OCN 390: Field Methods

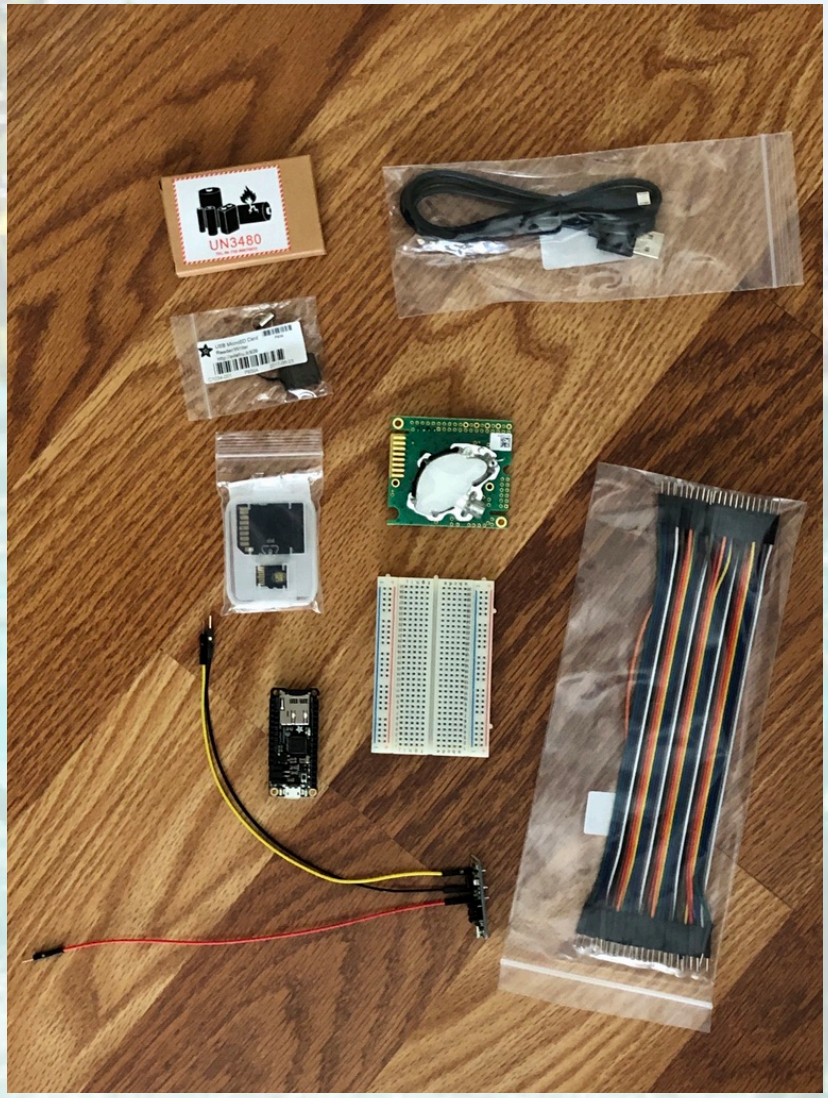
Week 9

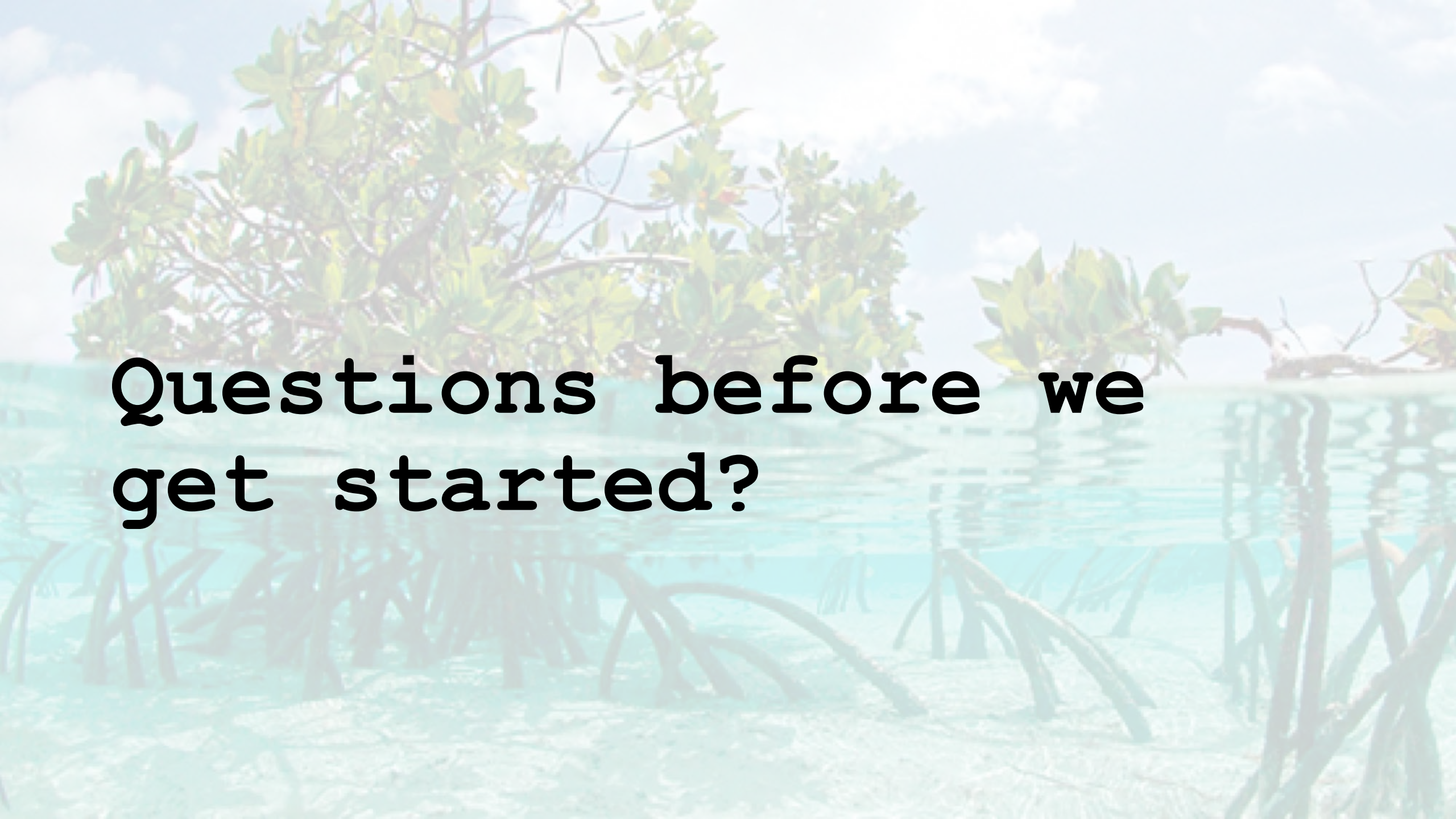
Quick Map-Making Techniques
& Data Interpolation


Note to self: record!

Announcements

- Please take advantage of reaching out to me and Jack as early in the week as possible so that we can offer guidance!
- Rotate who is the keeper of the components
- Rotate who submits the group assignment
- CC your teammates on emails to me or use the Canvas groups for communicating




Questions before we get started?

Story Maps for Scientific Storytelling

What you CAN'T see in the Tennessee River

A closer look at pollution in the river

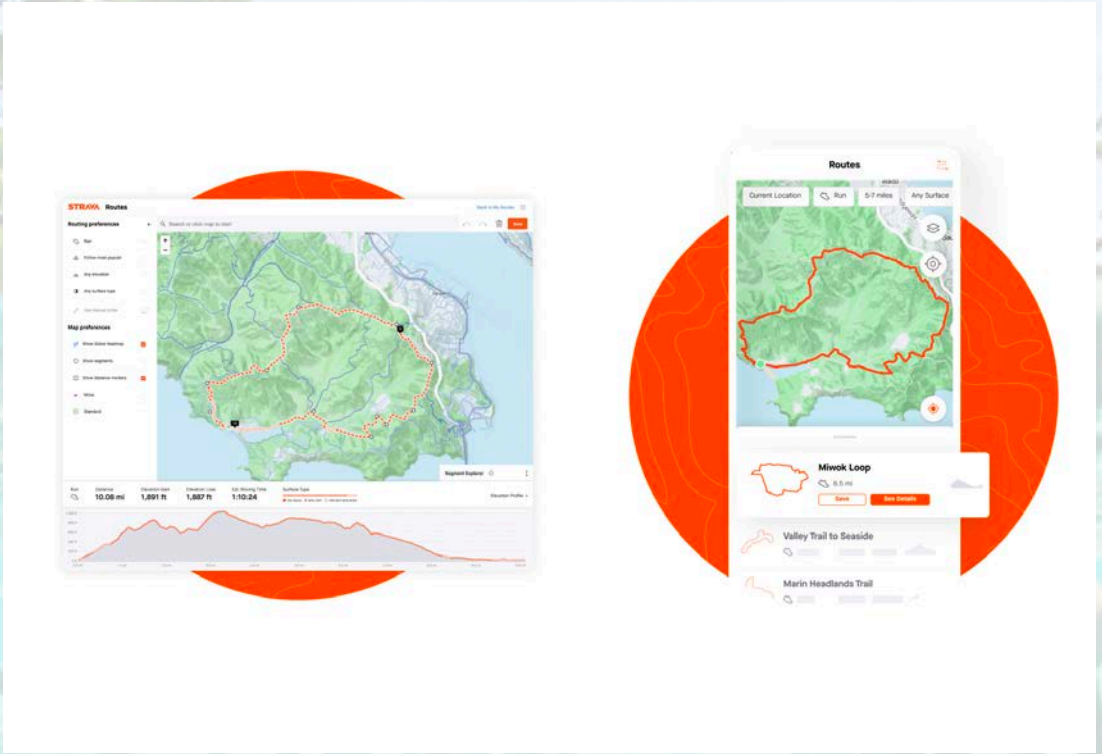
Kellie Ward | February 19, 2021

Important Components of Your Story Maps

- Images and/or video of field site. Images of sensor. Other images from web (with citation) if it adds to story.
- Images of field journal, if it adds to the story and provides helpful context
- Image or written out version of your field checklist
- Preliminary data, nicely visualized **(at least 1 interactive map with your data and 1 time-series plot with your data)**
- Text blocks explaining:
  - Why: what was the motivation for your study?
  - How: what were your methods and procedures?
  - What did you learn? Results? Provide both quantitative results and also how they fit into the context of your study.
  - What challenges did you face? How will you make improvements prior to final report? How would you recommend that others overcome those in future semesters? What other data will you collect? What other analysis/analyses will you perform?
  - Hyperlinked citations of peer-reviewed research described in context. Other hyperlinked references as needed.
  - Conclusion: tie it all together.
- Additional paragraph sent via Canvas (not in Story Map) describing your contributions to all aspects of

