

Package ‘redlistr’

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Title Tools for the IUCN Red List of Ecosystems and Species

Version 2.1.0

Description A toolbox created by members of the International Union for Conservation of Nature (IUCN) Red List of Ecosystems Committee for Scientific Standards. Primarily, it is a set of tools suitable for calculating the metrics required for making assessments of species and ecosystems against the IUCN Red List of Threatened Species and the IUCN Red List of Ecosystems categories and criteria. See the IUCN website for detailed guidelines, the criteria, publications and other information.

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URL <https://github.com/red-list-ecosystem/redlistr>,
<http://red-list-ecosystem.github.io/redlistr/>

BugReports <https://github.com/red-list-ecosystem/redlistr/issues>

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a	<i>Mangrove area combined</i>
---	-------------------------------

Description

Area of mangroves in 2000 and 2017

Usage

a

Format

a:
A data frame with 2 rows and 3 columns:
layer name of the layer
value raster value from which area was computed
area area in km2

Source

computed from mangrove.2000 and mangrove.2017 using getArea

a.2000	<i>Mangrove distribution data</i>
--------	-----------------------------------

Description

Mangrove distribution from the northern regions of Western Port Bay, Victoria, Australia, in the year 2000.

Usage

a.2000

Format

a.2000:
A data frame with 1 row and 3 columns:
layer name of the layer
value raster value from which area was computed
area area in km2

Details

The dataset is stored as a GeoTIFF file in inst/extdata and can be loaded with:

```
terra::rast(system.file("extdata", "example_distribution_2000.tif", package = "redlistr"))
```

The dataset is stored as a GeoTIFF file in inst/extdata and can be loaded with:

```
terra::rast(system.file("extdata", "example_distribution_2017.tif", package = "redlistr"))
```

Mangrove area
Area of mangroves in 2000

Source

<https://onlinelibrary.wiley.com/doi/10.1111/j.1466-8238.2010.00584.x/abstract> Mangrove distribution data
Mangrove distribution from the northern regions of Western Port Bay, Victoria, Australia, in the year 2017.
computed from mangrove.2000 using getArea

a.2017	<i>Mangrove area</i>
--------	----------------------

Description

Area of mangroves in 2017

Usage

a.2017

Format

a.2017:
A data frame with 1 row and 3 columns:
layer name of the layer
value raster value from which area was computed
area area in km2

Source

computed from mangrove.2017 using getArea

A00grid-class

A00grid class

Description

A class to represent an AOO grid object

Slots

name the name of the assessment unit

grid an AOO grid as a shapefile

A00 the number of grid squares in grid

params a named vector of input parameters (grid size, jitter, n_jitter)

pctrule logical indicating whether the 1% rule was applied

input the input ecosystem data used to generate the AOO grid

A00vals the list of AOO values

as.list.A00grid

A00grid as.list

Description

as.list method for A00grid object

Usage

```
## S3 method for class 'A00grid'
as.list(x, ...)
```

Arguments

x an A00grid object

... additional arguments

as.list.EOO	<i>EOO as.list</i>
-------------	--------------------

Description

as.list method for EOO object

Usage

```
## S3 method for class 'EOO'
as.list(x, ...)
```

Arguments

x	an EOO object
...	additional arguments

bundle	<i>Compute AOO and EOO, return as table</i>
--------	---

Description

bundle performs AOO and EOO calculations on an input object and returns the results as a table

Usage

```
bundle(input_data, names_from = NA, ...)
```

Arguments

input_data	Spatial object of an ecosystem or species distribution. Please use a CRS with units measured in metres.
names_from	name of the column containing ecosystem names. If missing all features will be analysed together. Only needed for vector data.
...	Additional graphical parameters passed to getAOO().

Value

a data.frame containing AOO and EOO information for all input units as rows.

Author(s)

Aniko B. Toth <anikobtoth@gmail.com>

See Also

Other synthesis functions: [list2table\(\)](#)

createGrid	Create empty Area of Occupancy (AOO) Grid.
------------	--

Description

createGrid produces empty grid which can be used as the basis to help compute AOO.

