

INTERNAL REPORT 18

NUTRIENT CYCLING IN 450-YEAR-OLD STANDS
OF DOUGLAS-FIR

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Drs. Dyrness and Franklin have established a series of over twenty plant communities on the H. J. Andrews Experimental Forest. They range from the "Pseudotsuga menziesii (Mirb) Franco-Holodiscus discolor" community, found on relatively warm, dry sites, to a "Abies-Tiarella" community growing on cool, moist areas. These communities were used as guides to locate the plots for the nutrient cycling study over a range of environments found on the experimental forest.

Six 1/2-acre plots have been serviced since September, 1970. Each plot has eight randomly located litter traps, each 1/4,000 acre in area. Four 20-inch rain gauges have been rotated among 20 random locations on each plot.

Stem and crown maps of each plot, which show the locations of all overstory and understory trees greater than 8 inches in dbh, have been prepared. In addition, vertical photographs, taken at the center of each litter trap and each rain-gauge location, form the basis for a density index for each collection device.

Original plans called for canopy drip collections at least twice a month and litterfall collections after every major storm. The extremely heavy snow cover on the plots from January through April, however, caused substantial modification of the collection schedule, especially of litter on the lower elevation areas, and both litter and canopy drip on the higher plots.

Twelve canopy drip collections have been analyzed for total nitrogen, nitrate, ammonia, ortho and total phosphate, potassium, calcium, and magnesium. Generally, the greatest concentration of the nutrients was found in the fall and early winter collections, with substantial reductions of all ion concentration in water collected in January, February, and March. No free ammonia and no more than seven parts per billion of nitrate were found in the canopy drip, although total nitrogen concentrations as high as 55 parts per billion were observed. Although the plots at the higher elevations generally experienced more rainfall than the remainder, a preliminary analysis indicates that the canopy drip for any rain-gauge point is more closely connected (negatively) with the density of the overstory immediately above than with plant community or elevation. No statistical analyses have been run thus far to establish the correlation between total quantities of nutrients in the canopy drip and either the density index or the plant community.

The litter collections have been dried to constant weight at 70°C and separated into the following classes: needles, twigs, branches, bark, reproductive organs, angiospermous material, and epiphytes (lichens, mosses). The weights of each of these classes

have been recorded for each trap and each collection period. Many of these collections have been ground for mineral analyses, but no such determinations have yet been made.

Not surprisingly, the heaviest litterfall occurred during the fall months. Further, the weights recorded for the individual traps appear to be more correlated with that trap's density index than with plant community or elevation.

The following modifications in the study are planned for 1971-72:

- (1) three additional plots, all in communities in the middle of the range established by Dyrness and Franklin, will be established;
- (2) elevated rain gauges will be installed in the two high-elevation plots to permit canopy drip measurements during periods of heavy snow pack; and
- (3) reservoirs will be installed under half the litter traps located on the higher plots and under two traps on each of the remaining plots. Analysis of the water collected in these devices will provide a measure of the material leached from litter during weather which prevents litter collection.

Data collected in this study are obviously closely related to investigations of the rate of litter decomposition, nutrient content of the soil, and biomass of the aerial parts of plant communities. Further, the data are certainly pertinent to those studies that will estimate the flux of nutrients entering and leaving the ecosystem.