

# An Open Science Approach to Modeling and Visualizing Cyanobacteria Blooms in Lakes and Ponds

American Association of Geographers Annual Meeting

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2017-04-05

Boston, MA

# Twitter?



hashtag: #AAG2017

me: @jhollist

Who, what, why, and how?

# Who are we?

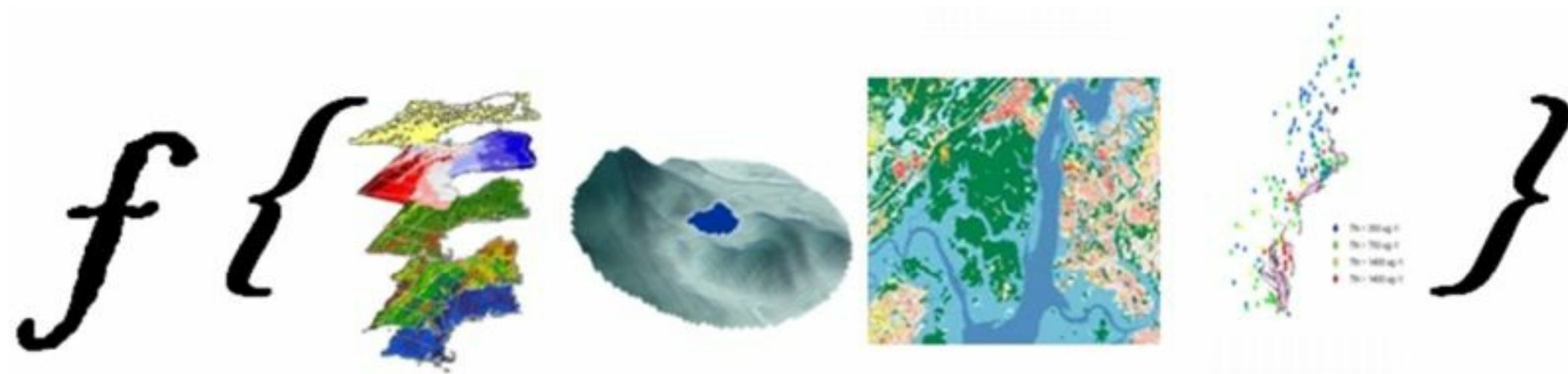
- Ecologists
- Computational focus
  - Enough to be dangerous
- 3 FTE
  - Myself
  - Betty Kreakie
  - Bryan Milstead
- 2 Post-docs
  - Farnaz Nojavan
  - Stephen Shivers





# What do we do?

- Apply computational approaches to understand water quality impacts in lakes
  - Modelling (Not this talk!, but see Farnaz's talk)
- 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 Alzheimer's"](#)



# How are we open?

- R package development
- Visualization
- Sharing and collaborating
- Publishing
- Open data (not in this talk)