Last week:

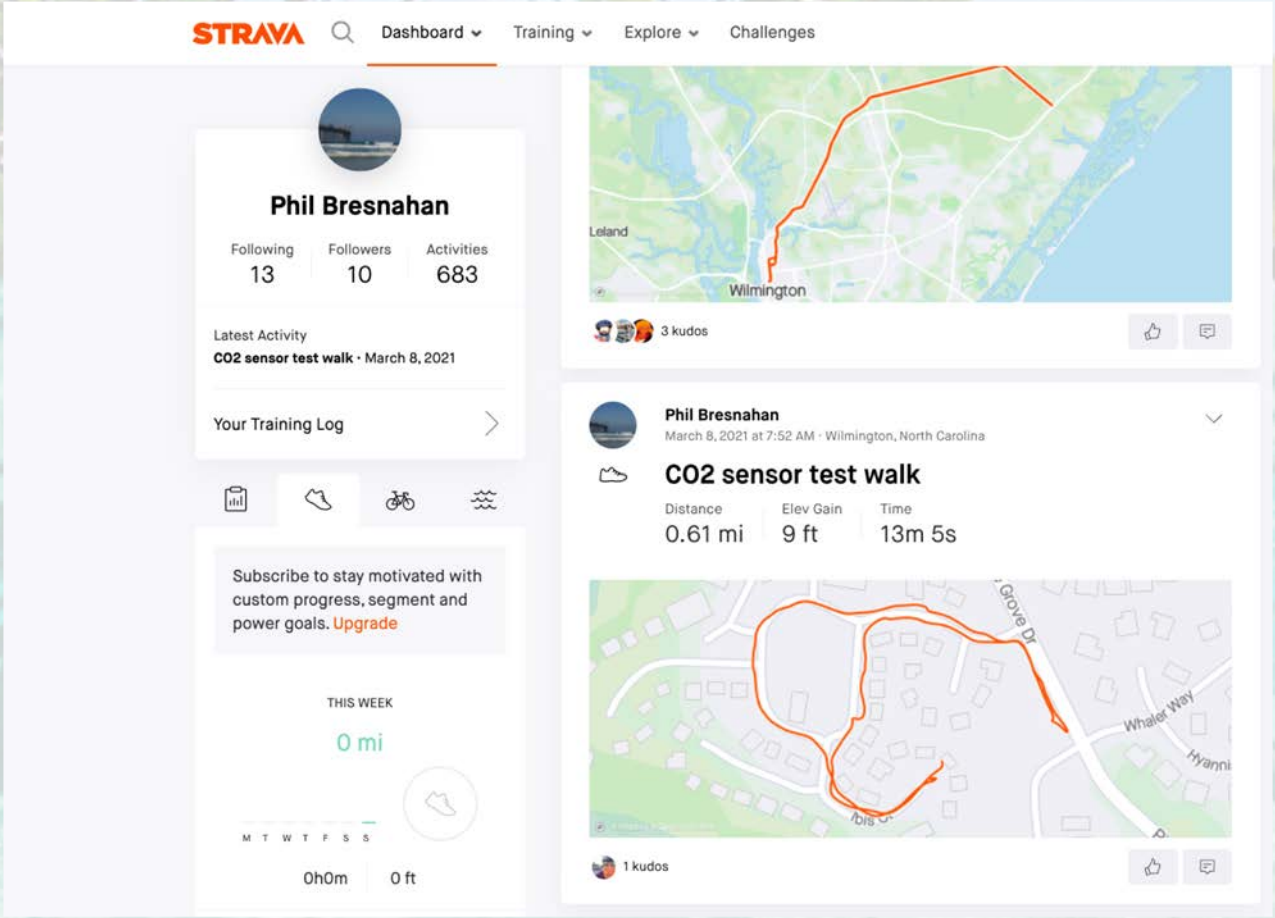
- Collecting indoor/outdoor data with GPS
- One person per team: download Strava app for your phone
- All heading outside
- Each team come talk to me one at a time to talk about proposed field study in greater depth



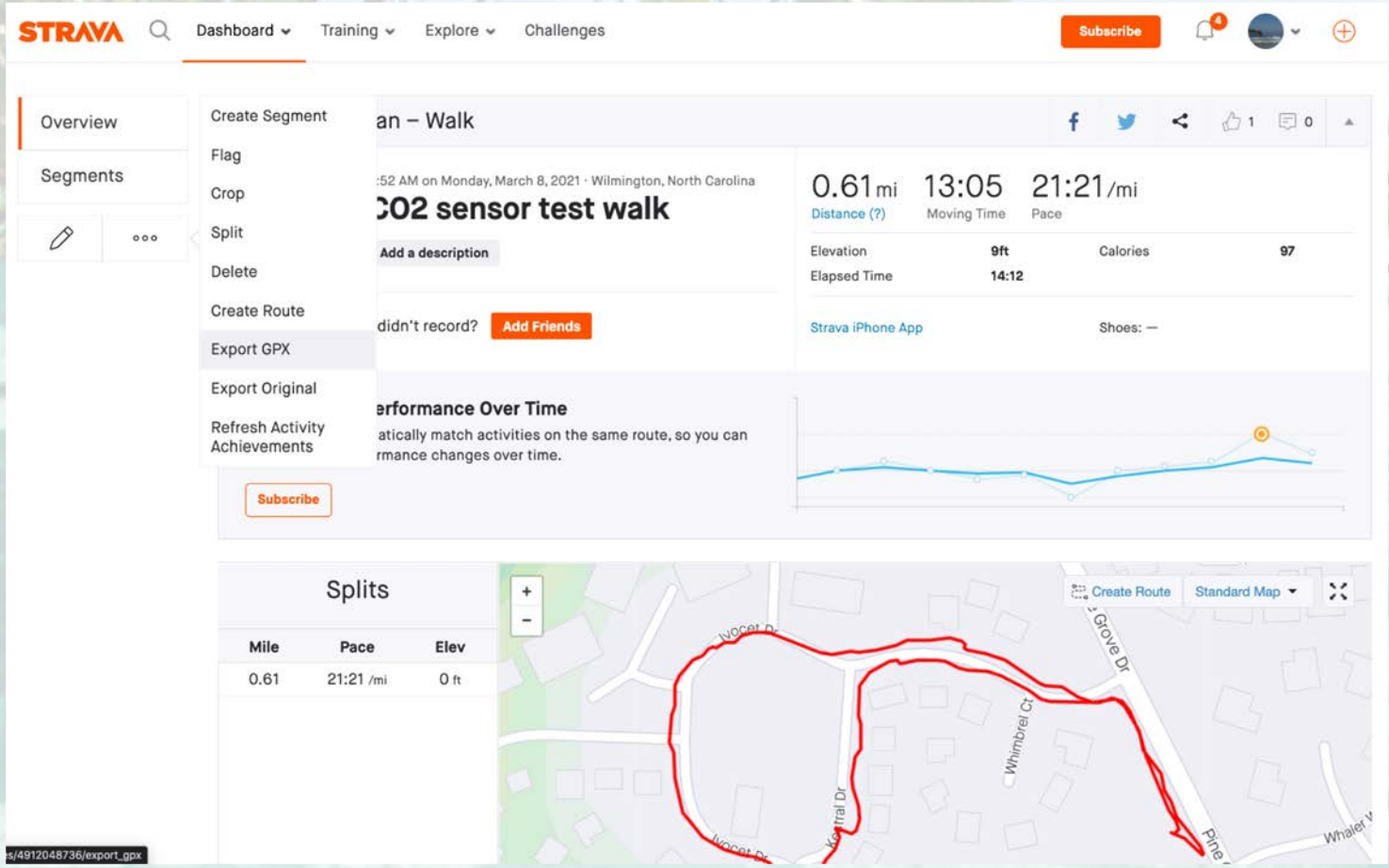
Today:
Data Processing (GPX)

1. Download GPX file from Strava
2. Process GPX file using https://www.gpsvisualizer.com/convert_input
3. Process GPX file further using Excel
4. Merge unprocessed GPX file with CO2 file using Python

