

Package: CBMutils (via r-universe)

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Type Package

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Description Implementation of several components of the Carbon Budget Model of the Canadian Forest Service (v3).

URL <https://github.com/PredictiveEcology/CBMutils>

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License GPL-3

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<i>adjustCohortAges</i>	<i>Adjust cohort ages</i>
-------------------------	---------------------------

Description

Adjust cohort ages to represent a year before or after a given date. Optionally include disturbance events that reset ages to year 0.

Usage

```
adjustCohortAges(  
  cohortAges,  
  yearInput,  
  yearOutput,  
  disturbanceEvents = NULL,  
  delay = NULL,  
  default = NULL,  
  warn = TRUE  
)
```

Arguments

cohortAges	data.table. Table of cohort ages with an ID column and the numeric columns 'age'. Optionally include a 'delay' column with regeneration delays for each cohort. A standard delay can also be provided with the delay argument. Optionally include a 'default' column with the default age for the cohort if it cannot be otherwise calculated. A default age can also be provided with the default argument.
yearInput	integer. The year that the 'ages' column in cohortAges represents.
yearOutput	integer. The year that cohort ages must be adjusted to.

disturbanceEvents	data.table. Optional. Table of disturbance events with the ID column in cohortAges and another column 'year' of when the disturbance occurred. This can also include rows for years that cohorts were first established.
delay	integer. Optional. Regeneration delay after a disturbance event.
default	integer. A default age for cohorts is otherwise unknown. If yearOutput precedes yearInput, the age cannot be calculated for cohorts that have disturbances between yearOutput and yearInput but none before yearOutput. default will be assigned in these cases. NOTE: if a cohort has an age lesser than the difference in these years, it is assumed that a disturbance event must have occurred when age == 0. default will be assigned in these cases.
warn	logical. Warn if ages cannot be calculated or if the provided disturbances do not match the input data.

Value

cohortAges with ages adjusted to yearOutput.

ageStepBackward

Age Step Backwards

Description

Step an age raster backwards in time. Ages that are set as <0 are replaced with surrounding ages >0 with idw_replace.

Usage

```
ageStepBackward(
  ageRast,
  yearIn,
  yearOut,
  distEvents = NULL,
  fill = TRUE,
  fillLT0 = TRUE,
  idp = 2,
  nmax = 100,
  ...,
  agg.fact = 1,
  agg.fun = "median",
  agg.na.rm = TRUE
)
```

Arguments

ageRast	SpatRaster. Raster with numeric values of cohort ages.
yearIn	numeric. Year that ages in ageRast represent.
yearOut	numeric. Year that ages will be stepped backwards to.
distEvents	data.table. Optional. Table of disturbance events with columns "pixelIndex" and "year". If provided, disturbances will be reversed and the disturbed areas will be filled with <code>idw_replace</code> .
fill	logical. Fill disturbed areas with values interpolated from surrounding cells.
fillLT0	logical. Fill cells with ages <0 with values interpolated from surrounding cells.
idp	numeric. IDW power.
nmax	numeric. The maximum number of nearest observations to use.
...	additional arguments to <code>idw_replace</code> .
agg.fact	Aggregation factor for the input raster. If >1, the raster will be aggregated before cell values are extracted as input data points for interpolation. This smooths the input data and speeds up the interpolation process. See <code>aggregate</code> .
agg.fun	Aggregation function.
agg.na.rm	Remove NA cells when aggregating.

Value

SpatRaster

alternativeParams	<i>Extract alternative set of parameters to apply to convert total biomass into pool biomass.</i>
-------------------	---

Description

When there is no match for the given ecozone, the parameters for a different ecozone in the same province/territory is returned. If there is no match for a given province/territory, the parameters for a different province/territory in the same ecozone is returned. If there is no match for the given ecozone and province/territory, the parameters for a different location is returned.

Usage

```
alternativeParams(params, table, cols)
```

Arguments

params	data.table containing a row for each curve with all required parameters.
table	data.table of the parameters.
cols	vector of parameter column names.

Value

A single data.table containing a row for each curve with all required parameters from bTable6tb, bTable7tb, and tableMerch.

b_m	<i>Calculate stemwood biomass (per ha) of live merchantable trees</i>
-----	---

Description

Implements equation 1 of Boudewyn et al. (2007) to determines the total stemwood biomass of merchantable trees (in metric tonnes per hectare; T/ha), using parameters a and b from Table 3.

Usage

```
b_m(vol, bTable3)
```

Arguments

vol	gross merchantable volume per hectare (m^3/ha)
bTable3	Boudewyn et al. (2007) stem wood biomass model parameters for merchantable-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table3.csv .

Value

stemwood biomass of merchantable trees (b_m in units T/ha)

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

biomProp	<i>Proportions of total tree biomass in stemwood, bark, branches, and foliage</i>
----------	---

Description

Implements equations 4-7 of Boudewyn et al. (2007), used to determine the proportions of total tree biomass in stemwood, bark, branches, and foliage ($p_{stemwood}$, p_{bark} , $p_{branches}$, $p_{foliage}$, respectively), using parameters a , b from Table 6 and volume-proportion caps from Table 7.

Usage

```
biomProp(
  x,
  type = "volume",
  bTable6 = NULL,
  bTable7 = NULL,
  bTable6tb = NULL,
  bTable7tb = NULL
)
```

Arguments

x	vector gross merchantable volume per hectare (m^3/ha) or total biomass (<i>tonnes/ha</i>)
type	character specifies if the x represents gross merchantable volume per hectare ("volume") or total biomass ("biomass").
bTable6	Boudewyn et al. (2007) proportion model parameters. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table6.csv .
bTable7	Boudewyn et al. (2007) caps on proportion models. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table7.csv .
bTable6tb	Boudewyn et al. (2007) an alternative set of proportion model parameters to use when total biomass per hectare in tonnes (tb = stem wood + stem bark + branches + foliage) is the independent variable instead of gross merchantable volume per hectare. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table6_tb.csv .
bTable7tb	Boudewyn et al. (2007) an alternative set of caps on proportion models to use in conjunction with the alternative set of proportion models when total biomass per hectare in tonnes (tb = stem wood + stem bark + branches + foliage) is the independent variable instead of gross merchantable volume per hectare. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table7_tb.csv .

