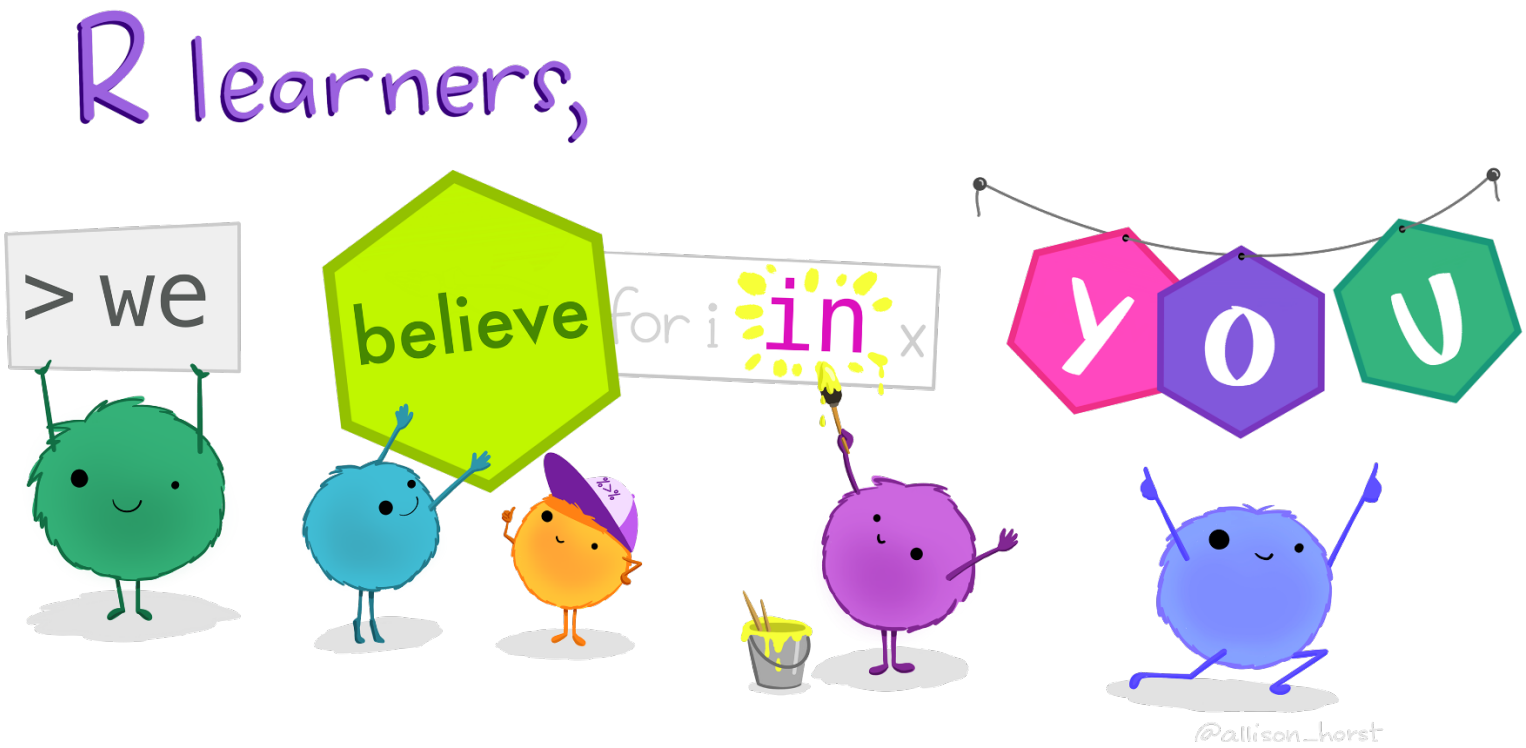
Teaching with R & RStudio

Bringing data science & coding skills into your classroom



Artwork throughout by @allison_horst

This morning's goals:

By lunchtime today(!), you will be able to:

- **Explain** the utility of R + RStudio as a teaching tool
- **Create** an .Rmd file and use it to document a sequence of R functions
- **Apply** `tidyverse` functions to read in, wrangle, analyze, and visualize biological/environmental data
- **Evaluate** potential pinch points for integration of R in your classroom and discuss strategies to work through them

1st impressions:

Why do biologists & env. scientists use R?

No wrong answers!

