Package ‘sitreeE’

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Author Clara Anton Fernandez [aut, cre]
Maintainer Clara Anton Fernandez <caf@nibio.no>
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Imports data.table, sitree
Description Provides extensions for package 'sitree' for allometric variables, growth, mortality, recruitment, management, tree removal and external modifiers functions.
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AM2016ClimateSensitiveSINorway

Climate-sensitive site index models for Norway

Description

Implementation of models for climate-sensitive site index models for Norway as described in Antón-Fernández et al. (2016).

Usage

AM2016ClimateSensitiveSINorway(soilquality, t.early.summer, waterbal, SI.spp)

Arguments

soilquality A factor with levels 1 to 5 indicating the soilquality category. 1 being the poorest soils and 5 the best soils

t.early.summer A vector with sum temperatures (in C) in spring and early summer (april, june and july)

waterbal A vector with the monthly moisture surplus in June (difference between the 30-year mean precipitation in June and mean potential evapotranspiration in June.).

SI.spp SI species, that is, the species for which SI should be calculated. 1 = spruce, 2 = pine, 3 = birch.

Value

Returns a vector with the estimated SI.

Author(s)

Clara Anton-Fernandez

References


Examples

AM2016ClimateSensitiveSINorway (soilquality = as.factor(c(1,2,3,4)),
  t.early.summer = c(10,20,30,10),
  waterbal = c(-40, 20,10,10),
  SI.spp = c(1,2,2,3))
biomass.birch.M1988

Marklund’s biomass equations

Description


Usage

biomass.spruce.M1988(dbh.cm, H.m)
biomass.pine.M1988(dbh.cm, H.m)
biomass.birch.M1988(dbh.cm, H.m)

Arguments

dbh.cm A vector with the dbh (diameter at breast height) of the trees, in cm.
H.m A vector with the heights of the trees, in meters.

Value

It returns a data.frame with the following biomass components in kg: living.branches, dead.branches, stem.wood, stump.roots, bark, usoil, rot1, rot2, and foliage.

Author(s)

Clara Anton Fernandez <caf@nibio.no>

References


Examples

biomass.spruce.M1988(dbh.cm = c(10, 20), H.m = c(8, 12))
Description


Usage

`biomass.birch.S2014(dbh.cm, H.m)`

Arguments

dbh.cm
H.m

Details

It uses stump.roots from biomass.birch.M1988 to calculate aboveground biomass (in kg) and belowground biomass (in kg). Aboveground biomass is calculated as Smith’s aboveground biomass (2014) + stump.roots. Belowground biomass is calculated as Smith’s belowground biomass (2016) - stump.roots.

Value

Returns a data.frame with the following biomass components: biomass.total.kg, biomass.aboveground.kg.S2014, biomass.belowground.kg.S2014, biomass.belowground.kg, biomass.aboveground.kg, living.branches, dead.branches, stem.wood, stump.roots, bark, usoil, rot1, rot2, foliage)

Author(s)

Clara Anton Fernandez (caf@nibio.no)

References


See Also

`biomass.birch.M1988`
biomass.norway.sitree

Examples

biomass.birch.S2014(dbh.cm = c(10, 20), H.m = c(12, 16))

biomass.norway.sitree  Calculates biomass for trees using the Norwegian biomass equations

Description

Calculates biomass

Usage

biomass.norway.sitree(dbh.mm, height.dm, tree.sp)

Arguments

dbh.mm     Diameter at breast height in mm.
height.dm  Tree height in dm.
tree.sp    Tree species according to the Norwegian NFI. It will use biomass.spruce.M1988 when tree.sp is 1, 2, 3, 21, or 29, biomass.pine.M1988 when tree.sp is 10, 11, or 20, and biomass.birch.S2014 otherwise.

Value

Returns a data.table containing the 12 columns resulting from applying the biomass functions.

See Also


Examples

bio.nor <- biomass.norway.sitree (dbh.mm = c(50, 60, 100 ), height.dm = c(40, 60, 80),
                                   tree.sp = c(1, 10, 30))
biomass.sitree

**Biomass for live, dead, or removed trees using Norwegian biomass functions**

**Description**
Calculates biomass for trees using the Norwegian biomass equations.

**Usage**

```r
biomass.sitree(tr, plot.data)
```

**Arguments**

- `tr` A trList or trListDead object.
- `plot.data` A data.frame or list with plot information. It should have at least plot.id and tree2ha.

**Value**

Returns a data.table containing the 12 columns resulting from applying the biomass functions.