Usage

```
createGrid(input_data, cell_size = 10000)
```

Arguments

input_data	Spatial object (sf or SpatRaster) of an ecosystem or species distribution. Please use a CRS with units measured in metres.
cell_size	A number specifying the width of the desired grid square (in same units as your coordinate reference system)

Value

A regular grid raster with extent input_data expanded by two cells in each direction and grid size cell_size. Each grid square has a unique raster value that serves as its identification number.

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>, Aniko B. Toth <anikobtoth@gmail.com>

References

Bland, L.M., Keith, D.A., Miller, R.M., Murray, N.J. and Rodriguez, J.P. (eds.) 2016. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 1.0. Gland, Switzerland: IUCN. ix + 94pp. Available at the following web site: <https://iucnrle.org/>

See Also

Other AOO functions: [getA00\(\)](#), [jplot\(\)](#), [makeA00Grid\(\)](#), [top_pct\(\)](#)

declineForecast	<i>Decline forecasts</i>
-----------------	--------------------------

Description

declineForecast calculates rates of change from two inputs and extrapolates the rate of change to a desired future time interval.

Usage

```
declineForecast(
  x,
  y,
  names_from_x = NA,
  names_from_y = NA,
  t1,
  year_diff,
  forecast_year = t1 + 50
)
```

Arguments

x	SpatRaster, SpatVector, or sf object representing one or more ecosystems or a data frame with two columns, one of them labeled "area", and the other containing ecosystem labels names_from_x.
y	SpatRaster, SpatVector, or sf object representing one or more ecosystems or a data frame with two columns, one of them labeled "area", and the other containing ecosystem labels names_from_y.
names_from_x	name of column containing ecosystem labels. Ignored if x is a raster.
names_from_y	name of column containing ecosystem labels. Ignored if y is a raster. names_from_x used if not provided.
t1	numeric year of earliest dataset, corresponding to x
year_diff	numeric year difference between x and y inputs
forecast_year	the desired year to which to forecast (or hindcast) change.

Value

returns a list of two elements: a table of areas and change in areas and a table of forecasts including decline rate, forecast area, and forecast percent decline.

Author(s)

Aniko B. Toth <anikobtoth@gmail.com>

See Also

Other Change functions: [getArea\(\)](#), [getAreaChange\(\)](#), [getAreaTrend\(\)](#), [getDeclineStats\(\)](#)

EOO-class	<i>EOO class</i>
-----------	------------------

Description

A class to represent an EOO convex hull object

Slots

name the name of the assessment unit
 pol an EOO convex hull polygon
 EOO the area of the EOO polygon as a numeric
 unit the unit in which the area is provided
 input the input ecosystem data used to generate the EOO polygon

extrapolateEstimate	<i>Extrapolate Estimate</i>
---------------------	-----------------------------

Description

extrapolateEstimate uses rates of decline from getDeclineStats to extrapolate estimates to a given time

Usage

```
extrapolateEstimate(A.t1, year.t1, nYears, ARD = NA, PRD = NA, ARC = NA)
```

Arguments

A.t1	Area at time t1
year.t1	Year of time t1
nYears	Number of years since t1 for prediction. Use negative values for backcasting
ARD	Absolute rate of decline
PRD	Proportional rate of decline
ARC	Annual rate of change

Value

A dataframe with the forecast year, and a combination of:

- Values as extrapolated with absolute rate of decline (ARD)
- Values as extrapolated with proportional rate of decline (PRD)
- Values as extrapolated with annual rate of change (ARC)

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>

References

IUCN 2024. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 2.0. Keith, D.A., Ferrer-Paris, J.R., Ghoraba, S.M.M., Henriksen, S., Monyeke, M., Murray, N.J., Nicholson, E., Rowland, J., Skowno, A., Slingsby, J.A., Storeng, A.B., Valderrábano, M. & Zager, I. (Eds.) Gland, Switzerland: IUCN. ix + 94pp.

