A NON-DESTRUCTIVE METHOD FOR QUANTIFYING SMALL-DIAMETER WOODY BIOMASS IN SOUTHERN PINE FORESTS

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Poster Summary

Quantifying the impact of silvicultural treatments on woody understory vegetation largely has been accomplished by destructive sampling or through estimates of frequency and coverage. In studies where repeated measures of understory biomass across large areas are needed, destructive sampling and percent cover estimates are not satisfactory. For example, estimates of change in net primary productivity on fixed plots and carbon and nutrient losses from fire both would be difficult to obtain using either visual coverage estimates or destructive sampling.

We developed a set of equations to estimate the biomass and nutrient content of woody understory species with main stems < 5-cm in diameter at breast height in southern pine stands. We destructively sampled 75 understory trees and shrubs from 5 pine stands in Louisiana and Mississippi and measured the height of the tallest stem to the nearest 15 cm, counted the number of stems in a rootstock, and noted the species and growth form (tree or shrub). We oven-dried and weighed the plants, then analyzed them for carbon, nitrogen, phosphorus, potassium, calcium, and magnesium. We used multiple linear regression with total height and number of stems in a rootstock as continuous regressors and plant growth type (shrub or tree) as a categorical regressor.

The study results surprised us; this simple regression was quite effective in predicting dry biomass and nutrient content (table 1). Although total height alone was a useful predictor (fig. 1), the number of stems also was a significant regressor for dry biomass and nutrient content. Plant growth form was not significantly related to either dry biomass or nutrient content. Further, because oven-dry weight was predicted very well by field-wet weight, we will not need to oven-dry new samples. We plan to expand our database by incorporating site fertility, stand age, and management regime to examine how these factors interact to control biomass and nutrient content of understory vegetation in Coastal Plain pine forests.

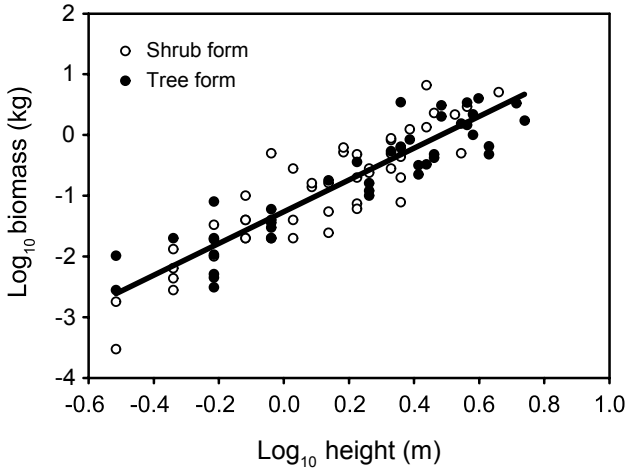

Figure 1. Biomass of understory vegetation in Gulf Coastal Plain pine forests relative to the total height of individual understory plants.

Table 1—Model parameters and goodness-of-fit for estimating understory vegetation biomass and nutrient content in Gulf Coastal Plain pine stands

	Model parameters			
Model[a]	B0	B1	B2	R2
Dry biomass[b] = B0+B1*height+B2*stems	-1.357	2.518	0.969	0.87
N content = B0+B1*height+B2*stems	-3.506	2.183	0.979	0.85
P content = B0+B1*height+B2*stems	-4.822	2.273	0.889	0.86
K content = B0+B1*height+B2*stems	-3.867	2.218	1.007	0.86
Ca content = B0+B1*height+B2*stems	-3.699	2.329	0.885	0.81
Mg content = B0+B1*height+B2*stems	-4.253	2.329	0.911	0.84
Dry biomass = B1*field-wet biomass	NA	0.526	NA	0.98

N = nitrogen; P = phosphorus; K = potassium; Ca = calcium; Mg = magnesium.
[a] All regressors and response variables were log10 transformed except for the wet and dry biomass model (model 7).
[b] Dry biomass = oven-dried aboveground biomass in kg; height = total height of tallest stem in m; nutrient content = N, P, K, Ca, or Mg content of aboveground plant biomass in kg.

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