Details

TODO: will eventually add species, ecozone

Value

four-column matrix will columns corresponding to $p_{stemwood}$, p_{bark} , $p_{branches}$, and $p_{foliage}$

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

biomPropAGB	<i>Calculates proportions of total tree biomass in stemwood, bark, branches, and foliage.</i>
-------------	---

Description

Implements equations 4-7 of Boudewyn et al. (2007) adapted for biomass input using parameters a , b , and c from Table 6 (bTable6tb) and biomass-proportion caps from Table 7 (bTable7tb).

Usage

```
biomPropAGB(AGBwithParams)
```

Arguments

AGBwithParams	data.frame with both the total aboveground biomass B to split and the parameters extracted from tables 6 and 7.
---------------	---

Value

four-column matrix will columns corresponding to $p_{stemwood}$, p_{bark} , $p_{branches}$, and $p_{foliage}$

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

boudewynSubsetTables	<i>Subset Boudewyn tables to fit study area</i>
----------------------	---

Description

Subset Boudewyn tables to fit study area

Usage

```
boudewynSubsetTables(bTable, thisAdmin)
```

Arguments

bTable	Boudewyn table to subset
thisAdmin	Table defining study area with columns juris_id: jurisdiction abbreviation(s); and ecozone: ecozone ID(s).

Value

smallTable data.table

calcC	<i>Sum carbon for totalCarbon or aboveGround or belowGround</i>
-------	---

Description

Sum carbon for totalCarbon or aboveGround or belowGround

Usage

```
calcC(cbmPools, poolToSum, masterRaster)
```

Arguments

- | | |
|--------------|--|
| cbmPools | DESCRIPTION NEEDED |
| poolToSum | DESCRIPTION NEEDED |
| masterRaster | SpatRaster template defining the study area. |

Value

DESCRIPTION NEEDED

calcRootC	calcRootC
-----------	-----------

Description

calcRootC calculates the mass of carbon in roots pools from above ground pools

Usage

```
calcRootC(  
  aboveGroundC,  
  a_sw = 0.222,  
  b_sw = 1,  
  a_hw = 1.576,  
  b_hw = 0.615,  
  a_frp = 0.072,  
  b_frp = 0.354,  
  c_frp = -0.060212,  
  bRateBiomassToCarbon = 0.5  
)
```

Arguments

aboveGroundC	data.table of above ground biomass with the mass of carbon (tonnes/ha) in each pool. Columns can either be sw (Softwood = TRUE, hardwood = FALSE), Merch, Foliage and Other, or SoftwoodMerch, HardwoodMerch, SoftwoodFoliage, HardwoodFoliage, SoftwoodOther, and HardwoodOther.
a_sw	"a" value for softwood root biomass
b_sw	"b" value for softwood root biomass
a_hw	"a" value for hardwood root biomass
b_hw	"b" value for hardwood root biomass
a_frp	"a" value for fine root proportion
b_frp	"b" value for fine root proportion
c_frp	"c" value for fine root proportion
bRateBiomassToCarbon	numeric. Conversion factor of biomass to carbon.

Value

data.table with mass of carbon (tonnes/ha) in coarseRoots and fineRoots pools.

References

Li, Z., Kurz, W. A., Apps, M. J., & Beukema, S. J. (2003). Belowground biomass dynamics in the Carbon Budget Model of the Canadian Forest Sector: recent improvements and implications for the estimation of NPP and NEP. Canadian journal of forest research, 33(1), 126-136.

cbm4MapNPP	CBM4: mapNPP
------------	--------------

Description

Map Net Primary Productivity (NPP) across a study area.

Usage

```
cbm4MapNPP(cbm4_results, years = NULL, yearStart = 1)
```

Arguments

cbm4_results	character or SQLResultsProcessor. Path to CBM4 spatial datasets directory or a SQLResultsProcessor object created with SQLResultsProcessor .
years	integer. Year(s) of simulation results.
yearStart	integer. Simulation start year.

Value

ggplot

cbm4MapTotalCarbon	<i>CBM4</i> : mapTotalCarbon
--------------------	------------------------------

Description

Map total carbon across a study area.

Usage

```
cbm4MapTotalCarbon(cbm4_results, years = NULL, yearStart = 1)
```

Arguments

cbm4_results	character or <code>SQLResultsProcessor</code> . Path to CBM4 spatial datasets directory or a <code>SQLResultsProcessor</code> object created with SQLResultsProcessor .
years	integer. Year(s) of simulation results.
yearStart	integer. Simulation start year.

Value

ggplot

cbm4PlotEmissionsProducts	<i>CBM4</i> : plotEmissionsProducts
---------------------------	-------------------------------------

Description

Map total carbon across a study area.

Usage

```
cbm4PlotEmissionsProducts(cbm4_results, years = NULL, yearStart = 1)
```

Arguments

cbm4_results	character or <code>SQLResultsProcessor</code> . Path to CBM4 spatial datasets directory or a <code>SQLResultsProcessor</code> object created with SQLResultsProcessor .
years	integer. Year(s) of simulation results.
yearStart	integer. Simulation start year.

Value

ggplot

cbm4PlotPoolProportions

CBM4: plotPoolProportions

Description

CBM4: plotPoolProportions

Usage

```
cbm4PlotPoolProportions(cbm4_results, years = NULL, yearStart = 1)
```

Arguments

cbm4_results	character or SQLResultsProcessor. Path to CBM4 spatial datasets directory or a SQLResultsProcessor object created with SQLResultsProcessor .
years	integer. Year(s) of simulation results.
yearStart	integer. Simulation start year.

