Package 'mnsentinellakes'

April 5, 2019

Title Minnesota DNR Sentinel Lakes Program Tools

Version 0.0.0.9000

Description This package contains a variety of tools developed to aid in the management of the MNDNR Sentinel Lakes Long-Term Ecological Monitoring Program. It contains functions used to access, analyze, and visualize Sentinel Lakes data. If possible, these functions have been designed to also be used for data from lakes that have been collected by the MNDNR and/or MNPCA but are not a part of the Sentinel Lakes Program.

Depends R (>= 3.3)

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Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Imports data.table, dplyr, ggplot2, ggpubr, Hmisc, httr, jsonlite, lubridate, plotKML, RODBC, rgdal, rlang, sp,
stats, tools, tidyr, utils, xml2, xts, zoo

R topics documented:

`addunderscore` *Add Underscore*

Description

A function that removes punctuation and spaces from a character string

Usage

```
addunderscore(term)
```

Arguments

`term`	a character string with punctuation and spaces.

Value

a character

See Also

Other Sentinel Lakes Tools: `fixlakeid`, `gpx2shp`, `lakeid2name`, `lakename2id`, `readaccessdatabase`

Examples

```
addunderscore("St. James")
```

fish2sentinel *Fish Survey Data Sentinel Formatting*

Description

Reorganizes fish survey data downloaded from lakefinder into a common Sentinel Lakes format, making it easier to integrate with other Sentinel Lakes formatted datasets.

Usage

```
fish2sentinel(fishsurvey)
```

Arguments

fishsurvey	results from the fishsurveydata() function.

See Also

Other Formatting: weather2sentinel, wq2sentinel

Examples

```
#' #Retrieve the lakefinder data
x <- lakefinderdownload("11041300")

#Extract the fish survey data
y <- fishsurveydata(x)

#Convert to Sentinel Lakes formatting
z <- fish2sentinel(y)
```

fishabbrev2common *Fish Abbreviations to Common Names*

Description

A function that returns the common name of a fish based upon the fish abbreviation provided.

Usage

```
fishabbrev2common(fishabbreviation)
```

Arguments

fishabbreviation	a three character string

Value

a character

See Also

Other Fish: fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
fishabbrev2common("BLG")
```

---

fishabbrev2scientific *Fish Abbreviations to Scientific Names*

Description

A function that returns the scientific name of a fish based upon the fish abbreviation provided.

Usage

```
fishabbrev2scientific(fishabbreviation)
```

Arguments

fishabbreviation	a three character string

Value

a character

See Also

Other Fish: fishabbrev2common, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
fishabbrev2scientific("BLG")
```

fishabbreviations *Fish Species Abbreviations*

Description

A lookup table connecting fish species common names with MN DNR species name abbreviations.

Usage

```
data(fishabbreviations)
```

Format

a data frame.

fishcommon2abbrev *Fish Common Names to Abbreviations*

Description

A function that returns the abbreviation of a fish based upon the common name provided.

Usage

```
fishcommon2abbrev(commonname)
```

Arguments

commonname	a character string

Value

a character

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
fishcommon2abbrev("Bluegill")
```

fishcommon2scientific *Fish Common Names to Scientific Names*

Description

A function that returns the scientific name of a fish based upon the common name provided.

Usage

```
fishcommon2scientific(commonname)
```

Arguments

commonname	a character string

Value

a character

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
fishcommon2scientific("Bluegill")
```

fishscientific2abbrev *Fish Scientific Names to Abbreviations*

Description

A function that returns the abbreviation of a fish based upon the scientific name provided.

Usage

```
fishscientific2abbrev(scientificname)
```

Arguments

scientificname	a character string

Value

a character

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
fishscientific2abbrev("Lepomis macrochirus")
```

---

fishscientific2common *Fish Scientific Names to Common Names*

Description

A function that returns the common name(s) of a fish based upon the scientific name provided.

Usage

```
fishscientific2common(scientificname)
```

Arguments

scientificname	a character string

Value

a character

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
fishscientific2common("Lepomis macrochirus")
```

fishspeciesmetadata *Fish Species Metadata*

Description

A dataset that includes name abbreviations and most effective gear for a selection of fish species.

Usage

```
data(fishspeciesmetadata)
```

Format

a data frame.

