



July 15, 2011

An Enhanced Online Piled Fuels Biomass and Emissions Calculator

Managers requested a comprehensive website including both machine-piled and hand-piled biomass calculators and the ability to estimate emissions in one convenient location. While this work was accomplished by Clint Wright and Paige Eagle under JFSP Project 10-S-02-2, the original machine pile work was from Colin Hardy. Some managers have expressed interest in use of this tool for commercial/industrial purposes (i.e. sales of woody debris for biomass energy utilization). The Joint Fire Science Program encourages all fire managers to download and use this new and convenient information. On the web at:

<http://www.fs.fed.us/pnw/fera/research/smoke/piles/index.shtml>

Project objectives

Add enhancements to the *Hand-piled Fuels Biomass Calculator* by:

- Incorporating the machine-pile algorithms available in CONSUME 3.0
- Including the ability to batch process pile data for biomass and emissions estimates
- Allowing operation of the *Calculator* while disconnected to the Internet

The screenshot shows a web browser window with the URL <http://depts.washington.edu/fwfire/piles/index.php?>. The page title is "Piled Fuels Biomass and Emissions Calculator".

Below the title, there is a message: "1. You have selected English units. [Reset (clear piles and start over)]".

The "Pile Group Data:" section contains a table with the following data:

Group No.	Group Name	No. Piles	Pile Type	Pile Shape	Pile Dimensions	Soil %	Packing Ratio	Pile Composition	Pile Quality	Percent Consumed	
1	Example 1	100	Machine	Half ellipsoid	W1: 6 H1: 6 L1: 12	5%	20%	Douglas-fir (75%); grand fir (25%)	Dirty	90%	[Remove]
2	Example 2	100	Hand	Half sphere	H1: 6	N/A	N/A	Conifer	N/A	90%	[Remove]

Buttons: "Add more piles", "Start over (clear all piles)"

The "Pile Group Results:" section contains a table with the following data:

Pile Group No.	Pile Group Name	Gross Volume (cubic ft)	Adjusted* Volume (cubic ft)	Pile Biomass (tons)	Consumed Fuel (tons)	Emissions by pollutant (tons)						
						PM	PM10	PM2.5	CO	CO2	CH4	NMHC
1	Example 1	22,619.47	4,297.70	67.5959	61.1603	0.8257	0.8116	0.5199	2.3233	101.7526	0.1714	0.1384
2	Example 2	46,238.93	30,991.13	\$2,8045	47.5240	0.5204	0.3683	0.3208	1.8053	79.0660	0.1332	0.1075
TOTAL		67,858.40	35,288.83	120.7504	108.6843	1.3461	0.9799	0.8406	4.1285	180.8186	0.3046	0.2460

Footnote: *Adjusted volume for hand piles is corrected to account for the difference between the gross volume of a geometric shape and the actual volume of the pile. Machine pile adjusted volume of solid wood is determined by subtracting the amount that is soil from the gross volume and applying the appropriate packing ratio.

Logos for FERA, UAS, and Pacific Wildland Fire Sciences Laboratory are visible at the bottom.

Future work

- Additional work is needed on characteristics of piles composed of material not covered in current algorithms (i.e. large logs)
- Research is needed to investigate the feasibility of using current pile characterization algorithms to estimate biomass for commercial/industrial piled forest debris removal and bio-energy operations.
- Research is needed on how different pile characteristics (size, age, composition) affect combustion rate and duration; soil structure and nutrition; and vegetation injury and response.

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