Introduction to Data Visualization

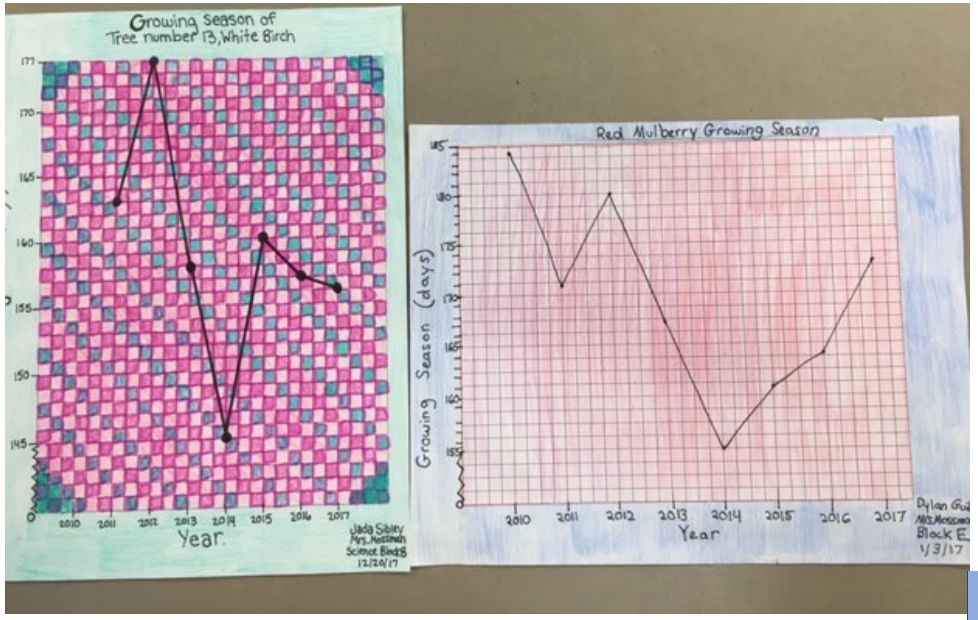
Schoolyard Ecology Looking at Data Workshop for Teachers

Betsy A. Colburn

Harvard Forest

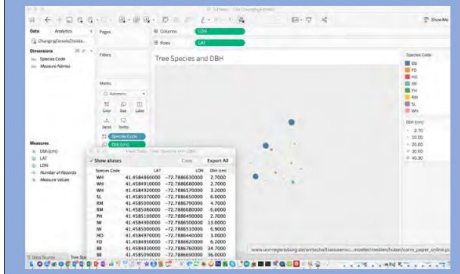
January 9, 2020

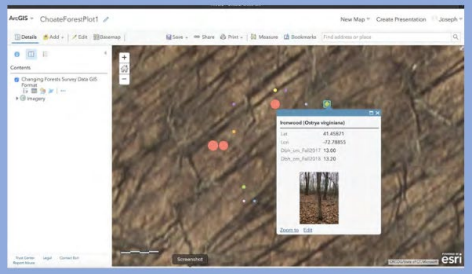
We use graphs of our data to tell a story and identify questions



J. Mossman

Choate Rosemary Hall
Our Changing Forests
Joseph Scanio





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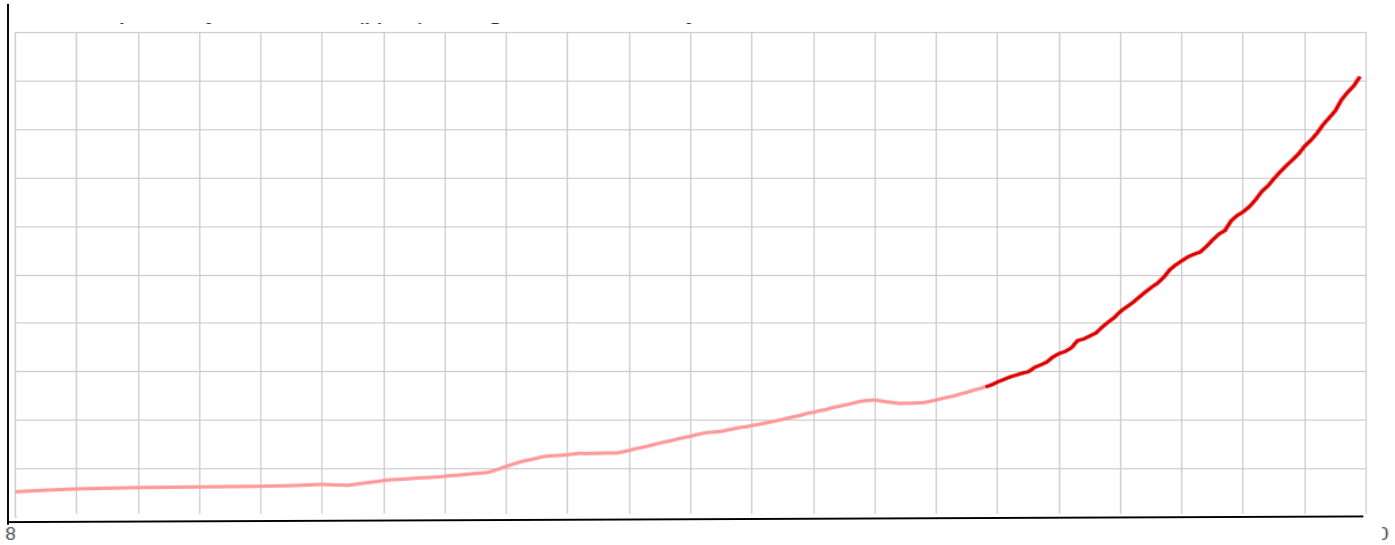

