Data Management
Git & GitHub

ENTMLGY 6702
Entomological Techniques and Data Analysis

Look for efficient solutions

Learning objectives

Become familiar with best practices in data management

Compare and contrast approaches to data organization using spreadsheets

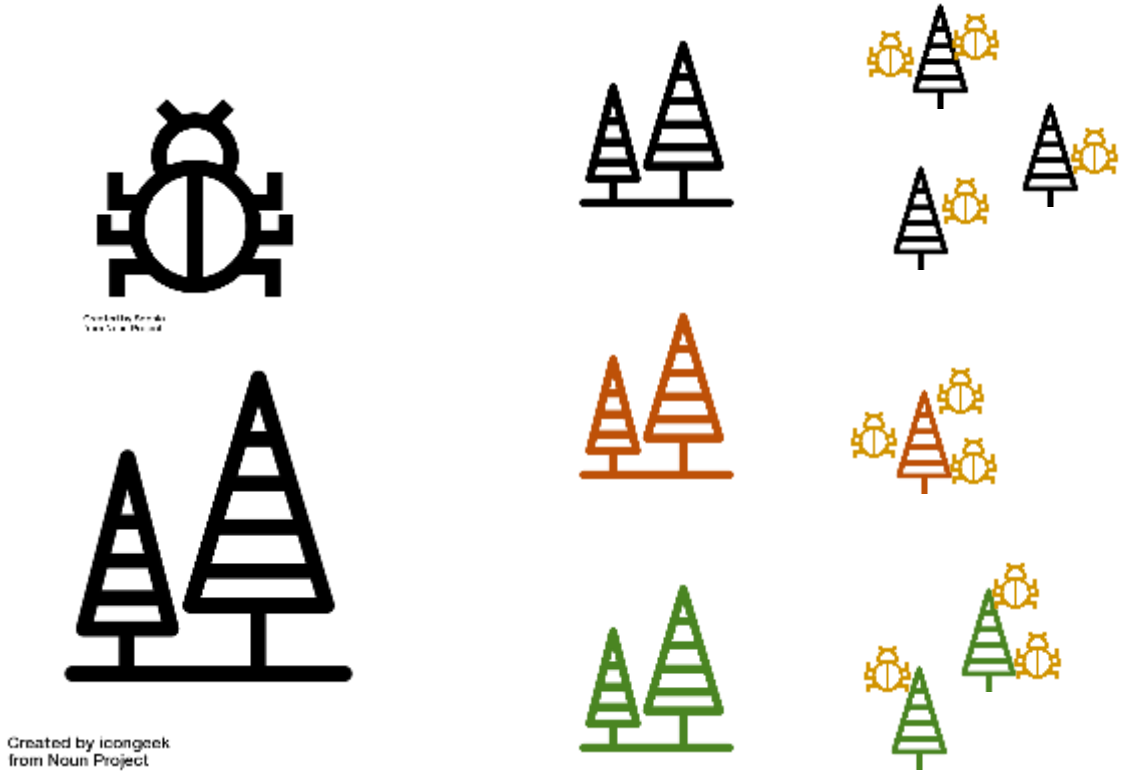
Given a data structure/input, anticipate barriers to loading the data into R

Introduction to Git/GitHub and its value for open science

Messy data

- Quite likely, in your previous math/stats course(s), you worked with data in homework problems provided by the instructor in a textbook
- The answers were in the back of the book
- It was tidy

Now, you will be analyzing “real life” data.



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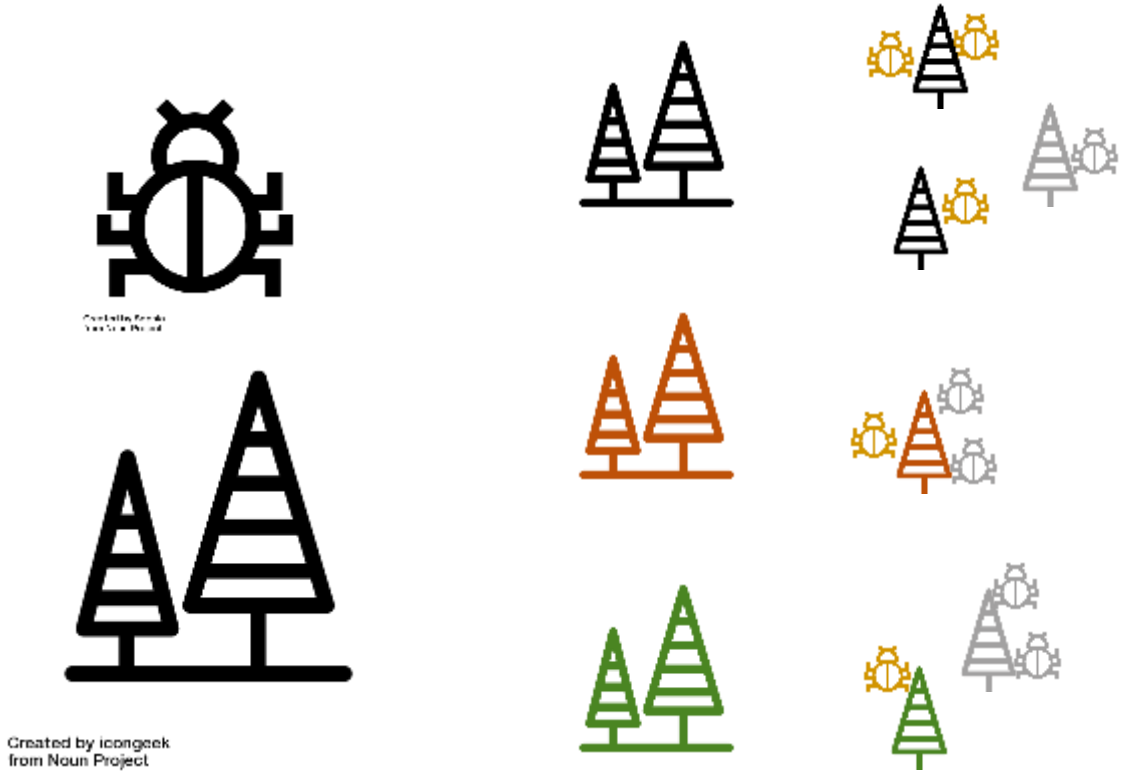


Best practices

- Keep multiple copies of your data: hard and electronic
  - Electronic = scanned hard copies & spreadsheet
- <u>MAKE SURE YOUR ELECTRONIC COPY IS BACKED UP AT ALL TIMES</u>
- Data safety issues are especially important when working with human subjects
  - Understand custodial issues in data sharing in advance
  - Ways to share sensitive data: removing personal information, create unique IDs

