**Title:** Long-term growth, mortality and regeneration of trees in permanent vegetation plots in the Pacific Northwest, 1910 to present

**Abstract:**

A network of more than 130 permanent vegetation plots provides long-term information on patterns and rates of forest succession in most of the major forest zones of the Pacific Northwest. The plot network extends from the coast to the Cascades in western Oregon and Washington and east to ponderosa pine forests in the Oregon Cascades. Most of the permanent plots were established during two intervals: from 1910 to 1948, and from 1970 to 1989. The earlier plots were established by U.S. Forest Service researchers to quantify timber growth in young stands of important commercial species and to help answer other applied forestry questions. The more recent period of plot establishment began under the Coniferous Forest Biome program of the International Biological Program during the 1970s, and continued under the Long-term Ecological Research program. A broader set of objectives motivated plot establishment since 1970, especially quantification of composition, structure, and population and ecosystem dynamics of natural forests. Plots have one of three spatial arrangements: (1) contiguous rectangles subjectively placed within an area of homogeneous forest; (2) circular plots subjectively placed within an area of homogeneous forest; and (3) circular plots systematically located on long transects to sample an entire watershed, ridge, or reserve. Rectangular study areas are mostly 1.0 ha or 0.4 ha (1.0 ac) in size (slope-corrected). Circular plots are 0.1 ha (0.247 ac), not corrected for slope. The tree stratum is the focus of work in closed-forest study areas. All trees larger than a minimum diameter (5 cm for most areas) are permanently tagged. Plots are censused every 5 or 6 years. Attributes measured or assessed at each census include tree diameter, tree vigor, and the condition of the crown and stem. The same attributes are recorded for trees (ingrowth) that have exceeded the minimum diameter since the previous census. In many plots tree locations are surveyed to provide a plot-specific x-y location. A mortality assessment is done for trees that have died since the previous census. The assessment characterizes rooting, stem, and crown condition, obvious signs of distress or disturbance, and the apparent predisposing and proximate causes of tree death.

**Keywords:** Biomass; Biomass (trees); Biomass (woody debris); Disturbance; Ecosystem dynamics; Forest composition; Forest structure; Growth and yield; Long-Term Ecological Research (LTER); Long-term productivity; Mortality; Natural forests; Old-growth forests; Pathogens; Permanent plots; Primary production; Regeneration; Succession; Tree measurements; Windthrow; Spatial data; Organic matter; Stand structure; Long-Term Ecological Research (LTER); Forest dynamics; Measurements; Productivity; Biomass; Plant properties; Wind; Community composition; Plant species composition; Spatial properties; Long-term permanent plots; Succession; Primary production; Plant growth; mortality; regeneration; disease; disturbance; woody debris; organic matter; ecosystems; forests; old growth forests; trees; windthrow;

**Date data commenced:** 1910-02-01

**Date data terminated:** 2018-07-27

**Principal Investigator:** David Carl Shaw

**List of Entities:**

1. Initial tree conditions with spatial coordinates
2. Individual tree remeasurement
3. Individual tree mortality
4. Tree heights
5. Plot description and establishment year
6. Stand characteristics and sampling status
7. Stand GPS spatial data
8. Stem tallies in three stands of the Cascade Head EF
9. Summaries for density, basal area, volume, biomass, bole npp, and mortality

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Table containing periodic remeasurement data of individual trees within reference stands

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2. Individual tree remeasurement
### Individual tree mortality

Table recording individual tree mortality year and contributing conditions and causes of mortality

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4. Tree heights

Height data of selected trees.

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5. Plot description and establishment year

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### Stand characteristics and sampling status

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<td>N</td>
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<td>range 0.3900 59.4700 seconds</td>
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<td>N</td>
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8. Stem tallies in three stands of the Cascade Head EF
<table>
<thead>
<tr>
<th>Attribute</th>
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<th>Description</th>
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<tr>
<td>ENTITY</td>
<td>N N</td>
<td>numeric(2,0) range</td>
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<tr>
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<td>N N</td>
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<td>STANDID</td>
<td>Y N</td>
<td>char(4) place</td>
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<tr>
<td>YEAR</td>
<td>Y N</td>
<td>numeric(4,0) range</td>
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<tr>
<td>MONTH</td>
<td>N N</td>
<td>numeric(2,0) range</td>
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<tr>
<td>SPECIES</td>
<td>Y N</td>
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<tr>
<td>CLASSTYPE</td>
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<td>char(1) enum</td>
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<td>STEMCOUNT</td>
<td>N N</td>
<td>numeric(4,0) range</td>
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### Attribute List:

<table>
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<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
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<td>char(5) taxa</td>
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<td>Y N</td>
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<td>N N</td>
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<td>numeric(5,1) range %</td>
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<td>numeric(8,2) range m3/ha</td>
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<tr>
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<td>N Y</td>
<td>numeric(5,1) range %</td>
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<tr>
<td>ANN_MORT_BM</td>
<td>N Y</td>
<td>numeric(8,2) range megag/ha</td>
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<tr>
<td>NPP</td>
<td>N Y</td>
<td>numeric(6,2) range megag/ha*year</td>
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<tr>
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<td>N Y</td>
<td>numeric(8,2) range megag/ha</td>
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<tr>
<td>INIT_DENSITY</td>
<td>N Y</td>
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<tr>
<td>PCTMORTPERYR</td>
<td>N Y</td>
<td>numeric(7,2) range %</td>
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</table>

Attributes Definitions:

ADD_LCOORD
Additional legal coordinates

ADD_QRCODE
Additional quad reference code

ADD_QUAD
Additional quad maps

ADDHT
Additional height if base of tree not visible

AGE
Tree age at stand establishment

AGE_DOM
Age of dominant trees in stand at the time of plot establishment, estimated or based on tree-ring count.

ANBASE
Angle to base of tree

ANCRBASE
Angle to base of tree crown

ANN_MORT_BM
Annual mortality biomass (total only)

ANTENNAHT
Antenna height

ANTOP
Angle to top of tree

AREA
Area of plot

AREA_HA
Stand area in ha, slope-corrected

ASPECT
Overall aspect in degrees azimuth of stand

BASALAREA
Basal area

BEG_YEAR
Overall aspect of stand

BIOMASS
Bole biomass (wood plus bark)

BOLE1
Bole conditions

BROKEN
Was top broken?
CANOPY_CLASS
   Canopy class code

CHECK_NOTES
   Pertinent comments about the condition of the tree or to explain oddities about the measurement for a given remeasurement check

CLASSTYPE
   Type of class (d = diameter class, h = height class)

CLIMATE
   Climate information

COMMENTS
   General comments about the measurement

CONDITION1
   Condition code 1 - general tree health indicator is one of potentially six noted conditions in arbitrary order

CONDITION2
   Condition code 2 - general tree health indicator is one of potentially six noted conditions in arbitrary order

CONDITION3
   Condition code 3 - general tree health indicator is one of potentially six noted conditions in arbitrary order

CONDITION4
   Condition code 4 - general tree health indicator is one of potentially six noted conditions in arbitrary order

CONDITION5
   Condition code 5 - general tree health indicator is one of potentially six noted conditions in arbitrary order

CONDITION6
   Condition code 6 - general tree health indicator is one of potentially six noted conditions in arbitrary order

CRBASEHT
   Height to base of crown

CREW4_DAYS
   Total number of days required for remeasurement with a crew of 4 people

CROWN_PCT
   Percent of a tree's live crown volume that is still intact along the stem (does not apply to uprooted trees); record for living trees begins in 2010 (Entity 2) - only recorded when mortality is noted before 2010 (Entity 3).

CROWN_RATIO
   Percent of a tree's height with live branches around one third or more of the bole's circumference

CROWN1
   Crown conditions

DATUM
   Datum

DBCODE
   FSDB Database code

DBH
Tree diameter at breast height (1.37 m)

DBH_CODE
Describes cases where dbh was estimated using methods defined in the codes

DBH_LAST
Last measured tree diameter at breast height (1.37m) - typically from last remeasurement as dbh is usually not measured for dead trees

DENSITY
Density

DETAILPLOT
Indicates whether plot is a detail plot

DIRECTIONS
Explicit directions for reaching stand

DISTURB1
Disturbance conditions

DOM_TREE
Dominant tree species (codes according to Garrison et al., 1972)

