Package 'LAGOSNE'

January 20, 2025

Title Interface to the Lake Multi-Scaled Geospatial and Temporal
Database

Version 2.0.3

URL <https://github.com/cont-limno/LAGOSNE>,

<https://cont-limno.github.io/LAGOSNE/>

BugReports <https://github.com/cont-limno/LAGOSNE/issues>

Description Client for programmatic access to the Lake
Multi-scaled Geospatial and Temporal database <https://lagoslakes.org>, with functions
for accessing lake water quality and ecological context data for the US.

Depends R (>= 3.5.0)

Imports dplyr (>= 0.7.0), rappdirs (>= 0.3.1), lazyeval (>= 0.2),
purrr (>= 0.2.2.2), magrittr (>= 1.5), sf, curl (>= 2.7.0),
stringr (>= 1.2.0), tibble, tidyr, memoise, rlang, progress,
qs, httr

Suggests testthat, knitr, rmarkdown, devtools, R.rsp, printr, ggplot2

License GPL

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VignetteBuilder R.rsp, knitr

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NeedsCompilation no

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LAGOSNE-package   *R interface to the LAGOSNE lakes database*

Description

Interface to the LAGOSNE lakes database

Author(s)

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chag	*Climate, Hydrology, Atmospheric, and Geologic (CHAG) Datasets*

Description

Datasets containing information on climate, hydrology, atmospheric deposition, and surficial geology characteristics calculated at hu12, hu8, hu4, edu, county and state spatial classifications (see ?scales).

Format

Data frames with all or a subset of the following variables. Number of observations is equal to the number of zones in each spatial scale (see Details below). Wildcard options include a subset of the LAGOSNE spatial scales (* = hu12, hu8, hu4, edu, county, state), years of measurement (** = 1985, 1990, 1995, 2000, 2005, 2010), and summary statistic or units (*** = min, max, mean, std for atmospheric deposition and hydrology; *** = ha, pct for surficial geology)

- *_zoneid: unique zone identifier
- *_dep_no3_**_***: nitrate ion wet deposition (kg/ha) in zone during specified year
- *_dep_so4_**_***: sulfate ion wet deposition (kg/ha) in zone during specified year
- *_dep_totaln_**_***: total inorganic nitrogen ion wet deposition (kg/ha) in zone during specified year
- *_baseflowindex_***: ground-water discharge into streams in the zone (baseflow/totalflow *100)
- *_groundwaterrecharge_***: mean annual natural groundwater recharge (mm/yr) in zone - Baseflow multiplied by mean annual runoff
- *_runoff_***: average annual runoff (in/yr) in the zone, 1951-80
- *_prism_ppt_30yr_normal_800mm2_annual_***: 30-yr long-term (normal) annual mean precipitation (mm/yr) for zone
- *_prism_tmax_30yr_normal_800mm2_annual_***: 30-yr long-term (normal) annual maximum temperature (deg C) for zone
- *_prism_tmean_30yr_normal_800mm2_annual_***: 30-yr long-term (normal) annual mean temperature (deg C) for zone
- *_prism_tmin_30yr_normal_800mm2_annual_***: 30-yr long-term (normal) annual minimum temperature (deg C) for zone
- *_surficialgeology_alluv_***: alluvial of all ages
- *_surficialgeology_beach_***: beach deposits of Holocene age
- *_surficialgeology_colluv_***: colluvium of all ages
- *_surficialgeology_dec_resid_***: decomposition residuum of all ages
- *_surficialgeology_eolian_***: silt (loess), sand of all ages
- *_surficialgeology_gf_out_***: glaciofluvial (outwash) deposits of all ages
- *_surficialgeology_grus_***: glaciated, granitic grus of Quaternary and Tertiary age

- *_surficialgeology_ice_***: ice-contact depositives of lake Wisconsin and Holocene age

- *_surficialgeology_lac_***: combination of: Glacial-lake clay and silt lake deposits of pre-Illinoian and Illinoin age; Glacial and postglacial lake deposits (delta, clay, silt and sand, sand and gravel, density-current underflow-fan) of Holocene and late Wisconsin age; Beach sand and dune sand deposits of Holocene age; and Lake slack-water and alluvium deposits of pre-Illinoian, Illinoian, and late Wisconsin ages

- *_surficialgeology_lac_clay_***: glacial and postglacial lake deposits (clay and silt) of Holocene and late Wisconsin age

- *_surficialgeology_marine_***: coastal-plain marine deposits of Pleistocene and Pliocene ages, and glaciomarine deposits of late Wisconsin age

- *_surficialgeology_open_water_***: open water

- *_surficialgeology_other_***: surficial deposits, surficial materials, and bedrock masses that were deformed and (or) transported intact by glacial ice

- *_surficialgeology_peat_mrsh_***: coastal or inland deposits of freshwater, brackish-water, peat and muck or freshwater swamps of Holocene and late Wisconsin age

- *_surficialgeology_saprol_***: saprolite of quaternary and tertiary age on crystalline igneous and metamorphic rocks mostly

- *_surficialgeology_solif_***: solifluction deposits of Holocene and late to middle Pleistocene age, and lake Wisconsin age

- *_surficialgeology_solut_***: solution residuum of Quaternary and tertiary age

- *_surficialgeology_till_clay_***: till, clay of pre-Illinoian age, late Wisconsin and Holocene(?) age

- *_surficialgeology_till_loam_***: till, loam of pre-Illinoian, Illinoian, and late Wisconsin and Holocene(?) age

- *_surficialgeology_till_oth_***: till, complex depositions of lake Wisconsin and Illinoian age

- *_surficialgeology_till_sand_***: till, sand of pre-Illinoian age, late Wisconsin and Holocene(?) age

Details

Original data sources and layers from which each metric was derived can be found in additional file 5 of Soranno et al. (2015). Briefly, climate data came from the PRISM climate group, hydrology metrics were derived from United States Geologic Survey (USGS) data, atmospheric deposition was from the National Atmospheric Deposition program, and surficial geology were derived from layers USGS data.