Value

ggplot

CBMsourceExtractToRast

CBM source: Extract to raster

Description

Prepare a data source from the [CBMsources](#) table with `link[reproducible]{prepInputs}`, then align the data with a template raster and extract values for each cell with `link{extractToRast}`.

Usage

```
CBMsourceExtractToRast(sourceID, templateRast, returnSource = FALSE, ...)
```

Arguments

sourceID	Source identifier.
templateRast	SpatRaster. Raster template.
returnSource	logical. Return the source spatial data object.
...	additional arguments to <code>link[reproducible]{prepInputs}</code>

CBMsourcePrepInputs	<i>CBM source: Prep inputs</i>
---------------------	--------------------------------

Description

Prepare a data source from the [CBMsources](#) table with `link[reproducible]{prepInputs}`.

Usage

```
CBMsourcePrepInputs(  
  sourceID,  
  inputPath = getOption("spades.inputPath", "."),  
  ...  
)
```

Arguments

- `sourceID` Source identifier.
- `inputPath` character. Path of download destination directory. Downloads will be sorted into subdirectories by data provider and region.
- `...` additional arguments to `link[reproducible]{prepInputs}`

CBMsources	<i>CBM Data Sources</i>
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Description

Data sources for CBM simulations. These can be read with `CBMsourcePrepInputs`.

Usage

```
CBMsources
```

Format

- A data table with 8 columns and 6 rows:
- sourceID** Source identifier.
 - provider** Data provider or inventory identifier.
 - year** Data year. The year that the data represents or was published.
 - region** Spatial domain. Defaults to all of Canada.
 - attr** Cohort or stand attribute defined by the source.
 - type** Spatial data type: 'vector' or 'raster'.
 - source** Data table of one or more downloadable data sources:

- url: Download URL of target data source.
- targetFile: File name of target data source.
- layer: Vector or raster layer.
- field: Vector attribute field.
- subattr: If the source is comprised of multiple vector fields or raster layers, this secondary attribute distinguishes each one.

...

convertAGB2pools	<i>Convert total above ground biomass into 3 pools (T/ha).</i>
------------------	--

Description

Implements the flowchart from figure 3 of Boudewyn et al. (2007) using an alternative set of parameter to divide total above ground biomass (T/ha) into total merchantable stemwood biomass (T/ha), foliage biomass (T/ha), and other wood biomass (T/ha).

Usage

```
convertAGB2pools(  
  AGB,  
  tableMerch,  
  bTable6tb = "https://nfi.nfis.org/resources/biomass_models/appendix2_table6_tb.csv",  
  bTable7tb = "https://nfi.nfis.org/resources/biomass_models/appendix2_table7_tb.csv",  
  ...  
)
```

Arguments

AGB	data.frame with columns: juris_id, ecozone, age, B and species, speciesCode, or canfi_species.
tableMerch	data.table with one row per b_nm. Parameters to estimate the proportion of stemwood biomass that is merchantable where $b_m/b_{nm} = k - \exp(-a * (b_{nm} - b))$ when b_{nm} is the total stemwood biomass and b_m is the total merchantable stemwood biomass. Available from https://drive.google.com/file/d/1wa2QMd7Eo-bPpfigchdpPP Parameters were estimated by approximating the relationship between stemwood biomass and nonmerchfactor predicted by equation 2 of Boudewyn et al. (2007).
bTable6tb	Boudewyn et al. (2007) an alternative set of proportion model parameters to use when total biomass per hectare in tonnes (tb = stem wood + stem bark + branches + foliage) is the independent variable instead of gross merchantable volume per hectare. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table6_tb.csv .

bTable7tb Boudewyn et al. (2007) an alternative set of caps on proportion models to use in conjunction with the alternative set of proportion models when total biomass per hectare in tonnes (tb = stem wood + stem bark + branches + foliage) is the independent variable instead of gross merchantable volume per hectare. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table7_tb.csv.

... arguments to `sppMatch` to get the CanFI species code if AGB does not have a `canfi_species` column.

Value

AGB table updated by reference with additional columns `merch`, `foliage`, and `other` with biomass (T/ha) in each above ground pool.

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

convertM3biom	<i>Calculate biomass from gross merchantable volume</i>
---------------	---

Description

Implements the flowchart from figure 3 of Boudewyn et al. (2007) to determined the total above ground biomass (T/ha) from gross merchantable volume (m^3/ha).

Usage

```
convertM3biom(
  meta,
  gCvalues,
  spsMatch,
  ecozones,
  bTable3 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table3.csv",
  bTable4 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table4.csv",
  bTable5 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table5.csv",
  bTable6 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table6.csv",
  bTable7 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table7.csv"
)
```

Arguments

<code>meta</code>	Growth curve metadata
<code>gCvalues</code>	Growth curve volume values for each age
<code>spsMatch</code>	Species associated with growth curve

ecozones	Ecozone associated with the growth curve
bTable3	Boudewyn et al. (2007) stem wood biomass model parameters for merchantable-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table3.csv .
bTable4	Boudewyn et al. (2007) stem wood biomass model parameters for nonmerchantable-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table4.csv .
bTable5	Boudewyn et al. (2007) stem wood biomass model parameters for sapling-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table5.csv .
bTable6	Boudewyn et al. (2007) proportion model parameters. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table6.csv .
bTable7	Boudewyn et al. (2007) caps on proportion models. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table7.csv .

Value

three-column matrix with columns corresponding to biomass (T/ha) for total merchantable, foliage, and other.

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

cTransfersAlluvial	cTransfersAlluvial
--------------------	--------------------

Description

Maps proportions of carbon transfers across pools during a disturbance.

