Looking at Data Workshop
Harvard Forest
9 Jan 2020
Emery R. Boose
Level 1 Session

- Scientific data
- Data entry
- Online graphing tool
- Graphing exercises
Paper Records
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### Born-Digital Data

**Harvard Forest Data Archive HF001**

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Real-Time Data

Temperature & Humidity

Stream Discharge

Precipitation

Snowpack

Harvard Forest Website: Real Time Data Graphs
Why Manage Data?

- Scientists build on the work of others
- Data must be accessible & understandable

Data may disappear

Information content may disappear
**DATA**

```
datetime,jd,airt,rh,dewp,prec
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**METADATA**

- **datetime** = Date and time at end of sampling period (YYYY-MM-DDThh:mm)
- **jd** = Julian day (DDD)
- **airt** = Air temperature. Average of 1-second measurements. (celsius)
- **rh** = Relative humidity. Average of 1-second measurements. (percent)
- **dewp** = Dew point. Average of 1-second values calculated from air temperature and relative humidity. (celsius)
- **prec** = Precipitation. Includes water equivalent of snow. Total value for 15-minute period. Measured in increments of 0.01 inch. (millimeter)

**Metadata** provide the information needed to locate, access, and correctly interpret a dataset.
Schoolyard LTER Database

Back End
Database on HF Server
(MySQL)

Front End
Web page in your browser
(Firefox, etc)

Programs

Data (PHP)

Graphs (R)

Welcome to the Harvard Forest Schoolyard LTER Data and to view current lists of schools, teachers, and new data. HF Schoolyard Staff can review current data and:

- Instructions
- Download Data
- Graph Data
- Schools
- Teachers
- Tree Species
- Submit Data
- Review Data
- Find Duplicates
Field Site Coordinates

Latitude  = 42° 31’ 55” N
Longitude = 72° 11’ 24” W

1 degree  = 60 minutes
1 minute  = 60 seconds

Latitude  = 42 + 31/60 + 55/3600
Longitude = 72 + 11/60 + 24/3600

Latitude  = 42.53194 degrees
Longitude = -72.19000 degrees
Data Entry

RECOMMENDATIONS

• If you have more than one email address, pick one address to use as your login

• Check your data in the online form and again in Review Submissions

• Read the Instructions section

Fall Phenology / JRB-buds-001 / Bennett

Review Submissions

To add a new observation complete this form and press Submit. If a data value is missing, please leave the text box empty or select ‘Missing Value’ from the pull-down list.

*NOTE* Please enter data for each tree (not each branch). A worksheet is available to help you calculate tree values from branch values.

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Missing Values

PROBLEMS

- Different software packages handle missing values differently
- Never use zero! Zero could be a measured value (0 degrees or 0 leaves fallen) or a code (0 = dead)

SCHOOLYARD DATABASE

- When entering data, leave text box empty or select “Missing Data” from pull-down list
- When data are downloaded, missing values are represented by NA

source: sendaiben.org
Calculating Growing Season

**Teacher Resources / Data Analysis**

Colburn, E. 2014. Calculating Growing Season Active Worksheet

**Schoolyard LTER Database / Download Data**

Length of growing season by tree
Calculating Carbon Biomass

**Schoolyard LTER Database**

Tree Biomass Equations
11-Nov-2013

Units: biomass = kilograms,dbh = centimeters
Biomass (metric tons) = biomass (kilograms)/1000
Carbon biomass = 0.5 * biomass
Default = red maple if biomass equation not available

### Acer pensylvanicum (ST)
Biomass = \((7.227 + 1.647 * \log(\text{dbh})/2.54))/1000

### Acer rubrum (RM)
Biomass = 0.126/2(\text{dbh}^2+3.804)

### Acer saccharum (SM)
Biomass = 0.1006/2(\text{dbh}^2+5.793)

### Betula allegheniensis (PB)
Biomass = 0.1936/2(\text{dbh}^2+4.315)

### Betula lenta (BB)
Biomass = 0.0632/2(\text{dbh}^2+2.660)

### Betula papyrifera (WB)
Biomass = 0.0632/2(\text{dbh}^2+2.6287)

### Betula populifolia (BB)
Biomass = 0.1854/2(\text{dbh}^2+3.314)

### Betula sp. (BB)
Biomass = 0.0629/2(\text{dbh}^2+2.6606)

### Castanea dentata (CH)
Biomass = 2.304/2(\text{dbh}^2+2.464/4+0.555/5+2.426/4+0.542/5)

### Fagus grandifolia (BE)
Biomass = 0.1916/2(\text{dbh}^2+2.916)

### Fraxinus Americana (WA)
Biomass = 7.1148/2(\text{dbh}^2+3.207/2/4+0.542/5)

### Nyssa sylvatica (BG)
Biomass = 10(1.4468+1.4806/4+0.542/5)/2

### Pinus resinosa (RP)
Biomass = 1.0309/2(\text{dbh}^2+2.386)

### Picea rubens (RS)
Biomass = 10(2.1735+2.936/5+0.542/5)/1000

### Picea spp. (BS, NS, WS)
Biomass = 10(2.1735+2.936/5+0.542/5)/1000

### Pinus strobus (WP)
Biomass = 0.0690/2(\text{dbh}^2+2.449)

### Populus grandidentata (LA)
Biomass = 0.0780/2(\text{dbh}^2+2.498)

### Populus tremuloides (TA)
Biomass = 0.0975/2(\text{dbh}^2+2.609)

### Populus sp. (CW)
Biomass = 0.0780/2(\text{dbh}^2+2.498)

### Prunus pensylvanica (PC)
Biomass = 0.1556/2(\text{dbh}^2+2.194)

### Prunus serotina (BC)
Biomass = 0.0706/2(\text{dbh}^2+2.6174)

### Quercus alba (WO)
Biomass = 0.075/2(\text{dbh}^2+2.6887)

### Quercus rubra (RO)
Biomass = 0.1318/2(\text{dbh}^2+2.457)

### Tsuga Canadensis (TS)
Biomass = 0.0993/2(\text{dbh}^2+2.3617)

---

**Schoolyard LTER Database / Download Data**

Carbon biomass by tree

---

**Changing Forests / Resources / Tree Biomass Equations**
## Summary Data by Site

### Schoolyard LTER Database / Download Data

**Length of growing season by site**

![Excel spreadsheet showing data on length of growing season by site](image1)

**Carbon biomass by site**

![Excel spreadsheet showing data on carbon biomass by site](image2)
Detailed Data from a Single Site

**Athol-Royalston Middle School**

- **Graph 1:** Percent of leaves fallen over time from 16-Sept-2009 to 11-Nov-2009.
- **Graph 2:** Percent of leaves fallen over time from 16-Sept-2009 to 11-Nov-2009.

**Drumlin Farm Mass Audubon**

- **Graph 1:** Water temperature over time from 03-Jan to 03-Nov.
- **Graph 2:** Water temperature over time from 03-Jan to 03-Nov.

**Gardner High School**

- **Graph 1:** Cutworm biomass (g/m²) for years 2005-2009.
- **Graph 2:** Cutworm biomass (g/m²) for years 2005-2009.
Summary Data from One or More Sites
Data Visualization

Graphs from Colburn, Orwig & Boose
Level 1 Session

Activities

1. Data entry
2. Online graphing tool
3. Graphing exercises

Wireless Network

Choose the Harvard University WiFi network
Go to http://getonline.harvard.edu
Select "I am a guest" button
Select "Log in with guest credentials" button
Enter username hfweb@fas.harvard.edu
Password: Forest1
Accept the terms of use