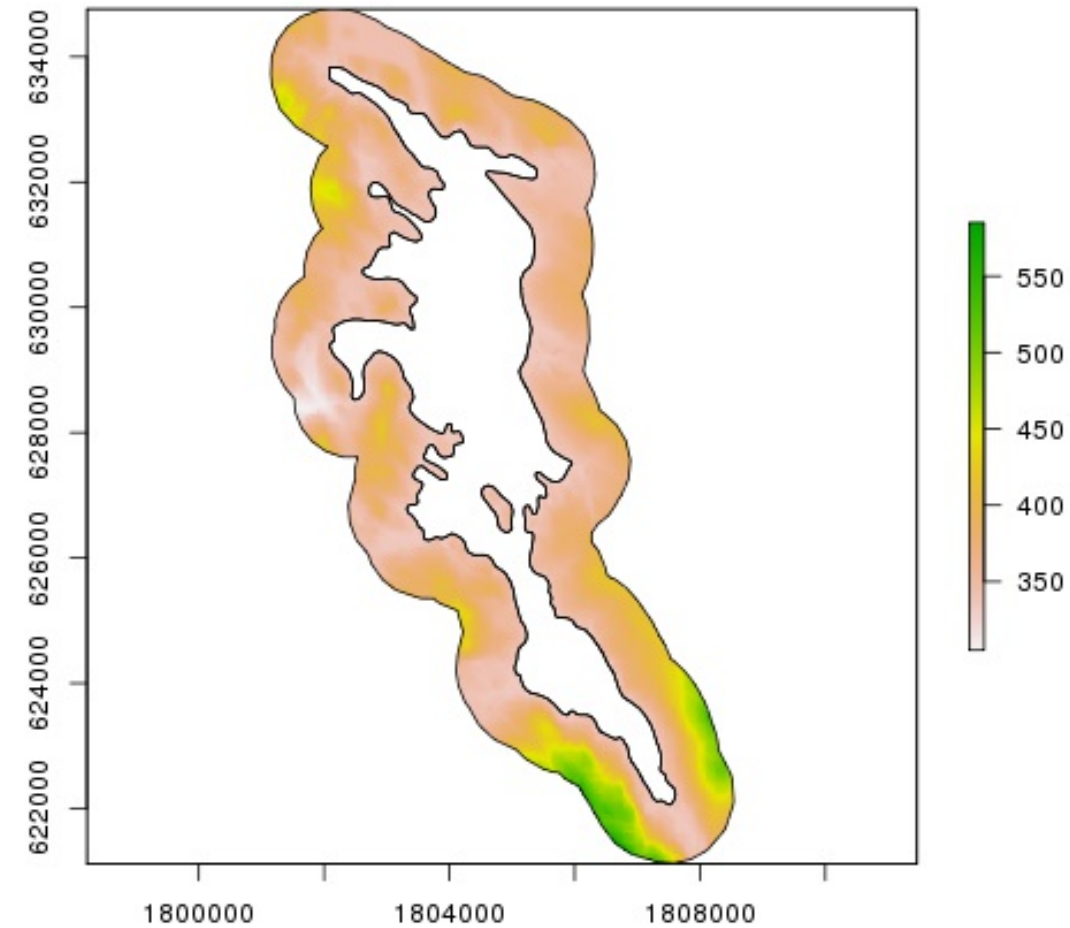




# R package development

# lakemorpho

- Lake morphometry metrics in R
- Version 1.0
  - August 2014
- Version 1.1.0
  - December 2016
- [National Lake Morphometry](#)
- [Hollister and Milstead \(2010\)](#)
- [Hollister \*et. al.\* \(2011\)](#)



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

Inbox - jeff.w.hollister@ xjhollist/elevatr\_demo xTwitter / Notifications xRStudio - lakemorpho\_d x

