Forest Fuels

Dr. Rebecca Kidd

Fire Type: disturbance regime characteristic

Surface Fuels

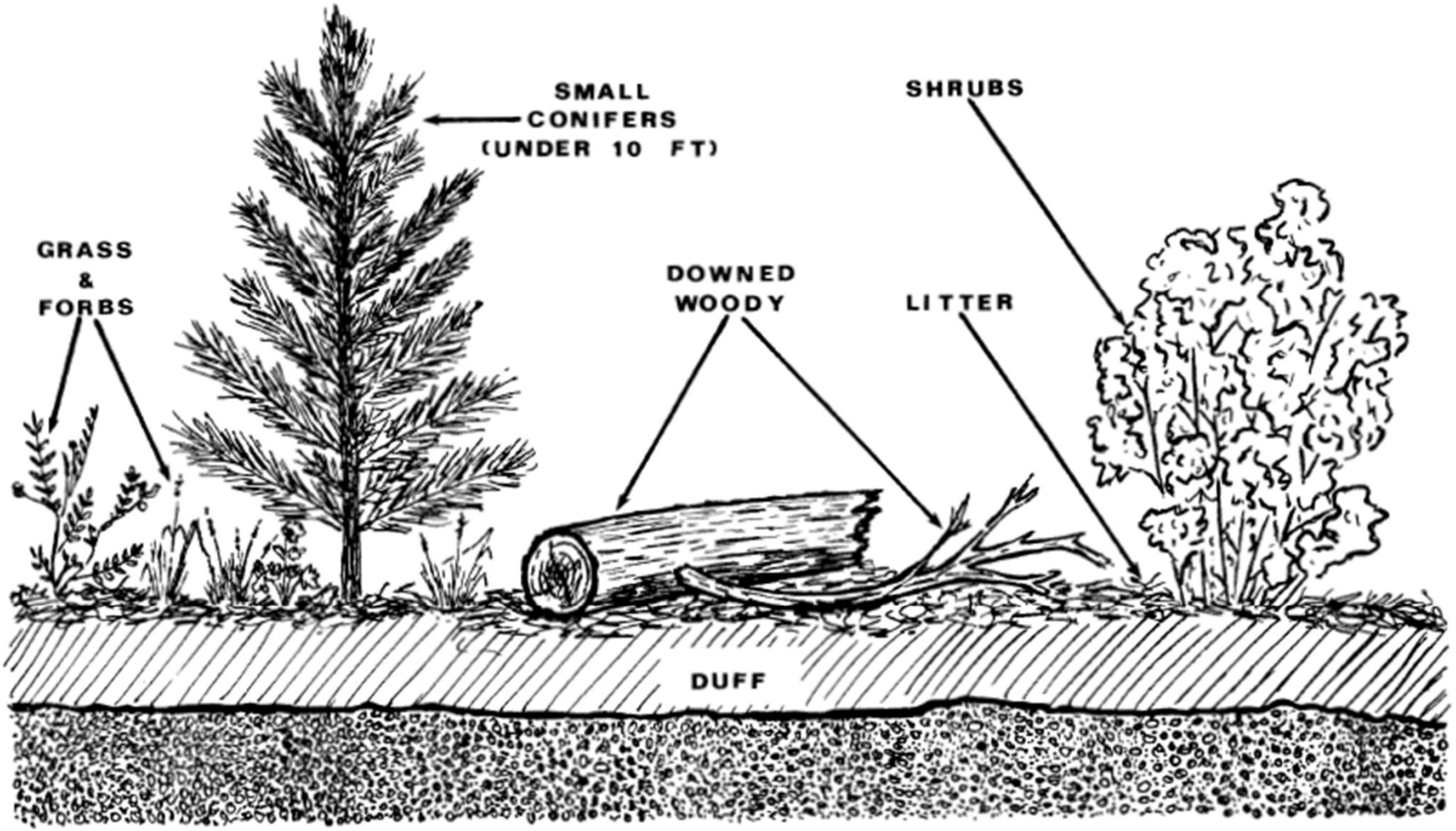


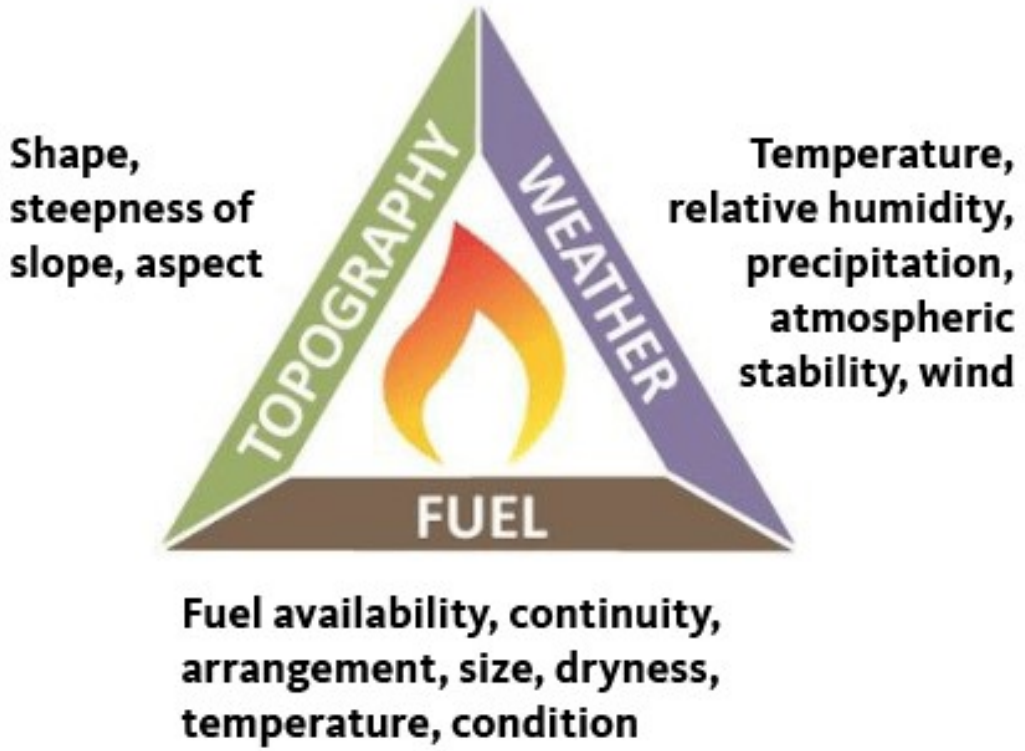
Figure 1.—Vegetative components included in procedures for estimating biomass and fuel loading.

Brown et al., 1982

Why characterize/quantify?

Why characterize/quantify?

Fire behavior triangle:



Why characterize?

Hazardous fuels reduction project. The "before" tile is prior to treatment with heavy fuels on the ground, the middle tile is midway through the project and the final tile is complete, except for handpile burning.

Why characterize/quantify?

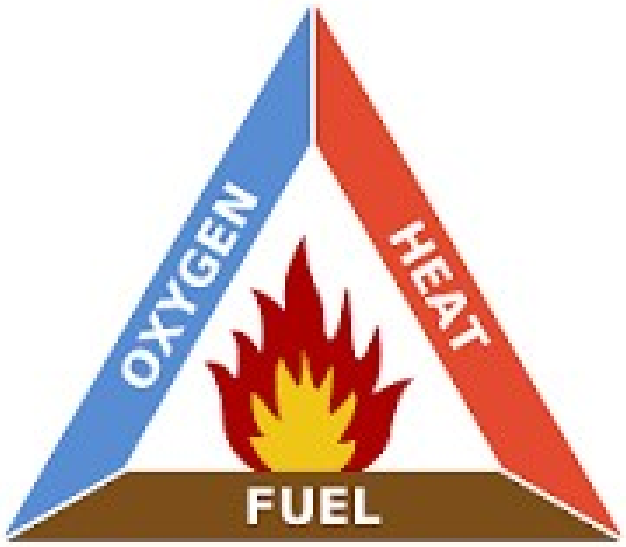
Wildlife Habitat Evals.

