Package 'wafR'

March 22, 2022

Title Data management and graphing for WAF

Version 0.0.0.9000

Description This package helps standardise data management and graphing for the outputs of the national wood availability forecast (WAF) produced by Margules Groome for the NZ MPI.

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Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.1.2

Imports ggplot2,
grDevices,
rlang,
dplyr,
grid,
magrittr,
here,
tidyr,
cowplot,
lemon,
gtable,
purrr

Depends R (>= 2.10)

R topics documented:

---

ba   *Basal Area - m2/ha*

Description

The basal area is the area of a given section of land that is occupied by the cross-section of tree trunks and stems at the base.

Usage

```
ba(DBH, plotsize)
```

Arguments

DBH	Field containing the tree DBH in cm
plotsize	Area of the plot in hectares

Value

The basal area in

Examples

```
## Not run:
ba(DBH = dbh_2,plotsize = 0.02)

## End(Not run)
```

`bi2000` *Taper bi2000*

Description

D Bi, H; 2000; Trigonometric variable-form taper equations for Australian Eucalypts; Forest Science 46(3) pp397-409.

Usage

```
bi2000(DBH, h, H, coefficients)
```

Arguments

DBH	(diameter at breast height).
h	Height for predicted diameter
H	Total tree height.
coefficients	Equation coefficients

Value

stem diameter at h

Examples

```
## Not run:
bi2000(30,5,40,coef())

## End(Not run)
```

`bi2000_squared` *Taper bi2000 squared*

Description

Internal function to be integrated for the integration of the Bi 2000 volume function

Usage

```
bi2000_squared(DBH, h, H, coefficients)
```

Arguments

DBH	Tree DBH in cm
h	Stem diameter height in m
H	Tree height in m
coefficients	equation coefficients

Value

squared stem diameter at h

Examples

```
## Not run:
bi2000(30,5,40,coef())

## End(Not run)
```

---

bi2000_volume   *Volume bi2000*

Description

D Bi, H; 2000; Trigonometric variable-form taper equations for Australian Eucalypts; Forest Science 46(3) pp397-409.

Usage

```
bi2000_volume(DBH, stump_height, h, H, coefficients)
```

Arguments

DBH	Tree diameter at breast height in cm
stump_height	Tree stump height in m
h	Height for predicted diameter
H	Tree height in m
coefficients	Equation coefficients

Value

Stem volume

Examples

```
## Not run:
bi2000_volume(30,0.3, 5,40,coef())

## End(Not run)
```

---

bi_tapercoef_aus   *BiTaper Coefficients Australia*

Description

Coefficients for Australian Eucalypts and P. radiata. Eucalypt coefficients from table 1 in Bi, H; 2000; Trigonometric variable-form taper equations for Australian Eucalypts; Forest Science 46(3) pp397-409. Radiata coefficients from Table 2 in Bi, H and Long, Y. (2001) Flexible taper equation for site-specific management of Pinus radiata in NSW, Australia For. Ecol. and Management 148

Usage

```
bi_tapercoef_aus(species)
```

Arguments

species   Eucalyptus species code

Value

Coefficients for Australian Eucalypts for the Bi model

Examples

```
bi_tapercoef_aus('CMAC')
```

---

clearfellAge_line   *Line graph showing clearfell ages*

Description

Function for plotting line graphs of clearfell ages from Woodflow model outputs

Usage

```
clearfellAge_line(data, Year, value, colourVariable, WAF_form)
```

Arguments

data	Dataframe containing woodflow outputs. This will typically have been produced using e.g. Remsoft Woodstock
Year	Column in df containing values for the x-axis
value	Column containing values to be plotted on the y-axis. This will typically be volume
colourVariable	Variable to use for assigning fill colour to the bar graph
WAF_form	Boolean indicating whether plot for WAF reporting or not. Default = TRUE

---

conf.int   *Confidence interval*

Description

Calculate the confidence limit for a confidence interval around a mean at the 95% confidence level

Usage

```
conf.int(mu)
```

Arguments

mu   The sampled variable. This might commonly be set of values calculated from
                    inventory plots

Value

The confidence limit in the same units as mu

Examples

```
vols<-runif(20, 150, 250)
conf.int(mu = vols)
```

---

is_outlier   *Identify outliers*

Description

Function that identifies whether observations are outliers.