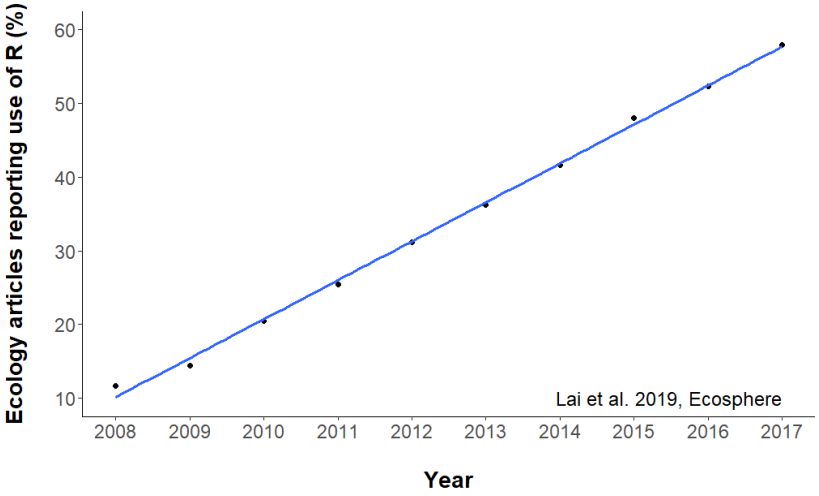
Why R?

- **R is:**
  - Open source and free (no license fees)
  - Available for Windows, Mac, Linux + on the cloud (Posit cloud)
- **R has:**
  - Coherent tools for statistical analysis
  - Flexible graphical capabilities to produce high-quality figures
  - Extensive support networks
- **R facilitates:**
  - Robust & reproducible research **and** teaching practices

Growth of R in research

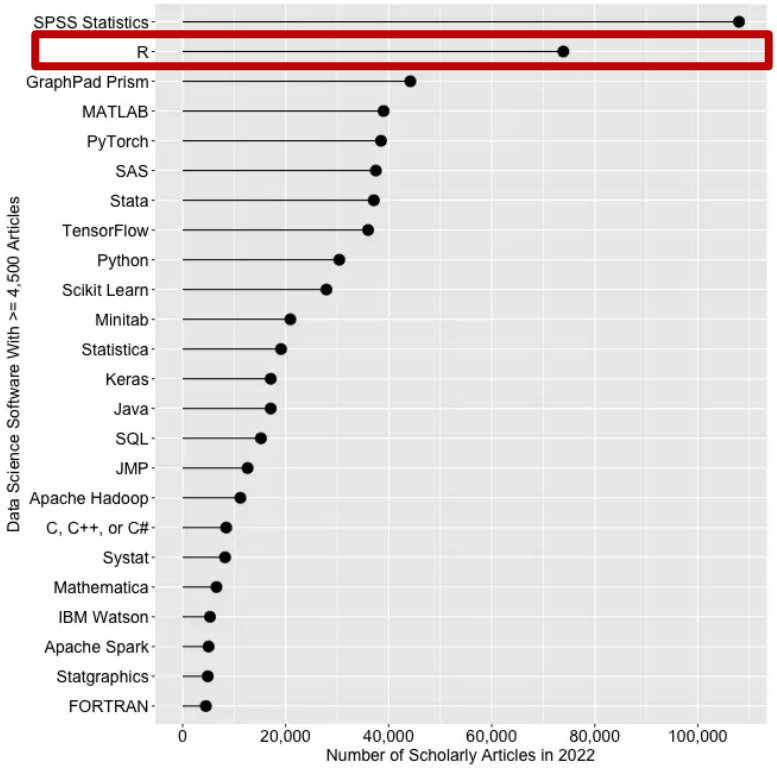
In 30 ecology journals (through 2017)

~60% of articles report using R in 2017



https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecs2.2567#

Articles on Google Scholar (2022)



https://r4stats.com/articles/popularity/

Teaching with R…

- Our students may carry baggage about computers and/or statistics
  - “I’m not a computer person”
  - “I’m not good at statistics”

```
m = matrix(data = NA, ncol=4,nrow=4)
colnames(m) = names(col[,1:4])
m[1,] = c(NA,col$collinearity[1:3])
m[2,] = c(NA,NA,col$collinearity[4:5])
m[3,] = c(NA,NA,NA,col$collinearity[6])
```