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Go to file/functionAddins

RunSource

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R Script
```

EnvironmentHistoryGit

Import Dataset

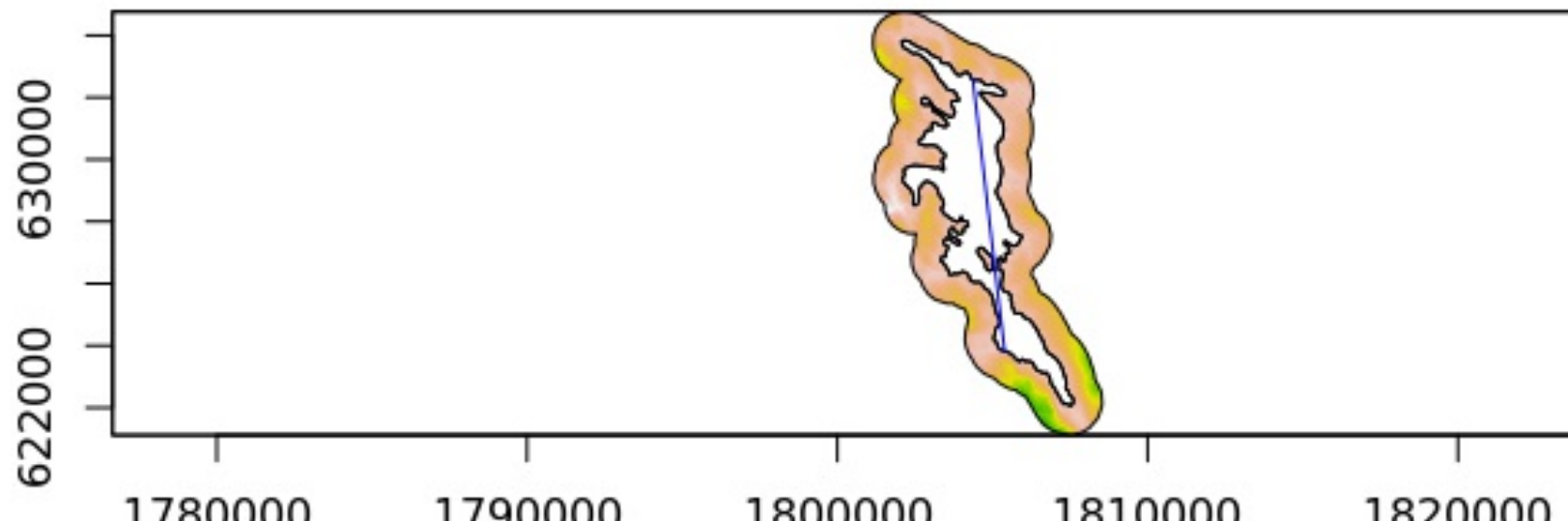
Global Environment

Values

exampleElev	Large RasterLayer (111930 elements, 885.9 Kb)
exampleLake	Formal class SpatialPolygonsDataFrame
inputLM	Large lakeMorpho (6 elements, 1.5 Mb)

FilesPlotsPackagesHelpViewer

ZoomExport



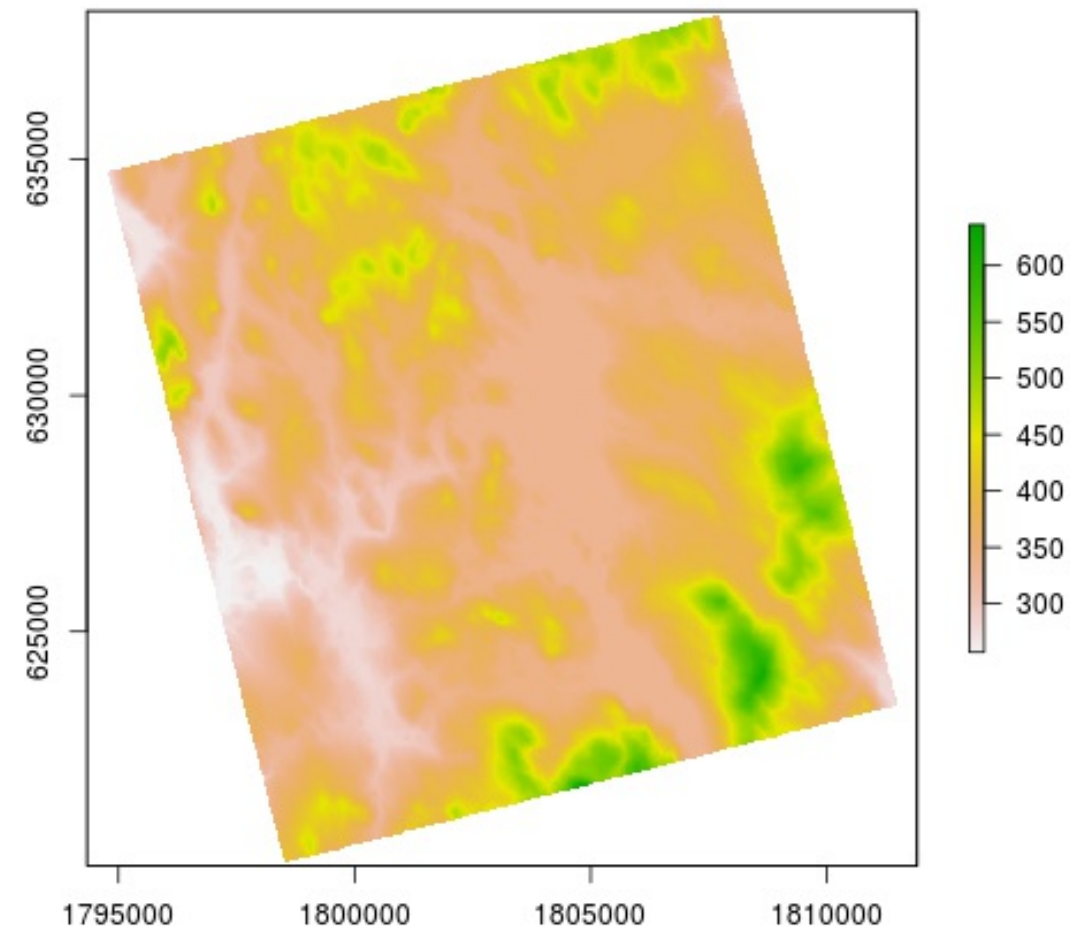
A map showing a lake with a blue line across it. The lake is irregularly shaped and colored with a gradient