Lakes, Landscape, and R:

A framework for open research on freshwater cyanobacteria

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Twitter?

hashtag: #usiale2018 #rstats #cyanobacteria

me: @jhollist

Open Science?

What is open science?

- Access to materials
- Reproducible/ Repeatable
- The Web!
- A process, not a state

Why open science?

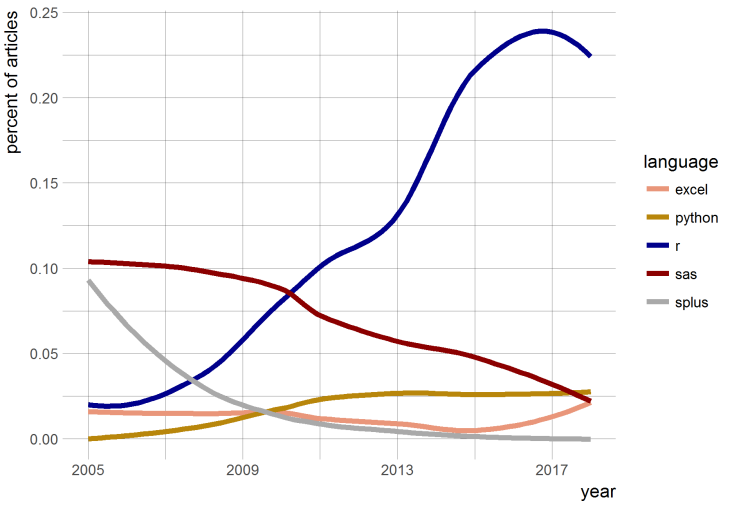
- Often required
  - Government/Funders/Journals
- Benefits researchers
  - Mciernan et al. (2016) How open science helps researchers succeed
- Improves quality
  - The classic example: Reinhart and Rogoff
- Benefits to society
  - "Sharing of Data Leads to Progress on Alzheimerâ€™s"

Open Science Solutions

- Publishing
- Data
- Code

R in Landscape Ecology

- Use of R on increase
- Packages
  - Old-timers: sp, rgdal, raster, rgeos,
  - Whippersnappers: sf, stars
  - landsat
  - SDMtools
  - nlmr
  - landscapetools
  - landscapemetrics



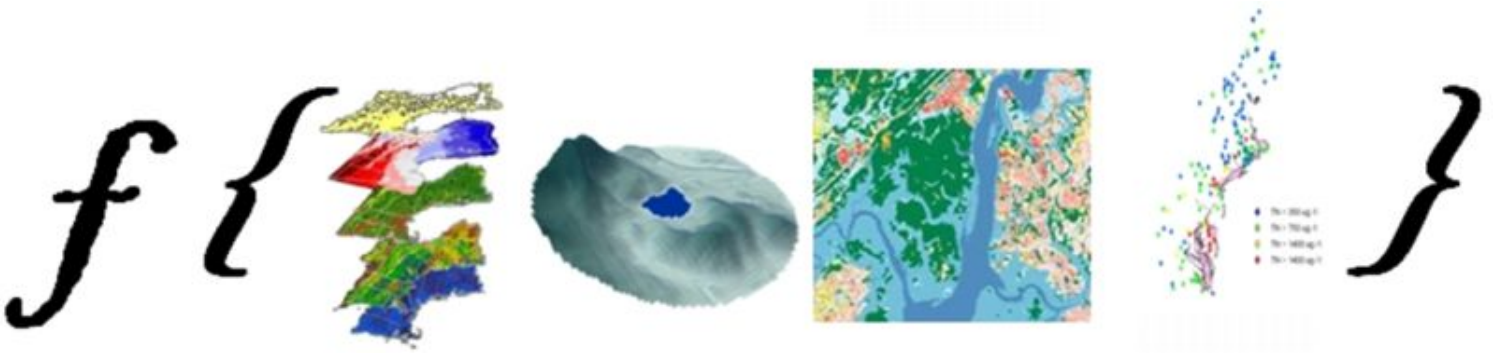
R, lakes, and cyanobacteria at USEPA

Who are we?

- Ecologists
- Computational focus
  - Enough to be dangerous
- 3 FTE
  - Myself
  - Betty Kreakie
  - Bryan Milstead
- 1 Post-doc
  - Stephen Shivers
- Alum
  - Farnaz Nojavan

What do we do?