A Sampling of Common Downed Log Users	
Birds	
Ruffed grouse	
Mammals	
Shrews	Star-nosed mole
Eastern chipmunk	Deer mouse
Black bear	White-footed mouse
Red-backed vole	Gray fox
Bobcat	Long-tailed weasel
Mink	
Amphibians / Reptiles	
Salamanders	Eastern narrowmouth toad
River cooter	Southern toad
Yellow-bellied slider	Skinks
Five-lined skink	Ring-necked snake
Eastern fence lizard	Red-bellied snake

NC STATE EXTENSION

Why characterize/quantify?

Fue to conduct a Rx fire (fire triangle):



How to characterize/quantify?

How to characterize/quantify?

On the ground measurements

however, some errors may remain.

United States
Department of
Agriculture

Forest Service

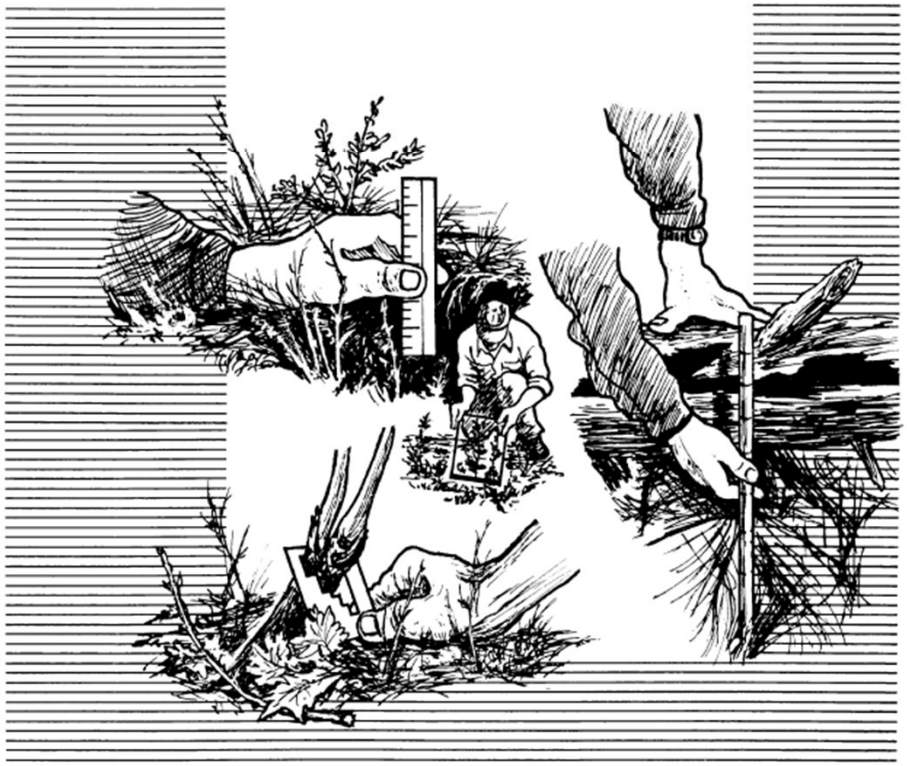
**Intermountain
Forest and Range
Experiment Station
Ogden, UT 84401**

General Technical
Report INT-129

August 1982

Handbook for Inventorying Surface Fuels and Biomass in the Interior West

James K. Brown, Rick D. Oberheu,
and Cameron M. Johnston

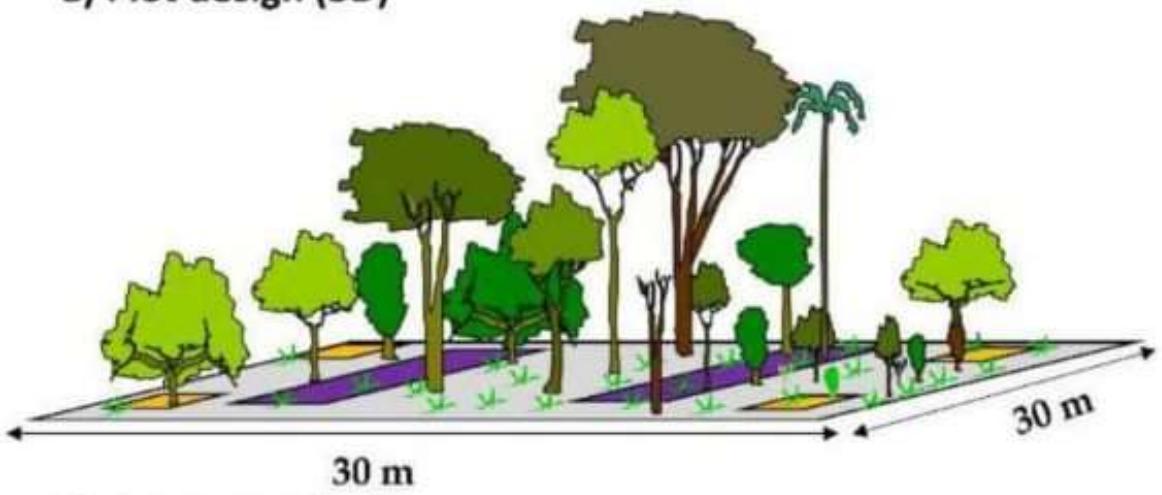


How to characterize/quantify?

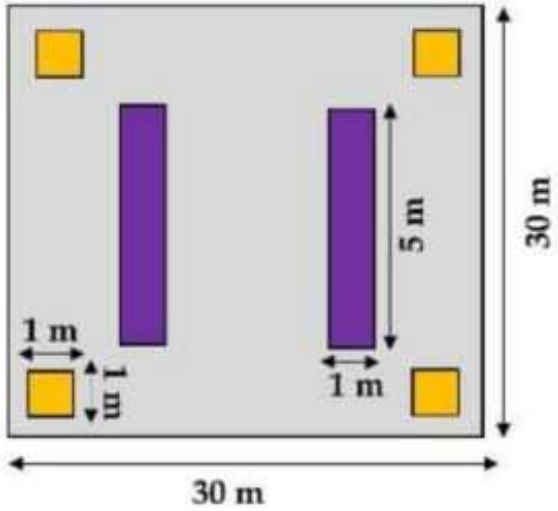
Photo Points

How to characterize/quantify?

a) Plot design (3D)



b) Plot design (2D)



Fuel loads

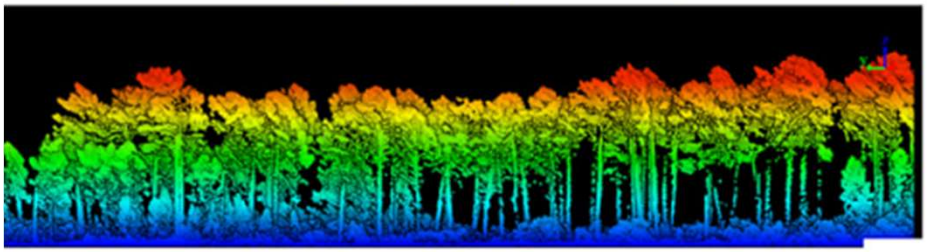
- Trees (dbh ≥ 10 cm)
- Shrubs and trees (dbh < 10 cm)
- Duff, litter, downed woody and Herbaceous fuels

c) Delimitation of plots

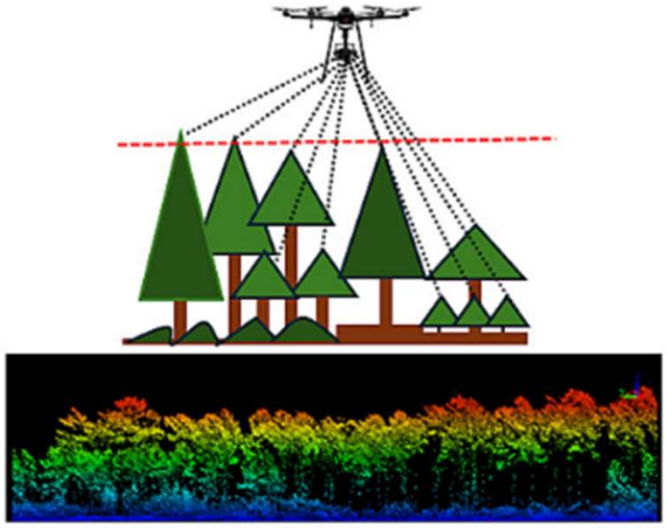
d) Fuel load measurements (e.g. surface fuels)

