NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Site preparation, forest, INW

Reference Flow: 1 ha of Site preparation, forest, INW

Brief Description: Site preparation involves piling and/or burning of forest residues from harvest operations

Section I: Meta Data

Geographical Coverage: United States **Region:** INW

Year Data Best Represents: 1996

Process Type: Auxiliary Process (AP)

Process Scope: Gate-to-Gate Process (GG)

Allocation Applied: No

Completeness: Individual Relevant Flows Captured

Flows Aggregated in Data Set:

☑ Process ☐ Energy Use ☐ Energy P&D ☐ Material P&D

Relevant Output Flows Included in Data Set:

Releases to Air:	☐ Greenhouse Gases	☐ Criteria Air	☐ Other
Releases to Water:	☐ Inorganic	☐ Organic Emissions	☐ Other
Water Usage:	☐ Water Consumption	☐ Water Demand (throughput)	
Releases to Soil:	☐ Inorganic Releases	☐ Organic Releases	☐ Other

Adjustable Process Parameters:

Stem	*Kg of tree stem residue burned. Min and Max are +/- 20% based on professional judgement.*
Crown	*Kg of tree crown burned. Min and Max are +/- 20% based on professional judgement.*
Residue_decomp	*Kg of non-root residual material that decomposes rather than burning. Min*

and Max are +/- 20% based on professional judgement.

Tracked Input Flows:

RNA: Crew to Burn Bole Only slash in the Woods, INW [Products and Intermediates]	*[Technosphere] Pile landing slash after final harvest*
RNA: Piling, whole tree slash, at landing, gentle slope forest, INW [Products and Intermediates]	*[Technosphere] Pile landing slash after first commercial thin (state/private lands only) and final harvest*
RNA: Piling, bole slash, in forest, steep slope forest, INW [Products and Intermediates]	*[Technosphere] Pile slash after first commercial thin (state/private lands only) and final harvest*
Stemwood, broadcast burned [Valuable substances]	*[Technosphere] Burn stemwood in slash piles*
Crownwood, broadcast burned [Valuable substances]	*[Technosphere] Burn crowns in slash piles*
Residue, dry weight, decomposed, on forest floor [Waste]	*[Technosphere] Decomposition of residue on forest floor*

Tracked Output Flows:

RNA: Site preparation, state or private dry softwood forest, gentle slope, INW [Products and Intermediates]	*Reference flow*
RNA: Site preparation, state or private dry softwood forest, steep slope, INW [Products and Intermediates]	*Reference flow*
RNA: Site preparation, state or private moist cold softwood forest, gentle slope, INW [Products and Intermediates]	*Reference flow*
RNA: Site preparation, state or private moist cold softwood forest, steep slope, INW [Products and Intermediates]	*Reference flow*
RNA: Site preparation, national softwood forest,	

gentle slope, INW [Products and Intermediates]	*Reference flow*
RNA: Site preparation, national softwood forest, steep slope, INW [Products and Intermediates]	*Reference flow*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_O_Forest_Site_Prep_2013.01.xlsx*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

This unit process provides a summary of relevant input and output flows associated with the preparation of steep or gentle slope sites in a state/private or national forest. The preparation includes burning stemwood and crownwood piled as whole tree slash at the landing site, or the broadcast burning of residual material. The reference flow of this unit process is: 1 hectare (ha) of Site preparation, burning, national forest, steep slope, Inner Northwest (INW)

Boundary and Description

Commercial forest harvesting in the INW region of the United States takes place on a variety of state/private and federal lands. Residual materials from the stem and crown of trees are generated during commercial thinning operations and final harvests. The extra fuel required for crews is accounted for in **Table 2**. The type of harvesting operations and residual disposal methods depend on the slope of the land and if it is state/private or federal. The residual matter on state/private lands is piled and burned at a landing next to the road. On federal forestry lands the residual matter is also piled and burned at the road when gentle slope areas are harvested, but the residual is broadcast burned in steep slope areas.