Usage

```
cTransfersAlluvial(
  cTransfers,
  distMatrixID = NULL,
  distName = NULL,
  spuID = NULL,
  sw = NULL,
  nearMatches = TRUE,
  identical = !ask,
  ask = interactive(),
  ...
)
```

Arguments

cTransfers	Carbon pool transfer matrix
distMatrixID	disturbance_matrix_id of the disturbance to plot.
distName	disturbance name you wish to plot. Required only if distMatrixID is not provided.
spuID	CBM-CFS3 spatial unit ID of the disturbance to plot. Required only if distMatrixID is not provided.
sw	logical. Softwood (TRUE) or hardwood (FALSE). Required only if distMatrixID is not provided.
nearMatches	logical. Allow for near matches; e.g. "clearcut" can match "clear-cut".
identical	logical. Require identical matches.
ask	logical. If TRUE, prompt the user to choose the correct matches. If FALSE, the function will look for a single match to each input.
...	additional arguments to .matchSelect

Value

alluvialDist Alluvial plot of a disturbance in a specific spatial unit.

cumPoolsCreate	<i>Create cumPools data.table</i>
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Description

Create cumPools data.table

Usage

```
cumPoolsCreate(
  fullSpecies,
  gcMeta,
  userGcM3,
  thisAdmin,
  bTable3 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table3.csv",
  bTable4 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table4.csv",
  bTable5 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table5.csv",
  bTable6 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table6.csv",
  bTable7 = "https://nfi.nfis.org/resources/biomass_models/appendix2_table7.csv",
  bRateBiomassToCarbon = 0.5
)
```

Arguments

fullSpecies	Study area species' names
gcMeta	Growth curve metadata table
userGcM3	Table of growth curve volume by age
thisAdmin	Ecozone and spatial unit information table for the study area
bTable3	Boudewyn et al. (2007) stem wood biomass model parameters for merchantable-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table3.csv .
bTable4	Boudewyn et al. (2007) stem wood biomass model parameters for nonmerchantable-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table4.csv .
bTable5	Boudewyn et al. (2007) stem wood biomass model parameters for sapling-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table5.csv .
bTable6	Boudewyn et al. (2007) proportion model parameters. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table6.csv .
bTable7	Boudewyn et al. (2007) caps on proportion models. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table7.csv .
bRateBiomassToCarbon	numeric. Conversion factor of biomass to carbon.

Value

cumPools data.table

cumPoolsCreateAGB	<i>Convert total above ground biomass into 3 carbon pools (T/ha). Implements the flowchart from figure 3 of Boudewyn et al. (2007) using an alternative set of parameter to divide total above ground biomass (T/ha) into total merchantable stemwood biomass (T/ha), foliage biomass (T/ha), and other wood biomass (T/ha). Biomass to converted to carbon using the biomass to carbon conversion factor.</i>
-------------------	--

Description

Implements the flowchart from figure 3 of Boudewyn et al. (2007) using an alternative set of parameter to divide total above ground biomass (T/ha) into total merchantable stemwood biomass (T/ha), foliage biomass (T/ha), and other wood biomass (T/ha).

Usage

```
cumPoolsCreateAGB(AGB, bRateBiomassToCarbon = 0.5, ...)
```

Arguments

AGB data.frame with columns: juris_id, ecozone, age, B and species, speciesCode, or canfi_species.

bRateBiomassToCarbon numeric. Conversion factor of biomass to carbon.

... arguments to [convertAGB2pools](#)

Value

AGB table updated by reference with additional columns merch, foliage, and other with carbon (T/ha) in each above ground pool.

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

cumPoolsSmooth	<i>Smooth the cumPools data.table</i>
----------------	---------------------------------------

Description

This uses the Chapman Richards equation to smooth the curves that are in colsToUse.

Usage

```
cumPoolsSmooth(
  cumPoolsRaw,
  colsToUse = c("totMerch", "fol", "other"),
  colsToUseNew = paste0(colsToUse, "_New")
)
```

Arguments

cumPoolsRaw Data.table with a numeric column called age and columns called colsToUse.

colsToUse A character vector of columns to smooth.

colsToUseNew A character vector of column names for the new smoothed columns

Value

#' A data.table with original columns plus new columns named 'colsToUseNew'.

Author(s)

Celine Boisvenue and Eliot McIntire

distList	<i>CBM-CFS3 Disturbance types</i>
----------	-----------------------------------

Description

List CBM-CFS3 disturbance types.

Usage

```
distList(cbm_defaults_db, localeID = 1)
```

Arguments

cbm_defaults_db	Path to CBM defaults SQLite database.
localeID	CBM-CFS3 locale_id

Value

data.table with 'disturbance_type_tr' columns 'disturbance_type_id', 'name', 'description'

distMatch	<i>CBM-CFS3 Disturbances Match</i>
-----------	------------------------------------

Description

Match disturbance names with CBM-CFS3 disturbance types.

Usage

```
distMatch(
  distNames,
  nearMatches = TRUE,
  identical = !ask,
  ask = interactive(),
  listDist = NULL,
  cbm_defaults_db = NULL,
  localeID = 1,
  ...
)
```

Arguments

distNames	character. Disturbance names to match with CBM-CFS3 database disturbance type names.
nearMatches	logical. Allow for near matches; e.g. "clearcut" can match "clear-cut".
identical	logical. Require identical matches.
ask	logical. If TRUE, prompt the user to choose the correct matches. If FALSE, the function will look for a single match to each input.
listDist	data.table. Optional. Result of a call to distList . Table of disturbance types with columns 'disturbance_type_id', 'name', 'description'.
cbm_defaults_db	Path to CBM defaults SQLite database.
localeID	CBM-CFS3 locale_id
...	additional arguments to .matchSelect

Value

data.table with columns 'disturbance_type_id', 'name', 'description'

extractToRast	<i>Extract to raster</i>
---------------	--------------------------

Description

Extract values from a spatial data source for each cell of a template raster. Resampling is done using "mode" resampling to preserve categorical values.