Thinning pulse density

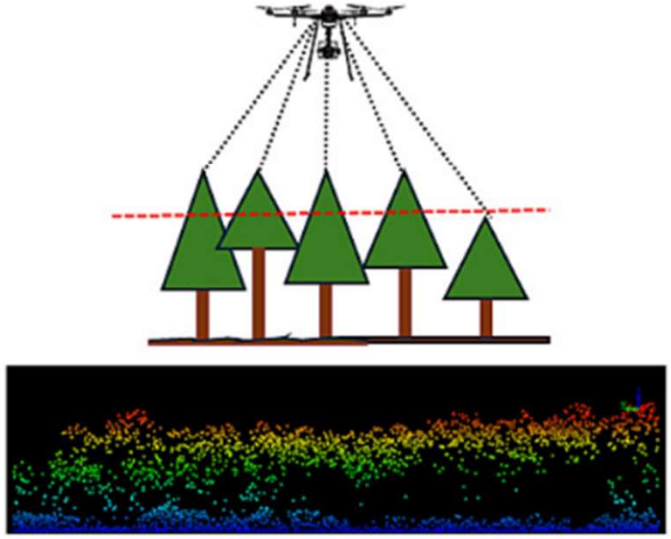
Original (>300 pulses/m²)



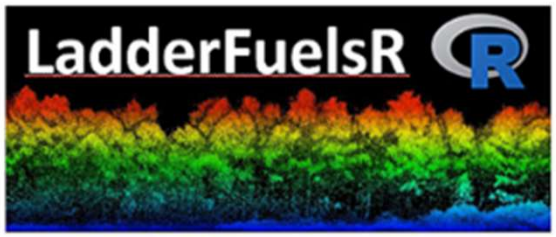
100 pulses/m²



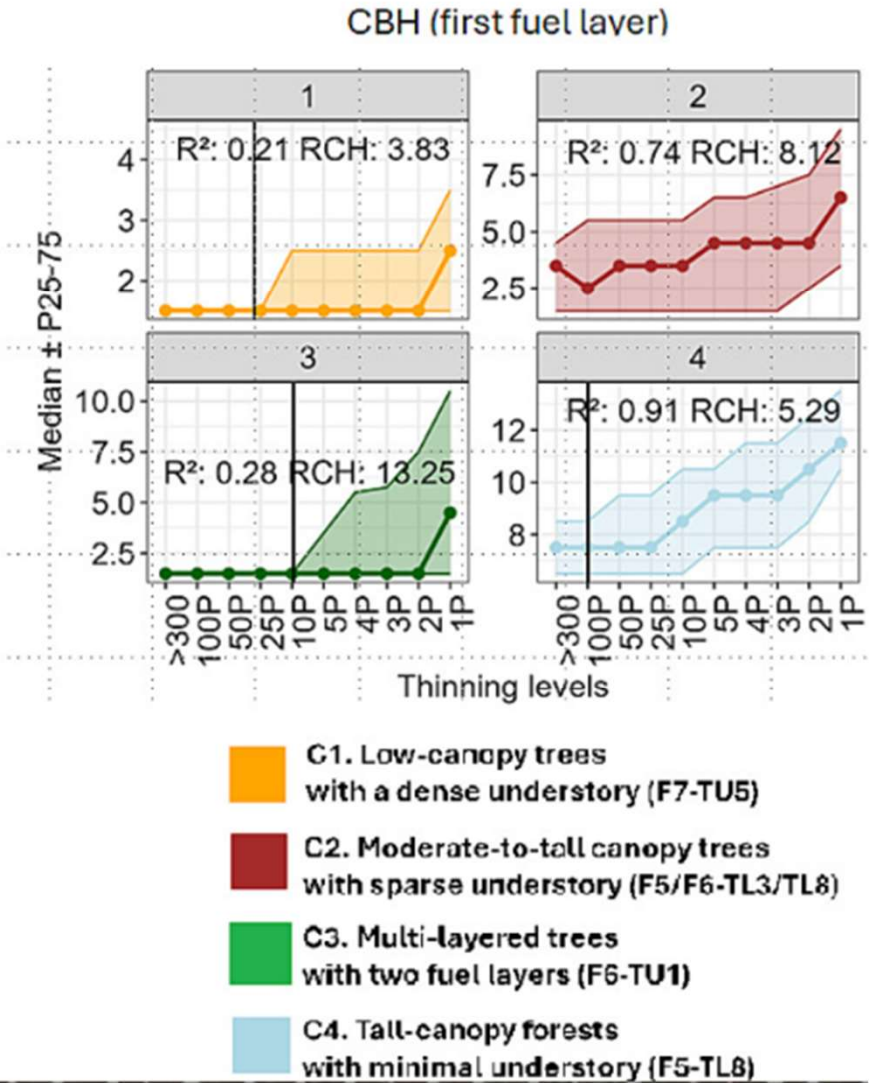
1 pulses/m²



LadderFuelsR fuel properties



Changes in fuel properties at different pulse densities



Surface Fuels: Downed Woody Material

TIME LAG	FUEL SIZE	DETERMINATION
1–hour	<0.25 inch diameter	Fine flashy fuels that respond quickly to weather changes. Computed from observation time temperature, humidity, and cloudiness.
10–hour	0.25 to 1 inch diameter	Computed from observation time temperature, humidity, and cloudiness. Can also be an observed value, from a standard set of fuel sticks that are weighed as part of the fire weather observation.
100–hour	1 to 3 inches diameter	Computed from 24–hour average conditions composed of day length, hours of rain, and daily temperature/humidity ranges.
1000–hour	3 to 8 inches diameter	Computed from a 7–day average conditions composed of day length, hours of rain, and daily temperature/humidity ranges.