**Author(s)**
Clara Anton Fernandez <caf@nibio.no>

**See Also**

- `biomass.birch.S2014`
- `biomass.birch.M1988`
- `biomass.pine.M1988`
- `biomass.spruce.M1988`
- `biomass.norway.sitree`

**Examples**

```r
##---- Should be DIRECTLY executable !! ----
##-- ==> Define data, use random,
##--or do help(data=index) for the standard data sets.
library(sitree)
## result.sitree <- sitree (tree.df = stand.west.tr,
## stand.df = stand.west.st,
## functions = list(
## fn.growth = 'grow.dbhinc.hgtinc',
## fn.mort = 'mort.B2007',
## fn.recr = 'recr.BBG2008',
## fn.management = NULL,
## fn.tree.removal = NULL,
## fn.modif = NULL,
## fn.prep.common.vars = 'prep.common.vars.fun'
## ),
## n.periods = 20,
```
height.of.X.tallest.trees

Mean height of X tallest trees

Description
It calculates the mean height of the X tallest trees by grouping variable (e.g. the plot ID)

Usage
height.of.X.tallest.trees(height, uplotID, num.trees)

Arguments
height A vector with heights
uplotID A vector with the grouping variable, most often this would be the plot ID.
num. trees Number of trees used to calculate the mean height.

Value
It returns a data.frame with two columns containing the uplotID and the mean height of the X tallest trees.

Note
This function can be used to calculate the average of the X largest values of any variable grouped by a grouping variable. It is mostly a wrapper for aggregate.

Author(s)
Clara Antón Fernández (caf@nibio.no)

See Also
lorey. height
Examples

```r
library(sitree)
height.of.X.tallest.trees(height = tr$height,
                         uplotID = tr$plot.id, 5)
```

---

**lorey.height**  
_Lorey’s height_

Description

Calculates Lorey’s height (mean height weighted by basal area). If group.id is not NULL, it will calculate Lorey’s height for each group.

Usage

```r
lorey.height(BA, height, group.id = NULL)
```

Arguments

- **BA**  
  A vector with the basal areas of the trees
- **height**  
  A vector with the height of the trees
- **group.id**  
  An optional vector with a grouping variable.

Value

If a grouping variable is provided it returns a data frame with two columns (group.id, and lorey.height). If a grouping variable is not provided it will return the Lorey’s height.

Author(s)

Clara Anton Fernandez (caf@nibio.no)

See Also

- `height.of.X.tallest.trees`

Examples

```r
library(sitree)
BA <- pi*(tr$dbh/2)^2
lorey.height(BA, tr$height)
lorey.height(BA, tr$height, tr$plot.id)
```
**PBAL**

*Basal area of larger trees*

**Description**

It calculates the basal area of larger trees for a plot.

**Usage**

\[ \text{PBAL}(\text{BA}) \]

**Arguments**

- \( \text{BA} \) A vector of trees basal area

**Value**

It returns a vector with the sum of the basal areas of larger trees. Trees with similar BA are not considered larger.

**Examples**

\[ \text{PBAL}(\text{c}(1,2,3,4,4)) \]

**PBAL.dbh.greater**

*Basal area of larger trees which are at least X cm larger than the tree of interest*

**Description**

Calculates the basal area (in cm\(^2\) if dbh is in mm) of trees that are at least X (in the same units as dbh) larger than the tree of interest for a list of trees.

**Usage**

\[ \text{PBAL.dbh.greater}(\text{dbh.mm}, \text{dbh.mm.diff}) \]

**Arguments**

- \( \text{dbh.mm} \) a vector of dbh in mm
- \( \text{dbh.mm.diff} \) minimum dbh difference between the tree and the tree of interest to be considered

**Details**

It estimates the basal area (in cm\(^2\)) of trees that are at least dbh.mm.diff mm larger than the tree of interest.
PlotDataToLong

Convert Plot data to a data.frame/data.table format

Description

It attempts to convert the plot level information to a data.frame/data.list format. For example, if management is an element of the plot list (pd) it will melt it to a long format.

Usage

PlotDataToLong(pd)

Arguments

pd A list with plot information. It specifically looks for two elements ‘stand.age.years’ and ‘management’.

Value

It returns a data.table with all vector from pd as columns, and dataframes melted.

Examples

library(sitree)

##result.sitree <- sitree (tree.df = tr, stand.df = fl,
## functions = list(fn.growth = 'grow.dbhinc.hgtinc',
## fn.mort = 'mort.B2007',
## fn.recr = 'recr.BBG2008',
## fn.management = 'management.prob',

Value

It returns a list with the basal area of larger trees.

