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Plant Observations in Validation Studies

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1. Initial Inventory

The initial observations should reflect the state of the plant population of the area, at a particular point in time, as completely as possible.

For each distinguishable vegetation type in each plot, the data for this point in time should include for each species the population density by age or size classes, and the characteristics of its distribution if non-random. For each species and age or size class, the distribution of biomass between main organ types, and between horizontal strata, will be needed, and the content of energy and main chemical constituents in each of these categories.

a. Woody Plants

For the larger woody species, it is suggested that three sampling levels be used to obtain this information. In the first place, high-level aerial photography (checked by ground observations) can be used to distinguish and delimit vegetation types within the validation study area; then lower-level photography would permit one to count the number of individuals in a part of each vegetation type, and to measure (individually) their projective cover (and height, if stereo-pairs are used). The coordinates of individuals would be recorded so that their spatial relationships could be analysed.

A small number of the plants measured on the low-level photographs, but outside the validation study area, would be destructively sampled. The plants would be excavated with care, aerial organs (including standing dead material) and roots would be divided by horizontal strata, each portion would be weighed, and a subsample of each used for dry-weight determination, calorimetry, and chemical analysis. Part of each subsample would be retained for unforeseen needs.

If organ weights as measured by destructive sampling are more closely related to some measurements which may be made non-destructively on the ground than to the measurements from aerial photographs, the overall estimates may be improved by performing these measurements both on the plants used for weight determinations, and for a fairly large subsample of those within the validation plots for which aerial survey data are available. This may be especially true where the plant habit differs as between different vegetation types.

b. Perennials

For perennials not distinguishable on aerial photographs (including seedlings of larger species) the basic records within the validation plots will be quadrat samples within each vegetation type, on which nondestructive measurements would be made on each individual or clump. These samples within the validation plots would be associated with similar quadrat samples in the same vegetation types outside them, in which the same non-destructive measurements would be followed by destructive sampling to give biomass of the various organs (and standing dead material), species by species. Both non-destructive and destructive

quadrat sampling should as far as possible be performed individual by individual (or clump by clump). If the relationship between destructive and non-destructive measurements varies with plant (or clump) size, this will permit increased precision in the overall estimates. In placing the quadrats the possibility of microhabitat differentiation within the vegetation type should be borne in mind.

c. Annuals

If the initial inventory occurs at a period of quiescence, annual plants will be present only as seeds and as dead material. Soil samples should be retained for seed analysis, and samples of litter lying on the soil surface should be separated into seeds, and the other main types of plant organ for dry-weight determination. Standing dead material of annual plants should be harvested on the quadrats used for perennial plant studies.

2. Validation Records

These will consist of observations and measurements selected (with respect to type and time) as sensitive indicators of changes within the ecosystem, and hance of the relative value of alternative models. The selection of these variables for recording will be guided by the results of computer simulation, and the suggestions in following paragraphs will be subject to modification as these results come to hand.

Changes over a period can often be measured more precisely than the absolute values themselves--by such devices as permanent quadrats, labelled branches, etc.--and they would serve validation purposes equally well (though estimates of absolute values are essential in the initial inventory). This possibility should be borne in mind.

a. Woody Plants and Other Perennials

Observations of total biomass are unlikely to provide a sensitive measure, though they may be worth repeating once a year for record purposes. Measurements of foliage biomass at a phenologically determined moment--for instance, when leaf expansion of a deciduous species is complete--would be more promising. The number of flowers formed, and the number of seeds set would also be informative. Dates of phenological events should be recorded, and may be of value in themselves.

b. Annuals

Seedling density at successive stages in the germination process, date of maximum flowering, biomass at this stage, and quantity of seed production suggest themselves as suitable measures. These measurements should be made in specific microhabitats.