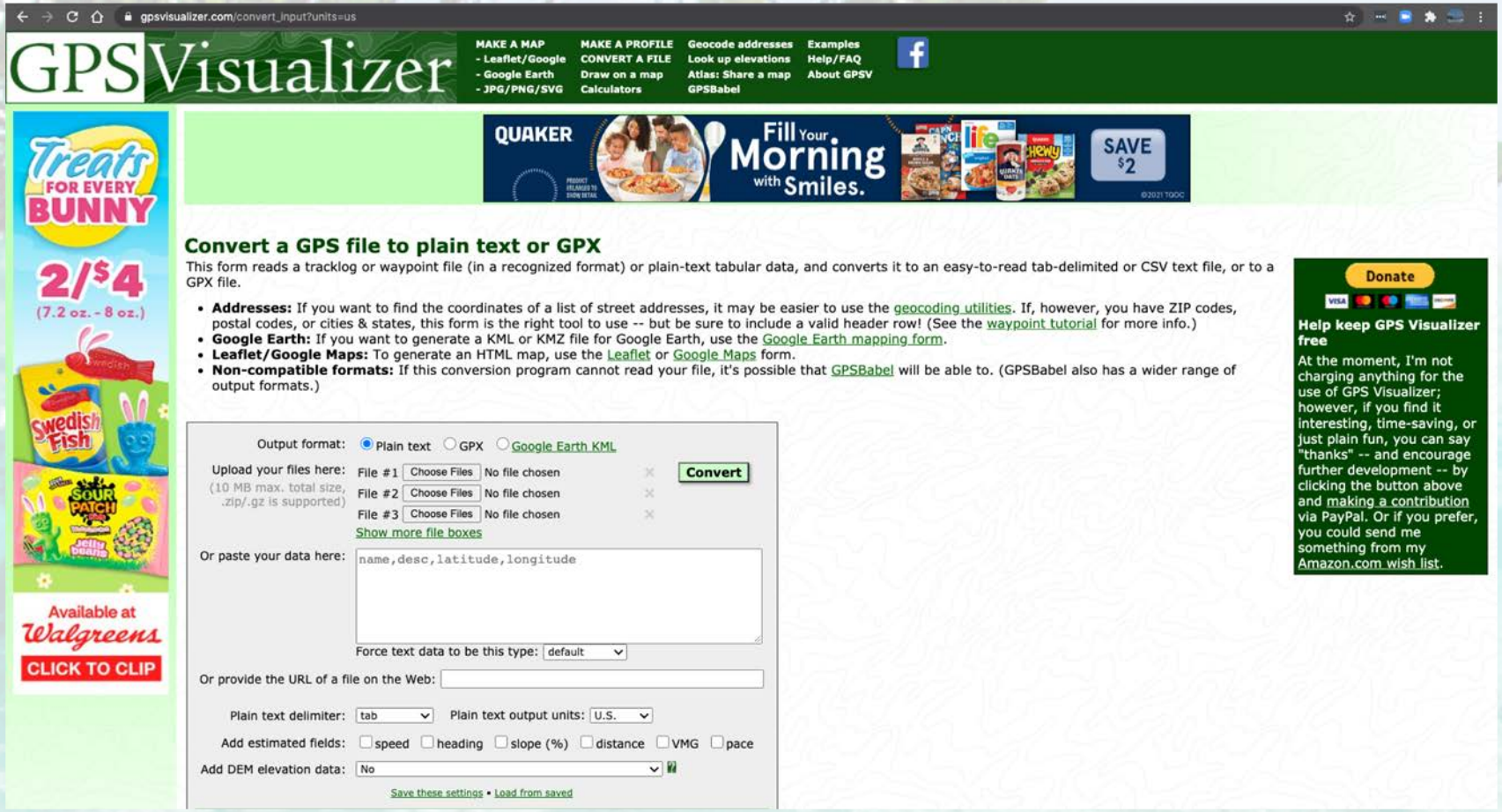
Get GPX from Strava.com (on a computer—not sure this works on mobile device)



Export GPX, save to computer



Skip this step if using Python (Python is highly recommended)



Process GPS data further in Excel

- Quick demo

CO2 vs. Location

What's wrong with this?

Last week's CO2 data

	A	B	C	D
1	Start Time	3/8/21 07:47		
2	Elapsed Time	CO2 Concentr	Time (absolute)	
3	2	1259	3/8/21 07:47:02	
4	4	1247	3/8/21 07:47:04	
5	6	1231	3/8/21 07:47:06	
6	8	1202	3/8/21 07:47:08	
7	10	1201	3/8/21 07:47:10	
8	12	1197	3/8/21 07:47:12	
9	14	1191	3/8/21 07:47:14	
10	16	1182	3/8/21 07:47:16	
11	18	1174	3/8/21 07:47:18	
12	20	1164	3/8/21 07:47:20	
13	22	1154	3/8/21 07:47:22	
14	24	1144	3/8/21 07:47:24	
15	27	1133	3/8/21 07:47:27	
16	29	1124	3/8/21 07:47:29	
17	31	1102	3/8/21 07:47:31	
18	33	1088	3/8/21 07:47:33	