United States
Department
of Agriculture

Forest Service

**Intermountain
Forest and Range
Experiment Station
Ogden, UT 84401**

General Technical
Report INT-122

April 1982

Aids to Determining Fuel Models For Estimating Fire Behavior

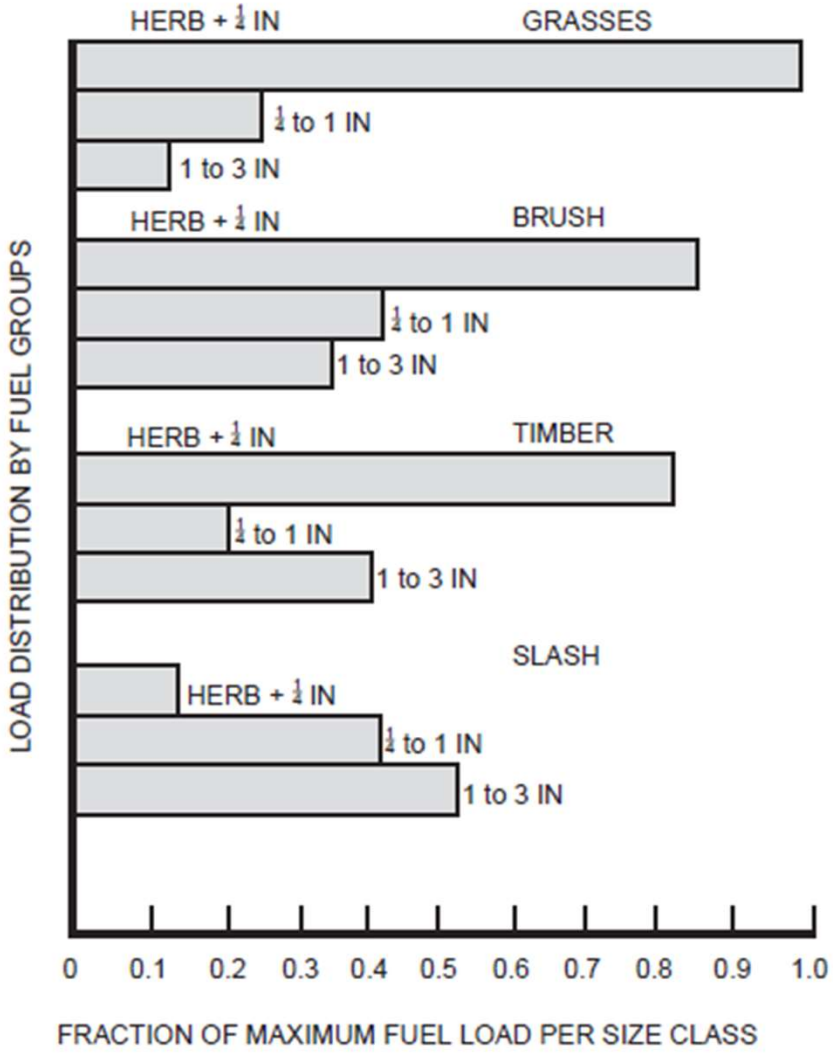
Hal E. Anderson

PHOTO GUIDE FOR APPRAISING SURFACE FUELS IN EAST TEXAS:

Grass, Clearcut, Seed Tree, Loblolly Pine, Shortleaf Pine, Loblolly/Shortleaf Pine, Slash Pine, Longleaf Pine, and Hardwood Cover Types

HERSHEL C. REEVES

CENTER FOR APPLIED STUDIES — SCHOOL OF FORESTRY
STEPHEN F. AUSTIN STATE UNIVERSITY
NACOGDOCHES, TEXAS 75962 OCTOBER 1988



Think about what fuels would be consumed on the site = this will determine your model.

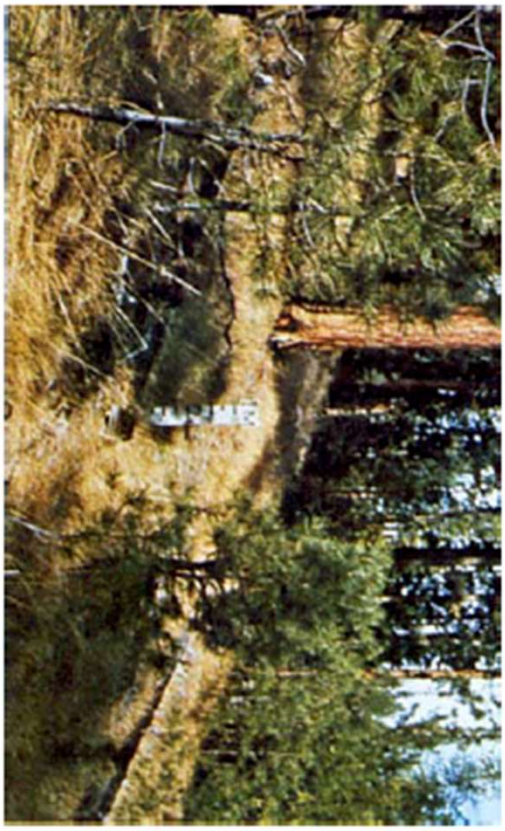
Figure 1. — Distribution of maximum fuel load by size class for each of the four general fuel groups. Note the shift in less than ¼-inch (0.6-cm) and 1- to 3-inch (2.5- to 7.6-cm) material

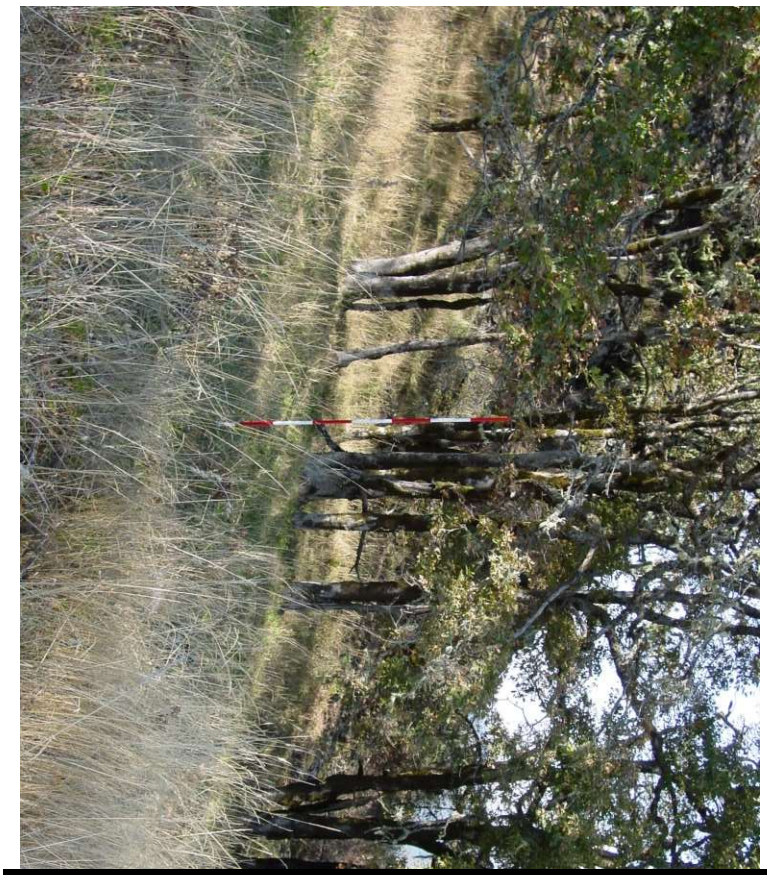
Anderson, 1982

Table 1. — Description of fuel models used in fire behavior as documented by Albini (1976)

Fuel model	Typical fuel complex	Fuel loading				Fuel bed depth	Moisture of extinction dead fuels
		1 hour	10 hours	100 hours	Live		
		Tons/acre				*Feet*	*Percent*
	Grass and grass-dominated						
1	Short grass (1 foot)	0.74	0.00	0.00	0.00	1.0	12
2	Timber (grass and understory)	2.00	1.00	.50	.50	1.0	15
3	Tall grass (2.5 feet)	3.01	.00	.00	.00	2.5	25
	Chaparral and shrub fields						
4	Chaparral (6 feet)	5.01	4.01	2.00	5.01	6 0	20
5	Brush (2 feet)	1.00	.50	.00	2.00	2.0	20
6	Dormant brush, hardwood slash	1.50	2.50	2.00	.00	2.5	25
7	Southern rough	1.13	1.87	1.50	.37	2.5	40
	Timber litter						
8	Closed timber litter	1.50	1.00	2.50	0.00	0.2	30
9	Hardwood litter	2.92	41	.15	.00	.2	25
10	Timber (litter and understory)	3.01	2.00	5.01	2.00	1.0	25
	Slash						
11	Light logging slash	1.50	4.51	5.51	0.00	1.0	15
12	Medium logging slash	4.01	14.03	16.53	.00	2.3	20
13	Heavy logging slash	7.01	23.04	28.05	.00	3.0	25