See Also

Other change_functions: [futureAreaEstimate\(\)](#), [sequentialExtrapolate\(\)](#)

Examples

```
a.r1 <- 23.55
a.r2 <- 15.79
decline.stats <- getDeclineStats(a.r1, a.r2, year.t1 = 1990, year.t2 = 2012,
                                methods = 'PRD')
a.2040.PRD <- extrapolateEstimate(a.r1, a.r2, year.t1 = 1990, nYears = 50,
                                  PRD = decline.stats$PRD)
```

futureAreaEstimate	<i>Future Area Estimate</i>
--------------------	-----------------------------

Description

futureAreaEstimate is now deprecated, please use extrapolateEstimate instead

Usage

```
futureAreaEstimate(A.t1, year.t1, nYears, ARD = NA, PRD = NA, ARC = NA)
```

Arguments

A.t1	Area at time t1
year.t1	Year of time t1
nYears	Number of years since t1 for area prediction
ARD	Absolute rate of decline
PRD	Proportional rate of decline
ARC	Annual rate of change

Value

A dataframe with the forecast year, and a combination of:

- Future area as estimated with absolute rate of decline (ARD)
- Future area as estimated with proportional rate of decline (PRD)
- Future area as estimated with annual rate of change (ARC)

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>

References

IUCN 2024. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 2.0. Keith, D.A., Ferrer-Paris, J.R., Ghoraba, S.M.M., Henriksen, S., Monyeke, M., Murray, N.J., Nicholson, E., Rowland, J., Skowno, A., Slingsby, J.A., Storeng, A.B., Valderrábano, M. & Zager, I. (Eds.) Gland, Switzerland: IUCN. ix + 94pp.

See Also

Other change_functions: [extrapolateEstimate\(\)](#), [sequentialExtrapolate\(\)](#)

getAOO

Compute Area of Occupancy (AOO)

Description

getAOO determines the number of area of occupancy (AOO) grid cells occupied by a species or ecosystem. It includes capability for specifying whether at least one percent of the grid cell needs to be occupied before it is counted in the AOO. This functionality is important for assessing the IUCN Red List of Ecosystems Criteria B.

Usage

```
getAOO(
  input_data,
  cell_size = 10000,
  names_from = NA,
  bottom_1pct_rule = TRUE,
  percent = 1,
  jitter = 150,
  n_jitter = 35
)
```

Arguments

input_data	Spatial object (sf or SpatRaster) of an ecosystem or species distribution. Please use a CRS with units measured in metres.
cell_size	A number specifying the width of the desired grid square (in same units as your coordinate reference system)
names_from	the name of the column containing ecosystem labels
bottom_1pct_rule	Logical. If TRUE, grid cells containing the least ecosystem area are dropped up to 1% of the total distribution.
percent	Numeric. The minimum percent to be applied as a threshold for the bottom_1pct_rule
jitter	Integer. 0 = do not jitter, 1 = force jitter, another number indicates conditional jitter, the number of AOO cells under which to jitter, and over which not to jitter the grid.
n_jitter	the number of grids to test for ecosystems near the AOO thresholds. Ignored if jitter = FALSE.

Value

an object of class AOOgrid or a list of AOOgrid objects. Ecosystems that received an AOO of 60 cells or fewer on a first pass are run with a jittered grid with n specified by n_jitter

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>, Aniko B. Toth <anikobtoth@gmail.com>

References

Bland, L.M., Keith, D.A., Miller, R.M., Murray, N.J. and Rodriguez, J.P. (eds.) 2016. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 1.0. Gland, Switzerland: IUCN. ix + 94pp. Available at the following web site: <https://iucnrle.org/>

See Also

Other AOO functions: [createGrid\(\)](#), [jplot\(\)](#), [makeAOOGrid\(\)](#), [top_pct\(\)](#)

getArea

Calculates the Area of ecosystems in spatial data

Description

getArea reports the area of ecosystem units provided as spatial data

Usage

```
getArea(x, names_from = NA, ...)
```

Arguments

x	A SpatRaster, SpatVector, or an sf object with POLYGONS geometry.
names_from	a column names containing ecosystem labels, as a string or dplyr-style column name. Only required for SpatVector and sf types. Units are assumed to be delineated by raster value for SpatRasters.
...	Addition arguments based on input format

Value

A data frame containing ecosystem identifiers and the total area of the ecosystem units in x as a units vector (km²). For raster bricks it also contains the layer number.