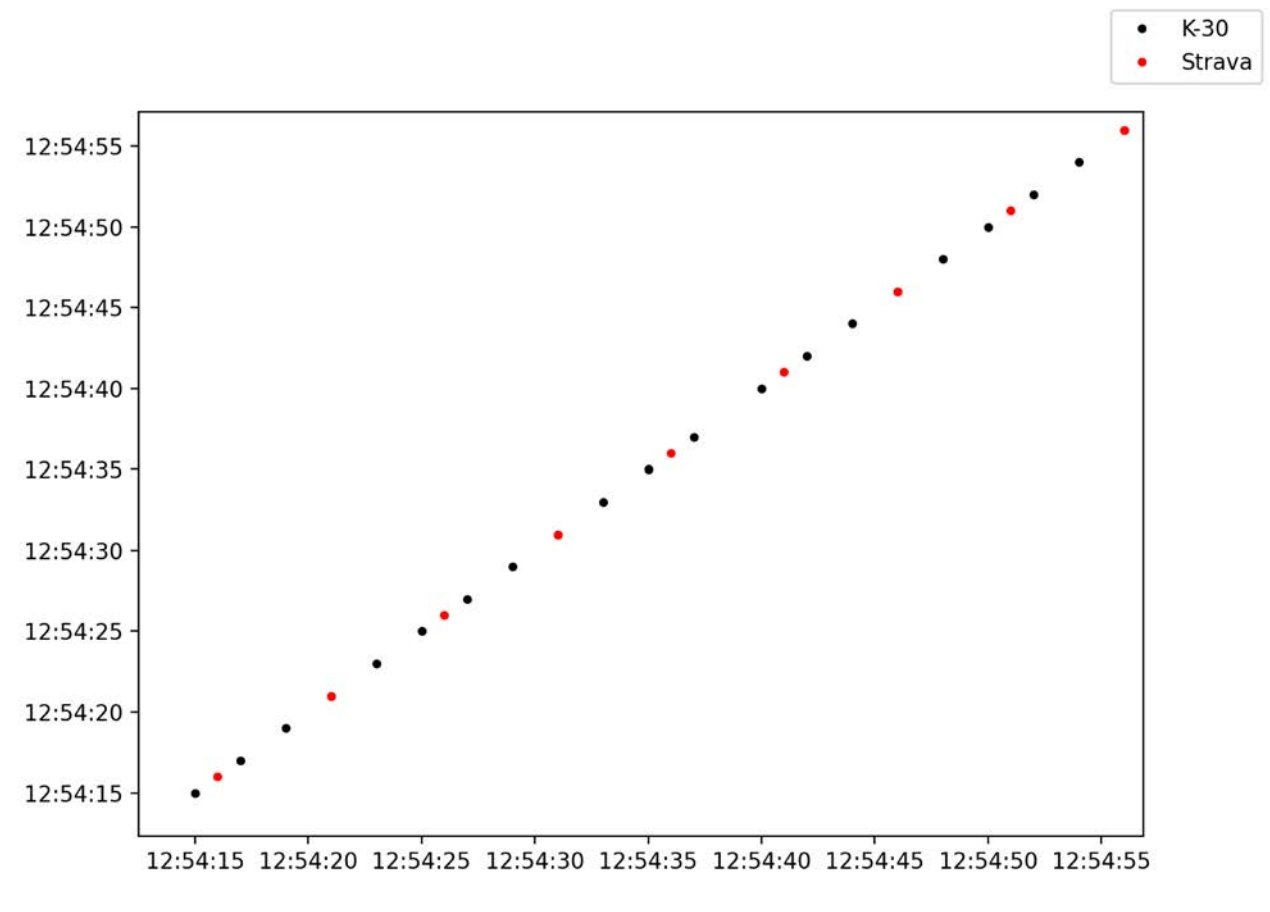
2021-03-08_CO2SensorTestWalk_CO +

Last week's GPS data

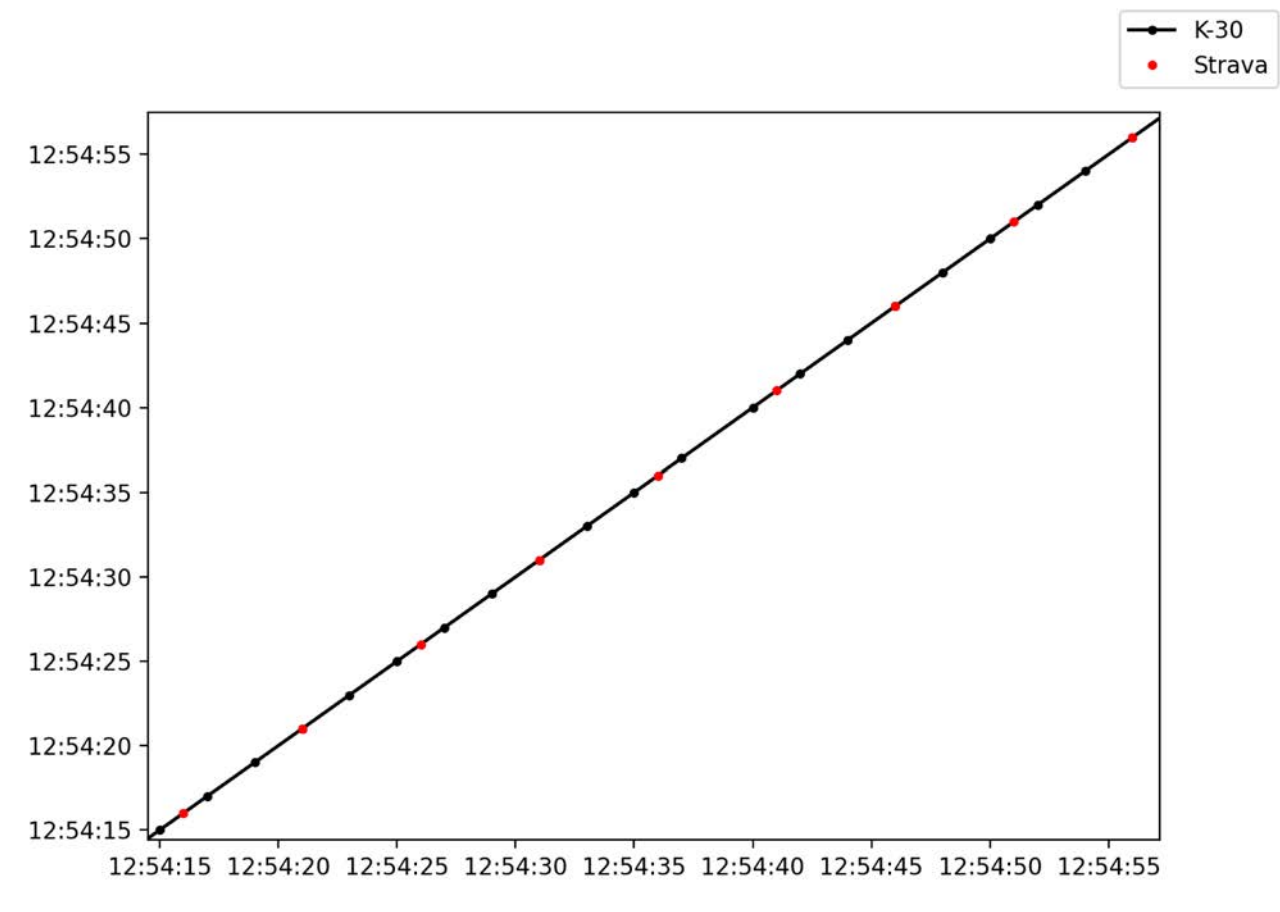
	A	B	C	D	E	F
1	type	date	time (UTC)	latitude	longitude	altitude (ft)
2	T	3/8/21	12:52:36	34.186881	-77.863983	11.2
3	T	3/8/21	12:52:37	34.186888	-77.863942	11.5
4	T	3/8/21	12:52:38	34.186891	-77.863927	11.5
5	T	3/8/21	12:52:39	34.186887	-77.86392	11.5
6	T	3/8/21	12:52:40	34.186884	-77.863922	11.5
7	T	3/8/21	12:52:41	34.18688	-77.863931	11.5
8	T	3/8/21	12:52:42	34.186875	-77.863943	11.5
9	T	3/8/21	12:52:43	34.186871	-77.863952	11.5
10	T	3/8/21	12:52:44	34.186866	-77.86396	11.8
11	T	3/8/21	12:52:45	34.186863	-77.86397	11.8
12	T	3/8/21	12:52:46	34.186861	-77.863979	11.8
13	T	3/8/21	12:52:47	34.186861	-77.863989	11.8
14	T	3/8/21	12:52:48	34.186861	-77.863996	11.8
15	T	3/8/21	12:52:49	34.186861	-77.863996	11.8
16	T	3/8/21	12:52:50	34.186861	-77.863996	11.8
17	T	3/8/21	12:52:51	34.18686	-77.864003	11.8
18	T	3/8/21	12:52:52	34.186856	-77.864013	11.8

Sheet1 +

What if different devices have different timestamps?



Interpolation



Interpolation

Benefits

- Can help fill in data where we don't have any
- Can help align timestamps in order to combine datasets

Risks

- It's an educated guess, not a true observation
- Can lead to false sense of security

How to merge GPS/CO2 data

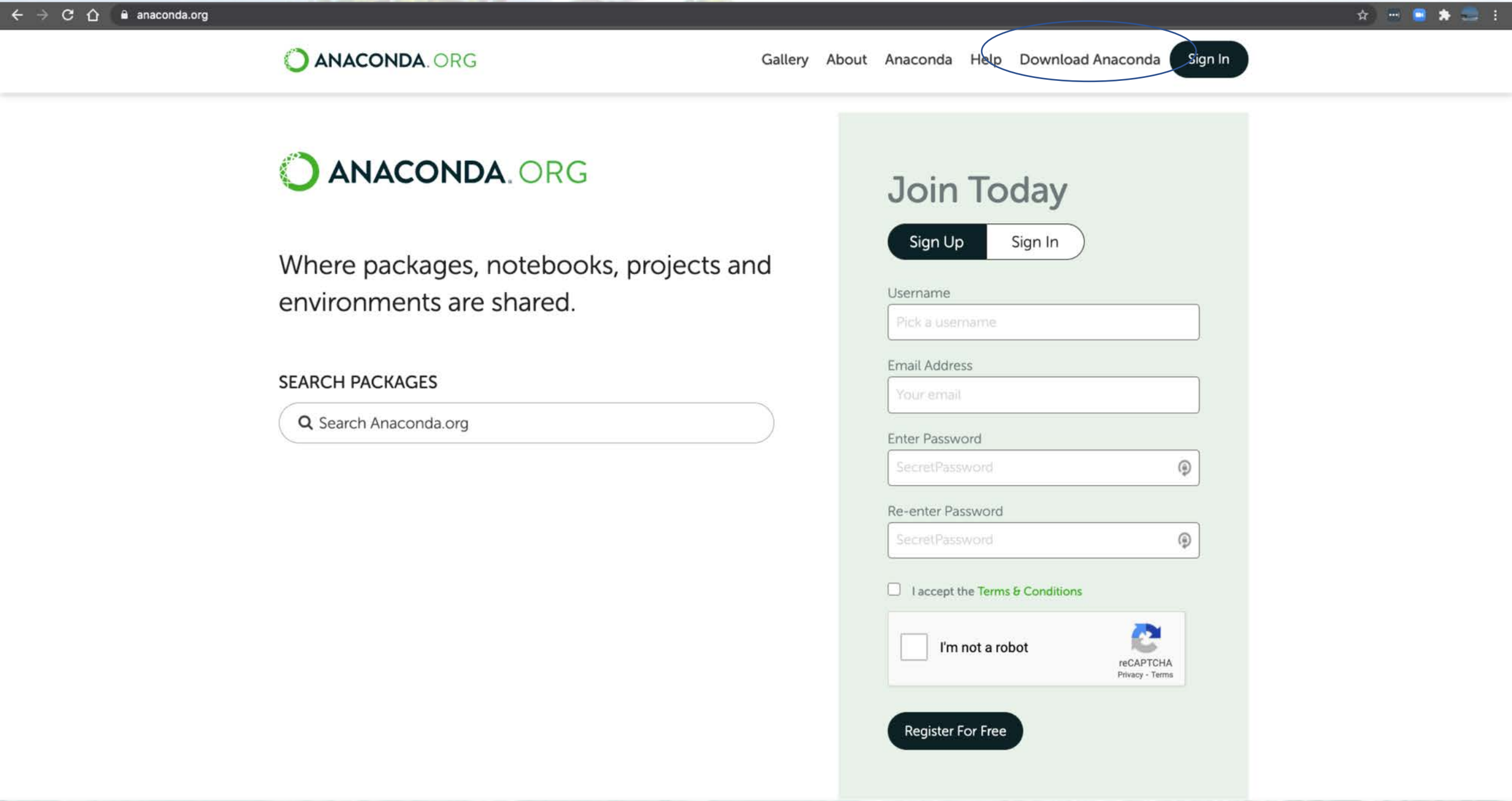
A few options:

1. Manually select rows from both spreadsheets that have matching times; make new spreadsheet with time, CO2, and lat/lon data
2. Learn way to do it programmatically with Excel (if you can figure this out, please let me know!)
3. Use scientific data analysis program like **Python**, R, or MATLAB

Python Quickstart

Why use Python

- Free!
- Repeatable coding, you don’t have to repeat a whole process with Excel every time you get new data
- Used by top professionals, from YouTube coders to NASA researchers
- Can be applied to any field of science or engineering
- One of the most helpful and lucrative skills in science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Email Address
Your email
Enter Password
SecretPassword
Re-enter Password
SecretPassword
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reCAPTCHA
Privacy - Terms
Register For Free

Anaconda Installers

Windows

Python 3.8

64-Bit Graphical Installer (457 MB)

32-Bit Graphical Installer (403 MB)

MacOS

Python 3.8

64-Bit Graphical Installer (435 MB)

64-Bit Command Line Installer (428 MB)

