Forest Plotter

INSTRUCTIONS

version 2.0

TABLE OF CONTENTS

Introduction

Since 1998, the Smithsonian Institution Conservation & Research Center (CRC) has worked closely with the Commonwealth of Virginia's Department of Education (VDOE) in the development and implementation of an innovative science education program, the CRC Forest Biodiversity Monitoring Project, that utilizes CRC scientists, staff and training techniques as an educational resource for Virginia schools.

The Forest Biodiversity Monitoring Project is designed to provide Virginia teachers with the skills and tools needed to teach the scientific principles of biodiversity monitoring using a local forest, woods or parkland as a living ecosystem laboratory. The curriculum has been correlated to the Virginia Standards of Learning (SOLs), particularly in math and science, and covers ecology, identifying and classifying species, assessing change in forests over time, understanding the impact of human disturbances

Teachers are are given kits with everything needed to plot a forest, and trained on gathering consistent data

and understanding how technology, including satellite remote sensing and Geographic Information System (GIS), contribute to the study of our ever-changing planet.

During training workshops, teachers are trained to work with their students to establish permanent biodiversity study plots of one hectare in size (100 meters by 100 meters square). CRC staff have assisted schools in surveying biodiversity study plots in a variety of settings--on forested land on school property, in nearby parks and natural areas, and on privately owned land. Plots have been established in both rural and urban settings.

What is Forest Plotter?

The Smithsonian Institution's Conservation & Research Center has developed this computer application, which allows schools to manage data obtained from a Forest Biodiversity Monitoring Plot. Data on trees within a one-hectare plot is entered using x/y coordinates, and includes species and size of each tree. Once the data is entered plot maps can then be generated, and statistics about the plot are calculated. Forest Plotter helps demonstrate to students important lessons in biodiversity, while providing valuable research.

Getting Started

NEW FOREST PLOT
If you have already gathered your data from your forest plot, you will need to start entering it into Forest Plotter. When opening a *New* plot, Forest Plotter will take you directly to the Edit page where you can start entering data from your student handouts (*fig 1*). To make the files transferable over the internet they are saved as simple text files. Although not necessary, please name the file with a .TXT extension.

OPEN EXISTING PLOT
More and more files will be posted on the internet on the CRC's Educational Resource web site (www.si.edu/crc/ep/forest/forest3.htm). *Open* the "Example" file supplied with Forest Plotter to display a sample plot.
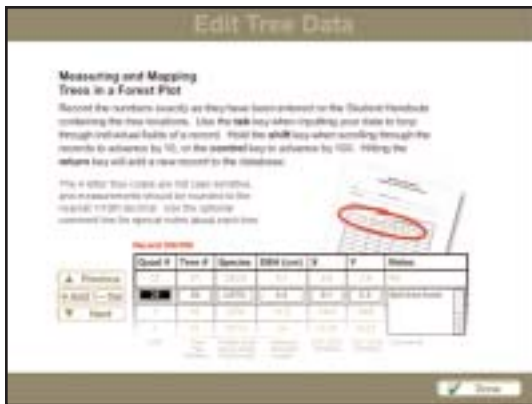
Editing Plot

ENTERING DATABASE
Entering data is pretty straight forward. Seven fields necessary for each tree's data are displayed (*fig 2*). Use the *<tab>* key to move from field to field when entering the data. Make sure you follow the parameters listed below the fields as Forest Plotter will not accept incorrect data. Use the <return/enter> key to add another record to the database.

HOW TO QUICKLY NAVIGATE A DATABASE
By holding the *<shift>* key down you can jump 10 records each time you click on the *Next* or *Previous* button, while the *<control>* key causes the plotter to jump 100 records at a time. In a plot with 1000 records or more you can quickly click your way to any record in the database.

Record 356/356

|		Quad #	Tree #	Species	DBH (cm)	X	Y	Notes
		25	37	CECA	5.1	8.6	2.9	AS
+Add	−Del	25	38	CATO	4.4	8.1	5.3	Split tree trunk
▲ Previous		1	18	LITU	11.2	13.3	14.9	
▼ Next		1	20	QUVE	20	16.59	18.02	
		1-25	Tree Tag Number	4 letter code (leave blank if unknown)	diameter at breast height	0.0 - 20.0 (meters)	0.0 - 20.0 (meters)	Comments

Forest Plotter

Viewing Plot

FULL PLOT

Forest Plotter will begin to place all of the trees on the screen one by one. The drawing process can be interrupted by either hitting the <*space bar*> or by clicking anywhere on the page. Slower computers may take a few more seconds to completely draw the map. Click *Refresh* to redraw the plot.
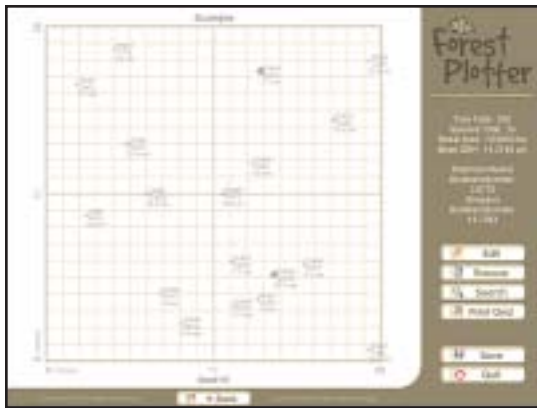
QUAD PLOT

If you'd like to zoom in and study an individual quad within the full plot, simply click on the quad you'd like to study. Forest Plotter will draw that quad and calculate its statistics.

Click on individual trees to list more detailed information about the tree at the bottom of the screen. This is handy if two or more trees overlap their stats. Click *Back* and return to the full area plot.