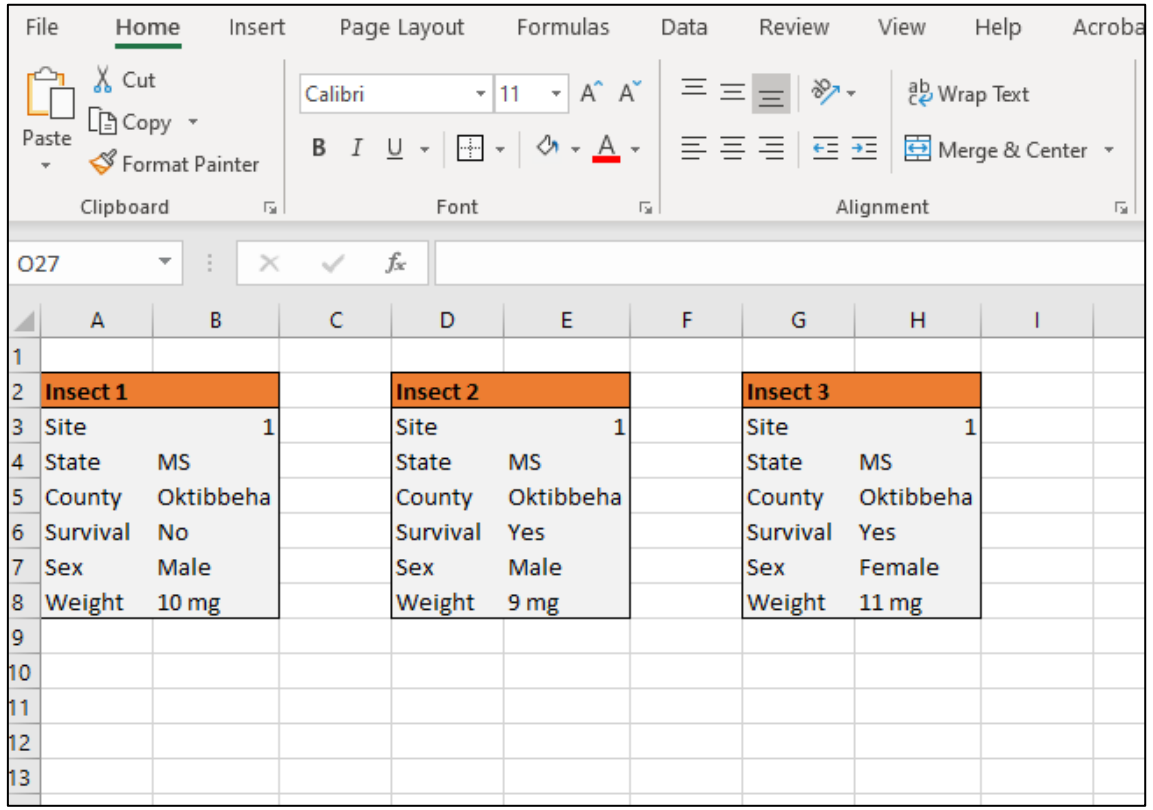
Spreadsheets

- Typically, data is entered into a spreadsheet before exporting to a dedicated statistics program.
- The most common spreadsheet is Microsoft Excel, but there are others (e.g., Google Docs, LibreOffice)
- Proper data setup early in your investigation will avoid a lot of headaches in the future!

Data in spreadsheets

- Avoid making “pretty” datasheets. Statistics programs, as a rule, don’t do “pretty” very well.
- Each line of data contains all the variables **for a single observation**
- Try to use a column for each variable

Don’t do this



Insect 1	
Site	1
State	MS
County	Oktibbeha
Survival	No
Sex	Male
Weight	10 mg

Insect 2	
Site	1
State	MS
County	Oktibbeha
Survival	Yes
Sex	Male
Weight	9 mg

Insect 3	
Site	1
State	MS
County	Oktibbeha
Survival	Yes
Sex	Female
Weight	11 mg

Codebook / Metadata

Data is typically kept along with a codebook or metadata. This is (more or less) information describing a particular study or data

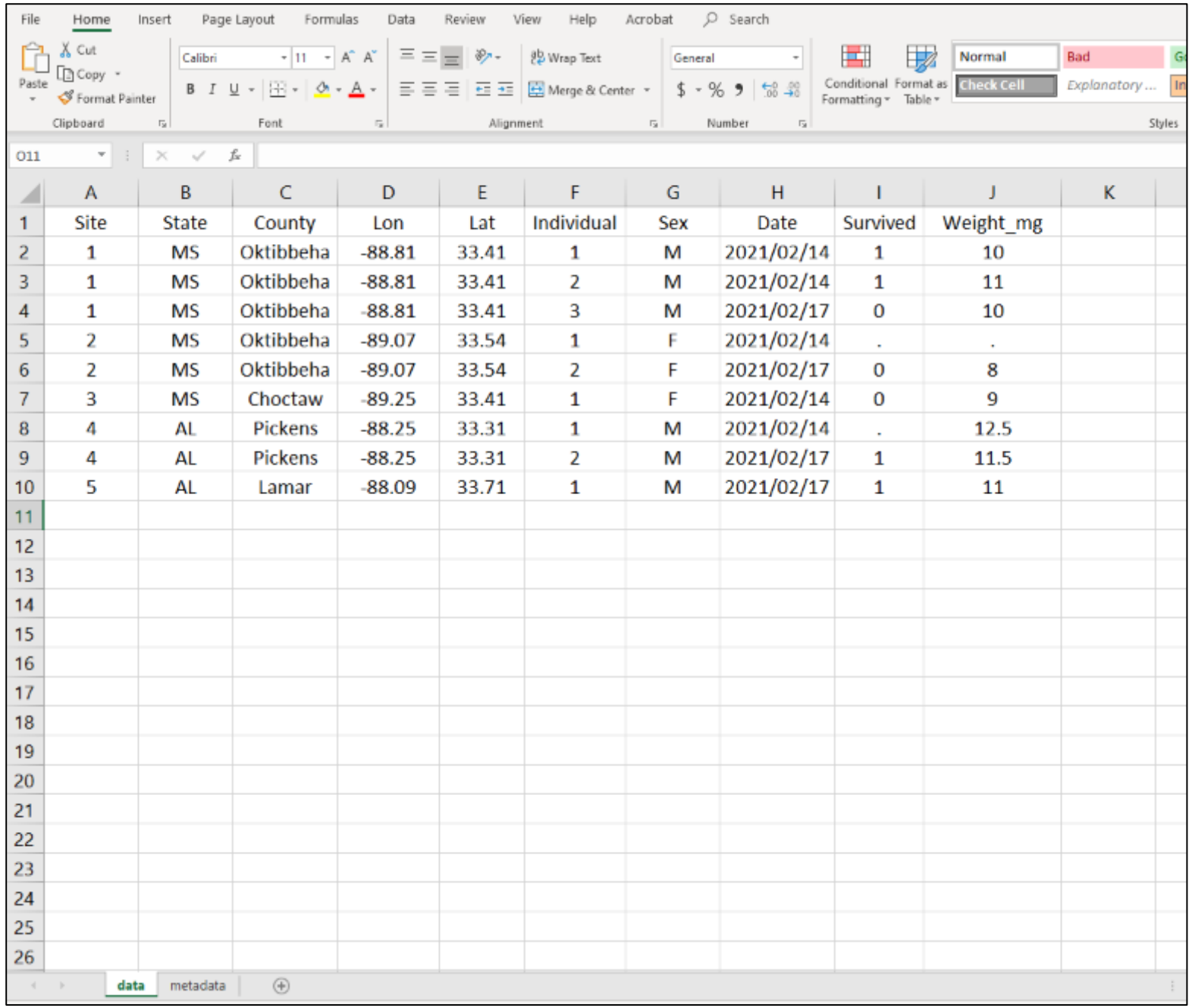
<u>The typical codebook contains</u>:

1. A description of how the data were collected including sampling design
2. The variables contained in the data
3. In the case of surveys, the survey instrument or questionnaire used to solicit responses from the respondent and the coded values of each question
4. The format and/or units of each variable within the raw data file
5. Meaning of the coded values for each variable, including (as necessary) whether data are continuous, categorical, ordinal, nominal, binary, etc.

Bad example

	A	B	C	D	E	F	G	H
1	Info	State	County	Lon	Lat	Date	Survived? (1=yes, 0=no)	Weight in milligrams
2	Site1-Ind1-M	MS	Oktibbeha	-88.81	33.41	14-Feb	1	10
3	Site1-Ind2-Male	MS	Oktibbeha	-88.81	33.41	14-Feb	1	11
4	Site1-Ind3-M	MS	Oktibbeha	-88.81	33.41	17-Feb	0	10
5	Site2-Ind1-F	MS	Oktibbeha	-89.07	33.54	14-Feb		
6	Site2-Ind2-female	MS	Oktibbeha	-89.07	33.54	17-Feb	0	8
7	Site3-Ind1-Female	MS	Choctaw	-89.25	33.41	14-Feb	0	9
8	Site4-Ind1-M	AL	Pickens	-88.25	33.31	14-Feb		12.5
9	Site4-Ind2-M	AL	Pickens	-88.25	33.31	17-Feb	1	11.5
10	Site5-Ind1-M	AL	Lamar	-88.09	33.71	17-Feb	1	11

Good example



	A	B	C	D	E	F	G	H	I	J	K
1	Site	State	County	Lon	Lat	Individual	Sex	Date	Survived	Weight_mg	
2	1	MS	Oktibbeha	-88.81	33.41	1	M	2021/02/14	1	10	
3	1	MS	Oktibbeha	-88.81	33.41	2	M	2021/02/14	1	11	
4	1	MS	Oktibbeha	-88.81	33.41	3	M	2021/02/17	0	10	
5	2	MS	Oktibbeha	-89.07	33.54	1	F	2021/02/14	.	.	
6	2	MS	Oktibbeha	-89.07	33.54	2	F	2021/02/17	0	8	
7	3	MS	Choctaw	-89.25	33.41	1	F	2021/02/14	0	9	
8	4	AL	Pickens	-88.25	33.31	1	M	2021/02/14	.	12.5	
9	4	AL	Pickens	-88.25	33.31	2	M	2021/02/17	1	11.5	
10	5	AL	Lamar	-88.09	33.71	1	M	2021/02/17	1	11	

Metadata

Data document survival of *Species interestis* before and after a winter storm in February 2021 in Mississippi and Alabama, USA.
Insects were collected from the duff layer of loblolly pine plantations and stored in a cooler for transportation to the laboratory.
Survival was assessed in the laboratory within 6 hours of collection.

Variable	Description
Site	collection site identifier
State	two letter state code
County	self explanatory
Lon	longitude in decimal degrees for collection site (approximate)
Lat	latitude in decimal degrees for collection site (approximate)
Individual	unique identifier for insect within a site
Sex	M=male, F=female
Date	date of collection (YYYY-MM-DD)
Survived	1=alive (movement of an insect following tactile stimulation of its legs with a small paintbrush), 0=dead (no movement)
Weight_mg	weight of insect in milligrams after drying for 72 hours at room temperature (~21 °C)

Quality control checks

- Once your data is entered, it is a good idea to perform a quality control check before reading the file into a statistics program.

- This is essential whether the data are generated by machine or people

Likely required to publish your data with manuscript

http://www.ecography.org/authors/author-guidelines

ECOGRAPHY

A JOURNAL OF SPACE AND TIME IN ECOLOGY
PUBLISHED BY THE NORDIC SOCIETY OIKOS.

AUTHOR GUIDELINES

This page explains how to prepare your manuscript for submission to the journal Ecography, a Nordic Society Oikos publication. Before submitting, please make sure that your article fits within the journal's aims and scope.

Please prepare your manuscript carefully, following the guidelines on this page.

Data archiving statement

For articles published in Ecography, it is required that authors deposit data supporting their accepted papers in public archives of their choice (see section on **Data sharing and repositories** below). Authors must confirm that they deposit their data in a public repository and indicate the repository of their choice.

Some journals now require code, too

https://www.esa.org/publications/data-policy/

OVERVIEW

ESA has adopted a society-wide Open Research Policy for its publications to further support scientific exploration and preservation, allow a full assessment of published research, and streamline policies across our family of journals. An open research policy provides full transparency for scientific data and code, facilitates replication and synthesis, and aligns ESA journals with current standards. As of 1 February 2021, all new manuscript submissions to ESA journals must abide by the following policy.

As a condition for publication in ESA journals, all underlying data and novel statistical code pertinent to the results presented in the publication must be made available in a permanent, publicly accessible data archive or repository upon acceptance of a manuscript, with rare exceptions (see the "Details" tab for more information). Archived data and novel statistical code should be sufficiently complete to allow replication of tables, graphs, and statistical analyses reported in the original publication, and perform new or meta-analyses. As such, the desire of authors to control additional research with these data and/or code shall not be grounds for withholding material.

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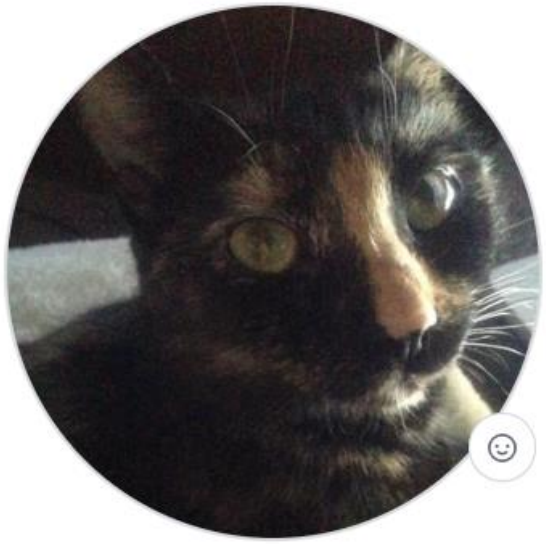
Git and GitHub – What are they?