DOM_YR
The year of remeasurement for which rank of tree species dominance (relative basal area) was assessed

ELEV_M
Elevation

ELEV_MASK
Elevation mask

ELEVATION
Stand elevation

ELEVSTDDEV
Elevation standard deviation

ENTITY
Entity number

EST_REPORT
Existance of establishement report (paper) and comments

EST_YEAR
Establishment year of plot

ESTAB
Establishment year

EXPANSION
Year(s) of stand expansion

FSDBCODE
Primary FSDB database code associated with study metadata and tree growth data for this STANDID
GEOIDSEP
Geoid differential

GROUND_PCT
Percent of the down portion of the tree bole that is in direct contact with the ground (does not include branch contact). Only applies to MAIN_STEM code= 1,2 or POSITION code=2,4

HEIGHT
Tree height

HERB_DOM
Dominant herbs, year of evaluation, and comments

HISTORY
Stand history

HITS
Number of positon fixes

IN_TV010
Indicates whether stand is part on TV010 database

INIT_BM
Bole biomass at the begining of a remeasurement period

INIT_DENSITY
Density at the begining of a remeasurement period (stems < 15cm in stands with detailplots are ignored)

INTERVAL
Remeasurement time interval (years)

LASTMORT
Most recent year of mortality check

LASTREM
Most recent year of remeasurement

LAT_DEC
Latitude decimal

LAT_DEG
Latitude degrees

LAT_MIN
Latitude minutes

LAT_SEC
Latitude seconds

LAT_UTM
Latitude utm

LATCENTER
Mean latitude value

LATITUDE
Stand latitude
LATSTDDEV
   Latitude standard deviation

LCOORD
   Legal coordinates

LEAN_ANGLE
   Angle of tree lean in degrees from vertical, where vertical is 0 degrees (not recorded for uprooted trees); record for living trees begins in 2010 (Entity 2) - only recorded when mortality is noted before 2010 (Entity 3).

LOC_NAME
   Location name

LOG_MAP
   Presence of log map (y/n)

LON_DEC
   Longitude decimal

LON_DEG
   Longitude degrees

LON_MIN
   Longitude minutes

LON_SEC
   Longitude seconds

LON_UTM
   Longitude utm

LONCENTER
   Mean longitude value

LONGITUDE
   Sand longitude

LONSTDDEV
   Longitude standard deviation

MAIN_STEM
   Main stem condition code (use of this code begins in 2010)

MAP_TREES
   A stem map (paper) exists for the stand (y/n)

MIDPOINT
   Midpoint of class in inches

MIN_DBH
   Minimum dbh measured in non-detail plots

MNG_AGNC
   Managing agency
MONTH

Month

MORT_CAUSE1

Proximate mortality cause: the immediate cause that precipitates tree death (defined as primary mortality cause before 2010)

MORT_CAUSE2

Predisposing mortality cause: any condition that produces a susceptibility or disposition to tree death without actually causing it (defined as secondary or contributing mortality cause before 2010)

MORT_NOTES

Mortality check comments added to clarify observations and decisions (for example, note the name of the pathogen if known)

MOSS_DOM

Dominant mosses, year of evaluation, and comments

NEXTMORT

Next mortality check

NEXTREM

Next remeasurement year

NPP

Net primary bole production

PCTMORTPERYR

Percent annual mortality

PDOP

Position, dilution and precision

PLOT_NR

Plot number

PLOTNUMBER

Plot number within STANDID

POSITION

Tree position (used prior to 2010); describes the physical position of the tree; POSITION is replaced with two separate measurements of MAIN_STEM and ROOTING beginning 2010

PSP_STUDYID

Permanent Study Plots (PSP) study identification code - a mutually exclusive grouping of study forest stands

QREF_CODE

Quad reference code

QUAD_MAP

Name of quad map

QUARTER

Quarter subplot number for circular plots - zero is assigned when quarter is not used or not applicable

REF_POINT

Reference point
REL_BA
Relative basal area

REL_BIOMASS
Relative biomass

REL_DENSITY
Relative density

REL_VOLUME
Relative bole wood volume

RNGR_DIST
Ranger district

ROOT
Rooting medium

ROOTING
Tree rooting condition code (use of this code begins in 2010)