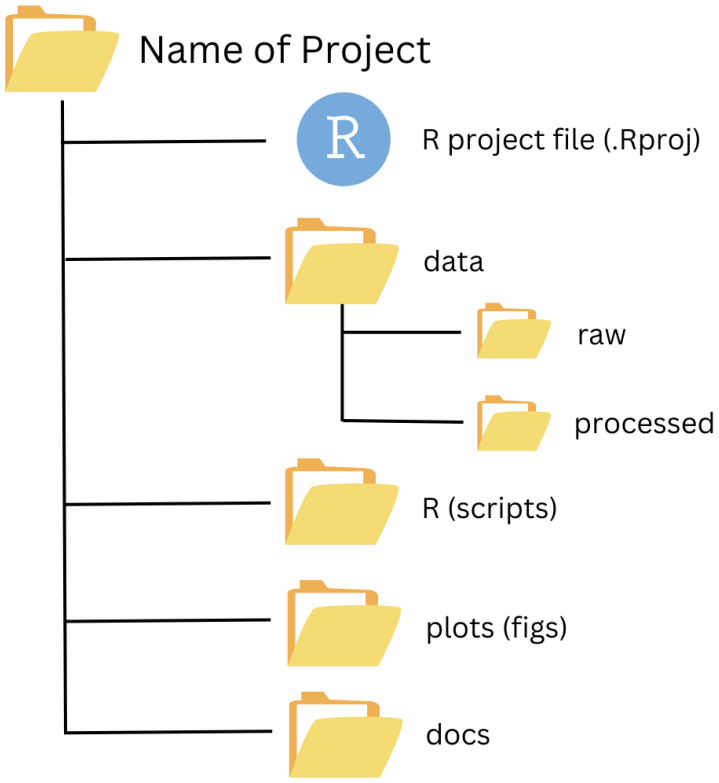
- How can we get student buy-in and foster a growth mindset with coding?

Strategies to get students on board:

- **Set them up for early success**
  - Stay organized with RStudio projects
  - Provide code-along scripts so students run as-is or modify-and-run instead of writing commands from scratch
  - Use consistent syntax and style so students can learn to read and interpret scripts they're working with

Organizing with R projects

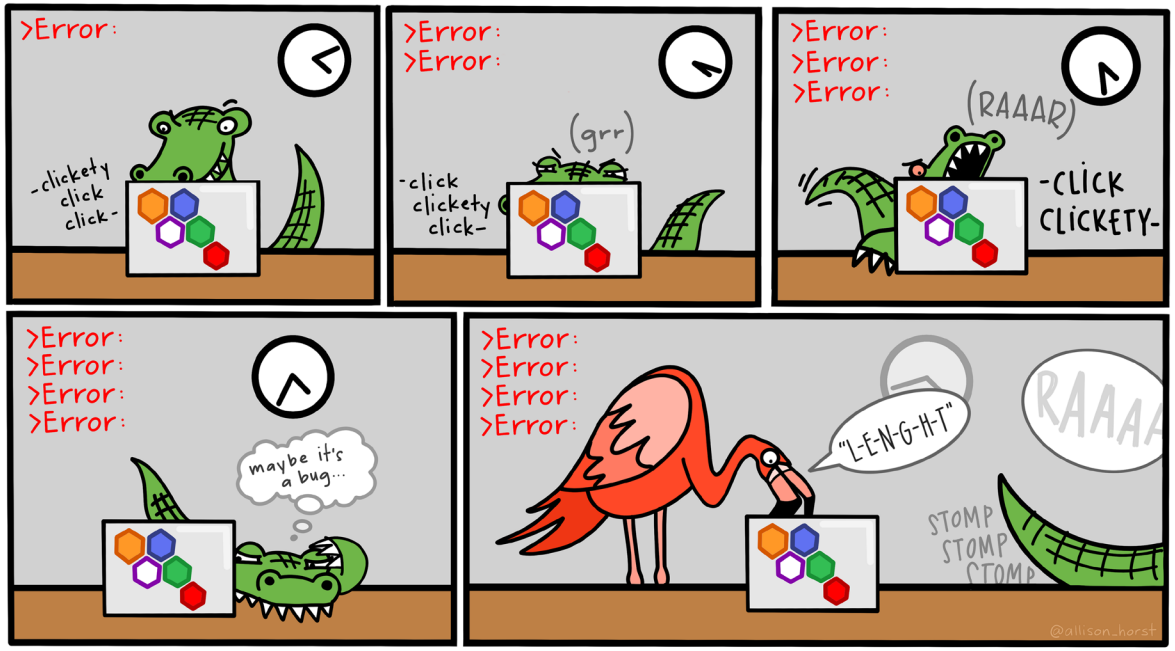
- Projects (.Rproj) help keep files organized & reduce frustration
  - Every student's file organization defaults are different; projects get around this
- Allow you to use *relative* file paths
  - More portable & reproducible!