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishsurveydata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

fishsurveydata *Lakefinder Fish Survey Data*

Description

A function to extract fish survey data from the data downloaded using the readlakefinder() function.

Usage

```
fishsurveydata(lakefinderdata)
```

Arguments

lakefinderdata	results from the readlakefinder() function.

Value

a data.frame of fish survey data

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishtable, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
#Retrieve the lakefinder data
x <- lakefinderdownload("11041300")
#Extract the fish survey data
y <- fishsurveydata(x)
```

fishtable *Fish Data table*

Description

This function selects fish catch data for the appropriate gear for the list of fish species in the fish-metadata table.

Usage

```
fishtable(fishsurvey, fishspecies, startyear = NULL, endyear = NULL)
```

Arguments

fishsurvey	results from the fishsurveydata() function.
fishspecies	a list of fish species names present in the fishspeciesmetadata table. Valid species include: "White Sucker", "Black Crappie", "Bluegill", "Largemouth Bass", "Rock Bass", "Smallmouth Bass", "Muskellunge", "Northern Pike", "Black Bullhead", "Brown Bullhead", "Channel Catfish", "Yellow Bullhead", "White Bass", "Walleye", "Yellow Perch", and "Lake Trout".
startyear	a numeric of the earliest year under consideration in the YYYY format. Default is NULL.
endyear	a numeric of the latest year under consideration in the YYYY format. Default is NULL.

Value

a data.frame of fish catch data

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtrendplots, fishtrendstats, lakefinderdownload

Examples

```
#Retrieve the lakefinder data
x <- lakefinderdownload("11041300")
#Extract the fish survey data
y <- fishsurveydata(x)
#Select the fish catch data
z <-fishtable(
      fishsurvey = y,
      fishspecies = c("Bluegill","Largemouth Bass"))
```

`fishtrendplots` *Fish Trend Plots*

Description

This function creates and saves fish trend scatter plots comparing CPUE across surveys. It will also save a .csv table with trend statistics calculated with the fishstats() function.

Usage

```
fishtrendplots(plotdata, logtransform = TRUE, saveto = paste0(getwd()),
  ptcolor = "blue", ptsize = 3, pttype = 20, addlm = TRUE,
  lmcolor = "black", lmsize = 1, lmtype = 2, includestats = TRUE,
  statstable = TRUE, maxpvalue = 0.1)
```

Arguments

`plotdata`	a water quality data.frame created with the fishtable() function.
`logtransform`	a logical indicating whether the statistics should be calulated using the natural log of the CPUE +1 values. Defaults to TRUE.
`saveto`	designates the folder where the plots and table should be saved. Defaults to the working directory.
`ptcolor`	designates the color of the points in the plots. Defaults to "blue".
`ptsize`	designates the size of the points in the plots. Defaults to 3.
`pttype`	designates the type of the points in the plots. Defaults to 20.
`addlm`	a logical indicating whether the linear regression line should be displayed on the plot. Defaults to TRUE.
`lmcolor`	designates the color of the linear regression line. Defaults to "black".
`lmsize`	designates the size of the linear regression line. Defaults to 1.
`lmtype`	designates the type of the linear regression line. Defaults to 2.
`includestats`	a logical indicating whether the R-squared and p-value statistics text should be displayed on the plot. Defaults to TRUE.
`statstable`	a logical indicating whether a .csv of trend statistics should be saved. Defaults to TRUE.
`maxpvalue`	a numeric indicating the maximum p-value limit for a species' CPUE trend to be included in the export. Any species' CPUE trends with a p-value above this number will not be exported. Defaults to 0.1.

Value

.png plots and statistics .csv

See Also

Other Fish: `fishabbrev2common`, `fishabbrev2scientific`, `fishcommon2abbrev`, `fishcommon2scientific`, `fishscientific2abbrev`, `fishscientific2common`, `fishspeciesmetadata`, `fishsurveydata`, `fishtable`, `fishtrendstats`, `lakefinderdownload`

Examples

```
#Download the data
x <- lakefinderdownload("21005700")

#Select fisheries survey data
y <- fishsurveydata(
       lakefinderdata = x
     )

