# When does Spring Spring? Comparing migrations and physical predictors of spring.

Teacher's lesson plan to accompany Journey North.
Recommended grades 10-12
Time: about 5 class days with computer access

Introduction: on Groundhog day lead a discussion of what it means to be spring. Point out that the vernal equinox is always in March on the same one of two days, so why would anyone need a ground hog? Point out that there are other things besides daylight which we associate with the advent of spring, and get the kids to list some. Likely candidates are flowers, sunshine, no snow, rabbits, robins, etc. Since these things are what we associate with spring the Groundhog is there to predict when they will arrive – NOT when the vernal equinox happens. Also point out that the list of signs of spring can be broken into physical factors and migratory factors.

Next have students search the internet for spring predictions of the groundhog and any statistics for accuracy they can find. What they tend to find is that groundhog prediction aren't very accurate.

Challenge: tell students that you want to challenge them to "Be your own groundhog". They will use data about the physical changes that happen each spring to look for patterns in when the migrations occur each year.

See student handout for detailed student instructions.

Side note: This graphing works out far better/faster if the student have access to excel or a comparable spreadsheet program. Have students graph the data and put in a linear tern or best fit line to help them identify patterns.

Pattern example: Earthworms tend to appear within 1 week of when the average dew point graph trend line crosses 28 degrees F.

**Phase 1 Gather trend data:** Use the internet to gather data about the temperature, length of day, cloud cover, and precipitation (type and amount) in our town for the last five years before this year for the Monday's between January 1 and May 31. (Each member of your group should do one dataset) Prepare graphs to represent the trends you see (trend graphs are line graphs or X Y scatter plots).

Gather the same data for another town in an different state at the same  Latitude.  Add these lines to your graphs in a different color.

- For which types of data do the lines for each town have a similar shape?
- For which types of data do the lines for each town have a different shape?

Go to the website http://www.learner.org/jnorth/search/ This is an online data gathering sight for signs of spring.  Look at spring for each of the past five years.  Click on a species seen commonly migrating in spring, and look at the update maps for that date. Find the map where that species was first seen north of Heyworth in Illinois each year and north of your second city.  Record this date as the date when migratory spring sprang that year for each location.

Recall that the day following the vernal equinox is the orbital first date of spring each year because of the Earth's position in orbit causing daylight to last longer than 12 hours each day.  Find the exact date of the first day of spring for each of the past five years.

- Mark the first day of orbital spring and the first day of migratory spring as a vertical line on your graphs.



Average Temp in Cleveland, Ohio in 2005
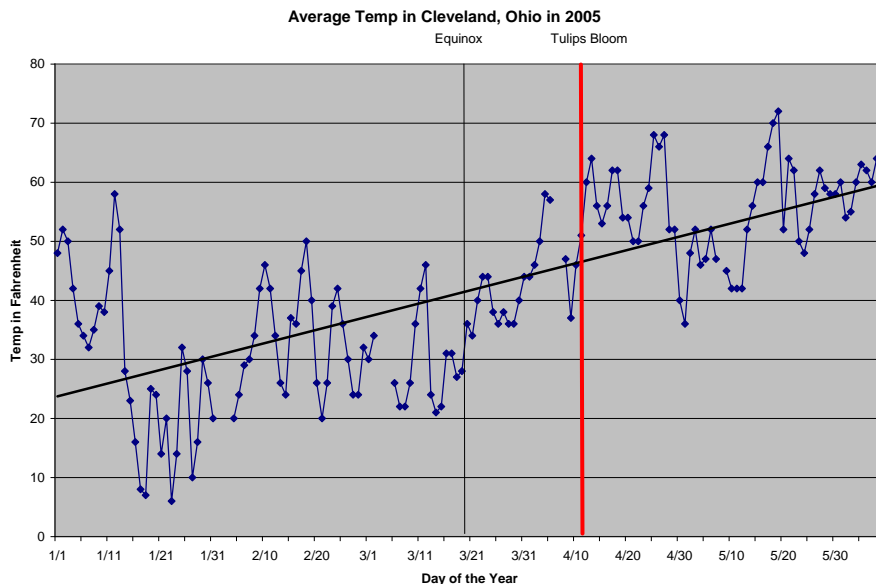
**Phase 2: Analyze**:
Look at your 5 graphs in one location for patterns between the data and the line you drew for spring migration. Once you find a pattern, look at the graphs for your second location and confirm the pattern. If you cannot find a pattern, there might not be one, try graphing a different physical factor.

- What are the best predictors of migratory spring?
- Since latitude determines length of day, does latitude also determine the date of migratory spring? Explain.

**Phase 3: Hypothesize:**

- Plot the trend data for your best predictors' identified above for this winter beginning with January 1. Since you have very little data this early in the season use the data for May of last year to fill out your graph. Based on your previous data predict the exact date of migratory spring for this year for home and your second city.

**Cleveland,OH Average Temp in 2006**
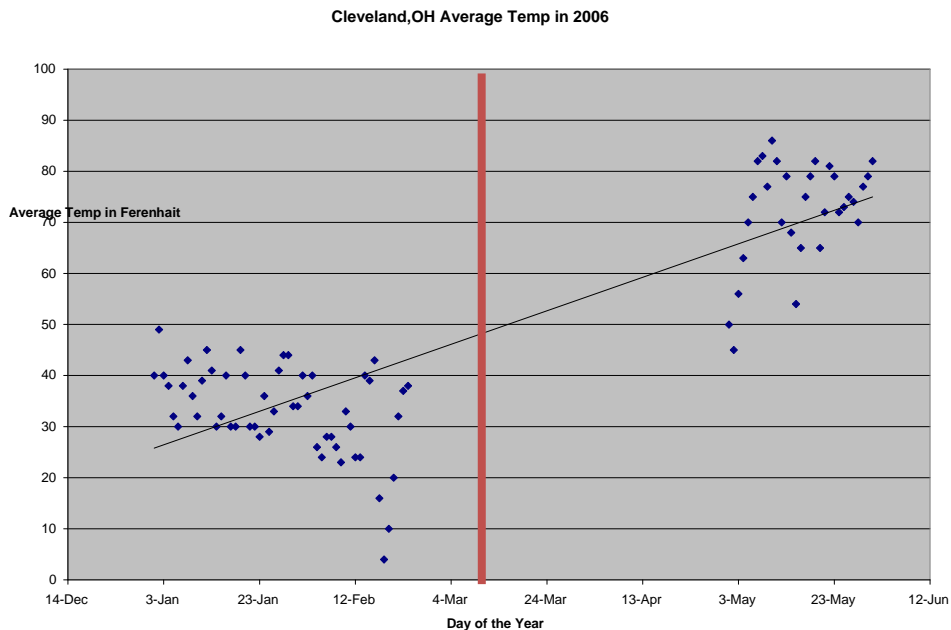


- Write a paragraph describing your prediction and how it was reached.

**Phase 4: Test:**
Now you will wait and see how well you did. In the meantime your group will
1. monitor the progression of migrations using journey north
2. learn about the species you're working on for migratory spring
3. use sunlight data and clues to identify mystery locations including longitude and latitude.

**Phase 5: Analyze and conclude:** When your spring species arrives we will discuss all of your predictions and make recommendations for the best way to predict when spring springs.