SCO-SOC Workshop: ArcGIS and Field Maps

Zachary M. Moore

Sep. 15, 2022 1:30-4:30 CDT

Today

- Today should be more informal. Don't let me be the only one talking up here.

- Please interrupt me using the hands up function or the chat.
- Please stay muted if you aren't talking.
- Turn your videos on if you are able so I can see your thinking face.

- **If you haven't already:**
  - **Log in to your ArcGIS Online Account**
  - **Download the Field Maps App on your Phone**
  - **Open your ArcGIS Pro Desktop App**

IF you have a second screen, it will help today

Today

- NOT going to teach you how to GIS

1. Setting up Data in ArcGIS Online
2. Setting up and Collecting Data in Field Maps
3. Integrating/Editing with ArcGIS Pro

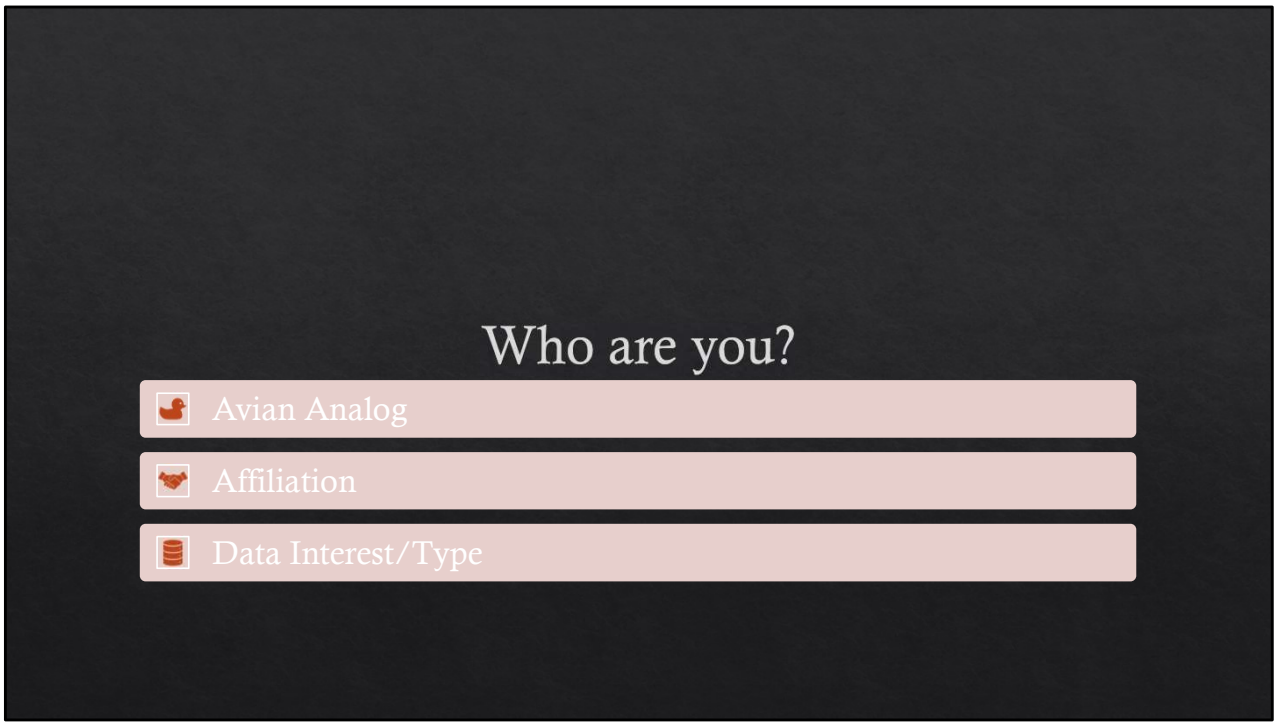
- IF there's time we can discuss:

1. Dashboards
2. Survey123
3. Linking to R ('arcgisbinding' package)

During the breaks, we will be mostly off, but people that want to stay on to ask questions can feel free to do so

You'll notice that no where on here does it say "expert in geographic systems analysis".
Introduced to GIS during my PGC in college
Figured things out through trying new things

When I originally designed this workshop, it was for masters/phd students with access to ArcGIS that might otherwise just be collecting paper and pencil data. This has been modified slightly for this conference, but still is very much just an introduction to these systems and how to set them up. If you already have an organizational lead doing these things, you might not be able to take too much away from this workshop. If you decide this isn't helpful, I will in no way be offended if you wave bye and leave!

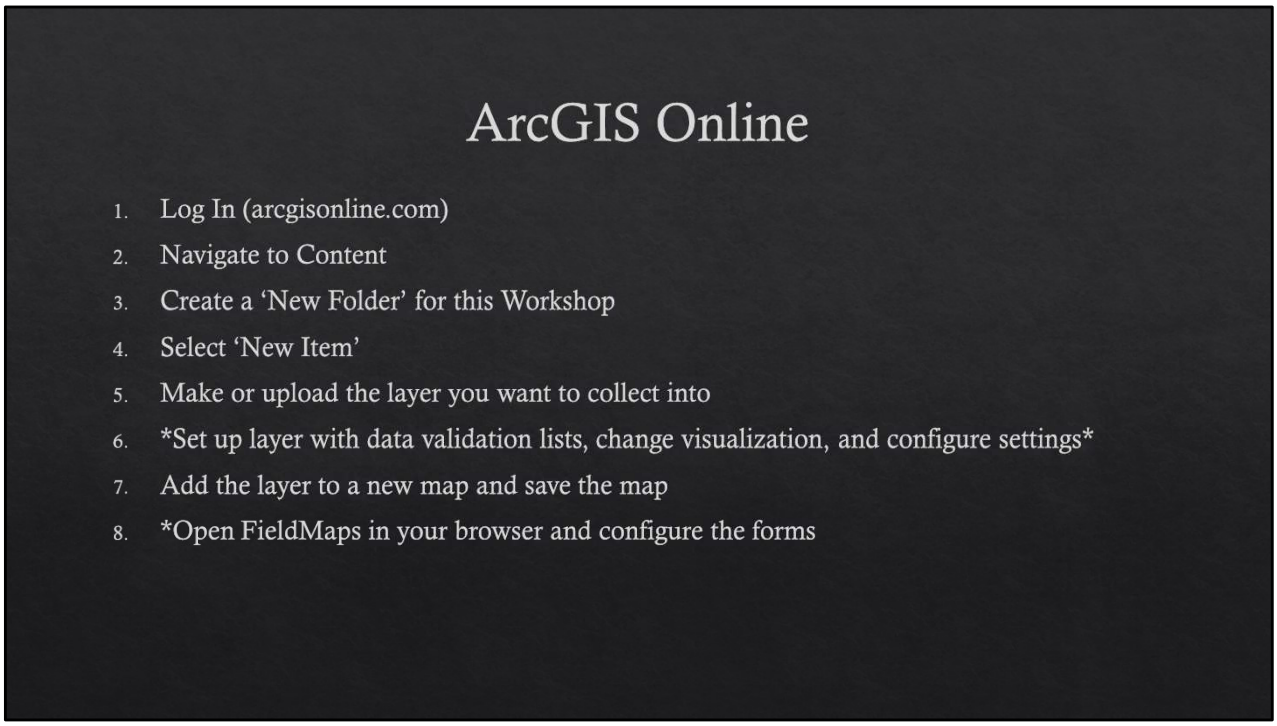

Who are you?
Avian Analog
Affiliation
Data Interest/Type

So you want to use digital data collection?

Good Things	Not-So-Good Things
Validate your data entry in field! Standardize your protocols amongst observers! Put the right thing in the right place! Force entry of required fields.	Time consuming to set up and maintain. Changes to protocols can be tricky to introduce once data is already collected.
Reduce data entry in office. Save trees! CAN collect without internet connection.	Means you aren't double checking data by default
Link in-field photos to data points	Difficult to take out of the online platform. Downloading online layers doesn't include photos. Easy to overwrite if not careful.
Can set accuracy limits (default +/- 10m). In my experience, accuracy is about +/- 3m.	Some GPS discrepancies between devices, but can be pretty accurate compared to GPS units.
Create auto-updated visual depictions (dashboards) Share your data throughout your organization.	This stuff is just awesome.
Maybe you don't want to work in the rain or for long hours.	Rain significantly impedes one's ability to collect data. Need to carry extra battery for device.

ALL of our data are spatial in nature. This type of data collection is truly the future of our field. The opportunities are nearly endless.

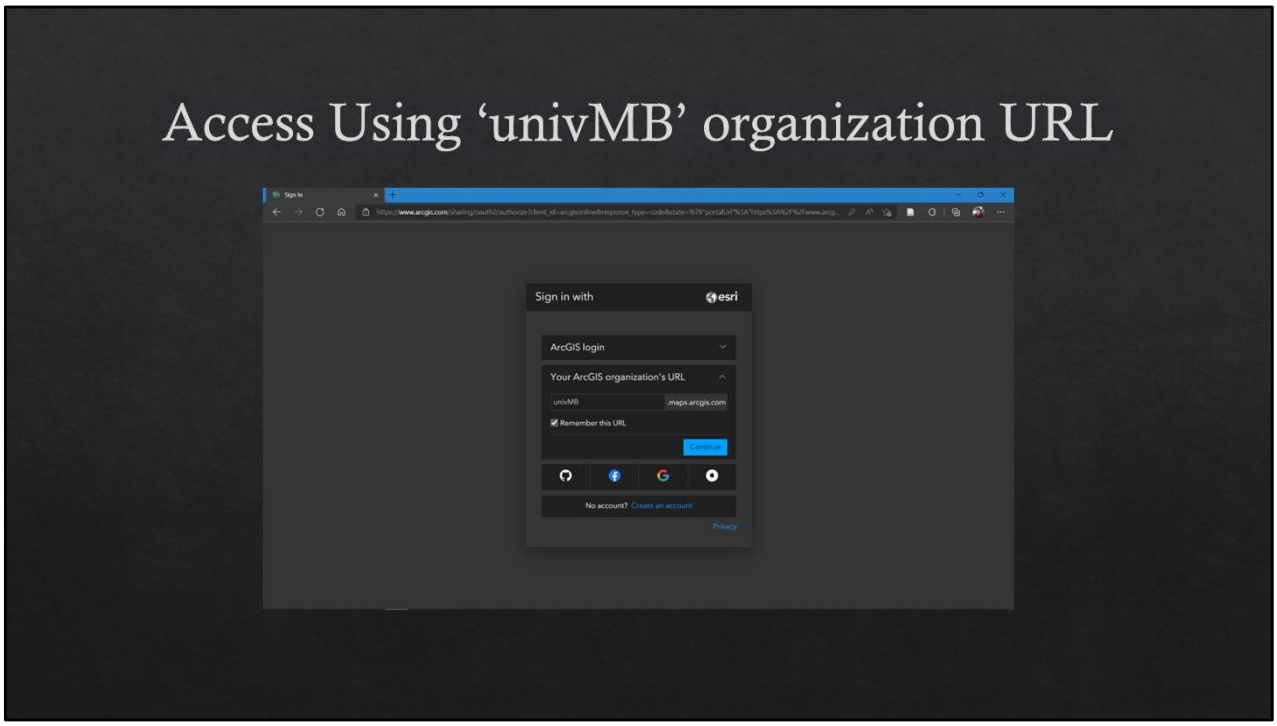

ArcGIS Online
Access and Navigation



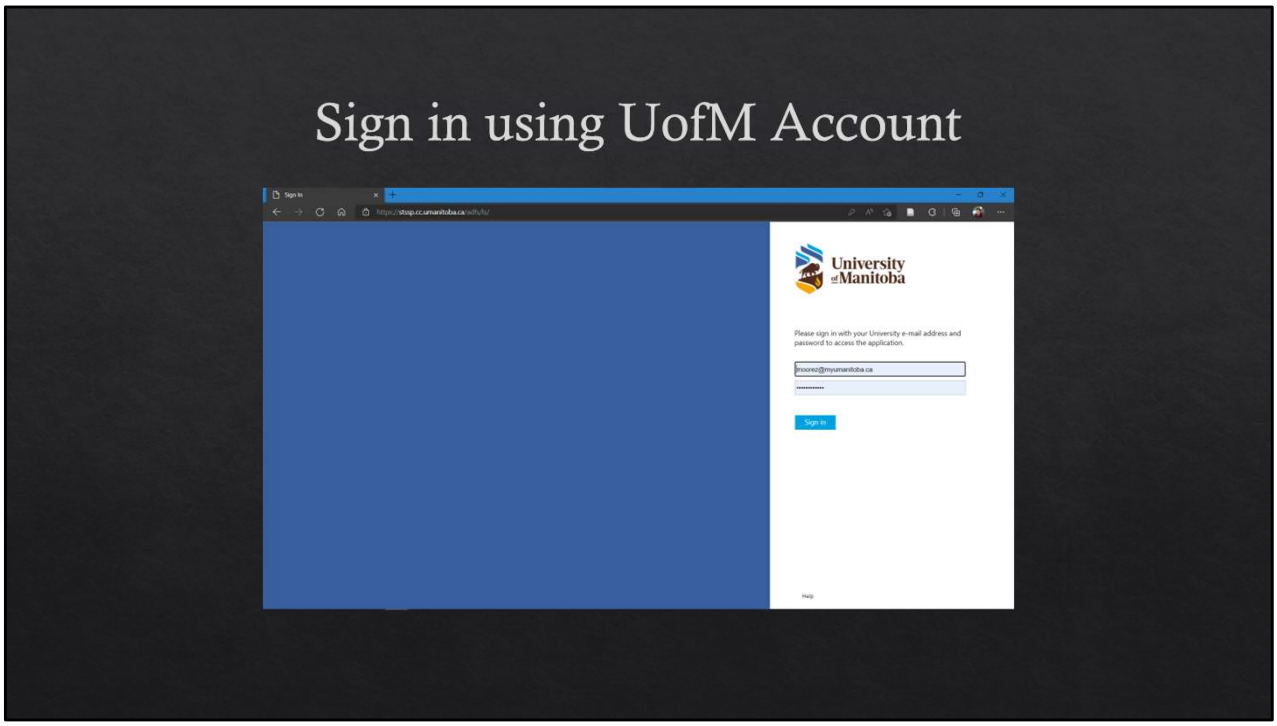
*Lengthy, complex steps

Go to www.arcgis.com and click 'Sign In'

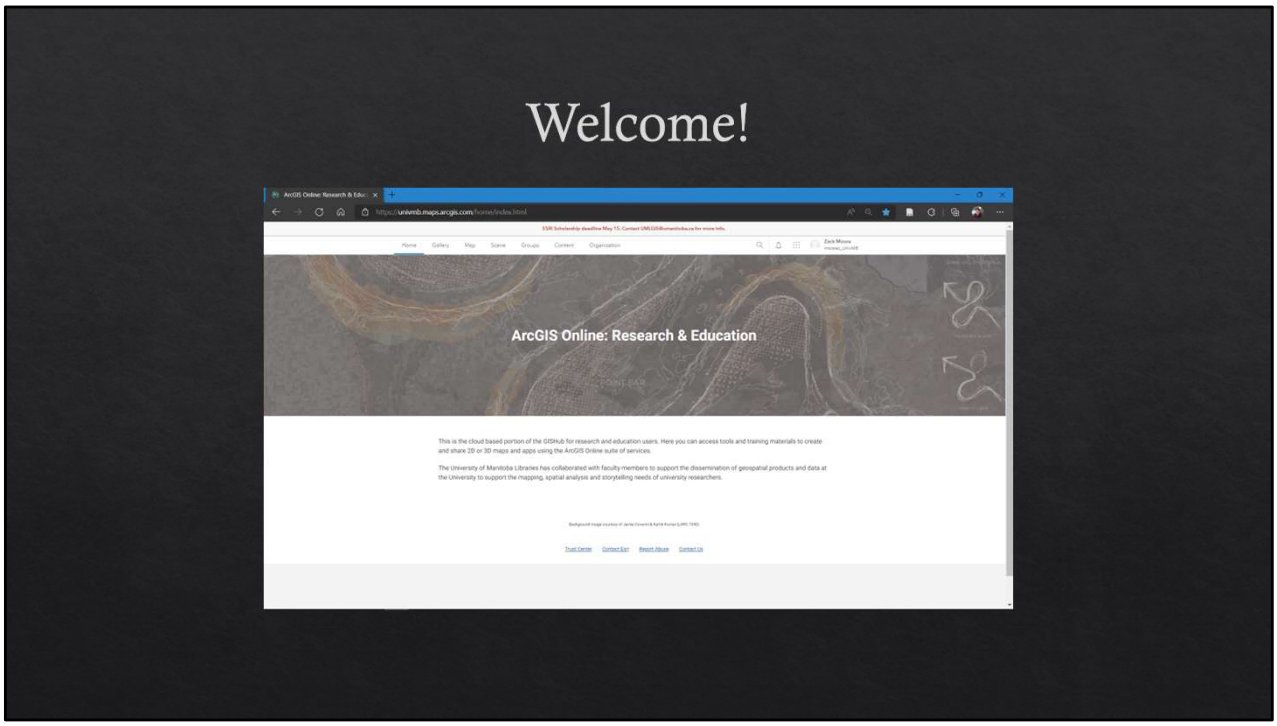
Welcome!