#Extract appropriate data for each fish species
z <-fishtable(
      fishsurvey = y,
      fishspecies = c("Bluegill","Largemouth Bass"))

fishtrendplots(plotdata = z)
```

`fishtrendstats` *Calculate Fish CPUE Linear Trend Statistics*

Description

This function calculates linear trend statistics using data download from the MNDNR Lakefinder website using the output of the fishtable() function.

Usage

```
fishtrendstats(statdata, logtransform = TRUE)
```

Arguments

`statdata`	a fish species data.frame processed through the fishtable() function.
`logtransform`	a logical indicating whether the statistics should be calculated using the natural log of the CPUE + 1 values. Defaults to TRUE.

Value

a data.frame with statistics for each species' CPUE.

See Also

Other Fish: `fishabbrev2common`, `fishabbrev2scientific`, `fishcommon2abbrev`, `fishcommon2scientific`, `fishscientific2abbrev`, `fishscientific2common`, `fishspeciesmetadata`, `fishsurveydata`, `fishtable`, `fishtrendplots`, `lakefinderdownload`

Examples

```
#Download the data
x <- lakefinderdownload("21005700")

#Select fisheries survey data
y <- fishsurveydata(
       lakefinderdata = x
```

```
    )

#Extract appropriate data for each fish species
z <-fishtable(
      fishsurvey = y,
      fishspecies = c("Bluegill","Largemouth Bass"))

fishtrendstats(statdata = z)
```

`fixlakeid` *Fix Minnesota Lake IDs*

Description

This function ensures Minnesota Lake IDs (also known as DOWLKNUMs) are characters with "0" at the front and do not have any dashes.

Usage

```
fixlakeid(lakeid)
```

Arguments

`lakeid`	lakeid number

Value

a character

See Also

Other Sentinel Lakes Tools: `addunderscore`, `gpx2shp`, `lakeid2name`, `lakename2id`, `readaccessdatabase`

Examples

```
fixlakeid(6000200)
fixlakeid("06-0002-00")
```

`gpx2shp` *Convert Garmin GPX files to ESRI shapefiles*

Description

This function converts gpx files exported from a Garmin GPS to shapefiles

Usage

```
gpx2shp(folder, saveto = NULL)
```

Arguments

folder	file folder containing the .gpx files.
saveto	file folder to save the shapefiles. If left blank, the files will be saved into a "SHP" file located in the same folder as the GPX files. Default is NULL

Value

an ESRI shapefile

See Also

Other Sentinel Lakes Tools: addunderscore, fixlakeid, lakeid2name, lakename2id, readaccessdatabase

Examples

```
## Not run:
gpx2shp("C:/Data/GPS/GPX")

## End(Not run)
```

---

icedownload *Download Minnesota Climatology Lake Ice Data*

Description

This function downloads lake ice in and out dates from the Minnesota Climatology website: https://www.dnr.state.mn.us/i and https://www.dnr.state.mn.us/ice_in/index.html. The data are already formatted into the Sentinel Lakes format.

Usage

```
icedownload(lakeid)
```

Arguments

lakeid	a character indicating the LakeId (DOWLKNUM) for the lake to be downloaded.

Value

a data.frame with lake ice data.

Examples

```
x <- icedownload("21005700")
```

lakefinderdownload *Download Lakefinder Data*

Description

This function downloads the MNDNR Lakefinder website json tables for the selected lake. It was developed by user hrbrmstr at https://stackoverflow.com/questions/46517463/scraping-html-data-table-using-rvest.

Usage

```
lakefinderdownload(lakeid)
```

Arguments

lakeid	a character indicating the LakeId (DOWLKNUM) for the lake to be downloaded.

Value

a list of data

See Also

Other Fish: fishabbrev2common, fishabbrev2scientific, fishcommon2abbrev, fishcommon2scientific, fishscientific2abbrev, fishscientific2common, fishspeciesmetadata, fishsurveydata, fishtable, fishtrendplots, fishtrendstats

Examples

```
x <- lakefinderdownload("11041300")
```

lakeid2name *LakeId to Lake Name*

Description

This function returns the name of the lake for the given LakeId.

Usage

```
lakeid2name(lakeid)
```

Arguments

lakeid	LakeId number.

Value

a character

See Also

Other Sentinel Lakes Tools: addunderscore, fixlakeid, gpx2shp, lakename2id, readaccessdatabase

Examples