Usage

```
extractToRast(input, templateRast, index = 1, crop = TRUE)
```

Arguments

input	terra SpatRaster, one or more raster files, or sf polygons.
templateRast	SpatRaster. Raster template.
index	numeric or character. Raster layer or vector field to extract.
crop	logical. Crop input before alignment to template raster.

Value

vector with a value for each cell of templateRast. Data type matches input data type.

gcidsCreate	<i>Standardized way to create gcids</i>
-------------	---

Description

This uses the underscore delimiter between column names.

Usage

```
gcidsCreate(...)
```

Arguments

...	The data.table with ONLY the columns on which to determine unique gcids
-----	---

getParameters	<i>Extract the parameters to apply to convert total biomass into pool biomass.</i>
---------------	--

Description

Extract the species- and location- specific parameters for equation 4-7 of Boudewyn et al. (2007). If there is no match for the given ecozone, the parameters for a different ecozone in the same province/territory is returned. If there is no match for a given province/territory, the parameters for a different province/territory in the same ecozone is returned. If there is no match for the given ecozone and province/territory, the parameters for a different location is returned.

Usage

```
getParameters(
  curves,
  tableMerch,
  bTable6tb = "https://nfi.nfis.org/resources/biomass_models/appendix2_table6_tb.csv",
  bTable7tb = "https://nfi.nfis.org/resources/biomass_models/appendix2_table7_tb.csv"
)
```

Arguments

curves	A data.table with unique combinations of canfi_species, ecozone, juris_id.
--------	--

tableMerch	data.table with one row per b_nm. Parameters to estimate the proportion of stemwood biomass that is merchantable where $b_m/b_{nm} = k - \exp(-a * (b_{nm} - b))$ when b_{nm} is the total stemwood biomass and b_m is the total merchantable stemwood biomass. Available from https://drive.google.com/file/d/1wa2QMd7Eo-bPpfigchdpPP . Parameters were estimated by approximating the relationship between stemwood biomass and nonmerchfactor predicted by equation 2 of Boudewyn et al. (2007).
------------	---

bTable6tb	Boudewyn et al. (2007) an alternative set of proportion model parameters to use when total biomass per hectare in tonnes (tb = stem wood + stem bark + branches + foliage) is the independent variable instead of gross merchantable volume per hectare. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table6_tb.csv .
bTable7tb	Boudewyn et al. (2007) an alternative set of caps on proportion models to use in conjunction with the alternative set of proportion models when total biomass per hectare in tonnes (tb = stem wood + stem bark + branches + foliage) is the independent variable instead of gross merchantable volume per hectare. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table7_tb.csv .

Value

A single data.table containing a row for each curve with all required parameters from bTable6tb, bTable7tb, and tableMerch.

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

m3ToBiomPlots	<i>Makes plots of all columns for each id_col ID</i>
---------------	--

Description

Makes plots of all columns for each id_col ID

Usage

```
m3ToBiomPlots(inc, id_col = "gcids", title)
```

Arguments

inc	increment data
id_col	column by which to group plots
title	Title of plots

mapNPP	mapNPP
--------	--------

Description

Map Net Primary Productivity (NPP) across a study area.

Usage

```
mapNPP(rastNPP, year = NULL)
```

Arguments

rastNPP	SpatRaster. Pixel values represent NPP (t/ha).
year	numeric. Year that the map represents. If provided, it will be included in the plot title.

Value

ggplot

mapTotalCarbon	mapTotalCarbon
----------------	----------------

Description

Map total carbon across a study area.

Usage

```
mapTotalCarbon(rastTC, year = NULL)
```

Arguments

rastTC	SpatRaster. Pixel values represent total carbon (t/ha).
year	numeric. Year that the map represents. If provided, it will be included in the plot title.

Value

ggplot

nmfac

*Expansion factor for non-merchantable live tree biomass***Description**

Implements equation 2 of Boudewyn et al. (2007), used to determine the total stem wood biomass (in metric tonnes per hectare; T/ha) of non-merchantable trees (B_n), together with the stemwood biomass of live merchantable and non-merchantable trees (B_{nm}), using parameters a , b , and k from Table 4.

Usage

```
nmfac(eq1, vol, bTable4)
```

Arguments

eq1	stemwood biomass of merchantable trees (T/ha) from equation 1 of Boudewyn et al. (2007) (i.e., the result of <code>b_m</code>).
vol	gross merchantable volume per hectare (m^3/ha)
bTable4	Boudewyn et al. (2007) stem wood biomass model parameters for nonmerchantable-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table4.csv .

Value

two-column matrix with columns corresponding to b_n and b_{nm}

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

plotEmissionsProducts plotEmissionsProducts

Description

Plot yearly emissions and products.

Usage

```
plotEmissionsProducts(emissionsProducts)
```

Arguments

emissionsProducts
Table of simlation emissions and products by cohort group by year

Value

ggplot

plotPoolProportions	plotPoolProportions
---------------------	---------------------

Description

plotPoolProportions

Usage

plotPoolProportions(pools)

Arguments

pools data.table. Table of pools for each cohort, pixel, or year. Must include the 'year' column.

Value

ggplot

propMerch	<i>propMerch</i>
-----------	------------------

Description

Calculate the proportion of total stemwood considered merchantable.

Usage

propMerch(b_nm, age, tableMerch)

Arguments

b_nm	numeric. Vector of total stemwood biomass in live trees.
age	numeric. Vector of cohort ages.
tableMerch	data.table with one row per b_nm. Parameters to estimate the proportion of stemwood biomass that is merchantable where $b_m/b_{nm} = k - \exp(-a * (b_{nm} - b))$ when b_nm is the total stemwood biomass and b_m is the total merchantable stemwood biomass. Available from https://drive.google.com/file/d/1wa2QMd7Eo-bPpfigchdpPP . Parameters were estimated by approximating the relationship between stemwood biomass and nonmerchfactor predicted by equation 2 of Boudewyn et al. (2007).

