Title: Comparison of terrestrial versus aquatic decomposition rates of logs at the Andrews Experimental Forest, 1985 to 2015

Abstract:

The data collected from this study describe the decomposition of small logs (20-30 cm diameter, 2 m length) in a stream channel to those on an adjacent upland site at the H. J. Andrews Experimental Forest. The stream is a 3rd order above the junction of Lookout Creek and Mack Creek. Three species of trees are being examined: Douglas-fir, western hemlock, and red alder. Data collection started in 1985 and is scheduled to continue to 2050. Periodically a subset of logs is resampled to determine changes in volume, bark cover, density, and nutrient stores. The last set of samples was collected in 2005. Logs ranging in diameter between 20 and 30 cm of a length of 2 m were cut out of live trees of the three species. Logs were placed by hand along a skid road at the terrestrial site. A cable system was used to place log randomly along a stream reach. The location of logs in the stream is noted when they are sampled. The length and diameter as well as bark cover of each sampled log is noted at the time of sampling (td01701). Six cross-sections are removed with a chainsaw. The thickness of the tissue types is noted (inner bark, outer bark, sapwood, and heartwood) and are described in td01702. Samples of each tissue type are taken to determine their moisture content (water mass/dry mass) and density (dry mass/green volume). Density is derived from dry mass and volume as determined via dimensional measurements. Dimensional data, volumes, masses, density, and moisture content are documented in the td01703 table. The volume of logs and tissue types, the total mass, and proportional mass of the tissue types as well as moisture contents is derived from the data in the other data tables and is stored in the td01704 table.

Keywords: Coarse woody debris; Decay; Decomposition; Geomorphology; Logs; Woody debris; Inorganic nutrients; Organic matter; geomorphology; decay rates; decomposition; inorganic nutrients; woody debris; coarse woody debris; organic matter; logs;

Date data commenced: 1985-06-04
Date data terminated: 2015-06-16
Principal Investigator: Mark E. Harmon

List of Entities:

1. Log Descriptions Including Length, Diameters, Bark Cover
2. Radial Thickness Of Tissue Types
3. Sample Dimensions, Weights, Density, and Moisture Contents
4. Log Volumes, Tissue Volumes, Total Mass, Proportional Mass

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### 2. Radial Thickness Of Tissue Types

### 3. Sample Dimensions, Weights, Density, and Moisture Contents
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Attributes Definitions:

**BARKCOVER**

Portion of log covered by bark, includes inner and outer bark

**CVOL**

Volume calculated from measurement

**D1**

Length in dimension 1

**D2**

Length in dimension 2

**D3**

Length in dimension 3

**D4**

Length in dimension 4, used only when volform = 4

**DBCODE**

FSDB Database code

**DEN**

Density of sample

**DENH**

Mean density (n=2) of heartwood for log.

**DENI**

Mean density (n=2) of inner bark (not calculated for alru)

**DENO**

Mean density (n=2) of outer bark. for alru inner and outer bark combined.

**DENS**

Mean density (n=2) of sapwood.
Diameter measurement of the large end of the log
DM1
Diameter measurement of the first cross-section
DM2
Diameter measurement of the second cross-section
DM3
Diameter measurement of the third cross-section
DM4
Diameter measurement of the fourth cross-section
DM5
Diameter measurement of the fifth cross-section
DM6
Diameter measurement of the sixth cross-section
DM7
Diameter at the small end of the log
DRYWTD
Oven-dry weight of total sample
DRYWTM
Dry weight of moisture content sample (subsample of total sample)
END_REM
The end of log cross-section was removed, 1=large end, 2=small end
ENTITY
Entity number
FMH
Fractional mass of heartwood. fmh = (fvh*vol*denh)/tmass.
FMI
Fractional mass of inner bark. not calculated for alru. see fmh for formula.
FMO
Fractional mass of outer bark. see fmh for formula. for alru this includes inner bark.
FMS
Fractional mass of sapwood. see fmh for formula.
FVH
Fractional volume of heartwood (not calculated for alru). shape is frustum of cone for this and next 3 variables
FVI
Fractional volume of inner bark (not calc for alru)
FVO
Fractional volume of outer bark (for alru this includes in ner bark)
FVS  
Fractional volume of sapwood

HWT  
Radial thickness of heartwood

IBT  
Radial thickness of inner bark

LENGTH  
Length of log

LOCATION  
Location of log, stream = a, land = t

MAXVOL  
Maximum volume of log based on exterior measurements on cardtype 1. assume shape is frustrum of cone.