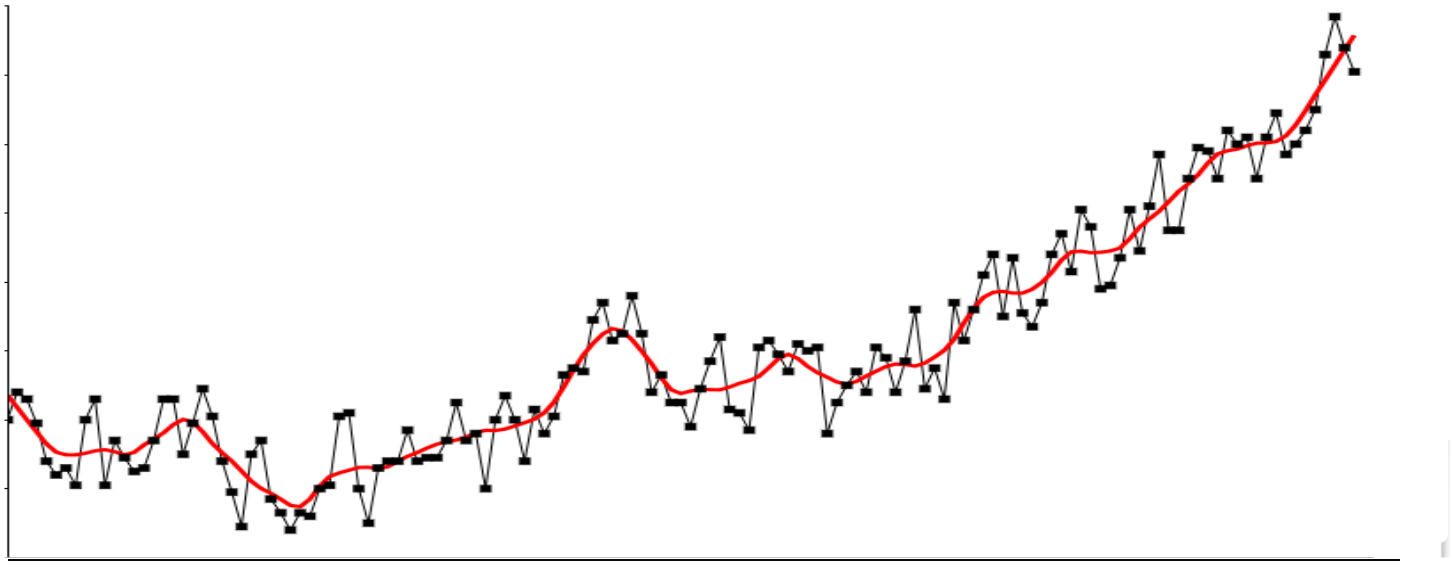

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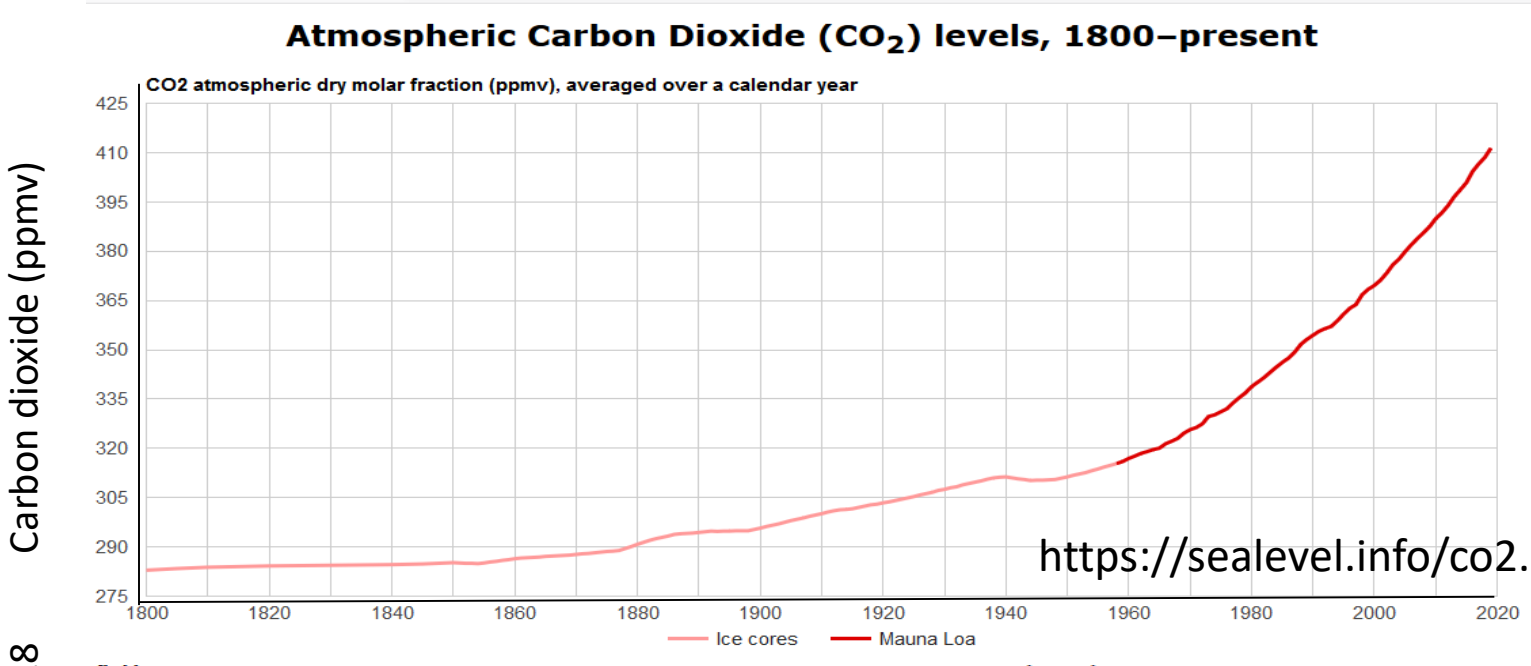
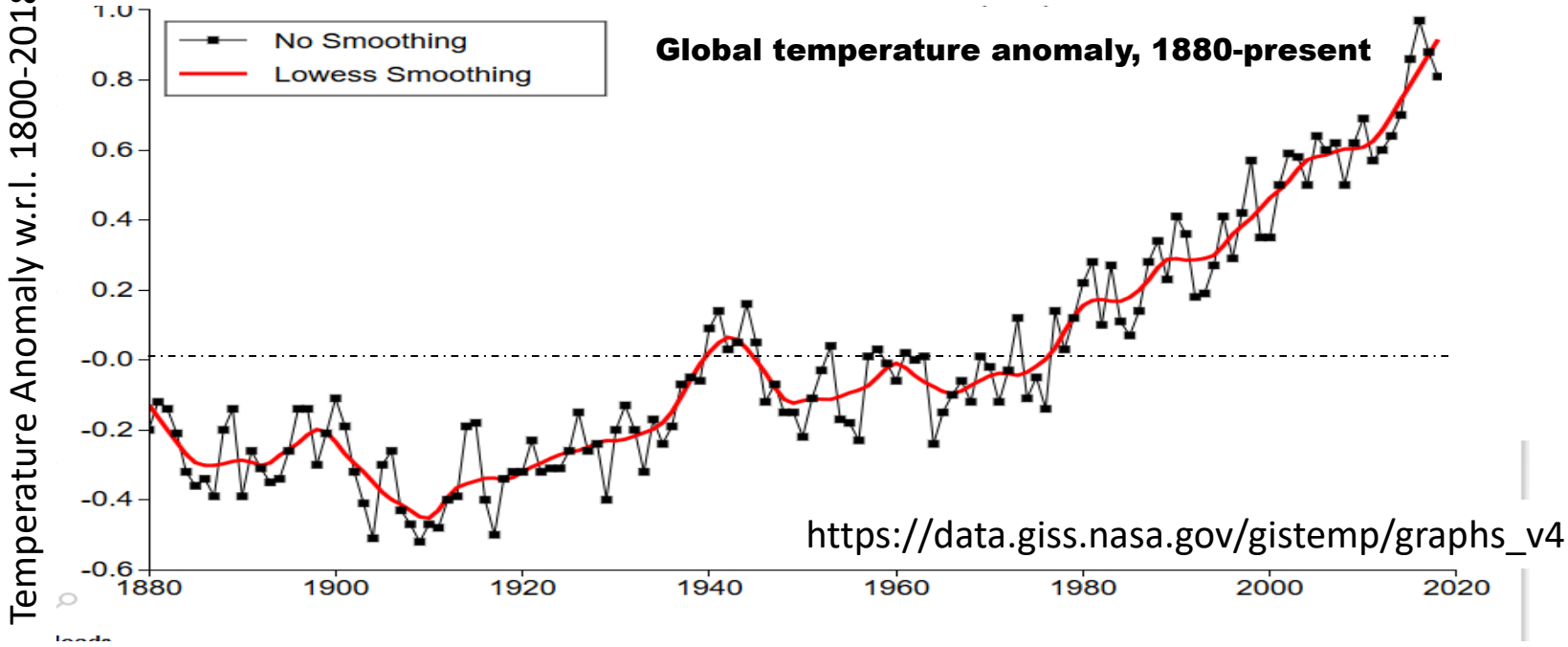


https://sealevel.info/co2.html



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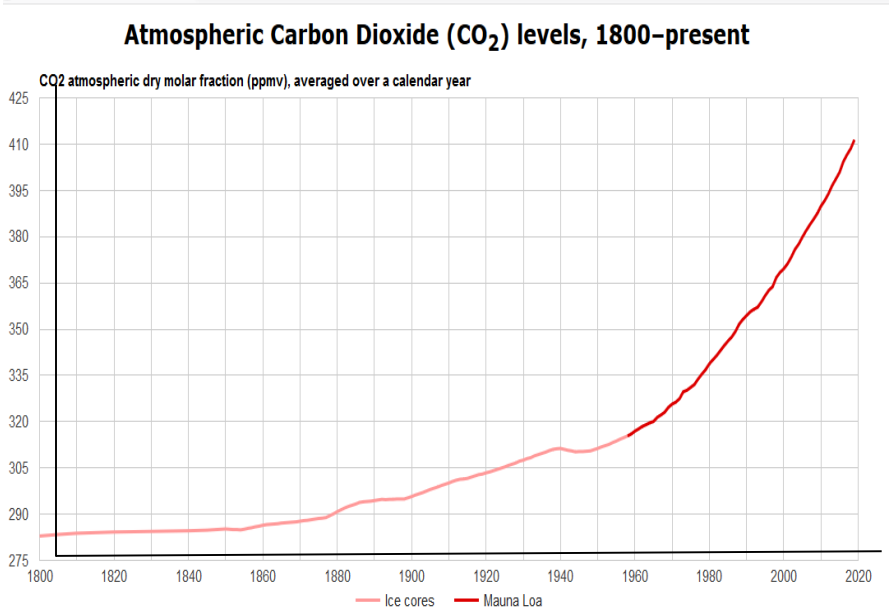