When trees and their residual material are transported to a landing, half of the residual material remains on the forest floor. **Table 1** shows this and other variables that are used to calculate the amount and fate of residual materials. Residual material left on the forest floor will decompose, releasing most of the carbon back into the atmosphere. Residuals that are burned (either in a pile or broadcast) also release carbon into the air, but they also release other environmental emissions such as particulate matter and NO_X. These emissions are not quantified in this unit process. Instead, this process

calculates the amount of stemwood and crownwood slash that is burned or left on the ground to decompose as the result of harvesting one ha of land.

The data used in this process was assembled by the Consortium for Research on Renewable Industrial Materials (CORRIM). It should be considered a case study, and not necessarily representative of forestry operations in the Inner Northwest region as a whole. However, it is the most complete data available on roundwood harvesting in this region.

Figure 1: Unit Process Scope and Boundary

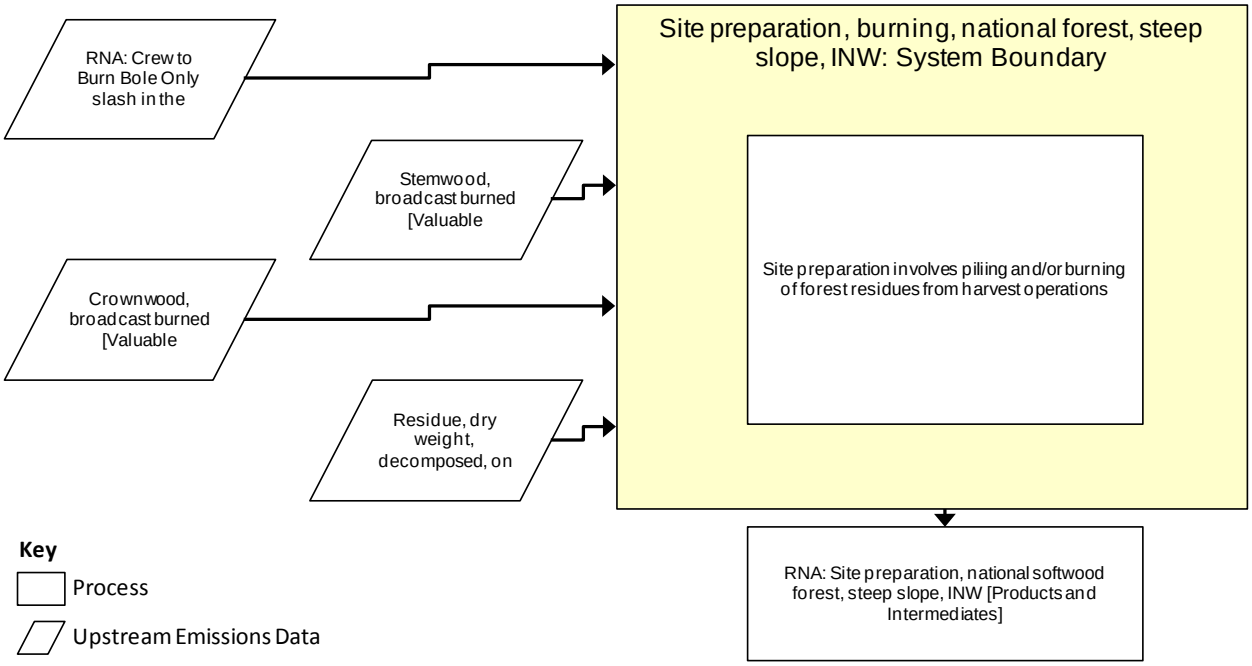

Table 1: Properties of INW Forests and Harvesting

Property	Value	Units
Dry Density of Residue	28	lb/cu. ft.
Non-merchantable to Landing	50%	
Wood Consumed in Pile Burning	90%	
Wood Consumed in Broadcast Burn	65%	
Stem and Bark	60%	
Root	18%	
Crown	22%	
State-Private Dry		
Total Harvest	3096	cu. ft./acre
Percent Ground Harvest	90%	
Percent Cable Harvest	10%	
State-Private Wet		
Total Harvest	3732	cu. ft./acre
Percent Ground Harvest	70%	
Percent Cable Harvest	30%	
National Forests		
Total Harvest	889	cu. ft./acre
Percent Ground Harvest	50%	
Percent Cable Harvest	50%	

