

### Emissions from the Combustion of One Ton of Woody Biomass

Activity	Greenhouse Gases (metric tons CO <sub>2</sub> e / bdt)	Particulate (lbs primary PM / bdt)	Nitrogen Oxides (lbs NO <sub>x</sub> / bdt)	Carbon Monoxide (lbs CO / bdt)	Benefits	Drawbacks
On-site decomposition	1.29	0.0	0.0	0	mimics nature, some soil stabilization, nutrient retention, habitat, low work	no beneficial energy, land not cleared, wildfire potential
On-site burning (piled logging slash)	1.47	12.0	NA	74	reduces wildfire potential, low work, emissions in low population areas	no beneficial energy, containment concerns
Wildfire	1.47	16.9	4.0	140	not guaranteed	unpredictable, possibility of damage to people, property, wildlife, response expensive - capacity limited
Masonry fireplace	1.47	34.6	2.6	253	aesthetic, heats a room	emissions in residential areas, potential for net heat loss, labor and expenses
Uncertified woodstove	1.47	30.6	2.8	231	heat home, aesthetic	emissions in residential areas, labor and expenses
EPA woodstove	1.47	14.6	2.0	141	heat home, aesthetic	emissions in residential areas, labor and expenses
Industrial boiler (no controls)	1.47	6.2	3.4	9	heat for industrial processes or electricity	concentrate emissions - often near people

					generation	
Industrial boiler (moderate controls)	1.47	1.0	3.4	9	heat for industrial processes or electricity generation	concentrate emissions - often near people
Industrial boiler (advanced controls)	1.47	0.01	3.4	9	heat for industrial processes or electricity generation	concentrate emissions - often near people

All emissions based on combustion of one short ton bone dry woody biomass. Greenhouse gas emission factors from EPA's Greenhouse Gas Reporting Program (40 CFR Part 98 - <http://edocket.access.gpo.gov/2010/pdf/2010-16488.pdf>). Greenhouse gas emissions from on-site decomposition based on a decomposition rate 0.022 per year for Pacific Northwest Douglas fir ([http://www.eia.doe.gov/oiaf/1605/Forestryappendix\[1\].pdf](http://www.eia.doe.gov/oiaf/1605/Forestryappendix[1].pdf)). Other emission factors from Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors (<http://www.epa.gov/ttn/chief/ap42/>).

### **Transportation Emissions Associated with Combusting One Ton of Woody Biomass**

Activity	Greenhouse Gases (metric tons CO <sub>2</sub> e / bdt)	Particulate (lbs primary PM / bdt)	Nitrogen Oxides (lbs NO <sub>x</sub> / bdt)	Carbon Monoxide (lbs CO / bdt)
On-site decomposition	0.0	0.000	0.0	0.0
On-site burning (piled logging slash)	0.0	0.000	0.0	0.0
Wildfire	0.0	0.000	0.0	0.0
Masonry fireplace	0.06	0.001	0.3	4.1
Uncertified woodstove	0.06	0.001	0.3	4.1
EPA woodstove	0.06	0.001	0.3	4.1
Industrial boiler (no controls)	0.01	0.004	0.1	0.03
Industrial boiler (moderate controls)	0.01	0.004	0.1	0.03
Industrial boiler (advanced controls)	0.01	0.004	0.1	0.03

All emissions based on transportation needs for one short ton bone dry woody biomass. Assumptions of 50 miles by large diesel semi-trailer truck (11 bdt /truckload) at 5.4 mpg for industrial processes and 50 miles by gasoline truck for residential biomass (0.5 tons / truckload) at 14 mpg based on Air Quality and Climate Implications of Options for Woody Biomass draft calculator (ORCAA and SEI, 2010). Greenhouse gas emission factors from The Climate Registry's General Reporting Protocol (<http://www.theclimateregistry.org/resources/protocols/general-reporting-protocol/>). Other emission factors from 2008 EPA MOVES model (<http://www.epa.gov/otaq/models/moves/index.htm>).

**Alternative to Wood Equivalent to the Energy from One Ton of Woody Biomass**

<b>Activity</b>	<b>Greenhouse Gases (metric tons CO<sub>2</sub>e / bdt)</b>	<b>Particulate (lbs primary PM / bdt)</b>	<b>Nitrogen Oxides (lbs NO<sub>x</sub> / bdt)</b>	<b>Carbon Monoxide (lbs CO / bdt)</b>
Oil-fired residential furnace	1.14	0.04	1.9	0.5
Natural gas residential furnace	0.82	0.2	1.4	0.6
Industrial boiler – natural gas (no controls)	0.82	0.03	2.1	1.3
Industrial boiler – No 4 fuel oil (no controls)	1.15	0.7	5.0	0.5
Industrial boiler – coal (no controls)	1.45	6.2	7.4	0.3
Industrial boiler – coal (advanced controls)	1.45	0.05	1.5	0.3

All emissions based on the equivalent heat generation from the combustion of one short ton bone dry woody biomass. Greenhouse gas emission factors from EPA's Greenhouse Gas Reporting Program (40 CFR Part 98 - <http://edocket.access.gpo.gov/2010/pdf/2010-16488.pdf>). Other emission factors from Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors (<http://www.epa.gov/ttn/chief/ap42/>).