Data from Greenland ice cores through 1958, and subsequently from Mauna Loa Observatory, HI. Annual means of monthly measurements. 2019 data are from July, 2019 as estimate of annual average.

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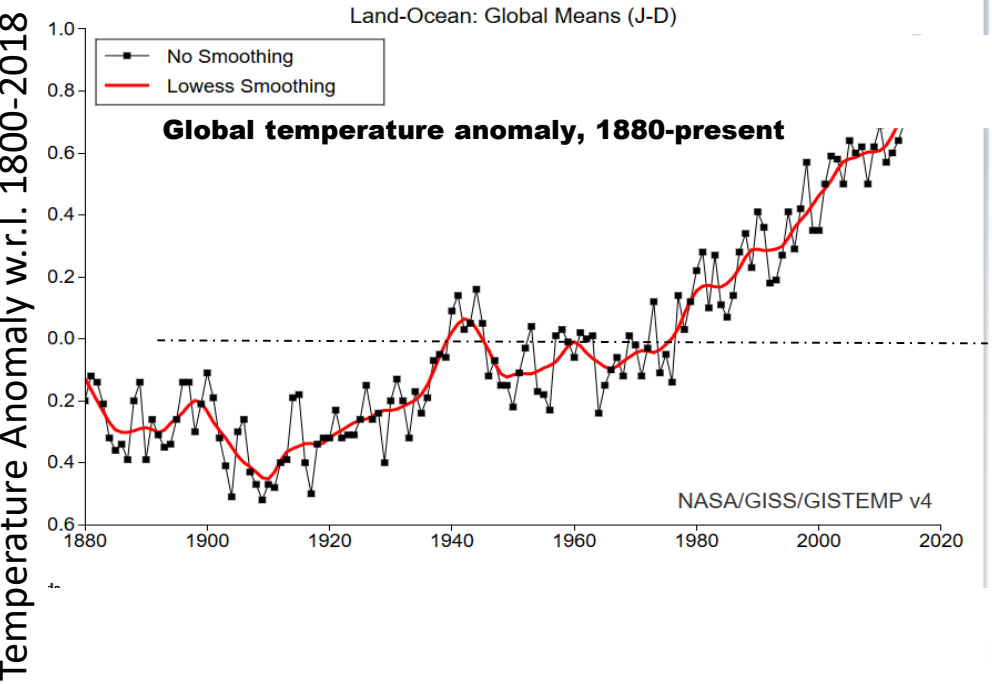

Temperature graph from weather stations and buoys worldwide; shows yearly average differences between measured land and ocean temperatures in a given year and a baseline average annual temperature (the temperature anomaly shown on the Y axis). Also shown is five-year running average, which is the average of the temperature anomalies for the current year and the four preceding years. The base period (0 point on Y axis) is 1951-1980

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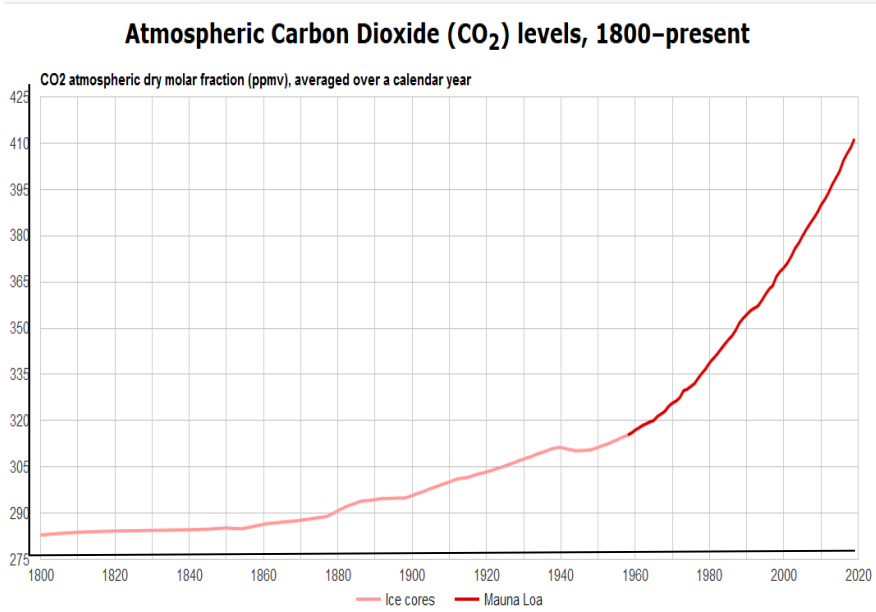
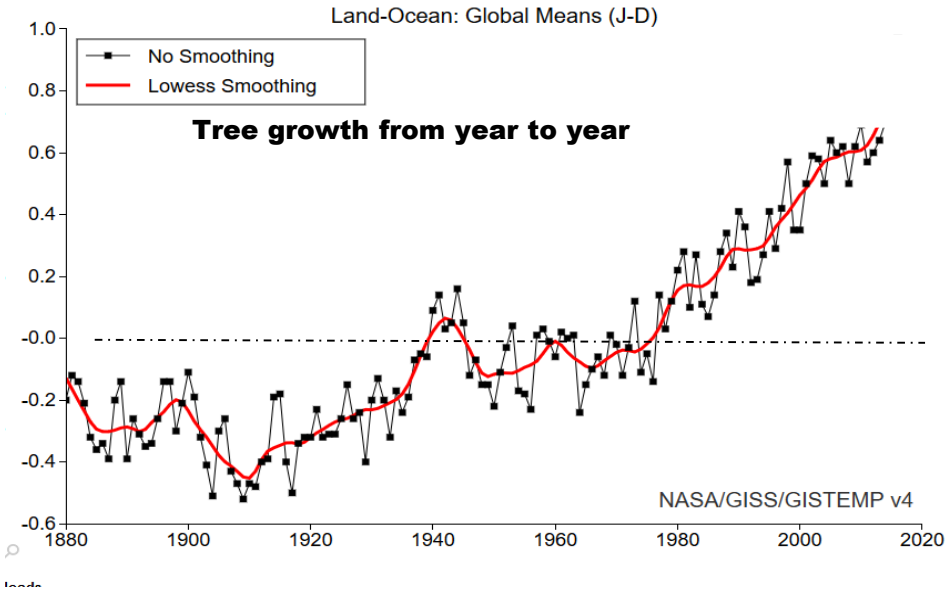


Would this graph help you interpret year-to-year changes in tree growth, if that was the subject of the graph below



What if this graph were showing changes in annual growth of trees relative to the previous year (biomass or diameter) what might you conclude?