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

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classifications   *LAGOSNE Spatial Classifications Metadata*

Description

Data frames containing metadata for each spatial classification at which ecological context data are derived in LAGOSNE. The spatial classifications include 100m buffers (buffer100m), 500m buffers (buffer500m), interlake watersheds (iws), hydrologic units (hu12, hu8, hu4), ecological drainage units (edu), counties (county), and states (state). Each abbreviation is the name of the data frame, with all or a subset of the following variables. For more information about derivation of each spatial classification, see Details below or Additional file 7 from doi:10.1186/s1374201500674.

Format

Data frames with all or a subset of the following variables. Number of observations is equal to the number of zones in each spatial classification (see Details below).

- *_nhdid: permanent lake-specific identifier from the National Hydrography Dataset (* = buffer100m, buffer500m, iws)
- *_name: text name of the zone (* = iws, hu12, hu8, hu4, county, state)
- hu*: unique zone identifier (* = 12, 8, 4)
- *_ha: area of spatial classification in hectares (* = buffer100m, buffer500m, hu12, hu8, hu4, edu, county)
- *_areaha: area of spatial classification in hectares (* = iws,)
- *_perimkm: perimeter of spatial classification in kilometers (* = iws,)
- *_lat: latitude of centroid of polygon in decimal degrees (NAD83) (* = iws, hu12, hu8, hu4, edu, county, state)
- *_long: longitude of centroid of polygon in decimal degrees (NAD83) (* = iws, hu12, hu8, hu4, edu, county, state)
- *_lakeareaha: lake area (ha) of focal lake associated with polygon (* = iws,)
- *_country: whether the polygon lies within the US ("US") or the US and Canada (US_CA) (* = hu12, edu)
- *_pct_in_usa: percent of polygon within the US boundary (* = iws, hu12, edu)
- *_ha_in_usa: area (ha) of polygon within the US boundary (* = iws, hu12, edu)
- *_pct_in_nwi: percent of polygon within the USFWS National Wetland Inventory (NWI) boundary (* = hu12, hu8, hu4, edu, county, state)
- *_ha_in_nwi: area (ha) of polygon within the USFWS National Wetland Inventory (NWI) boundary (* = hu12, hu8, hu4, edu, county, state)
- *_zoneid: a unique identifier for each IWS in LAGOSNE, numbered 1:n with classification prefix (e.g., HU12_1) (* = iws, hu12, hu8, hu4, edu, county, state)
- lagoslakeid: LAGOSNE unique identifier for focal lake
- hu4_states: states that intersect hu4 zone polygon
- state: 2-letter state abbreviation
- county_state: state where county is located

Details

The nine LAGOSNE spatial classifications were used to summarize the ecological context of each lake. Ecological context themes include land use/land cover (LULC), connectivity (CONN), and climate, hydrology, atmospheric deposition, and groundwater (CHAG). Not all themes were derived at all classifications due to data availability. Briefly:

- iws: a dataframe with 51065 observations of 12 variables. The area of land that drains directly into a lake, and into all upstream-connected, permanent streams to that lake exclusive of any upstream lake watersheds for lakes greater than 10 ha that are connected via permanent streams. For details on how the watersheds were delineated, see additional file 8 in Soranno et al. (2015). Themes derived at the iws classification include LULC and CONN.

- buffer100m: a dataframe with 51065 of 3 variables. Buffers are a 100 m equidistant buffer of the land that is 100 m from the lake shoreline, calculated using the ArcGIS Buffer tool. Themes derived at the 100m buffer classification include LULC.

- buffer500m: a dataframe with 51065 of 3 variables. Buffers are a 500 m equidistant buffer of the land that is 500 m from the lake shoreline, calculated using the ArcGIS Buffer tool. Themes derived at the 500m buffer classification include LULC and CONN.

- hu12: a dataframe with 20257 observations of 11 variables. The Watershed Boundary Dataset defines boundaries based on surface water drainage and creates nested Hydrologic Units (sometimes abbreviated and referred to as HUCs, which are hydrologic unit codes) that are georeferenced to the USGS 1:24,000 topographic base map. HUC12s are the sixth level of classificiation. HUC12s are defined along natural hydrologic breaks based on land surface and surface-water flow and they have a single flow outlet except in frontal, lake, braided-stream, or closed-basin hydrologic units. Themes derived at the HUC12 classification include LULC, CONN and CHAG.

- hu8: a data frame with 511 observations of 9 variables. HUC8s are the fourth level of classificciation. Sometimes called 'watersheds', a HUC8 is a geographic area representing part or all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature. Themes derived at the HUC8 classification include LULC, CONN, and CHAG.

- hu4: a data frame with 65 observations of 9 variables. HUC4s are the second level of classification, called a 'subregion'. A subregion includes the area drained by a river system, a reach of a river and its tributaries in that reach, a closed basin(s), or a group of streams forming a coastal drainage area. Themes derived at the HUC4 classification include LULC, CONN, and CHAG.

- edu: a data frame with 91 observations of 10 variables. Ecological drainage units (EDUs) follow the WBD boundaries, and are of roughly similar size to HUC6s. EDUs were delineated by grouping the HUC8 watersheds based on common zoogeographic history, and physiographic and climatic characteristics. Themes derived at the EDU classification include LULC, CONN, and CHAG.

- county: a data frame with 955 observations of 8 variables. Counties (political boundary) within the 17-state region of LAGOSNE. Themes derived at the county classification include LULC, CONN, and CHAG.

- state: a dataframe with 17 observations of 7 variables. Themes derived at the state classification include LULC, CONN, and CHAG.

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

See Also

conn lakes.geo chag lulc

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conn	*Connectivity Datasets*

Description

Datasets containing lake, stream, and wetland abundance and connectivity metrics calculated at the 500m buffer (buffer500m.conn), HUC12 (hu12.conn), HUC8 (hu8.conn), HUC4 (hu4.conn), EDU (edu.conn), county (county.conn) and state (state.conn) classifications.

Format

Data frames with all or a subset of the following variables. Number of observations is equal to the number of zones in each spatial classification (see ?classifications). Wildcard options include a subset of the LAGOSNE spatial classifications (* = buffer500m, iws, hu12, hu8, hu4, edu, county, state) and additional wildcards described below.