SAMPL_DATE
Date of remeasurement (day of month was not always tracked; in these cases the 1st of each month is assigned)

SEASON
Season of remeasurement

SEC16TH
Direction of 1/16th section

SEC4TH
Direction of quarter section

SEC64TH
Direction of 1/64th section

SERAL
Seral stage

SHRUB_DOM
Dominant shrubs, year of evaluation, and comments

SIGSTR
Satellite signal level

SLOPE
Slope of plot

SLOPEDIST
Horizontal distance from measuring point to tree

SOILS
Soil information

SPECIES
Tree species code (Taxonomic reference: Garrison and Skovlin 1976)

ST_SLOPE
  Overall slope of stand in percent

STANDID
  Study forest stand or watershed identification code

START_DATE
  Starting date

STATE
  State

STEM_MAP
  Presence of stem map (y/n)

STEMCOUNT
  Count of stems in class

STND_SHAPE
  Plot shapes

SUPPORT_PCT
  Percent of the down portion of the tree bole that is supported above the ground (by its own branches, other trees or downed logs, or other objects such as rocks). Only applies to MAIN_STEM code=1,2 or POSITION code=2,4

TAG
  Current tree tag number

TOPO
  Stand topography information

TRANSECT
  Transect number

TREE_PCT
  Percent of the entire main stem length that is intact (does not apply to uprooted trees); record for living trees begins in 2010 (Entity 2) - only recorded when mortality is noted before 2010 (Entity 3).

TREE_STATUS
  Tree status code

TREE_VIGOR
  Overall vigor code

TREEID
  Tree identification code represented as STANDID+PLOTID+00000, where 00000 represents a unique tree number for that stand and plot

UNDERSTORY
  Presence of understory data (y/n)

UTM_DATUM
  Utm datum

VEG_TYPE
Dominant vegetation

VOLUME
Bole wood volume

XCOORD
X coordinate

YCOORD
Y coordinate

YEAR
Year of establishment, remeasurement, or mortality

Enumerated Domains:

Enumerated Domain for Attribute: BOLE1
U  No bole condition is recorded
1  Good straight bole
2  Pistol butt
3  Butt swell -- listed if abnormal for species
4  Forked or multiple butt
5  Leaning
6  Grouse ladder
7  Sweeping
8  Crooks in bole
9  Conks present

Enumerated Domain for Attribute: BOLE2
U  No bole condition is recorded
1  Good straight bole
2  Pistol butt
3  Butt swell -- listed if abnormal for species
4  Forked or multiple butt
5  Leaning
6  Grouse ladder
7  Sweeping
8  Crooks in bole
9  Conks present

Enumerated Domain for Attribute: BOLE3
U  No bole condition is recorded
1  Good straight bole
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>2</td>
<td>Pistol butt</td>
</tr>
<tr>
<td>3</td>
<td>Butt swell -- listed if abnormal for species</td>
</tr>
<tr>
<td>4</td>
<td>Forked or multiple butt</td>
</tr>
<tr>
<td>5</td>
<td>Leaning</td>
</tr>
<tr>
<td>6</td>
<td>Grouse ladder</td>
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<td>7</td>
<td>Sweeping</td>
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<tr>
<td>8</td>
<td>Crooks in bole</td>
</tr>
<tr>
<td>9</td>
<td>Conks present</td>
</tr>
</tbody>
</table>

**Enumerated Domain for Attribute: CROWN1**

- **U**: No crown condition is recorded
- 1: Crown in good condition
- 2: Broken top
- 3: Multiple tops or leaders
- 4: Dead top
- 5: Top condition is unknown
- 6: Half-crowned
- 7: Crook in crown
- 8: Mistletoe
- 9: Flat top

**Enumerated Domain for Attribute: CROWN2**

- **U**: No crown condition is recorded
- 1: Crown in good condition
- 2: Broken top
- 3: Multiple tops or leaders
- 4: Dead top
- 5: Top condition is unknown
- 6: Half-crowned
- 7: Crook in crown
- 8: Mistletoe
- 9: Flat top

