

Modeling the relationship between below ground and above ground biomass of Black cohosh

Gabrielle Ness

University of Kentucky, USA

Non-Timber Forest Products (NTFP's) are harvested extensively from Appalachian forests, but the effects of wild harvest on native plant populations is rarely considered and only loosely regulated. Forest management has historically focused on timber products; consequently, impacts on NTFP's have not been extensively studied or modelled. In 2005, two long-term study sites were established near Reddish Knob and Mount Rogers, VA, to study the sustainability of current black cohosh (*Actaea racemosa*) harvesting practices. Roots and rhizomes of this native Appalachian medicinal herb are used to treat menopausal symptoms, with nearly all commercial harvest derived from wild populations. In permanent plots, measurements of above- and below-ground plant biomass were recorded and the largest plants removed in 0%, 33%, and 66% experimental harvests, to simulate current practices. The objective of this analysis was to model the relationship between above- and below-ground measures to provide forest managers with a practical tool to predict yield. A linear mixed effects model was used to account for different levels of variation from the nested experimental design and provide proper estimates of uncertainty. We found that log root mass increases on average by 0.76 (0.66, 0.86) and 0.46 (0.24, 0.68) g for each unit change in log maximum crown area (m²) and plant height (cm), respectively. Variance components indicated that variations between plots within or across the two sites were much smaller than variations between plants within a single plot. Three new study sites in VA were used to validate this model and determine its predictive ability.

gabrielle.ness@uky.edu