MC  
Moisture content of sample

MCH  
Mean moisture content of sapwood (n=2), not calculated for alru.

MCI  
Mean moisture content of inner bark (n=2), not calculated for alru.

MCO  
Mean moisture content of outer bark (n=2), for alru inner and outer bark combined.

MCS  
Mean moisture content of sapwood (n=2).

NUMBER  
Log number

OBT  
Radial thickness of outer bark

POS  
Position of sample (consecutive alpha codes for sample sections) 2=small end

POSITION  
Indicates where log was found or placed. for stream the numbers indicate the 10-m section log occurred, 1=1-10,2-10-20, etc

SAMPLEDATE  
Date of observation

SPECIES  
Species of log

STUDYID  
Study area id

SUBSTR
Code for type of substrate sampled

SWT
  Radial thickness of softwood
TMASS
  Total dry mass of log.

TVOL
  Total vol based on length on cardtype 1 and radial measure mentson cardtype 2. incl bark loss. shape is frustrum of cone.

VOLFORM
  Code for equation to be used in calculating the volume from variables d1, d2 d3

WETWTD
  Fresh weight of total sample

WETWTM
  Wet weight of moisture content sample (subsample of total sample)

WVOL
  Volume from water displacement

X0
  The point where diameter measurement was taken for the large end of the log

X1
  The point where first cross-section was removed

X2
  Point where second cross-section was removed

X3
  The point where third cross-section was removed

X4
  The point where fourth cross-section was removed

X5
  The point where fifth cross-section was removed

X6
  The point where the sixth cross-section was removed

X7
  Position of the small end of the log, should equal the total length

YEAR
  Year of observation

Enumerated Domains:

Enumerated Domain for Attribute: LOCATION
  T  Terrestrial or upland site
  A  Aquatic or stream site
Enumerated Domain for Attribute: END_REM
2  Small end
1  Large end

Enumerated Domain for Attribute: POS
D  Fourth sample from decayed log
E  Fifth sample from decayed log
F  Sixth sample from decayed log, nearest the small end
C  Third sample from decayed log
1  Initial sample from large end of log
A  First sample from decayed nearest large end of log
B  Second sample from decayed nearest large end of log
2  Initial sample from small end of log

Enumerated Domain for Attribute: SUBSTR
OB  Outer bark
IB  Inner bark
HW  Heartwood
SW  Sapwood
W  Undifferentiated wood; unable to distinguish SW from HW

Enumerated Domain for Attribute: VOLFORM
5  Sector of circle: \( v = \frac{1}{4} \pi d^1 \left( \frac{d^2}{360} \right) d^3 \).
3  Frustum of cone: \( d^1 = \text{large end diam}, d^2 = \text{small end diam}, d^3 = \text{length}, \)
   \( v = \pi \frac{3}{2} d^3 \left( \frac{1}{4} \pi d^1 \left( d^1 + \frac{d^2}{2} \right) + \frac{d^2}{4} \right) \).
1  Cylinder: \( d^1 = \text{diameter}, d^2 = \text{length}, v = \pi \frac{1}{4} d^1 d^2 d^3 \).
2  Rectangular parallelepoid: \( d^1, d^2, d^3 \) are lengths of sides, \( v = d^1 d^2 d^3 \).
4  Triangular piece: \( d^1 = \text{log side of triangle}, d^2 = \text{base of triangle}, d^3 = \text{thickness of piece}, v = a d^3 \)
6  Donut shape; circle with hollow