Git: Software that handles version control on your repository

- Working in the background when using GitHub

GitHub: Web interface that hosts your repository online

- Allows for collaboration on projects
- Interfaces with R/RStudio & Git



Kayla I Perry

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https://u.osu.edu/perrylab/

https://www.researchgate.net/profile/Kayla_Perry

Organizations

Popular repositories

Customize your pins

ENT6702_DataAnalysis Public

Repository for the course ENT 6702: Entomological Techniques and Data Analysis

R 1

Ash_Beetle_Communities Public

R

Arthropod_Marking Public

LadyBeetle_SEM Public

R

ESA_NCB_2021 Public

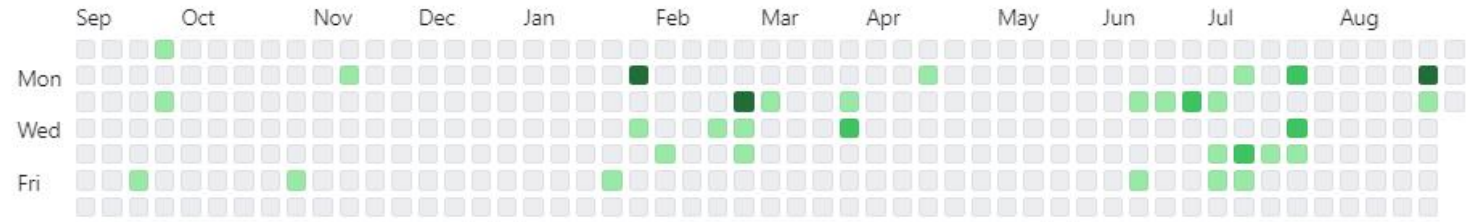
R

OSU_Statistics_Workshops Public

1

72 contributions in the last year

Contribution settings



Learn how we count contributions

Less More

Contribution activity

2023

2022

August 2023

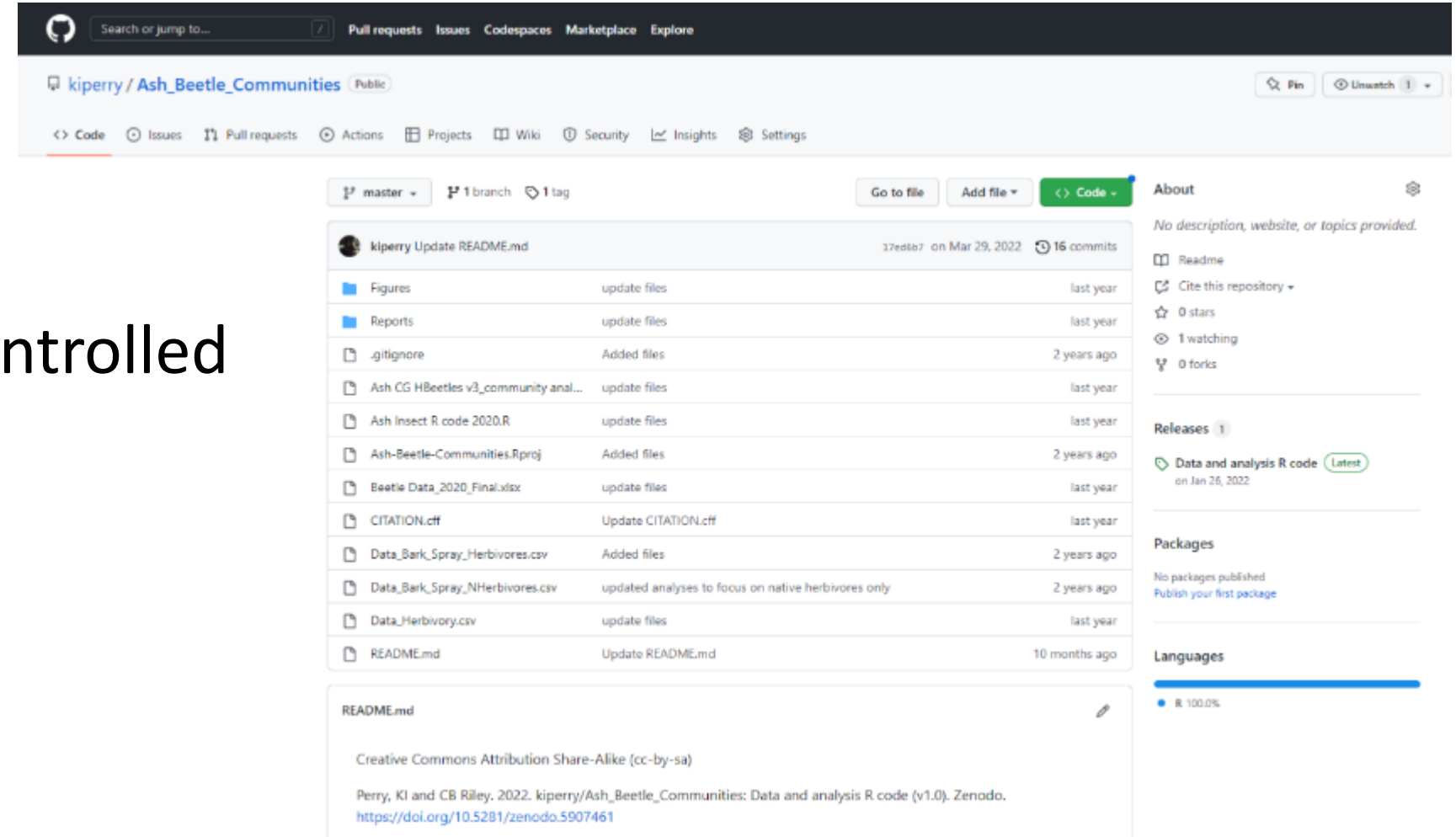
What is a repository (or repo)?