- Apply computational approaches to understand water quality impacts in lakes
- Open Science
- Use R
  - Analysis
  - Sharing code
  - Solve common problems

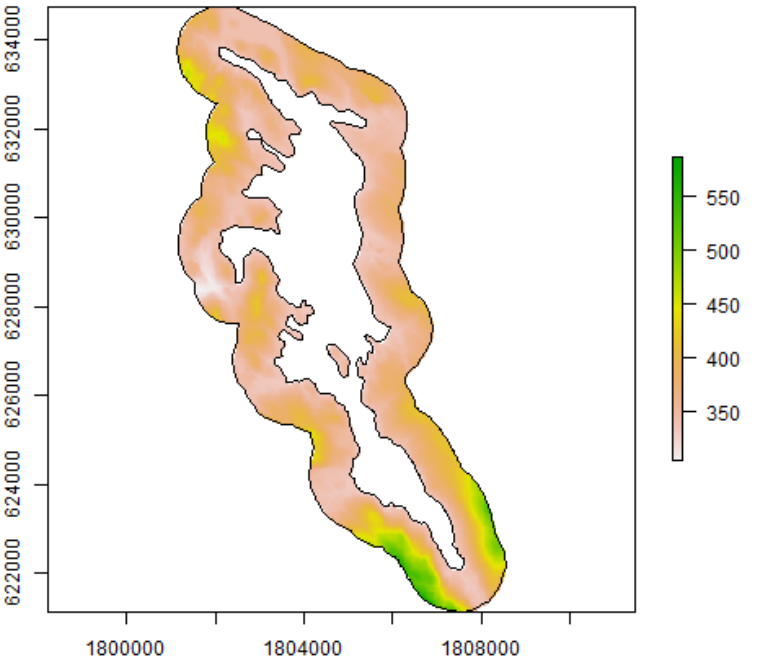


Packages to solve common problems

- `lakemorpho`
- `elevatr`
- `goatscape` (in development)

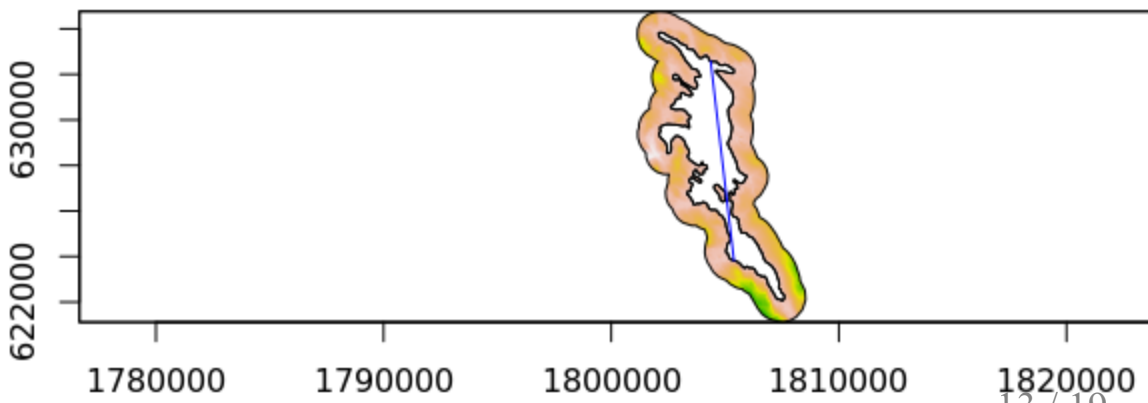
`lakemorpho`

- Lake morphometry metrics in R
- Built off of `sp`, `rgdal`, `rgeos`, and `raster` suite
- Version 1.0
  - August 2014
- Version 1.1.0
  - December 2016
- `sf` support to be added
- National Lake Morphometry
- Some metrics included in NHD+
- Hollister and Milstead (2010)
- Hollister *et. al.* (2011)
- Hollister and Stachelek (2017)