**Enumerated Domain for Attribute: CROWN3**

- **U**: No crown condition is recorded
- 1: Crown in good condition
- 2: Broken top
3 Multiple tops or leaders
4 Dead top
5 Top condition is unknown
6 Half-crowned
7 Crook in crown
8 Mistletoe
9 Flat top

Enumerated Domain for Attribute: DBCODE
TV010 FSDB Data set code TV010

Enumerated Domain for Attribute: DISTURB1
U No disturbance condition noted
1 No scars or other disturbances observed
2 Fire scar
3 Log fall scar
4 Unknown scar
5 Animal scar
6 Frost crack
7 Lightning

Enumerated Domain for Attribute: DISTURB2
U No disturbance condition noted
1 No scars or other disturbances observed
2 Fire scar
3 Log fall scar
4 Unknown scar
5 Animal scar
6 Frost crack
7 Lightning

Enumerated Domain for Attribute: QUARTER
0 No quarter subplot number assigned
1 Quarter subplot number 1
2 Quarter subplot number 2
3 Quarter subplot number 3
4 Quarter subplot number 4

Enumerated Domain for Attribute: ROOT
Rooting medium not recorded
1 Trees rooted in mineral medium
2 Trees rooted in an organic medium
3 Rooting medium examined but unknown

Enumerated Domain for Attribute: CANOPY_CLASS
C Co-dominant: Crown extends to the top of the general canopy layer and receives light from the top but not much from the sides
D Dominant: Crown emerges from the general canopy layer and receives light from the top and the sides
E Emergent: only used in Stand RS39 in 1992
I Intermediate: Crown extends into the lower portion of the general canopy layer and receives mostly filtered light from the top and the sides
S Suppressed: Crown completely beneath the general canopy layer
U Unknown or not measured

Enumerated Domain for Attribute: DBCODE
TV010 FSDB Data set code TV010

Enumerated Domain for Attribute: DBH_CODE
1 DBH estimated by linear interpolation or extrapolation
2 DBH estimated from growth rates of nearby trees of similar size
3 DBH estimated assuming 'no growth' (usually missing, non-vigorous, or damaged trees)
4 DBH estimated for individual boles using basal area of joint dbh of grown together (fused) trees
8 DBH is measured using a non-standard field procedure or estimated in the field
9 DBH estimated, method unknown or unspecified
G Good: normally measured DBH
M Missing: no measurement taken for missing or dead (mortality) trees
U Unknown: DBH is missing for a tree not listed as missing or dead
V Verified: diameter is double checked in the field
A DBH needs adjustment based on comments
5 DBH estimated for individual boles using USFS Forest Inventory and Analysis (FIA) method for Independent trees that grow together

Enumerated Domain for Attribute: QUARTER
0 No quarter subplot number assigned
1 Quarter subplot number 1
2 Quarter subplot number 2
3 Quarter subplot number 3
4 Quarter subplot number 4

Enumerated Domain for Attribute: TREE_STATUS
1 Living tree
Ingrowth - typically young and previously unmeasured trees that now satisfy minimum diameter requirements. Ingrowth codes are not used in the year of plot establishment.

Living stem is fused with one or more tree stems at measurement height and measured together as one.

Dead tree - typically is not noted in the year of plot establishment.

Tree is missing or not found; no measurements are possible.

Enumerated Domain for Attribute: TREE_VIGOR
1 Good vigor: no apparent signs of distress
2 Fair vigor: some signs of distress apparent (e.g., discolored foliage, paucity of leaves or needles, broken stem with few live branches)
3 Poor vigor: extreme distress apparent (i.e., death imminent)
M Vigor is not recorded for dead or missing trees
U Unknown vigor of a living tree - vigor is not recorded

Enumerated Domain for Attribute: MAIN_STEM
1 Main stem intact (not broken)
2 Main stem broken at or above the root collar
3 Main stem broken below root collar
9 Not recorded / missing

Enumerated Domain for Attribute: ROOTING
1 Fully rooted; root-soil interface intact, stem is freestanding
2 Partially uprooted (roots exposed), but stem is still freestanding and self-supporting
3 Uprooted and down, stem is not freestanding
9 Condition not recorded / missing

