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be the thickest. It is hypothesized that the 5 lakes in Croatan National Forest were actually formed by deep burning of the peat during severe drought (WELLS and BOYCE 1953).

Although soils with surface horizons of peat less than 40 cm thick are not classified as histosols they form an important part of the peatland landscape. For example, Wasda soils have histic epipedons which are not thick enough (less than 40 cm) to be called histosols. Most of the soil south of forest route 128 is spodosol with highly organic surface layers (Murville series) which make it ecologically part of the bog system.

The soils of Carteret County were last mapped in 1935 (PERKINS et al. 1938), long before the current soil taxonomy was formulated. A new county soil survey is currently in progress but is not yet available. However, the Forest Service has completed a reconnaissance soil survey of Croatan National Forest and the soil map (Fig. 4) was compiled from the photomaps produced in that survey. The mapping units are somewhat more broadly defined than those of a standard county soil survey but they provide sufficient resolution for soil-vegetation correlations. Table 1 gives the taxonomic classification of the soil series included in the mapping units, and Table 2 differentiates the series in a brief outline. A brief description of each of the mapping units is given in SNYDER (1978).

2. Methods

2.1. *Vegetation*

2.1.1. *Sampling*

The object of study within the circumscribed research area is the "natural vegetation". This excludes agricultural and residential areas and as defined here also excludes pine plantations in which evidence of site manipulations such as bedding is visible. Disturbed areas such as logging roads and plowed fire lines where the soil had been bared were not studied, but sites which had been prescription burned were included. Much of the *Pinus palustris* land has been cut in the last few years, but if there was evidence of regeneration and the ground cover appeared undisturbed it was considered natural vegetation.

The canopy of *P. palustris* forests is naturally somewhat open so that removal of trees does not cause a major change in the understory environment. The *P. palustris* sites also appear to be more resistant to disturbance in the sense that weedy species do not invade, probably because the sandy soils are not as easily altered by traffic as more loamy or organic soils. This does not hold however for the deep sands in the Kureb series.

The method used for sampling the vegetation was essentially the BRAUN-BLANQUET method as described by MUELLER-DOMBOIS and ELLENBERG (1974, see PITILLO 1979, in Vol. 1 of the 16th IPE report). The location of the relevés was partly by random selection of points and partly by subjective placement to include accessible sites and to represent the range of variation. A standard size relevé of 20 x 10 m was done at each point to permit direct comparison of species diversity. An area of 200 m^2 was more than adequate to sample all the vegetation types with the possible exception of the bottomland forest; even here there were rarely more than one or two additional species found outside the quadrat.

At each relevé a complete list of species present, the approximate heights of the various strata, and the importance of each species by stratum were recorded. Species importance was estimated by the use of a slightly modified BRAUN-BLANQUET cover-abundance scale as follows:

5	> 75 % cover	1	1-5 % cover
4	50-75 %	+	< 1 %
3	25-50 %	R	one individual of < 1 % cover
2	5-25 %		

Notes on the water table and evidence of past fires were recorded at each relevé. The depth of the water table was determined if it was less than 30 cm since that was the length of the soil auger used. Soil samples were collected and observations recorded at each relevé as described in the soil methods section. Other pertinent notes on such matters as the presence of stumps or additional species present outside of the plot were also recorded. In the rare cases in which there was appreciable slope, its degree and aspect were recorded.

2.1.2. *Synthesis of Phytosociological Tables*

The traditional method of table arrangement is normally done by hand which means that it is rather time-consuming. In addition to being rather slow, there is constantly present the opportunity for copying errors as the tables are rearranged. There are available a number of computerized table methods which perform much of the tedious work formerly done by hand (LIETH and MOORE 1971, and several others mentioned in WESTHOFF and VAN DER MAAREL 1973). These computer methods can perform rearrangements quickly without errors in copying but in all cases require a subjective assessment and final touching up by the investigator.

In this study the computer program PHYTO (LIETH and MOORE 1971) was used to do the basic table work. The program provides for printout of a raw table and a presence or frequency table. The upper and lower frequency limits for delimiting species to be used in the clustering procedure are variable input parameters, and the rearranging is performed by a clustering algorithm. The program allows a final table to be printed in which the order of species and relevés is specified by the user. This permits the user to make improvements on the final differentiated table.