Anderson, 1982





NFFL Fuel Model 2- Medium Grassland

Fuel Model 2 = Grass (Medium) and Understory

DATA SHEET

Stand No. 7

FOREST COVER TYPE: SAF NO. 70, Longleaf pine

LOCATION: Sabine County, UNDERSTORY SPECIES, Sassafras

DOWN & DEAD WOODY FUEL LOADINGS

Size Class (Inches)	Weight (T/ac)
0-0.25	0.12
0.25-1	0.56
1-3	0.04
Subtotal 0-3	0.72
3+ Sound	
3+ Rotten	
Subtotal 3+	

LITTER AND HERBACEOUS

Litter 3.79 T/ac

Herbaceous 0.76 T/ac

NFDRS FUEL MODEL	STYLIZED FUEL MODEL
C	2

OTHER FUEL DATA

Average duff depth 0.30 in

Duff weight 2.72 T/ac

Hardwoods ≤ 2" dbh ____ T/ac

Pine ≤ 10' Tall 0.02 T/ac

STAND AND SITE DATA

Age of overstory 40 yrs.

Height of overstory 56 ft.

Aspect West

Slope 2 %

Remarks Managed natural stand on deep sandy hills

FIRE POTENTIAL RATING

Based on an average bad day:
Temp. 65-70°F, RH 25-35%
Wind 10-15 mph, 10-hr TL 10-12%
Two weeks since last rain

Rate of Spread Medium

Intensity Medium

Crowning Low

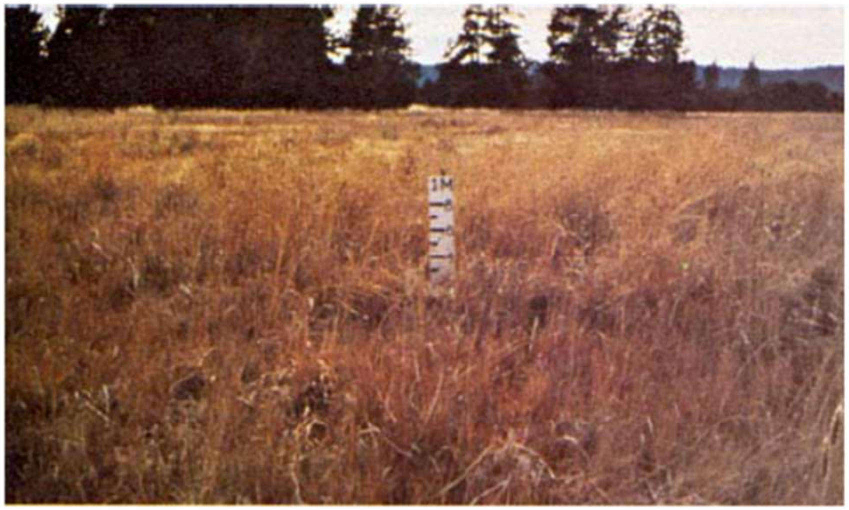
Resistance to Control Low

MISCELLANEOUS

Date of sampling February 16, 1985

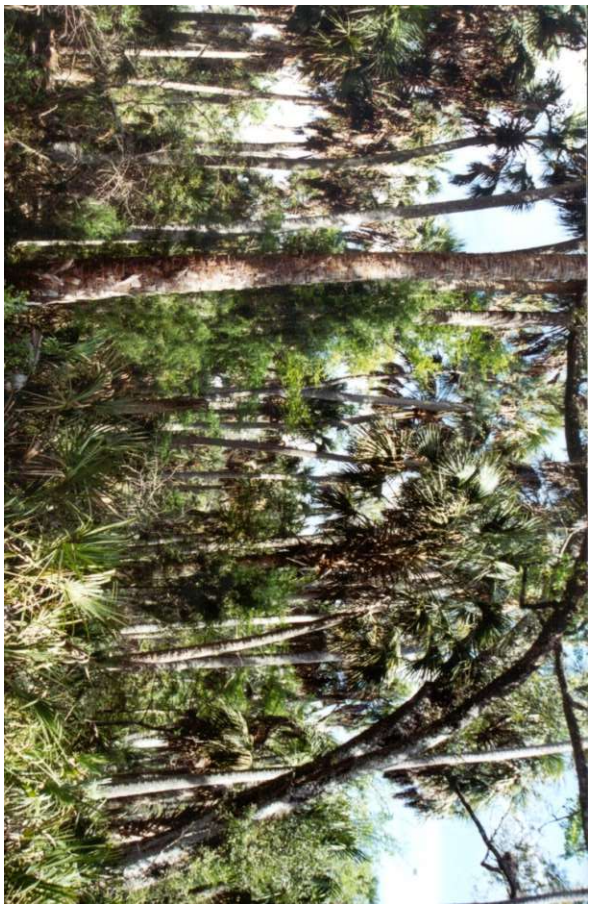
Photo by: Hershel C. Reeves

NFFL Fuel Model 3- Tall Grassland









NFFL Fuel Model 7- Southern Rough/ Palmetto-Gallberry

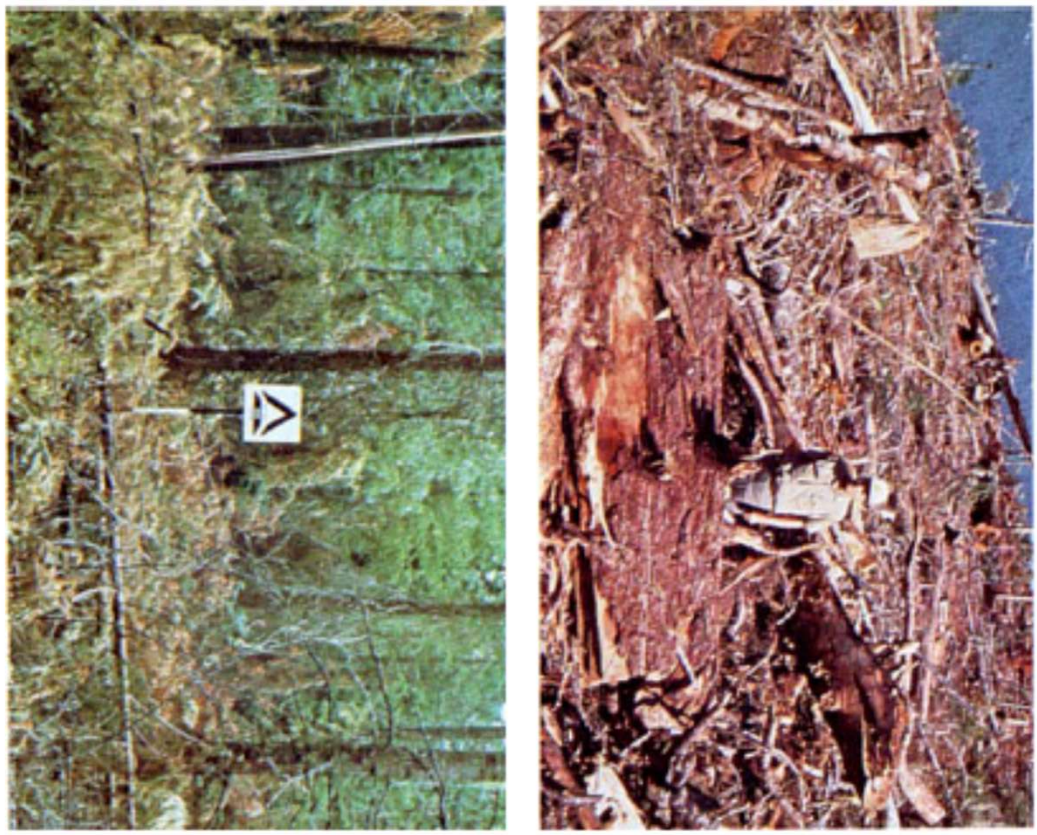
Fuel Model 7 = Southern Rough

NFFL Fuel Model 9- Blowy Leaf- Loose (Forest) Timber Litter

Fuel Model 9 = Timber Litter (Loose)



