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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**1. Log Descriptions Including Length, Diameters, Bark Cover**

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<thead>
<tr>
<th>Attribute List</th>
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<tbody>
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<td>DBCODE</td>
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<tr>
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<tr>
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<td>YEAR</td>
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<tr>
<td>NUMBER</td>
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<td>SPECIES</td>
</tr>
<tr>
<td>LOCATION</td>
</tr>
<tr>
<td>POSITION</td>
</tr>
<tr>
<td>LENGTH</td>
</tr>
<tr>
<td>BARKCOVER</td>
</tr>
<tr>
<td>X0</td>
</tr>
<tr>
<td>DM0</td>
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<td>X1</td>
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2: Radial Thickness Of Tissue Types

**Attribute List:**

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**STUDYID** N N char(3) place

**YEAR** Y N numeric(4,0) range 1985.0000 2015.0000 number

**NUMBER** Y N numeric(3,0) range 1.0000 280.0000 number

**END_REM** Y N char(1) enum

**HWT** N N numeric(4,1) range 0.0000 131.0000 cm

**SWT** N N numeric(4,1) range 4.0000 153.0000 cm

**IBT** N N numeric(4,1) range 1.0000 7.0000 cm

**OBT** N N numeric(4,1) range 1.0000 18.0000 cm

**SAMPLEDATE** N N datetime range 6/19/1985 11/10/2015 YYYY-MM-DD

3: Sample Dimensions, Weights, Density, and Moisture Contents

**Attribute List:**

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**STUDYID** N N char(3) place

**YEAR** Y N numeric(4,0) range 1985.0000 2015.0000 number
4: Log Volumes, Tissue Volumes, Total Mass, Proportional Mass

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<td>TVOL</td>
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<td>FVO</td>
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<td>FMO</td>
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FMS N N numeric(3,0) range 0.0000 100.0000 %
DENH N Y numeric(5,3) range 0.0000 0.6350 g/ml
DENI N Y numeric(5,3) range 0.0000 0.7000 g/ml
DENO N Y numeric(5,3) range 0.0000 0.9060 g/ml
DENS N N numeric(5,3) range 0.0000 0.6120 g/ml
MCH N Y numeric(3,0) range 0.0000 332.0000 %
MCI N Y numeric(3,0) range 0.0000 495.0000 %
MCO N Y numeric(3,0) range 0.0000 467.0000 %
MCS N N numeric(3,0) range 0.0000 525.0000 %
SAMPLEDATE N N datetime range 6/19/1985 12:00:00 AM 11/10/2015 12:00:00 AM YYYY-MM-DD

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. \( fmh = \frac{(f\text{vh} \times \text{tvol} \times \text{denh})}{\text{tmass}}. \)

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 frustrum 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 measurements on 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: \( v = \frac{1}{3}d1^2(d2/360)d3 \).
3  Frustum of cone: \( d1 = \) large end diam, \( d2 = \) small end diam, \( d3 = \) length, 
   \( v = \frac{\pi}{3}d3(d1^2/4 + d1d2/2 + d2^2/4) \).
1  Cylinder: \( d1 = \) diameter, \( d2 = \) length, \( v = \pi/4d1^2d1d2 \).
2  Rectangular paralleloid: \( d1, d2, d3 \) are lengths of sides, \( v = d1d2d3 \).
4  Triangular piece: \( d1 = \) log side of triangle, \( d2 = \) base of triangle, \( d3 = \) thickness of 
   piece, \( v = a^2d3 \)
6  Donut shape; circle with hollow