Enumerated Domain for Attribute: MORT_CAUSE1
01 Suppression
10 Disease
11 Mistletoe
12 Bark insect
13 Defoliating insect
14 Unknown pathogen
20 Windthrow
21 Co-opted windthrow
22 Windsnap
23 Broken top
24 Crushed by fallen GREEN tree or limb
30 Crushed by fallen DEAD tree, limb, rock, etc.
31 Lightning
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>32</td>
<td>Animal kill</td>
</tr>
<tr>
<td>33</td>
<td>Snow or ice breakage or crushing</td>
</tr>
<tr>
<td>34</td>
<td>Mudflow</td>
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<tr>
<td>40</td>
<td>Fire</td>
</tr>
<tr>
<td>50</td>
<td>Other disturbance</td>
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<tr>
<td>60</td>
<td>Unable to determine primal or primary cause during field inspection</td>
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<tr>
<td>70</td>
<td>Tree removed from plot via landslides or other disturbance. This does not apply to trees not found or missing.</td>
</tr>
<tr>
<td>99</td>
<td>Unknown: no attempt to note proximal or primary cause of mortality</td>
</tr>
<tr>
<td>02</td>
<td>Previously noted injury/damage</td>
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</table>

**Enumerated Domain for Attribute: MORT_CAUSE2**

<table>
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<tbody>
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<td>Unknown: no attempt to note proximal or primary cause of mortality</td>
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<tr>
<td>01</td>
<td>Suppression</td>
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<tr>
<td>10</td>
<td>Disease</td>
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<tr>
<td>11</td>
<td>Mistletoe</td>
</tr>
<tr>
<td>12</td>
<td>Bark insect</td>
</tr>
<tr>
<td>13</td>
<td>Defoliating insect</td>
</tr>
<tr>
<td>14</td>
<td>Unknown pathogen</td>
</tr>
<tr>
<td>20</td>
<td>Windthrow</td>
</tr>
<tr>
<td>21</td>
<td>Co-opted windthrow</td>
</tr>
<tr>
<td>22</td>
<td>Windsnap</td>
</tr>
<tr>
<td>23</td>
<td>Broken top</td>
</tr>
<tr>
<td>24</td>
<td>Crushed by fallen GREEN tree or limb</td>
</tr>
<tr>
<td>30</td>
<td>Crushed by fallen DEAD tree, limb, rock, etc.</td>
</tr>
<tr>
<td>31</td>
<td>Lightning</td>
</tr>
<tr>
<td>32</td>
<td>Animal kill</td>
</tr>
<tr>
<td>33</td>
<td>Snow or ice breakage or crushing</td>
</tr>
<tr>
<td>34</td>
<td>Mudflow</td>
</tr>
<tr>
<td>40</td>
<td>Fire</td>
</tr>
<tr>
<td>50</td>
<td>Other disturbance</td>
</tr>
<tr>
<td>60</td>
<td>Unable to determine primal or primary cause during field inspection</td>
</tr>
<tr>
<td>70</td>
<td>Tree removed from plot via landslides or other disturbance. This does not apply to trees not found or missing.</td>
</tr>
<tr>
<td>02</td>
<td>Previously noted injury/damage</td>
</tr>
</tbody>
</table>

**Enumerated Domain for Attribute: CONDITION1**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Green needles or leaves present</td>
</tr>
</tbody>
</table>
02 Dead needles or leaves present
03 Bark sloughing
04 Tree has been dead for several years
11 Crown flat-topped
12 Evidence for earlier loss of part of crown
13 Spike top / Top dieback
14 Crown stripped by falling tree or snag
21 Rot at break
41 Pitch tubes on bole
42 Beetle galleries
51 Conks
52 Rot
53 Tree hollow
54 Pitch sheets
55 Oozing wounds
56 Mistletoe plants observed
60 Witch's broom
71 Scarring of bole
72 Girdling
73 Woodpecker / Sapsucker activity
74 No bark remaining on tree
99 Condition code not noted
22 Top not found
43 Insect frass
44 Insect holes