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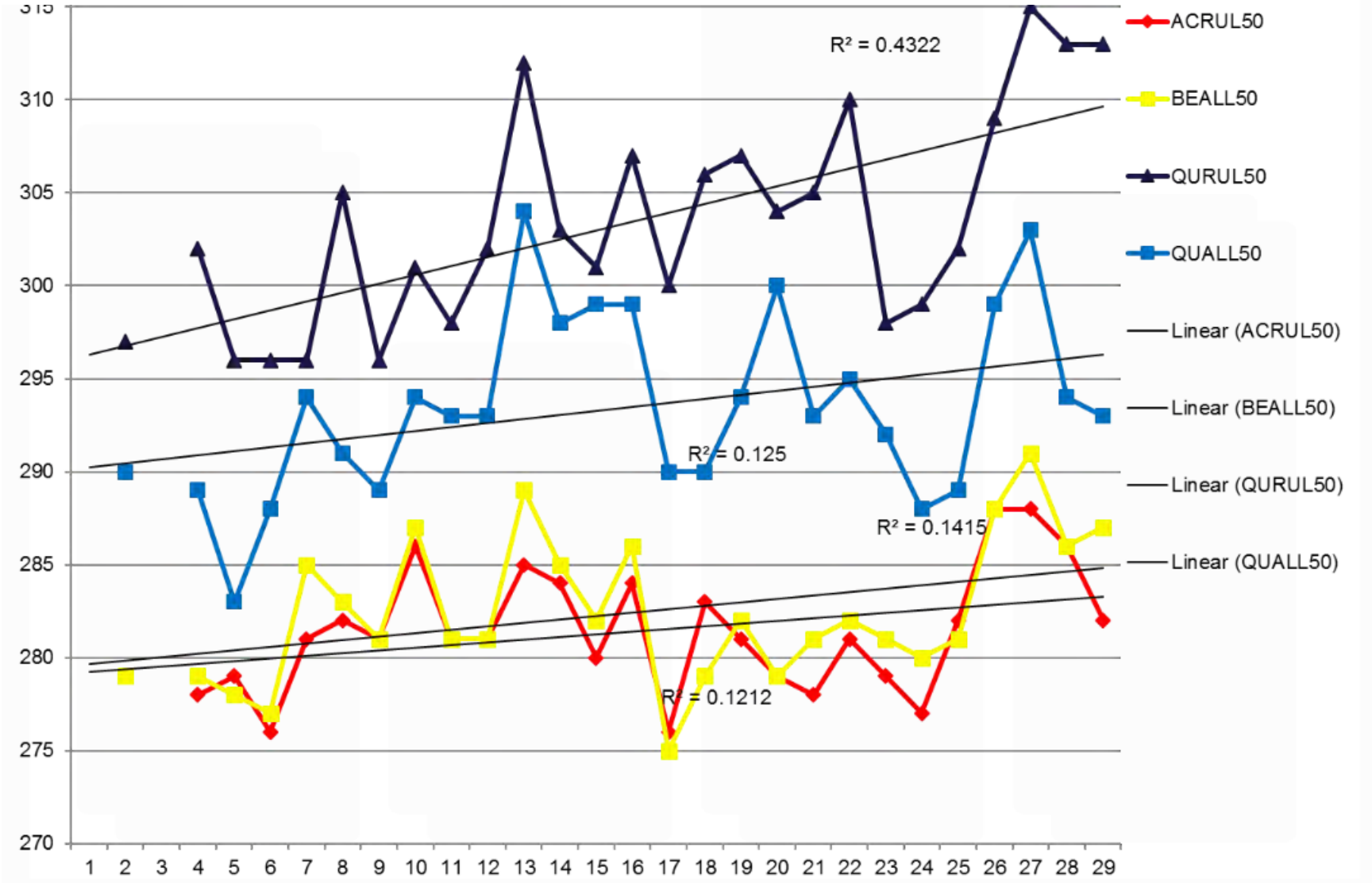
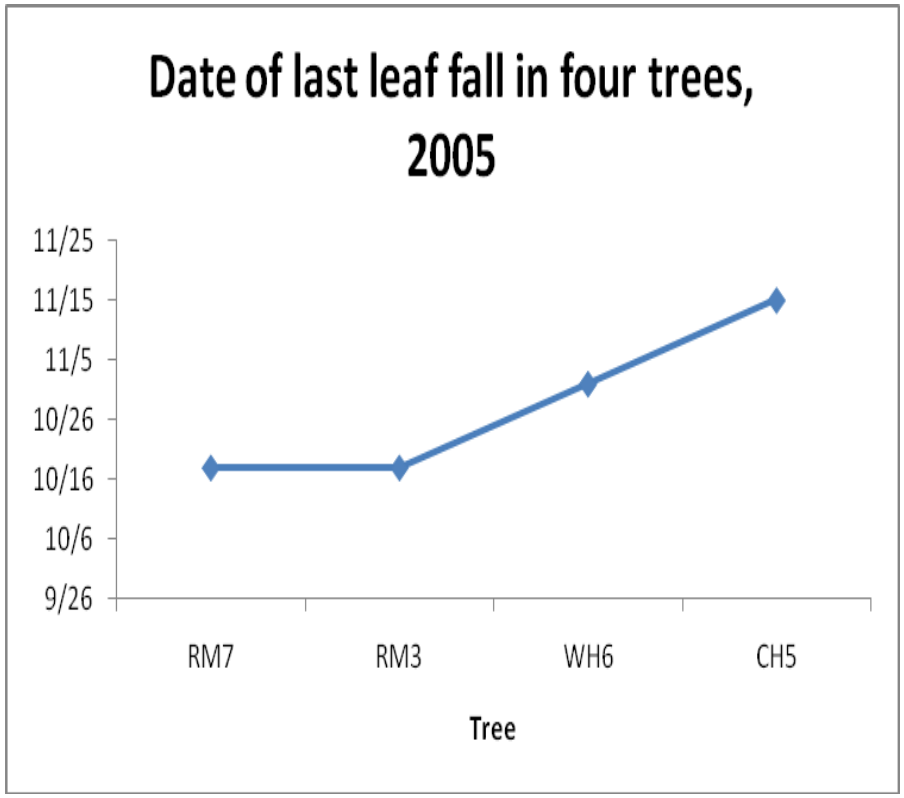
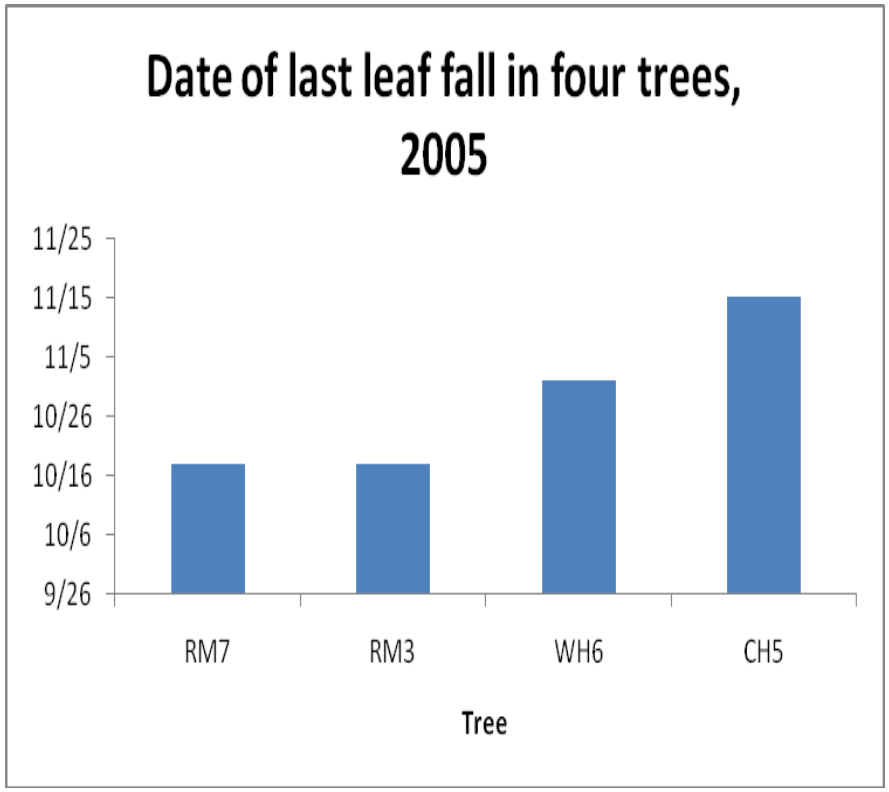
Mean Date of 50% Leaf-fall in Four Species of Trees at the Harvard Forest, 1990-2018 (John O'Keefe Data)