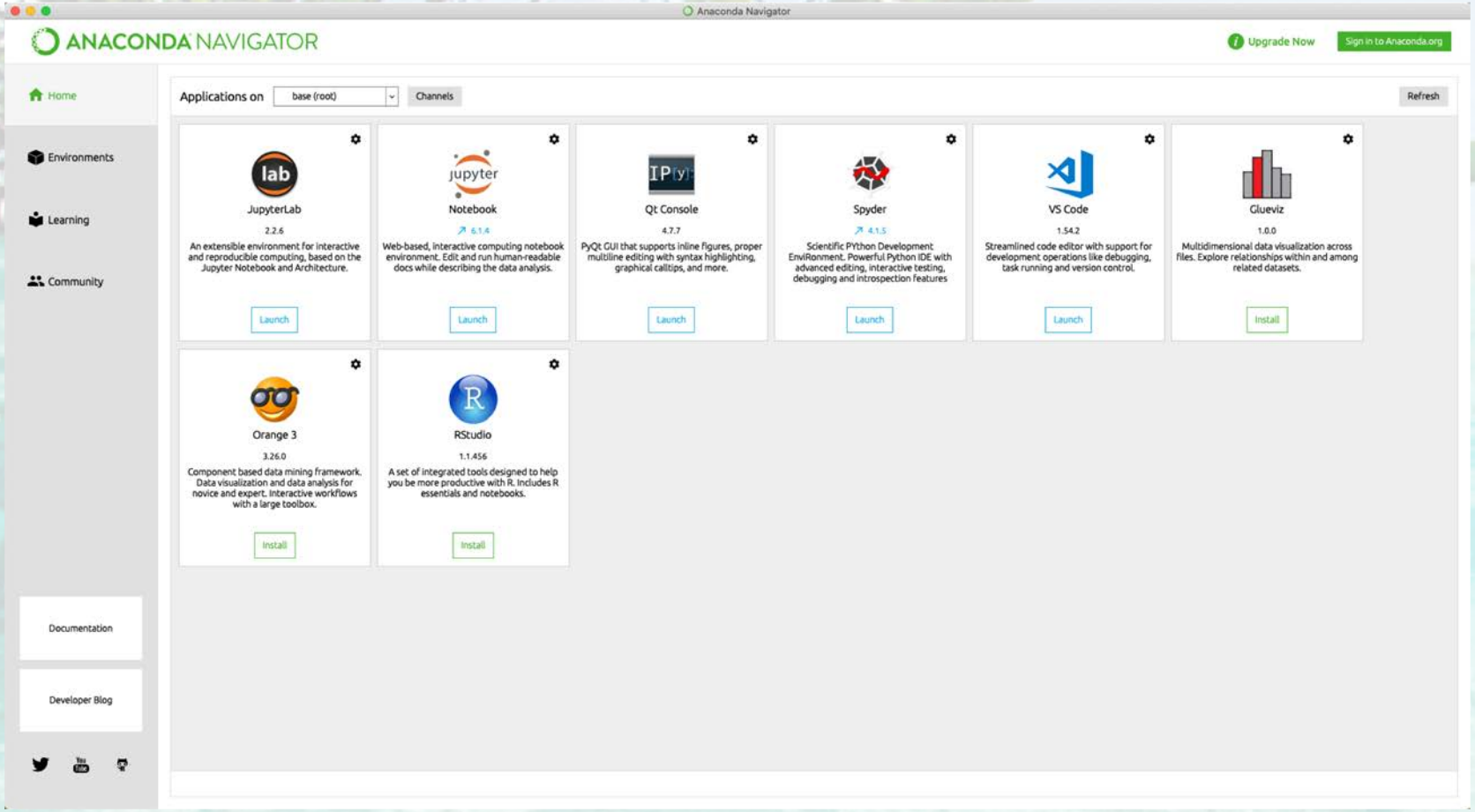
Linux

Python 3.8

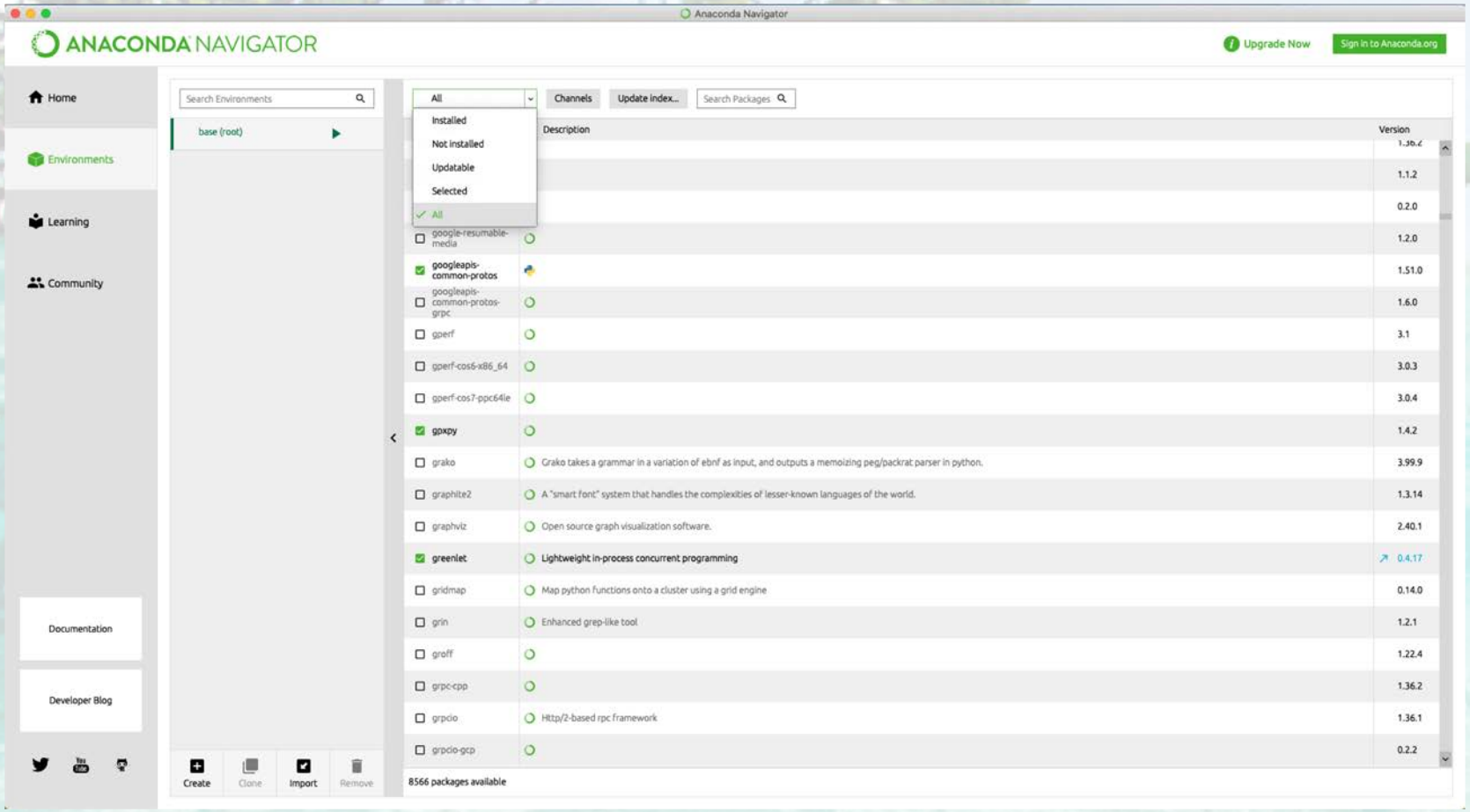
64-Bit (x86) Installer (529 MB)

64-Bit (Power8 and Power9) Installer (279 MB)

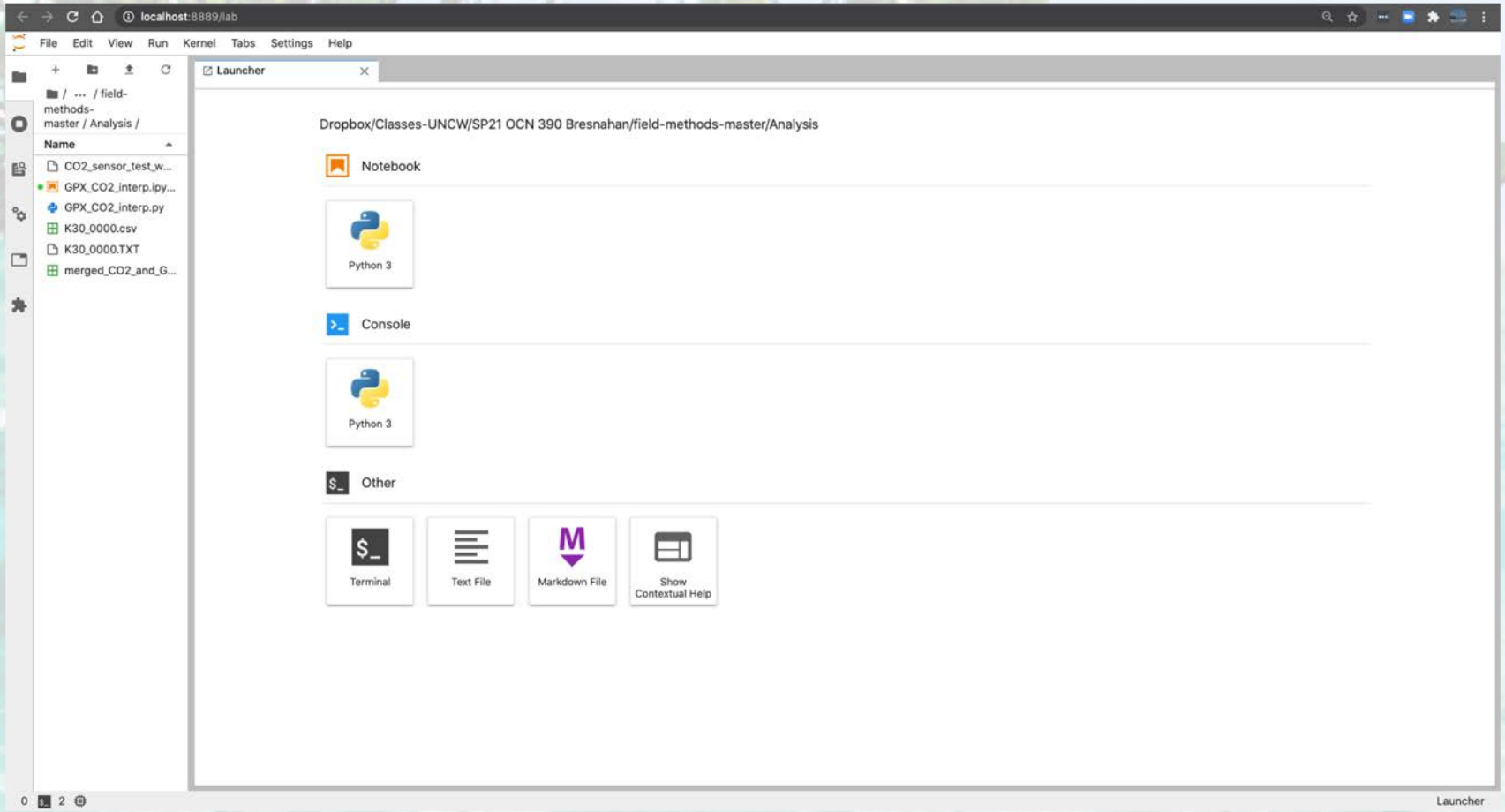
Launch Anaconda Navigator



Go to Environments tab.
Select “All” where it currently says “Installed.”
Check box next to gpxpy.

