

# **Lakes, Landscape, and R:**

## **A framework for open science on freshwater cyanobacteria**

**Jeff Hollister and Bryan Milstead (USEPA)**

**US-IALE 2018**

**Chicago, IL**

**2018-04-11**

# Twitter?



**hashtag: #usiale2018 #rstats #cyanobacteria**

**me: @jhollist**

# Open Science?

# Why open science?

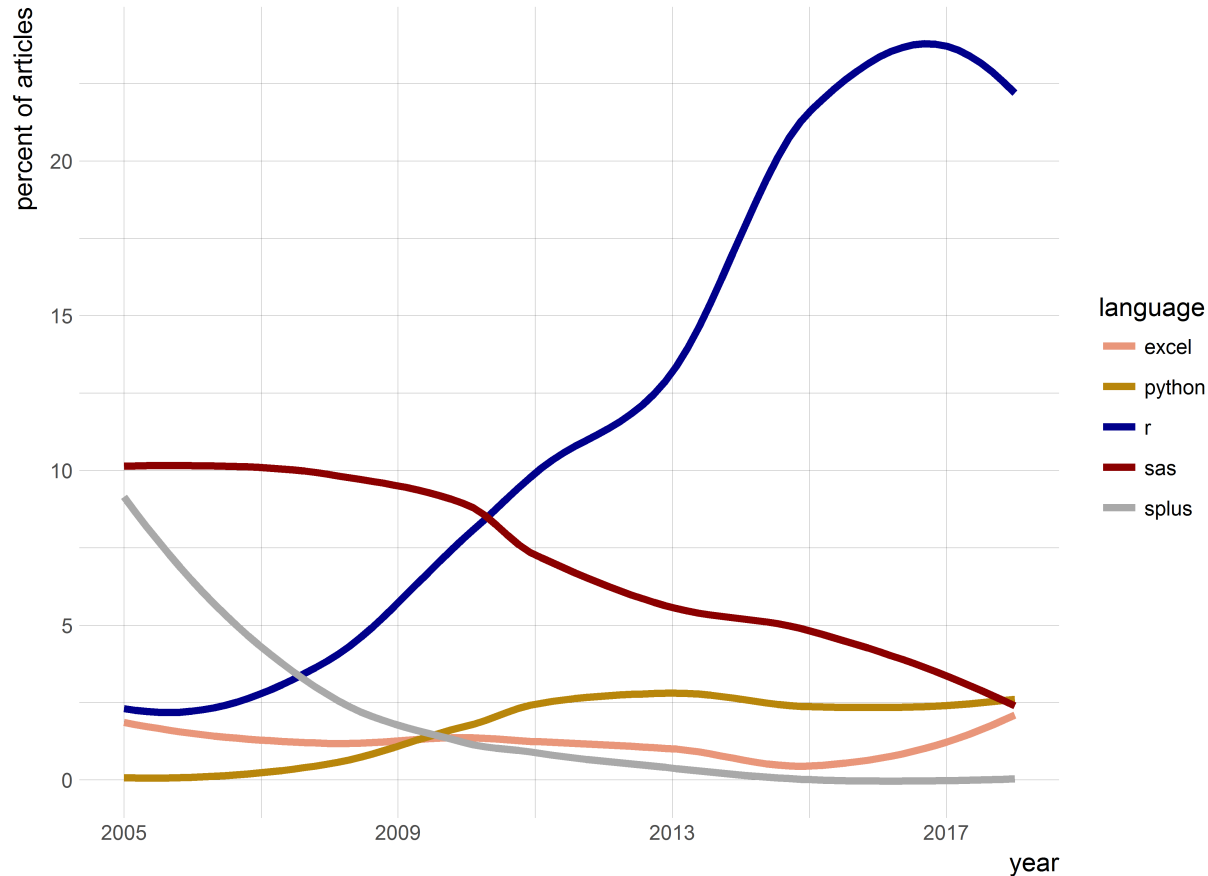
- Often required
  - Government/Funders/Journals
- Benefits researchers
  - [Mciernan et al. \(2016\) How open science helps researchers succeed](#)
- Improves quality
  - [The classic example: Reinhart and Rogoff](#)
- Benefits to society
  - ["Sharing of Data Leads to Progress on Alzheimerâ€™s"](#)



# Open Science Solutions

- Publishing
- Data
- Code

# R in Landscape Ecology



Text mining facilitated by [rOpenSci's](#) awesome [fulltext](#) package

# R in Landscape Ecology

- Foundations
  - [sp](#), [rgdal](#), [raster](#), [rgeos](#)
  - [sf](#), [stars](#)
- Speciality
  - [landsat](#)
  - [SDMtools](#)
  - [nlmr](#)
  - [landscapetools](#)