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>, Aniko B. Toth <anikobtoth@gmail.com>

See Also

Other Change functions: [declineForecast\(\)](#), [getAreaChange\(\)](#), [getAreaTrend\(\)](#), [getDeclineStats\(\)](#)

getAreaChange	<i>Area change between two inputs in km2</i>
---------------	--

Description

getAreaChange reports the difference in area between two inputs. Inputs can be SpatRaster, SpatVector, sf or a data frame of areas and may contain data for multiple ecosystem types. Ensure x and y are the same data type. If using data frame as input, ensure areas are measured in km2

Usage

```
getAreaChange(x, y, names_from_x = NA, names_from_y = NA)
```

Arguments

x	SpatRaster, SpatVector, or sf object representing one or more ecosystems or a data frame with two columns, one of them labeled "area", and the other containing ecosystem labels names_from_x.
y	SpatRaster, SpatVector, or sf object representing one or more ecosystems or a data frame with two columns, one of them labeled "area", and the other containing ecosystem labels names_from_y.
names_from_x	name of column containing ecosystem labels. Ignored if x is a raster.
names_from_y	name of column containing ecosystem labels. Ignored if y is a raster. names_from_x used if not provided.

Value

Returns a table containing ecosystem labels, areas, and the difference in area of the two inputs in km2

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>, Aniko B. Toth <anikobtoth@gmail.com>

See Also

Other Change functions: [declineForecast\(\)](#), [getArea\(\)](#), [getAreaTrend\(\)](#), [getDeclineStats\(\)](#)

Examples

```
if (requireNamespace("terra", quietly = TRUE)) {
  ok <- try({
    m1 <- matrix(sample(1:4, 500, replace = TRUE, prob = c(4,1,1,6)), 25, 20)
    r1 <- terra::rast(m1)
    terra::crs(r1) <- "+proj=utm +zone=55 +south +datum=WGS84 +units=m +no_defs"

    m2 <- matrix(sample(1:4, 500, replace = TRUE, prob = c(4,1,1,6)), 25, 20)
    r2 <- terra::rast(m2)
    terra::crs(r2) <- "+proj=utm +zone=55 +south +datum=WGS84 +units=m +no_defs"

    getAreaChange(r1, r2)
  }, silent = TRUE)
}
```

getAreaEOO

Extracts the area from an EOO polygon

Description

getEOOarea wrapper that extracts the area slot of the EOO input

Usage

```
getAreaEOO(EOO)
```

Arguments

EOO an object of class EOO

Value

an integer

See Also

Other EOO functions: [getEOO\(\)](#), [makeEOO\(\)](#)

getAreaTrend

Calculate area trends of ecosystems

Description

getAreaTrend is used to calculate changes in area over time. Output is a list can be used to easily visualise trends for one ecosystem at a time.

Usage

```
getAreaTrend(x, names_from = NA)
```

Arguments

x	SpatRaster with multiple layers or data frame containing two numerical columns "area" and "time". The data.frame can contain an additional column containing a key, whose name should be placed in names_from.
names_from	name of column containing ecosystem labels. Ignored if x is a raster.

Value

returns a list

Author(s)

Aniko B. Toth <anikobtoth@gmail.com>

See Also

Other Change functions: [declineForecast\(\)](#), [getArea\(\)](#), [getAreaChange\(\)](#), [getDeclineStats\(\)](#)

getDeclineStats	<i>Change statistics.</i>
-----------------	---------------------------

Description

getDeclineStats calculates the Proportional Rate of Decline (PRD), Absolute Rate of Decline (ARD) and Annual Rate of Change (ARC), given two areas at two points in time. Also provides the total area difference. Inputs are usually the results from getArea.

Usage

```
getDeclineStats(A.t1, A.t2, year.t1, year.t2, methods)
```

Arguments

A.t1	Area at time t1
A.t2	Area at time t2
year.t1	Year of time t1
year.t2	Year of time t2
methods	Method(s) used to calculate rate of decline. Either 'PRD', 'ARD', and/or 'ARC'. See vignette to see a more detailed explanation for each of them.

Value

A dataframe with absolute differences between the two inputs, and a selection of:

- Proportional Rate of Decline (PRD)
- Absolute Rate of Decline (ARD)
- Annual Rate of Change (ARC)

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>

References

IUCN 2024. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 2.0. Keith, D.A., Ferrer-Paris, J.R., Ghoraba, S.M.M., Henriksen, S., Monyeke, M., Murray, N.J., Nicholson, E., Rowland, J., Skowno, A., Slingsby, J.A., Storeng, A.B., Valderrábano, M. & Zager, I. (Eds.) Gland, Switzerland: IUCN. ix + 94pp. Puyravaud, J.-P. 2003. Standardizing the calculation of the annual rate of deforestation. Forest Ecology and Management, 177, 593-596.