Table 2: Unit Process Input and Output Flows

Flow Name	*State/Private Dry Gentle*	*State/Private Dry Steep*	*State/Private Wet Gentle*	*Unit*
Inputs				
RNA: Crew to Burn Bole Only slash in the Woods, INW [Products and Intermediates]	0.00	0.00	0.00	ha
RNA: Piling, whole tree slash, at landing, gentle slope forest, INW [Products and Intermediates]	2.00	0.00	2.00	ha
RNA: Piling, bole slash, in forest, steep slope forest, INW [Products and Intermediates]	0.00	2.00	0.00	ha
Stemwood, broadcast burned [Valuable substances]	6.23E+03	6.93E+02	5.84E+03	kg
Crownwood, broadcast burned [Valuable substances]	1.80E+04	2.00E+03	1.69E+04	kg
Residue, dry weight, decomposed, on forest floor [Waste]	2.96E+04	3.29E+03	2.78E+04	kg
Outputs				
RNA: Site preparation, state or private dry softwood forest, gentle slope, INW [Products and Intermediates]	1.00	0.00	0.00	ha
RNA: Site preparation, state or private dry softwood forest, steep slope, INW [Products and Intermediates]	0.00	1.00	0.00	ha
RNA: Site preparation, state or private moist cold softwood forest, gentle slope, INW [Products and Intermediates]	0.00	0.00	1.00	ha
Flow Name	*State/Private Wet Steep*	*National Forest Gentle*	*National Forest Steep*	
Inputs				
RNA: Crew to Burn Bole Only slash in the Woods, INW [Products and Intermediates]	0.00	0.00	1.00	ha
RNA: Piling, whole tree slash, at landing, gentle slope forest, INW [Products and Intermediates]	0.00	1.00	0.00	ha
RNA: Piling, bole slash, in forest, steep slope forest, INW [Products and Intermediates]	2.00	0.00	0.00	ha
Stemwood, broadcast burned [Valuable substances]	2.50E+03	1.41E+04	2.04E+04	kg
Crownwood, broadcast burned [Valuable substances]	7.23E+03	7.74E+03	1.12E+04	kg
Residue, dry weight, decomposed, on forest floor [Waste]	1.19E+04	2.67E+04	1.70E+04	kg
Outputs				
RNA: Site preparation, state or private dry softwood forest, gentle slope, INW [Products and Intermediates]	1.00	0.00	0.00	ha
RNA: Site preparation, state or private dry softwood forest, steep slope, INW [Products and Intermediates]	0.00	1.00	0.00	ha
RNA: Site preparation, state or private moist cold softwood forest, gentle slope, INW [Products and Intermediates]	0.00	0.00	1.00	ha

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows.

Embedded Unit Processes

None.

References

Oneil *et al.* 2010	Oneil, E. E., Johnson, L. R., Lippke, B. R., McCarter, J. B., McDill, M. E., & Roth, P. A. (2010). Life-Cycle Impacts of Inland Northwest and Northeast/North Central Forest Resources. *Wood and Fiber Science, 42*, 29-51.
Johnson *et al.* 2012	Johnson, L., Lippke, B., & Oneil, E. (2012). Modeling Biomass Collection and Woods Processing Life-Cycle Analysis. *Forest Products Journal*, 62(4), 258-272

Section III: Document Control Information

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