# R, lakes, and cyanobacteria at USEPA



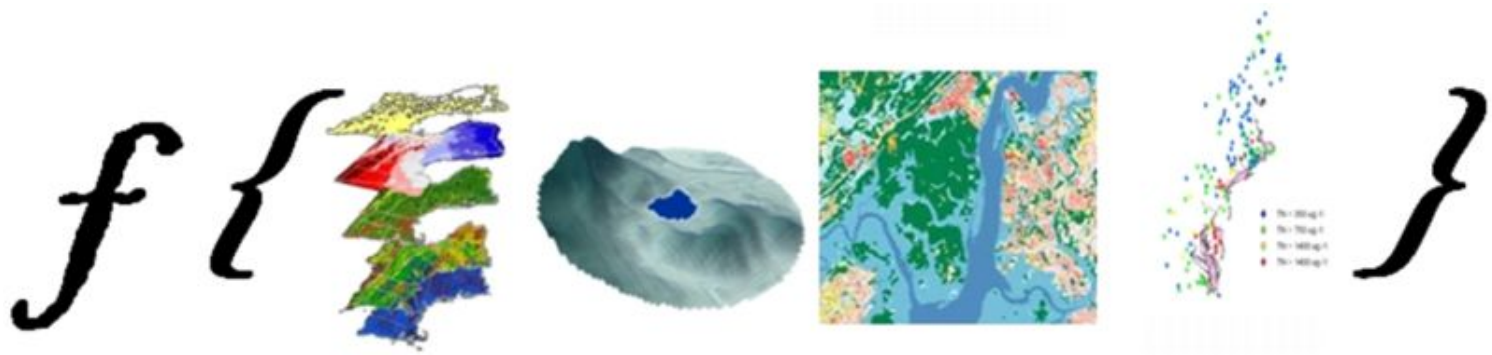
# Who are we?

- 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



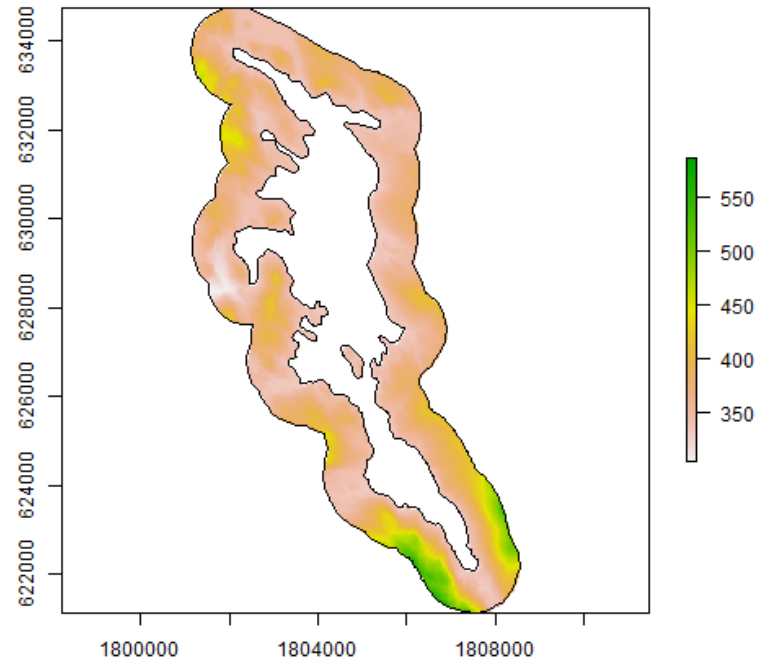
# Packages to solve common problems

- lakemorpho
- elevatr
- goatscape (in development)