Place for all files associated with a project

With GitHub, your repo lives on your computer and online

Each file is version controlled with documented development history

Public or private



Kayla I Perry

kiperry

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kiperry1488@gmail.com

https://u.osu.edu/perrylab/

https://www.researchgate.net/profile/Kayla_Perry

Organizations

Find a repository... | Type | Language | Sort | New

ENT6702_DataAnalysis Public

Repository for the course ENT 6702: Entomological Techniques and Data Analysis

R · 1 · Updated 4 days ago

Star

OSU_Statistics_Workshops Public

1 · Updated last week

Star

Ohio_Bees Private

HTML · Updated on Jul 27

Star

IDH_Ground_Beetles Public

R · Updated on Jul 20

Star

WI_Bumble_Bees Private

R · Updated on Jun 20

Star

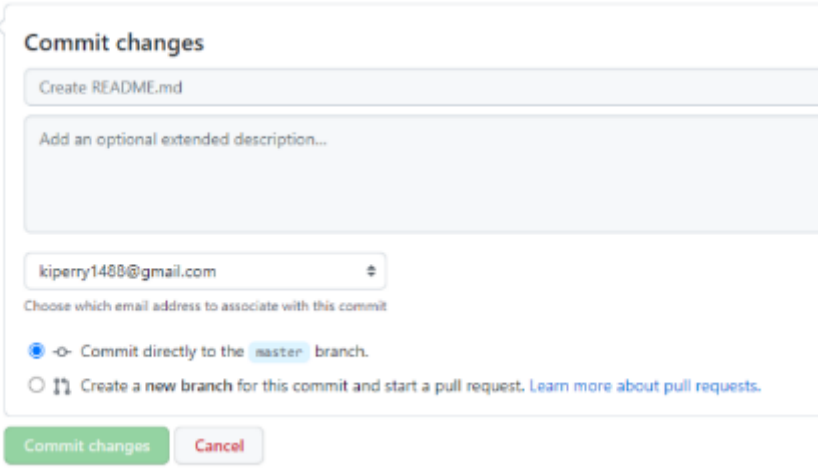
PNR_Beetles Public

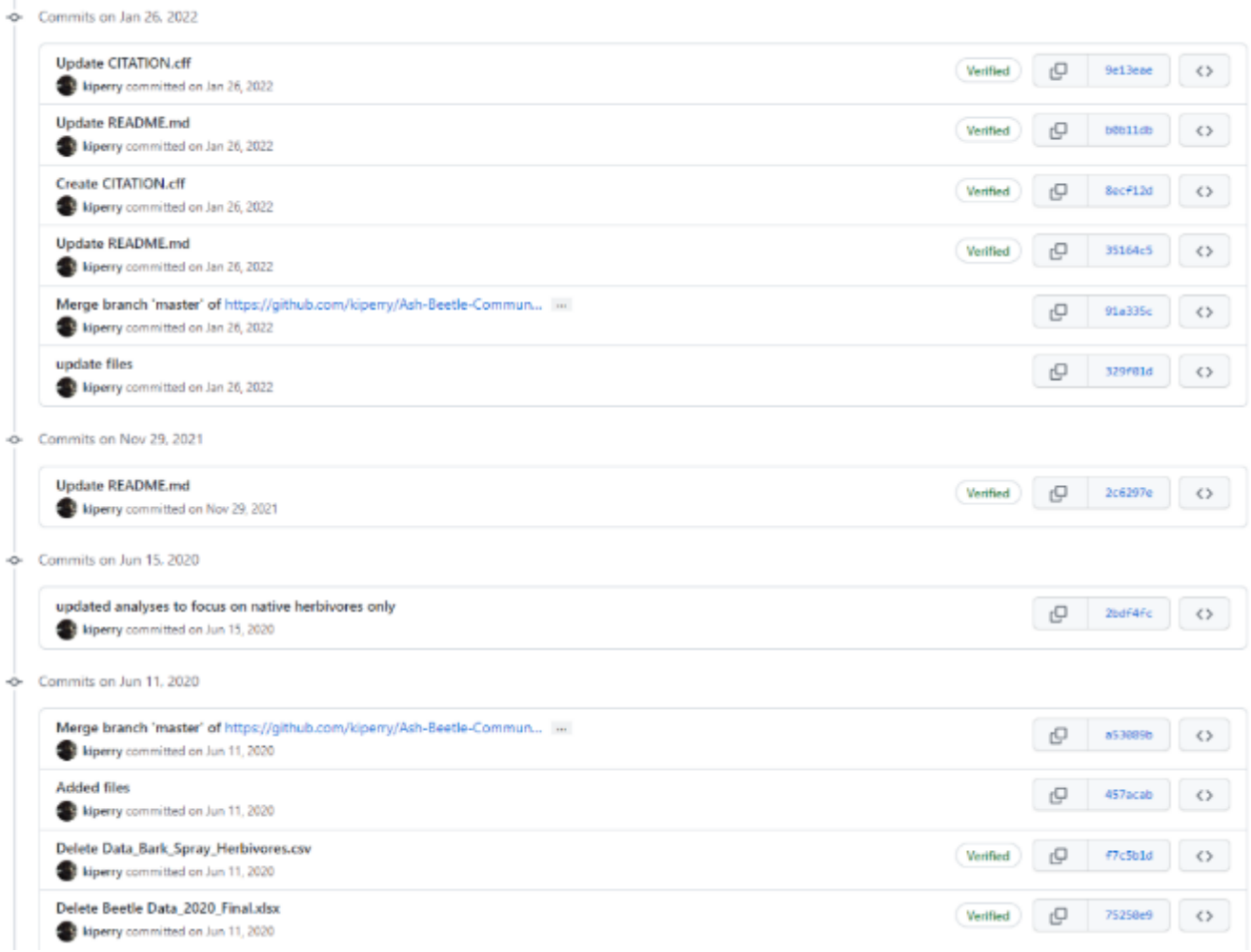
Star

Make changes or updates to repo with <u>commit</u>

Save a version of a file, and provide notes on what you changed

When you commit a file in Git/GitHub, you are saving a new version, but also keeping a record of the changes you made