Usage

```
is_outlier(x, type = "both", outlier_range = 1.5)
```

Arguments

x   The variable of interest

type   Choose whether to identify 'high', 'low', or 'both' types of outliers. Default is
                    'both'.

outlier_range   The number of times outside the IQR that an observation is deemed to be an
                    outlier. Default = 1.5.

Examples

```
x <- rnorm(n = 1000, mean = 100) # Create a normally distributed dataset

is_outlier(x) # Find outliers

boxplot(x) # Plot x to visualise the outliers
```

MagGroome_cols   *Extract Margules Groome colour hex codes*

Description

Function to extract Margules Groome colours as hex codes

Usage

```
MagGroome_cols(...)
```

Arguments

...   Character name of MagGroome_colors

Value

hex code for Margules Groome Colour

Examples

```
MagGroome_cols('mgcblue')
```

MagGroome_pal   *Return function to interpolate a Mag Groome color palette*

Description

Return function to interpolate a Mag Groome color palette

Usage

```
MagGroome_pal(palette = "main", reverse = FALSE, ...)
```

Arguments

palette	Character name of palette in MagGroome_palettes
reverse	Boolean indicating whether the palette should be reversed
...	Additional arguments to pass to colorRampPalette()

Examples

```
MagGroome_pal('main') (10)
```

mdd	*MDD*

Description

Calculate the plot mean dominant DBH

Usage

```
mdd(DBH, H, plotsize)
```

Arguments

DBH	Field containing the tree DBHs in cm
H	Field containing the tree heights in m
plotsize	Plot area in ha

Value

Mean dominant DBH (cm)

Examples

```
dbh<-runif(20, 20 ,30)
h<-runif(20, 25, 35)
plot.size <- 0.06
mdd(DBH = dbh, H = h, plotsize = plot.size)
```

MG_save	*Save plots in the MG report style*

Description

Convenience function for saving plots in the style needed for the Margules Groome report output. PNG files produced are suitable for copying directly into Word docs.

Usage

```
MG_save(plt, height, fileName)
```

Arguments

plt	ggplot object to be saved
height	Height in cm of the figure in the document. A single panel is often 10 cm but greater heights are suggested for multiple panel plots.
fileName	File name for the output. Should end with .png

---

mth   *Mean Top Height*

Description

The average height of the primary leaders of the largest 100 trees per hectare where largest is measured in terms of the dbh of the primary leader of that tree.

Usage

```
mth(DBH, H, plotsize)
```

Arguments

DBH   Field containing the tree DBH values in cm measured in the plot

H   Field containing the tree height measurements in m.

plotsize   Area of the plot in hectares

Value

The mean top height of the plot.

Examples

```
## Not run:
mth(DBH = dbh_m, H = h_m, plotsize = 0.05)

## End(Not run)
```

---

pdh   *Predominant Mean Height*

Description

The average height of the primary leaders of the largest 100 trees per hectare where largest is measured in terms of the height of the primary leader of that tree.

Usage

```
pdh(DBH, H, plotsize)
```

Arguments

DBH   Tree DBH in cm

H   Total tree height in m.

plotsize   Plot area in ha

Value

The predominant top height of the plot.

Examples

```
## Not run:
mth(DBH, H, plotsize)

## End(Not run)
```

---

ple   *Probably limit of error (PLE) around a mean*

Description

Calculate the PLE around a mean at the 95% confidence level. This statistic is commonly used in forest inventory analysis in NZ and Australia

Usage

```
ple(mu)
```

Arguments

mu   The sampled variable. This might commonly be set of values calculated from inventory plots

Value

The PLE in percent

Examples

```
vols<-runif(20, 150, 250)
ple(mu = vols)
```

---

prepare_WAF_allrep   *Prepare WAF allrep data*

Description

Function that transforms data from the allrep output of Remsoft Woodstock

Usage

```
prepare_WAF_allrep(df, startYear, cutOverYear)
```

Arguments

df   The WAF allrep file.

startYear   Simulation start year.

cutOverYear   simulation cutover year.