```
lakeid2name("02000400")
```

`lakename2id` *Lake Name to LakeIds*

Description

This function creates a data frame with the LakeIds for all lakes with the input name, as well as the County they are located in. If multiple lakes have the same name, this will return a list of LakeIds.

Usage

```
lakename2id(lakename, county = NULL)
```

Arguments

`lakename`	name of the lake.
`county`	county where the lake is located. Default is NULL.

Value

a data.frame

See Also

Other Sentinel Lakes Tools: addunderscore, fixlakeid, gpx2shp, lakeid2name, readaccessdatabase

Examples

```
lakename2id("Echo")
```

`mnlakesmetadata` *Minnesota Lakes Metadata*

Description

A dataset with metadata for Minnesota lakes with a lakeid (DOWLKNUM).

Usage

```
data(mnlakesmetadata)
```

Format

a data frame.

mnpcastations *MNPCA Stations*

Description

A dataset with a list of lake mnpca stations.

Usage

```
data(mnpcastations)
```

Format

a data frame.

readaccessdatabase *Read Access Databases*

Description

This function opens a connection to an Access database, reads the selected table, and closes the connection using the RODBC R package.

Usage

```
readaccessdatabase(database, sqtable)
```

Arguments

database	file path to the Access database.
sqtable	name of the table in the database.

Value

data.frame

See Also

Other Sentinel Lakes Tools: addunderscore, fixlakeid, gpx2shp, lakeid2name, lakename2id

sentinellakesmetadata *Sentinel Lakes Metadata*

Description

A dataset that contains various metadata required for the mnsentinellakes package.

Usage

```
data(sentinellakesmetadata)
```

Format

a data frame.

sentinelmnpcastations *Sentinel MNPCA Stations*

Description

A dataset with a list of Sentinel Lake mnpca stations.

Usage

```
data(sentinelmnpcastations)
```

Format

a data frame.

stratificationperiod *Lake Stratification Periods*

Description

This function calculates the start and end of lake thermal stratification using daily lake temperature profile data. In this calculation, a lake is considered stratified when there is a difference of one degree C between one meter depth intervals anywhere within the water column.

Usage

```
stratificationperiod(tempdata, consecutivedays = 10)
```

Arguments

tempdata	a table with "Date","Depth", and "Temperature" fields.
consecutivedays	the number of consecutive days of uninterrupted stratification required to consider the lake stratified for the season. Default is 10 days.

Value

a data.frame indicating the start (S) and end (E) stratification dates.

Examples

```
## Not run:
x <-stratificationperiod(
      tempdata = temperaturedata,
      consecutivedays = 15
      )

## End(Not run)
```

---

waterleveldownload *Download Water Level Data*

Description

This function downloads water level data from the MNDNR Lakefinder website and converts the elevation to meters. The data are already formatted into the Sentinel Lakes format.

Usage

```
waterleveldownload(lakeid)
```

Arguments

lakeid	Minnesota lake identifier (DOWLKNUM) for the lake of interest.

Value

a data.frame with water level data examples x <- waterleveldownload("11041300")

---

weather2sentinel *Weather Data Sentinel Formatting*

Description

Reorganizes weather data downloaded from Iowa State's Mesonet website into a common Sentinel Lakes format, making it easier to integrate with other Sentinel Lakes formatted datasets. This will also convert all units to metric. All numbers rounded to 2 decimal places.

Usage

```
weather2sentinel(weatherdata)
```

Arguments

weatherdata	a weather data.frame downloaded using the weatherdownload() function.

See Also

Other Formatting: fish2sentinel, wq2sentinel

Examples

```
#Download the data
x <- weatherdownload(
       lakeid = 21005700,
       startdate = "2019-03-20",
       enddate = "2019-04-01")
#Convert to Sentinel Lakes formatting
y <- weather2sentinel(x)
```

---

weatherdownload *Downloads Airport Weather Data*

Description

This function downloads airport weather station data from the Iowa State Mesonet from the station nearest to chosen lake.

Usage