Enumerated Domain for Attribute: CONDITION2
01 Green needles or leaves present
02 Dead needles or leaves present
03 Bark sloughing
04 Tree has been dead for several years
11 Crown flat-topped
12 Evidence for earlier loss of part of crown
13 Spike top / Top dieback
14 Crown stripped by falling tree or snag
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Rot at break</td>
</tr>
<tr>
<td>41</td>
<td>Pitch tubes on bole</td>
</tr>
<tr>
<td>42</td>
<td>Beetle galleries</td>
</tr>
<tr>
<td>51</td>
<td>Conks</td>
</tr>
<tr>
<td>52</td>
<td>Rot</td>
</tr>
<tr>
<td>53</td>
<td>Tree hollow</td>
</tr>
<tr>
<td>54</td>
<td>Pitch sheets</td>
</tr>
<tr>
<td>55</td>
<td>Oozing wounds</td>
</tr>
<tr>
<td>56</td>
<td>Mistletoe plants observed</td>
</tr>
<tr>
<td>60</td>
<td>Witch's broom</td>
</tr>
<tr>
<td>71</td>
<td>Scarring of bole</td>
</tr>
<tr>
<td>72</td>
<td>Girdling</td>
</tr>
<tr>
<td>73</td>
<td>Woodpecker / Sapsucker activity</td>
</tr>
<tr>
<td>74</td>
<td>No bark remaining on tree</td>
</tr>
<tr>
<td>99</td>
<td>Condition code not noted</td>
</tr>
<tr>
<td>22</td>
<td>Top not found</td>
</tr>
<tr>
<td>43</td>
<td>Insect frass</td>
</tr>
<tr>
<td>44</td>
<td>Insect holes</td>
</tr>
</tbody>
</table>

Enumerated Domain for Attribute: CONDITION3

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Green needles or leaves present</td>
</tr>
<tr>
<td>02</td>
<td>Dead needles or leaves present</td>
</tr>
<tr>
<td>03</td>
<td>Bark sloughing</td>
</tr>
<tr>
<td>04</td>
<td>Tree has been dead for several years</td>
</tr>
<tr>
<td>11</td>
<td>Crown flat-topped</td>
</tr>
<tr>
<td>12</td>
<td>Evidence for earlier loss of part of crown</td>
</tr>
<tr>
<td>13</td>
<td>Spike top / Top dieback</td>
</tr>
<tr>
<td>14</td>
<td>Crown stripped by falling tree or snag</td>
</tr>
<tr>
<td>21</td>
<td>Rot at break</td>
</tr>
<tr>
<td>41</td>
<td>Pitch tubes on bole</td>
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<td>42</td>
<td>Beetle galleries</td>
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<tr>
<td>52</td>
<td>Rot</td>
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<tr>
<td>53</td>
<td>Tree hollow</td>
</tr>
<tr>
<td>54</td>
<td>Pitch sheets</td>
</tr>
</tbody>
</table>
55  Oozing wounds
56  Mistletoe plants observed
60  Witch's broom
71  Scarring of bole
72  Girdling
73  Woodpecker / Sapsucker activity
74  No bark remaining on tree
99  Condition code not noted
22  Top not found
43  Insect frass
44  Insect holes

Enumerated Domain for Attribute: CONDITION4
01  Green needles or leaves present
02  Dead needles or leaves present
03  Bark sloughing
04  Tree has been dead for several years
11  Crown flat-topped
12  Evidence for earlier loss of part of crown
13  Spike top / Top dieback
14  Crown stripped by falling tree or snag
21  Rot at break
41  Pitch tubes on bole
42  Beetle galleries
51  Conks
52  Rot
53  Tree hollow
54  Pitch sheets
55  Oozing wounds
56  Mistletoe plants observed
60  Witch's broom
71  Scarring of bole
72  Girdling
73  Woodpecker / Sapsucker activity
74  No bark remaining on tree
99  Condition code not noted
22  Top not found
43  Insect frass
44  Insect holes

Enumerated Domain for Attribute: CONDITION5
01  Green needles or leaves present
02  Dead needles or leaves present
03  Bark sloughing
04  Tree has been dead for several years
11  Crown flat-topped
12  Evidence for earlier loss of part of crown
13  Spike top / Top dieback
14  Crown stripped by falling tree or snag
21  Rot at break
41  Pitch tubes on bole
42  Beetle galleries
51  Conks
52  Rot
53  Tree hollow
54  Pitch sheets
55  Oozing wounds
56  Mistletoe plants observed
60  Witch's broom
71  Scarring of bole
72  Girdling
73  Woodpecker / Sapsucker activity
74  No bark remaining on tree
99  Condition code not noted
22  Top not found
43  Insect frass
44  Insect holes