- Identifiers and Zone Metadata
  - *_zoneid: unique zone identifier
  - *_nwiexclusions: zones that are not completely covered by the National Wetlands Inventory
- Lake Connectivity Metrics. Lake abundance metrics are derived for all lakes, isolated lakes ("isolated" - no inflow or outflow streams), headwater lakes ("headwater" - no inflowing streams), stream drainage lakes ("drstream" - lakes with inflowing stream(s), with or without outflows, and no upstream lakes greater than 10 ha), and lake drainage lakes ("drlakeStream" lakes with inflowing stream(s) and at least one upstream lake greater than 10 ha).
  - *_lakes_**_***: all lakes that are within or intersect the zone boundary and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as average lake area (*** = agsize_ha) or count (** = count)
  - *_lakes_**_overlapping_***: all lakes that are clipped to the zone boundary and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area (*** = area_ha) or percent of zone area (*** = area_pct)
  - *_lakes_**_contributing_area_ha: all lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area
  - *_lakes_**_isolated_***: all isolated lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as average size in hectares (*** = avgsize_ha) or count (*** = count

- *_lakes_**_isolated_overlapping_***: all isolated lakes that are clipped to the zone boundary and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area (*** = area_ha) or percent of zone area (*** = area_pct)
- *_lakes_**_isolated_contributing_area_ha: all isolated lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area
- *_lakes_**_headwater_***: all headwater lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as average size in hectares (*** = avgsize_ha) or count (*** = count
- *_lakes_**_headwater_overlapping_***: all headwater lakes that are clipped to the zone boundary and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area (*** = area_ha) or percent of zone area (*** = area_pct)
- *_lakes_**_headwater_contributing_area_ha: all headwater lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area
- *_lakes_**_drstream_***: all drstream lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as average size in hectares (*** = avgsize_ha) or count (*** = count
- *_lakes_**_drstream_overlapping_***: all drstream lakes that are clipped to the zone boundary and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area (*** = area_ha) or percent of zone area (*** = area_pct)
- *_lakes_**_drstream_contributing_area_ha: all drstream lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area
- *_lakes_**_drlakestream_***: all drlakestream lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as average size in hectares (*** = avgsize_ha) or count (*** = count
- *_lakes_**_drlakestream_overlapping_***: all drlakestream lakes that are clipped to the zone boundary and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area (*** = area_ha) or percent of zone area (*** = area_pct)
- *_lakes_**_drlakestream_contributing_area_ha: all drlakestream lakes that are within or intersect the zone boundary, and are in a particular size class (** = lakes4ha, lakes4to10ha, lakes10ha), expressed as sum of lake area
- *_latewisconsinglaciation_glaciation: zone glaciation status during the late Wisconsin glaciation (Glaciated, Not_Glaciated, Partially)

- Stream Connectivity Metrics

  - *_streamdensity_streams_**: all streams (NHDFlowline minus artificial lines through lakes) within the zone expressed as sum of length in meters (** = sum_lengthm) or density in meters per hectare (** = mperha)
  - *_streamdensity_headwaters_*: headwater streams (1st-3rd Strahler order) within the zone expressed as sum of length in meters (** = sum_lengthm) or density in meters per hectare (** = mperha)
  - *_streamdensity_midreaches_*: Midreach streams (4th-6th Strahler order) within the zone expressed as sum of length in meters (** = sum_lengthm) or density in meters per hectare (** = mperha)

- *_streamdensity_rivers_*: large river-streams (>6th Strahler order) within the zone expressed as sum of length in meters (** = sum_lengthm) or density in meters per hectare (** = mperha)
- *_canalditchdensity_**: canals within the zone, expressed as sum of length in meters (** = sum_lengthm) or density in meters per hectare (** = mperha)

- Wetland Connectivity Metrics
  - *_wl_allwetlandsdissolved_**: all wetlands (regardless of vegetation, connection, or regime), expressed as average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by all wetlands (** = contributing_area_ha), or percent of land area of this zone that is covered by all wetlands (** = overlapping_area_pct). Before calculating this value, contiguous patches of different types of wetlands were first dissolved to represent a single patch.
  - *_wl_allwetlandsundissolved_**: all wetlands (regardless of vegetation, connection, or regime), expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by all wetlands (** = contributing_area_ha), or percent of land area of this zone that is covered by all wetlands (** = overlapping_area_pct). Before calculating this value, contiguous patches of different types of wetlands were first dissolved to represent a single patch.
  - *_wl_isolatedwetlandsundissolved_**: isolated wetland patches (no intersecting streams within a 30 m buffer of the wetland patch) in this zone.all wetlands (regardless of vegetation, connection, or regime), expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.
  - *_wl_singlewetlandsundissolved_**: single wetland patches (intersected within a 30 m buffer by a single first order stream) in this zone, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.
  - *_wl_connectedwetlandsundissolved_**: connected wetland patches (intersected within a 30 m buffer by a higher order stream or by multiple streams) in this zone, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.
  - *_wl_forestedwetlandsundissolved_**: forested wetland patches (dominated by woody vegetation 6m or taller) in this zone, expressed as count (** = count), average size in

hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_scrubshrubwetlandsundissolved_**: scrub-shrub wetland patches (dominated by woody vegetation < 6m tall) in this zone, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_openwaterwetlandsundissolved_**: open water wetland patches (dominated by woody vegetation < 6m tall) in this zone, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_regimefwetlandsundissolved_**: regime f (semipermanently flooded) wetland patches where surface water persists throughout the growing season in most years, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_regimegwetlandsundissolved_**: regime g (intermittently exposed) wetland patches where surface water persists throughout the growing season in most years, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_regimeawetlandsundissolved_**: regime a (temporarily flooded) wetland patches where surface water persists throughout the growing season in most years, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_regimecwetlandsundissolved_**: regime c (seasonally flooded) wetland patches where surface water persists throughout the growing season in most years, expressed

as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

– *_wl_regimehwetlandsundissolved_**: regime h (permanently flooded) wetland patches where surface water persists throughout the growing season in most years, expressed as count (** = count), average size in hectares (** = avgsize_ha), total area of wetlands that is contained within or partially intersect the border of this zone (** = overlapping_area_ha), total land area of this zone that is covered by this wetland type (** = contributing_area_ha), or percent of land area of this zone that is covered by this wetland type (** = overlapping_area_pct). The patches were left as delineated by the National Wetlands Inventory ("undissolved") for calculating this variable.