```
weatherdownload(lakeid, startdate, enddate,
  parameters = c("Air Temperature", "Dew Point", "Relative Humidity",
  "Wind Direction", "Wind Speed", "Altimeter", "Precipitation",
  "Gust Speed"))
```

Arguments

lakeid	Minnesota lake identifier (DOWLKNUM) for the lake of interest.
startdate	a date indicating the beginning of the date range to be downloaded. Format: "yyyy-mm-dd".
enddate	a date indicating the end of the date range to be downloaded. Format: "yyyy-mm-dd".
parameters	a list of parameters to download. Valid parameters include "Air Temperature", "Dew Point", "Relative Humidity", "Wind Direction", "Wind Speed", "Altimeter", "Precipitation", and "Gust Speed". Default includes all parameters.

Examples

```
x <- weatherdownload(
       lakeid = 21005700,
       startdate = "2019-03-20",
       enddate = "2019-04-01")
```

wq2sentinel *Water Quality Data Sentinel Formatting*

Description

Reorganizes water quality data downloaded from the MNPCA's EDA website into a common Sentinel Lakes format, making it easier to integrate with other Sentinel Lakes formatted datasets.

Usage

```
wq2sentinel(wqdata)
```

Arguments

wqdata	a water quality data.frame downloaded using the wqdatadownload() function.

See Also

Other Formatting: fish2sentinel, weather2sentinel

Examples

```
#Download the data
x <- wqdatadownload(c("15-0010-00-100","15-0010-00-101","15-0010-00-102"))

#Convert to Sentinel Lakes formatting
y <- wq2sentinel(x)
```

wqdatadownload *Download MNPCA Water Quality Data*

Description

This function allows you to download data directly from the Minnesota Pollution Control Agency's EDA website.

Usage

```
wqdatadownload(stationids)
```

Arguments

stationids	a character vector of station ids in the format "##-####-##-###".

Value

data.frame with the downloaded data.

See Also

Other Water Quality: wqmonthtable, wqmonthtrendplots, wqmonthtrendstats, wqparameters, wqstations

Examples

```
wqdatadownload("15-0010-00-100")
wqdatadownload(c("15-0010-00-100","15-0010-00-101","15-0010-00-102"))
```

---

wqmonthtable *Process Downloaded Water Quality Data*

Description

This function extracts selected parameters for selected months from the MNPCA water quality data. If multiple months are selected, the function will average each parameter across the selected months.

Usage

```
wqmonthtable(wqdata, parameters, months, startyear = NULL,
  endyear = NULL)
```

Arguments

wqdata	a water quality data.frame downloaded using the wqdatadownload() function.
parameters	a character vector of the parameters to be extracted from the data.
months	a numeric vector of the months to be extracted from the data.
startyear	a numeric of the earliest year under consideration in the YYYY format. Default is NULL.
endyear	a numeric of the latest year under consideration in the YYYY format. Default is NULL.

Value

A data.frame

See Also

Other Water Quality: wqdatadownload, wqmonthtrendplots, wqmonthtrendstats, wqparameters, wqstations

Examples

```
#Download the data
x <- wqdatadownload(c("15-0010-00-100","15-0010-00-101","15-0010-00-102"))

#Process a single parameter for a single month
y <- wqmonthtable(
       wqdata = x,
       parameters = "Depth, Secchi disk depth",
       months = 6
     )

#Process multiple parameters across multiple months within a given year range
```

```
y <- wqmonthtable(
       wqdata = x,
       parameters = c("Depth, Secchi disk depth","Temperature, water","pH"),
       months = c(7,8,9),
       startyear = 2008,
       endyear = 2018
     )

 #Process all parameters above a specific sample size across a specified time period
 y <- wqmonthtable(
        wqdata = x,
        parameters = wqparameters(x,minsample = 5),
        months = c(6,7,8,9),
        startyear = 2008
     )
```

---

wqmonthtrendplots *WQ Trend Plots*

Description

This function creates and saves water quality trend scatter plots comparing parameters for specific months across years. It will also save a .csv table with trend statistics calculated with the wqmonthrendstats() function.

Usage