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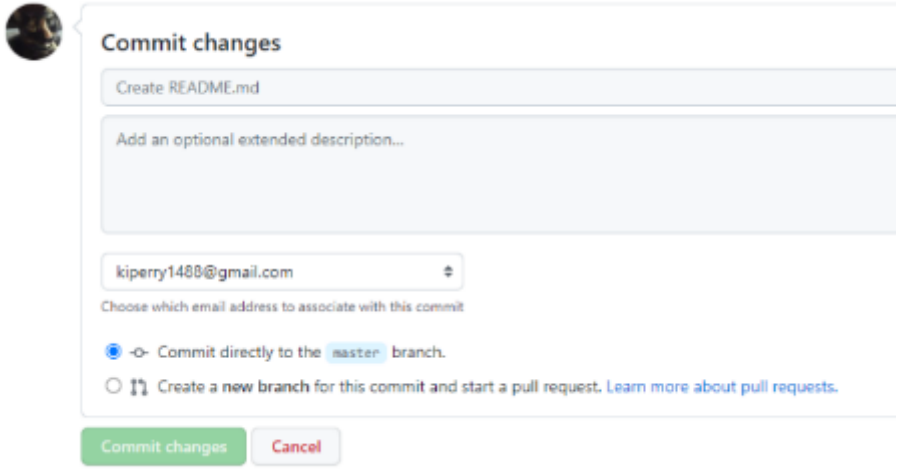
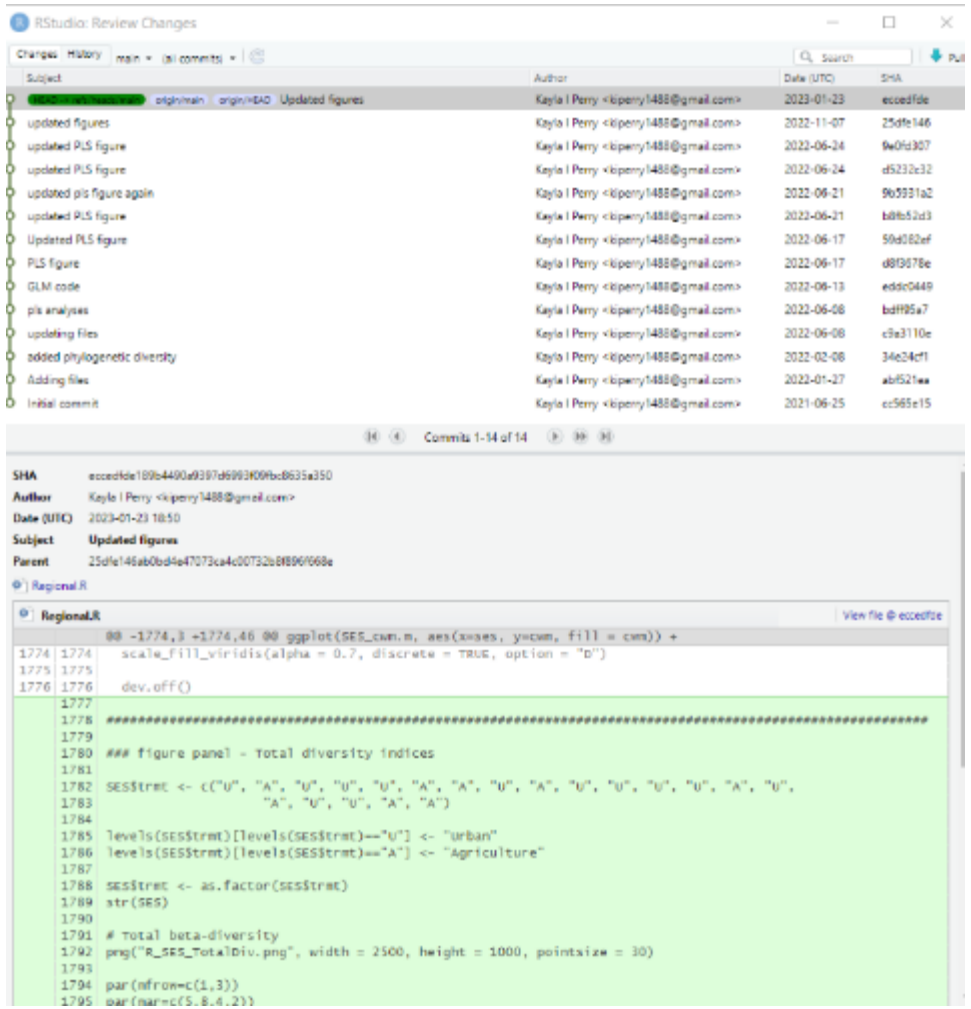
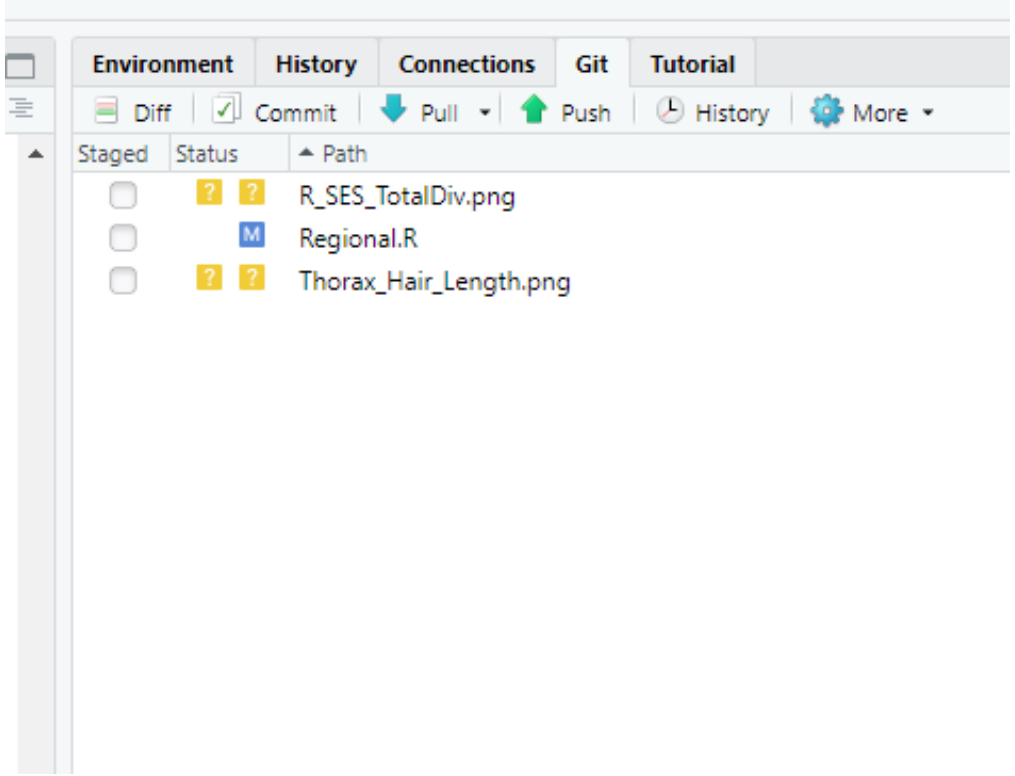
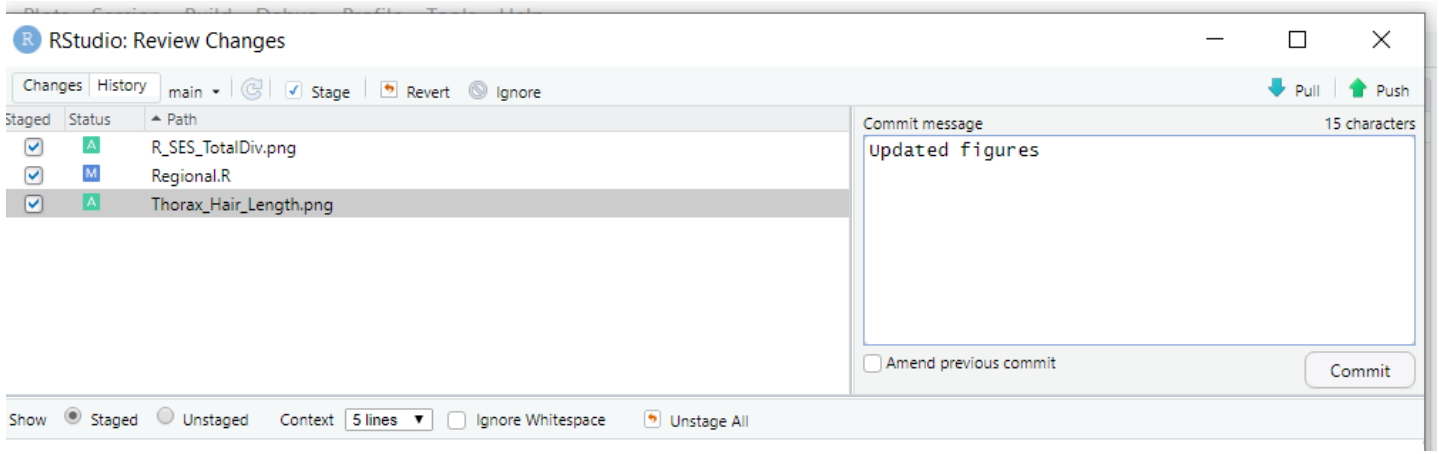




Pull, Commit, then Push

1. **Pull** from the online repository to update your local files
2. **Commit** to save a new version of a file(s)
3. **Push** those changes online to the repository





1) Sync project files locally on your computer and online

2) Make commits to record changes to files over time

3) Facilitates remote collaboration because multiple folks can add and make changes to project files in the repository at the same time

What can we do with Git/GitHub?