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101Gigascience 6:12

See Also

lakes.geo

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coordinatize	*Convert a LAGOSNE flat file into a spatial object*

Description

This function turns a data.frame into a spatial object using a reasonable default projection.

Usage

```
coordinatize(dt, latname = "nhd_lat", longname = "nhd_long", crs = 4326)
```

Arguments

dt	data.frame
latname	character name of latitude column; default is "nhd_lat"
longname	character name of longitude column; default is "nhd_long"
crs	numeric epsg code; default is 4326 WGS84-lat-long

Examples

```
## Not run:
dt <- lagosne_load("1.087.3")
res <- coordinatize(dt$locus)

library(maps)
map("state", xlim = c(-97.90363, -66.99892), ylim = c(34.61761, 49.41941))
plot(res$geometry, add = TRUE, pch = 19, cex = 0.05)

## End(Not run)
```

---

display_names	*Convert table names for display*

Description

Convert table names for display

Usage

```
display_names(nms_raw)
```

Arguments

nms_raw   character vector of column names

Examples

```
## Not run:
lg <- lagosne_load("1.087.3")
cbind(names(lg$iws), display_names(names(lg$iws)))
cbind(names(lg$county.chag), display_names(names(lg$county.chag)))
cbind(names(lg$county.conn), display_names(names(lg$county.conn)))
cbind(names(lg$county.lulc), display_names(names(lg$county.lulc)))
cbind(names(lg$hu4), display_names(names(lg$hu4)))
cbind(names(lg$locus), display_names(names(lg$locus)))
cbind(names(lg$epi_nutr), display_names(names(lg$epi_nutr)))
cbind(names(lg$lakes_limno), display_names(names(lg$lakes_limno)))
cbind(names(lg$lakes.geo), display_names(names(lg$lakes.geo)))

## End(Not run)
```

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epi_nutr	*Epilimnion Water Quality Data*

Description

A dataset containing physical and chemical observations in the epilimnion (surface waters). Each row is a sampling event, and lakes can have multiple sampling events.

Format

A data frame with observations of 93 variables:

- eventida1087: unique combination of programid, lakeid, and date for each sampling event in LAGOSNE
- lagoslakeid: unique integer identifier for each lake in LAGOSNE
- programname: name of the sampling/monitoring program that collected the data
- programtype: categorical description of the type of sampling/monitoring effort (Federal Agency, LTER = Long Term Ecological Research program, National Survey Program, Non-Profit Agency, State Agency, State Agency/Citizen Monitoring Program, State Agency/University/Citizen Monitoring Program, State Agency/Citizen Monitoring Program, Tribal Agency, University)
- lagosversion: current version of LAGOSNE that the data record belongs to
- sampledate: date at which the sample was collected, stored in date format (YYYY-MM-DD)
- chla: chlorophyll a (µg/l)
- colora: color, apparent (PCU)
- colort: color, true (PCU)
- dkn: nitrogen, dissolved Kjeldahl (µg/l as N)
- doc: carbon, dissolved organic (µg/l as C)
- nh4: nitrogen, ammonium NH4 (µg/l as N)
- no2: nitrogen, nitrite NO2 (µg/l as N)
- no2no3: nitrogen, nitrite NO2 + nitrate NO3 nitrogen (µg/l as N)
- srp: phosphorus, soluble reactive (µg/l as P)
- tdn: nitrogen, total dissolved (µg/l as N)
- tdp: phosphorus, total dissolved (µg/l as P)
- tkn: nitrogen, total Kjeldahl (µg/l as N)
- tn: nitrogen, total (µg/l as N)
- toc: carbon, total organic (µg/l as C)
- ton: nitrogen, total organic (µg/l as N)
- tp: phosphorus, total (µg/l as P)
- secchi: Secchi disk transparency (m).

- *_qual: data flags (qualifiers) from the source program for each water quality parameter (* = all water quality parameters listed above). For example, "chla_qual" is the variable name for the data flag for chlorophyll a observations.

- *_censorcode: identifies whether a data value is censored and the censor type for each water quality parameter (* = all water quality parameters listed above). For example, "chla_censorcode" is the variable name for censor information regarding chlorophyll a observations.

  – NC1: has detection limit and data value is above detection limit and has no qualifier or comments

  – NC2: has detection limit and data value is above detection limit, and has qualifier or comments

  – NC3: has no detection limit and has qualifier or comments

  – NC4: has no detection limit and has no qualifiers or comments

  – LE1: has detection limit, data value is less than or equal to detection limit, has qualifier or comments

  – LE2: has detection limit, data value is less than or equal to detection limit, has no qualifier or comments

  – LE3: has no detection limit, < than comes from source program, has qualifier or comments

  – LE4: has no detection limit, < than comes from source program, has no qualifier or comments

- *_detectionlimit: the detection limit used by the source program for each water quality parameter (* = all water quality parameters listed above). For example, "chla_detectionlimit" is the name of the variable that reports detection limits for chlorophyll a observations.

- *_labmethodname: analytical procedure, from a standards body if available for each water quality parameter (* = all water quality parameters listed above). For example, "chla_labmethodname" is the variable name for lab methods associated with each chlorophyll a observation.

- chla_methodinfo: flag to indicate variable was sampled using different methods. "CHLA_UNFILTERED" means that a sample was

- secchi_methodinfo: flag to indicate variable was sampled using different methods. "SEC-CHI_VIEW" means that Secchi depth was measured using a viewer box, whereas "SEC-CHI_VIEW_UNKNOWN" reports observations where it is unclear if a Secchi viewer box was used. A secchi observation without a methodinfo code means the Secchi depth was made without the viewer box.

- sampleyear: year (4-digit) in which sample was collected

- samplemonth: month in which sample was collected

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

---

info_table	*Summarize all LAGOSNE flat files*

Description

Generate table summary statistics for all LAGOSNE data frames.