Author(s)

Cara Antón-Fernández (email: caf@nibio.no)

See Also

PBAL
## fn.tree.removal = 'mng.tree.removal',
## fn.modif = NULL,
## fn.prep.common.vars = 'prep.common.vars.fun'),
## n.periods = 5,
## period.length = 5,mng.options = NA,
## print.comments = FALSE,
## fn.dbh.inc = "dbhi.BN2009",
## fn.hgt.inc = "height.korf",
## species.spruce = c(1, 2, 3),
## species.pine = c(10, 11, 20, 21, 29),species.harw = c(30, 31),
## fun.final.felling = "harv.prob",
## fun.thinning = "thin.prob",per.vol.harv = 0.83)
## PlotDataToLong(result.sitree$plot.data)

### top.height

#### Description
Average height of the n thickest trees per ha

#### Usage

```r
top.height(thickness, height, num.trees.per.ha, plot.id, plot.size.m2)
```

#### Arguments

- `thickness`: A vector with the thickness for every tree. Other variables can be used instead to thickness. This is only used to order the trees.
- `height`: Height of the trees.
- `num.trees.per.ha`: Number of trees per ha that the top height should correspond to. E.g. 100 trees per ha.
- `plot.id`: Vector with the plot.id to which every tree corresponds to.
- `plot.size.m2`: Plot size in square meters. It can be either a single number if all plots have the same size of a vector of equal length as thickness, height, and plot.id with the corresponding plot size for each tree.

#### Details
thickness, height, and plot.id should have the same length, that is, one value per tree.

#### Value
It returns a data.frame with two columns: top.heights in the same units as height, and plot.id.
Examples

top.height(thickness = runif(100, 10, 40), height = runif(100, 12, 45),
num.trees.per.ha = 100, plot.id = 1, plot.size.m2 = 250)

tree.age  ESTimation of individual tree age

Description

Estimates individual tree age of trees within a plot based on basal area, site index, species, and
development class.

Usage

tree.age(stand.age.years, plot.id, tree.BA.m2, dbh.mm,
SI.spp, SI.m, spp, dev.class, apply.correction = TRUE)

Arguments

stand.age.years  The age of the stand in years.
plot.id  The unique ID of the stand
 tree.BA.m2  A vector with the basal areas of each tree in m2.
 dbh.mm  A vector with the DBH in mm of each tree.
 SI.spp  Species for which SI has been calculated (1, 2, 3).
 SI.m  Site index (SI) in m.
 spp  Species group classification.
 dev.class  Development class.
 apply.correction  TRUE/FALSE. If a correction to age should be applied

Value

A vector with the estimated ages of trees

Author(s)

Clara Anton Fernandez <caf@nibio.no>

Examples

tree.age(stand.age.years = 40,
plot.id = c(1,1), tree.BA.m2 = c(0.05, 0.5), dbh.mm
= c(50,150), SI.spp = 2,
SI.m = 11, spp = c(1,1), dev.class = 3, apply.correction = TRUE)
volume.sitree

Volume for sitree output for Norwegian conditions

Description
It calculates volume following the Norwegian national forest inventory equations for a trList or trListDead object

Usage
volume.sitree(tr, plot.data)

Arguments

tr a trListDead or trList object
plot.data a list or data.frame containing at least a 'kom' and 'tree2ha' column/element. kom is the kommune (municipality) code, and tree2ha should be the expansion factor to go from tree to per ha basis.

Details
It uses the volume.norway function to estimate the volume for all trees with dbh.mm greater than 0. It returns NA when dbh.mm is 0 or lower. tree2ha is included to facilitate the calculation of per ha values.

Value
It returns a data.table with columns for treeid, plot.id, dbh.mm, height.dm, kom, tree2ha, tree.sp, vol.w.tr.m3 (volume with bark in m3 per tree), and vol.wo.tr.m3 (volume without bark in m3 per tree)

Author(s)
Clara Anton Fernandez

Examples
library(sitree)
#res <- sitree (tree.df = tr,
#    stand.df = fl,
#    functions = list(
#        fn.growth = 'grow.dbhinc.hgtinc',
#        fn.mort = 'mort.B2007',
#        fn.recr = 'recr.BBG2008',
#        fn.management = 'management.prob',
#        fn.tree.removal = 'mng.tree.removal',
#        fn.modif = NULL,
#        fn.prep.common.vars = 'prep.common.vars.fun'
##
## n.periods = 5,
## period.length = 5,
## mng.options = NA,
## print.comments = FALSE,
## fn.dbh.inc = "dbh.BN2009",
## fn.hgt.inc = "height.korf",
## species.spruce = c(1, 2, 3),
## species.pine = c(10, 11, 20, 21, 29),
## species.harw = c(30, 31),
## fun.final.felling = "harv.prob",
## fun.thinning = "thin.prob",
## per.vol.harv = 0.83
##
## volume.sitree(tr = res$live, plot.data = res$plot.data)
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