Enumerated Domain for Attribute: CONDITION6
01  Green needles or leaves present
02  Dead needles or leaves present
03 Bark sloughing
04 Tree has been dead for several years
11 Crown flat-topped
12 Evidence for earlier loss of part of crown
13 Spike top / Top dieback
14 Crown stripped by falling tree or snag
21 Rot at break
41 Pitch tubes on bole
42 Beetle galleries
51 Conks
52 Rot
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54 Pitch sheets
55 Oozing wounds
56 Mistletoe plants observed
60 Witch's broom
71 Scarring of bole
72 Girdling
73 Woodpecker / Sapsucker activity
74 No bark remaining on tree
99 Condition code not noted
22 Top not found
43 Insect frass
44 Insect holes

Enumerated Domain for Attribute: DBCODE
TV010 FSDB Data set code TV010

Enumerated Domain for Attribute: POSITION
1 Standing with crown (may be leaning)
2 Main stem broken
3 Crushed/knocked over/fallen over AND still rooted
4 Uprooted
9 Unknown: position not recorded or otherwise unknown

Enumerated Domain for Attribute: MAIN_STEM
1 Main stem intact (not broken)
2 Main stem broken at or above the root collar
3 Main stem broken below root collar
9 Not recorded / missing

Enumerated Domain for Attribute: ROOTING
1 Fully rooted; root-soil interface intact, stem is freestanding
2 Partially uprooted (roots exposed), but stem is still freestanding and self-supporting
3 Uprooted and down, stem is not freestanding
9 Condition not recorded / missing

Enumerated Domain for Attribute: BROKEN
N TREE NORMAL (BLANK)
B TREE WITH BROKEN TOP

Enumerated Domain for Attribute: DBCODE
TV010 FSDB Data set code TV010

Enumerated Domain for Attribute: DETAILPLOT
T Plot is a detailplot
F Plot is not a detailplot

Enumerated Domain for Attribute: IN_TV010
T Stand is in TV010 database
F Stand is not in TV010 database

Enumerated Domain for Attribute: LOG_MAP
Y Stem map exists
N Stem map does not exist

Enumerated Domain for Attribute: MAP_TREES
Y Stem map exists
N Stem map does not exist

Enumerated Domain for Attribute: SERAL
Old-growth Old-growth stage
Mature Mature stage
Young Young stage

Enumerated Domain for Attribute: STEM_MAP
Y Stem map exists
N  Stem map does not exist

**Enumerated Domain for Attribute: UNDERSTORY**
- Y  Stem map exists
- N  Stem map does not exist

**Enumerated Domain for Attribute: SEASON**
- Spring  Spring remeasurement; before leaf out
- Summer  Summer remeasurement

**Enumerated Domain for Attribute: FSDBCODE**
- **TV010**  Tree growth and mortality measurements in long-term permanent vegetation plots in the Pacific Northwest (LTER Reference Stands) study code
- **TP073**  Plant succession and biomass dynamics following logging and burning in the Andrews Experimental Forest Watersheds 1 and 3, 1962-Present study code
- **TP041**  Post-logging community structure and biomass accumulation in Andrews Experimental Forest Watershed 10 study code
- **TP059**  WATERSHED 10, H.J. ANDREWS EF; RIPARIAN study code
- **TP098**  MACK WATERSHED, H.J. ANDREWS EF; RIPARIAN study code
- **TP114**  Plant biomass dynamics following logging, burning, and thinning in watersheds 6 and 7 at the Andrews Experimental Forest study code
- **TP115**  Plant biomass dynamics in old-growth watersheds 8 and 9 at the Andrews Experimental Forest study code

**Enumerated Domain for Attribute: DBCODE**
- **TV010**  FSDB Data set code TV010

**Enumerated Domain for Attribute: CLASSTYPE**
- D  Diameter class
- H  Height class

**Enumerated Domain for Attribute: DBCODE**
- **TV010**  FSDB Data set code TV010

**Enumerated Domain for Attribute: DBCODE**
- **TV010**  FSDB Data set code TV010