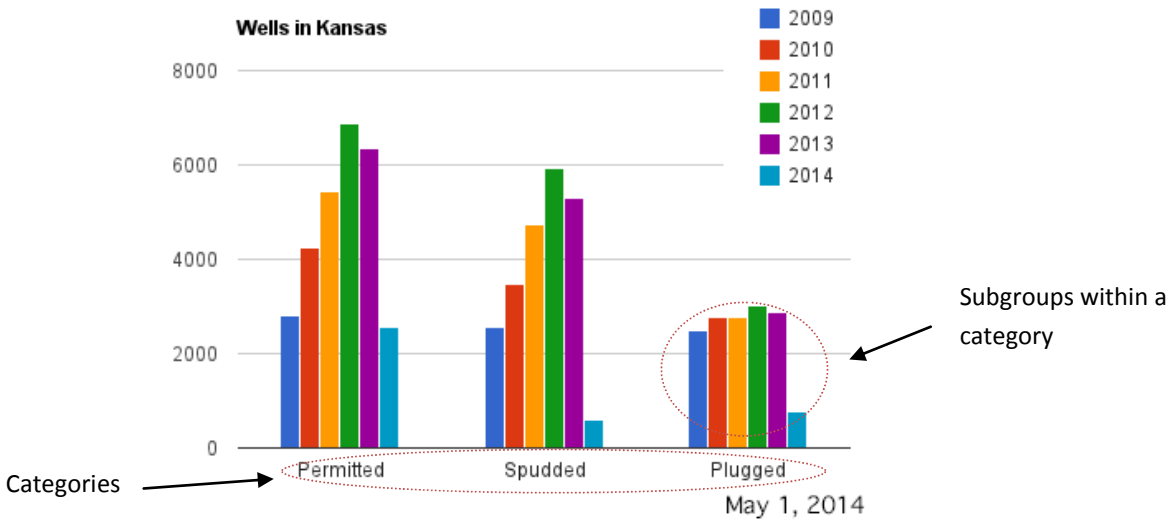
The number of eruptions of each category follow the same scale. This allows the discrete categories to be easily compared.



Source: http://geology.com/stories/13/volcanic-explosivity-index/

Grouped bar charts allow for comparison for different subgroups in a category, and comparing subgroups across categories. Each categorical group may have two or more bars.

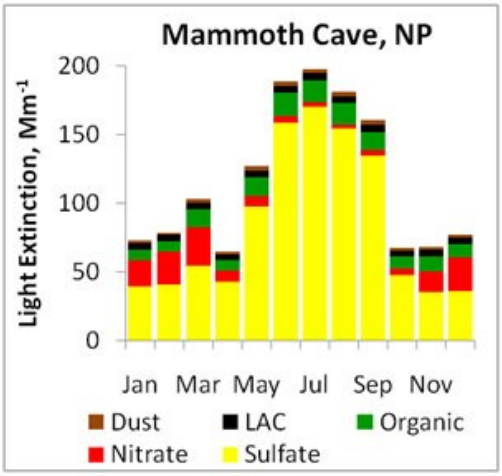
The example below shows the number of different types of wells in Kansas (the categories) by year (the subgroups):



Source: http://www.kgs.ku.edu/PRS/wellStats.html

However, it is difficult to observe the difference in total between categories in grouped bar charts. This is where *stacked bar charts* are useful. In each category, different subgroups are stacked atop of each other, which shows a *combined result* for the category. This allows for a visual comparison of the total measure for each category.

The example below shows the average monthly variation in fine particle concentrations in Mammoth Cave National Park. The total measure for each category can be clearly seen, but the proportion of each subgroup becomes less clear.



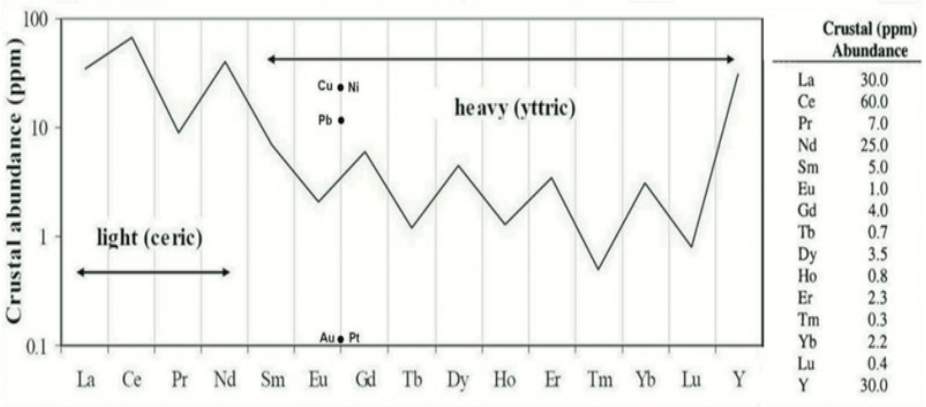
Source: http://www2.nature.nps.gov/air/monitoring/vismonresults.cfm

