

Downed Woody Debris

FNR 353

April 10, 2017

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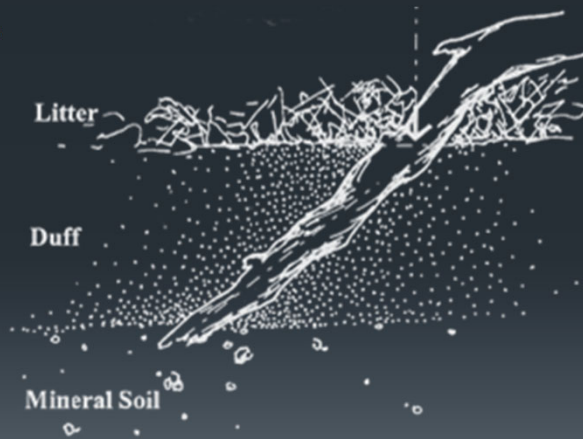
Important Why?

- Indication of
 - Fuel Loads and Fire Behavior
 - Carbon Storage
 - Nutrient Cycling
 - Wildlife Habitat and Resource

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Makeup of the Forest Floor

- Debris
- Litter
- Duff
- Soil



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Coarse and Fine Woody Debris

- CWD (Coarse)
 - Downed, dead trees/shrubs, large limbs, and detached woody pieces on ground
 - Includes dead trees or stumps leaning $> 45^\circ$ from vertical

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Coarse and Fine Woody Debris

- **CWD does not include**
 - **Pieces < 3" diameter or loose bits**
 - **Anything alive or not leaning > 45°**
 - **Anything below the root collar**

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Coarse and Fine Woody Debris

- **FWD (Fine)**
 - **Downed, dead branches, twigs, shrubs or trees**

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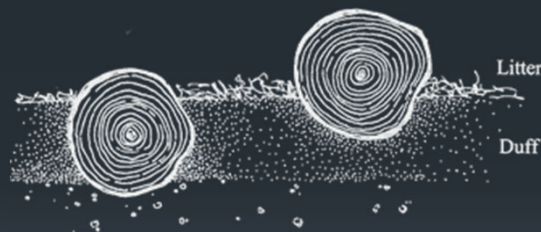
Coarse and Fine Woody Debris

- FWD does not include
 - Pieces $\geq 3''$ diameter or loose bits
 - Anything attached to live or dead material not leaning $> 45^\circ$
 - Foliage or needles
 - Decomposed woody chunks
 - Anything $\geq 6'$ from ground

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Position is Important

- Woody debris considered only if majority outside of duff

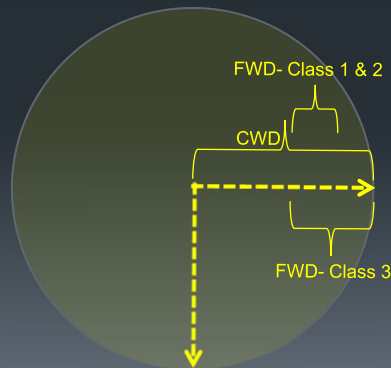


- Otherwise, debris starts or stops where it exits or enters the duff

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Measuring

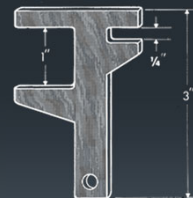
- Typically fixed plot or along a transect
- Transect oriented randomly, in perpendicular pairs, or 120° triplets



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Measuring

- Procedures differ somewhat between CWD and FWD
- Transect lengths vs. fixed plot
- FWD subclasses (1,2,3)
 - Diameter: 0"-0.25", 0.25"-0.9", 1"-2.9"
- May require some estimations



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Measuring (transect)

- Interested in intersecting DW
- Procedure may be approached in same way as prism plot (PPS)
 - Prism based on angle/BAF
 - Count proportional to size (DBH)
 - Results in basal area per acre
- Transect based on length (of transect)
 - Count proportional to debris length
 - Results in linear feet of debris per acre

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Measuring

- Make certain to follow your specific protocol (for research) or the prescribed sampling procedure (e.g. Forest Service)
- Simplified version
 - If transect crosses central axis of debris
 - Measure small and large diameter of piece along with length
 - Use Smalian's formula (see Volume lecture)
 - Determine transect Length Factor (LF)
 - Extend counts and volumes to per acre basis