Date of last leaf fall in four trees, 2005
11/25
11/15
11/5
10/26
10/16
10/6
9/26
RM7
RM3
WH6
CH5
Tree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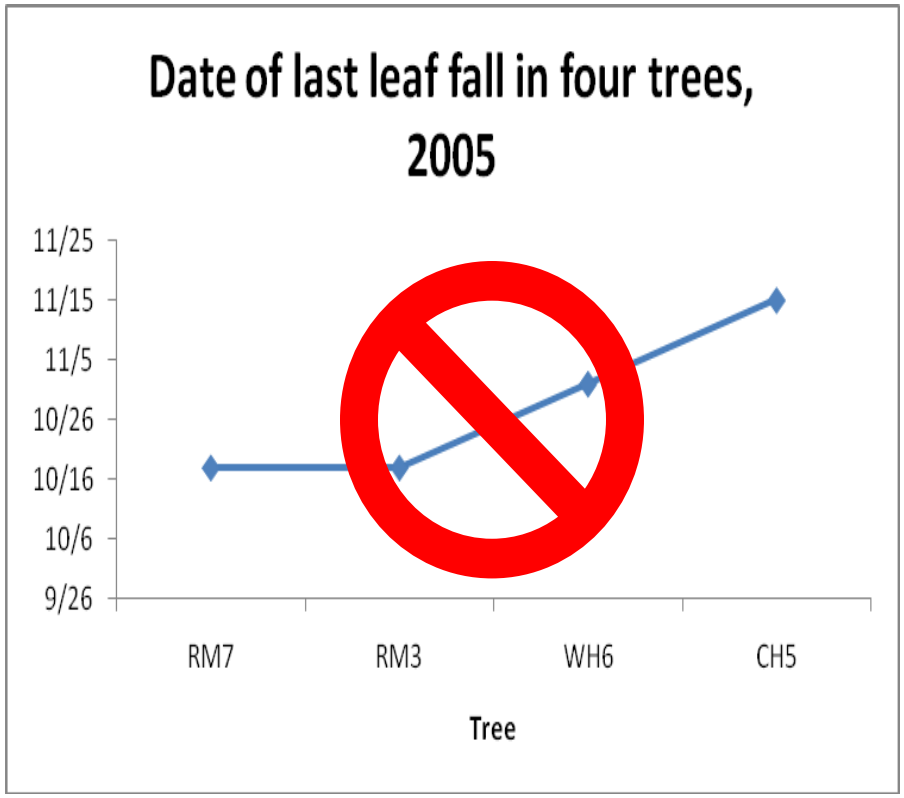
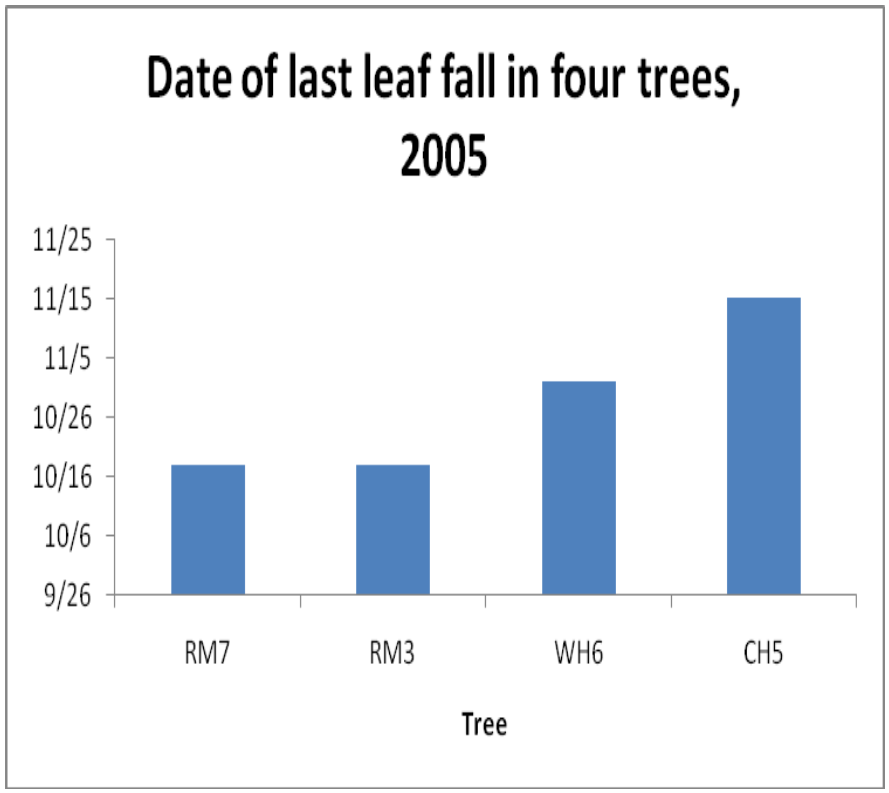
Tree