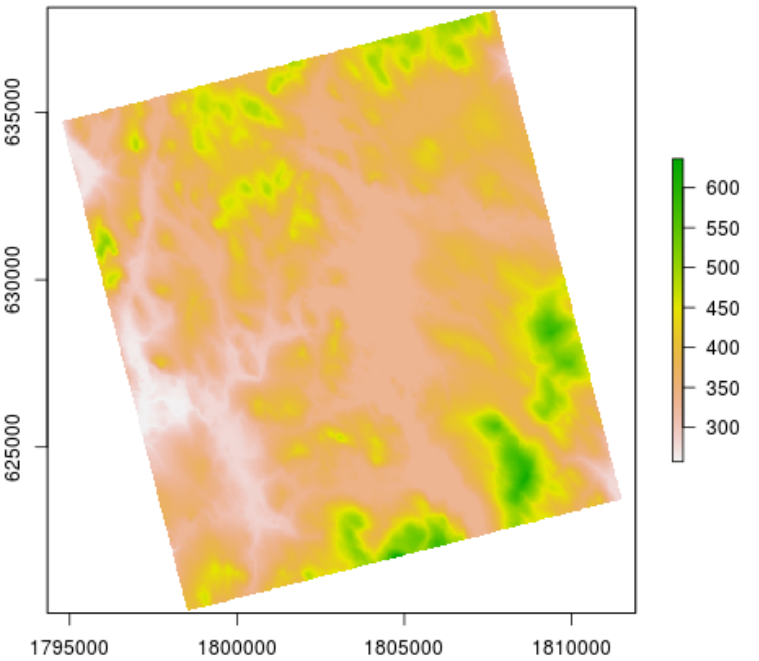
Package URL: https://cran.r-project.org/package=lakemorpho

lakemorpho::demo



elevatr

- Access elevation data in R
  - Mapzen
  - AWS
  - USGS
- Built off of `sp`, `rgdal`, `rgeos`, and `raster` suite
- Version 0.1.1
  - January 2017
- Version 0.1.3
  - March 2017
- Will be paired with `lakemorpho`
- `sf` support to be added



Package URL: https://cran.r-project.org/package=elevatr

elevatr::demo

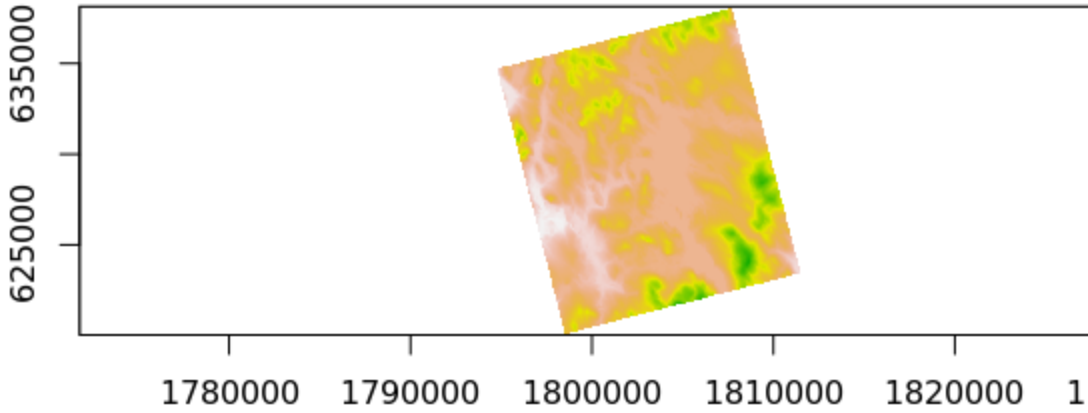
```
t elevations
at +ellps=WGS84 +datum=WGS84 +no_defs"
oint(pt_df, prj = ll_wgs84 )

 DEM
raster(lake, z = 12, src = "aws")
```

```
514  (nrow, ncol, ncell)
y)
, 620036.4, 638140.2  (xmin, xmax, ymi

=20 +lat_2=60 +lat_0=40 +lon_0=-96 +x_0
n +no_defs +ellps=GRS80 +towgs84=0,0,0


ln, max)
```



goatscape

- New effort with Bryan Milstead
- What's in a name?
- Summarizes ancillary data for a user-defined landscape polygon
  - Census (via `censusapi`)
  - Landcover
  - Impervious
- Accepts arbitrary spatial data for the landscape
- Based on `sf` and tidy by design
- https://github.com/usepa/goatscape

Take Home Message

Take Home Message

- R is awesome
- Can be used for a wide array of uses (including this talk)
- Increasing use in LE
- Our packages and Others

Thanks!

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Slides created via the R package **xaringan**.