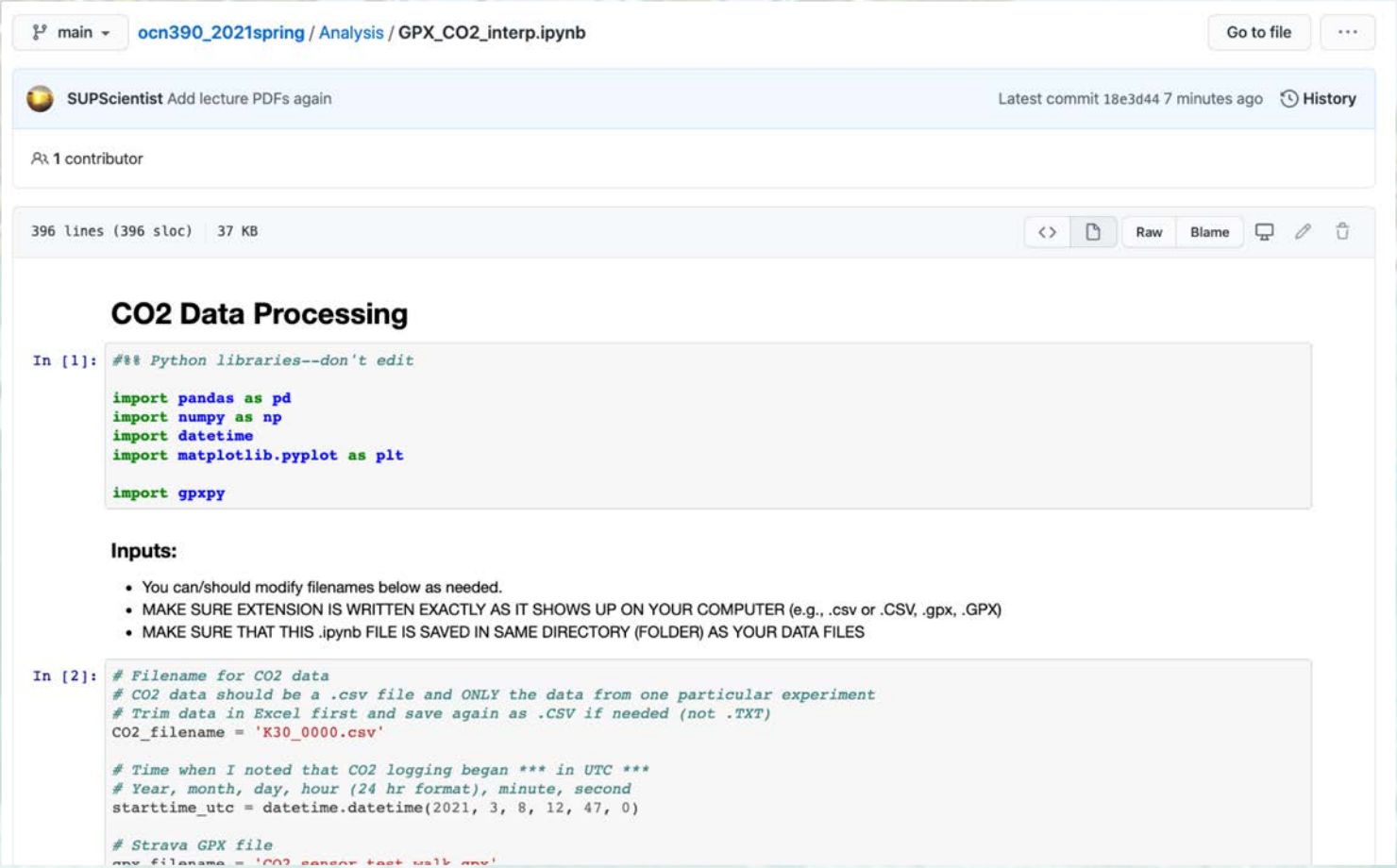


Return to Home tab, Launch JupyterLab



Download Python notebook

(From GitHub or remind me to post to Canvas)



main ocn390_2021spring / Analysis / GPX_CO2_interp.ipynb Go to file ...

SUPScientist Add lecture PDFs again Latest commit 18e3d44 7 minutes ago History

1 contributor

396 lines (396 sloc) 37 KB Raw Blame

CO2 Data Processing

In [1]:
```
#%% Python libraries--don't edit

import pandas as pd
import numpy as np
import datetime
import matplotlib.pyplot as plt

import gpxpy
```

Inputs:

- You can/should modify filenames below as needed.
- MAKE SURE EXTENSION IS WRITTEN EXACTLY AS IT SHOWS UP ON YOUR COMPUTER (e.g., .csv or .CSV, .gpx, .GPX)
- MAKE SURE THAT THIS .ipynb FILE IS SAVED IN SAME DIRECTORY (FOLDER) AS YOUR DATA FILES

In [2]:
```
# Filename for CO2 data
# CO2 data should be a .csv file and ONLY the data from one particular experiment
# Trim data in Excel first and save again as .CSV if needed (not .TXT)
CO2_filename = 'K30_0000.csv'

# Time when I noted that CO2 logging began *** in UTC ***
# Year, month, day, hour (24 hr format), minute, second
starttime_utc = datetime.datetime(2021, 3, 8, 12, 47, 0)

# Strava GPX file
gpx_filename = 'CO2_sensor_test_walk.gpx'
```

