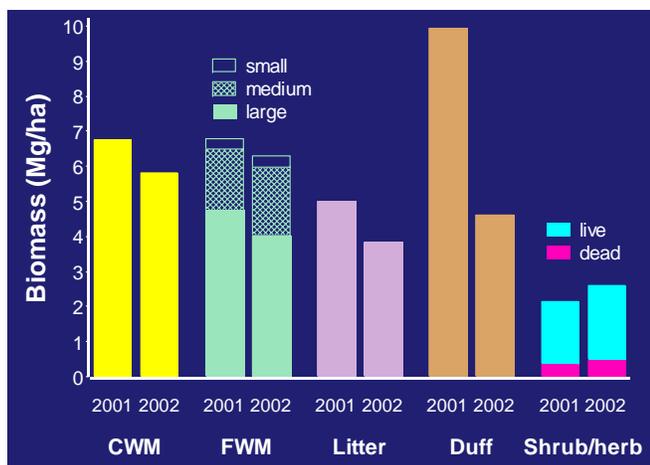


TITLE: Duff and Litter Estimation for Eastern U.S.**LOCATION:** Entire eastern U.S.**DURATION:** 1 year of 1-year project **FUNDING SOURCE:** Fire Plan**PROJECT LEADER:** David C. Chojnacky, Forest Inventory Research Enterprise Unit, USDA Forest Service, Washington, DC
703-605-5262, dchojnacky@fs.fed.us**COOPERATORS:** Michael C. Amacher, Rocky Mountain Research Station, Logan, UT; Robert A. Mickler, Mantech Environmental Technology, Inc. (Southern Research Station), Raleigh, NC; Linda S. Heath, Northeastern Research Station, Durham, NH**PROJECT OBJECTIVES:** (1) Develop bulk density (specific gravity) auxiliary parameters for the eastern U.S. from Forest Inventory and Analysis (FIA) phase 3 (P3) soils data. (2) Use these parameters to estimate duff and litter fuel loading from P3 down woody material data to combine with phase 2 (P2) plot data to produce county-level duff and litter estimates for the eastern U.S.**JUSTIFICATION:** FIA collects duff and litter depth measurements on P3 plots but there is no bulk density information available for eastern forest conditions to calculate biomass from these P3 measurements. Presently, bulk density information from western forests (Chojnacky and others [in press]) is being used. In order to best use P3 down woody data for fire risk and fuel loading assessment, accurate and scientifically credible estimators are needed.**DESCRIPTION:**

a. Background: To better manage and monitor forests for down woody materials (DWM), available and easily accessible data on DWM components are needed. To meet this need, we are working on development of linkage between P3 DWM data and the entire database of P2 plots (Chojnacky 2001; Chojnacky and Woodall 2002; Chojnacky and Heath 2002; Chojnacky and others 2003a, 2003b; Chojnacky and Schuler [in preparation]) for coarse woody material (CWM), fine woody material (FWM), litter, duff, and shrub/herb cover. For compilation of duff and litter biomass we have had to use bulk density estimates from western forests. However, bulk density data for eastern forests are available from the soils component of the FHM monitoring program. We propose to obtain and summarize P3 soils data to develop needed auxiliary parameters to estimate DWM for the eastern U.S. We will also use the soil duff and litter data to examine excessively large duff estimates from 2001 data.



b. Methods: We are currently using Brown's (1974) transect methodology for calculating litter and duff from depth measurements and a single material density parameter:

$$\text{Litter or Duff} = f D \rho$$

where

Litter = recognizable plant material on forest floor (Mg/ha)

Duff = unrecognizable plant material below litter and above mineral soil (Mg/ha)

