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## BIOMASS REGRESSION RELATIONS FOR THE EL VERDE RAIN FOREST IN PUERTO RICO

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At the request of the Puerto Rico Nuclear Center (PRNC), a visit to the El Verde rain forest provided advice on the continuing PRNC study of secondary succession following massive gamma irradiation which killed part of this forest.[26] Also ORNL computer programs were used to calculate appropriate regression parameters relating tree diameter and/or height to the mass of several tree parts in order to compute the forest biomass. Early steps included the conversion of fresh weights to dry weights on the basis of sampling that was initiated by J. D. Ovington in November 1963 and completed by the PRNC staff during several months following. Preliminary regression analyses then were made for the few individual species and genera for which sufficient numbers of trees were available for individual regressions.

Table 11.6. Regression of Mass on Diameter for Several Tree Components of the El Verde Rain Forest, Puerto Rico

| Component | Species Group[a,b] | | | |
|---|---|---|---|---|
| | C | | D | |
| | $e^A$ | $B$ | $e^A$ | $B$ |
| Leaves | 45.925 | 1.400 | 21.867 | 1.930 |
| Branches | 47.656 | 1.629 | 15.518 | 2.493 |
| Bole | 194.416 | 1.816 | 95.297 | 2.416 |
| Branch plus bole | 254.68 | 1.831 | 115.123 | 2.413 |
| Large and butt roots | 52.300 | 2.095 | 22.646 | 2.578 |
| All roots (estd) | 65.170 | 1.950 | 27.113 | 2.512 |

[a]Group C includes miscellaneous species: *Alchorneopsis portoricensis, Cecropia peltata, Calycogonium squamulosum, Drypetes glauca, Didymopanax morototoni, Eugenia stahlii, Hirtella rugosa, Myrcia spendens, Ocotea portoricensis, Psychotria berteriana,* and *Tetramogastris balsamifera.*

[b]Group D includes major species in two subgroups – namely, A: *Dacryodes excelsa, Palicourea riparia, Cordia borinquensis, Cordia sulcata, Cyrilla recemiflora, Ocotea leucoxylon, Micropholis garciniaefolia, Ocotea spathulata,* and *Tabebuia heterophylla* (or *pallida*); and B: *Ormosia krugii, Inga vera, Inga laurina, Miconia tetrandra, Miconia prasina, Matayba domingensis, Buchenayia capitata, Casearia arborea, Casearia sylvestris, Sloanea berteriana,* and *Manilkara bidentata* (or *nitida*).

For many species there were only one to three individuals represented, but fortunately these appeared to fit the same mass-diameter-height relations as were found for the more thoroughly sampled groups. Diameter was generally a much better predictor for mass than was tree height. Simple, usable bases for predicting mass of major components could therefore be made on the basis of diameter alone for certain broad species groups shown in Table 11.6. These linear regressions were made using the formula

$$\ln(\text{mass}) = A - B \ln(\text{diameter at 137 cm height}), \quad (1)$$

which is equivalent to the power expression

$$m = e^A d^B, \quad (2)$$

where $d$ is diameter (cm) and $m$ is mass (g).

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## FOLIAR APPLICATION OF $^{137}$Cs ON UNDERSTORY SPECIES OF MESIC FOREST

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Earlier studies on a 20- by 25-m plot of *Liriodendron* forest used $^{137}$Cs injected in trunks of canopy trees at the rate of 936 $\mu$c per square meter of plot area to trace the movement of this nuclide in the forest ecosystem.[27] Results indicated that a small portion (<0.5%) was absorbed by understory species from rainout during the first growing season, while major portions of the isotope remained in the woody parts of the injected trees or moved into litter, fine roots, and soil.[28] The present study was planned to clarify the relative absorption of the rainout fraction by foliage of understory species and to check previous estimates of movement to litter and soil through understory species which may have been obscured by the much larger activities remaining in other parts of

[26]H. T. Odum, ed., *The Rain Forest Project Annual Report FY-65*, PRNC-61 (Mar. 1, 1965).

[27]J. S. Olson, *Health Phys.* 11(12), 1385–92 (1965).

[28]H. D. Waller and J. S. Olson, *Ecology* 48(1), 15–25 (1967).

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the system. On June 27, 1966, the same isotope was applied as a foliar spray at the rate of 35 $\mu c/m^2$ to vegetation up to 1 m high on a plot 2 by 5 m about 10 m from the original plot. The isotope was diluted in 10 liters of tap water and applied with a garden sprinkling can to simulate a rainout effect equivalent to about 0.04 in. of rain through the canopy.

Figure 11.9 shows 18% retention of the isotope on foliage after 2 hr and 9, 8, and 7% after two, four, and six weeks; the major part of the applied solution dripped onto the litter layer. Approximately 22 cm of rain during the test period accounted for most of the reduction in isotope in the foliage as well as for transfer through the litter to the top 5 cm of soil (3% of application) by the end of the sixth week. Less than 5% was absorbed and translocated to stem and roots. Differences between species are probably related to leaf surface structure, mass/area ratio, and leaf orientation.

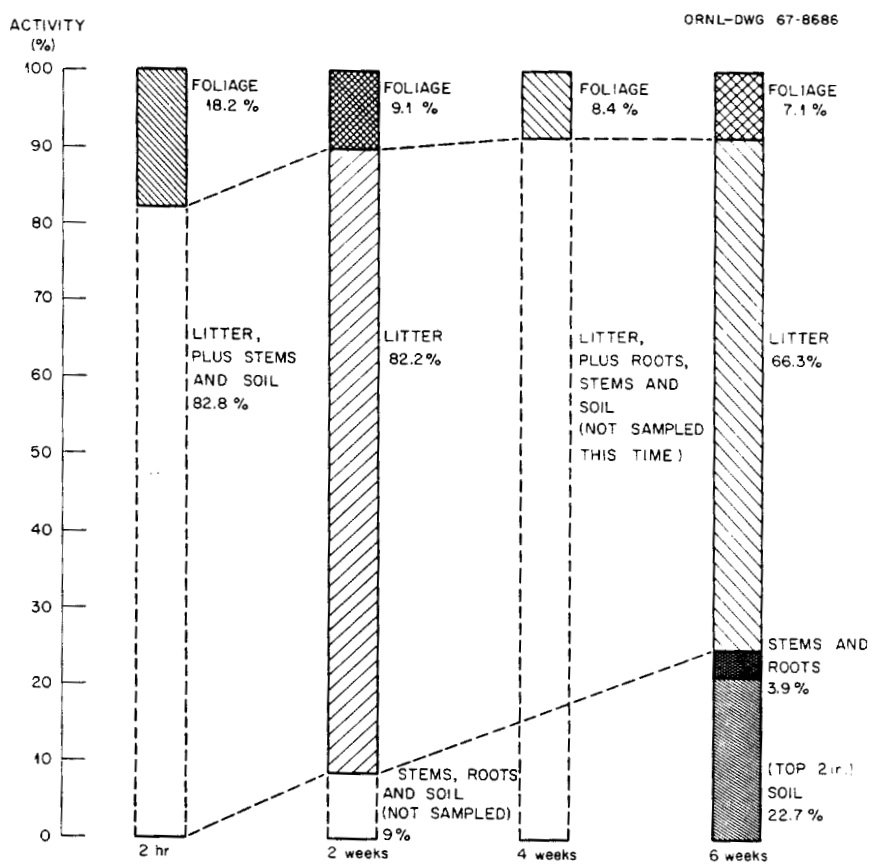


**Fig. 11.9. Distribution of $^{137}Cs$ After Foliage Application.**

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