

RESEARCH PROPOSAL:

The Vegetation of the Cary Arboretum

SUMMARY

The proposed research has 4 principal objectives:

(1): To quantify the variation in composition and structure of forest, field and wetland plant communities within the Cary Arboretum, including an ordination of the forest communities to identify major plant community types.

(2) To examine the relationships between the vegetation of the Cary Arboretum and environmental and historical factors.

(3) To provide an extensive data-base of information on the vegetation of the Cary Arboretum, keyed to the standard grid system.

(4) To provide a network of sample sites that can be combined with existing vegetation maps to provide an updated vegetation map based on the results of the analyses described in (1) and (2) above.

Our approach is to identify the major contiguous areas of forests, fields, and wetlands within the Arboretum. In contrast to traditional vegetation sampling schemes, we will not choose sample sites on the basis of preconceived criteria of composition and structure. Our objective is to provide a representative sample of the existing vegetation through a method of stand selection that stratifies the placement of sample plots by grid squares, with the actual location of the plots at random distances along transects midway between grid lines. This will allow us to use the results of the study to make quantitative estimates of the frequency and area of occurrence of different community types and plant species within the Cary Arboretum. Our major focus will be the forests and unmanaged fields within the property. The permanent wetlands are of very local occurrence, and will be sampled individually.

The sampling scheme for forest stands is described in a memo attached to this proposal. We anticipate that 2 field assistants will spend 8 weeks sampling approximately 80 forest plots. The size of each plot is deliberately small (400 m²: 1/25 of a hectare) because of the apparent heterogeneity of site conditions within the Arboretum. At this intensity of sampling, there is one plot for every 3 adjacent grid squares that are entirely within the contiguous forest areas of the Arboretum. The remaining weeks of the summer field season will be devoted to fields and wetlands (in that order of priority).

SAMPLING PROCEDURE

Trees:

The DBH and crown class of all stems > 10 cm DBH (1. m above the ground) in the ~~400~~⁵⁴⁰⁰ m² plot will be recorded by species. Four crown classes will be recognized:

C = Canopy: trees with $> 25\%$ of crown cross-sectional area exposed to the sky.

SC = Subcanopy: trees with $< 25\%$ of crown area exposed to the sky.

U = Understory: trees whose crowns are entirely overtopped by adjacent canopy and subcanopy trees.

D = Standing Dead: for standing dead trees.

Saplings:

Sapling density will be recorded in two of the four quadrants of the main circular plot. The two quadrants will be randomly chosen. The numbers of all tree stems > 1 m height but < 10 cm DBH will be recorded by 2 cm size classes for each species. The size classes are:

1 = 0-2 cm DBH

3 = 2-4 cm DBH

5 = 4-6 cm DBH

7 = 6-8 cm DBH

9 = 8-10 cm DBH

The presence of all species of saplings within the entire 400 m² plot will also be recorded.

Shrubs:

Shrub abundance will be estimated from a line intercept sampling scheme. Shrub cover will be recorded along a ~~20~~^{25.23} m length *the entire* of the main transect (~~10~~ m to each side of the center of the plot). The presence of all shrub species within the 400 m² plot will also be recorded. CDC
3/5/85
after confirmation
by C.W.

Seedlings and Herbaceous Species:

The density of tree seedlings and the cover of herbaceous species will be recorded in 8 - 1 m x 0.5 m rectangular quadrats located at random distances along the 22.56 m transect running through the plot. The cover of exposed rocks, bare soil, mosses, lichens and fallen logs will also be recorded in each quadrat. A species list of all vascular plants present in the 400 m² plot will also be compiled.

Topographic Variables:

The following topographic variables will be recorded for each stand:

Slope

Aspect

Slope position : in one of the following classes: ridge top, crest of slope, mid slope, foot of slope, local depression.

Approximate elevation : from topographic maps.

Soil Sampling:

At 4 randomly chosen distances along the central transect, 10 cm deep soil cores (starting from the top of the mineral soil) will be collected using an Oakfield tube sampler and combined in a single sample bag for a composite sample. The depth of the litter layer (L,F and H horizons combined) will also be recorded at each of the 4 locations.

Stand Structure:

For each plot, record:

Maximum Canopy Height: using the clinometer and tape measure to record the height of the tallest tree on the plot.

Crown Closure: as the number of grid intersections of the camera field that are exposed to the sky. The camera should be positioned vertically at the center of the plot.

Stand History:

We will attempt to estimate the age of the forest stand and the history of disturbance at the site through a series of types of observations. The presence or absence of mound and pit microtopography will be recorded. The largest tree in the stand will be cored. If the tree has a hollow core, the next largest tree should also be cored (repeating this procedure as necessary to get a complete core). All cores should be saved. If a core misses the center of the tree by more than approximately 1 cm, the tree should be cored again. The presence of stone walls within the stand should be recorded. Evidence of selective logging or other recent disturbance to the canopy should also be recorded.