NFFL Fuel Model 11- Light Slash

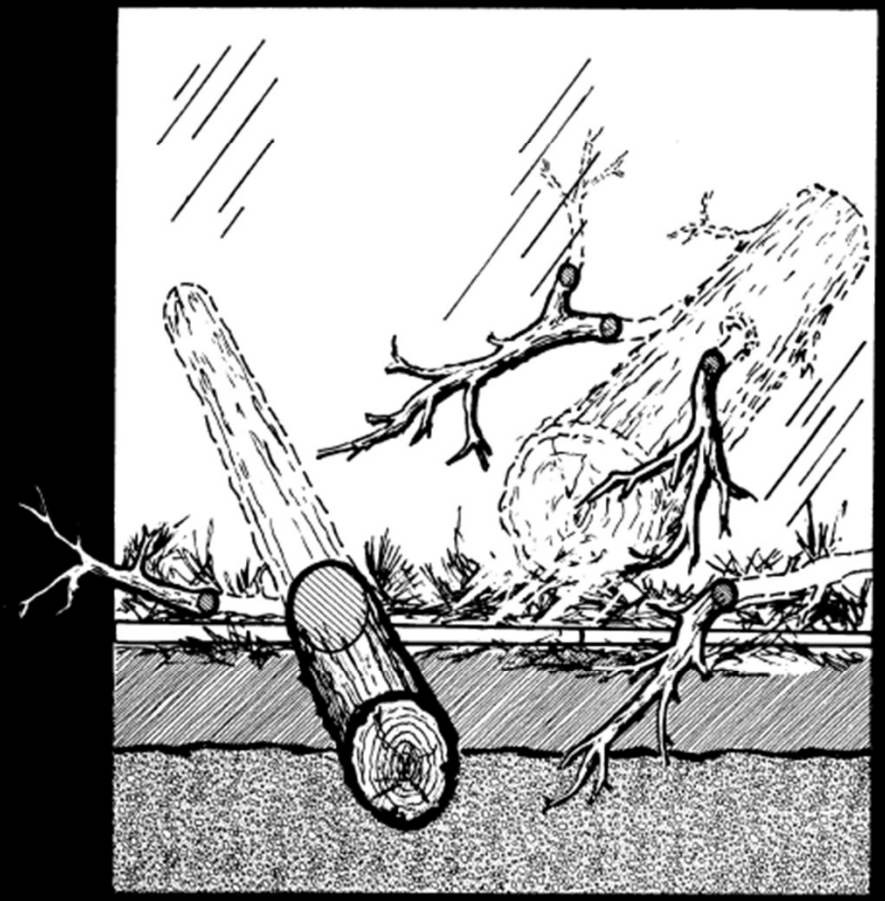


NFFL Fuel Model 13- Heavy Slash

Surface Fuels Assignment

HANDBOOK FOR INVENTORYING DOWNED WOODY MATERIAL

James K. Brown



USDA Forest Service General Technical Report INT-16, 1974
INTERMOUNTAIN FOREST & RANGE
EXPERIMENT STATION
Ogden, Utah 84401

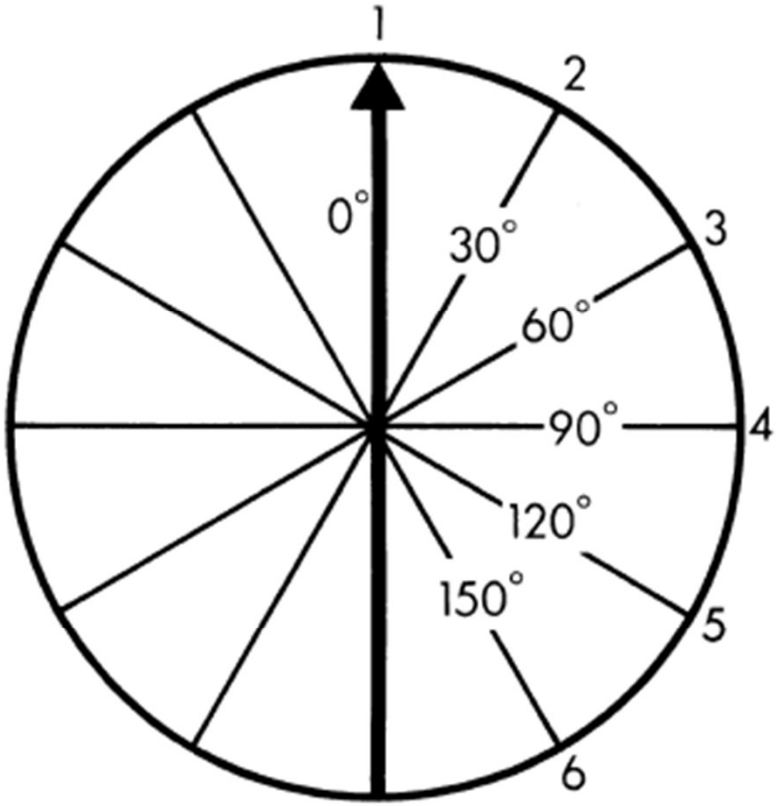


Figure 1.--Locating sampling plane by using die to pick one of six directions.

*** NEED compass***

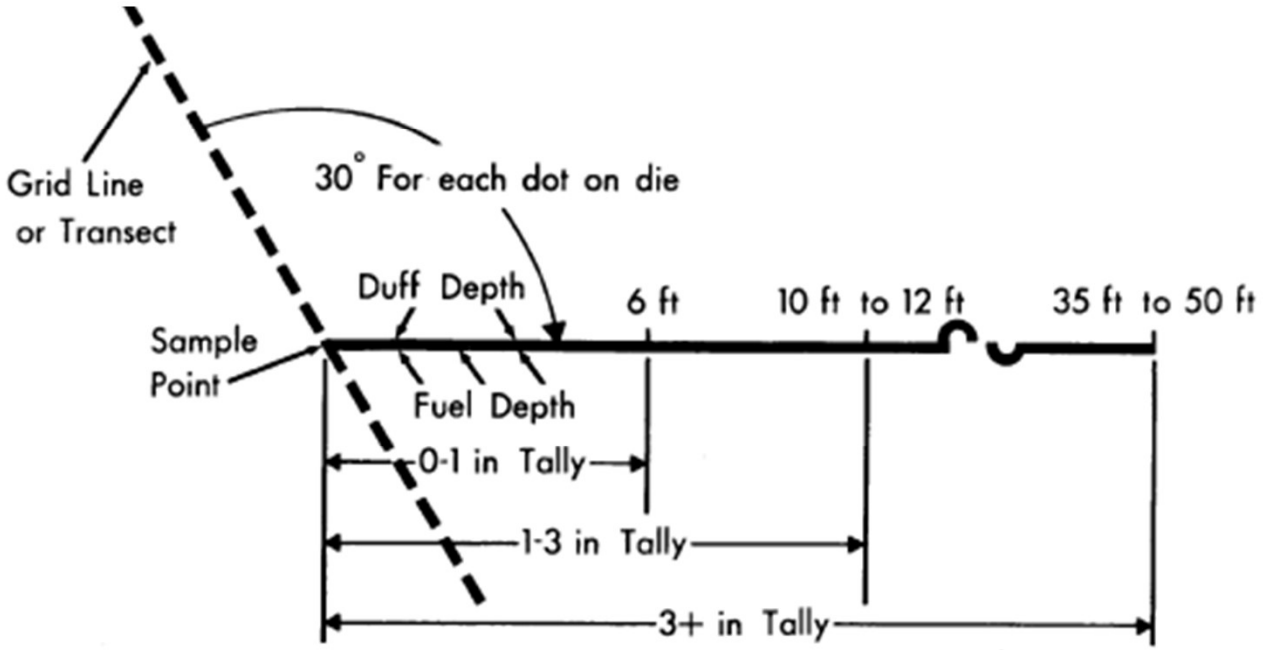


Figure 2.--Top view of sampling plane and location of fuel depth measurements.