from green to yellow. The blue line is a straight line segment crossing the lake. The map is displayed in a coordinate system with x-axis values from 1780000 to 1820000 and y-axis values from 622000 to 630000.

# lakemorpho: Demo

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# elevatr

- Access elevation data in R
  - Mapzen
  - AWS
  - USGS
- Version 0.1.1
  - January 2017
- Version 0.1.3
  - March 2017
- Will be paired with lakemorpho



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



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Twitter / Notifications x

RStudio - elevatr\_demo x

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ew | Plots | Session | Build | Debug | Profile | Tools | Help

Go to file/function | Addins

Run | Source

pt elevations  
at +ellps=WGS84 +datum=WGS84 +no\_defs"  
oint(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)

Environment | History

Import Dataset

Global Environment

Data

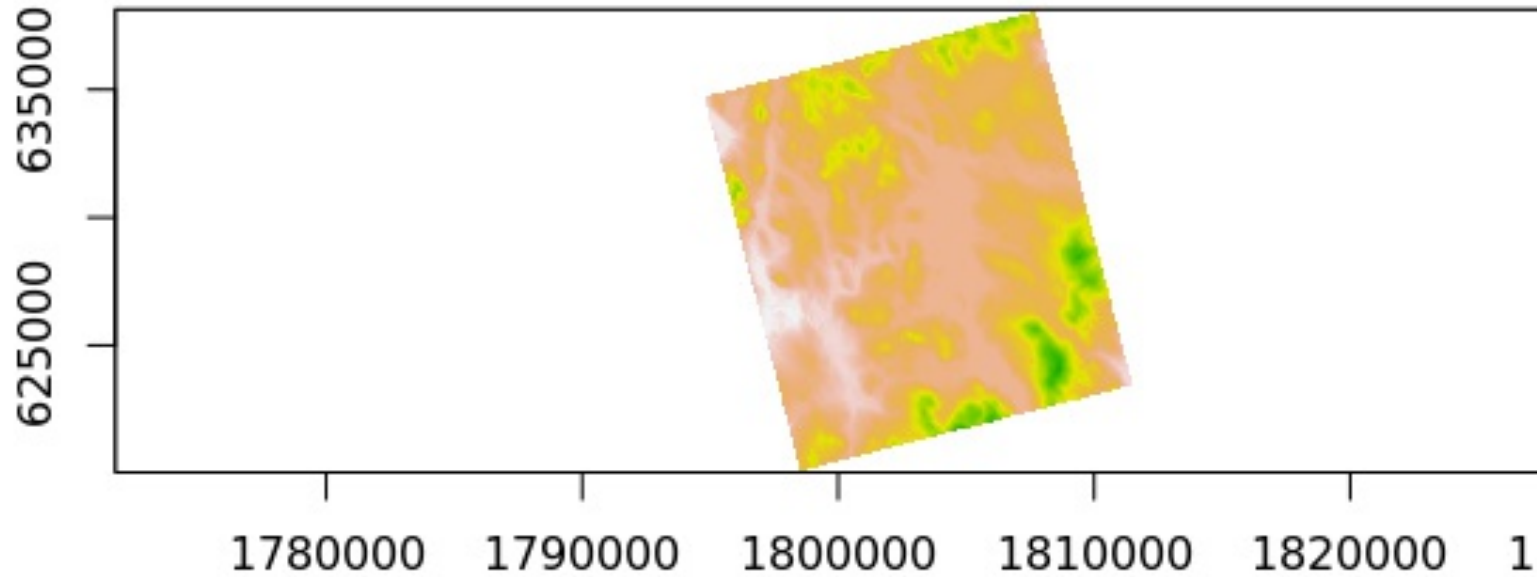
pt\_df 5 obs. of 2 variables

Values

lake Formal class SpatialPolygonsDataFrame

Files | Plots | Packages | Help | Viewer

Zoom | Export



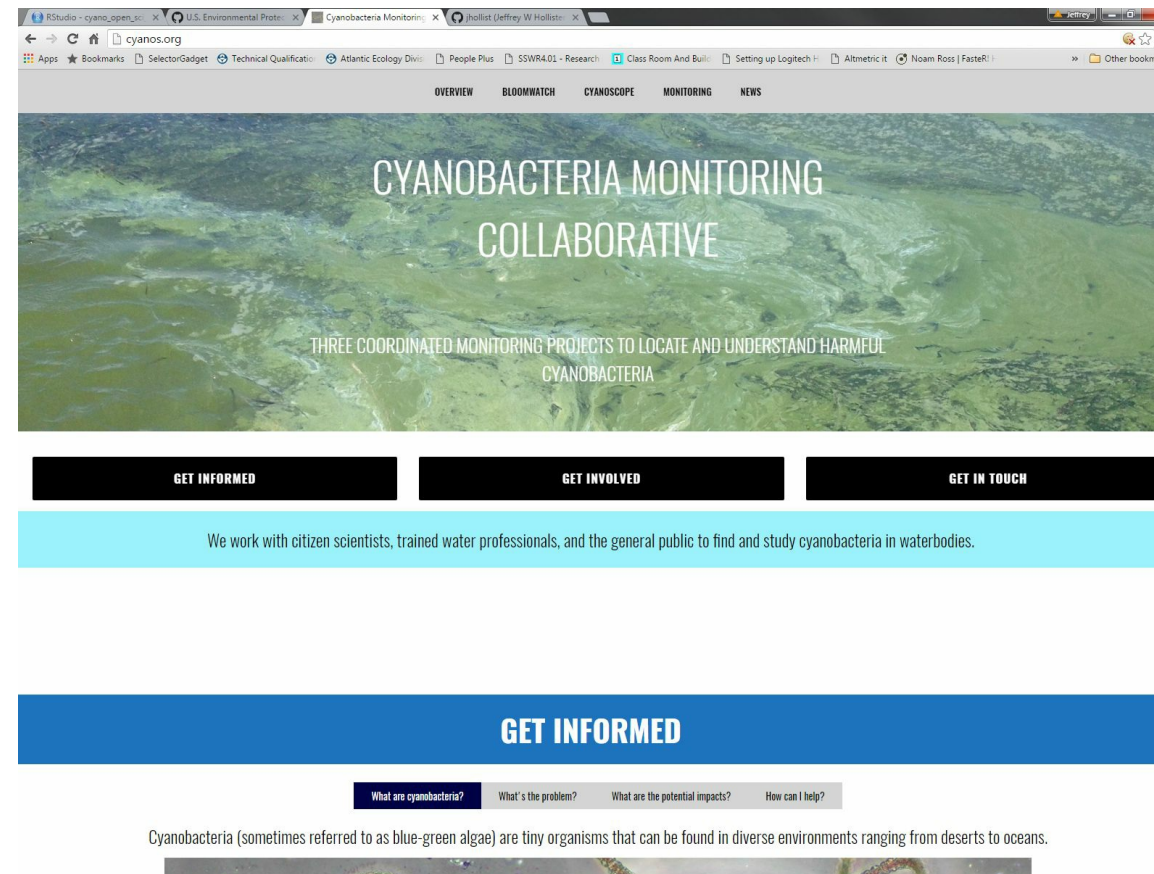
