Package 'kelpdecline'

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Type Package

Title Estimate kelp decline from historical baseline of Landsat
estimated kelp biomass

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Description Estimates proportion of Landsat pixels with kelp biomass in decline when compared to historical baseline.
The proportions are given for quarter degree cells in Central, Southern and Baja California.

Imports ncdf4, sp, raster

License GPL (>=2)

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

R topics documented:

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kelpdecline-package   *Estmates kelp biomass decline relative to a historical baseline*

Description

Estimates proportion of Landsat pixels with kelp biomass in decline when compared to a historical baseline. The proportions are given for 0.25 x 0.25 degree, lat x long, cells in Central, Southern and Baja California.

Details

The nc_convert function first converts the nc file curated by the SBC-LTER project to a data.frame
with kelp biomass by Landsat pixel and quarter. Then the decline_finder function estimates if
individual Landsat pixels (30x30 m) are declining or not when compared to a historical baseline
(also estimated internally). The function then calculates the proportion of pixels in decline inside
larger areas of 0.25 by 0.25 degree (lat and long). This function produces an array that can be useful
to map out kelp in decline. The function can also produce an output table with summary statistics
for each region (0.25 by 0.25 degree scale).

Author(s)

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References

Tennies N, Alberto F. (in prep) A tool for detecting kelp canopy biomass decline in Central, South-
ern and Baja California.

Bell, T. W., Cavanaugh, K. C., and Siegel, D. A. (2017). SBC LTER: Time series of quarterly netcdf
files of kelp biomass in the canopy from Landsat 5, 7 and 8, 1984-2016 (ongoing). Santa Barbara
Coastal LTER.

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decline_finder	*The main function estimating proportion of Landsat pixels with kelp biomass in decline.*

Description

The function first estimates if individual Landsat pixels (30x30 m) are declining or not when com-
pared to a historical baseline (also estimated internally). Then calculates the proportion of pixels
in decline inside larger areas of 0.25 x0.25 degree (lat and long). The function produces an array
that can be useful to map out kelp in decline. The function can also produce an output table with
summary statistics for each region (0.25 x 0.25 degree scale).

Usage

```
decline_finder(data, baseline_threshold = 0.1, scarce_cutoff = 0.6, present_window = 16,
hist_period = 100, window_lag = 0, lat_min = 27.01, lat_max = 37.5, lon_min = -123.5,
        lon_max = -114, table_name = NULL)
```

Arguments

data   A data frame of temporal variation of kelp biomass per Landsat pixel, as pro-
                duced by nc_convert.

baseline_threshold

        A proportion of the average historical biomass (per pixel) below which all quarters in present_window period, for the same pixel, are required to be for the pixel to be classified as in decline. Defaults conservatively to 0.1, i.e., 10 percent of the historical average.

scarce_cutoff   If the proportion of quarters with no kelp in the time series of length hist_period is larger than this cutoff value, the pixel is considered kelp-scarce and removed from analysis. Defaults to 0.6, i.e., pixel needs to have non-zero kelp biomass in at least 40 percent of the quarters to be retained in the analysis.

present_window   The duration of the current period, in number of quarters, used to characterize present biomass status.

hist_period   Number of quarters, counting back from the present, used to calculate hist_biomass. Defaults to 100 quarters.

window_lag   How many quarters from the most recent quarter in the time series should present_window slide back. This allows to estimate how kelp in decline was classified for periods in the past. It defaults to zero.

lat_min   Used to limit the extent of the output files and maps by providing the minimum latitude in decimal degrees. Defaults to 27.01, the edge of the data in the SBC-LTER file in 2022.

lat_max   Used to limit the extent of the output files and maps by providing the maximum latitude in decimal degrees. Defaults to 37.05, the edge of the data in the SBC-LTER file in 2022.

lon_min   Used to limit the extent of the output files and maps by providing the minimum longitude in decimal degrees. Defaults to -123.5, the edge of the data in the SBC-LTER file in 2022.

lon_max   Used to limit the extent of the output files and maps by providing the maximum longitude in decimal degrees. Defaults to -114, the edge of the data in the SBC-LTER file in 2022.

table_name   A string with the name of the output file recording summary statistics for each 0.25 x 0.25 degree region in the study extent. This defaults to NULL, so be sure to replace with a quoted file name (string) here if you want a detailed output written to the working directory.

Details

The function offers several arguments that allow for flexible definition of the periods used for charactherizing historical and present times and to control overall functionality. The flexibility allows for an easy implementation of sensitivity analysis of the effect of these arguments to the characterization of kelp decline. Examples are given in a package vignette.

Value

A raster file with the proportion of Landsat pixels in decline for each 0.25 x 0.25 degree region in the study extent. This raster can be easily plotted to map out regions of kelp in decline (see examples in package vignette). To get an optional summary statistic file written to the working directory be sure to supply a name to argument table_name.

Author(s)

Nathaniel Tennies and Filipe Alberto

References

Tennies N, Alberto F. (in prep) A tool for detecting kelp canopy biomass decline in Central, Southern and Baja California.

See Also

nc_convert

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nc_convert   *Convert nc input to a data.frame with kelp biomass variation*

Description

The function converts the external file in nc format to a data.frame with the time series of kelp biomass.

Usage

```
nc_convert(nc_data_location)
```

Arguments

nc_data_location

A string with the name of the nc file file containing kelp biomass temporal variation, curated by the SBC-LTER team.

Value

A data frame with kelp biomass recorded for each 30 x 30m Landsat pixel areas in the study extent (Central to Baja California). Each pixel with kelp is a row in the data frame, whereas columns contain temporal variation recorded by quarter.

Author(s)

Nathaniel Tennies and Filipe Alberto

References

Tennies N, Alberto F. (in prep) A tool for detecting kelp canopy biomass decline in Central, Southern and Baja California

See Also

decline_finder

Index