Browsing Data

TREE LISTINGS

Tree codes and colors are generated using the first two letters of the *genus* name, plus the first two letters of the *species* name. In the rare event that the both start with the same two letters, use a number as the last character in your tree code. Use the *Sort* to alphabetize the listings by Code or Common, *Toggle Code List* to switch between Code and Common without sorting, and *Change Palette* to browse through various listings. (Updated palettes will be made available for download on the CRC's Educational Resource web site.)

TREE TABLE

Whenever a new plot is loaded, or an addition has been made to the current plot, it is reloaded into a table at the bottom of the screen. Large plots will take a longer time to rebuild.

NOTE: If you have a slow computer and want to cancel loading the table, simply hit the <space bar> *before it finishes; the plotter will list only those records that were loaded before it was interupted. To rebuild a table, go to the previous screen and hold the* <shift> *key down while clicking the* Browse *button.*

Searching Plot

SEARCH BY TREE CODES
Choose a species of tree to view and enter its 4-letter tree code. The data on the plotter page will be refigured to that species.

SEARCH BY DBH
You may quantify your DBH (diameter at breast height) search by entering values into the greater, less than, or equal to fields. You may like to view only the older, larger trees in the plot, or simply search for a tree that may be of a certain size.

SEARCH BY QUADRATS
The tiny quadrat map (top left, *fig 3*) was designed to be a quick way of plotting a smaller section of the forest plot data. Use the tiny quadrat grid on the left to focus your search. Hold the mouse button down to paint several search grids on/off at the same time.

MULTIPLE SEARCHES
You can mix your searches by using multiple queries. The example in *fig 3* shows a search in 16 different quadrats for White Oaks (Quercus alba) with diameters larger than 5 cm but smaller than 60 cm.
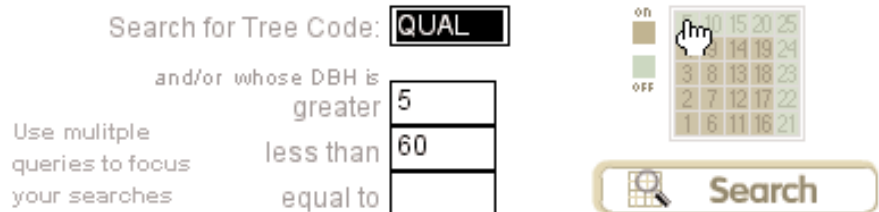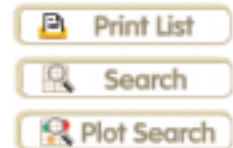

figure 3

PLOT SEARCH
Forest Plotter will display the matching queries before asking if you'd like to plot the results. Click *Plot Search* to plot the results of your search, or *Search* again to modify your search. If you decide you would rather return to the plotter without plotting your query, simply click *Done* and return to the previous plot unchanged.

When you click *Plot Search,* the Forest Plotter will begin to draw the results of your search. You can then zoom in on them as you would on the full plot--click on each tree to list its stats below the plot.

Print Lists and Plots

PRINT GRID
The entire grid, or an individual quadrat, may be printed by clicking *Print Grid*. Since the Forest Plotter uses a screen shot for printing, whatever appears on-screen is what will print, so be careful to let the plotter finish drawing before trying to print.

PRINT LIST
You may also print a list of the database by choosing *Print List*, but be aware that if you interrupt the database before it has completed building its table you will get a truncated list. Unfortunately, <tabs> will not print.

PREVIEW LIST
By holding the <shift> key down when selecting *Print List*, you may view the list on-screen. Clicking on the preview will return you to the plotter.

What Do the Numbers Mean?

TREE AND SPECIES TOTAL
The Tree Total is displayed above the Species Total. The higher the Species Total is in comparison to the Tree Total the greater the indication that a plot has a more diverse cross-section.

BASAL AREA
Basal Area is a term describing the measurable area of the trees diameter at breast height, (usually measured at the root or rootstock). This area is measured in hectare (ha=10,000 square meters.)

MEAN DBH (Diameter at Breast Height)
Measured in centimeters using the data gathered from the forest plot.

These numbers can be recalculated according to search status of the plot.

SHANNON-WEINER BIODIVERSITY INDEX

$$H' = -\left[\Sum (p_i)(\ln p_i)\right]$$

The Shannon-Weiner Index is a quantitative way to measure the biodiversity of a plot. **H'** represents the symbol for the amount of diversity in an ecosystem. **H'** will be the greatest if the species are all equally abundant. **p**$_i$ represents the proportion, or relative abundance, of each individual species to the total (measured from 0 to 1). The **ln p**$_i$ represents the natural logarithm of **p**$_i$.

SIMPSON BIODIVERSITY INDEX

$$H' = 1 / \Sum (p_i^2)$$

Other methods for calculating a biodiversity index exist, like the Simpson Biodiversity Index, which may be simpler to use than the Shannon-Weiner Biodiversity Index. These other indices sometimes yield different results because each index places different degrees of importance on factors such as species richness or relative abundance.

RELATIVE ABUNDANCE

Displayed only when doing a *Search Plot* for a certain species. Used by ecologists to describe the number of individuals of a species relative to the total number of individuals of all species found in a plot.

Participating Plots

WHERE TO FIND PLOTS

The CRC staff have assisted many schools in surveying biodiversity study plots in a variety of settings--on forested land on school property, in nearby parks and natural areas, and on privately owned land. Plots have been established in both rural and urban settings. Detailed reports about the plots are also gathered.

Visit the CRC Educational Resource web site (www.si.edu/crc/ep/main.htm). Follow the Forest Biodiversity link, and click on School Sites; you will be taken to a long list of participating schools, as well as the CRC. Click the PLOT icon (pictured above) to download the files. Place the downloaded text file within the same folder as the Forest Plotter, and proceed to open it with the application.