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?

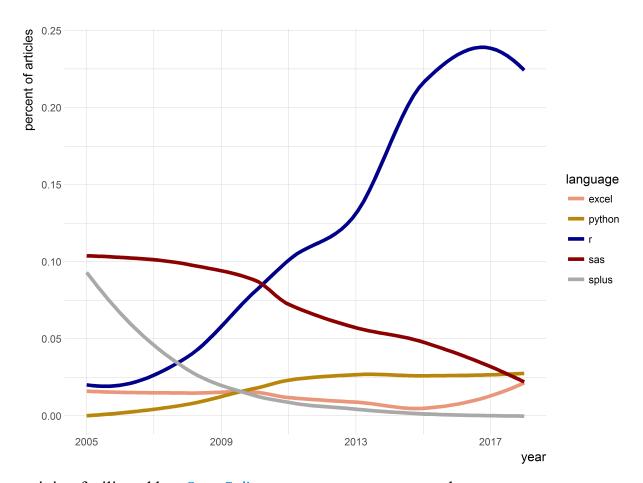
- Often required
 - Government/Funders/Journals
- Benefits researchers
 - o Mciernan et al. (2016) How open science helps researchers succeed
- Improves quality
 - The classic example: Reinhart and Rogoff
- Benefits to society
 - "Sharing of Data Leads to Progress on Alzheimer's"



Open Science Solutions

- Publishing
- Data
- Code

R in Landscape Ecology



Text mining facilitated by <u>rOpenSci's</u> awesome <u>fulltext</u> package

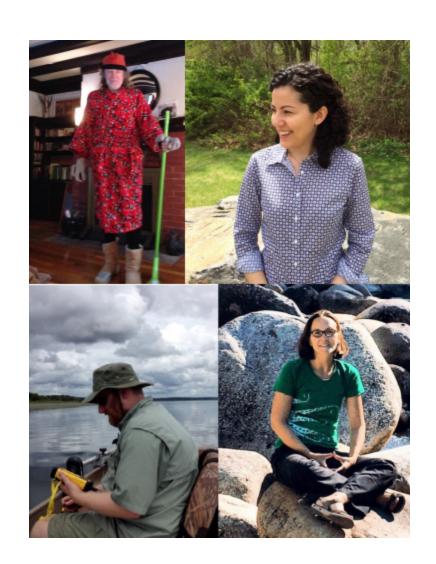
R in Landscape Ecology

- Foundations
 - sp, rgdal, raster, rgeos
 - o sf, stars
- Speciality
 - <u>landsat</u>
 - <u>SDMtools</u>
 - o <u>nlmr</u>
 - <u>landscapetools</u>

R, lakes, and cyanobacteria at USEPA

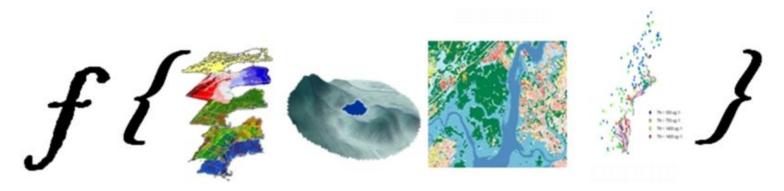
Who are we?