See Also

Other Change functions: [declineForecast\(\)](#), [getArea\(\)](#), [getAreaChange\(\)](#), [getAreaTrend\(\)](#)

Examples

```
a.r1 <- 23.55
a.r2 <- 15.79
decline.stats <- getDeclineStats(a.r1, a.r2, year.t1 = 1990, year.t2 = 2012,
                                methods = c('ARD', 'ARC'))
```

getEOO	<i>Calculates area of the created EOO polygon and returns a summary object with useful info.</i>
--------	--

Description

getEOO calculates the area of the EOO polygon generated from makeEOO the provided data and returns an EOO class object or a list of these with defined summary and plot functions available.

Usage

```
getEOO(input_data, names_from = NA)
```

Arguments

input_data	Spatial object of an ecosystem or species distribution. Please use a CRS with units measured in metres.
names_from	name of the column containing ecosystem names. If missing all features will be analysed together. Only needed for vector data.

Value

An object of type EOO or a list of EOO objects that store the EOO polygon, its area, and its input_data

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>

See Also

Other EOO functions: [getAreaEOO\(\)](#), [makeEOO\(\)](#)

Examples

```
if (requireNamespace("terra", quietly = TRUE)) {
  ok <- try({
    m <- matrix(sample(1:4, 500, replace = TRUE, prob = c(4,1,1,6)), nrow=25, ncol=20)
    r1 <- terra::rast(m, crs = "+proj=utm +zone=55 +south +datum=WGS84 +units=m +no_defs")
    EOO <- getEOO(r1)
  }, silent = TRUE)
}
```

hist,A00grid-method	<i>A00grid hist</i>
---------------------	---------------------

Description

hist method for A00grid objects

Usage

```
## S4 method for signature 'A00grid'
hist(x, ...)
```

Arguments

x	an A00grid object
...	Additional graphical parameters passed to hist .

jplot	<i>Make elbow plot to check jitter iterations</i>
-------	---

Description

jplot creates an elbow plot of the min AOO against the number of grid replicates run. Jplots that fall to the minimum value well before the highest n are robust.

Usage

```
jplot(x)
```

Arguments

x	an A00grid object
---	-------------------

Value

NULL; plots min AOO against number of reps

Author(s)

Aniko B. Toth <anikobtoth@gmail.com>

See Also

Other AOO functions: [createGrid\(\)](#), [getA00\(\)](#), [makeA00Grid\(\)](#), [top_pct\(\)](#)

list2table	<i>Summarises a list of EOO or AOOgrid objects in a table</i>
------------	---

Description

list2table wrapper that summarises a list of EOO or AOOgrid objects as a table.

Usage

```
list2table(l)
```

Arguments

l a list of EOO or AOOgrid objects

Value

a data.frame

See Also

Other synthesis functions: [bundle\(\)](#)

makeA00Grid	<i>Create Area of Occupancy (AOO) grid for an ecosystem or species distribution</i>
-------------	---

Description

makeA00Grid is a generic function that creates grids representing the area of occupancy for distributions based on the input spatial data. It includes capability for specifying whether the least occupied cells collectively containing less than 1% of the ecosystem are counted in the AOO. This functionality is important for assessing the IUCN Red List of Ecosystems Criteria B.

Usage

```
makeA00Grid(  
  input_data,  
  cell_size = 10000,  
  names_from = NA,  
  bottom_1pct_rule = TRUE,  
  percent = 1,  
  jitter = 150,  
  n_jitter = 35  
)
```

Arguments

<code>input_data</code>	Spatial object (sf or SpatRaster) of an ecosystem or species distribution. Please use a CRS with units measured in metres.
<code>cell_size</code>	A number specifying the width of the desired grid square (in same units as your coordinate reference system)
<code>names_from</code>	the name of the column containing ecosystem labels
<code>bottom_1pct_rule</code>	Logical. If TRUE, grid cells containing the least ecosystem area are dropped up to 1% of the total distribution.
<code>percent</code>	Numeric. The minimum percent to be applied as a threshold for the <code>bottom_1pct_rule</code>
<code>jitter</code>	Integer. 0 = do not jitter, 1 = force jitter, another number indicates conditional jitter, the number of AOO cells under which to jitter, and over which not to jitter the grid.
<code>n_jitter</code>	the number of grids to test for ecosystems near the AOO thresholds. Ignored if jitter = FALSE.