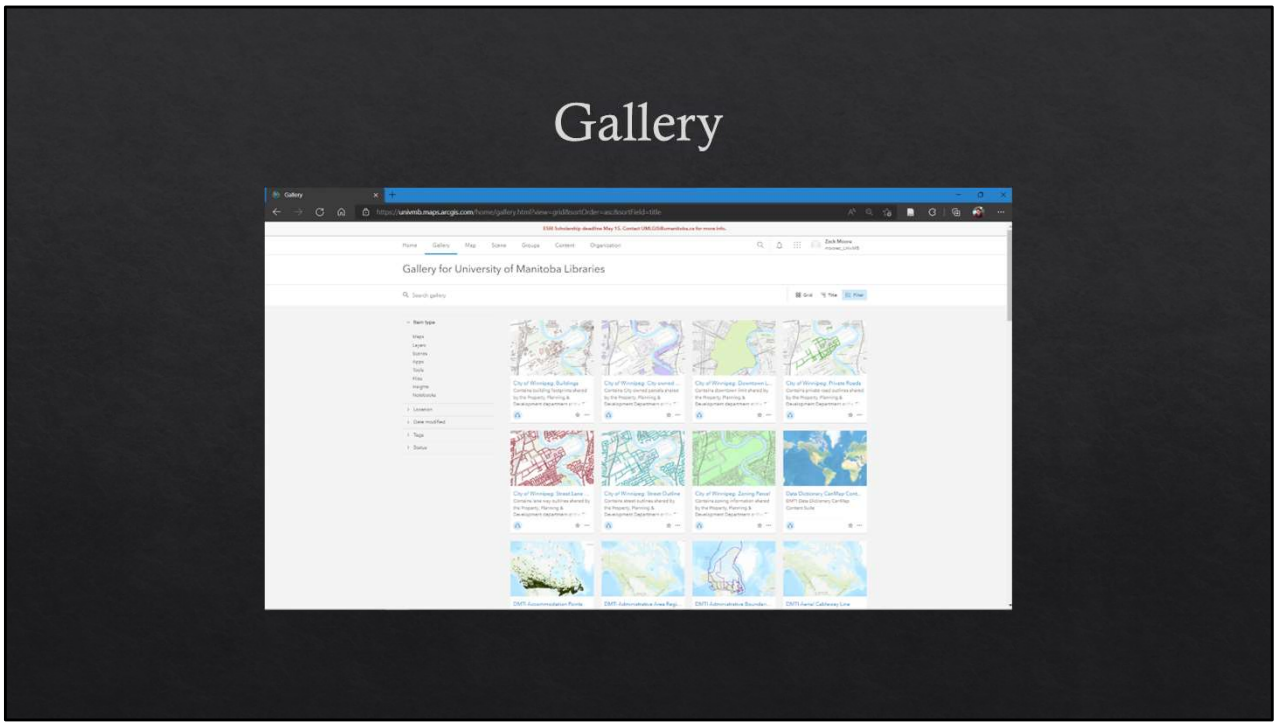
univMB is the organization url. You can also sign in with your ArcGIS Login, which has your UofM login with "_UnivMB" after, and a password you need to set up.



Full email and password. Make sure Meg Miller has set up your account.

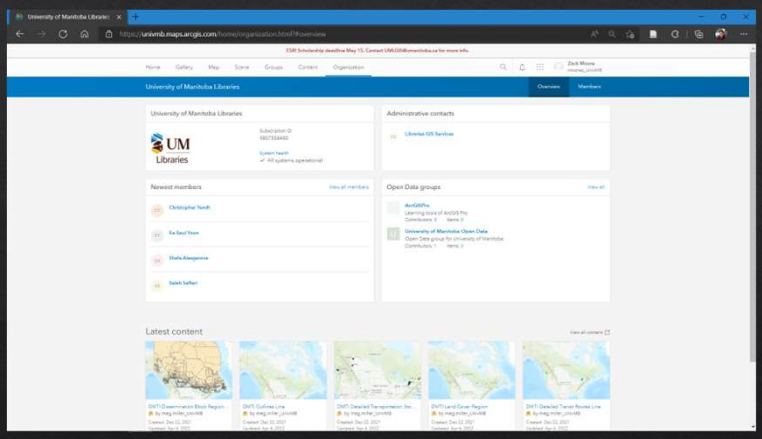


Welcome screen has all the good stuff. Let's try clicking each of the banners. We'll go through the collaborative stuff and then into the data set-up side of things.

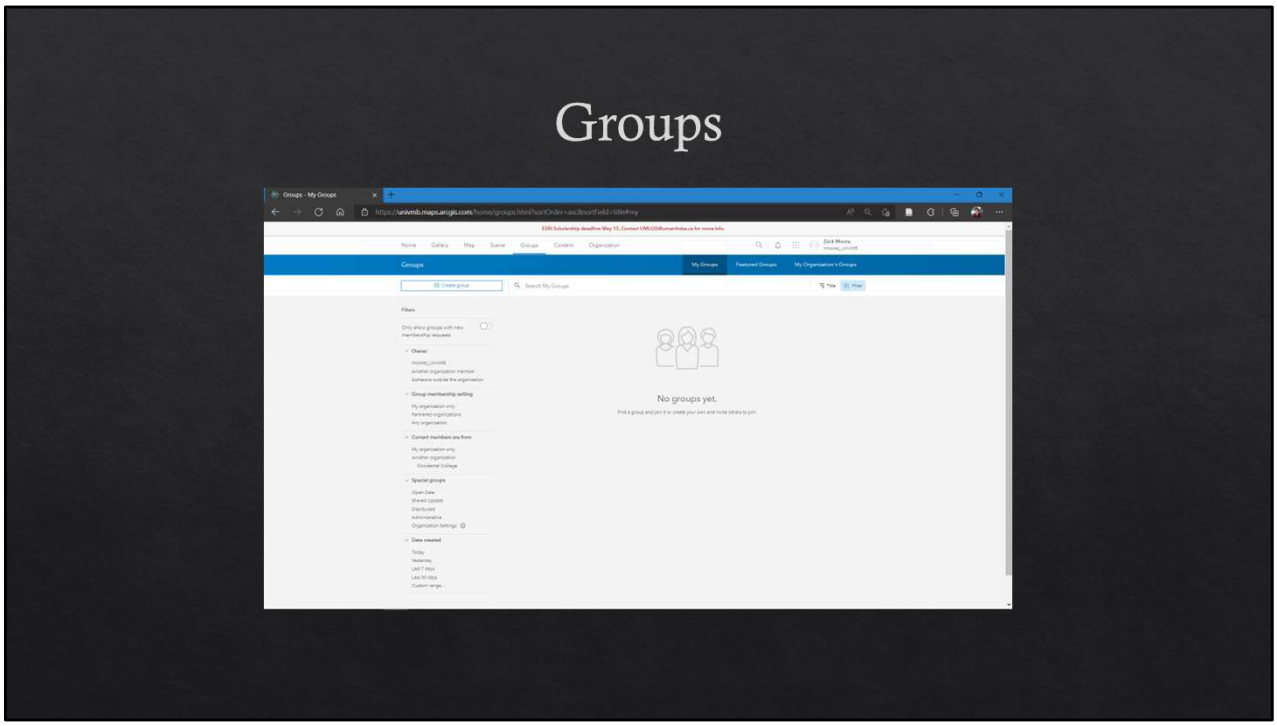


Has Library datasets. Lots of cool layers in here.

Organization



Can see all the other UofM members, can access TRAINING and lessons



Can create groups where you have clusters of shared data. Great for collaborative projects. Could even have a group where we have all the Koper Lab data so Nicky can look at your stuff as you collect it! But there are also existing groups “Featured Groups” and “My Organization’s Groups”

Not going to spend any more time on the collaborative side of things, but did want to point out that it’s an option, and Nicky particularly might want to explore it.

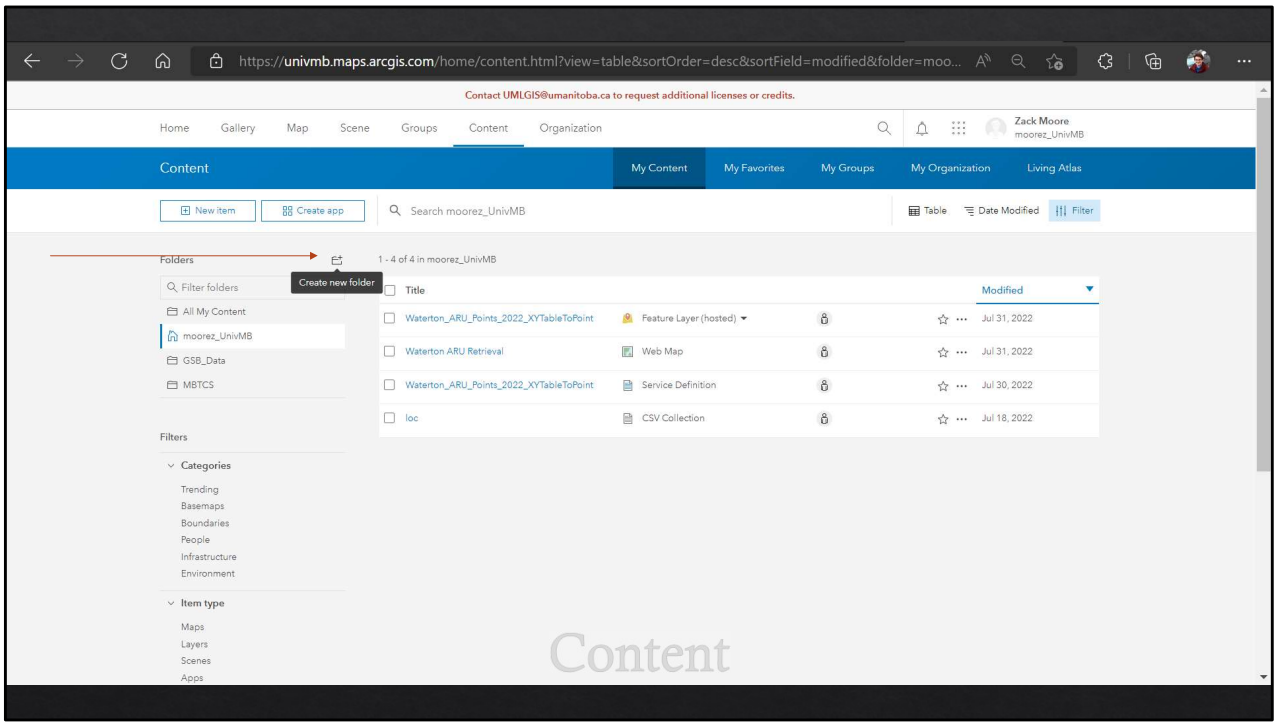
3 Ways to Set Up Data Bases

- Scratch/Prefab Template/Existing Layer
  - Simple, easy.
  - Time consuming.
- From Custom Excel Template
  - Allows specifying of domains (drop downs)
  - Need to create template, upload, specify domains, then copy layer to remove excess data points.
  - Limit of 1000 entries in drop downs.
- In ArcGIS Pro
  - Greatest customizability, most technically challenging.

Database Considerations

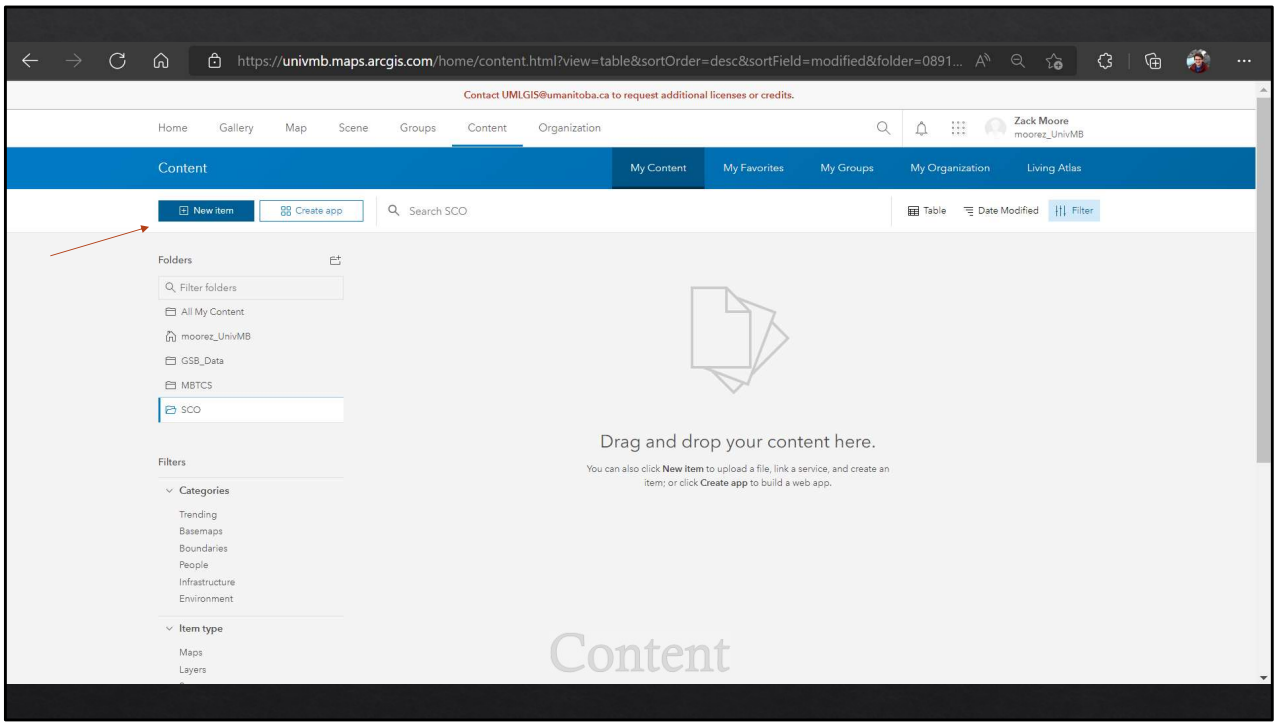
- GET THIS RIGHT THE FIRST TIME TO SAVE YOURSELF HASSLE LATER
- This should take a lot of thought and foresight.
- Create a naming convention early and stick to the same names, especially through multiple layers (ex. 'site' is always 'site', not sometimes 'location')
- Make sure each field is the correct type (integer, double, text, date)
- Adding 'other' as an option for your drop downs will always help. ArcGIS doesn't allow you to use entries not defined in your domains.
- Good validation will greatly increase data collection efficacy and accuracy. Bad validation will upset your field staff.