1) Experiment on projects without breaking them – **Branch**

2) Make, assign, and keep track of tasks – **Issues**

3) Access existing projects made by others – **Fork or Clone**

4) Build on existing projects with collaborators – **Pull, Commit, Push**

Why use Git/GitHub with R?

Facilitates research transparency and reproducibility

Share data, code, and analyses with collaborators and scientific community

- Track development history over time

Aligns with open science journal requirements

Submitting your manuscript for review?

Include your GitHub repository link in your open research/data availability statement

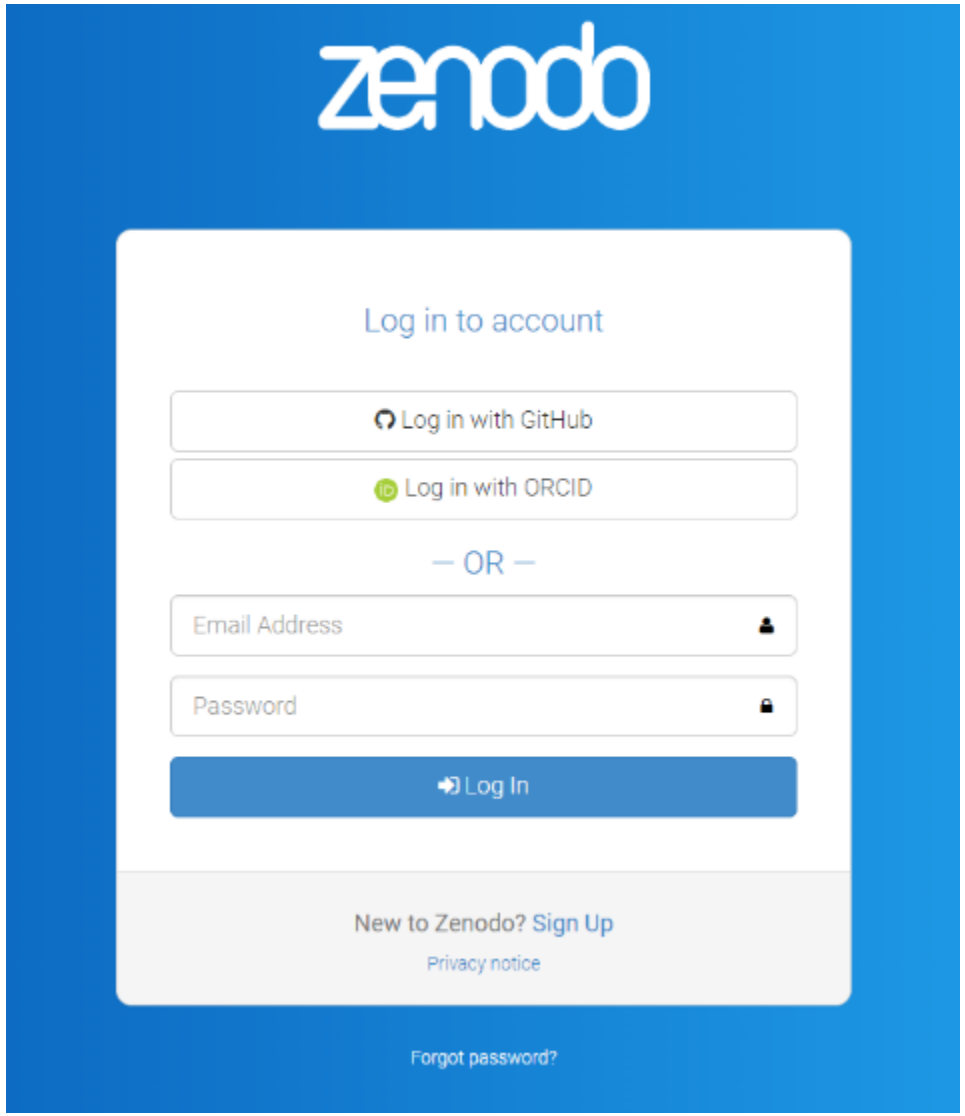
Many journals now require submission of data and code for peer-review