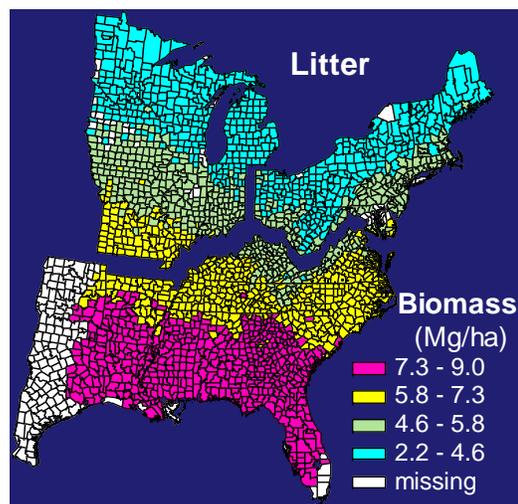
$$f = \text{units conversion factor} : \left(\frac{43560}{(2.2046)(0.404686)(1000)} \right) = 48.82473$$

D = material depth (ft)

ρ = material density (lbs/ft³); for litter = 0.9, for duff = 2.0 (source : Woodall 2002, pers. comm.)

From analysis of P3 soils data and forest stand data of associated P2 plots, we will test for significant number of density parameters (ρ) needed for the different forest and geographic conditions in the eastern U.S.

c. Products: Results of this work will be combined with another on-going study to link P3 to P2 data for producing county-scale maps on down woody materials. In the on-going study, regression models are being developed from P3 and P2-plot data, to estimate duff and litter for each P2 plot. The example map on the right is from 2001 litter data and regression equation based on number of live trees per P2 plots and auxiliary climate data.



d. Schedule of Activities:

Obtain P3 soils data and associated P2-plot data for eastern U.S.	Jan 2004
Summarize/analyze duff and litter P3-data for forest and geographic differences	Apr 2004
Model duff and litter estimates for extension to P2 data	June 2004
Produce duff and litter maps	Sept 2004

e. Progress/Accomplishments: Not applicable.

f. References:

- Brown, J.K. 1974. Handbook for inventorying downed woody material. GTR INT-16. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT, 34 pp.
- Chojnacky, D.C. 2001. Down deadwood (DDW) estimated at regional scale from temperature, disturbance and stand size. Presented at: Ecological Society of America 86th Annual Meeting. Madison, WI, August 2001.
- Chojnacky, D.C.; Woodall, C.W. 2002. Down woody material and fire fuels: calculations and assumptions. Presented at: Symposium on Statistics and Information Technology in Forestry (IUFRO: S 4.11 Statistical Methods, Mathematics and Computers), Blacksburg, VA, September 2002.

- Chojnacky, D.C.; Heath, L.S. 2002. Estimating down deadwood from forest attributes in Maine. *Environmental Pollution* 116(1): S25–S30.
- Chojnacky, D.C.; Mickler, R.A.; Heath, L.S. 2003a. Carbon in down woody materials of eastern U.S. forests. In: Second Annual Conference on Carbon Sequestration. 2003 May 5–8; Alexandria, VA; Online: <http://www.carbonsq.com/proceedings.htm> 8 p.
- Chojnacky, D.C.; Mickler, R.A.; Heath, L.S. 2003b. Biomass in down woody materials of eastern U.S. forests. Presented at: 88th Ecological Society of American annual meeting. Savannah, GA, August 2003.
- Chojnacky, D.C.; Mickler, R.A.; Heath, L.S.; Woodall, C.W. [*In press: submitted to Environmental Management*] Estimates of down woody materials in eastern U. S. forests. Presented at: The USDA Symposium on Natural Resource Management to Offset Greenhouse Gas Emissions, Raleigh, NC, November 2002.
- Chojnacky, D.C.; Schuler, T.M. [*In preparation: submitted to Southern Journal of Applied Forestry*] Amounts of down woody materials for mixed-oak forests in Kentucky, Virginia, Tennessee, and North Carolina.

COSTS:

	Item	Requested FHM EM Funding	Other- Source Funding*	Source
YEAR 2004				
Administration	Salary	19,000		
	Overhead	5,000		
	Travel	1,500		
Procurements	Contracting	3,000		
	Equipment			
	Supplies/Misc	1,000		
TOTAL		30,000		

* Although other source funding is not needed on this aspect of the study, the broader study objective of modeling DWM components for linking to P2 data is expected to be supported by \$40,000 to \$50,000 in FY04 from the Southern and Northeastern Research Stations.