QMD *Quadratic mean DBH*

Description

Calculate the quadratic mean DBH

Usage

```
QMD(DBH)
```

Arguments

DBH   tree DBH values

Value

Quadratic mean DBH

Examples

```
## Not run:
QMD(DBH = dap)

## End(Not run)
```

RMSE *RMSE*

Description

Calculate the RMSE

Usage

```
RMSE(predicted, actual)
```

Arguments

predicted   Predicted value

actual   Actual values

Value

Root mean square error

scale_colour_MagGroome

Color scale constructor for MagGroome colors

Description

Color scale constructor for MagGroome colors

Usage

```
scale_colour_MagGroome(palette = "main", discrete = TRUE, reverse = FALSE, ...)
```

Arguments

palette	Character name of palette in MagGroome_palettes
discrete	Boolean indicating whether color aesthetic is discrete or not
reverse	Boolean indicating whether the palette should be reversed
...	Additional arguments passed to discrete_scale() or scale_color_gradientn(), used respectively when discrete is TRUE or FALSE

Examples

```
scale_colour_MagGroome()
```

scale_fill_MagGroome   *Fill scale constructor for MagGroome colours*

Description

Fill scale constructor for MagGroome colours

Usage

```
scale_fill_MagGroome(palette = "main", discrete = TRUE, reverse = FALSE, ...)
```

Arguments

palette	Character name of palette in MagGroome_palettes
discrete	Boolean indicating whether color aesthetic is discrete or not
reverse	Boolean indicating whether the palette should be reversed
...	Additional arguments passed to discrete_scale() or scale_fill_gradientn(), used respectively when discrete is TRUE or FALSE

Examples

```
scale_fill_MagGroome()
```

---

shift_legend   *Shift legend*

Description

Shift legend into empty facets in a multipanel ggplot.

Usage

```
shift_legend(p)
```

Arguments

p   The ggplot2 multi-panel object.

---

spha   *SPHA*

Description

Return stems per hectare

Usage

```
spha(DBH, plotsize)
```

Arguments

DBH   Field containing the tree DBH in cm

plotsize   Area of the plot in hectares

Value

Stems per hectare with a DBH greater than 0

Examples

```
## Not run:
spha(DBH = dap,plotsize = 0.02)

## End(Not run)
```

---

std.err   *Standard error*

Description

Calculate the standard error of a sample

Usage

```
std.err(mu)
```

Arguments

mu   The sampled variable. This might commonly be set of values calculated from
                    inventory plots

Value

The standard error in the same units as mu

Examples

```
vols<-runif(20, 150, 250)
std.err(mu = vols)
```

---

theme_MagGroome   *Margules Groome plotting theme for ggplots*

Description

Function for Margules Groome general and WAF plotting theme for ggplots. Once appllied you can
further customise using theme

Usage

```
theme_MagGroome(WAF = FALSE)
```

Arguments

WAF   Boolean indicating whether plot for WAF reporting or not. Default = FALSE

Examples

```
theme_MagGroome(WAF = FALSE)
```

---

tpha *TPHA*

Description

Function to return the number of trees per hectare

Usage

```
tpha(TreeNo, plotsize)
```

Arguments

TreeNo	Tree name
plotsize	Plot size in hectares

---

tpr_max_burkhart_safh *Stem taper*

Description

Max and Burkhart taper function with regression coefficients from the South African forestry handbook

Usage

```
tpr_max_burkhart_safh(DBH, H, h, coefficients)
```

Arguments

DBH	Tree DBH in cm
H	Tree height in m
h	Stem height
coefficients	Equation coefficients

Value

stem diameter at height h

---

volume_graph_bar *Bar graph showing woodflow volumes*

Description

Function for plotting bar graphs of volumes from Woodflow model outputs

Usage

```
volume_graph_bar(
  data,
  value,
  Year,
  fillvariable,
  WAF_form = TRUE,
  Species_select = "Radiata_pine",
  ylim = 7e+06
)
```