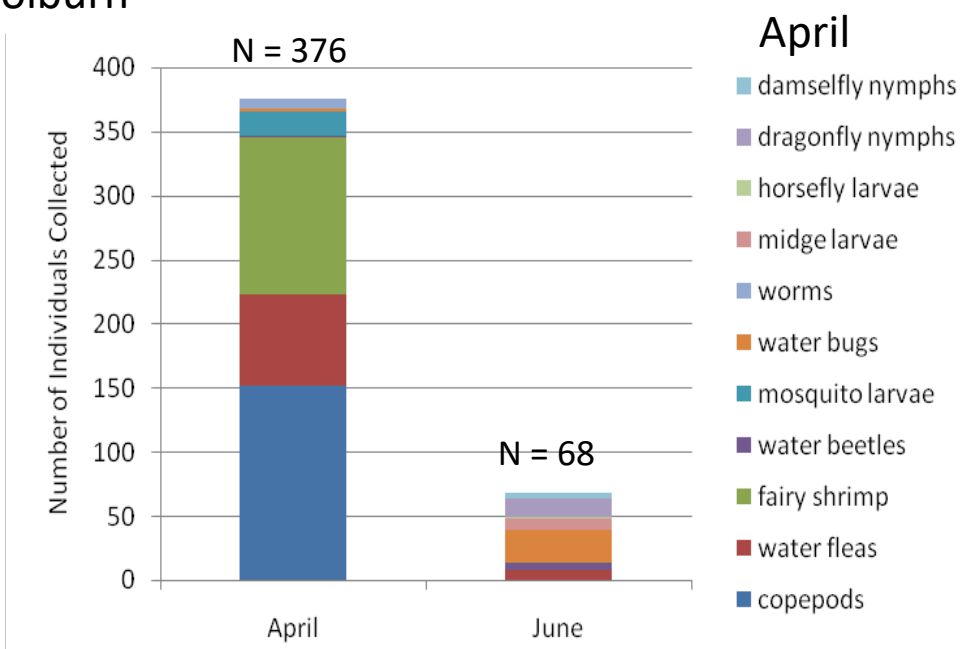
a. Line graph – not appropriate

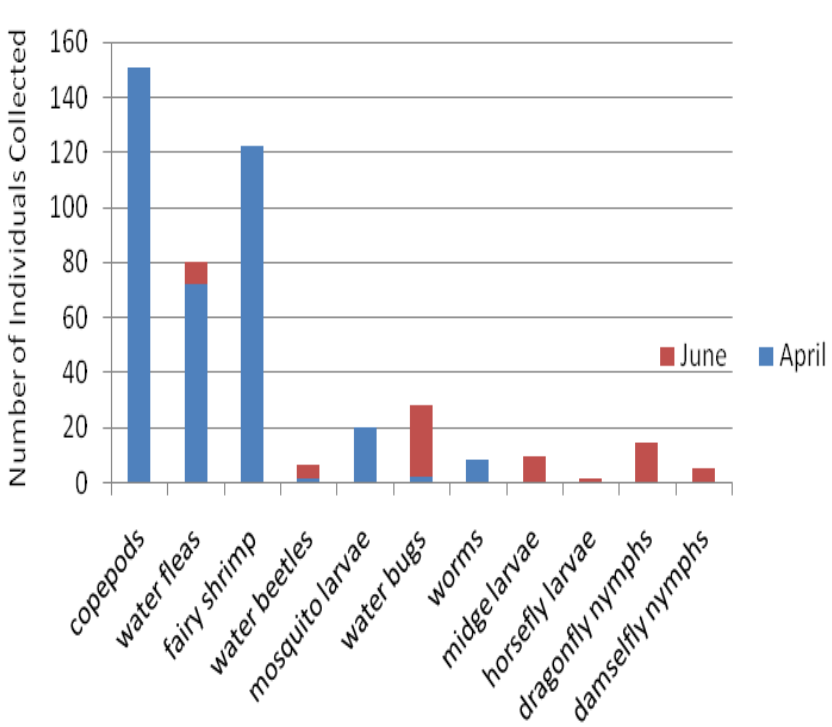


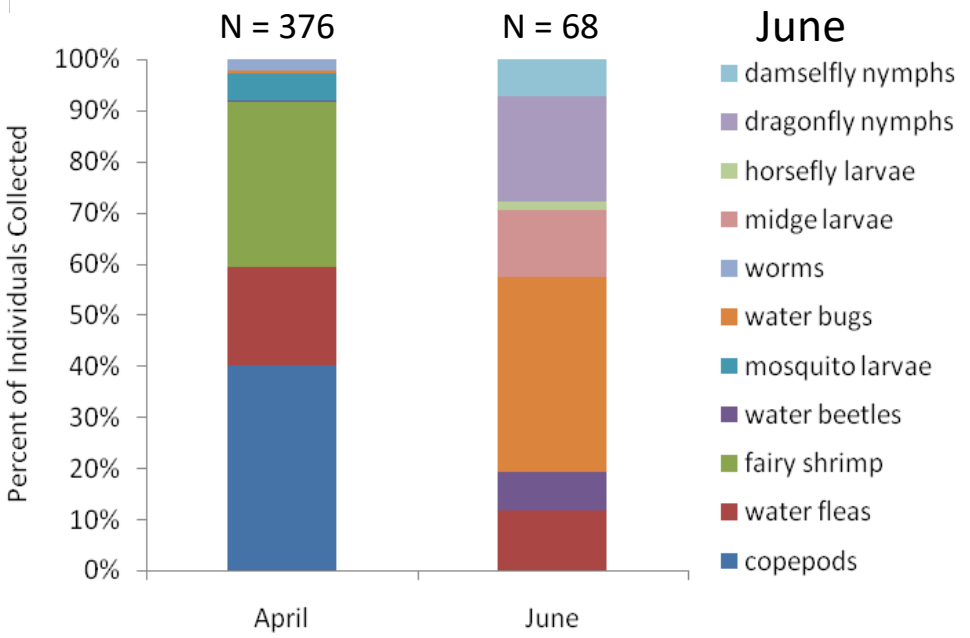
b. Bar graph – appropriate

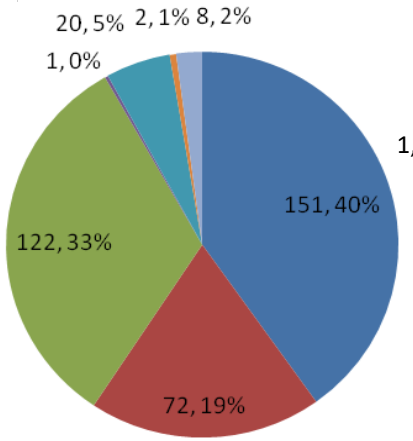


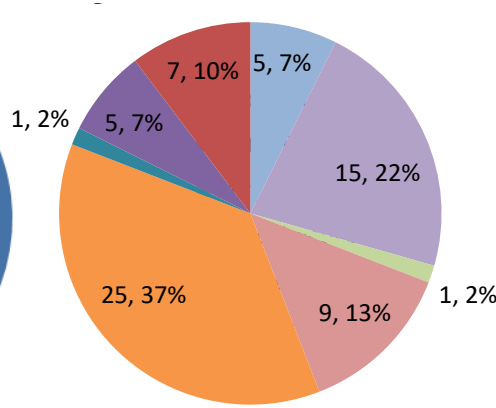
Macroinvertebrate communities in a Cape Cod Vernal Pool, April and June, 1996. Data from EA Colburn