Usage

```
info_table(lg)
```

Arguments

lg	list output of lagosne_load

Author(s)

Masrour Farzan

Examples

```
## Not run:
lg <- lagosne_load("1.087.3")
LAGOSNE:::info_table(lg)

## End(Not run)
```

---

lagoslakes	*Lake Geospatial Metadata*

Description

A dataset containing geospatial identifiers, upstream lake connectivity, and wetland connectivity of all lakes in LAGOSNE >1 hectare.

Format

A data frame with 141271 observations and 31 variables:

- lagoslakeid: unique lake identifier in LAGOSNE
- lakes_nhdid: unique lake identifier from the National Hydrography Dataset (NHD)
- iws_zoneid: zone ID of interlake watershed (IWS) in which focal lake is located
- hu4_zoneid: zone ID of HUC4 in which focal lake is located
- hu6_zoneid: zone ID of HUC6 in which focal lake is located
- hu8_zoneid: zone ID of HUC8 in which focal lake is located

- hu12_zoneid: zone ID of HU12 in which focal lake is located
- edu_zoneid: zone ID of ecological drainage unit (EDU) in which focal lake is located
- county_zoneid: zone ID of county in which focal lake is located
- state_zoneid: two-letter abbreviation of state in which focal lake is located
- upstream_lakes_4ha_count: count of lakes >= 4 ha upstream of the focal lake, connected via the NHD network of all surface flow connections (defined as ephemeral, intermittent, or permanent streams, or any other connections)
- upstream_lakes_4ha_area_ha: total area of lakes >= 4 ha upstream of the focal lake, connected via the NHD network of all surface flow connections (defined as ephemeral, intermittent, or permanent streams, or any other connections)
- upstream_lakes_10ha_count: count of lakes >= 10 ha upstream of the focal lake, connected via the NHD network of all surface flow connections (defined as ephemeral, intermittent, or permanent streams, or any other connections)
- upstream_lakes_10ha_area_ha: total area of lakes >= 10ha upstream of the focal lake, connected via the NHD network of all surface flow connections (defined as ephemeral, intermittent, or permanent streams, or any other connections)
- latewisconsinglaciation_glacial: glaciation status during the Late Wisconsin glaciation, where 'Glaciated' where the whole zone was glaciated, 'Not_Glaciated' where the whole zone was not glaciated, and 'Partially_Glaciated' where a part of the zone was glaciated
- wlconnections_allwetlands_*: the wetland polygons that intersect or are within 30 m buffer around a lake shoreline, measured as count, area (ha), or sum of shoreline length (km) that intersects or touches wetland polygons (* = count, contributing_area_ha, shoreline_km).
- wlconnections_forestedwetlands_count: the forested wetland polygons that intersect or are within 30 m buffer around a lake shoreline, measured as count, area (ha), or sum of shoreline length (km) that intersects or touches wetland polygons (* = count, contributing_area_ha, shoreline_km).
- wlconnections_scrubshrubwetlands_count: the scrub-shrub wetland polygons that intersect or are within 30 m buffer around a lake shoreline, measured as count, area (ha), or sum of shoreline length (km) that intersects or touches wetland polygons (* = count, contributing_area_ha, shoreline_km).
- wlconnections_openwaterwetlands_count: the open water wetland polygons that intersect or are within 30 m buffer around a lake shoreline, measured as count, area (ha), or sum of shoreline length (km) that intersects or touches wetland polygons (* = count, contributing_area_ha, shoreline_km).
- wlconnections_otherwetlands_count: the other-wetland polygons that intersect or are within 30 m buffer around a lake shoreline, measured as count, area (ha), or sum of shoreline length (km) that intersects or touches wetland polygons (* = count, contributing_area_ha, shoreline_km).
- lakeconnection: connectivity of focal lake to upstream features (DR_LakeStream = drainage lake with an upstream lake, DR_Stream = drainage lake with upstream stream, Headwater = lake with outlet but no inlet, Isolated = lake with no inlets or outlets)

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

---

lagosne_compile   *Compile LAGOSNE data*

Description

Compile LAGOSNE data from component flat files. This function should rarely be called directly outside of manual updating of source data.

Usage

```
lagosne_compile(
  version,
  limno_folder = NA,
  geo_folder = NA,
  locus_folder = NA,
  dest_folder = NA
)
```

Arguments

version	character LAGOSNE database version string
limno_folder	file.path to limno export folder
geo_folder	file.path to geo export folder
locus_folder	file.path to locus export folder
dest_folder	file.path optional will default to the location returned by user_data_dir

Examples

```
## Not run:
lagosne_compile("1.087.3",
 limno_folder = "~/Downloads/LAGOS-NE-LIMNO-EXPORT",
 geo_folder   = "~/Downloads/LAGOS-NE-GEO-EXPORT",
 locus_folder = "~/Downloads/LAGOS-NE-LOCUS-EXPORT",
 dest_folder = lagos_path())

## End(Not run)
```

---

lagosne_get   *Retrieve LAGOSNE flat files*

Description

Retrieve LAGOSNE flat files from EDI.

Usage

```
lagosne_get(
  version = lagosne_version(),
  overwrite = FALSE,
  dest_folder = tempdir()
)
```

Arguments

version	character LAGOSNE database version string
overwrite	logical overwrite existing data for the specified version
dest_folder	file.path to save data. Default to a temporary folder. Recommended to set to LAGOSNE:::lagos_path() so that data persists between R sessions.

Examples

```
## Not run:
# default to latest version
lagosne_get(dest_folder = LAGOSNE:::lagos_path())

# get previous version(s)
# - recommended to install corresponding package version
# - See 'Legacy Versions' section of the README for instructions

## End(Not run)
```

---

lagosne_load   *Load LAGOSNE data*

Description

Load LAGOSNE data from local system files

Usage

```
lagosne_load(version = NULL, fpath = NA)
```

Arguments

version	character LAGOSNE database version string. Defaults to `lagosne_version`
fpath	file.path optionally specify custom location of LAGOSNE rds file

Examples

```
## Not run:
dt  <- lagosne_load("1.087.3")

## End(Not run)
```

---

lagosne_select   *Select and filter LAGOSNE data*

Description

Select and filter LAGOSNE data with keyword helpers.