Field Equipment

Item	Use
1. Hand compass	Transect and plot layout.
2. Gaming die	Random orientation of sampling planes.
3. 50-foot tape or string and one chaining pin	Delineate the sampling planes.
4. Plot rod	Delineate sampling planes and if calibrated, measure fuel depth.
5. Go-No-Go gage (fig. 11)	Determine size class of borderline particles.
6. 1-foot ruler or steel pocket tape	Measure duff depth and diameters of pieces over 3 inches. Fuel depth could be measured with steel pocket tape.
7. Hypsometer with percent scale	Slope measurement.
8. Sample forms	Record data.
9. For slash: Jacob's staff with attached yard or meter stick and level	Delineate sampling plane for counting small particles.

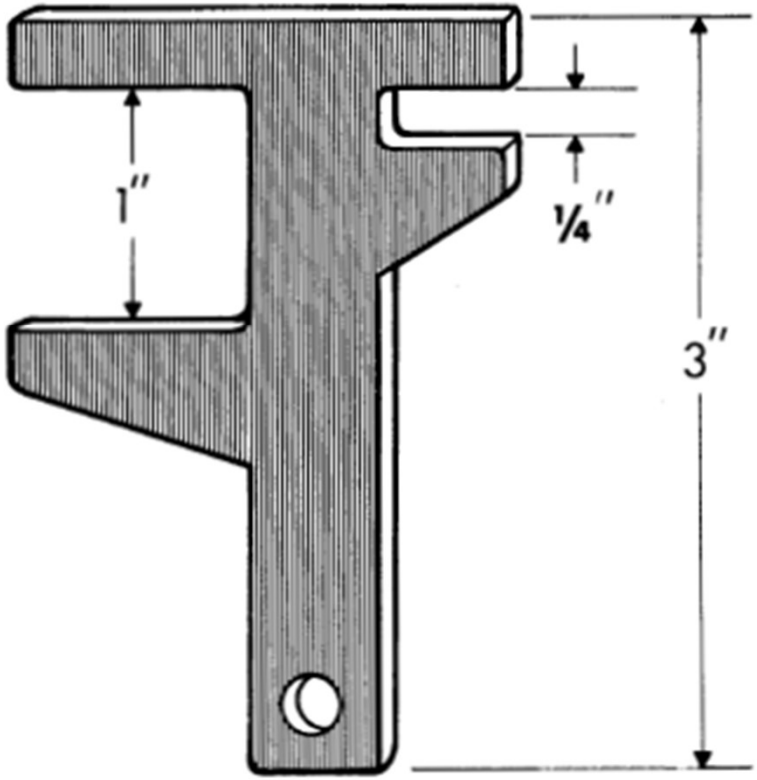


Figure 11.--A Go-No-Go gage can be cut from 1/16 or 1/8-inch sheet aluminum. Cut the notches slightly tight and file smooth to final dimensions.

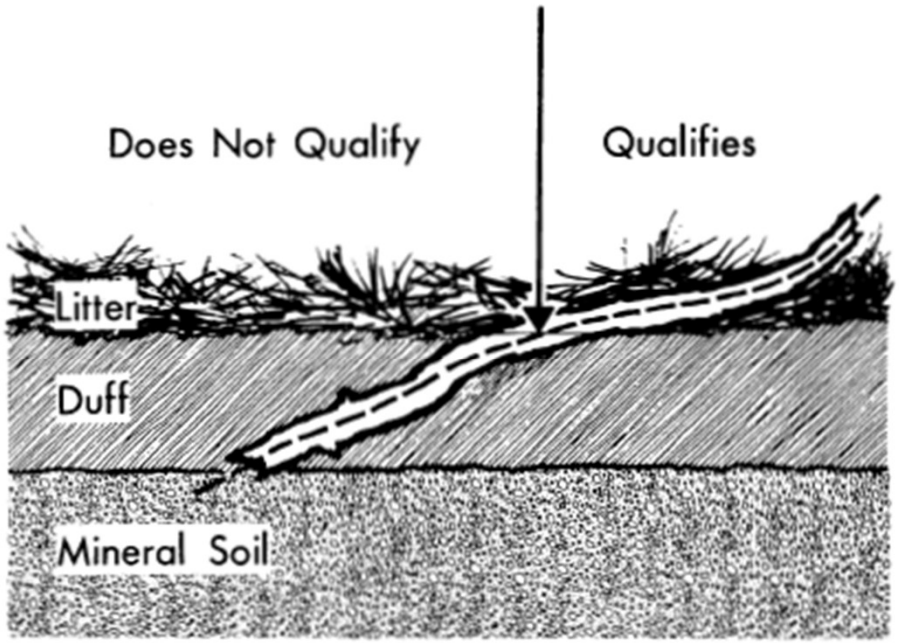


Figure 7.--Regardless of size, pieces are tallied only when intersection lies in and above the litter (right of arrow).

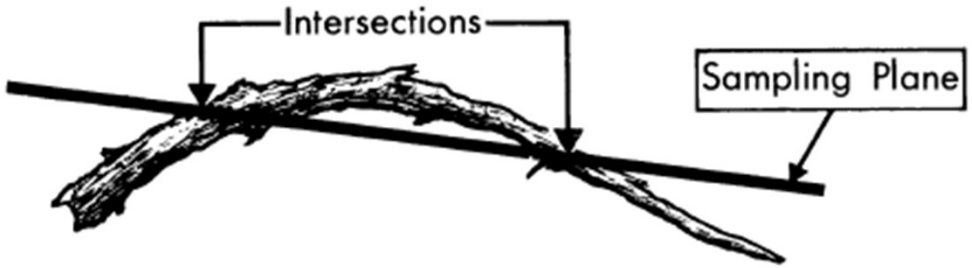


Figure 9.--Count both intersections for a curved piece.

Litter depth

Ground Cover (%)