Setting Up Your Database 1
Start from Scratch or a Template and Upload to ArcGIS Online

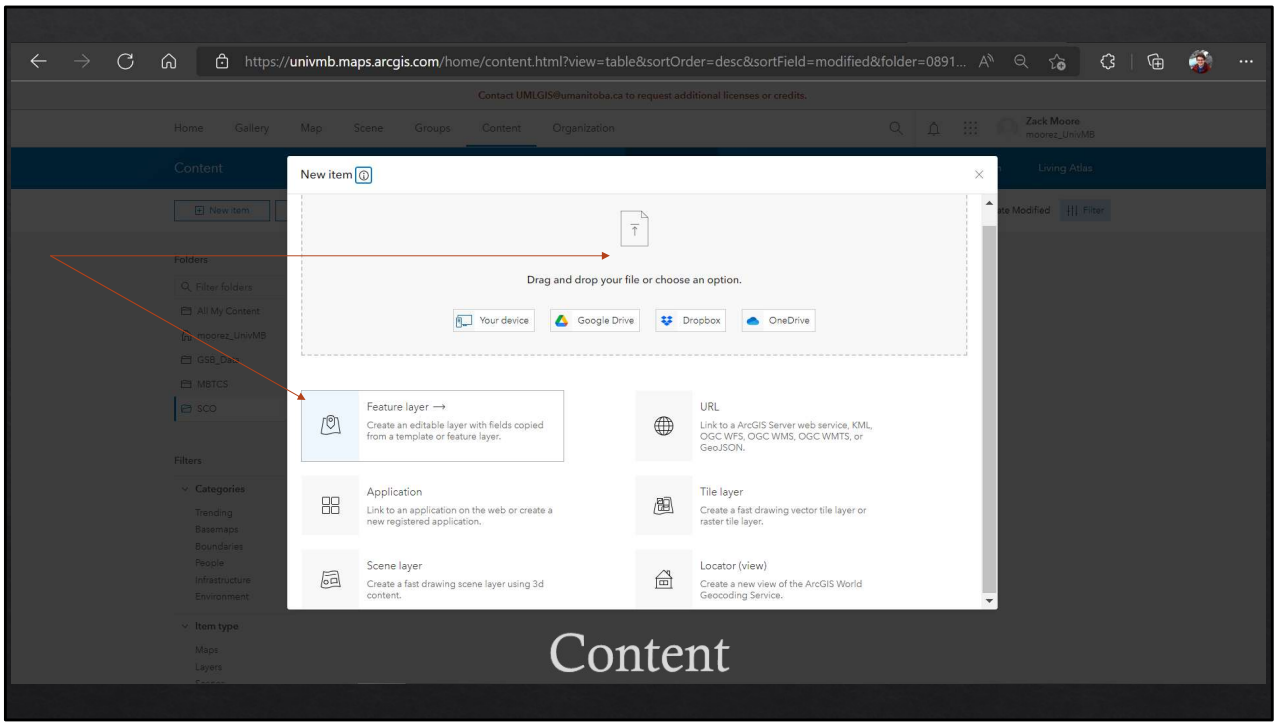


Has a general folder structure, can have multiple different file types.

Feature Layers
Web Maps
Dashboards
.shp/.gdb files

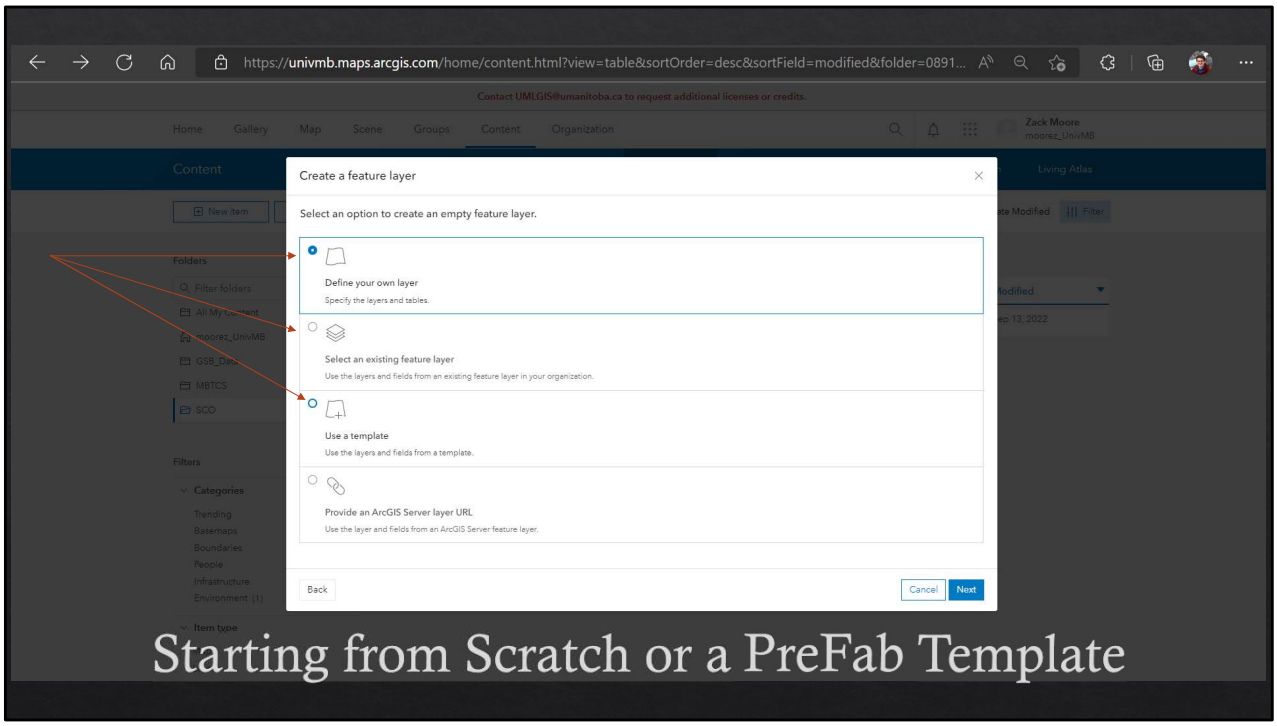


Click create new item to add or create data layers

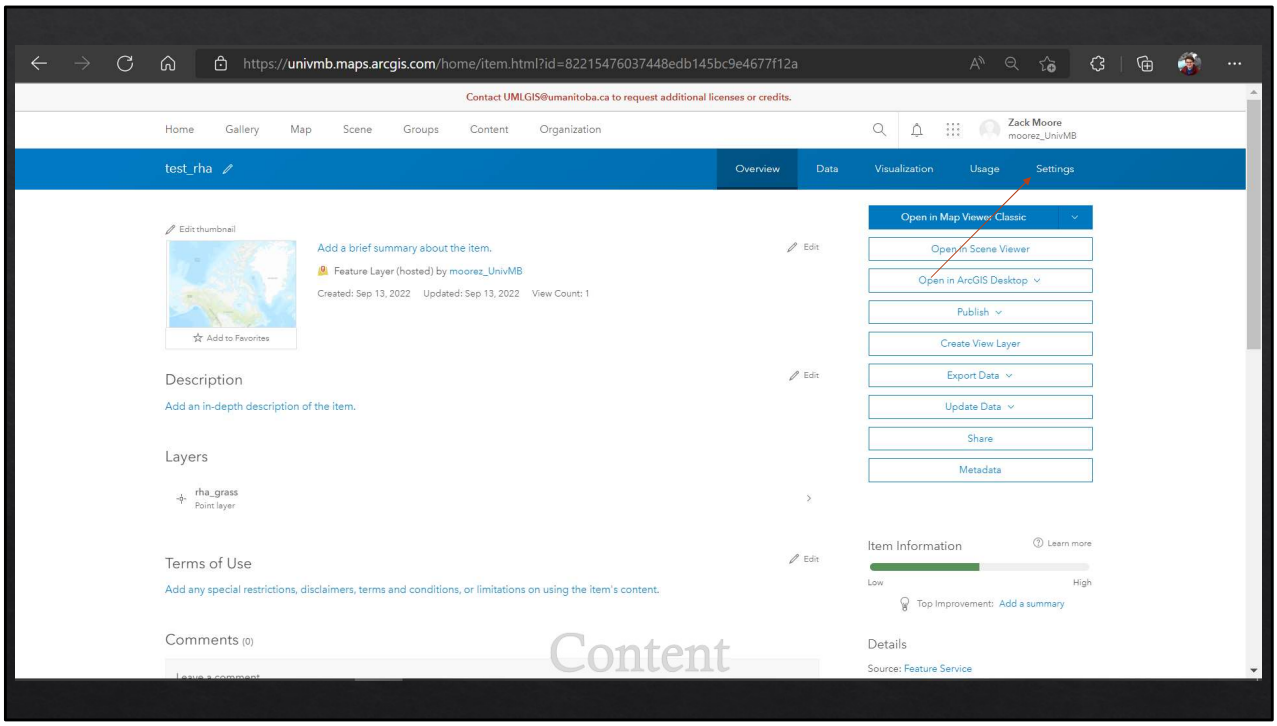


Can create layers from scratch, or you can upload existing CSVs, SHPs, GDBs, etc.

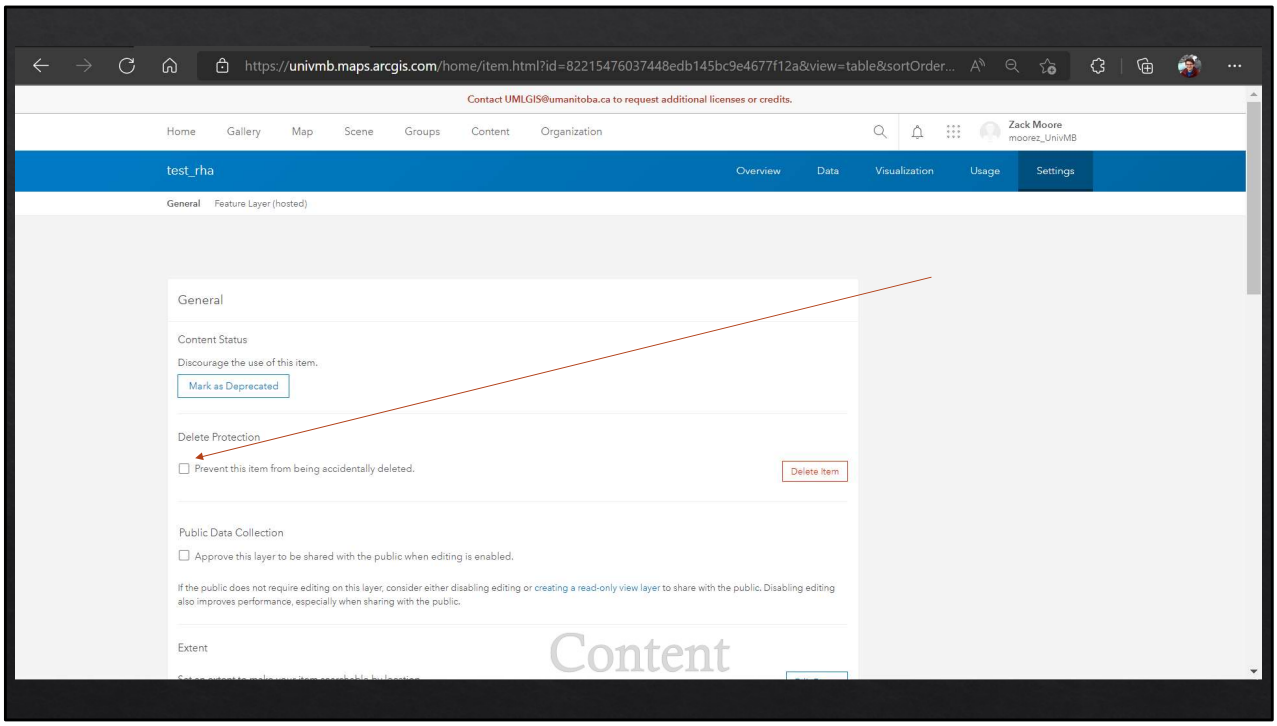
Establish a naming convention early! Especially if you're using multiple layers to collect data you hope to compare.
Ex. If you start using 'site' to describe a sampling location, stick with that across all your layers. Generally use '_' as opposed to periods or spaces.



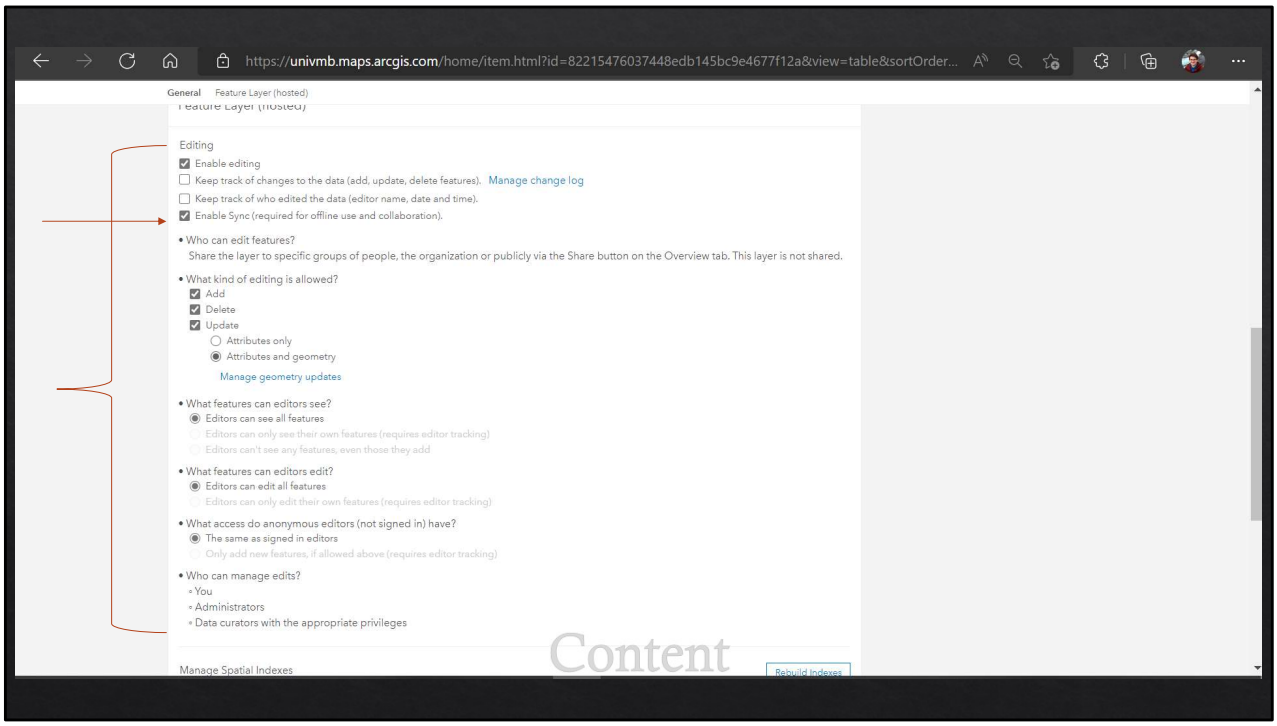
LOTS of options to use existing templates, layers, or start from scratch. You CAN make multiple vector layers (ex. Points, lines, and polygons) all within a single Feature Layer. This groups them together, so whenever you open the feature layer it loads all the layers within it. Later, we'll go through how to start from an excel template