Value

numeric Vector of the proportion of stemwood that is merchantable.

ReticulateFindPython *Reticulate Find Python*

Description

Use reticulate to find or install Python to meet version requirements. Download and use the [pyenv-win](#) Python version management tool from Github if necessary.

Usage

```
ReticulateFindPython(
  version,
  versionInstall = version,
  pyenvRoot = tools::R_user_dir("CBMutils"),
  pyenvOnly = FALSE,
  useGit = TRUE,
  prompt = FALSE
)
```

Arguments

version	character. Python version or a comma separated list of version constraints. See virtualenv_starter for more details.
versionInstall	character. Version to install if suitable version not found. Required if version is a list of version constraints.
pyenvRoot	character. Path of location for install of the pyenv-win tool. Defaults to the R user data directory.
pyenvOnly	logical. Exclude versions not within a pyenv install directory.
useGit	logical. Allow reticulate to clone pyenv-win if Git is available.
prompt	logical. Prompt user to approve download of pyenv-win tool.

Details

This function was created to bypass the requirement for Git to be installed when `install_python` is called on a Windows computer without pyenv-win already installed. If Git is available, `reticulate` will clone the [pyenv-win Github repository](#) and use the tool to install Python. If Git is not available, this function will instead download the latest version directly from the repository and make it available to `reticulate`.

Value

character. Path to Python interpreter.

sapfac	<i>Expansion factor for sapling-sized trees</i>
--------	---

Description

Implements equation 3 of Boudewyn et al. (2007), used to determine the total stem wood biomass (in metric tonnes per hectare; T/ha) of sapling-sized trees (B_s), using parameters a , b , and k from Table 5.

Usage

```
sapfac(eq2, vol, bTable5)
```

Arguments

- eq2 two-column matrix giving stemwood biomass of non-merchantable trees (i.e., b_n given in units T/ha), and merchantable + non-merchantable trees (i.e., b_{nm} given in units T/ha), from equation 2 of Boudewyn et al. (2007) (i.e., the result of `nmfac`).
- vol gross merchantable volume per hectare (m^3/ha)
- bTable5 Boudewyn et al. (2007) stem wood biomass model parameters for sapling-sized trees. Available from https://nfi.nfis.org/resources/biomass_models/appendix2_table5.csv.

Value

stemwood biomass of sapling-sized trees (b_s in units T/ha)

References

Boudewyn, P., Song, X., Magnussen, S., & Gillis, M. D. (2007). Model-based, volume-to-biomass conversion for forested and vegetated land in Canada (BC-X-411). Natural Resource Canada, Pacific Forestry Centre. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/27434.pdf>

seeDist	<i>See disturbances</i>
---------	-------------------------

Description

Retrieve disturbance source pools, sink pools, and the proportions transferred.

Usage

```
seeDist(
  EXN = TRUE,
  matrixIDs = NULL,
  cbm_defaults_db = NULL,
  cbm_exn_dir = NULL
)
```

Arguments

EXN	logical. Use CBM-EXN CBM-CFS3 equivalent model data.
matrixIDs	character. Optional. Subset disturbances by disturbance_matrix_id
cbm_defaults_db	Path to CBM defaults SQLite database.
cbm_exn_dir	Path to CBM-EXN parameters directory.

Value

List of data.frame named by disturbance_matrix_id

simCBMdbReadRaw	<i>simList: Read SpaDES CBM database</i>
-----------------	--

Description

Read a raw data table from a simulation's **CBM_core** SpaDES CBM database.

Usage

```
simCBMdbReadRaw(simCBM, year, table, ...)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
year	numeric. Year of simulation results. Defaults to the current simulation year.
table	character. Name of database table to read. One of 'key', 'parameters', 'state', 'flux', or 'pools'.
...	not used

Value

data.table

simCBMdbReadSummary	<i>simList: Read SpaDES CBM database summary</i>
---------------------	--

Description

Read a data summary from a simulation's **CBM_core** SpaDES CBM database.

Usage

```
simCBMdbReadSummary(
  simCBM,
  summary,
  by = "cohortID",
  units = "t/ha",
  year = NULL,
  years = NULL,
  useCache = TRUE
)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
summary	character. Name of summary table to collect.
by	character. Name of field to summarize results by. Data can be summarized by 'cohortID', 'pixelIndex', or 'year'
units	character. 't/ha', 't', or 'Mt'.
year	numeric. Year of simulation results. Required if by = 'cohortID' or 'pixelIndex'. Defaults to the current simulation year.
years	numeric. Years of simulation results to summarize. Required if by = 'year'. Defaults to the full simulation time span.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

data.table with key matching the by argument.

simCBMdbReadTable	<i>simList: Read SpaDES CBM database table</i>
-------------------	--

Description

Read a table of cohort data from a simulation's **CBM_core** SpaDES CBM database.

