Show Me a Picture, Tell Me A Story

Harvard Forest Schoolyard Ecology Program:
Level II & III Data Analysis Workshop

Date | Sampled | Fallen
--- | --- | ---
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9/29/2004 | 10 | 0
10/6/2004 | 10 | 0
10/13/2004 | 10 | 0
10/19/2004 | 10 | 0
10/27/2004 | 10 | 0
11/4/2004 | 5 | 5
9/28/2005 | 24 | 3
10/5/2005 | 24 | 3
10/12/2005 | 24 | 8
10/19/2005 | 24 | 10
10/26/2005 | 24 | 13
11/2/2005 | 24 | 20
11/10/2005 | 24 | 24
9/20/2006 | 24 | 2
9/27/2006 | 18 | 6
10/4/2006 | 24 | 11
10/11/2006 | 24 | 16
10/18/2006 | 24 | 17
10/25/2006 | 24 | 18
11/1/2006 | 24 | 23
11/8/2006 | 12 | 12
9/12/2007 | 24 | 4
9/19/2007 | 24 | 4
9/26/2007 | 24 | 9
10/3/2007 | 24 | 13
10/10/2007 | 24 | 20
10/17/2007 | 24 | 21
10/24/2007 | 24 | 23
10/31/2007 | 6 | 6

Thursday, December 3, 2015
Harvard Forest, Petersham, MA
Morning Presentation

- Schoolyard Data
- Preparing data for analysis
- Data analysis
- Graphing considerations
- Kinds of graphs – examples from HF research and Schoolyard Ecology data

Level 2 teachers – Creating graphs by hand or using graphics programs with structured exercises

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

After Lunch

- Additional practice graphing schoolyard data
- Further opportunity to practice making calculations and graphing the modified data
- Sharing graphs, ideas, questions

Evaluation and feedback
Schoolyard Science phenology data set in comma-delimited text (.csv) format, as on the Harvard Forest Schoolyard Science website, and in a spreadsheet.

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Data Analysis – Understanding Results of Sampling

• Spreadsheets and Tables

• Graphs and Figures

• Statistics
Considerations for Analyzing & Graphing Data

• What do you have for data?

• What do you want to find out? (What are the questions you are asking of your data?)

• What kind of graphs(s) [or statistics] can help you address your questions?

• What graphs [or statistics] can help you tell your story effectively?
a. Line graph – not appropriate

Date of last leaf fall in four trees, 2005

b. Bar graph – appropriate

Date of last leaf fall in four trees, 2005
Macroinvertebrate communities in a Cape Cod Vernal Pool, April and June, 1996. Data from EA Colburn.

N = 376 organisms
- copepods: 151,40%
- water fleas: 122,33%
- dragonfly nymphs: 72,19%
- water beetles: 20,5%
- fairy shrimp: 2,1%
- water bugs: 8,2%
- damselfly nymphs: 1,0%
- mosquito larvae: 0,0%
- horsefly larvae: 0,0%
- midge larvae: 0,0%
- worms: 0,0%
- water fleas: 0,0%
- copepods: 0,0%

Number of individuals collected:
- April: N = 376
- June: N = 68

Percent of individuals collected:
- April: Copepods 40%, Water Fleas 30%, Dragonfly Nymphs 20%, Water Beetles 10%
- June: Copepods 40%, Water Fleas 30%, Dragonfly Nymphs 20%, Water Beetles 10%
Tree species sampled in a schoolyard phenology study. ARM Schoolyard data. a. Pie graph. b. Stacked bar graph. (Species codes as in a.) c. Bar graph.
Aquatic Macroinvertebrates in a Cape Cod Vernal Pool in April, 1996.
Data from EA Colburn

N = 376 organisms

- Copepods: 151,40%
- Water fleas: 122,33%
- Fairy shrimp: 72,19%
- Water beetles: 20,5%
- Mosquito larvae: 8,2%
- Water bugs: 2,1%
- Worms: 1,0%
Spring leaf emergence and autumn leaf fall in four tree species at the Harvard Forest. Data from J O’Keefe

**Fall:**
- --- Date of 50% leaf drop

**Spring:**
- --- Date of 75% leaf development
- --- Date of 50% bud break

### Graph Details

- **Acer rubrum**
- **Betula alleghaniensis**
- **Quercus alba**
- **Quercus rubra**
Leaf fall in one tree over four years of sampling. ARM Schoolyard data.

**Progression of Leaf fall in Yellow Birch #1 over Four Years of Study**

- First leaf fall
- 100% Fallen

![Graph showing the progression of leaf fall over four years.](image)
Leaf fall in Multiple Trees. ARM Schoolyard data.
Leaf fall in Multiple Trees. ARM Schoolyard Data.
Before Data Analysis:

Look at data

Evaluate for:
  • errors
  • missing information
  • corrections that are necessary

Adjust accordingly

Extract additional information – e.g., length of growing season, percent of leaves fallen, etc.
Growing Season Calculation:
1. Determine 50% bud burst and 50% leaf-fall dates for each tree, or alternatively, you could calculate the average for each species, or average for all trees at a site, depending on your analysis goals.
2. Subtract budburst date from leaf-fall date; this gives the number of days in the growing season for the selected tree(s).
3. This approach could also be used to estimate average duration of flooding in some vernal pools, if data are available on both the increase in water depth in spring, and the decline in water levels as the hydrologic year progresses.

Estimated date of 50% leaf fall, bud burst, pool filling or drying, or other event

Use data measuring change in factor of interest -- water depth, growth, leaf fall, etc.

Look at the data, and choose two points bracketing the 50% level -- the formula below finds the 50% point between them:

$p1$ and $p2$ are the percent of leaf-fall estimated for measurement dates $d1$ and $d2$, respectively.

Plug the values for $d1$, $d2$, $p1$, and $p2$ into the following formula:

$$50\%\text{ Leaf-fall or bud-burst Julian Date:} = d1 + \left[\frac{(d2-d1)(50-p1)}{(p2-p1)}\right]$$

NOTE: For measurements of water depth, growth, etc., plug in the comparable Julian days.

Example:
Spring

$d1 = 95$
$d2 = 122$
$50\%\text{ bud burst} = 95 + \left[\frac{(122-95)(50-47)}{(62-47)}\right] = 100.4$
$p1 = 47$
$p2 = 62$

Fall

$d1 = 277$
$d2 = 284$
$50\%\text{ leaf fall} = 277 + \left[\frac{(284-277)(50-46)}{(67-46)}\right] = 278.3$
$p1 = 46$
$p2 = 67$

If 50% bud-burst was at day 100 (April 10 in a non-leap year), and if 50% leaf-fall was day 278, then 278-100 = 178: the growing season was 178 days long for this particular tree or group of trees.