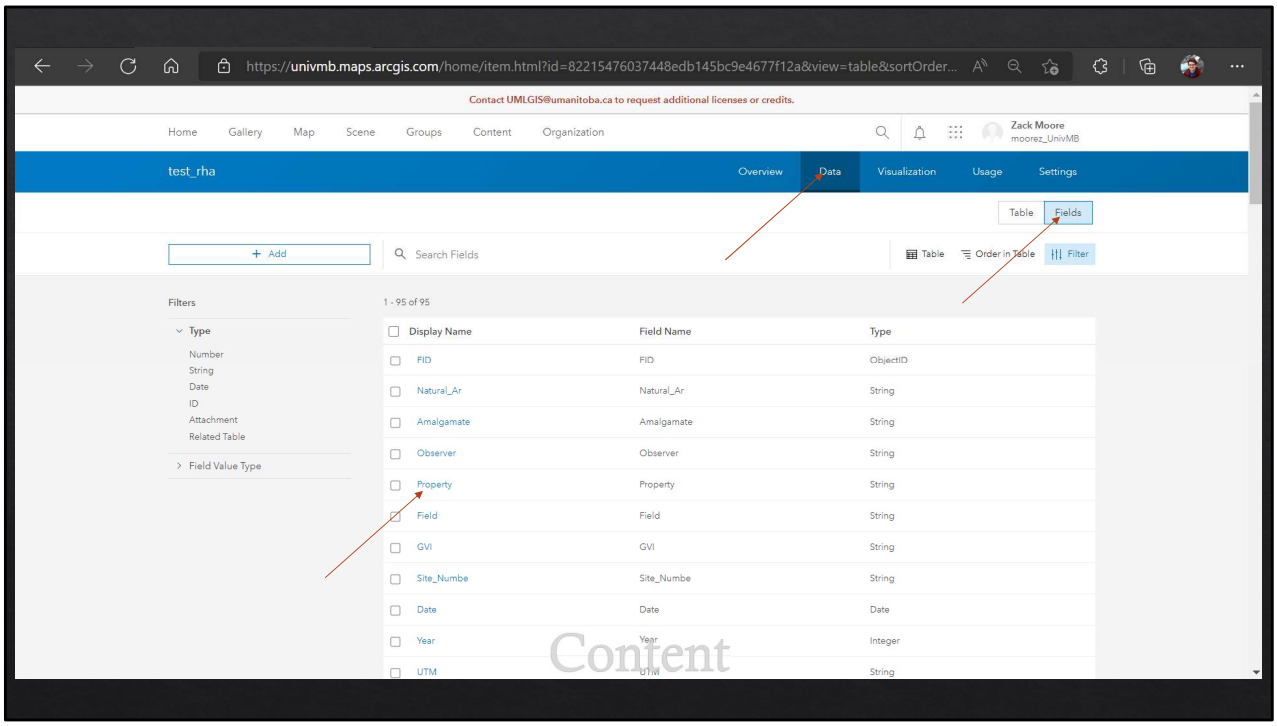
After you make a new layer, it'll take you to the layer's overview. Here, I just replicated an existing layer I had created for collecting Range Health Assessment data. It has a ton of fields, each with some existing data validation lists. This step is critical for making sure you are collecting data as you need it. Pay close attention to the character limits of field names, the display names and the field type! Know the difference between when you need to collect dates, integers, double (decimals), and strings (text). This makes your life easy later. The first thing we're going to do is go to Settings.



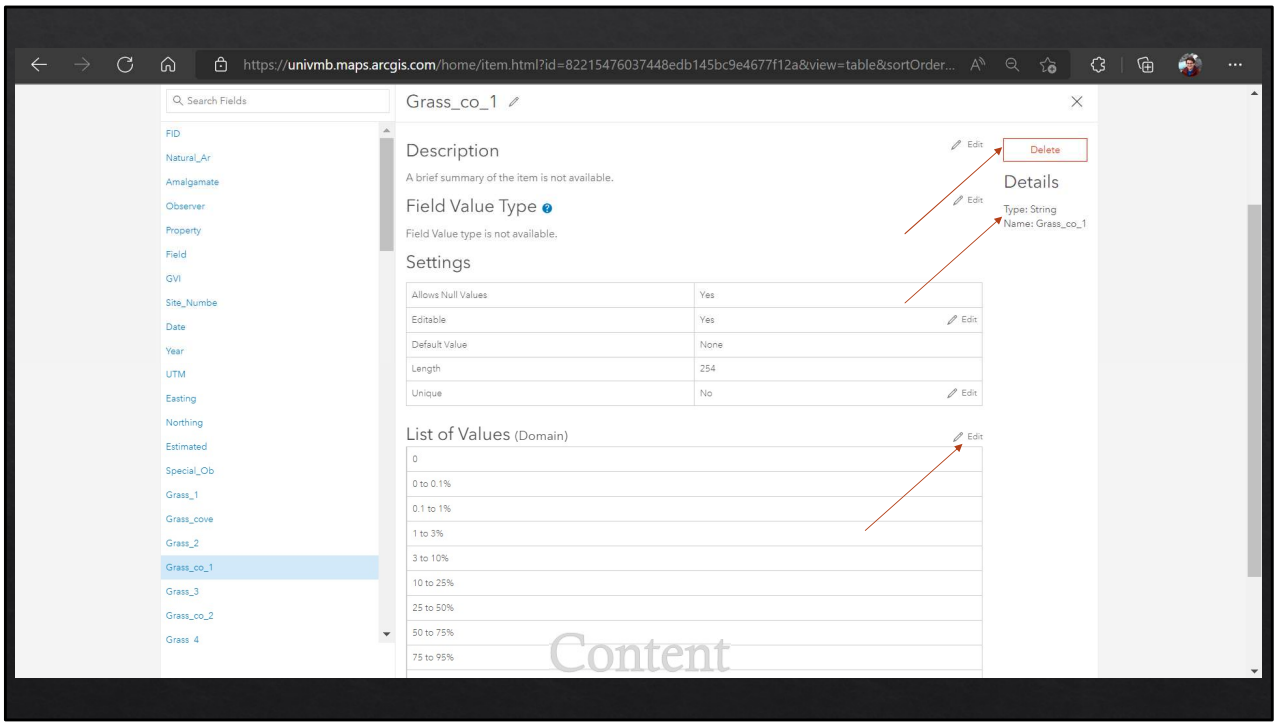
ALWAYS TICK THIS BOX SO YOU DON'T DELETE YOUR DATA. But there are also other settings like approving public data collection.



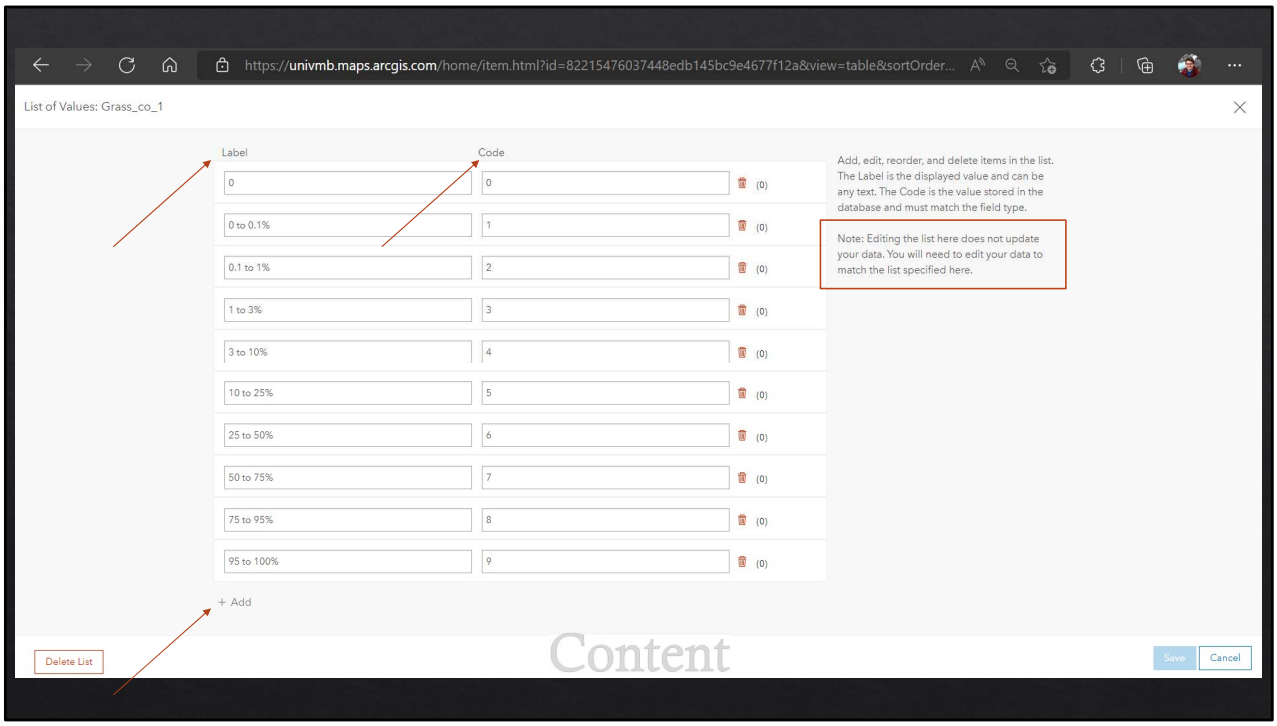
Scroll down to these other critical settings. Specifically the “Enable Sync”. This feature is what allows you to collect and upload data in Field Maps. Without this ticked, Field Maps will get upset with you when you go to set it up. You can also choose what kind of editing you want your users to be allowed to do, and if you want to create fields that track who created and edited features and when.



Scroll back up and hit data, then go to fields so we can edit them. If you click on any given field you'll see the properties for it.



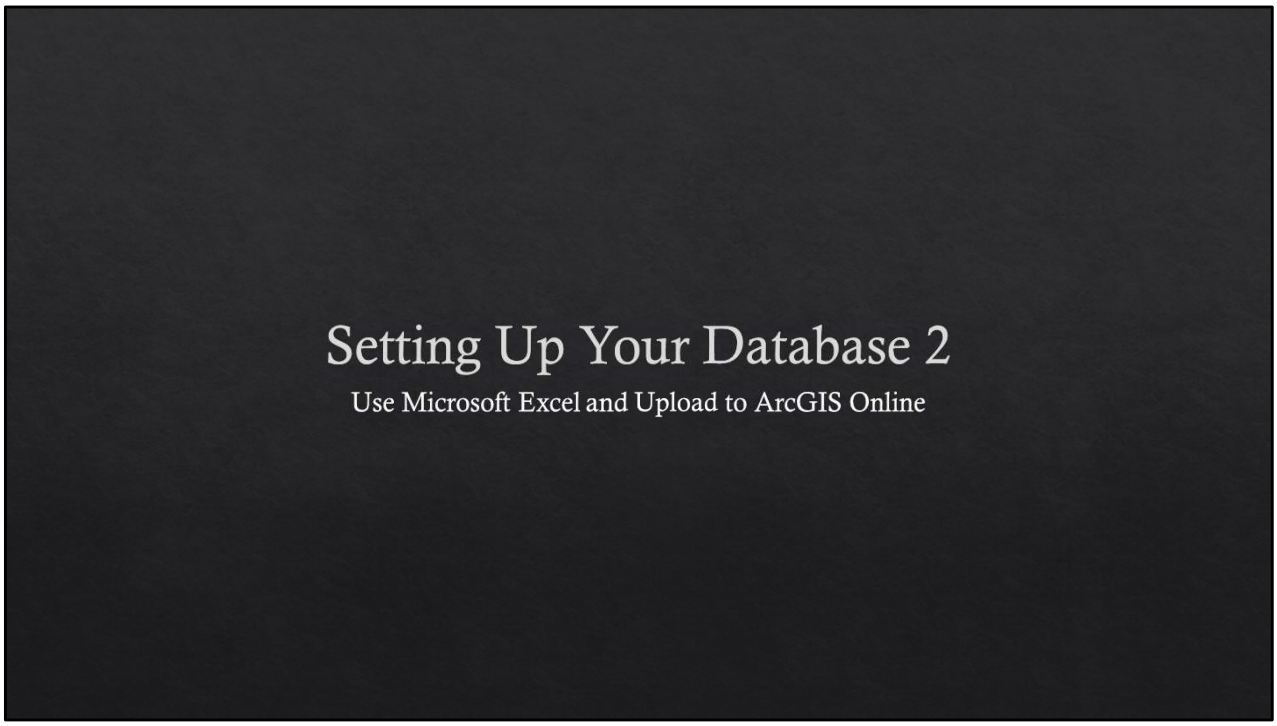
Here, you can edit a bunch of stuff to do with the field and see what type it is. This one already has a List of Values (Domain) that populate a drop down menu in field maps.



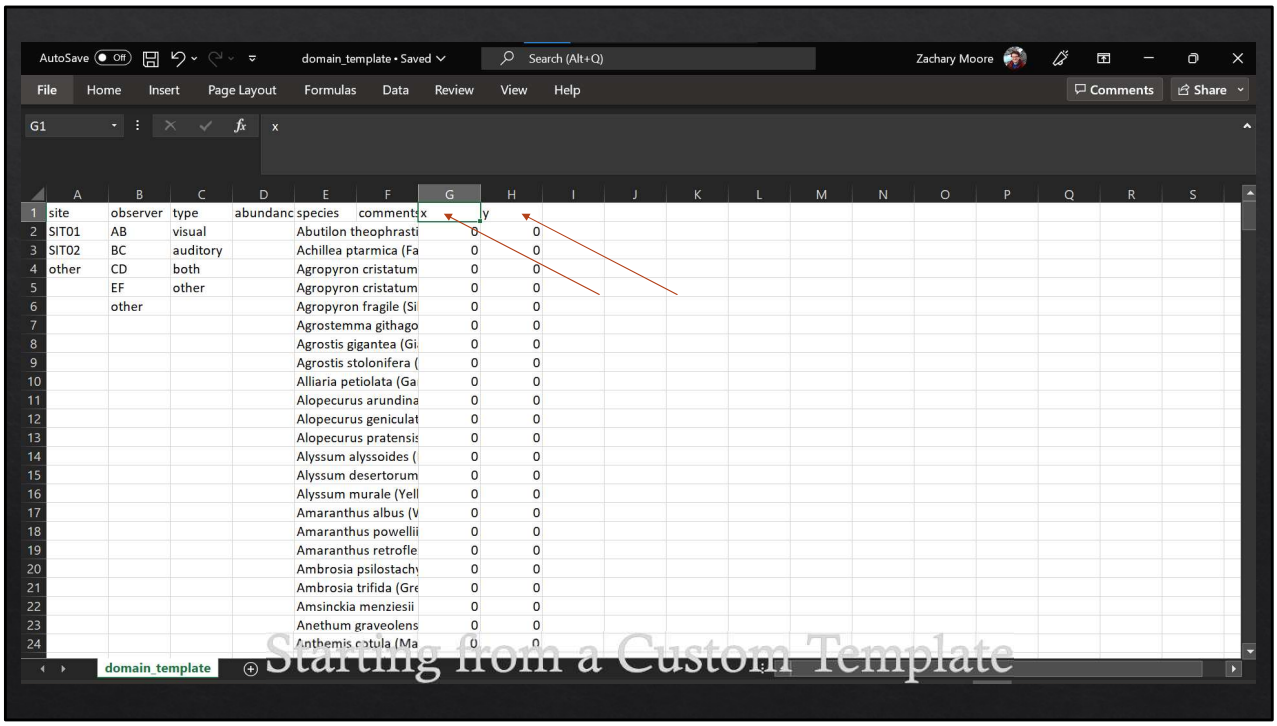
If you click edit, you can change the list of values. Here, “Label” is what will appear in the drop downs, and “Code” is what each entry will store in the actual data tables.

NOTE: editing the list here does not update your data. You will need to edit your data to match the list specified here.

This is why it is important to get what you want right the first time, when you are setting up, in order to save yourself hassle later. Good validation lists make for good entry and analysis. You CAN set these up manually, but you have to enter them individually and it’s quite complicated to copy lists across multiple fields. If you have large or complex or repeated lists (like species lists or percent cover for example), it’s better to set up your data in ArcGIS Pro and use the “Table to Domain” geoprocessing tool, and then upload this to ArcGIS Online so you can use it in Field Maps (see later in presentation). Editing domains in the desktop app is much simpler, but once the layer is created in Online, you CANNOT edit domains for Online layers EVEN if you open the layer in ArcGIS Pro Desktop.



You can also set up your data structure using a .CSV file excel where each of your fields is a column, and underneath each column is all of the options you want for the drop down list. Make sure you have empty location columns so that ArcGIS Online can recognize you want to attribute locations to new observations later.