Code-along scripts

- Providing ready-to-run scripts can help students focus on the process & logic of data workflows

- Ready-to-use example → modify-and-run practice → independent challenges



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- **Make it fun & collaborative**
  - Help set up custom RStudio "look"
  - Create space for student-driven learning ("choose your own adventure" data and/or graphing challenges)
  - Integrate whimsy and creativity

R 4.3.3- "Angel Food Cake"

The pipe- an aside

The Treachery of Images (1929)
René Magritte

"The pipe"
magrittr package for R

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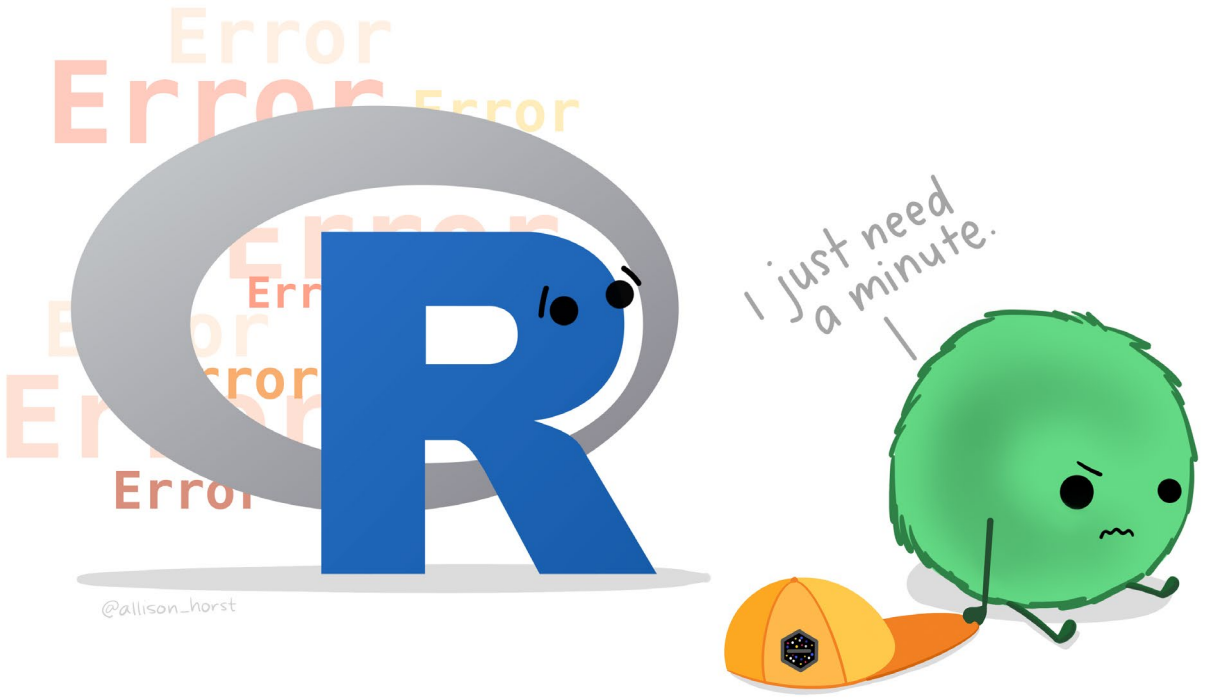
- **Model your own coding process**
  - Many long-term users still rely on Google regularly for coding!
  - Learning how to efficiently get help is a valuable skill

Finding help with errors & warnings

- R errors & warnings are often cryptic
  - Red text? Students often assume this means something is broken and they can't proceed
  - ChatGPT et al. can be a great resource for decoding these!



R + RStudio

- RStudio is an Integrated Development Environment (IDE) for using R (& some other programming languages)
  - Provides a user-friendly interface for working in R, rather than just a command line
  - This can do a *lot* toward making it seem more accessible to self-proclaimed “not computer” people!