Usage

```
simCBMdbReadTable(simCBM, year, table, useCache = TRUE)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
year	numeric. Year of simulation results. Defaults to the current simulation year.
table	character. Name of database table to read. One of 'key', 'parameters', 'state', 'flux', or 'pools'.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

data.table with key 'cohortID', columns 'pixelIndex' and 'row_idx' (cohort group ID), and any additional columns in the source table.

simCBMdbWrite	<i>simList: Write SpaDES CBM database</i>
---------------	---

Description

Write simulation **CBM_core** module data to the SpaDES CBM database.

Usage

```
simCBMdbWrite(
  simCBM,
  year,
  parameters = TRUE,
  state = TRUE,
  flux = TRUE,
  pools = TRUE
)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
year	numeric. Simulation data year. Defaults to the current simulation year.
parameters	logical. Write the 'parameters' table to file.
state	logical. Write the 'state' table to file.
flux	logical. Write the 'flux' table to file.
pools	logical. Write the 'pools' table to file.

simDist	<i>See disturbances in simList</i>
---------	------------------------------------

Description

get the descriptive name and proportions transferred for disturbances in a simulation requires a simulation list post simulations (from `spades()`) and returns a list of data.frames. Each data had the descriptive name of a disturbance used in the simulations, the disturbance matrix identification number from `cbm_defaults`, the pool from which carbon is taken (source pools) in this specific disturbance, the pools into which carbon goes, and the proportion in which the carbon-transfers are completed.

Usage

```
simDist(simCBM)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
--------	--

Value

List of data.frame for each disturbance matrix id in the study area, named by disturbance name

simMapNPP	simMapNPP
-----------	-----------

Description

Map Net Primary Productivity (NPP) across a study area.

Usage

```
simMapNPP(simCBM, year = NULL, useCache = TRUE)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
year	numeric. Year of simulation results. Defaults to the current simulation year.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

ggplot

simMapTotalCarbon	simMapTotalCarbon
-------------------	-------------------

Description

Map total carbon across a study area.

Usage

```
simMapTotalCarbon(simCBM, year = NULL, useCache = TRUE)
```

Arguments

simCBM	SpaDES.core simList for a CBM simulation including the CBM_core module.
year	numeric. Year of simulation results. Defaults to the current simulation year.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

ggplot

simPlotEmissionsProducts	simPlotEmissionsProducts
--------------------------	--------------------------

Description

Plot yearly emissions and products.

Usage

```
simPlotEmissionsProducts(simCBM, years = NULL, useCache = TRUE)
```

Arguments

<code>simCBM</code>	SpaDES.core simList for a CBM simulation including the CBM_core module.
<code>years</code>	numeric. Simulation years to include in plot. Defaults to all simulation years.
<code>useCache</code>	logical. Cache database query result to the database's cache directory with Cache .

Value

`ggplot`

```
simPlotPoolProportions
      simPlotPoolProportions
```

Description

`simPlotPoolProportions`

Usage

```
simPlotPoolProportions(simCBM, years = NULL, useCache = TRUE)
```

Arguments

<code>simCBM</code>	SpaDES.core simList for a CBM simulation including the CBM_core module.
<code>years</code>	numeric. Simulation years to include in plot. Defaults to all simulation years.
<code>useCache</code>	logical. Cache database query result to the database's cache directory with Cache .

Value

`ggplot`

spadesCBMdbMapNPP	<i>spadesCBMdb</i> : mapNPP
-------------------	-----------------------------

Description

Map Net Primary Productivity (NPP) across a study area.

Usage

```
spadesCBMdbMapNPP(spadesCBMdb, masterRaster, year, useCache = TRUE)
```

Arguments

- | | |
|--------------|---|
| spadesCBMdb | CBM_core module outputs database path. |
| masterRaster | SpatRaster template defining the study area. |
| year | numeric. Year of simulation results. |
| useCache | logical. Cache database query result to the database’s cache directory with Cache . |

Value

ggplot

spadesCBMdbMapTotalCarbon	<i>spadesCBMdb</i> simMapTotalCarbon
---------------------------	--------------------------------------

Description

Map total carbon across a study area.

Usage

```
spadesCBMdbMapTotalCarbon(spadesCBMdb, masterRaster, year, useCache = TRUE)
```

Arguments

- | | |
|--------------|---|
| spadesCBMdb | CBM_core module outputs database path. |
| masterRaster | SpatRaster template defining the study area. |
| year | numeric. Year of simulation results. |
| useCache | logical. Cache database query result to the database’s cache directory with Cache . |

Value

ggplot

```
spadesCBMdbPlotEmissionsProducts
      spadesCBMdb plotEmissionsProducts
```

Description

Plot yearly emissions and products.

Usage

```
spadesCBMdbPlotEmissionsProducts(spadesCBMdb, years, useCache = TRUE)
```

Arguments

spadesCBMdb	CBM_core module outputs database path.
years	numeric. Simulation years to include in plot.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

ggplot

```
spadesCBMdbPlotPoolProportions
      spadesCBMdb simPlotPoolProportions
```

Description

spadesCBMdb simPlotPoolProportions

Usage

```
spadesCBMdbPlotPoolProportions(spadesCBMdb, years, useCache = TRUE)
```

Arguments

spadesCBMdb	CBM_core module outputs database path.
years	numeric. Simulation years to include in plot.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

ggplot

spadesCBMdbReadRaw	<i>Read CBM SpaDES CBM database</i>
--------------------	-------------------------------------

Description

Read a raw data table from a **CBM_core** SpaDES CBM database.

Usage

```
spadesCBMdbReadRaw(spadesCBMdb, year, table, ...)
```

Arguments

spadesCBMdb	CBM_core module outputs database path.
year	numeric. Year of simulation results.
table	character. Name of database table to read. One of 'key', 'parameters', 'state', 'flux', or 'pools'.
...	not used

Value

data.table

spadesCBMdbReadSummary	<i>Read CBM SpaDES CBM database summary</i>
------------------------	---

Description

Read a data summary from a **CBM_core** SpaDES CBM database.

Usage

```
spadesCBMdbReadSummary(
  spadesCBMdb,
  summary,
  by = "cohortID",
  units = "t/ha",
  year = NULL,
  years = NULL,
  useCache = TRUE
)
```

Arguments

spadesCBMdb	CBM_core module outputs database path.
summary	character. Name of summary table to collect.
by	character. Name of field to summarize results by. Data can be summarized by 'cohortID', 'pixelIndex', or 'year'
units	character. 't/ha', 't', or 'Mt'.
year	numeric. Year of simulation results. Required if by = 'cohortID' or 'pixelIndex'.
years	numeric. Years of simulation results to summarize. Required if by = 'year'.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

data.table with key matching the by argument.

spadesCBMdbReadTable *Read SpaDES CBM database table*

Description

Read a table of cohort data from a **CBM_core** SpaDES CBM database.

