



The Piled Fuels Biomass and Emissions Calculator

Background

Land managers throughout the West pile and burn surface fuels to mitigate fire hazard in dry forests. An estimate of the weight of the piled debris to be burned is necessary to assess potential smoke emissions and air quality impacts associated with this practice. Research to characterize the biomass present in machine- (Hardy 1996) and hand-constructed (Wright et al. 2010) piles was incorporated into a calculation tool for use by fire, fuel, and air quality managers.

<http://www.fs.fed.us/pnw/fera>

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1. DATA ENTRY MODE: **MANUAL** [Clear all/start over] [Help]

2. MEASUREMENT SYSTEM: **ENGLISH**

3. Add Pile Group of Pile Type: Hand Machine

Describe this pile group:

Pile group name:

Number of piles:

Pile shape: Half sphere Paraboloid Half cylinder Half-frustum of cone Cone w/ rounded ends Half ellipsoid Irregular solid

Pile dimensions (ft):

W1: W2:

H1: H2:

L1: L2:

Estimated pile volume that is soil: %

Packing ratio:

1. 10%: Piles with species content dominated by long-needled pines and/or broadleaf deciduous litter. Mean diameters of large woody fuels < 10 inches.

2. 20%: Piles dominated by short-needled conifers. Mean diameters of large woody fuels < 10 inches.

3. 25%: Highly compacted, clean piles with large logs (diameters > 10 inches), especially those built with a crane or loader.

Pile composition:

Primary species (wood density in lb/ft³): Douglas-fir (33.55) %

Secondary species (wood density in lb/ft³): grand fir (25.86) % } percents must sum to 100%

Pile quality: Clean (0% soil) Dirty (>0 - 10% soil) Very dirty (>10% soil)

Consumption: % of piled material

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Fire and fuels managers now have the ability to characterize the volume, biomass, and potential emissions of both hand- and machine-constructed piles with a single application, the Piled Fuels Biomass and Emissions Calculator, or the *Pile Calculator*, for short. The *Pile Calculator* is a simple-to-use, web application that uses the formulas for different geometric shapes to estimate pile volume, and

empirically-derived relationships between volume and biomass to estimate pile weight for different piles types (machine vs. hand) composed of different material (different types of coniferous material for machine piles, and coniferous vs. hardwood/shrub material for hand piles). Users can accept the default fuel consumption estimate of 90 percent, or enter a different value if they are burning under conditions where more or less consumption is expected. Emissions (PM, PM₁₀, PM_{2.5}, CO, CO₂, CH₄, and non-methane hydrocarbons) are estimated by calculating the consumable tonnage and multiplying by a fire-averaged emission factor.



The *Pile Calculator* allows users to characterize the biomass, consumption, and emissions for a variety of piles or pile types simultaneously. Input data can be entered manually through the graphical user interface or in a batch mode by uploading a properly formatted text file. Data inputs and calculation results are available within the user interface and also in a downloadable format.

Management Implications

This project developed a tool to simplify the work processes of fire, fuel, and air quality managers tasked with managing fire hazard and air quality. The *Pile Calculator* is executed by using standard web browser software (e.g., Microsoft Internet Explorer, Mozilla Firefox, etc.) so no software installation is necessary, and users will always have the most up to date version for use at their disposal. Furthermore, since the *Pile Calculator* is executed within a standard web browser, it can be used on any device capable of running any commercially available browser software, such as a personal computer, netbook PC, or smart phone, for example. A stand-alone version is also available for users who require access where Internet access is unavailable.

Citations

Hardy, C.C. 1996. Guidelines for estimating volume, biomass, and smoke production for piled slash. Gen. Tech. Rep. PNW-GTR-364. U.S. Forest Service, Pacific Northwest Research Station. 21 p.
Wright, C.S., C.S. Balog and J.W. Kelly. 2010. Estimating volume, biomass, and potential emissions of hand-piled fuels. Gen. Tech. Rep. PNW-GTR-805. U.S. Forest Service, Pacific Northwest Research Station. 23 p.

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Visit the Pile Calculator Website at:

<http://depts.washington.edu/nwfire/piles/>