Usage

```
lagosne_select(
  table = NULL,
  vars = NULL,
  categories = NULL,
  dt = lagosne_load(lagosne_version())
)
```

Arguments

table	character name of a dt table
vars	character vector of specific column names to select from table
categories	what type of variables should be kept. Note not all scale-category options are available. Variable categories include:

- "waterquality" - includes all in-situ chemistry, chlorophyll, and water clarity measurements from the epi_nutr table.
- "deposition" - all atmospheric deposition variables from the .chag tables
- "hydrology" - baseflow, groundwater, runoff, and overland flow variables from the .chag tables
- "climate" - 30-year normal precipitation and temperature variables from the .chag tables
- "geology" - all surficial geology variables from the .chag tables
- "topography" - Terrain Roughness Index and slope variables from the .lulc tables
- "lulc1992" - all 1992 land use/land cover variables from the .lulc tables
- "lulc2001" - all 2001 land use/land cover variables from the .lulc tables

- "lulc2006" - all 2006 land use/land cover variables from the .lulc tables
- "lulc2011" - all 2011 land use/land cover variables from the .lulc tables
- "lakes" - all lake connectivity metrics from the .conn tables
- "wetlands" - all wetland connectivity metrics from the .conn tables
- "streams" - all stream/river connectivity metrics from the .conn tables

dt   data.frame of local copy of LAGOSNE data. Can be loaded with `lagosne_load`
                    and will use version as specified in `lagosne_version`.

Examples

```
## Not run:
dt <- lagosne_load("1.087.3")

# specific variables
head(lagosne_select(table = "epi_nutr", vars = c("tp", "tn")))
head(lagosne_select(table = "iws.lulc", vars = c("iws_nlcd2011_pct_95")))

# categories
head(lagosne_select(table = "epi_nutr", categories = "waterquality"))
head(lagosne_select(table = "county.chag", categories = "hydrology"))
head(lagosne_select(table = "hu4.chag", categories = "deposition"))

# mix of specific variables and categories
head(lagosne_select(table = "epi_nutr", vars = "lagoslakeid", categories = c("waterquality")))


## End(Not run)
```

---

lagosne_version   *Latest LAGOSNE version*

Description

Latest LAGOSNE version

Usage

```
lagosne_version()
```

Examples

```
lagosne_version()
```

`lagos_get_collins_2017`

Get LAGOSNE snapshot from Collins et al. 2017

Description

Get LAGOSNE snapshot from Collins et al. 2017

Usage

```
lagos_get_collins_2017(dest_folder, overwrite = FALSE)
```

Arguments

`dest_folder`	file.path not implemented yet
`overwrite`	logical overwrite existing data?

References

Collins S., S. Oliver, J. Lapierre, E. Stanley, J. Jones, T. Wagner, P. Soranno. 2016. LAGOS - Lake nitrogen, phosphorus, stoichiometry, and geospatial data for a 17-state region of the U.S.. Environmental Data Initiative. doi:10.6073/pasta/3abb4a56e76a52a12a366a338fc07dd8.

Examples

```
## Not run:
lagos_get_collins_2017()

## End(Not run)
```

`lagos_get_oliver_2015` *Get depth data from Oliver et al. 2015*

Description

Get depth data from Oliver et al. 2015

Usage

```
lagos_get_oliver_2015(dest_folder, overwrite = FALSE)
```

Arguments

`dest_folder`	file.path not implemented yet
`overwrite`	logical overwrite existing data?

References

Oliver SK, Soranno PA, Fergus EC, Wagner T, Webster KE, Scott C, Winslow LA, Downing JA, Stanley EH. 2015. LAGOS - Predicted and observed maximum depth values for lakes in a 17-state region of the U.S. Long Term Ecological Research Network. doi:10.6073/pasta/f00a245fd9461529b8cd9d992d7e3a2f

Examples

```
## Not run:
lagos_get_oliver_2015()

## End(Not run)
```

---

lagos_ingest	*Ingest LAGOSNE flat files*

Description

Ingest LAGOSNE data from component flat files

Usage

```
lagos_ingest(version, limno_folder = NA, geo_folder = NA, locus_folder = NA)
```

Arguments

`version`	character LAGOSNE database version string
`limno_folder`	file.path to limno export folder. optional.
`geo_folder`	file.path to geo export folder. optional.
`locus_folder`	file.path to locus export folder. optional.

Examples

```
## Not run:
lagos_ingest("1.087.3",
 limno_folder = "~/Downloads/LAGOS-NE-LIMNO-EXPORT",
 geo_folder   = "~/Downloads/LAGOS-NE-GEO-EXPORT",
 locus_folder = "~/Downloads/LAGOS-NE-LOCUS-EXPORT")

## End(Not run)
```

```
lagos_load_collins_2017
```
Load LAGOSNE snapshot from Collins et al. 2017.

Description

Load LAGOSNE snapshot from Collins et al. 2017.

Usage

```
lagos_load_collins_2017(fpath = NA)
```

Arguments

fpath   file.path optionally specify custom location of csv data file

References

Collins S., S. Oliver, J. Lapierre, E. Stanley, J. Jones, T. Wagner, P. Soranno. 2016. LAGOS - Lake nitrogen, phosphorus, stoichiometry, and geospatial data for a 17-state region of the U.S.. Environmental Data Initiative. doi:10.6073/pasta/3abb4a56e76a52a12a366a338fc07dd8.

Examples

```
## Not run:
lg <- lagos_load_collins_2017()

## End(Not run)
```

```
lagos_load_oliver_2015
```
Load depth data from Oliver et al. 2015.

Description

Load depth data from Oliver et al. 2015.