- 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



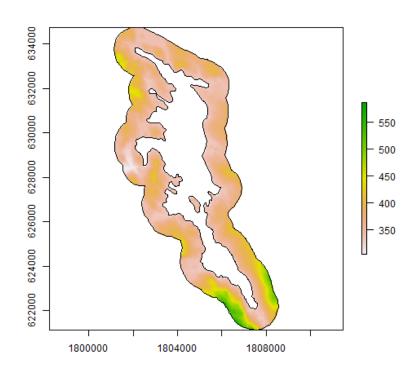
Packages to solve common problems

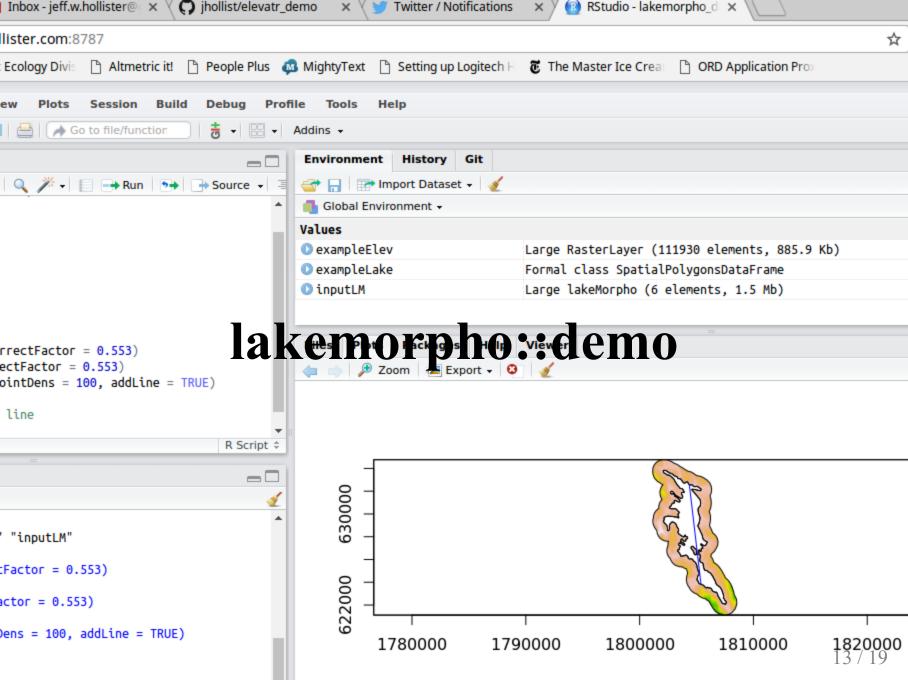
- lakemorpho
- elevatr
- goatscape (in development)



lakemorpho

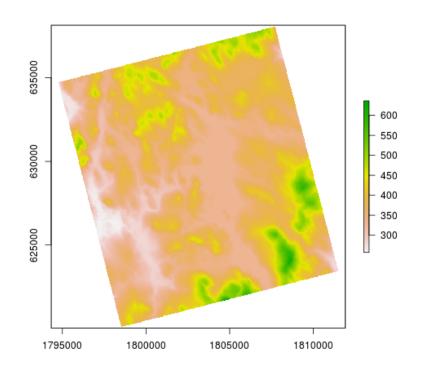
- Lake morphometry metrics in R
- Built off of sp, rgdal, rgeos, and raster suite
- Version 1.0
 - o August 2014
- Version 1.1.0
 - o December 2016
- sf support to be added
- National Lake Morphometry
- Some metrics included in NHD+
- Hollister and Milstead (2010)
- Hollister *et. al.* (2011)
- Hollister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

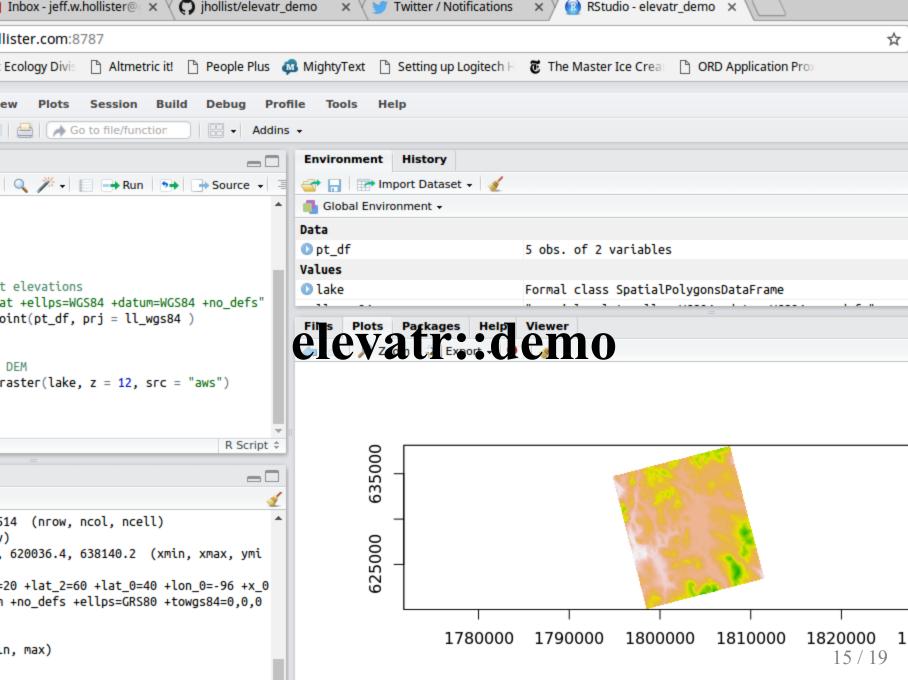




elevatr

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





goatscape

- New effort with Bryan Milstead
- What's in a name?
- Summarizes ancillary data for a user-defined landscape polygon
 - Census (via censusapi)
 - Landcover
 - o 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 <u>xaringan</u>.