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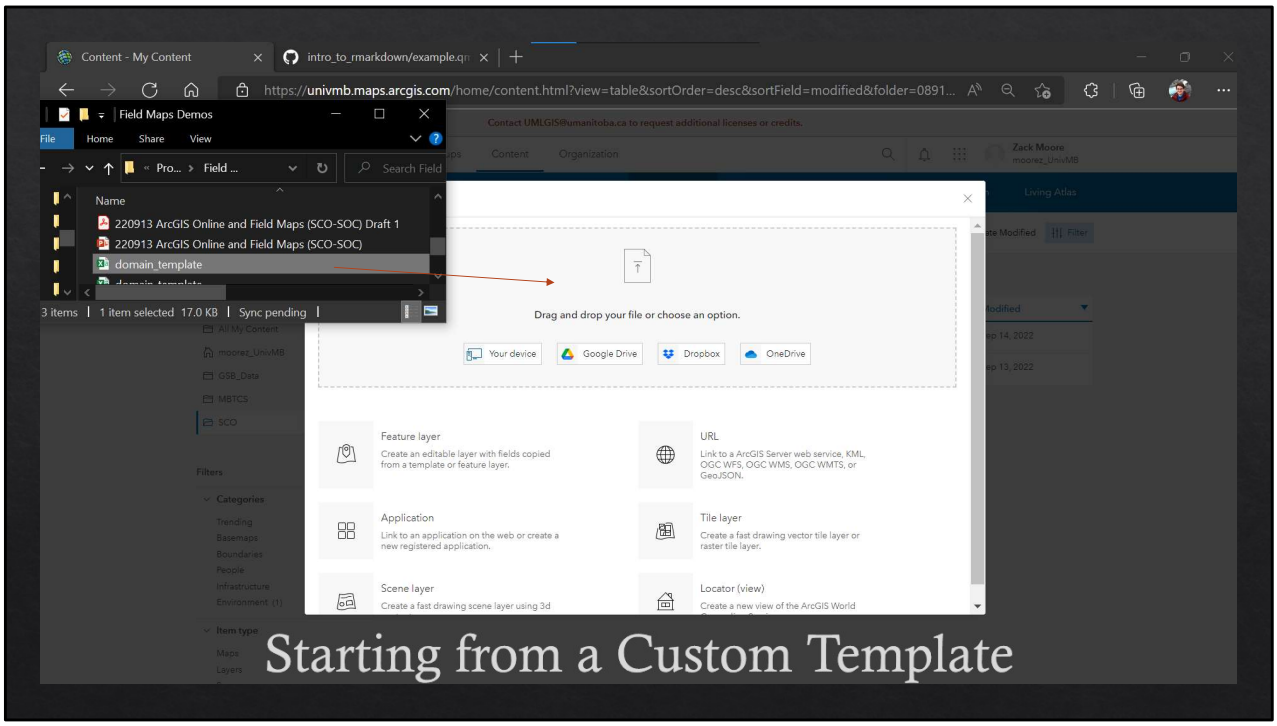
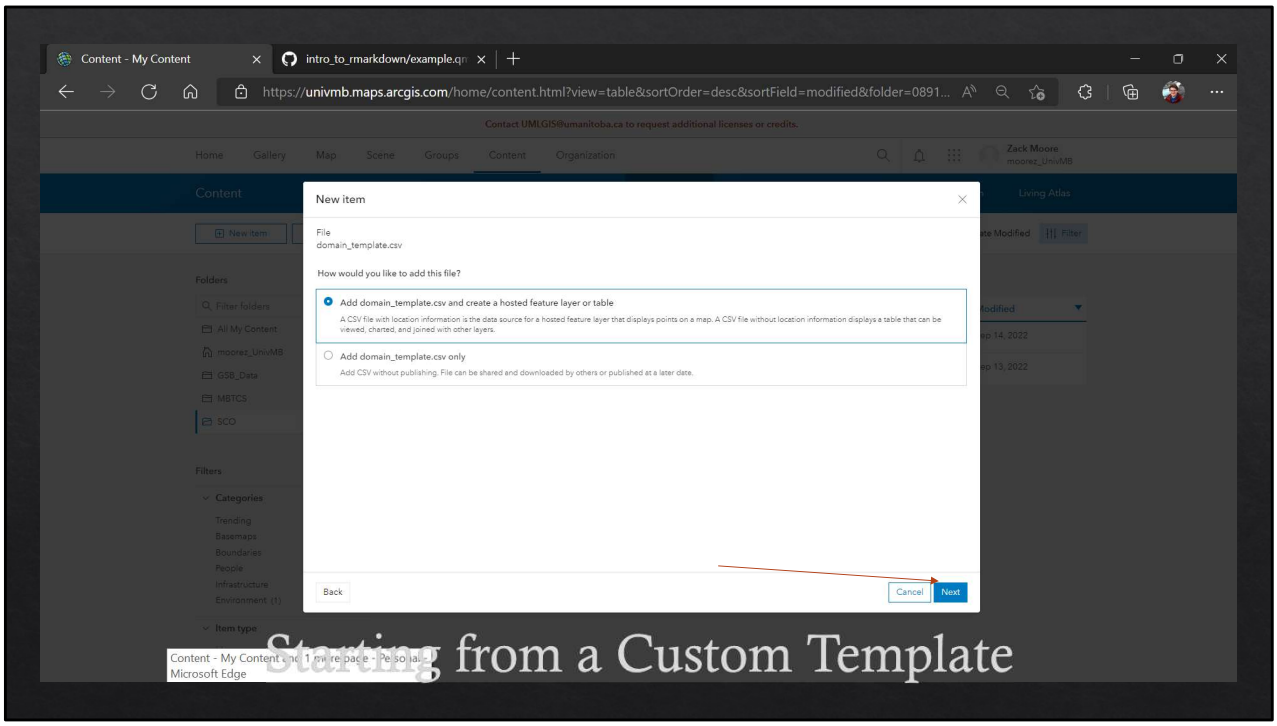
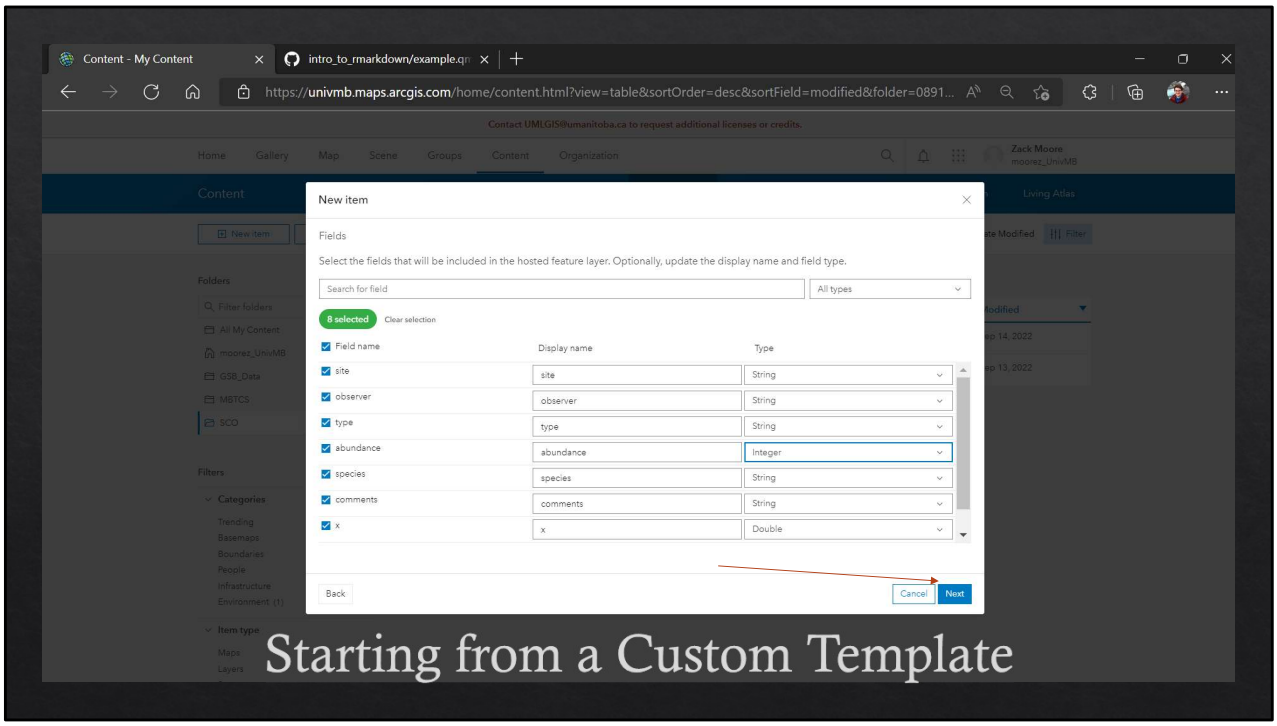


Upload the file

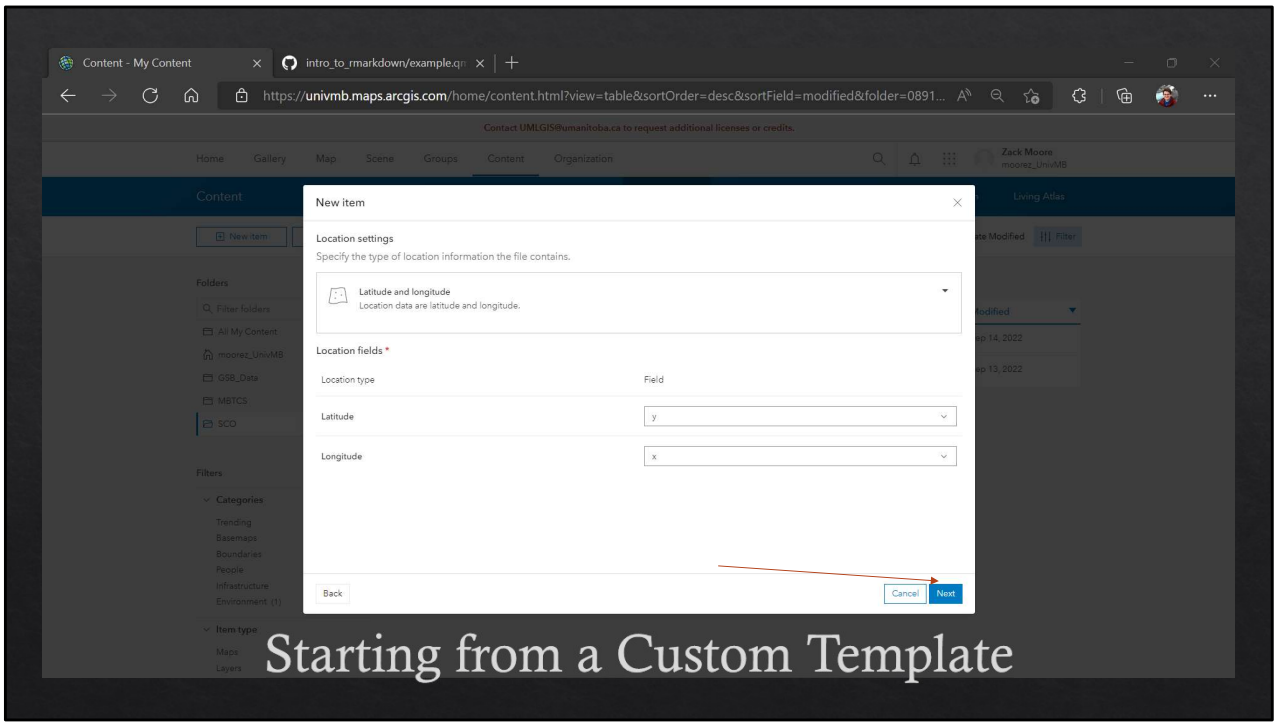
Then, in Contents>Data>Fields>Create List, you can tap ‘Generate List’ in the bottom corner to create the drop down, then you can delete the data in the table. However, you can only do this for lists of <1000 observations.



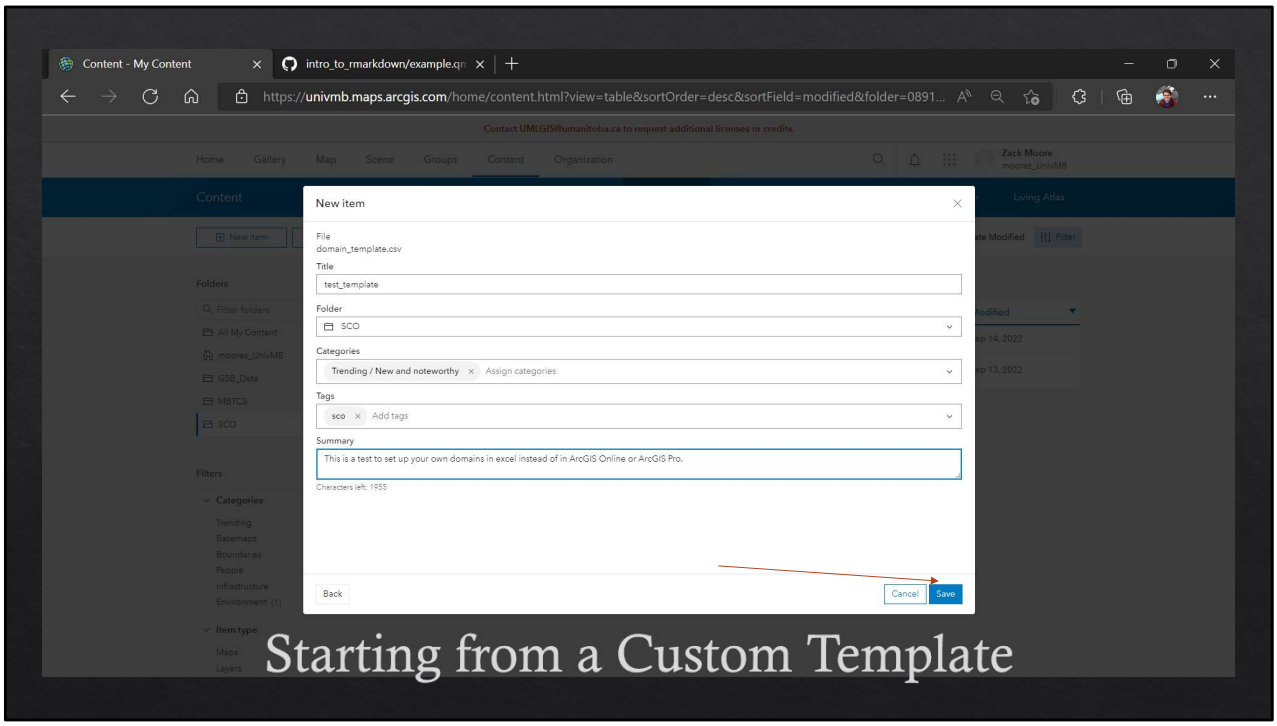
Add as a feature layer and a .csv



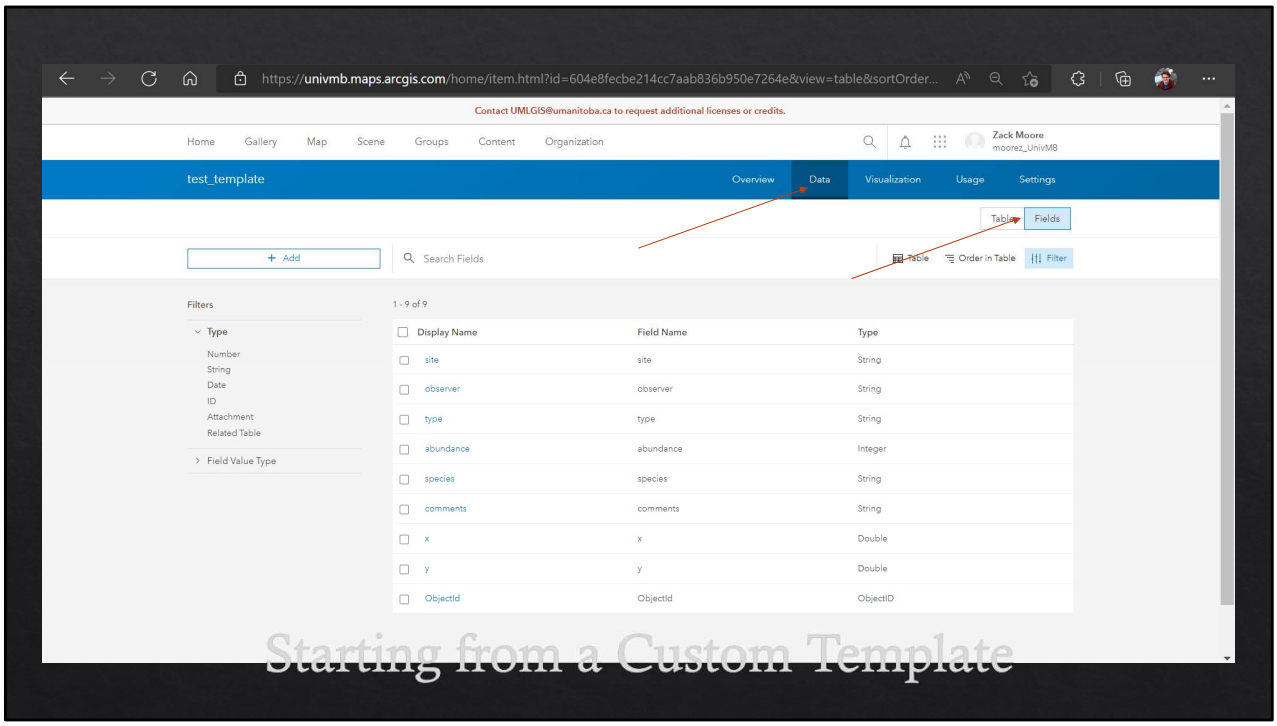
Check that each field is the correct type or you'll run into issues later!