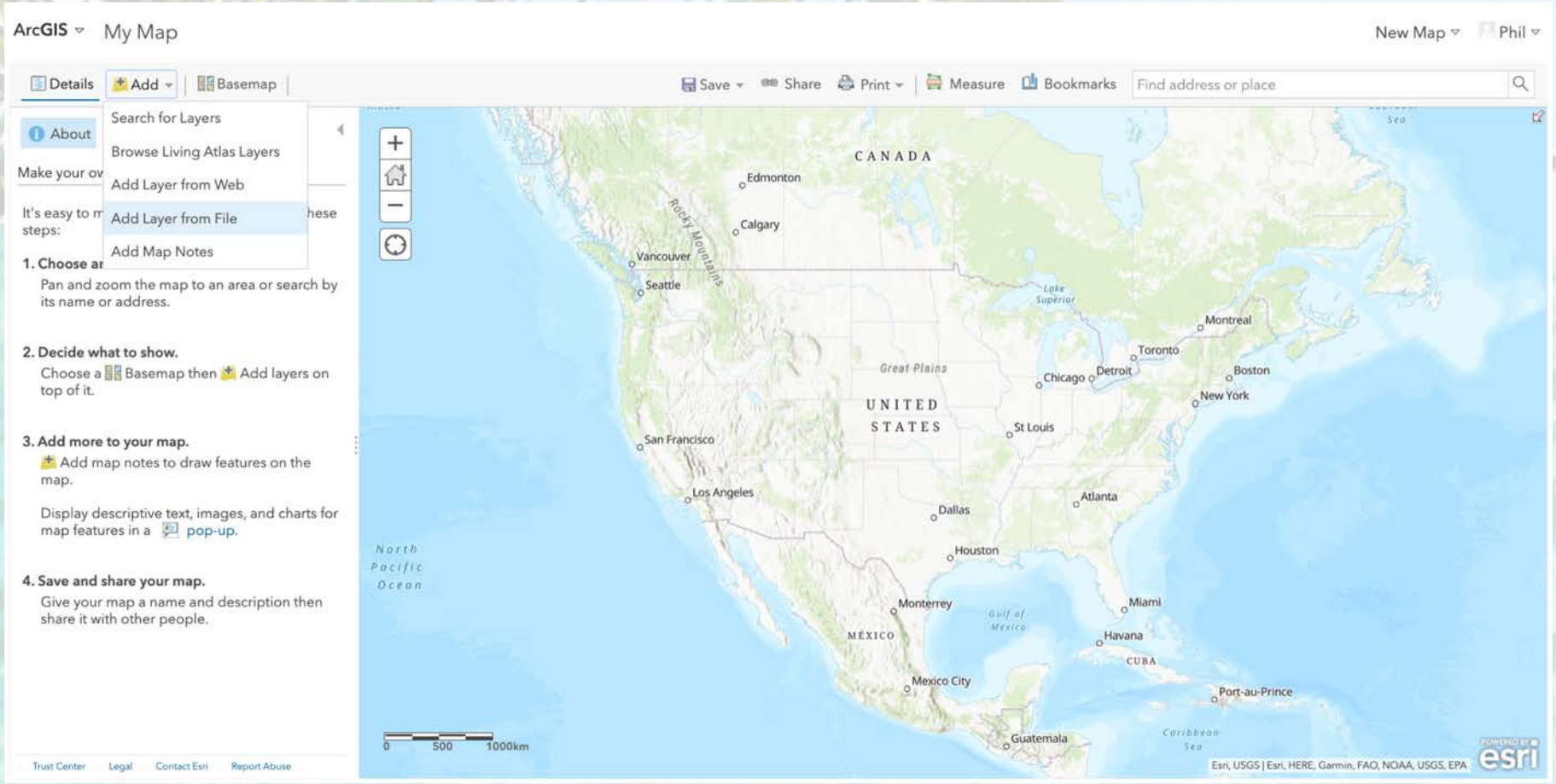
Mapping CO2 data with Lat/Lon

ArcGIS Online

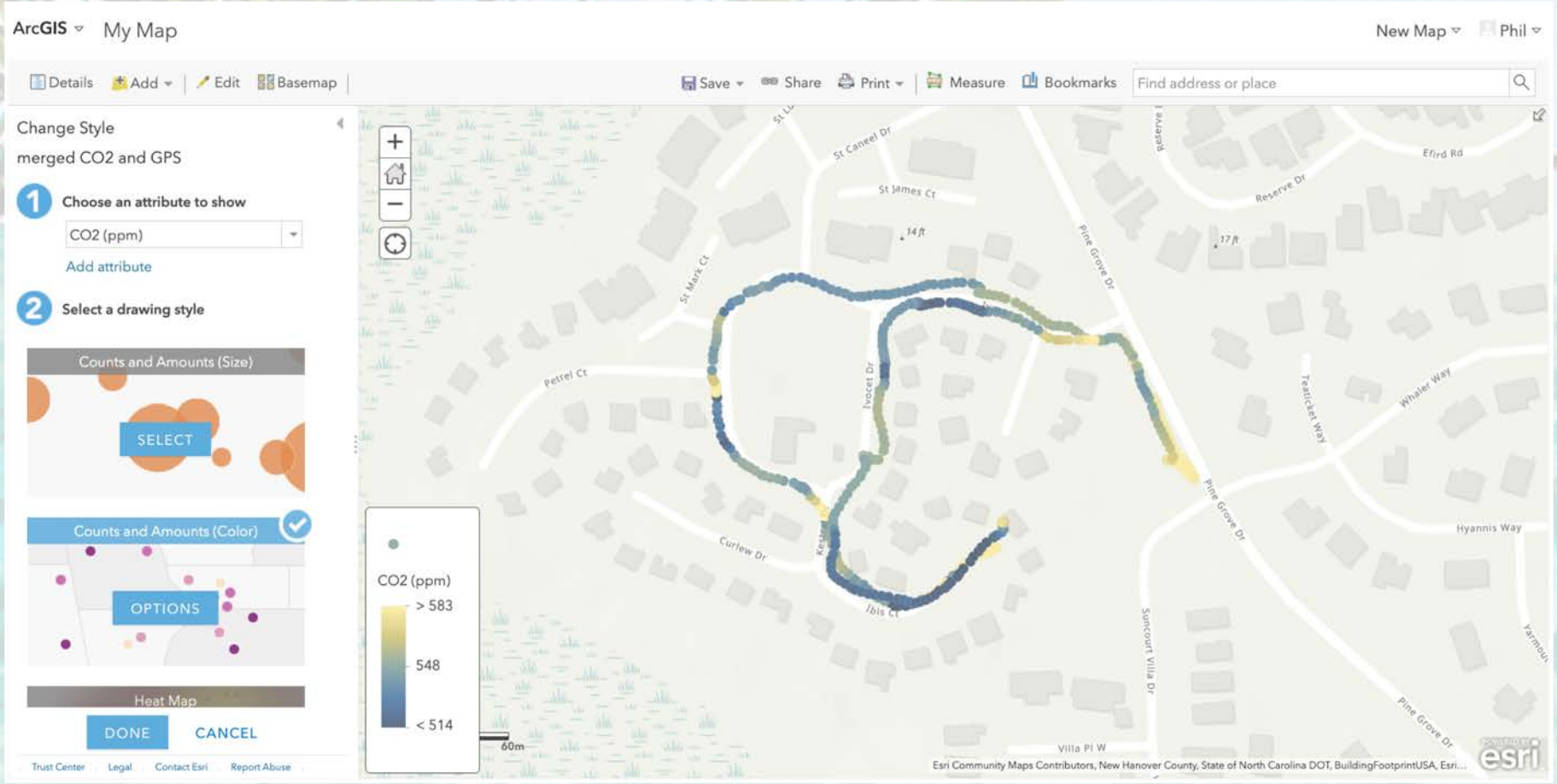
Simple Map-Making

- If you have previously taken a GIS class here or elsewhere, feel free to use other techniques. This is a very basic getting-started guide designed to empower complete beginners to create interactive digital maps of their own data.
- Navigate to https://www.arcgis.com/home/index.html
- If you do not already have an ArcGIS account, create one; otherwise, sign in
- Click “Map” in navigation bar

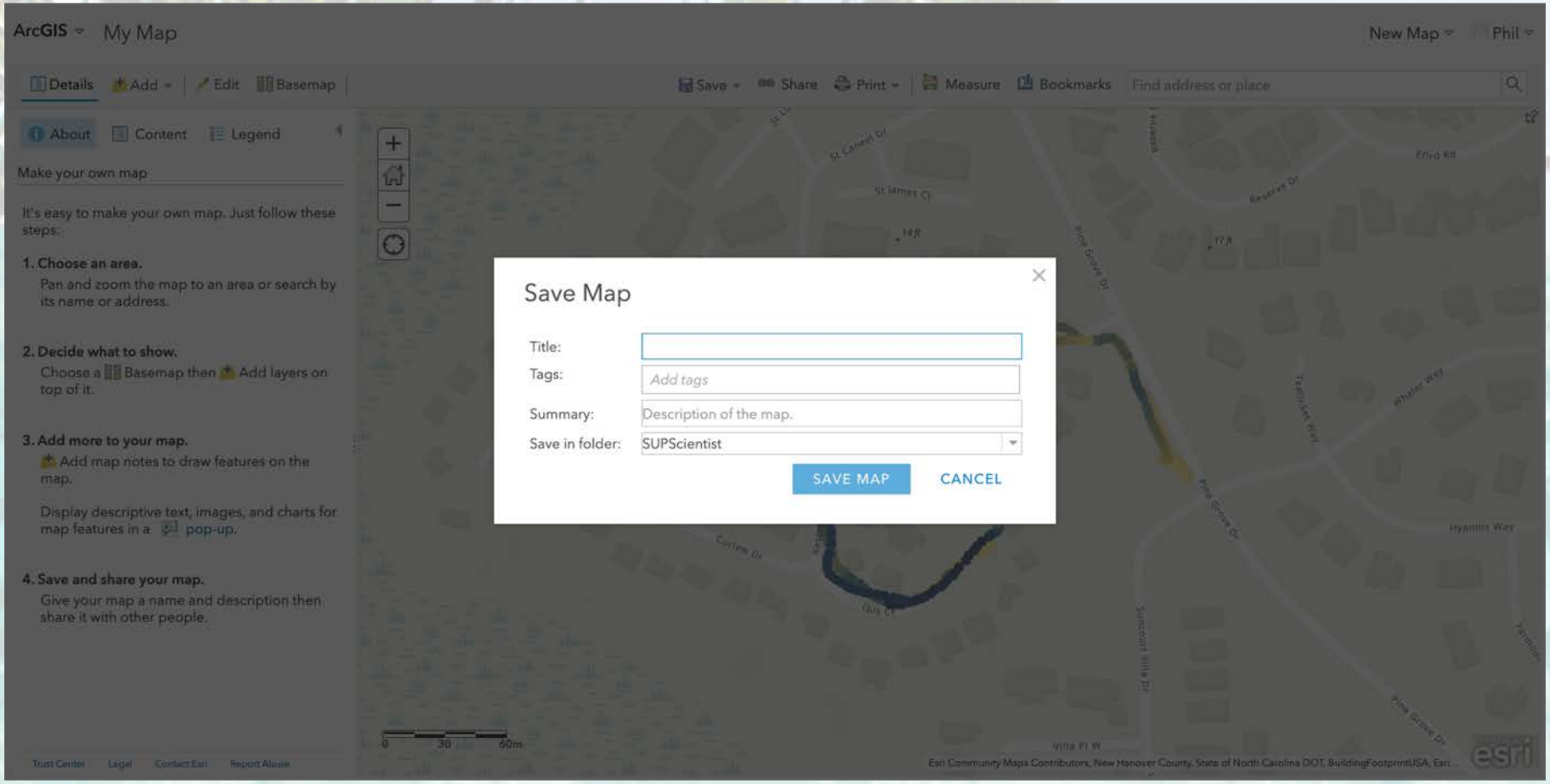
Should see this:
now "Add Layer from File"
Select your new CSV file



Change style and make sure you are viewing the correct parameter!