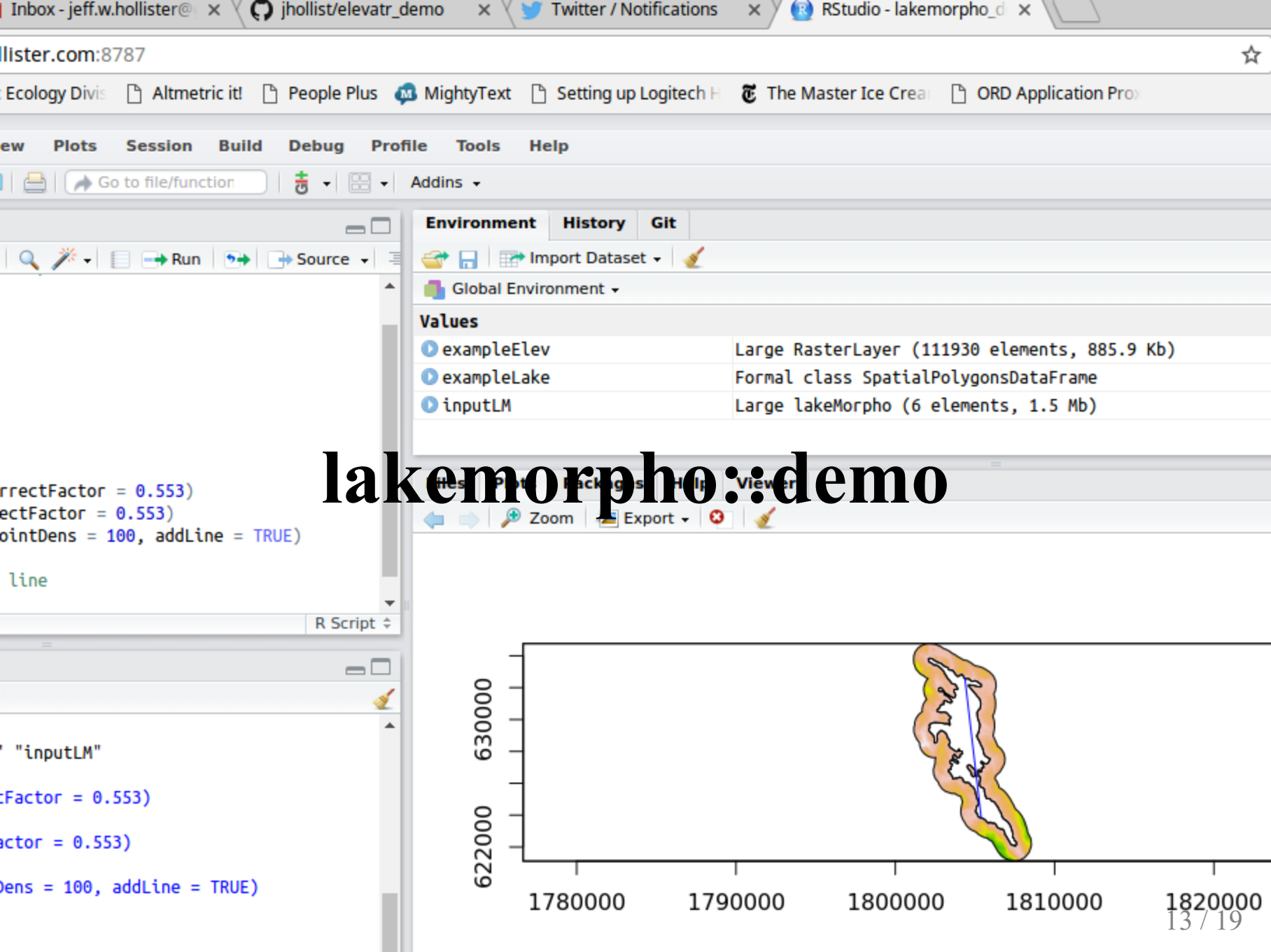


# lakemorpho

- 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 \(2017\)](#)

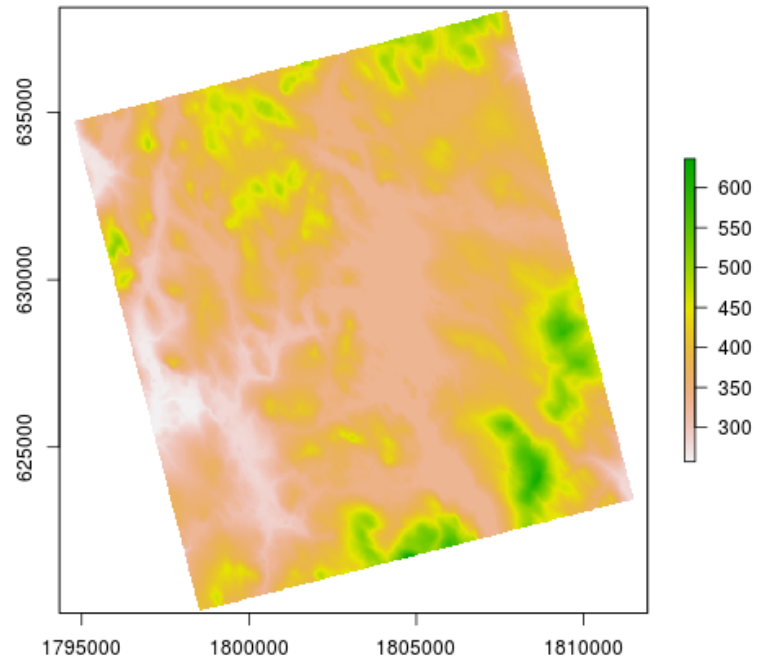


Package URL: <https://cran.r-project.org/package=lakemorpho>



# 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>

hollister.com:8787

Ecology DivisAltmetric itlPeople PlusMightyTextSetting up Logitech HThe Master Ice CreaORD Application Pro

ewPlotsSessionBuildDebugProfileToolsHelp

Go to file/functionAddins

pt elevations  
at +ellps=WGS84 +datum=WGS84 +no\_defs"  
point(pt\_df, prj = ll\_wgs84 )  
  
DEM  
raster(lake, z = 12, src = "aws")

R Script

514 (nrow, ncol, ncell)  
)  
, 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  
n, max)

EnvironmentHistory

Import Dataset

Global Environment

Data

pt\_df5 obs. of 2 variables

Values

lakeFormal class SpatialPolygonsDataFrame

FilesPlotsPackagesHelpViewer

elevatr::demo

635000  
625000

178000017900001800000181000018200001

15 / 19

# 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](#).