Usage

```
lagos_load_oliver_2015(fpath = NA)
```

Arguments

fpath   file.path optionally specify custom location of csv data file

Format

A data frame with 50607 observations of 8 variables:

- lagoslakeid: unique identifier for each lake in LAGOS-NE. For each row of data in this table, the lagoslakeid identifies the focal lake for which other measures are calculated

- nhdid: the 'Permanent_identifier' from the NHD, but is called the NHDID in LAGOS-NE

- hu4id: the unique ID of the HU4 zone that the focal lake is located within

- lat_decimal: lattitude geographic coordinate in decimal degrees

- long_decimal: longitude geographic coordinate in decimal degrees

- area: lake area in hectares

- zmaxobs: observed maximum lake depth (meters)

- zmaxpredict: predicted maximum lake depth (meters)

References

Oliver SK, Soranno PA, Fergus EC, Wagner T, Webster KE, Scott C, Winslow LA, Downing JA, Stanley EH. 2015. LAGOS - Predicted and observed maximum depth values for lakes in a 17-state region of the U.S. Long Term Ecological Research Network. doi:10.6073/pasta/f00a245fd9461529b8cd9d992d7e3a2f

Examples

```
## Not run:
lagos_load_oliver_2015()

## End(Not run)
```

---

lagos_path   *Return the cross-platform data path designated for LAGOSNE.*

Description

Return the cross-platform data path designated for LAGOSNE.

Usage

```
lagos_path()
```

lagos_source_program   *LAGOSNE sources*

Description

A dataset identifying the sources of limnological data in LAGOSNE.

Format

A data frame with observations of 19 variables:

- programid: unique LAGOSNE program identifier
- programname: name of the sampling/monitoring program that collected the data
- metadataid: unique metadata identifier associated with
- sourceid
- sourcename
- composite
- programtype: categorical description of the type of sampling /monitoring effort
- fundingsource
- labtype
- programlink
- programstatus
- dataprovider
- organization
- sourcedescription
- beg_yr
- end_yr
- state_name
- lakecount
- variable_list

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

---

lakes_limno *Metadata for Lakes with Water Quality*

Description

A dataset containing depth and names for lakes included in the limno module.

Format

A data frame with observations of 8 variables:

- lagoslakeid: unique lake identifier developed for LAGOS-NE
- nhdid: the 'Permanent_identifier' from the NHD, but is called the NHDID in LAGOS-NE
- lagosname1: name of lake from source dataset used as the authoritative lake name for LAGOSNE
- meandepth: mean lake depth (meters)
- meandepthsource: source of mean depth data, see "lagos_source_program" for definitions
- maxdepth: maximum lake depth (meters)
- maxdepthsource: source of maximum depth data, see "lagos_source_program" for definitions
- legacyid: unique lake identifier from the original water quality source dataset, this is not standardized and each source dataset has its own system

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101Gigascience 6:12

See Also

lakes.geo

---

lake_info *Get a summary of lake attribute information*

Description

Return lake attribute information from its name and state or its lagoslakeid.

Usage

```
lake_info(lagoslakeid = NA, name = NA, state = NA, dt = lagosne_load(), ...)
```

Arguments

lagoslakeid	numeric lake id
name	character lake name not caps sensitive
state	character state name not caps sensitive
dt	list of data.frames. output of `lagosne_load`.
...	arguments passed to `agrepl` to fuzzy match lake name

Examples

```
## Not run:
lake_info(lagoslakeid = 4314)
lake_info(lagoslakeid = 7441)
lake_info(lagoslakeid = 244)
lake_info(lagoslakeid = 4686)
lake_info(lagoslakeid = 8016)
lake_info(lagoslakeid = c(21864, 2317))
lake_info(lagoslakeid = c(1441))
lake_info(lagoslakeid = c(125428, 1441))
lake_info(lagoslakeid = c(4686, 8016))

# fuzzy matching to lake name
lake_info(name = "Duck Lake", state = "Michigan")
# exact matching to lake name
lake_info(name = "Duck Lake", state = "Michigan",
          max.distance = list(all = 0))

lake_info(name = "Sunapee Lake", state = "New Hampshire")
lake_info(name = c("Sunapee Lake", "Oneida Lake"),
              state = c("New Hampshire", "New York"))

## End(Not run)
```

---

lg_extent	*The spatial extent of LAGOSNE data*

Description

A dataset containing the spatial extent of LAGOSNE data.

Format

A single sf polygon

---

load_lagos_txt *Load LAGOSNE data from disk*

Description

A wrapper for `read.table` with a default set of parameters.

Usage

```
load_lagos_txt(file_name, sep = "\t", ...)
```

Arguments

file_name	character
sep	character separator (tab or comma separated values)
...	Options passed on to `read.table`

Value

data.frame

---

locus *Metadata for all lakes > 1ha*

Description

A dataset containing identifying information for all lakes > 1ha. This includes lake name, lake size (area and perimeter), location (lat/long), elevation, and codes identifying zones in which the lake is located.

Format

A data frame with 141265 observations of 17 variables:

- lagoslakeid: unique identifier for each lake in LAGOS-NE. For each row of data in this table, the lagoslakeid identifies the focal lake for which other measures are calculated
- nhdid: the 'Permanent_identifier' from the NHD, but is called the NHDID in LAGOS-NE
- gnis_name: lake name from the GNIS database
- nhd_lat: latitude of centroid of the NHD lake polygon in decimal degrees (NAD83)
- nhd_long: longitude of centroid of the NHD lake polygon in decimal degrees (NAD83)
- lake_area_ha: surface area (in hectares) of lake waterbody polygon from NHD
- lake_perim_meters: perimeter (in meters) of lake waterbody polygon from the NHD
- nhd_fcode: NHD five-digit integer code with feature code plus additional characteristics/values

- nhd_ftype: NHD three-digit integer code providing a unique identifier of feature type for the waterbody

- iws_zoneid: the unique ID of the IWS that is estimated for the focal lake in the row of data that is identified by the lagoslakeid.

- hu4_zoneid: the unique ID of the HU4 zone that the focal lake is located within

- hu6_zoneid: the unique ID of the HU6 zone that the focal lake is located within

- hu8_zoneid: the unique ID of the HU8 zone that the focal lake is located within

- hu12_zoneid: the unique ID of the HU12 zone that the focal lake is located within

- edu_zoneid: the unique ID of the EDU zone that the focal lake is located within

- county_zoneid: the unique ID of the county that the focal lake is located within

- state_zoneid: the unique ID of the state that the focal lake is located within

- elevation_m: the elevation of the lake centroid, in meters (referenced to the North American Vertical Datum of 1988 (NAVD88)) and obtained from the National Elevation Dataset

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

See Also

lakes.geo

---

lulc   *Land Use Land Cover (LULC) Data Frames*

Description

Datasets containing information on the land use and land cover (LULC) characteristics calculated at all LAGOSNE spatial classifications (see ?scales) from the National Land Cover Dataset (NLCD).