Welcome to the `tidyverse`

- This morning, we'll explore a small slice of the `tidyverse`
  - `tidyverse` Packages play nicely together
  - Consistent syntax → often easier to learn
  - Packages within tidyverse allow for full data import, wrangling, analysis, & visualization workflows

Our ultimate goal

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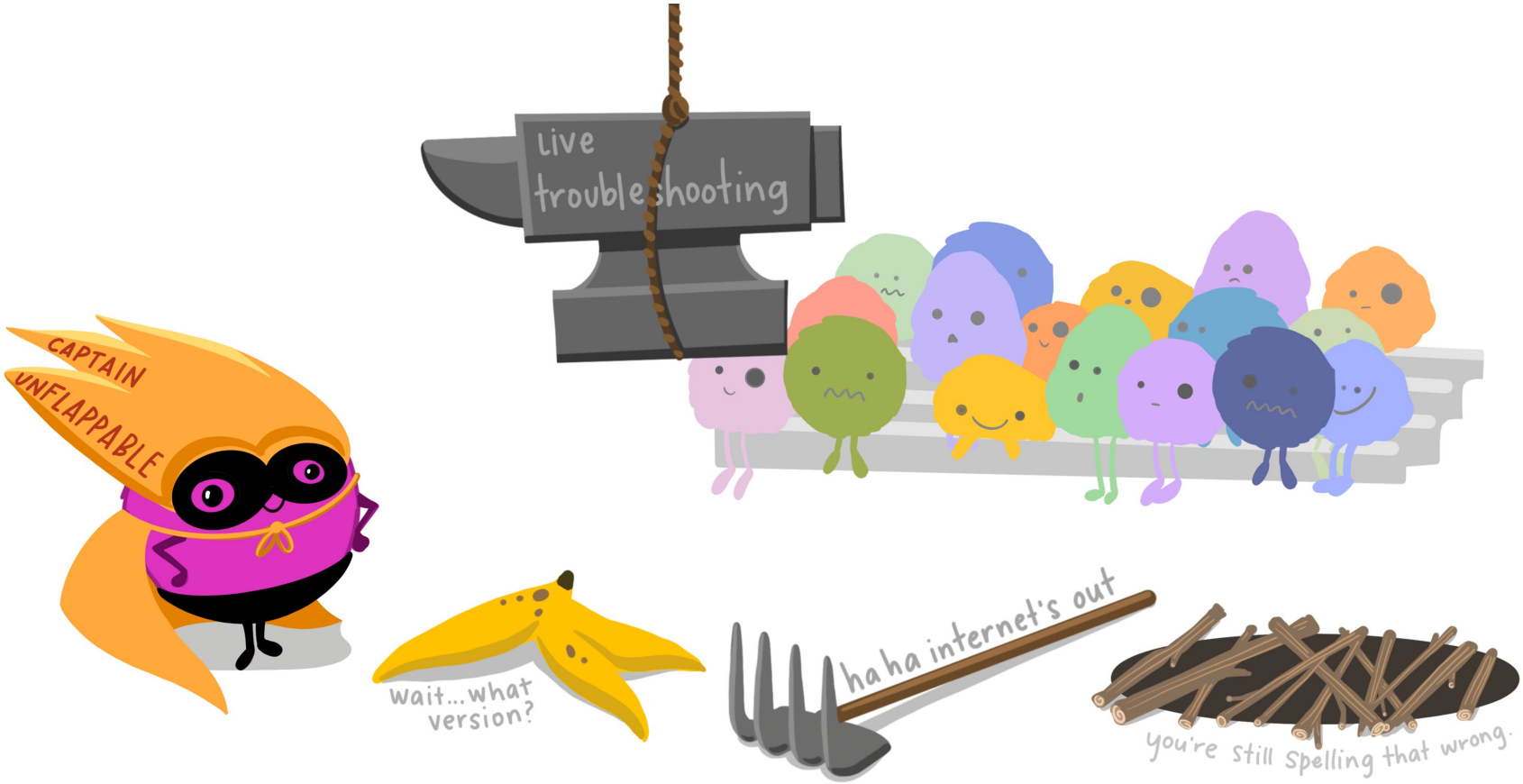
Let's channel our own growth mindsets



and dive in to R + RStudio!