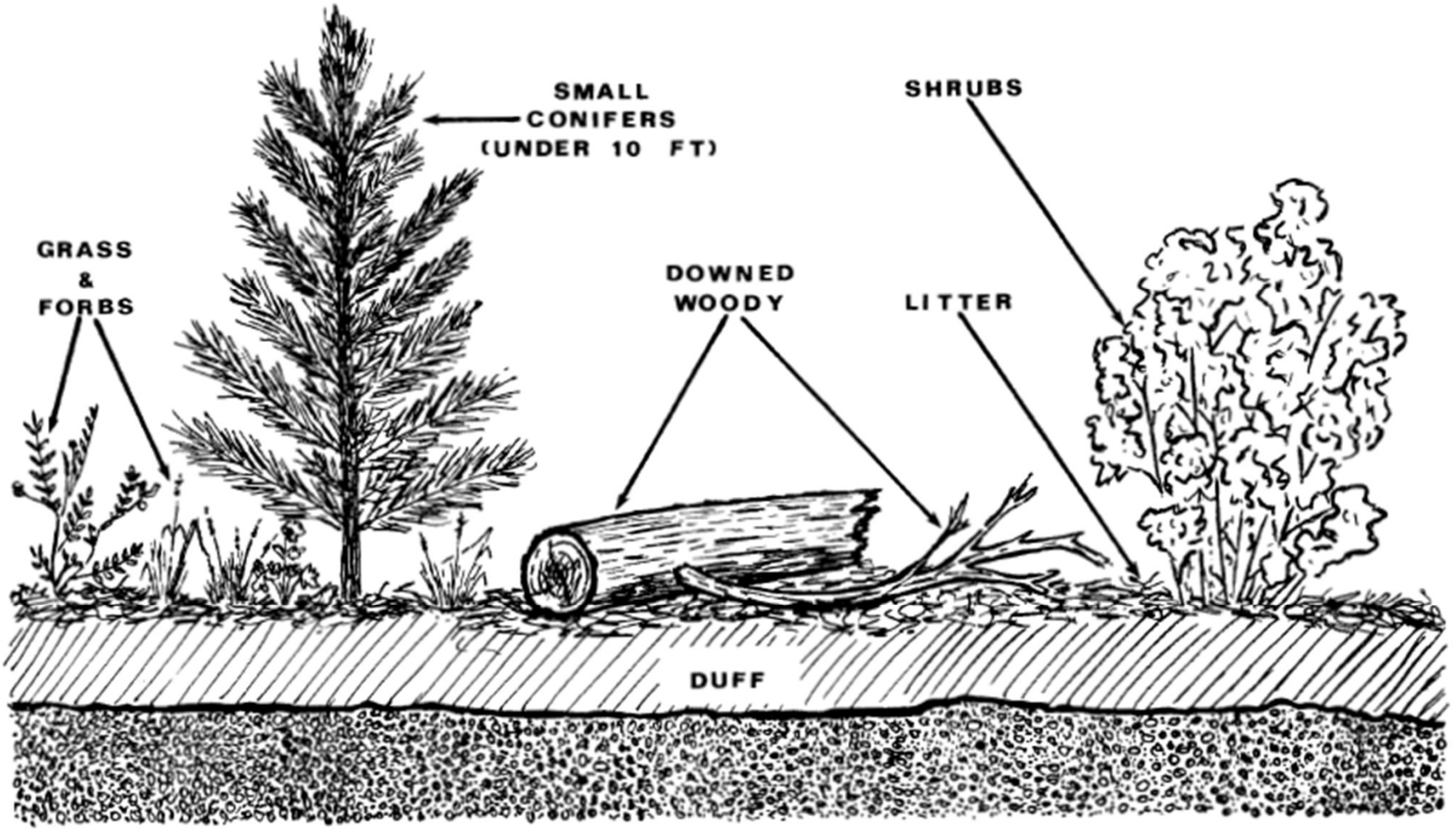
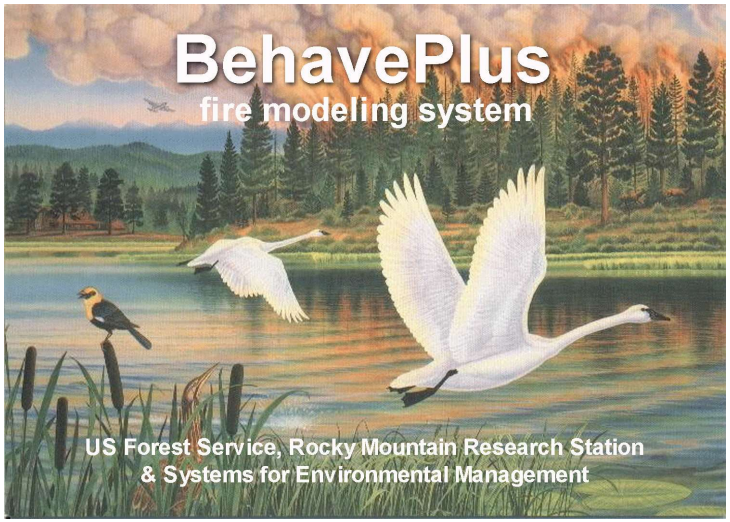
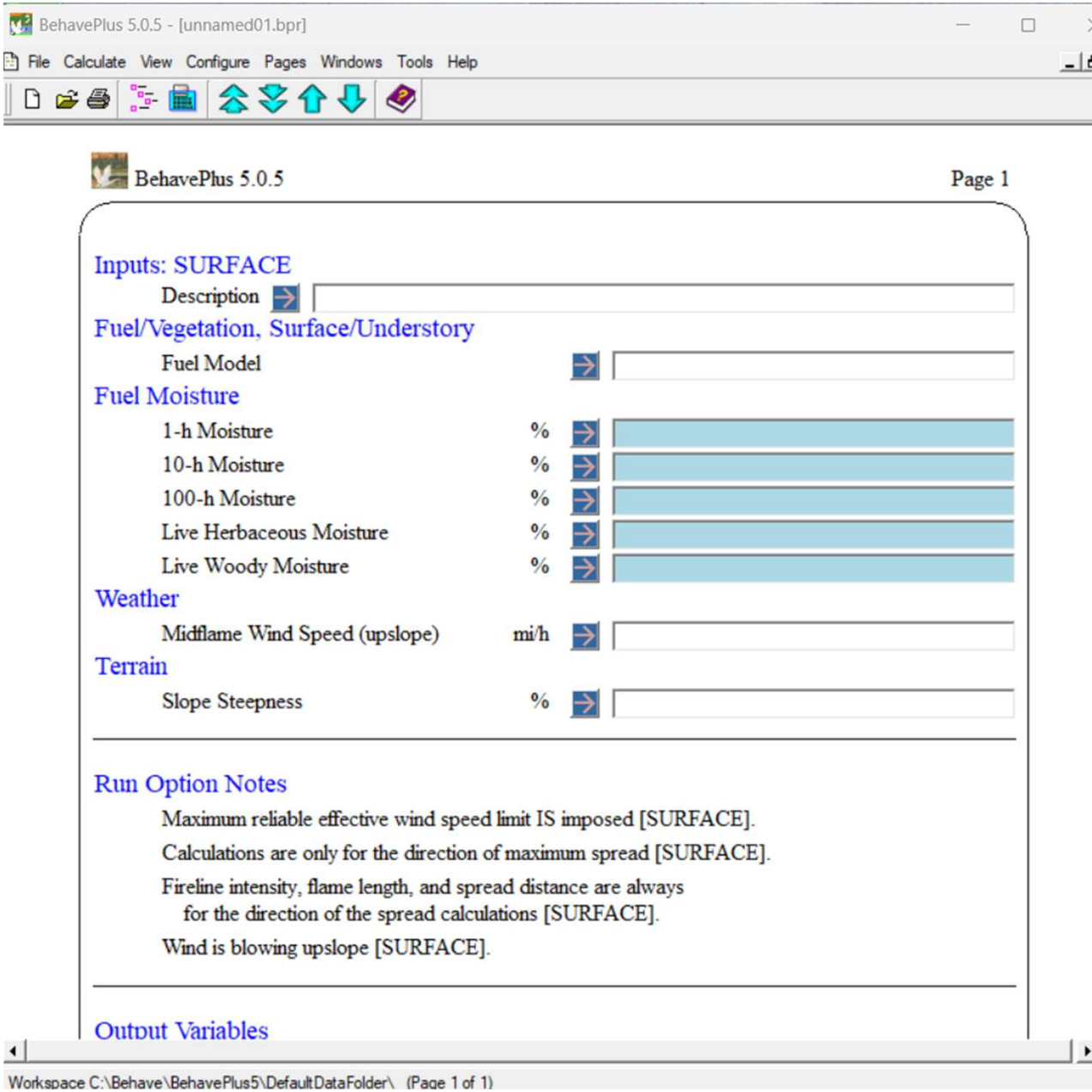


Figure 1.—Vegetative components included in procedures for estimating biomass and fuel loading.

Brown et al., 1982

Monday afternoon/evening demo:





RCW Assignment