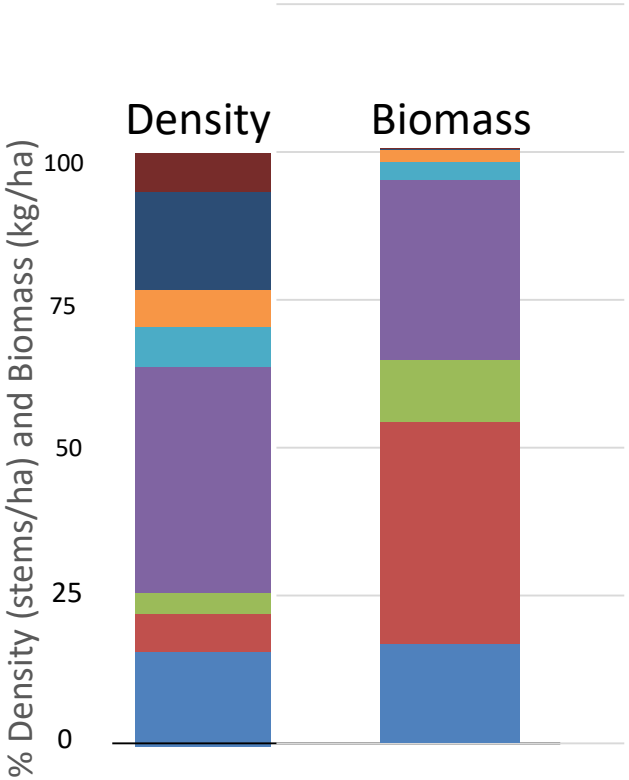


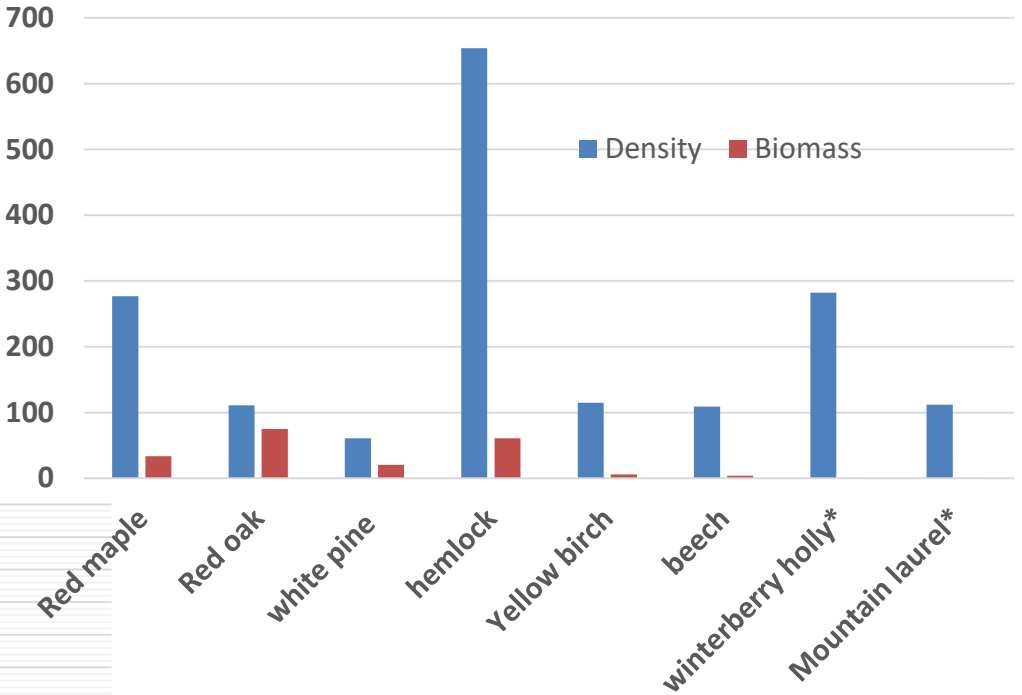


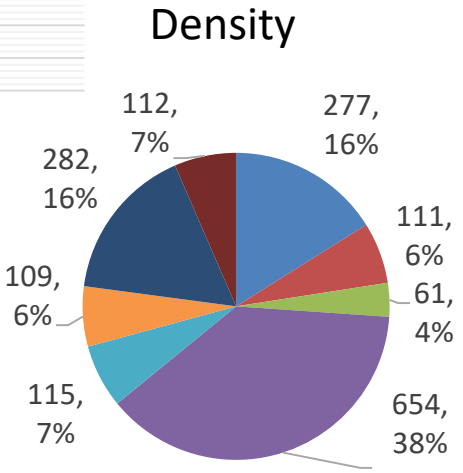
April, 376 organisms

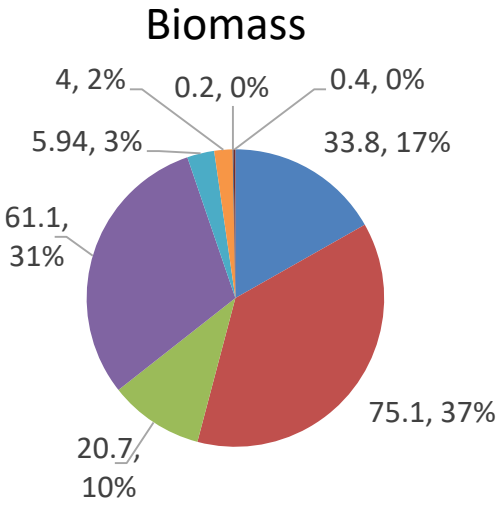
June, 68 organisms

Density and Biomass of Trees and Shrubs in the Harvard Forest Megaplot (Data from D. A. Orwig)