Line charts

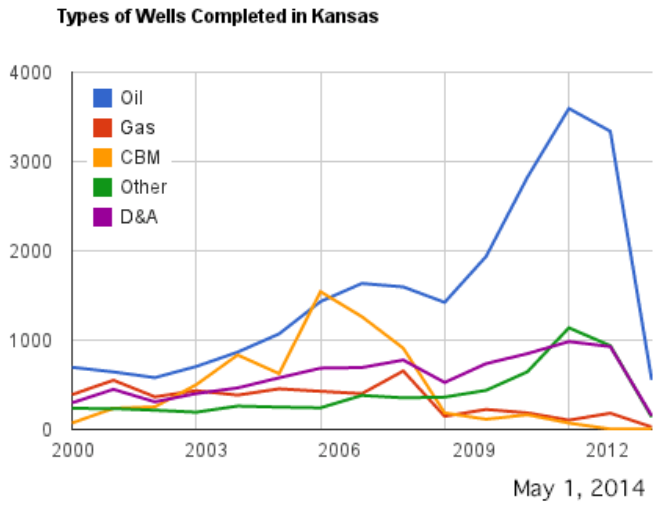
Line charts are most useful to showing *changing data trends* with respect to an independent variable. This can include time, spatial measurements (like depth or width), or abundance measurements.

Individual data values that are marked on the chart are connected by lines that join the points together. This allows for trends to be clearly seen from point to point, as well as the overall trend of the group of data values.

The first example below shows the relative abundance of different rare earth elements in the crust. The second example shows the types of wells that were constructed in Kansas over a period of time.



Source: http://www.rareearthelements.us/ree_geology



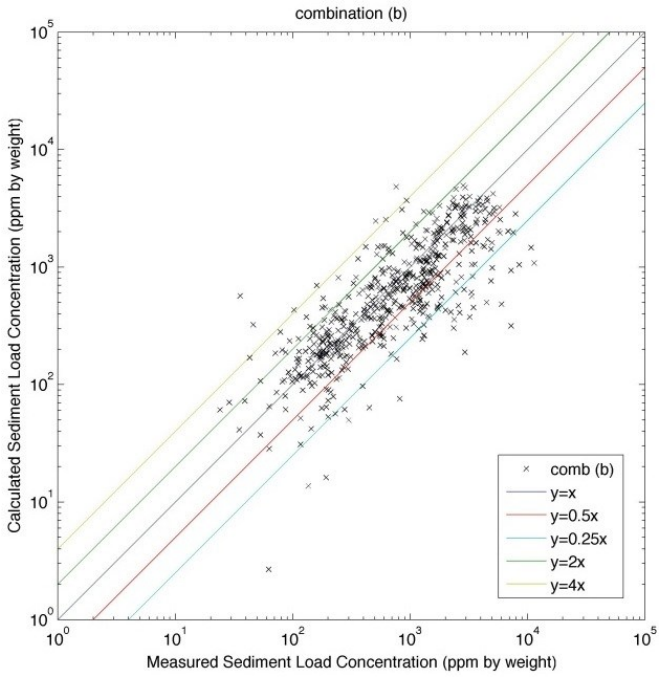
Source: http://www.kgs.ku.edu/PRS/wellStats.html

Scatter plots

Scatter plots are similar to line charts in that they both record *individual data values* as data points on a graph from the relationship of *two variables*. While data points are joined together by straight lines in a line chart to display *changing trends*, the researcher attempts to find a *single trend* that is expressed by the pattern of the individual points.

Scatter plots is most commonly used in scientific data representation due to its ability to display *causative* or *correlative relationships* between variables. To look at causative relationships, the *independent variable* is commonly plotted on the x-axis, while the *dependent variable* is recorded on the y-axis. When there is no dependent variable, either variable can be recorded on either axis, and the scatter plot could illustrate a correlative relationship instead.

The example below shows the relationship between calculated and measured sediment load concentration. The researcher was able to draw *lines of best fit* through the data points based on its tight cluster. This indicates that a *positive correlative relationship* exists between the two variables.



Source: http://www.intechopen.com/books/sediment-transport-processes-and-their-modelling-applications/derivation-of-sediment-transport-models-for-sand-bed-rivers-from-data-driven-techniques