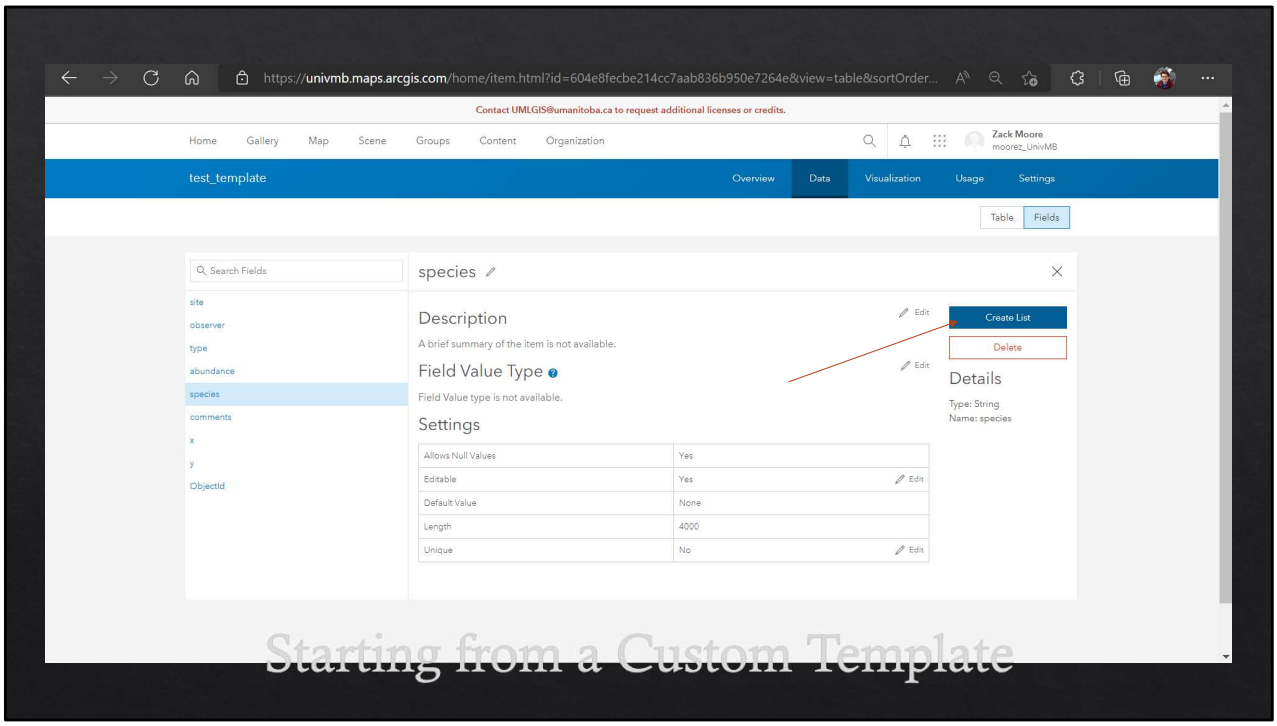
Agree to set up by lat long in your x/y columns.



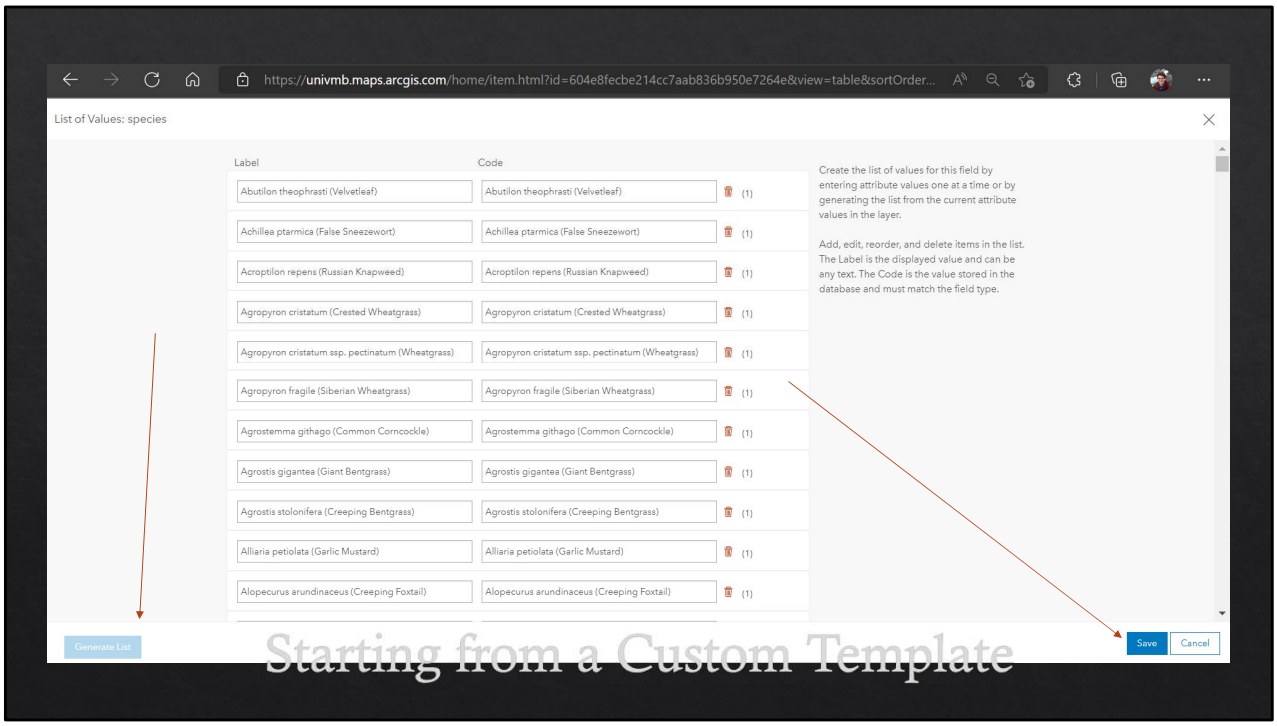
Add layer information.



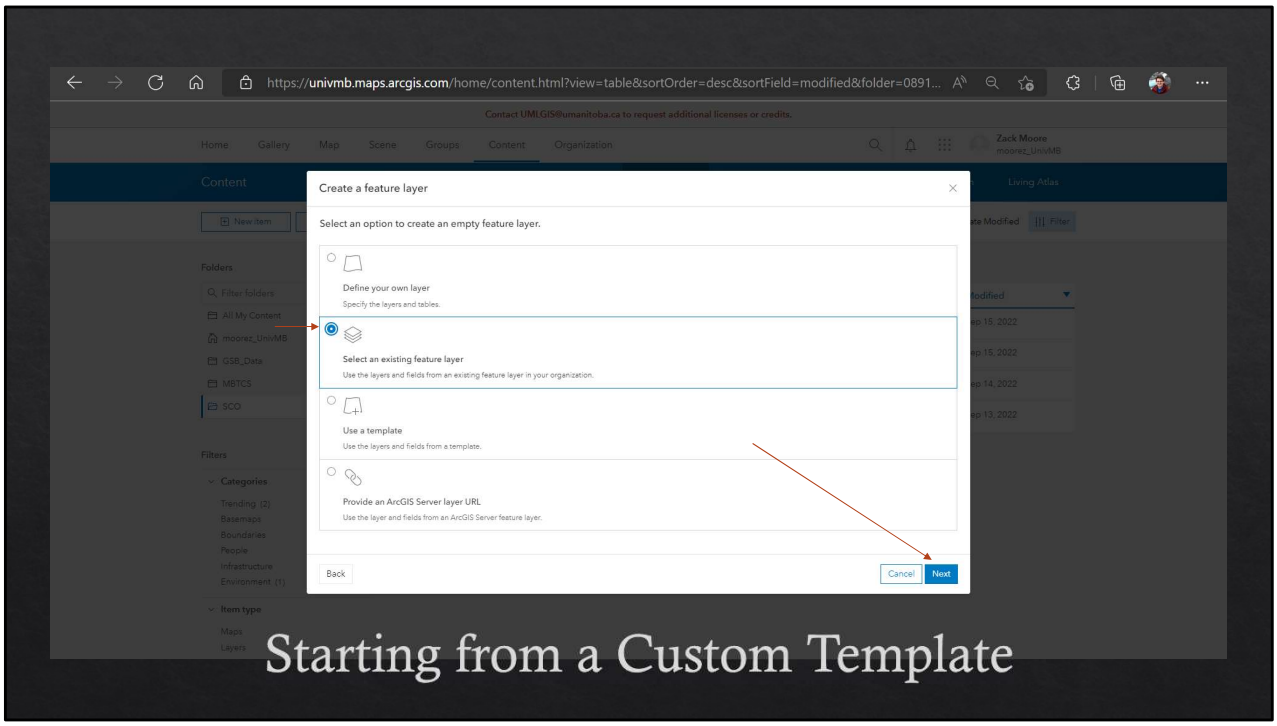
You'll end up in the info for the feature layer, go to Data> Fields and select each of the fields you wrote a list for.



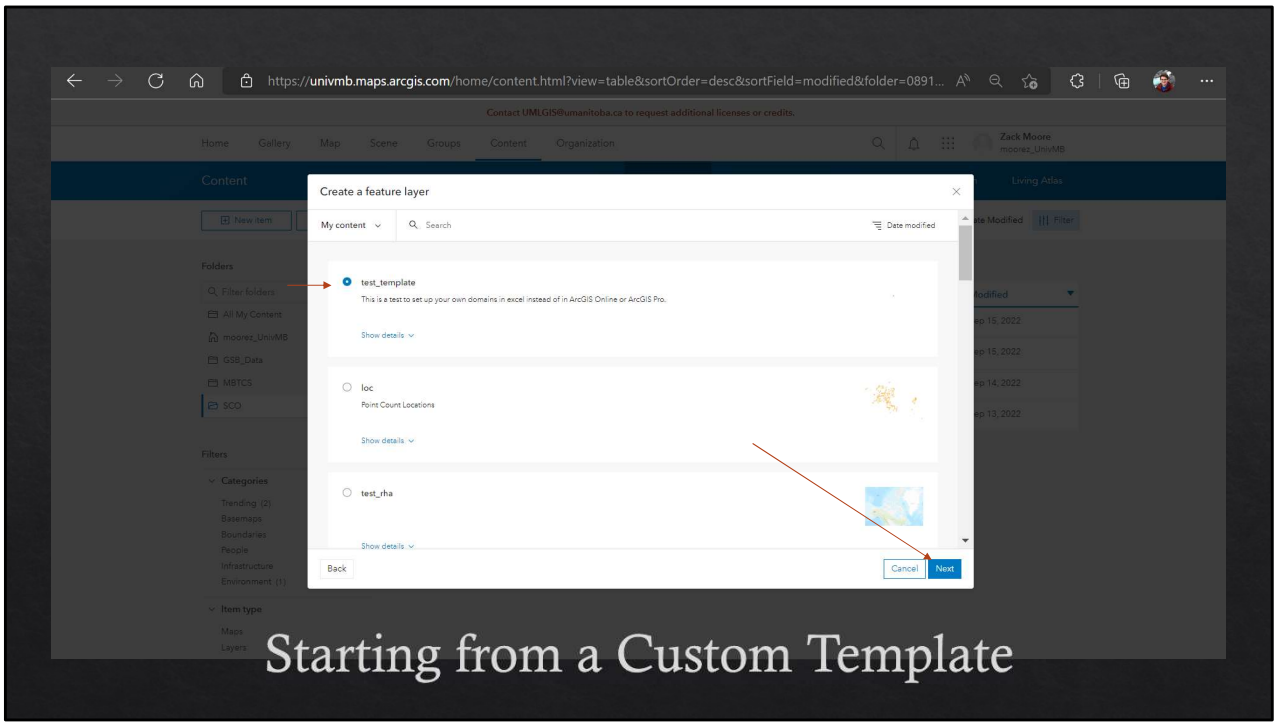
Select create list



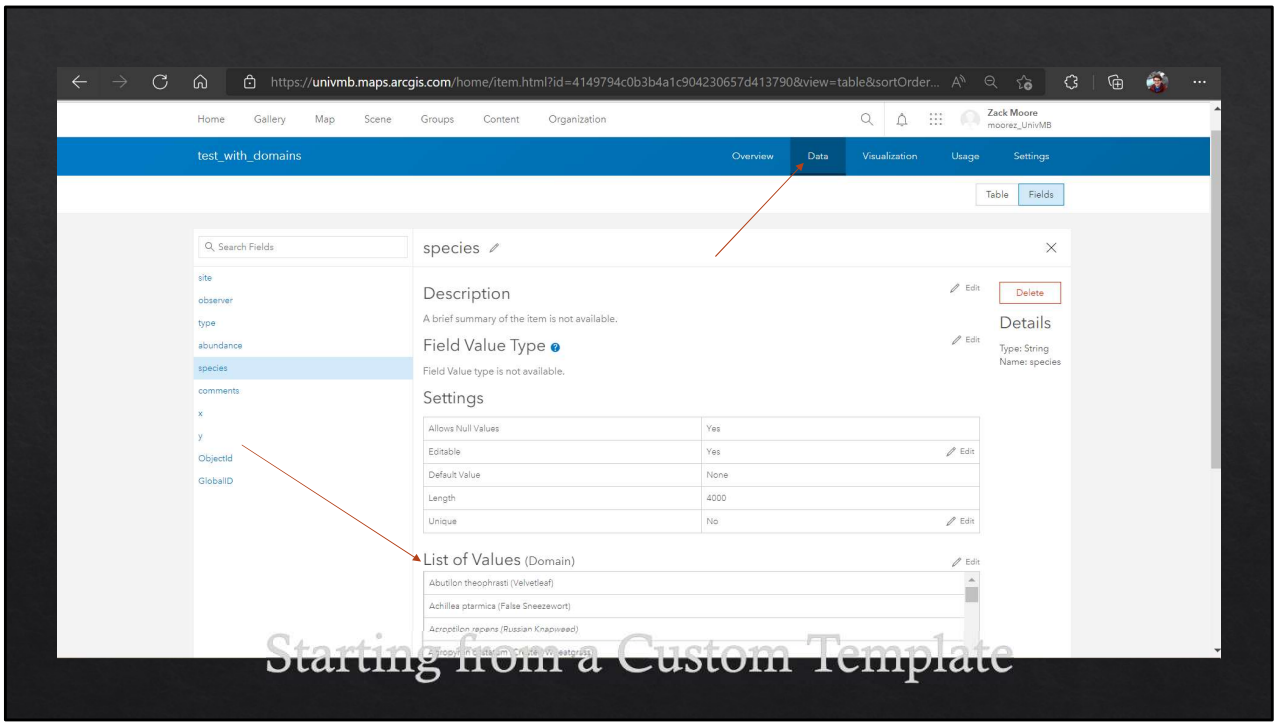
Select generate list in the bottom corner, and the list will autopopulate with every option from that column. Now, your drop downs will have these values in Field Maps. Save, and exit. Do this with EACH field you set values for.



