Metadata

Dataset Title:

Cary_Forest_Plots_1993_1999_FORSTAD_Canopy_Census.csv

Cary Institute of Ecosystem Studies, Cary Forest Plot Data, Canopy Census Data from Forest Response to Stress and Damage (FORSTAD) Project

Abstract

This dataset is a contribution to the Cary Institute of Ecosystem Studies. The Cary Forest Plots were established in 1984 as part of The Cary Vegetation Study, which described the vegetation of the then Cary Arboretum. The project established 76 permanent plots referred to as the "Cary Forest Plots". Data collection in the plots was extensive and included a survey of mature trees, saplings, seedlings, shrubs and herbaceous species as well as soil analyses, tree ring data and physical descriptions of each plot. Subsequent re-surveys of the plots were done in 20 of the 76 original plots as part of the Forest Response to Stress and Damage (FORSTAD) project, which took place over approximately 10 years in the 1990's. These surveys included an annual canopy census of trees. Canopy census data were also collected in other plots studied in the FORSTAD project, including Nutrient Cycling Plots A & B and in the control plots in the Yellow, Teahouse grid and the Red, Henry Grid. Another resurvey of 43 of the Cary Forest Plots was done in 2006 by Dan Katz as part of his Research Experience for Undergraduates (REU) project and his senior thesis project at Bard College. His surveys included mature trees, saplings, seedlings, shrubs and herbaceous species as well as soil analyses. This repository includes canopy census data from 20 of the Cary Forest Plots from the 1993-1999 FORSTAD project.

Publications:

GLITZENSTEIN, J. S., C. D. CANHAM, M. J. MCDONNELL, AND D. R. STRENG. 1990. Effects of environment and land-use history on upland forests of the Cary Arboretum, Hudson Valley, New York. Bull. Torrey Bot. Club 117: 106–122.

Katz, D.S.W., Lovett, G.M., Canham, C.D., & O'Reilly, C.M. 2010. Legacies of land use history diminish over 22 years in a forest in southeastern New York. Bull. Torrey Bot. Soc. 137: 236–251.

Data provided in this dataset include canopy census data collected in 1993, 1994, 1995, 1996, 1997, 1998 and 1999.

Those wishing to publish data from Cary Institute of Ecosystem Studies, Cary Forest Plots are encouraged to contact the data manager at datamanagement@caryinstitute.org.

Investigators

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Keywords

Cary Institute, Cary Institute of Ecosystem Studies, data, hardwood forest, tree inventory, land-use history, vegetation survey

Timeframe

1993-1999

Geographic location

The Cary Institute of Ecosystem Studies is located in Millbrook, NY USA.

Methods

Annual Canopy Census Protocol

(Adapted from VCCPR.93, .94)

Background:

In 1993 it was decided that FORSTAD should undertake an annual census of tagged canopy trees on the two mammal trapping grids and twenty forest plots. The census has two purposes: 1) to produce an annual estimate of reproductive effort and phenology and 2) to produce a visual estimate of defoliation for trees on the gypsy moth sampling grids each year. The annual canopy census will accomplish both purposes as well as providing long-term data on the health and mortality of individual trees at the FORSTAD field sites. The seed trap data (see Seed Rain Protocol) currently provide a measure of reproduction for only a small subset of canopy trees; a widespread canopy census will give us a count of the number of trees producing large numbers of seeds each year, providing a better understanding of the spatial extent of masting behavior on the Arboretum property.

The census was undertaken for the first time in 1993, accompanied by on-going procedural modifications. The reproductive category was particularly problematic: initially we scored the tree as "Y" if at least one reproductive structure (in this case, an acorn, hickory nut, or pine cone) was present on the tree. In 1994, binoculars were used. The canopy of the tree is scanned briefly, examining several different branches. A tree was scored as "N" if it had few to no reproductive structures and "Y" if it (albeit subjectively) had more than a few. In a seed year, heavy-laden individuals stand out even without binoculars, and it is hoped that reproductive status will provide a "quick and dirty" means of determining which individual trees are

reproducing.

In 1999, the categories of Disease and Dieback were complicated by the detection of woolly adelgid on the property and a severe drought. (See Notes 1 and 2.)

Censusing:

The census should occur each year in early August. Visit each tagged tree on the two grids (Red and Yellow), the twenty forest plots, and the two nutrient cycling sites. Do a quick visual survey of the following characteristics: status, dieback, defoliation, damage, disease/pests, and reproduction. Detailed descriptions of these characteristics and their scoring categories follow. Take a hard copy of the category descriptions into the field, along with data sheets (Use the working disk to make data sheets with the appropriate columns, making sure to print out tree number, species, and DBH). Surveyed locations of trees are recorded in VMD[plot].93 files or in hardcopy in an archived binder called "FORSTAD MAPPING DATA."

As new pests and diseases, like the hemlock woolly adelgid arrive on the Arboretum property, the disease categories may require some modification. The Canopy Census folder contains some notes on HWA biology and the scoring categories utilized by the US Park Service; perhaps these could be modified for use here at the Arboretum.

QPRO data sheets (with proofed data) for 1993 are saved as VCC- files (VCC[plot].[year]) on the SyQuest removable drive. Hard copies of the data are assembled in a FORSTAD binder.