Save it


ArcGIS
My Map
New Map
Phil
Details
Add
Edit
Basemap
Save
Share
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Measure
Bookmarks
Find address or place
About
Content
Legend
Make your own map
It's easy to make your own map. Just follow these steps:
1. Choose an area.
Pan and zoom the map to an area or search by its name or address.
2. Decide what to show.
Choose a Basemap then Add layers on top of it.
3. Add more to your map.
Add map notes to draw features on the map.
Display descriptive text, images, and charts for map features in a pop-up.
4. Save and share your map.
Give your map a name and description then share it with other people.
Save Map
Title:
Tags:
Add tags
Summary:
Description of the map.
Save in folder:
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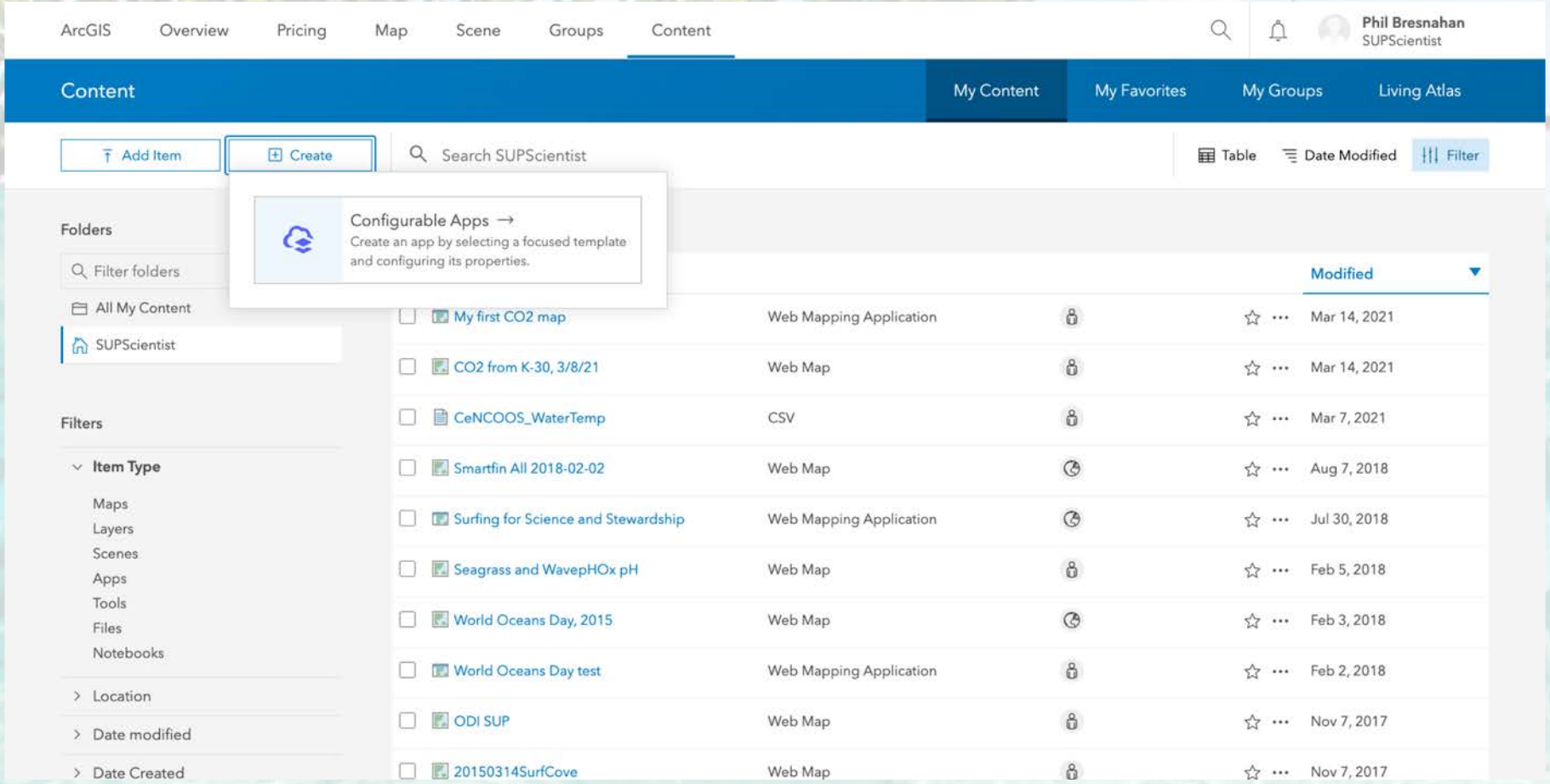
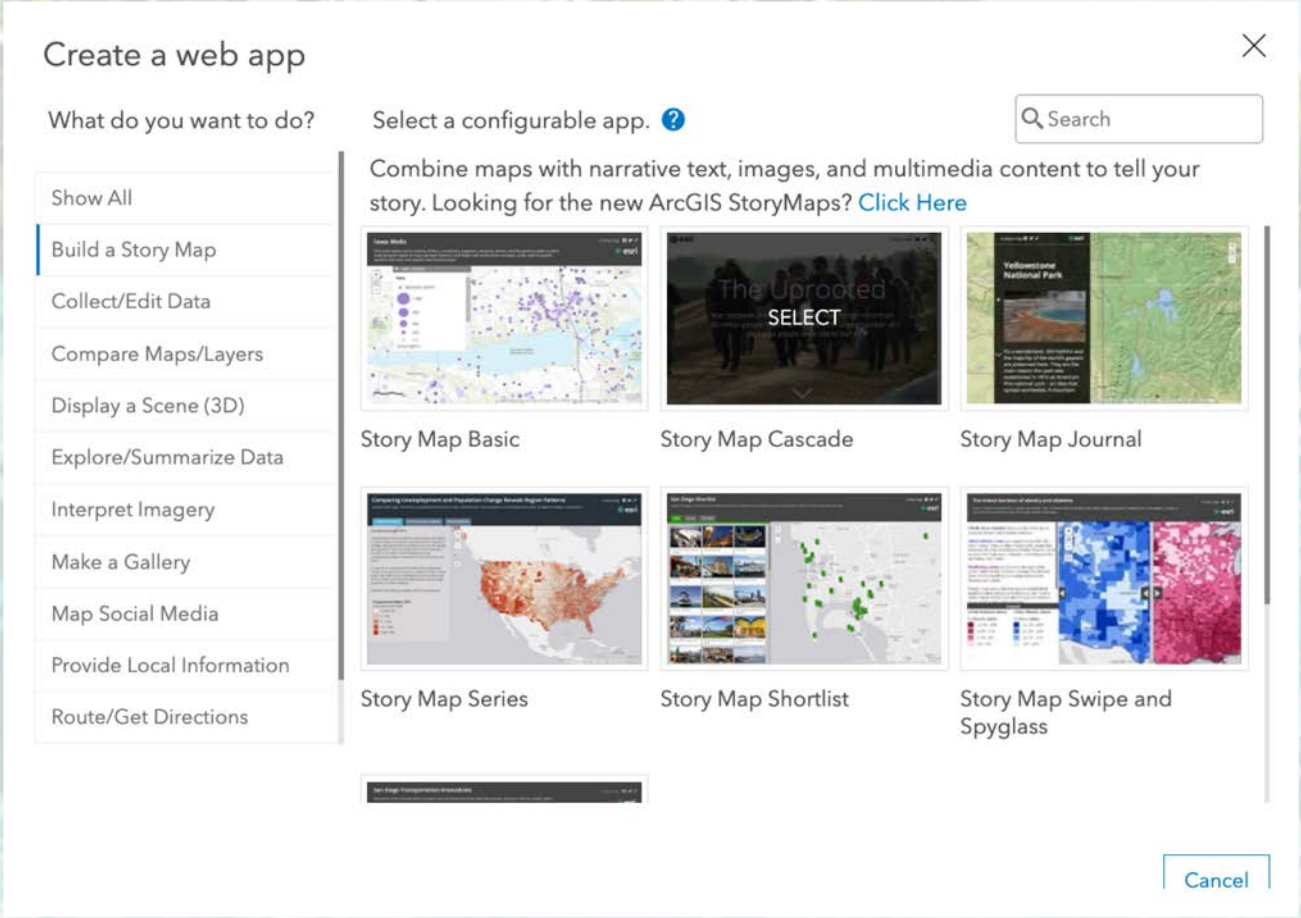
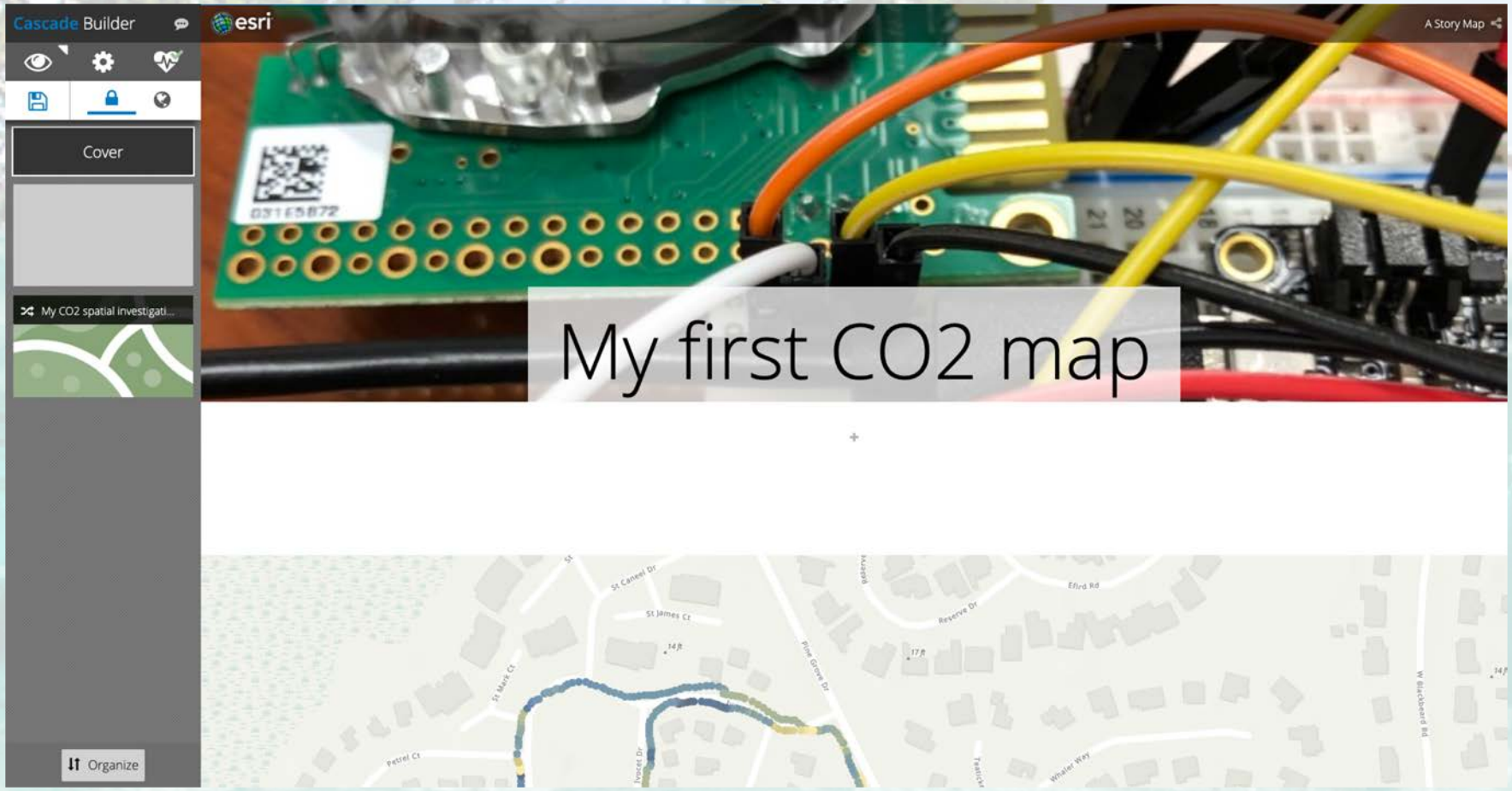
Return to https://www.arcgis.com/home/index.html and click "Content"



Build a Story Map (Cascade or your preference)



Begin adding content where you want it to tell your story



This Week's Assignments due Mar. 21 @ 11:59 pm

1. Nature journal (last mandatory one)
2. Map of CO_2 with > 300 points (> 600 seconds = 5 minutes of CO_2 logging): final non-project assignment
3. I HIGHLY encourage you to get started on your Story Maps which are due (GROUP ASSIGNMENT) on Sun., Mar. 28 (WITH DATA FROM YOUR PRELIMINARY FIELD WORK) to the class on Mon., Mar. 29.
   - Start writing text and taking photos/videos

   Note: I will accept submissions as late as the following Sunday (Sun., Apr. 4) but note that the following weekend is a holiday weekend here.

Summary of data analysis tools

- Microsoft Excel for time-series analysis, graphing
- Excel for averages, standard deviations
- Python for data merging, repeated analyses
- ArcGIS/Esri free online tools for mapping, Story Maps
- That’s it—other tools and analyses are up to you

Rest of this semester

- This week's homework
- Story Maps (team assignment)
- Final report (individual assignment)
- Remaining classes to be used for additional topics in data analysis and scientific communication
- Possible re-quiz to correct mistakes from prior quiz (TBD)