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Calculations

- **Length Factor**
 - This is very much the same as the prism Tree Factor
 - $LF (ft/acre) = \frac{43560 ft^2/acre \times \pi}{2L (ft)}$ (Ducey, 2001)
 - LF = Length Factor
 - L = Length of transect line
 - Each intersected piece will represent LF linear feet of material per acre
 - So, if LF = 300 ft/acre and an intersected piece is 15 ft long, you can expect $300/15 = 20$ similar sized pieces in an acre

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Measuring

- **A few notes**
 - Debris ends at size cutoff or insertion into duff layer
 - Debris counted each time intersected
 - Forked or similar stems and branches measured as individual units
 - Both natural and manmade debris counted only if not systematically piled
 - Otherwise, estimates made
 - Only include transect intersections on accessible land exhibiting forest conditions

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Measuring

- A few notes- Decay Class
 - Advanced decay may increase minimum diameter required for inclusion

Decay Class	Structural Integrity	Texture of Rotten Portions
1	Sound, intact, freshly fallen, bark on	Intact, no rot
2	Sound	Mostly intact, sapwood rotting and soft, can't pull off easily
3	Heartwood sound, supports own weight	Heartwood hard, rot beginning, large cubical rot pieces, sapwood easily pulled off or missing
4	Heartwood rotten, does not support its own weight, but holds shape	Heartwood soft, small cubical decay pieces, metal pin easily pushed into heartwood
5	None! Spreads out on ground, losing shape of log	Wood is soft, crumbly, heavily decomposed, powdery when dry

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Calculations

- As an aside
 - http://www2.latech.edu/~strimbu/Teaching/FOR315/2011/Annex/LineIntersectSampling_TR003.pdf
 - Pages 15-17 provide a technical derivation
 - $\rho_{intersect} = \rho_{in\ rectangle} \times \rho_{intersect\ if\ in\ rectangle}$
 - $\rho_{intersect} = \frac{2 \times L_{transect} \times L_{debris}}{Area \times \pi}$ or $\frac{Area \times \pi}{2 \times L_{transect}} = \frac{L_{debris}}{\rho_{intersect}} = LF$
 - $LF\ (ft/acre) = \frac{43560\ ft^2/acre \times \pi}{2L\ (ft)}$



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Other Considerations

- Photo series for complex areas

35.4
T/acre



20.5
T/acre



36.9
T/acre



DOWN & DEAD WOODY FUEL LOADINGS		OTHER FUEL DATA		FIRE POTENTIAL RATING	
Size Class (Inches)	T/acre	Weight (kg/m ²)			
0-0.25	0.5	0.11			
0.25-1	2.9	0.65			
1-3	12.9	2.89			
Subtotal 0-3	16.3	3.65			
3-6	13.0	2.91			
6-10	2.2	0.49			
10-20	5.4	1.23			
20+	0	0			
SUBTOTAL 3+	20.6	4.61			
TOTAL	36.9	8.26			
NFORS FUEL MODEL	STYLIZED FUEL MODEL				
G	10				

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Other Considerations

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STAND AND SITE DATA		STAND LOCATION	
Age of overstory dominants:		National Forest:	Loilo
LAOC	134 yrs	Ranger District:	Missoula
PJCO	120 yrs	Drainage:	N. Fork, Swarts Cr.
PSME	90 yrs		
Average slope:	50 %	Photo taken:	6/20/77
Aspect:	East	By:	W. C. Fischer
Elevation:	5555 ft 1693 m		
Remarks:	Fire Ecology Group Nine		

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Other Considerations

- Other estimators- Log models



15.9 T/acre



28.3 T/acre



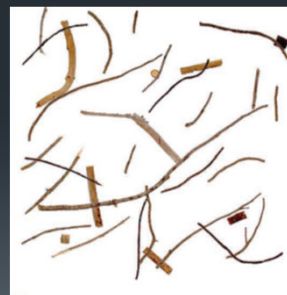
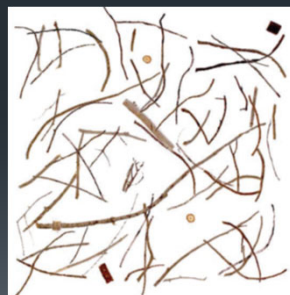
35.1 T/acre

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Other Considerations

- Other estimators- FWD

Each photo covers 1 m² (11 ft²)
and represents 2.4 T/acre



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