2.2. *Soils*

2.2.1. *Sampling*

Surface soil samples were collected at each relevé to permit making correlations between certain soil parameters and vegetation. The soil samples were composite samples of the upper 20 cm of the soil profile, excluding the litter layer. In general a subsample was collected one meter inside each corner of the relevé using either a soil auger or a machete, depending on soil texture and moisture content. The subsamples were pooled and transported in a plastic bag for later laboratory analysis. In some cases in very wet soils where there was difficulty in extracting samples only 2 subsamples were taken.

At each relevé a brief description of the soil color, texture, and consistency to a depth of 30 cm was recorded.

In addition to the sampling at each relevé a few more complete soil profiles were described within the research area. It was planned to do profiles in soils representative of each of the vegetation types but not all were done. These profiles were done from soil pits in the case of the drier areas or from cores extracted with an 8 cm bucket auger in wetter areas. The color of the fresh soils was determined with a Munsell color chart and then samples of each horizon were collected in plastic bags for further analysis.

2.2.2. *Analysis*

Soils were generally close to field capacity or higher in moisture content when brought in from the field. Inasmuch as the literature suggests that drying and rewetting significantly affects pH values, especially in organic soils (FARNHAM and FINNEY 1965), the soil pH was measured before drying in a 1:2 (soil to distilled water by volume) slurry equilibrated for 30 minutes. The soils were then dried at 50 - 70^{o}C and stored up to 3 months before further analysis.

The soils were crushed and sieved through a U.S. standard sieve no. 12 (mesh size 1.68 mm) before being sent to the Soil Testing Division of the North Carolina Department of Agriculture. Three of the surface soil samples and the profile samples were not sieved before being sent to the state lab and there they received the standard treatment of crushing and separation through a 2 mm screen. This difference in mesh size is insignificant since none of the soil samples contained any particles larger than 1.68 mm in diameter other than coarse pieces of plant material.

All further analysis was performed on dried and sieved material by the Soil Testing Division. The volume weight was determined on an unpacked sample and pH was measured in a 1:1 (water) slurry with an equilibration time of one hour. The amount of readily oxidizable organic matter was measured by a modification of the WALKLEY-BLACK wet combustion method. The buffer acidity was determined by a barium-triethanolamine method at pH 6.6.

Inorganic nutrients were analyzed by extracting 5 cm^3 of soil with 25 ml of a solution of 0.5N HCl and 0.025N H_2SO_4. Calcium, magnesium, and manganese were measured by atomic absorption spectrophotometry, potassium by flame photometry, and phosphorus by a colorimetric method utilizing molybdate and ascorbic acid. Detailed methods are described in SOIL TESTING DIVISION (1972).

With these methods only a crude approximation of the cation exchange capacity and percentage base saturation of the soils can be calculated. The cation exchange capacity is found by summing the buffer acidity and the extractable quantities of the basic cations calcium, magnesium, and potassium. The percentage base saturation is calculated by dividing the sum of the basic cations by the cation exchange capacity and multiplying by 100. This approximation differs from a more suitable method such as the normal ammonium acetate saturation method conducted at soil pH. The acidity was determined at pH 6.6 which is well above soil pH and therefore tends to overestimate exchangeable acidity (BUOL et al. 1973). Also, the weak acid extraction procedure for the cations does not yield values particularly close to those found exchangeable by ammonium acetate extraction (cf. DOLMAN and BUOL 1967). However, this approximation can at least give an idea of the relative base status and exchange capabilities of the various soils.

3. Results and Discussion

3.1. *Vegetation*

3.1.1. *Phytosociology*

The data from 91 relevés (54 randomly and 37 subjectively chosen) was run through the PHYTO program to produce the preliminary species-relevé clusters. A number of clusters were evident, and the relevés of each cluster were then run separately to determine if there were subclusters or atypical relevés. It became evident through this analysis that some of the relevés did not meet the requirement of homogeneity. Almost all of these were randomly chosen relevés which were noted as being heterogeneous in the field. A total of 12 relevés were heterogeneous in habitat factors and species composition, and they were not included in further tables.
The 79 relevés that remained after removal of heterogeneous plots fell into five fairly distinct groups when ordered by the clustering algorithm. A few changes were made by hand when consideration of all the species found in a relevé (rather than only those considered by the algorithm) in my judgement made it more appropriate in another group. Only the 12 relevés which were initially excluded were not included in the final grouping. In no case were any relevés removed from the tables because they did not "fit" in any group.

The five clusters produced on the large table represent unranked vegetation units, or plant community-types. These community-types are here referred to