Value

A shapefile of grid cells occupied by an ecosystem or species, or a list of these if multiple ecosystems were input.

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>, Aniko B. Toth <anikobtoth@gmail.com>

References

Bland, L.M., Keith, D.A., Miller, R.M., Murray, N.J. and Rodriguez, J.P. (eds.) 2016. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 1.0. Gland, Switzerland: IUCN. ix + 94pp. Available at the following web site: <https://iucnrle.org/>

See Also

Other AOO functions: [createGrid\(\)](#), [getAOO\(\)](#), [jplot\(\)](#), [top_pct\(\)](#)

Examples

```
if (requireNamespace("terra", quietly = TRUE)) {
  ok <- try({
    m <- matrix(sample(1:4, 500, replace = TRUE, prob = c(4,1,1,6)), nrow=25, ncol=20)
    r1 <- terra::rast(m, crs = "+proj=utm +zone=55 +south +datum=WGS84 +units=m +no_defs")
    AOO_grid <- makeAOOGrid(r1, cell_size = 3)
  }, silent = TRUE)
}
```

makeEOO	<i>Creates Extent of occurrence (EOO) Polygon</i>
---------	---

Description

makeEOO is a generic function that creates a minimum convex polygon enclosing all occurrences of the ecosystems provided in the input data. If the input provided is a raster layer, the points are taken from a buffer that has the radius of half of the shorter edge of the pixel around the centroid.

Usage

```
makeEOO(input_data, names_from)
```

Arguments

input_data	Spatial object of an ecosystem or species distribution. Please use a CRS with units measured in metres.
names_from	name of the column containing ecosystem names. If missing all features will be analysed together. Only needed for vector data.

Value

An object of class sf representing the EOO of input_data, or a list of sf objects if multiple ecosystems were input. Also inherits its CRS from input_data.

Author(s)

Nicholas Murray <murr.nick@gmail.com>, Calvin Lee <calvinkflee@gmail.com>

References

IUCN 2024. Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 2.0. Keith, D.A., Ferrer-Paris, J.R., Ghoraba, S.M.M., Henriksen, S., Monyeke, M., Murray, N.J., Nicholson, E., Rowland, J., Skowno, A., Slingsby, J.A., Storeng, A.B., Valderrábano, M. & Zager, I. (Eds.) Gland, Switzerland: IUCN. ix + 94pp.

See Also

Other EOO functions: [getAreaEOO\(\)](#), [getEOO\(\)](#)

Examples

```
if (requireNamespace("terra", quietly = TRUE)) {
  ok <- try({
    m <- matrix(sample(1:4, 500, replace = TRUE, prob = c(4,1,1,6)), nrow=25, ncol=20)
    r1 <- terra::rast(m, crs = "+proj=utm +zone=55 +south +datum=WGS84 +units=m +no_defs")
    EOO.polygon <- makeEOO(r1)
  }, silent = TRUE)
}
```

```
plot, AOOgrid, ANY-method
```

AOOgrid plot

Description

plot method for AOOgrid object

Usage

```
## S4 method for signature 'AOOgrid,ANY'
plot(x, title = x@name)
```

Arguments

x	an AOOgrid object
title	plot title, defaults to the assessment unit name.

```
plot, EOO, ANY-method
```

EOO plot

Description

plot method for EOO object

Usage

```
## S4 method for signature 'EOO,ANY'
plot(x, title = x@name)
```

Arguments

x	an EOO object
title	Plot title, defaults to name of assessment unit.

plot,trend,ANY-method	<i>trend plot</i>
-----------------------	-------------------

Description

plot method for trend object

Usage

```
## S4 method for signature 'trend,ANY'
plot(x, y, ...)
```

Arguments

x	an trend object
y	Ignored. Included for consistency with the plot generic.
...	Additional graphical parameters passed to plot .

sequentialExtrapolate	<i>Sequential extrapolation estimate</i>
-----------------------	--

Description

sequentialExtrapolate uses rates of decline from getDeclineStats and generates a sequence of estimates at regular time-steps. Useful for generating a sequence for plotting graphs.