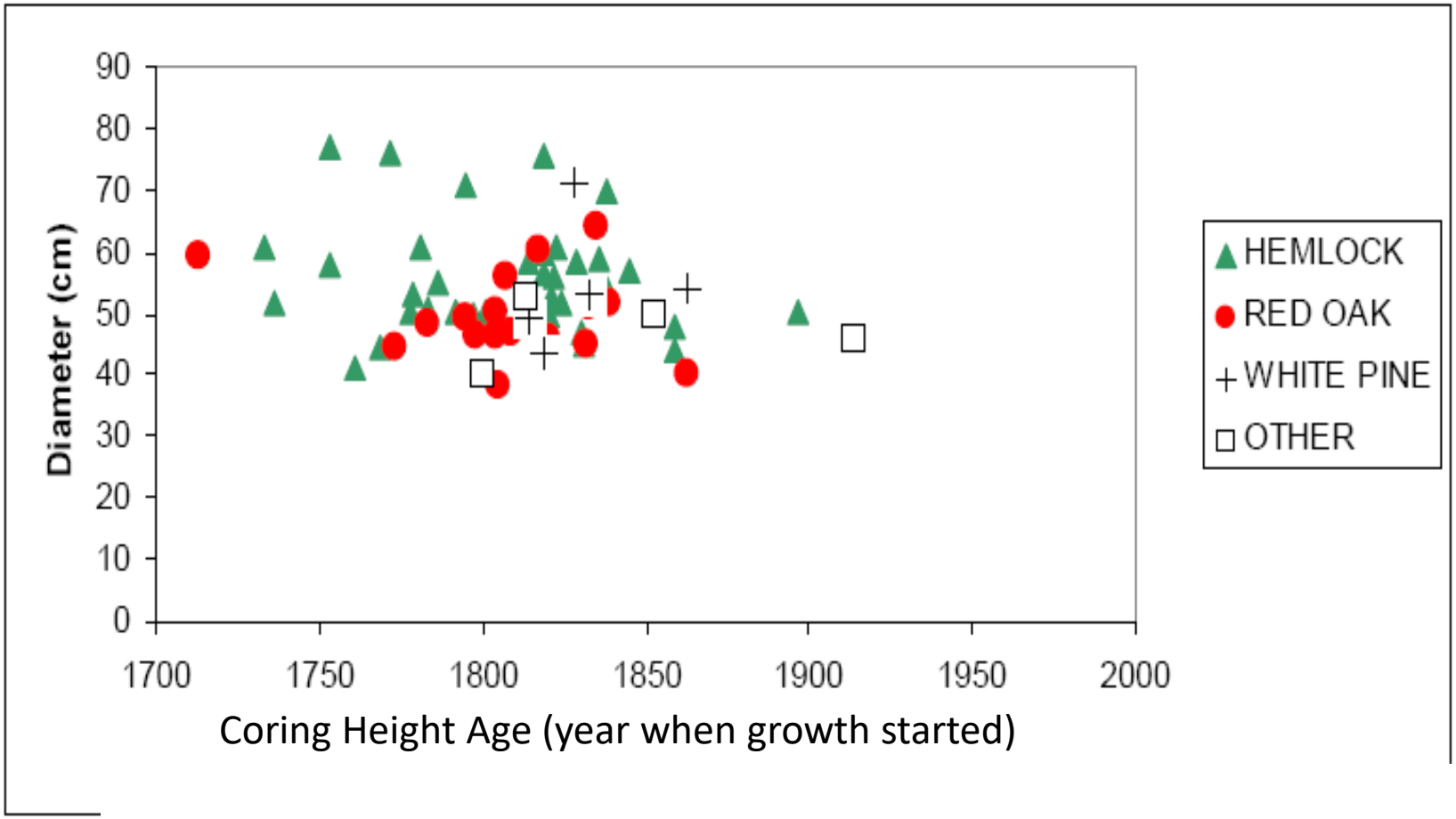




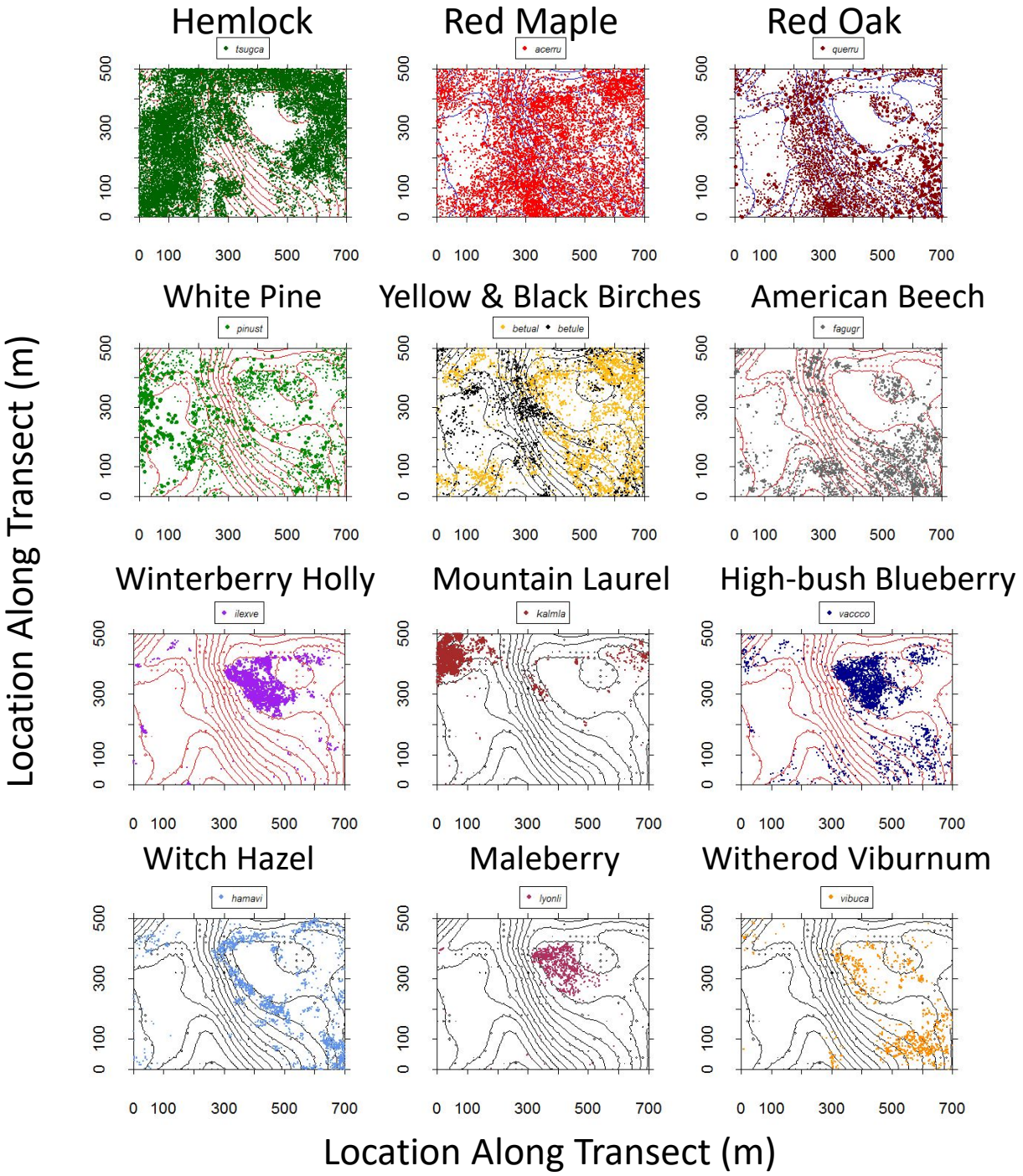




Age and diameter of trees on Mt Wachusett. Data from DA Orwig.



Distribution of Six Tree Species and Six Shrub Species in the Harvard Forest Megaplot. (Data: D.A. Orwig)



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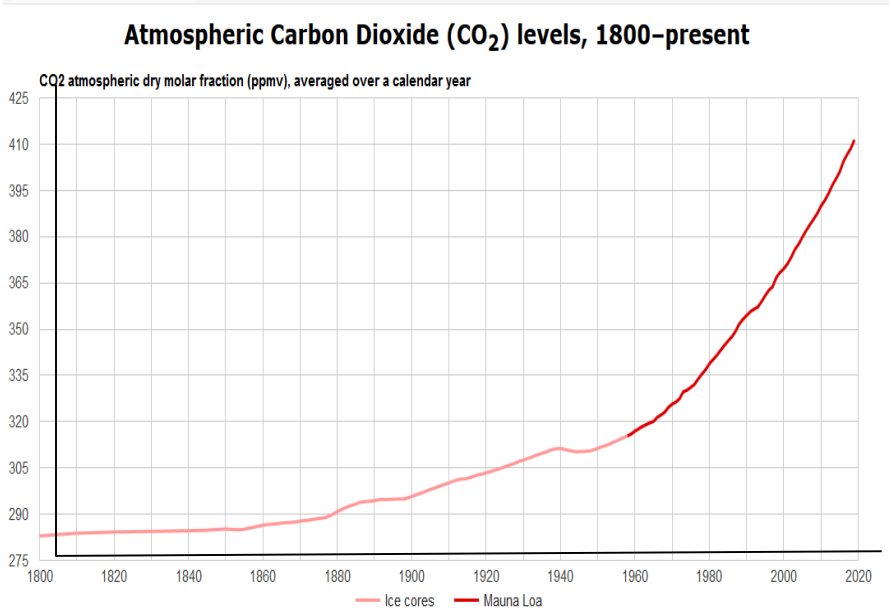

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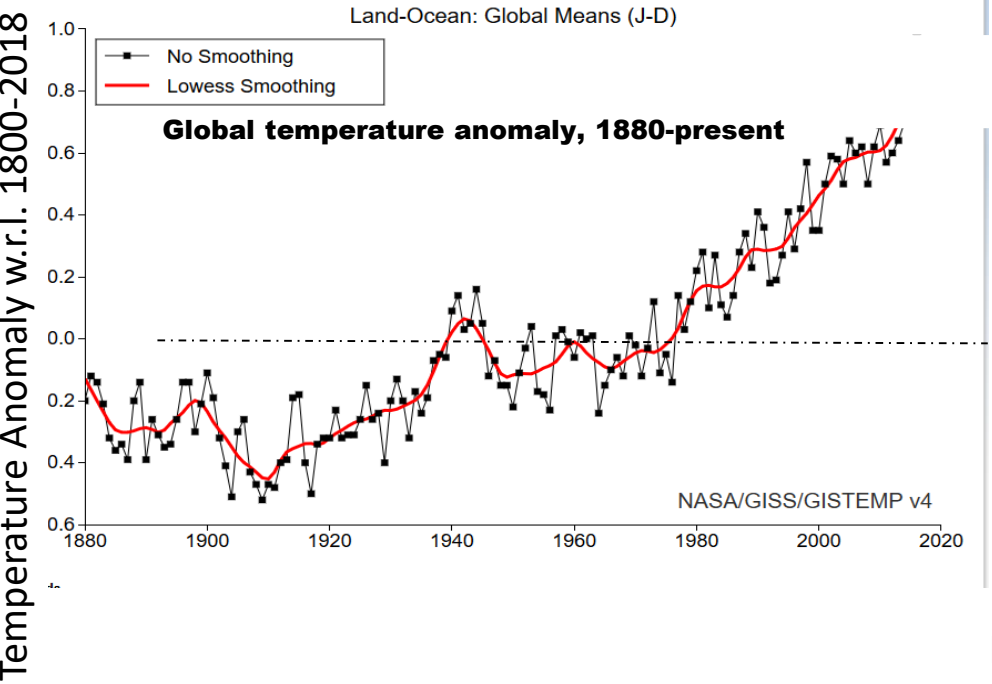

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Steps in Preparing Visual Presentations of (Schoolyard) Data

- Collecting the Data
- Organizing Data and Inputting data to a Data base

} Level 1 – STEP 1 IN DATA ANALYSIS
Levels 2 and 3 also need to do this

- Preparing data for analysis
  - Transformations (e.g., change numbers to percent, date to Julian Day, etc.)
  - Extracting additional information
    - (e.g., biomass accrual for the whole plot, length of growing season)
- Carrying out data analysis
- Data analysis through visual presentations of data
  - Looking at Data – Graphing considerations
  - Kinds of graphs – what is appropriate for your data and questions?

} Levels 2, 3

Level 2 teachers – Creating graphs by hand or by using graphics programs with structured exercises
Looking at graphs and answering questions about them.

Level 3 teachers – Organizing your students' data and creating **and interpreting** graphs of the data, or otherwise working with data to meet your individual goals for today. We hope graph INTERPRETATION will be part of your work!

Everyone – wrapping up

- Sharing graphs, ideas, questions
- **Workshop evaluation and feedback**