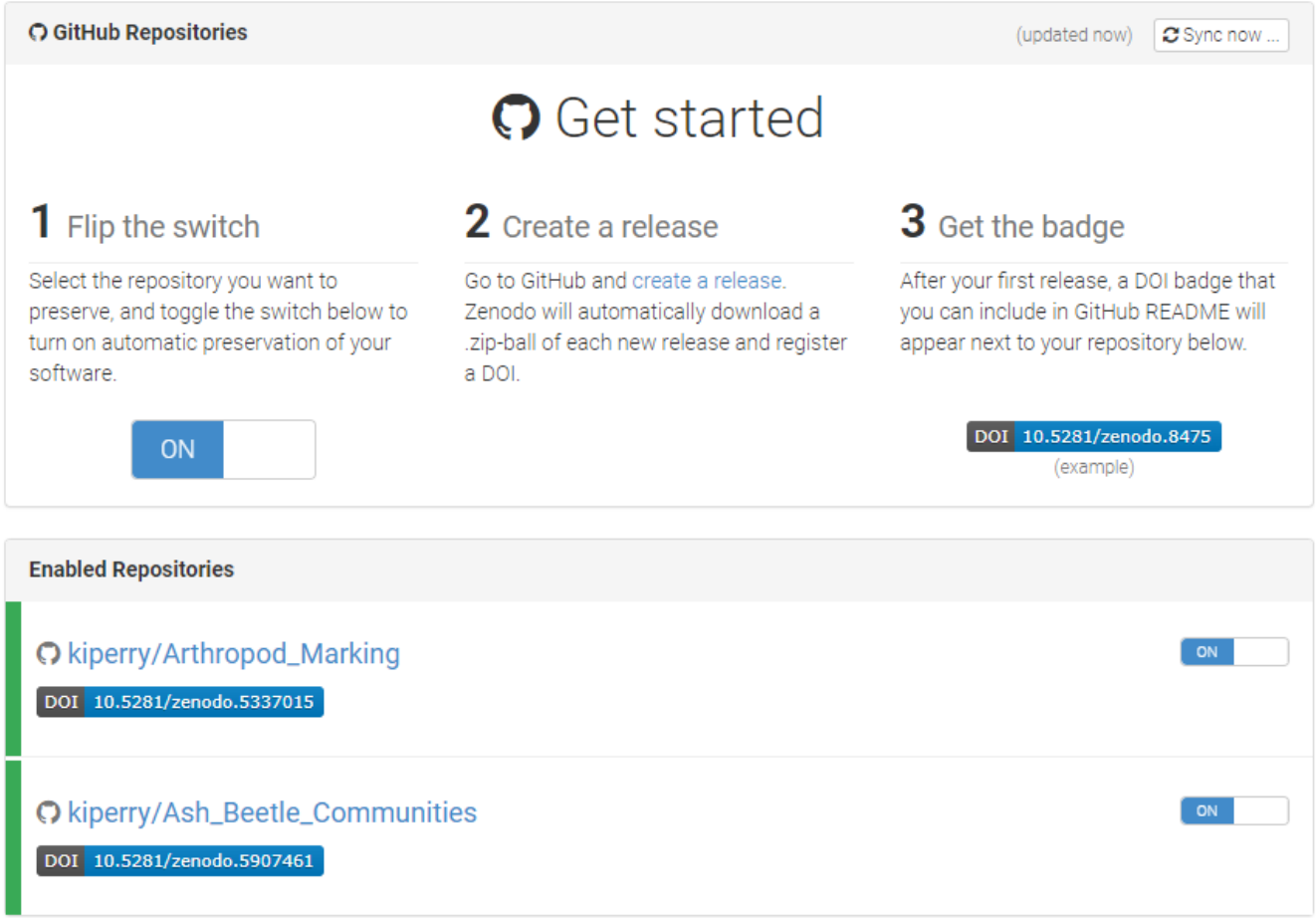
Open Research Statement: Data are already published and publicly available, with those items properly cited in this submission. This submission uses novel code, which is provided in an external repository to be evaluated during the peer review process and are available at https://github.com/BahlaiLab/Ohio_ladybeetles. If this paper is accepted for publication, data and code will be permanently archived in Zenodo.

Link GitHub repository with Zenodo for DOI

Developed under European OpenAIRE Program

Operated by CERN





Software and Data Products category on your CV!

January 26, 2022

Dataset | Open Access

Study data and analysis code

Kayla I Perry; Christopher B Riley

Study data and R code, first release v1.0

This dataset supports the following study:

Perry, KI, CB Riley, F Fan, J Radl, DA Herms, and MM Gardiner. The value of hybrid and nonnative ash for the conservation of ash specialists is limited following late stages of emerald ash borer invasion, Agricultural and Forest Entomology, doi.org/10.1111/afe.12499

Preview

Ash_Beetle_Communities-v1.0.zip

kiperry-Ash_Beetle_Communities-91a335c	
.gitignore	40 Bytes
Ash CG HBeetles v3_community analyses.R	35.2 kB
Ash Insect R code 2020.R	6.8 kB
Ash-Beetle-Communities.Rproj	209 Bytes
Beetle Data_2020_Final.xlsx	91.5 kB
Data_Bark_Spray_Herbivores.csv	25.1 kB
Data_Bark_Spray_NHerbivores.csv	23.1 kB
Data_Herbivory.csv	27.8 kB
Figures	
NBetaDiversity_Bark_Ash.png	10.1 kB
NBetaDiversity_Spray_Ash.png	10.3 kB
NMDS_Herbivores_Bark_Ash.png	34.3 kB
NMDS_Herbivores_Spray_Ash.png	32.9 kB
NMDS_NHerbivores_Canopy_Bark_Ash.png	64.1 kB
NSpecies_Rarefaction_Ash.png	27.4 kB
README.md	257 Bytes
Reports	

Files (428.0 kB)

Name	Size	
kiperry/Ash_Beetle_Communities-v1.0.zip	428.0 kB	Preview Download

md5:55e0cc39fb6c5ee28ef1a4ffd5c4414e

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New version

44 views

2 downloads

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Available in

GitHub

Indexed in

OpenAIRE

Publication date:
January 26, 2022

DOI:
DOI 10.5281/zenodo.5907461

Published in:
Agricultural and Forest Entomology; doi.org/10.1111/afe.12499:.

Related identifiers:
Supplement to https://github.com/kiperry/Ash_Beetle_Communities/tree/v1.0

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Update readme file on GitHub with DOIs

kiperry / Ash_Beetle_Communities Public

Pin

Code | Issues | Pull requests | Actions | Projects | Wiki | Security | Insights | Settings

master | 1 branch | 1 tag | Go to file | Add file | Code

kiperry Update README.md 17ed6b7 on Mar 29, 2022 16 commits

Figures	update files	last year
Reports	update files	last year
.gitignore	Added files	2 years ago
Ash CG HBeetles v3_community anal...	update files	last year
Ash Insect R code 2020.R	update files	last year
Ash-Beetle-Communities.Rproj	Added files	2 years ago
Beetle Data_2020_Final.xlsx	update files	last year
CITATION.cff	Update CITATION.cff	last year
Data_Bark_Spray_Herbivores.csv	Added files	2 years ago
Data_Bark_Spray_NHerbivores.csv	updated analyses to focus on native herbivores only	2 years ago
Data_Herbivory.csv	update files	last year
README.md	Update README.md	10 months ago

README.md

Creative Commons Attribution Share-Alike (cc-by-sa)

Perry, KI and CB Riley. 2022. kiperry/Ash_Beetle_Communities: Data and analysis R code (v1.0). Zenodo. https://doi.org/10.5281/zenodo.5907461

Perry, KI, CB Riley, F Fan, J Radl, DA Herms, and MM Gardiner. The value of hybrid and nonnative ash for the conservation of ash specialists is limited following late stages of emerald ash borer invasion, Agricultural and Forest Entomology, https://doi.org/10.1111/afe.12499

About

No description, website, or topics provided.

Readme

Cite this repository

0 stars

1 watching

0 forks

Releases 1

Data and analysis R code Latest

on Jan 26, 2022

Link to Zenodo

Packages

No packages published

Publish your first package

Languages

R 100.0%

Before Friday….

Download and install:

Git (https://git-scm.com/downloads)

GitDesktop (https://desktop.github.com/)

Create a free account on GitHub (https://github.com)

R Assignment – Loading data into R

- When you have a dataset ready for analysis, it needs to be exported to a statistics program
- Some, but not all programs, can read an Excel file directly
- More commonly, the data needs to be saved as a plain text file (space or tab delimited)
- Understand how the file is delimited and what the statistics program is expecting!

<u>Files and delimitations:</u>

*.txt Plain text

*.txt Tab-delimited plain text

*.dat Space delimited plain text

*.csv Comma separated values