## elevatr: Demo

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# Data Visualization

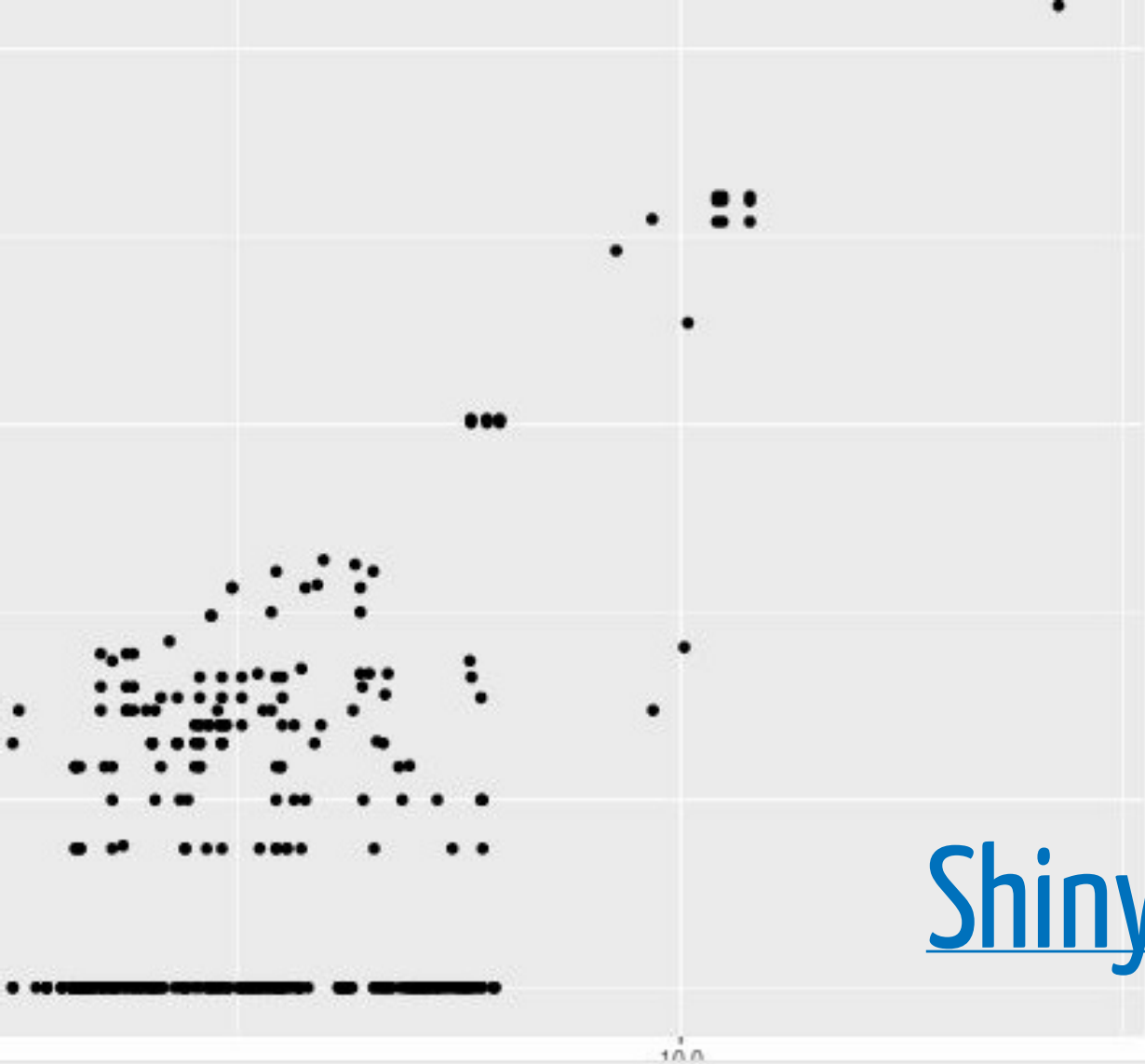
# Shiny: Cyanobacteria Monitoring Collaborative

- Started in 2013
  - New England Region Cyanobacteria Monitoring Workgroup
- Three Projects
  - bloomWatch
  - cyanoScope
  - Monitoring
- DataViz with Shiny



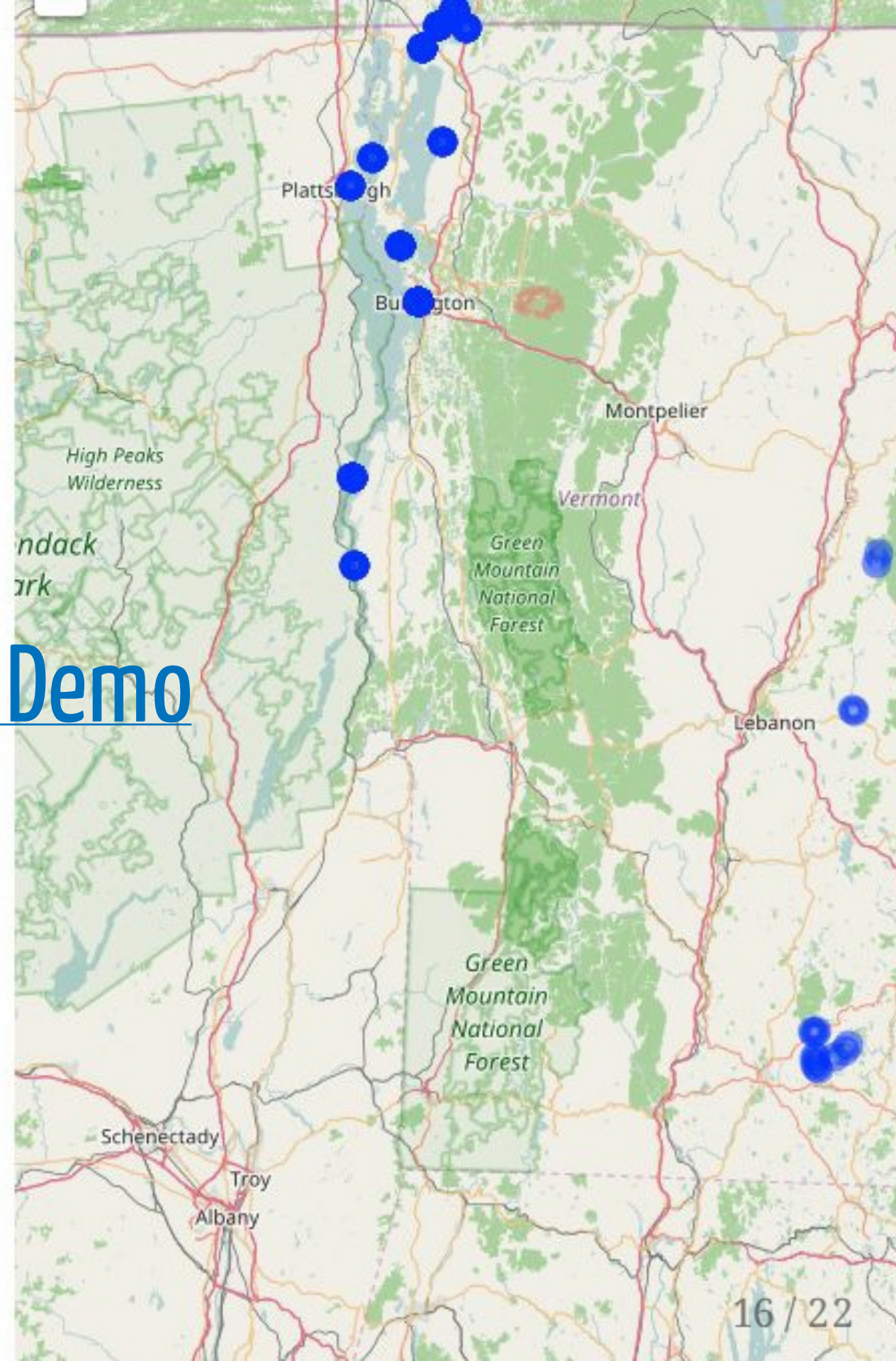
Project URL: <http://cyanos.org>





# Shiny: Demo

Date	Chlorophyll	Phycocyanin
2014-09-03	71.37	16998.17
2014-07-10	2.18	0.10
2014-07-17	2.44	1.52
2014-08-08	3.17	0.10
2014-08-08	3.57	0.10
2014-08-08	3.22	0.10

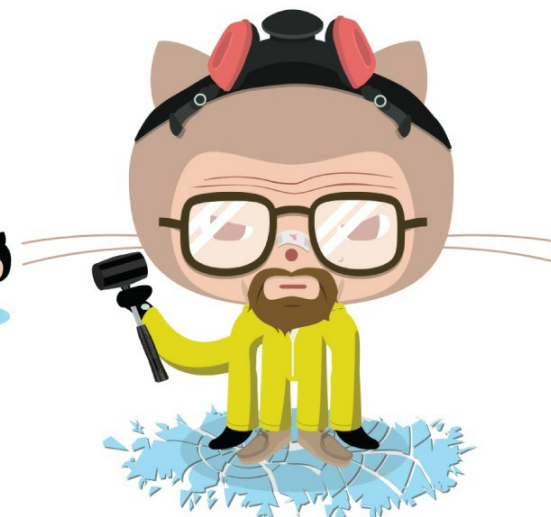