```
wqmonthtrendplots(plotdata, logtransform = FALSE,
  saveto = paste0(getwd()), ptcolor = "blue", ptsize = 3,
  pttype = 20, addlm = TRUE, lmcolor = "black", lmsize = 1,
  lmtype = 2, includestats = TRUE, statstable = TRUE,
  maxpvalue = 0.1)
```

Arguments

plotdata	a water quality data.frame created with the wqmonthtable() function.
logtransform	a logical indicating whether the statistics should be calulated using the natural log of the parameter values. Defaults to FALSE.
saveto	designates the folder where the plots and table should be saved. Defaults to the working directory.
ptcolor	designates the color of the points in the plots. Defaults to "blue".
ptsize	designates the size of the points in the plots. Defaults to 3.
pttype	designates the type of the points in the plots. Defaults to 20.
addlm	a logical indicating whether the linear regression line should be displayed on the plot. Defaults to TRUE.
lmcolor	designates the color of the linear regression line. Defaults to "black".
lmsize	designates the size of the linear regression line. Defaults to 1.
lmtype	designates the type of the linear regression line. Defaults to 2.
includestats	a logical indicating whether the R-squared and p-value statistics text should be displayed on the plot. Defaults to TRUE.

statstable	a logical indicating whether a .csv of trend statistics should be saved. Defaults to TRUE.
maxpvalue	a numeric indicating the maximum p-value limit for a parameter trend to be included in the export. Any parameters trends with a p-value above this number will not be exported. Defaults to 0.1.

Value

.png plots and statistics .csv

See Also

Other Water Quality: wqdatadownload, wqmonthtable, wqmonthtrendstats, wqparameters, wqstations

Examples

```
#Download the data
x <- wqdatadownload(c("15-0010-00-100","15-0010-00-101","15-0010-00-102"))

#Process multiple parameters across multiple months within a given year range
y <- wqmonthtable(
       wqdata = x,
       parameters = c("Depth, Secchi disk depth","Temperature, water","pH"),
       months = c(7,8,9),
       startyear = 2008,
       endyear = 2018
     )

#Create the trend plots
wqmonthtrendplots(
  plotdata = y
  )
```

---

wqmonthtrendstats *Calculate Water Quality Linear Trend Statistics*

Description

This function calculates linear trend statistics using data download from the MNPCA using the output of the wqmonthtable() function.

Usage

```
wqmonthtrendstats(statdata, logtransform = FALSE)
```

Arguments

statdata	a water quality data.frame processed through the wqmonthtable() function.
logtransform	a logical indicating whether the statistics should be calculated using the natural log of the parameter values. Defaults to FALSE.

Value

a data.frame with statistics for each parameter in the water quality data.frame input.

See Also

Other Water Quality: wqdatadownload, wqmonthtable, wqmonthtrendplots, wqparameters, wqstations

Examples

```
#Download the data
x <- wqdatadownload(c("15-0010-00-100","15-0010-00-101","15-0010-00-102"))

#Create WQ formatted table
y <- wqmonthtable(
       wqdata = x,
       parameters = c("Depth", "Secchi disk depth","Temperature"),
       months = c(7,8,9),
       startyear = 2008,
       endyear = 2018
     )

wqmonthtrendstats(statdata = y)
```

---

wqparameters *Water Quality Parameters*

Description

This function returns a vector of the water quality parameters present in data downloaded from the Minnesota Pollution Control Agency's EDA website.

Usage

```
wqparameters(wqdata, minsample = 0)
```

Arguments

wqdata	a water quality data.frame downloaded using the wqdatadownload() function.
minsample	the minimum number of parameter samples required to be included in the list. Defaults to 0.

Value

A vector of water quality parameters.

See Also

Other Water Quality: wqdatadownload, wqmonthtable, wqmonthtrendplots, wqmonthtrendstats, wqstations

Examples

```
x <- wqdatadownload("15-0010-00-100")
wqparameters(x)
```

`wqstations` *Water Quality Stations*

Description

This function returns a list of station ids located on the lake with the supplied LakeId.

Usage

```
wqstations(lakeid)
```

Arguments

`lakeid`	a character indicating the LakeId (DOWLKNUM) for the lake to be downloaded.

Value

a list of water quality station ids

See Also

Other Water Quality: `wqdatadownload`, `wqmonthtable`, `wqmonthtrendplots`, `wqmonthtrendstats`, `wqparameters`

`writeaccessdatabase` *Write to Access Database*

Description

A function that writes data to an Access database using the RODBC package.

Usage

```
writeaccessdatabase(data, database, sqtable, append = TRUE)
```

Arguments

`data`	a data.frame to write to an Access database.
`database`	file path to the Access database.
`sqtable`	name of the table in the database.
`append`	a logical indicating whether to append to the table or overwrite it. Default is TRUE.

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