Format

Data frames with all or a subset of the following variables. Number of observations is equal to the number of zones in each spatial scale (see Details below). Wildcard options include the 9 LAGOSNE spatial scales (* = buffer100m, buffer500m, iws, hu12, hu8, hu4, edu, county, state), year of measurement (** = 1992, 2001, 2006, 2011), and unit of measurement in hectares or percent of zone area (*** = ha, pct unless noted otherwise). Each variable is available at each scale, year, and unit unless otherwise noted.

- *_nhdid (* = buffer100m, buffer500m, iws)

- *_canopy2001_***: per pixel tree canopy percent measured 2001. Summary statistics include minimum, maximum, mean and standard deviation (*** = min, max, mean, std).

- *_damdensity_***: dams in zone. Summary statistics include a point count, points per hectare, and points per square kilometer (*** = pointcount, pointsperha, pointspersqkm)

- *_nlcd**_***_0: No data

- *_nlcd**_***_11: Open water

- *_nlcd1992_***_21: Residential, low intensity

- *_nlcd**_***_21: Developed, open space. Note, this variable was not measured in 1992 (**
  = 2001, 2006, 2011)

- *_nlcd1992_***_22: Residential, high intensity

- *_nlcd**_***_22: Developed, low intensity. Note, this variable was not measured in 1992
  (** = 2001, 2006, 2011)

- *_nlcd1992_***_23: Commercial/industrial/transportation

- *_nlcd**_***_23: Developed, medium intensity. Note, this variable was not measured in
  1992 (** = 2001, 2006, 2011)

- *_nlcd**_***_24: Developed, high Intensity. Note, this variable was not measured in 1992
  (** = 2001, 2006, 2011)

- *_nlcd**_***_31: Bare rock/sand/clay

- *_nlcd1992_***_32: Quarries/strip mines/gravel pits measured in 1992

- *_nlcd1992_***_33: Transitional (barren) measured in 1992

- *_nlcd**_***_41: Deciduous forest

- *_nlcd**_***_42: Evergreen forest

- *_nlcd**_***_43: Mixed forest

- *_nlcd1992_***_51: Shrubland measured in 1992.

- *_nlcd1992_***_52: Scrub/shrub. Note, this variable not measured in 1992 (** = 2001, 2006,
  2011)

- *_nlcd1992_***_61: Orchards/vineyards/other measured in 1992.

- *_nlcd**_***_71: Grasslands/herbaceous

- *_nlcd**_***_81: Pasture/hay

- *_nlcd**_***_82: Row crops

- *_nlcd1992_***_83: Small grains measured in 1992.

- *_nlcd1992_***_85: Urban/recreational grasses measured in 1992.

- *_nlcd**_***_90: Woody wetlands. Note, this variable not calculated in 1992 (** = 2001,
  2006, 2011). Equivalent code for 1992 = 91.

- *_nlcd1992_***_91: Woody wetlands measured in 1992. Equivalent code for 2001, 2006 and
  2011 = 90.

- *_nlcd1992_***_92: Emergent herbaceous wetlands measured in 1992. Equivalent code for
  2001, 2006, and 2011 = 95.

- *_nlcd**_***_95: Emergent herbaceous wetlands. Note, this variable not calculated in 1992
  (** = 2001, 2006, 2011). Equivalent code for 1992 = 92.

- *_roaddensity_***: Roads within the zone, calculated as sum of the length in meters, or
  sum of the length in meters divided by area of zone in hectares (*** = sum_lengthm, den-
  sity_mperha)

- *_slope_***: The slope at each cell is the slope with respect to its immediate neighbors (10m scale). Cells in zone summarized as either the minimum, maximum, mean, or standard deviation (*** = min, max, mean, std)

- *_tri_***: Terrain ruggedness index (TRI) at each cell is the absolute difference in meters between the elevation of the focal cell and its immediate neighbors (10m scale). Cells in zone summarized as either the minimum, maximum, mean, or standard deviation (*** = min, max, mean, std)

- *_zoneid: unique zone identifier (* = iws, hu12, hu8, hu4, edu, county, state)

- lagoslakeid: unique integer identifier for focal lake

- lakeconnection: connectivity class of focal lake. Only in iws.lulc table.

- borderiws: whether iws zone intersects Canadian border (1 = yes, NA = no). Only in iws.lulc table.

Details

Original data sources and layers from which each metric was derived can be found in additional file 5 of Soranno et al. (2015).

References

Soranno et al. (2017) doi:10.1093/gigascience/gix101

See Also

lakes.geo

---

query_column_keywords   *Query column keywords*

Description

Return a vector of column names, given a table name and keyword string.

Usage

```
query_column_keywords(dt, table_name, keyword_string)
```

Arguments

dt	data.frame
table_name	character
keyword_string	character

Examples

```
## Not run:
dt <- lagosne_load("1.087.3")
query_column_keywords(dt, "hu12.chag", "hydrology")

## End(Not run)
```

---

query_column_names   *Query column names*

Description

Return a vector of column names, given a table name and grep query string.

Usage

```
query_column_names(dt, table_name, grep_string)
```

Arguments

dt	data.frame
table_name	character
grep_string	character

Examples

```
## Not run:
dt <- lagosne_load("1.087.3")
query_column_names(dt, "hu4.chag", "_dep_")
query_column_names(dt, "county.chag", "baseflowindex")

## End(Not run)
```

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query_lagos_names   *Query LAGOSNE names*

Description

Return a vector of table names whose associated tables have columns that grep to query.

Usage

```
query_lagos_names(grep_string, scale = NA, dt = lagosne_load())
```

Arguments

grep_string	character search string to grep to table column names
scale	character filter results by one of:

       • county
       • edu
       • hu4
       • hu8
       • hu12
       • state

dt	data.frame output of `lagosne_load`

Examples

```
## Not run:
query_lagos_names("_dep_")
query_lagos_names("_dep_", "hu4")
query_lagos_names("chla")
query_lagos_names("secchi")
query_lagos_names("conn")

## End(Not run)
```

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