Usage

```
spadesCBMdbReadTable(spadesCBMdb, year, table, useCache = TRUE)
```

Arguments

spadesCBMdb	CBM_core module outputs database path.
year	numeric. Year of simulation results.
table	character. Name of database table to read. One of 'key', 'parameters', 'state', 'flux', or 'pools'.
useCache	logical. Cache database query result to the database's cache directory with Cache .

Value

data.table with key 'cohortID', columns 'pixelIndex' and 'row_idx' (cohort group ID), and any additional columns in the source table.

sppMatch	<i>Species match</i>
----------	----------------------

Description

Retrieve species metadata by matching species names or other identifiers with columns in sppEquiv.

Usage

```
sppMatch(  
  species,  
  match = c("LandR", "Latin_full", "EN_generic_short", "EN_generic_full"),  
  otherNames = NULL,  
  return = NULL,  
  checkNA = !is.null(return),  
  sppEquiv = NULL  
)
```

Arguments

species	Species identifiers.
match	character. sppEquiv column(s) to match species with.
otherNames	list. A list of alternative species identified to allow in matching. Item names must match species and item contents must be vectors of additional allowable matches.
return	character. sppEquiv columns to return. All columns will be returned by default.
checkNA	logical. Check for NA values in the returned columns. Defaults to TRUE if the return argument is used; otherwise FALSE.
sppEquiv	data.table. Table of species identifiers and metadata. Defaults to LandR::sppEquivalencies_CA.

Value

data.table. Subset of sppEquivalencies with 1 row per species.

spuDistList	<i>CBM-CFS3 Spatial Unit Disturbances</i>
-------------	---

Description

List the disturbances possible in spatial units.

Usage

```
spuDistList(  
  EXN = TRUE,  
  spuIDs = NULL,  
  cbm_defaults_db = NULL,  
  cbm_exn_dir = NULL,  
  localeID = 1  
)
```

Arguments

- EXN logical. Use CBM-EXN CBM-CFS3 equivalent model data.
- spuIDs Optional. Subset by spatial unit ID(s)
- cbm_defaults_db Path to CBM defaults SQLite database.
- cbm_exn_dir Path to CBM-EXN parameters directory.
- localeID CBM-CFS3 locale_id

Value

data.table with 'disturbance_type_tr' columns 'disturbance_type_id', 'name', 'description' and 'disturbance_matrix_association' columns 'spatial_unit_id' and 'disturbance_matrix_id'

spuDistMatch	<i>CBM-CFS3 Spatial Unit Disturbances Match</i>
--------------	---

Description

Match disturbance names with CBM-CFS3 spatial unit disturbances.

Usage

```
spuDistMatch(  
  distTable,  
  nearMatches = TRUE,  
  identical = !ask,  
  ask = interactive(),  
  listDist = NULL,  
  ...  
)
```

Arguments

distTable	data.table with columns 'spatial_unit_id' and 'name' (or 'distName'). The name column will be matched with disturbance names and descriptions in the CBM-CFS3 database.
nearMatches	logical. Allow for near matches; e.g. "clearcut" can match "clear-cut".
identical	logical. Require identical matches.
ask	logical. If TRUE, prompt the user to choose the correct matches. If FALSE, the function will look for a single match to each input.
listDist	data.table. Optional. Result of a call to spuDistList . A list of possible disturbances in the spatial unit(s) with columns 'spatial_unit_id', 'disturbance_type_id', 'disturbance_matrix_id', 'name', 'description'.
...	arguments to spuDistList for listing the possible disturbances in the spatial units.

Value

data.table with columns 'spatial_unit_id', 'disturbance_type_id', 'disturbance_matrix_id', 'name', 'description'

spuHistDist	<i>CBM-CFS3 Historical Disturbances</i>
-------------	---

Description

Identifies the stand-replacing wildfire disturbance in each spatial unit.

Usage

```
spuHistDist(spuIDs, localeID = 1, ask = FALSE, ...)
```

Arguments

spuIDs	Spatial unit ID(s)
localeID	CBM-CFS3 locale_id
ask	logical. If TRUE, prompt the user to choose the correct disturbance matches. If FALSE, the function will look for exact name matches.
...	arguments to spuDistMatch

Details

In all spatial units in Canada, the historical disturbance is set to fire. Historical disturbances in CBM-CFS3 are used for "filling-up" the soil-related carbon pools. Boudewyn et al. (2007) translate the m3/ha curves into biomass per ha in each of four pools: total biomass for stem wood, total biomass for bark, total biomass for branches and total biomass for foliage. Biomass in coarse and fine roots, in aboveground- and belowground- very-fast, -fast, -slow, in medium-soil, and in snags still needs to be estimated. A stand-replacing fire disturbance is used in a disturb-grow cycle, where stands are disturbed and regrown with turnover, overmature, decay, functioning until the dead organic matter pools biomass values stabilize (+/- 10%) (TODO: check this).

`writeRasterWithValues` *Write raster with values*

Description

Replace the values in a `SpatRaster` before writing it to file.

Usage

```
writeRasterWithValues(templateRast, filename, cells = NULL, values = NULL, ...)
```

Arguments

<code>templateRast</code>	terra <code>SpatRaster</code> template defining raster geometry.
<code>filename</code>	character. Output filename.
<code>cells</code>	integer. Raster cell index.
<code>values</code>	numeric or character. New raster values.
<code>...</code>	arguments to <code>writeRaster</code>

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