Arguments

data	Dataframe containing woodflow outputs. This will typically have been produced using e.g. Remsoft Woodstock
value	Column containing values to be plotted on the y-axis. This will typically be volume
Year	Column in df containing values for the x-axis
fillvariable	Variable to use for assigning fill colour to the bar graph
WAF_form	True/False indicating whether plot for WAF reporting or not. Default = TRUE
Species_select	Which species is being plotted if this is a WAF report output, Default = 'Radiata_pine'
ylim	Maximum value for the y axis

Examples

```
data("WAF_allrep")

volume_graph_bar(data = WAF_allrep,
value = value, Year = Year,
fillvariable = Ownership,
WAF_form = TRUE,
Species_select = 'Radiata_pine')
```

---

volume_graph_line   *Line graph showing woodflow volumes*

Description

Function for plotting line graphs of volumes from Woodflow model outputs

Usage

```
volume_graph_line(
  data,
  value,
  Year,
  colourvariable,
  WAF_form = TRUE,
  Species_select = "Radiata_pine",
  ylim = 7e+05
)
```

Arguments

data	Dataframe containing woodflow outputs. This will typically have been produced using e.g. Remsoft Woodstock
value	Column containing values to be plotted on the y-axis. This will typically be volume
Year	Column in df containing values for the x-axis
colourvariable	Variable to use for assigning fill colour to the bar graph
WAF_form	True/False indicating whether plot for WAF reporting or not. Default = TRUE
Species_select	Which species is being plotted if this is a WAF report output, Default = 'Radiata_pine'
ylim	Maximum value for the y axis

---

vol_tpr_coef_sa   *SA Vol TPR coefficients*

Description

Coefficients for the volume and taper equation from the South African Forestry handbook

Usage

```
vol_tpr_coef_sa(species)
```

Arguments

species	Species code

Value

Returns equation coefficients for South Africa.

Examples

```
vol_tpr_coef_sa('EGRA')
```

`vol_tree_safh` *Estimate tree volume*

Description

Estimate tree volume from DBH and height using functions from the South African Forestry Handbook. These species are available. 'A. mearnsii', 'A. melanoxylon', 'C. equisetifolia', 'E. camaldulensis', 'E. cladocalyx', 'E. diversicolor', 'E. fastigata', 'E. globulus', 'E. grandis', 'E. maculata', 'E. nitens', 'E. grandis x camaldulensis', 'P. canariensis', 'P. caribea', 'P. elliotti', 'P. patula', 'P. pinaster', 'P. radiata', 'P. taeda', 'T. grandis'

Usage

```
vol_tree_safh(DBH, H, coefficients)
```

Arguments

DBH	Tree DBH in cm
H	Tree height in m
coefficients	Equation coefficients

Value

Returns tree volume in cubic metres

`WAF_allrep` *Simple Woodflow example for Marlborough.*

Description

A dataset containing the recoverable volumes for a scenario in Marlborough. Data extracted from the allrep report.

Usage

```
WAF_allrep
```

Format

A data frame with 62 rows and 10 variables:

Output Output identifier produced by Woodstock

VariableName Name of the variable contained in the value field

WSR Wood supply region

Species Species code

Ownership Ownership code

Action Model action that generated the data

PeriodText Model period when the action occurred

value value of VariableName produced

Year Calendar year when the action occurred

Scenario Wood flow modelling scenario used to generate the data ...

Source

<http://www.margulesgroome.com>

YT_graph_line   *Line graph showing yield tables*

Description

Function for plotting line graphs of clearfell ages from Woodflow model outputs

Usage

```
YT_graph_line(data, Year, value, colourVariable, WAF_form)
```

Arguments

data	Dataframe containing woodflow outputs. This will typically have been produced using e.g. Remsoft Woodstock
Year	Column in df containing values for the x-axis
value	Column containing values to be plotted on the y-axis. This will typically be volume
colourVariable	Variable to use for assigning fill colour to the bar graph
WAF_form	Boolean indicating whether plot for WAF reporting or not. Default = TRUE

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