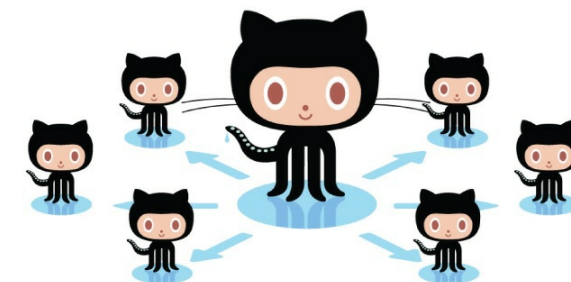




# Sharing and Collaborating

# GitHub

- What is it?
- How do we use it?





Hollister

Open Science at

al Protection A...

a.gov

com



## Pinned repositories

Customize yo

≡ [quickmapr](#)

An R package for quickly mapping and navigating spatial data

● R ★ 44 🍴 6

≡ [elevatr](#)

An R package for accessing elevation data

● R ★ 33 🍴 4

≡ [rmd\\_word\\_manuscript](#)

rmd to docx: draft manuscript

● TeX ★ 17

≡ [ropensci/lawn](#)

turf.js R client

● R ★ 42 🍴 8

≡ [USEPA/lakemorpho](#)

ORD lakemorpho

● R ★ 8 🍴 7

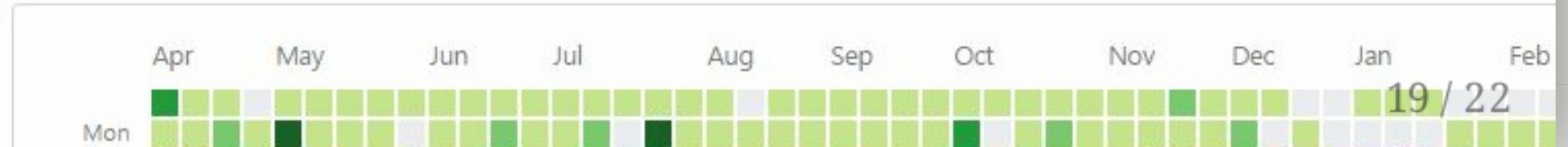
≡ [manuscriptPackage](#)

Template for writing manuscripts as an R

● R ★ 30 🍴 6

[GitHub: Demo](#)

1,876 contributions in the last year

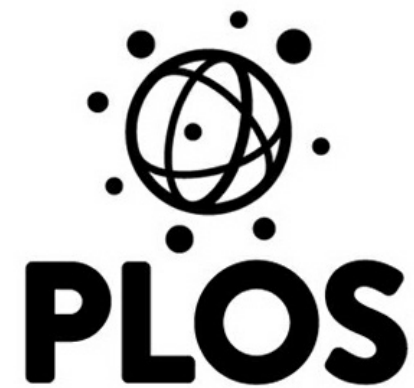


# Open Access



# Publishing

- Preprints
  - [Hollister \*et al.\* \(2016\) PeerJ Preprints](#)
- Open first
  - [Milstead \*et al.\* \(2013\) PLoS One](#)
  - [Hollister and Kreakie \(2016\) F1000Research](#)
- Money where our mouth(s) is(are)
  - [Kreakie \*et al.\* \(2015\) LakeLines](#)



# Thanks!

## Jeff Hollister

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Slides created via the R package [xaringan](#).