Usage

```
sequentialExtrapolate(A.t1, year.t1, nYears, ARD = NA, PRD = NA, ARC = NA)
```

Arguments

A.t1	Area at time t1
year.t1	Year of time t1
nYears	Number of years since t1 for prediction. Use negative values for backcasting
ARD	Absolute rate of decline
PRD	Proportional rate of decline
ARC	Annual rate of change

Value

- A dataframe with the forecast year, and a combination of:
- Sequence of values as extrapolated with absolute rate of decline (ARD)
 - Sequence of values as extrapolated with proportional rate of decline (PRD)
 - Sequence of values as extrapolated with annual rate of change (ARC)

Author(s)

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References

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See Also

Other change_functions: [extrapolateEstimate\(\)](#), [futureAreaEstimate\(\)](#)

Examples

```
a.r1 <- 23.55
a.r2 <- 15.79
decline.stats <- getDeclineStats(a.r1, a.r2, year.t1 = 1990, year.t2 = 2012,
                                methods = 'PRD')
a.2040.PRD.seq <- sequentialExtrapolate(a.r1, a.r2, year.t1 = 1990, nYears = 50,
                                         PRD = decline.stats$PRD)
```

show,AOGrid-method *AOGrid show*

Description

show method for AOGrid object

Usage

```
## S4 method for signature 'AOGrid'
show(object)
```

Arguments

object an AOGrid object

show,EOO-method	<i>EOO show</i>
-----------------	-----------------

Description

show method for EOO object

Usage

```
## S4 method for signature 'EOO'
show(object)
```

Arguments

object an EOO object

summary,A0Ogrid-method	<i>A0Ogrid summary</i>
------------------------	------------------------

Description

summary method for A0Ogrid object

Usage

```
## S4 method for signature 'A0Ogrid'
summary(object)
```

Arguments

object an A0Ogrid object

summary,E00-method	<i>E00 summary</i>
--------------------	--------------------

Description

summary method for E00 object

Usage

```
## S4 method for signature 'E00'  
summary(object)
```

Arguments

object an E00 object

summary,trend-method	<i>trend summary</i>
----------------------	----------------------

Description

summary method for trend object

Usage

```
## S4 method for signature 'trend'  
summary(object)
```

Arguments

object a trend object

top_pct	<i>Identify positions of the bottom 1% of ecosystem area in AOO grid</i>
---------	--

Description

top_pct returns the vector positions of the largest elements collectively comprising a given percentage more of the vector sum. This function helps perform the bottom_1pct_rule when selecting the AOO grid by identifying grid positions to keep.

Usage

```
top_pct(v, pct = 99)
```

Arguments

v	A numeric vector.
pct	percent of area to drop

Value

a numeric vector indicating the indices of the elements to keep.

Author(s)

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References

IUCN (2024). Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria, Version 2.0. Keith, D.A., Ferrer-Paris, J.R., Ghoraba, S.M.M., Henriksen, S., Monyeke, M., Murray, N.J., Nicholson, E., Rowland, J., Skowno, A., Slingsby, J.A., Storeng, A.B., Valderrábano, M. & Zager, I. (Eds.). Gland, Switzerland: IUCN. ix + 94pp. Available at the following web site: <https://iucnrle.org/>

See Also

Other AOO functions: [createGrid\(\)](#), [getAOO\(\)](#), [jplot\(\)](#), [makeAOOGrid\(\)](#)

trend-class	<i>trend class</i>
-------------	--------------------

Description

A class to represent change in area over time for an ecosystem.

Slots

input binary raster or list of sf POLYGON objects representing the input ecosystem extent
 areas the area of the ecosystem in each layer or list element
 model a fitted model object typically of the class lm containing the model used to calculate the trend
 netdiff difference between the area in the first layer or list element and the last.
 diff raster stack showing change over layers or list elements of the ecosystem extent.

trend_fitting_functions	<i>Fit linear model with log-link.</i>
-------------------------	--

Description

fit_lm_ll produces a simple model to estimate trends in short time series.

Usage

```
fit_lm_ll(df)

fit_glm_ll(df)

fit_spline(df)
```

Arguments

df	a data frame containing the columns "area" and "t" for time. Time can be an index or year.
----	--

Value

an lm object

Author(s)

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