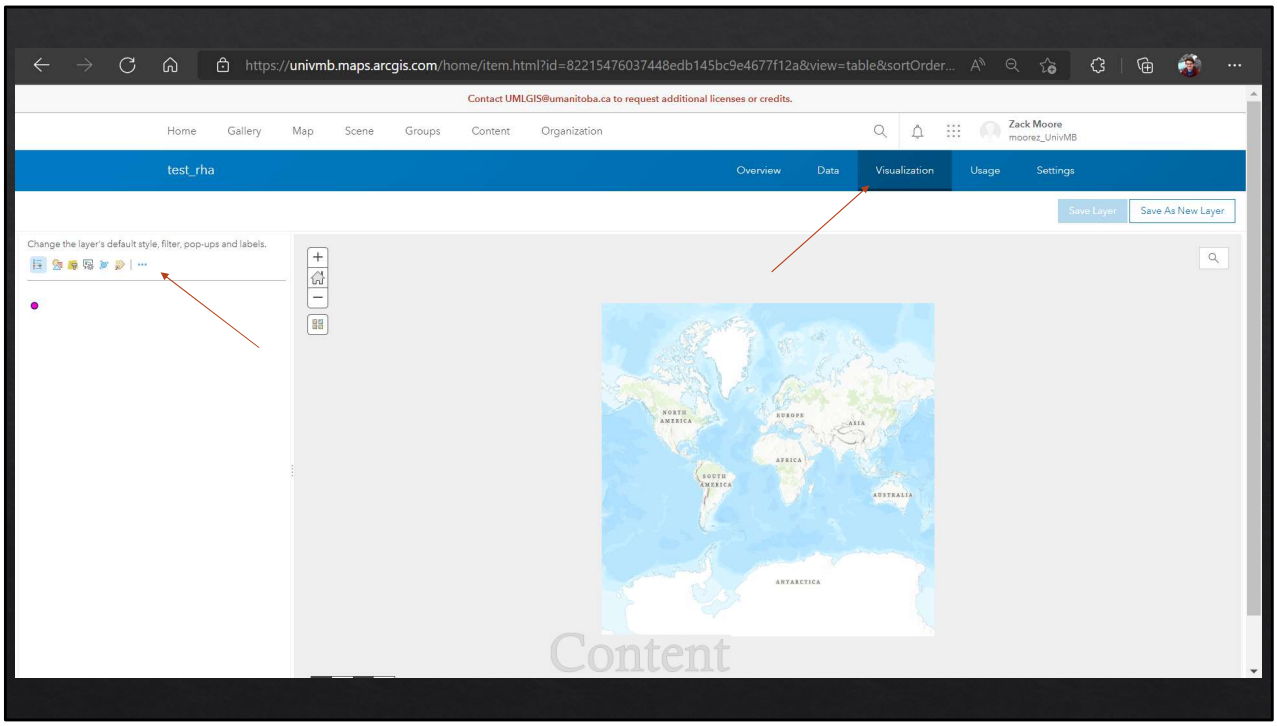
Then, go back to New Item in content,



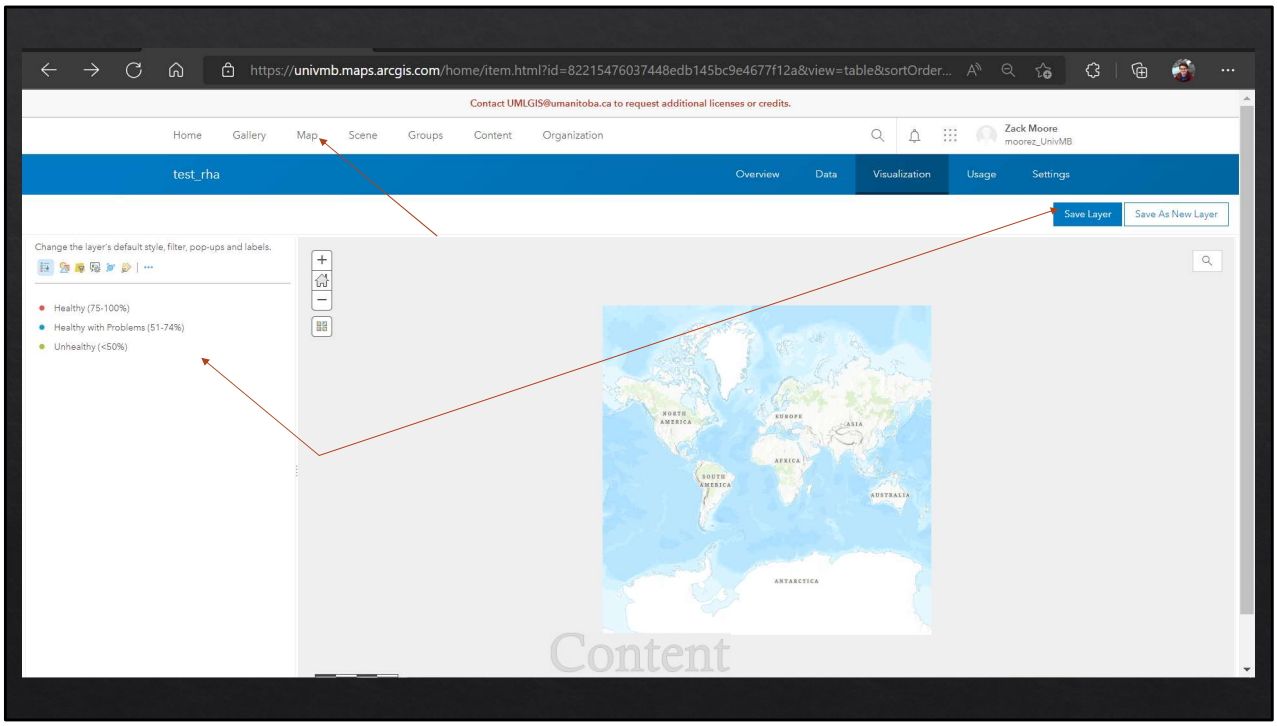
Then, go back to New Item in content, select your template with the domains defined, and create a new copy of this template to remove all of the points in the old one.



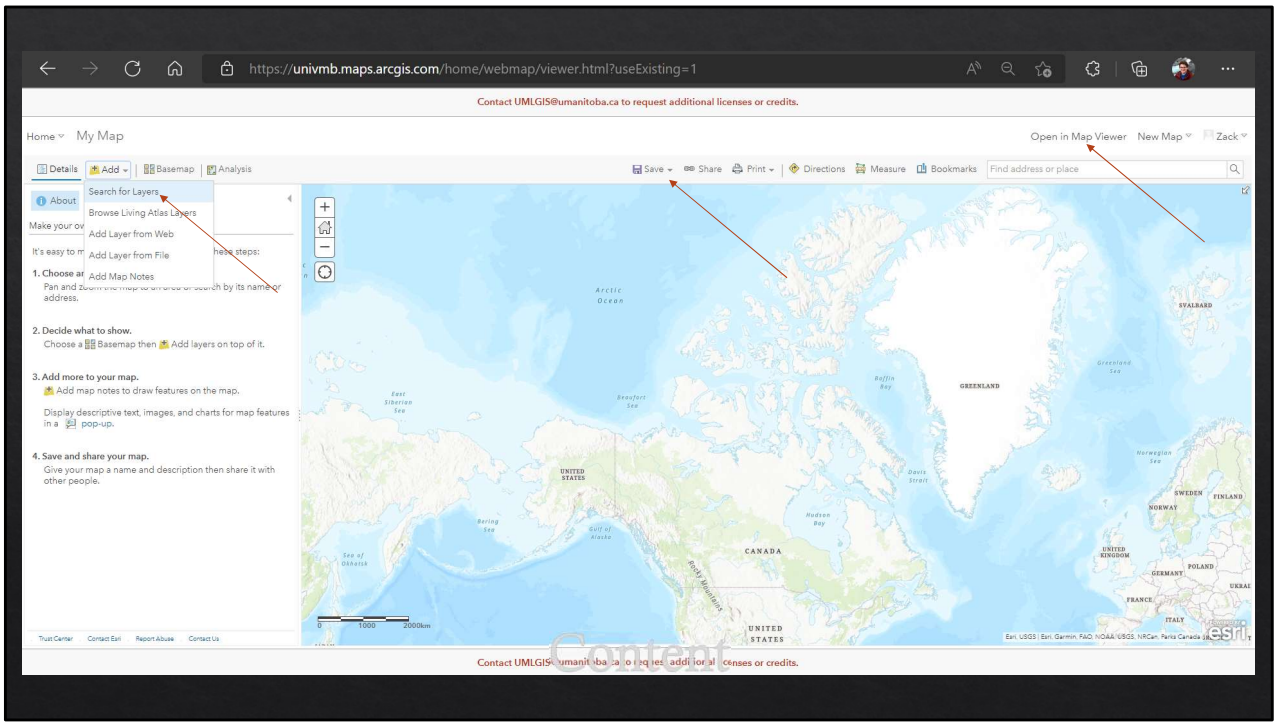
NOW your layer will have all the domains you set from your excel template!



If we get out of there and go to visualization, we can change how this layer will look every time we open it. We can add labels, change symbology, even filter or configure pop-ups. The pop-ups are an underappreciated nuance of this work, as this is the default that Field Maps will use to start the form.

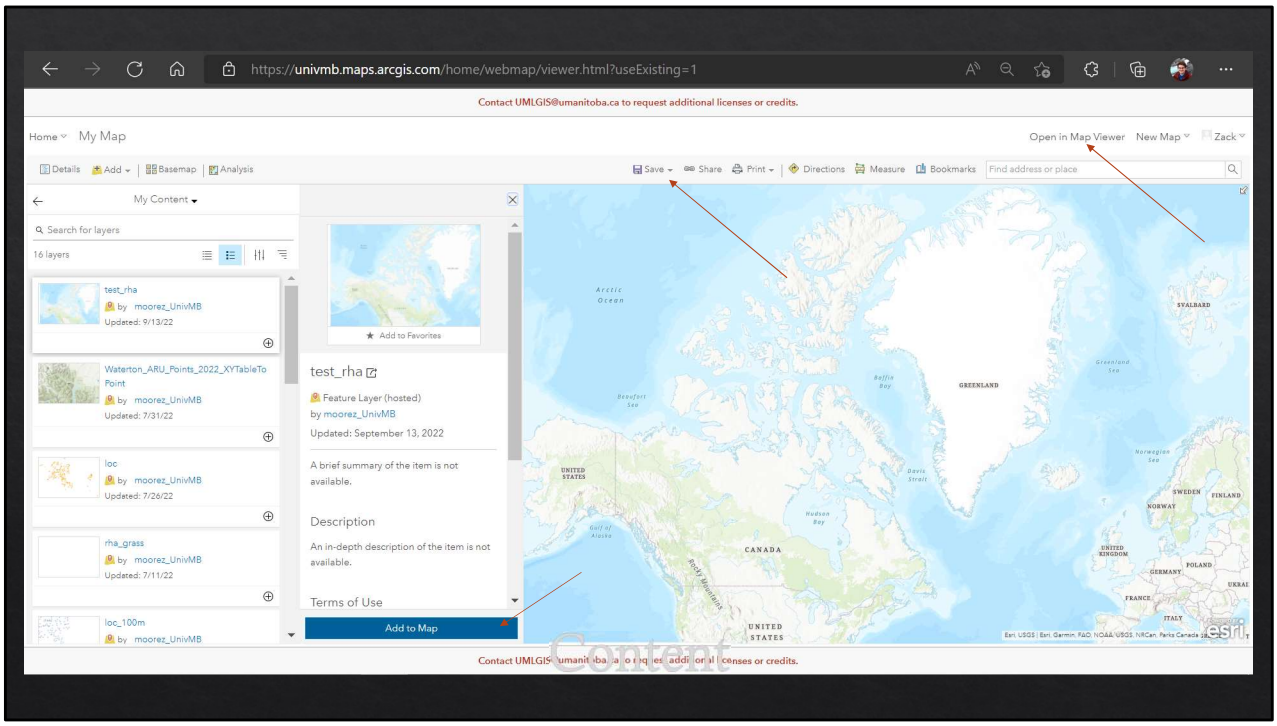


You can change the visualization so it populates with the list of values you added to a field, and this will make it so that when you go to create the field maps, it gives you these options to start your forms. Don't forget to click save! Once you're done here, go to Map in the top banner.

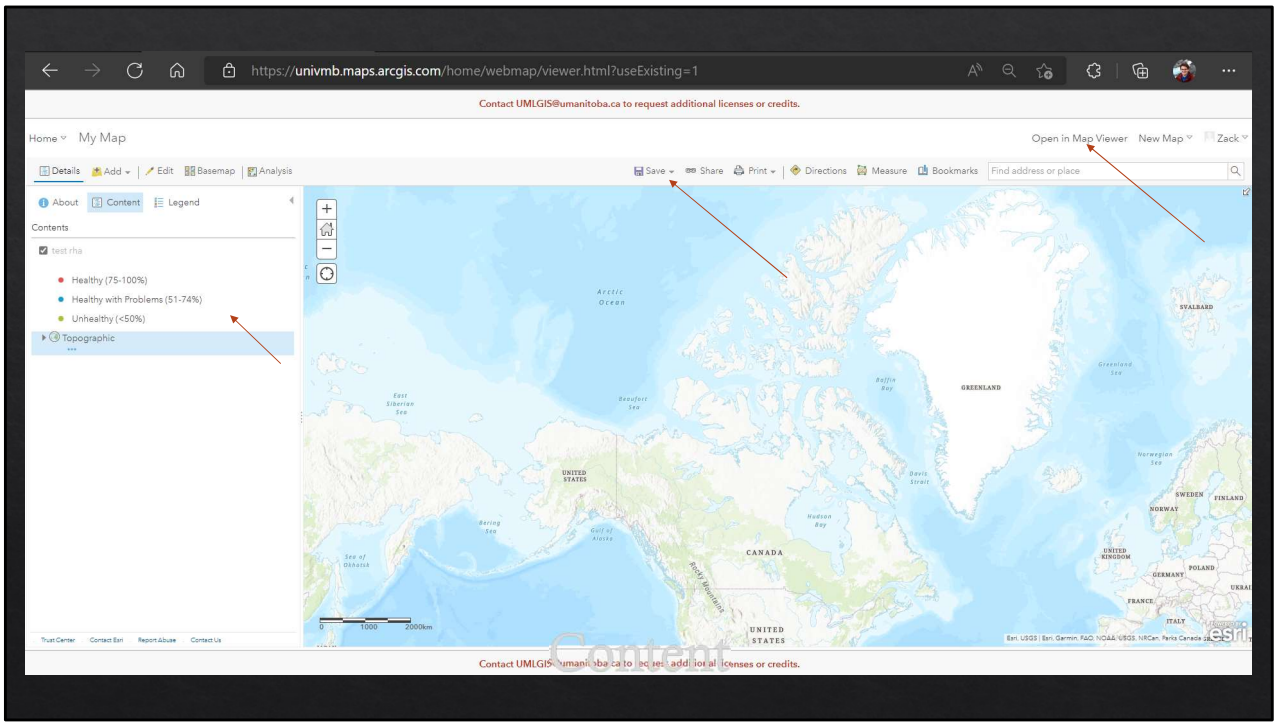


You can add layers to the map here, then save it to your folder. I recommend that you use the “Map Viewer” (top right) as opposed to Map Viewer Classic, because it allows you to group Feature Layers with multiple Layers into collapsible units. In general, the new “Map Viewer” has more features but Online still offers the more familiar version of the past.

