Package 'Wisclakebathy'

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Type Package

Title Wisconsin Lake Bathymetry Calculations

Version 1.0.0

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Description Calculations related to lake depth, area, and volume and changes in these values.

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Encoding UTF-8

LazyData true

Depends R (>= 2.10)

Imports dplyr,
magrittr,
rlang,
stringr,
stats

Suggests extrafont,
ggplot2,
knitr,
rmarkdown

RoxygenNote 7.1.1

VignetteBuilder knitr

R topics documented:

`calculate_volumes` *Calculate lake volumes (acre-ft) from lake areas (acres) and lake depths (ft)*

Description

Given a data frame with information about "WBIC", "depth_feet", and "area_acres" and which type of volume estimate to use ("trapezoidal" or "conical"), calculates the lake volume in acre-ft associated with each lake depth. Note that this approach assumes that information about "depth_feet" is arranged such that the maximum depth value corresponds with the lake surface and the maximum lake volume value, while a depth value of 0 corresponds with the lake bottom and a lake volume of 0.

Usage

```
calculate_volumes(df, method = "trapezoidal")
```

Arguments

`df`	data frame with information about "WBIC", "depth_feet", and "area_acres". Input data frame may have other columns, but must have these.
`method`	Specify which volume estimation approach to use. Options include "trapezoidal" or "conical". Defaults to "trapezoidal".

Value

the input data frame with an additional column for "volume_acre_ft" appended, which represents the lake volume at the given lake depth (acre-ft).

`convert_proportion_areas` *Convert proportional area hypsography to areas in acres*

Description

Given the path of a directory where csv files live, reads in information about depth (ft) vs. proportional area relationship, maximum areas, and converts to depth (ft) vs. area (acres) relationships.

Usage

```
convert_proportion_areas(
  path = "data-raw/Wisconsin_Hypsography",
  max_area_file = "WI_areas.csv",
  flip = TRUE
)
```

Arguments

path	Path of directory containing all csv files with depth and proportional area info (extracted from bathymetry maps using imageJ). Defaults to "data-raw/Wisconsin_Hypsography". See details in description about expected format of these csv files.
max_area_file	Name of csv file with information about maximum areas of each lake. Defaults to "WI_areas.csv". See details in description about expected format of this csv file.
flip	Indicates whether should flip depths so that the maximum depth corresponds to the lake surface and a depth of zero corresponds to the lake bottom (TRUE) or keep as-is, with a depth of zero corresponding to the lake surface (FALSE). Defaults to TRUE to flip.

Details

Expects csv files with depth vs. proportional area information to adhere to the following conventions: * All csv files are stored in the same directory (specified by "path") * Filenames are "singlelakename_WBIC.csv", e.g. "easthorsehead_1523000.csv" * Columns are (in order): "depth_ft", "proportion_area" * A proportion area of "1" corresponds with a depth_ft of "0" and represents the maximum area as measured at the top of the lake. * Every csv file following this convention should have a corresponding entry in the maximum lake area csv file.

Expects that information about maximum lake areas (in acres) adheres to the following conventions: * Information is in a single csv file (specified by "max_area_file") stored in the same directory as includes the individual csv files. * Columns are (in order): "WBIC" and "Area_acres" * Every lake with a proportional area csv file should have an entry here

Note that the returned data frame lists the lake area (acres) corresponding to lake depths such that 0ft is the lake bottom, 5ft is 5ft above the the lake bottom, and the maximum depth value represents the surface of the lake. If the parameter "flip" is set to FALSE, the returned data frame instead retains the conventions in the proportional area csv files, where lake areas correspond to lake depth contours such that 0ft is the lake surface, 5ft is 5ft below the lake surface, and the maximum depth value represents the bottom of the lake.

Value

a data frame with the following columns:

WBIC	Wisconsin Water Body Identification Code (WBIC) of lake
lakename	name of lake as included in csv filename (will be a single word, e.g. "easthorsehead", just to help with quick identification)
depth_ft	lake depth (ft)
area_acres	lake area at this lake depth (acres)

`depth_change_given_volume_loss` *Calculate change in lake depth with X percent loss of lake volume*

Description

Given a data frame with information about "WBIC", "depth_feet", and "volume_acre_ft" and what percentage volume loss to assume, calculates the estimated change in lake depth from the maximum lake depth/volume. Assumes a linear change in depth and volume between specified contour intervals in order to approximate lower lake depth.

Usage

```
depth_change_given_volume_loss(df, pcnt_loss = 10)
```

Arguments

df	data frame with information about "WBIC", "lakename", depth_feet", and "volume_acre_ft". Input data frame may have other columns, but must have these.
pcnt_loss	Specify what percentage loss of lake volume from maximum lake volume to evaluate. Defaults to 10 (percent).

Value

data frame with the following columns:

WBIC	Wisconsin Water Body Identification Code (WBIC) of lake
lakename	name of lake as included in the input data frame. Typically something like "easthorsehead", just to help with quick identification)
max_vol	maximum lake volume (acre-ft)
max_depth	lake depth corresponding to maximum lake volume (ft)
lower_vol	volume assuming X pcnt loss (as input, default is 10 pcnt loss) (acre-ft)
lower_depth	lake depth corresponding to lowered lake volume (ft)
depth_change	change in lake depth corresponding to X pcnt loss (as input, default is 10 pcnt loss) in lake volume (ft)

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volume_loss_given_depth_change

Calculate percent loss of lake volume with Xft change in lake depth

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Description

Given a data frame with information about "WBIC", "depth_feet", and "volume_acre_ft" and what reduction in max depth (ft) to assume, calculates the estimated change in lake volume (Assumes a linear change in depth and volume between specified contour intervals in order to approximate lower lake volume.

Usage

```
volume_loss_given_depth_change(df, depth_change_ft = 1)
```

Arguments

df	data frame with information about "WBIC", "lakename", depth_feet", and "volume_acre_ft". Input data frame may have other columns, but must have these.
depth_change_ft	Specify what reduction in lake depth from maximum lake depth to evaluate. Defaults to 1 (ft).

Value

data frame with the following columns:

WBIC	Wisconsin Water Body Identification Code (WBIC) of lake
lakename	name of lake as included in the input data frame. Typically something like "easthorsehead", just to help with quick identification)
max_depth	maximum lake depth (ft)
max_vol	lake volume corresponding to macimum lake depth (acre-ft)
lower_depth	lake depth assuming Xft reduction (as input, default is 1ft reduction) (ft)
lower_vol	volume corresponding to lowered depth (acre-ft)
vol_pcnt_loss	percentage change in lake volume relative to maximum lake volume given a Xft reduction in lake depth (as input, default is 1ft reduction)

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