Thus far, new data has been added to the 1993 spreadsheet as six new columns corresponding to each tagged tree (VCC[plot].93). Nutrient Cycling Sites were mapped in 1993 and censused for the first time in 1994, thus 1995 - 1996 data are recorded in VCC0A.94 and VCC0B.94 files.

NOTES:

In 1997 the DBH of all trees was measured again. (These were added to the data sheets in a new column labeled “97 DBH”) The trees should continue to be re-measured every five years. Measure DBH 10 cm below the tree tag, as tags were nailed to the trees 10 cm above the level where DBH is measured to serve as a reference point.

Updated: K. Eisenhart 2/95

Updated: K. Eisenhart 1/97

Updated: J. Masina 12/97

Updated: J. Hart adelgid info added 10/99

Canopy Census Category Descriptions (1/96 KSE)

Revised 10/99 J. Hart – adelgid info added

STATUS:

L = Live

D = Dead (no live tissues above ground)

On the raw data sheets DS (dead standing) and DF (dead fallen) were used to aid in finding the tree in following years)

CONDITION: Record condition only if status is Live.

DIEBACK:

Y = Yes (At least one recently dead branch that reaches to the top of the crown. Branch(es) should have fine twigs attached and no green leaves; dead branches at the bottom of the crown are probably self-pruning and do NOT qualify as dieback.)

N = No

DEFOLIATION: (Glance at canopy defoliation mock-ups in Protocols folder before going out in the field. Mock-ups mimic the appearance of defoliation levels in the middle of each category.)

0 - 10% N = None

11 - 50% L = Low

51 - 90% M = Medium

91 - 100% C = Complete

DAMAGE:

Y = Yes (Look for live, main branches broken in the past year. Wood should be light-colored with jagged edges. Search surrounding ground for fallen branches.)

N = No

DISEASES and PESTS: (Add others as they occur in the future.)

A = Wooly Adelgid. Adelgids are cold weather insects and are most visible when they are active from October through May. Thus, it is necessary to re survey the hemlocks that are part of the canopy census in November, when the chances are better that the egg sacs can be visualized. Watch for white cottony egg sacs along the underside of young hemlock twigs. Add a second code for browning of needles:

0 - 10% N = no brown needles

11 - 50% L = low numbers of brown needles

51 - 90% M = over half of tree canopy is brown

91 - 100% C = foliage is completely brown

For example, if white egg sacs are present but tree looks healthy and green, appropriate code is "A/N." If white egg sacs are present and over half the canopy needles are brown, appropriate code is "A/M."

B = Beech Bark Disease. Key characters on the bark of the tree include cankers and white flecking secreted by the microscopic scale insect that allows the fungus Nectria to enter the bark.

N = No (no evidence of two diseases listed above.)

REPRODUCTION:

Y = Yes (Use binoculars to briefly scan ends of crown branches (30 sec or less). If seeds are observed in abundance or if there are seeds on several different branches, the score is Yes. In late July/early August seeds should be apparent on Acer saccharum, Quercus species (hugely visible for the Q rubra and Q velutina; Q alba and Q prinus have less seeds per branch), Carya species, Fagus grandifolia, Castanea dentatum. Fruit will have already fallen from Acer rubrum, Amelanchier, and Sassafras.

In the past this category has proven difficult. Having had the benefit of a bountiful mast year followed by a no-seed year, I can say that if a tree is reproductive, it will be apparent. If you have difficulty determining if there are seeds, the score is probably No.

N = No (Few or no flowers and/or developing seeds.)

NOTES:

1. The hemlock woolly adelgid was found on IES property for the first time in the spring of 1999. Two isolated trees on the Henry Farm Experimental grid were found to be infested. The trees were injected with insecticide in an effort to control the outbreak. However, as we familiarized ourselves with the appearance and life cycle of the adelgid, we found several other outbreaks on the property, leading us to conclude that the adelgid had in fact been present but previously undetected. During the canopy census of 1999, we detected adelgid on several Cary Plots.

2. The summer of 1999 was one of the worst droughts on record. With little snow over the winter and virtually no rainfall until the middle of August, the trees were showing signs of drought stress (including early senescence) when we surveyed them in early August. This made the category of Dieback particularly difficult to judge. In order to score the category as accurately as possible, our strategy became "take a lot of notes". We noted the approximate percentage of leaves that were brown or senesced. These trees can be checked in the future to monitor how the drought stress affected each tree. Did early senescence make a tree more or less likely to survive to the next year? What are the differences between Yellow Grid (with many trees showing signs of drought stress) and Red Grid (with very little in the way of obvious signs of stress)?

Data Table

Column name	Description	Unit or code explanation or date format	Empty value code
Plot_Number	Plot number, associated with grid square number within which plot was located		
Year	Year of census		blank
Species	Tree species		blank
Tag_Number	Tag number on tree		blank
Tree_dbh	Diameter at breast height	Centimeters	blank
Sta	Status of tree, L=live, D=dead		blank
Db	Condition: Dieback, Y=Yes, N=No		blank
Df	Condition: Defoliation, 0 - 10% N = None 11 - 50% L = Low 51 - 90% M = Medium 91 - 100% C = Complete		blank
Dm	Condition: Damage, Y=Yes, N=No		blank
Ds	Condition: Diseases & Pests, Y=Yes, N=No		blank
Rp	Reproductive Status, Y=flowers or developing seeds present in significant numbers, N=flowers or		blank

	developing seeds few or not present		

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