Lagos Spatial Analysis

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25/12/2019

```r
library(tidyverse) #tidy packcages
```

```
## -- Attaching packages -------------------------------------------------------------------------------
## v ggplot2 3.2.1     v purrr   0.3.3
## v tibble  2.1.3     v dplyr   0.8.3
## v tidyr   1.0.0     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.4.0
## -- Conflicts --------------------------------------------------------------------------------------- t
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```r
library(sf) # Package that can read and create shapefiles
```

```
## Linking to GEOS 3.6.1, GDAL 2.2.3, PROJ 4.9.3
```

```r
library(mapview) # Interactive maps
library(LAGOSNE) # lots of clean datasets
library(USAboundaries) # Package that conyains the USA Boundary Data
```

LAGOS Analysis

Loading in data

First download and then specifically grab the locus (or site lat lon)

```r
# download script
lagosne_get(dest_folder = LAGOSNE:::lagos_path())
```

```
## Warning in lagosne_get(dest_folder = LAGOSNE:::lagos_path()): LAGOSNE data for this version already e
##   Re-download if neccessary using the 'overwrite` argument.'
```

```r
#Load lagos data
lagos <- lagosne_load()
```

```
## Warning in `_f`(version = version, fpath = fpath): LAGOSNE version unspecified,
## loading version: 1.087.3
```

```r
# lagos dataset is list of lists and check what lists of data are in the lagos
names(lagos)
```

```
##  [1] "county"                "county.chag"           "county.conn"
##  [4] "county.lulc"           "edu"                   "edu.chag"
##  [7] "edu.conn"              "edu.lulc"              "hu4"
## [10] "hu4.chag"              "hu4.conn"              "hu4.lulc"
## [13] "hu8"                   "hu8.chag"              "hu8.conn"
## [16] "hu8.lulc"              "hu12"                  "hu12.chag"
## [19] "hu12.conn"             "hu12.lulc"             "iws"
## [22] "iws.conn"              "iws.lulc"              "state"
## [25] "state.chag"            "state.conn"            "state.lulc"
## [28] "buffer100m"           "buffer100m.lulc"      "buffer500m"
## [31] "buffer500m.conn"      "buffer500m.lulc"      "lakes.geo"
## [34] "epi_nutr"             "lakes_limno"          "lagos_source_program"
## [37] "locus"
```

```
# Garb the lake center information
lake_centers <- lagos$locus
```

Convert to spatial data

```
names(lake_centers) # check the column names or variables fo the lake centres
```

```
##  [1] "lagoslakeid"       "nhdid"             "gnis_name"
##  [4] "nhd_lat"           "nhd_long"          "lake_area_ha"
##  [7] "lake_perim_meters" "nhd_fcode"         "nhd_ftype"
## [10] "iws_zoneid"        "hu4_zoneid"        "hu6_zoneid"
## [13] "hu8_zoneid"        "hu12_zoneid"       "edu_zoneid"
## [16] "county_zoneid"     "state_zoneid"      "elevation_m"
```

```
# Look at the structure of the
str(lake_centers)
```

```
## 'data.frame':    141265 obs. of  18 variables:
##  $ lagoslakeid      : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ nhdid            : chr  "50524769" "123632625" "50524793" "135695054" ...
##  $ gnis_name        : chr  NA "Benton Pond" NA "Wedge Pond" ...
##  $ nhd_lat          : num  42.5 42.2 42.5 42.5 42.6 ...
##  $ nhd_long         : num  -73.2 -73 -73.2 -71.1 -70.8 ...
##  $ lake_area_ha     : num  114.95 24.87 75.41 9.26 14 ...
##  $ lake_perim_meters: num  9296 2939 5822 1417 2013 ...
##  $ nhd_fcode        : int  43613 39009 43613 39004 39004 39010 39004 39004 39004 39004 ...
##  $ nhd_ftype        : int  436 390 436 390 390 390 390 390 390 390 ...
##  $ iws_zoneid       : chr  "IWS_45400" "IWS_41585" "IWS_44511" "IWS_42712" ...
##  $ hu4_zoneid       : chr  "HU4_12" "HU4_7" "HU4_12" "HU4_10" ...
##  $ hu6_zoneid       : chr  "HU6_15" "HU6_10" "HU6_15" "HU6_11" ...
##  $ hu8_zoneid       : chr  "HU8_49" "HU8_41" "HU8_49" "HU8_35" ...
##  $ hu12_zoneid      : chr  "HU12_16694" "HU12_16612" "HU12_16694" "HU12_16625" ...
##  $ edu_zoneid       : chr  "EDU_75" "EDU_27" "EDU_75" "EDU_58" ...
##  $ county_zoneid    : chr  "County_319" "County_319" "County_319" "County_326" ...
##  $ state_zoneid     : chr  "State_2" "State_2" "State_2" "State_2" ...
##  $ elevation_m      : num  295.86 447.83 295.86 4.26 13.65 ...
```

```
# Base R style index
# View(lake_centers[1:100,]) # first rows 1 to 100 and all the columns

# Similarly Tidyverse version
# View(lake_centers %>% slice(1:100))

# suite of sf functions check for st_as_sf
# ?st_as_sf

# take the table data and convert that to a spatial object using st_as_sf

spatial_lake <- st_as_sf(lake_centers,coords=c("nhd_long", "nhd_lat"),
                         crs=4326) %>%
  st_transform(2163)
```

```r
# Subet for ploting
subset_spatial <- spatial_lake %>%
  slice(1:100)

# Dynamic mapview

mapview(subset_spatial)
```

```
## PhantomJS not found. You can install it with webshot::install_phantomjs(). If it is installed, please
```

Subset only Minesota

```r
states <- us_states()

mapview(states)
```

```r
minnesota <- states %>%
  filter(name == "Minnesota") %>%
  st_transform(2163)

# Subset lakes based on spatial position
minnesota_lakes <- spatial_lake[minnesota,]

#ploting first 100 lakes
minnesota_lakes %>%
  slice(1:100) %>%
  arrange(lake_area_ha) %>%
  mapview(.,zcol="lake_area_ha")
```