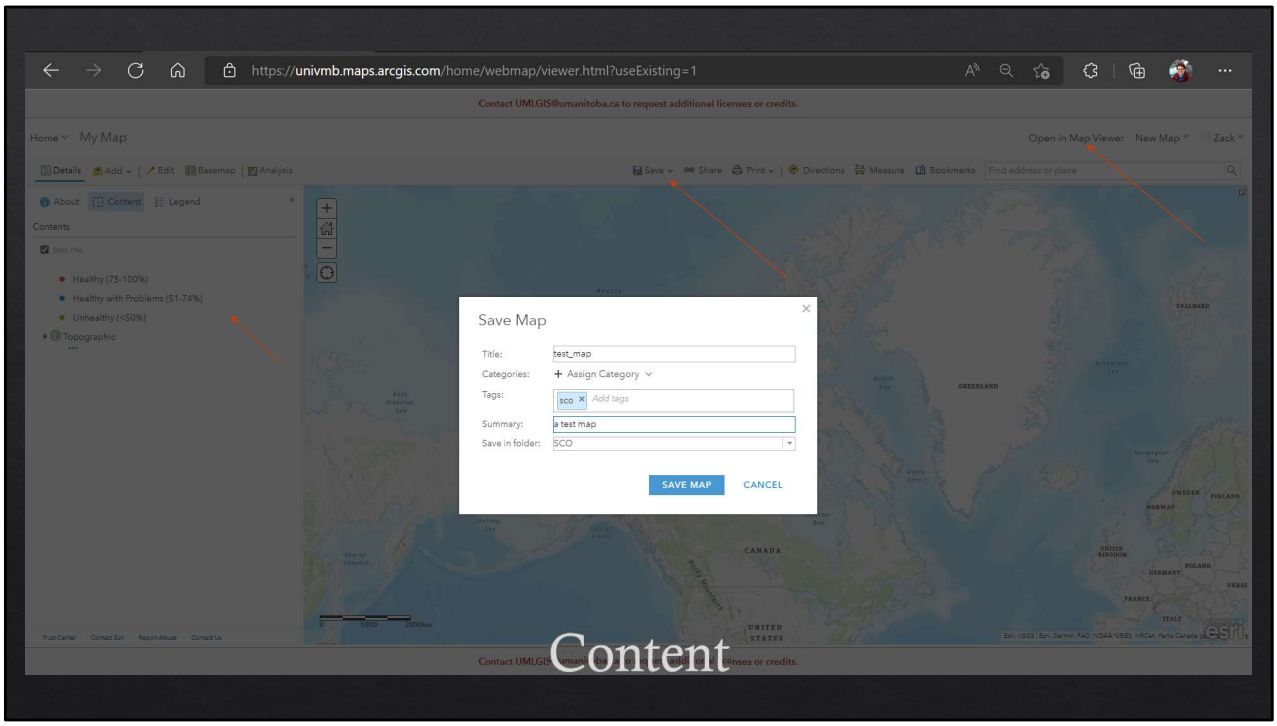
You can add layers that you have made, but you can also search the vast ArcGIS online portal for any publicly available layer. There is A LOT of background data you can add to your map from here without having to set up anything yourself.



Navigate to the layer you want and add it to the map



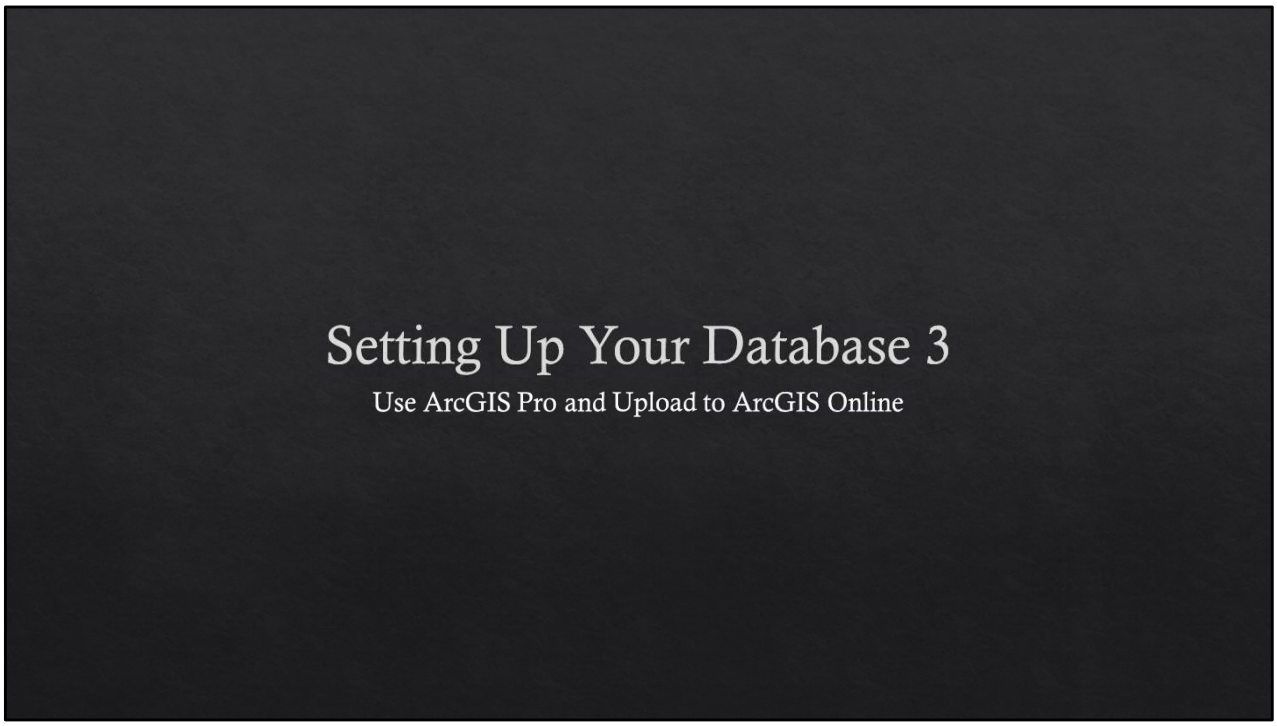
And it will open with your saved visualization changes.

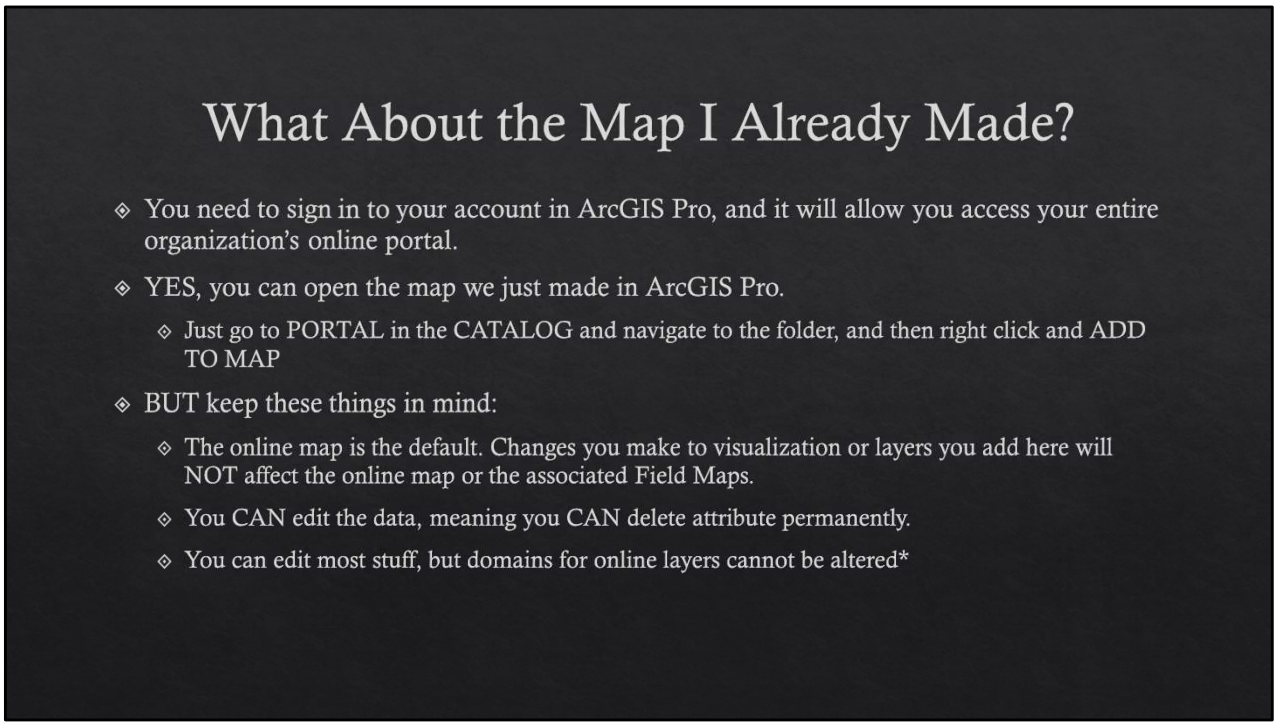


Save the map so we can open it in Field Maps. However you set up the map will be how it appears in Field Maps (ie. Whether layers are turned on or off, how they are labelled/visualized, etc.)

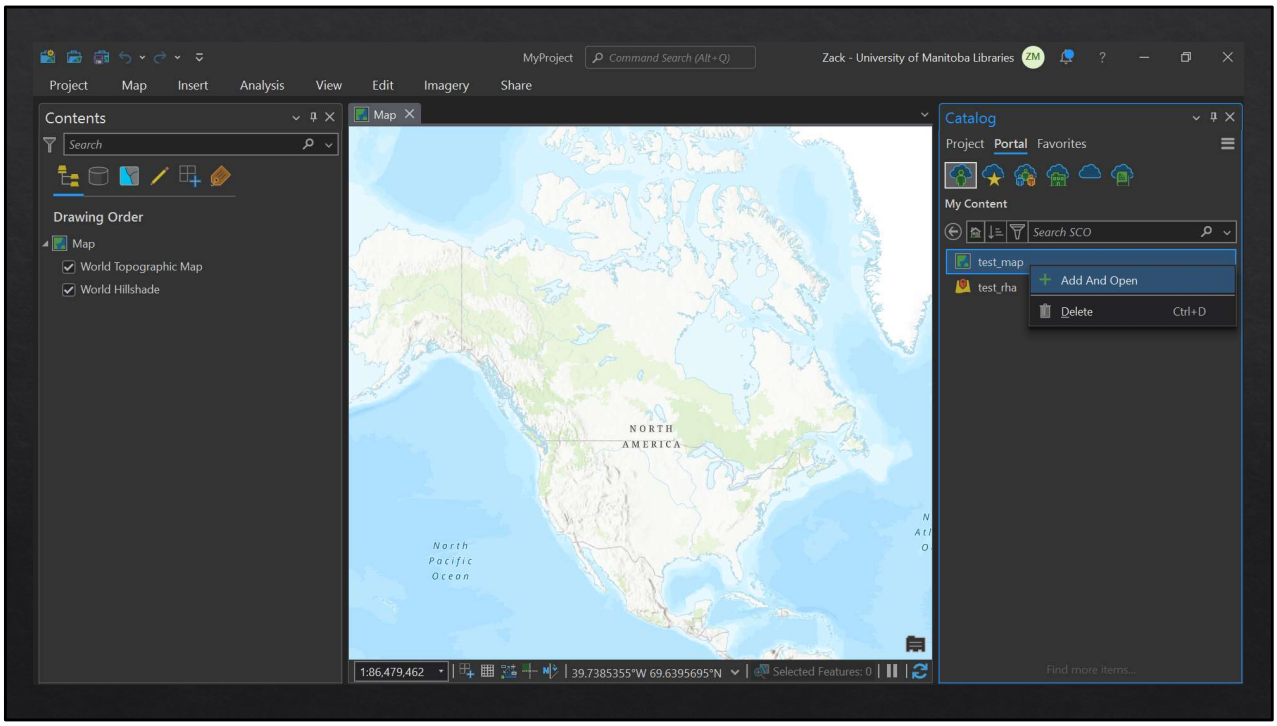
Now What?

- We now have the layers we've designed in a map.
- NOW we open that map in Field Maps and configure it for entry.

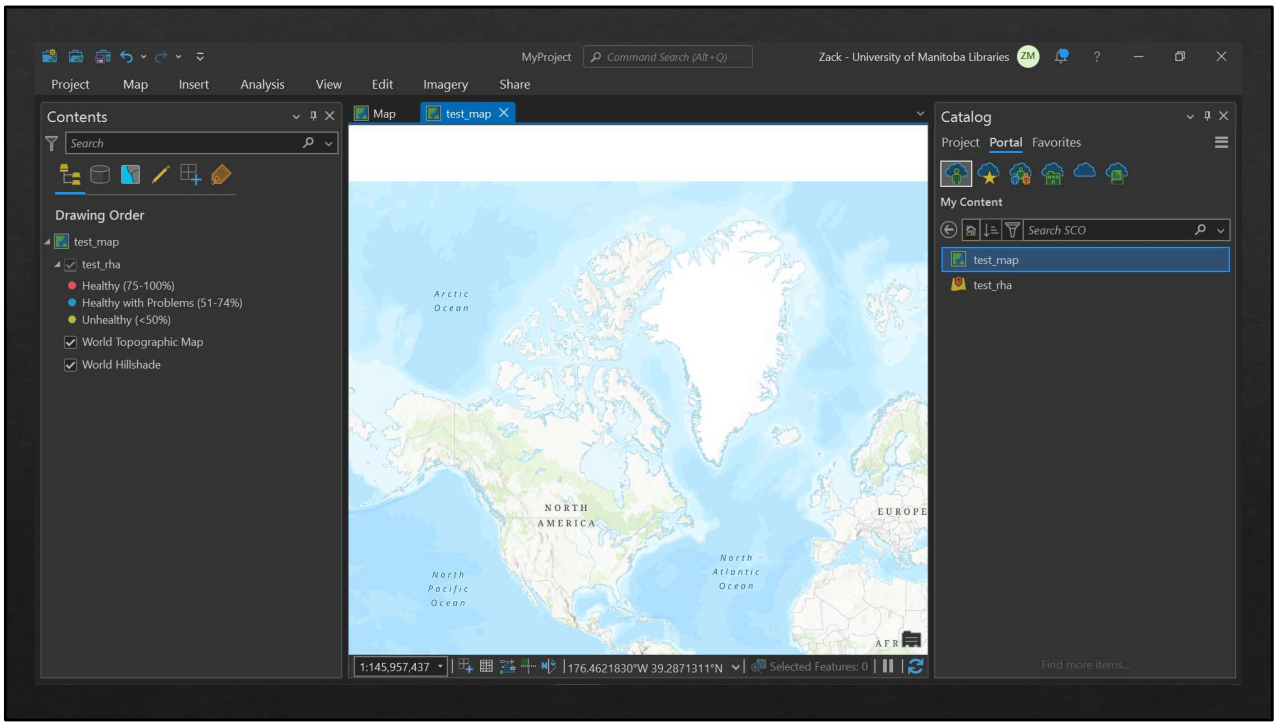

Setting Up Your Database 3
Use ArcGIS Pro and Upload to ArcGIS Online



*You COULD get advanced here. If you have an existing online layer that you want to edit or add some complex domains (drop-down lists), you could copy the layer to a desktop geodatabase, edit the domains, and then overwrite the online layer, BUT you would LOSE ANY PHOTOS in the original online layer.



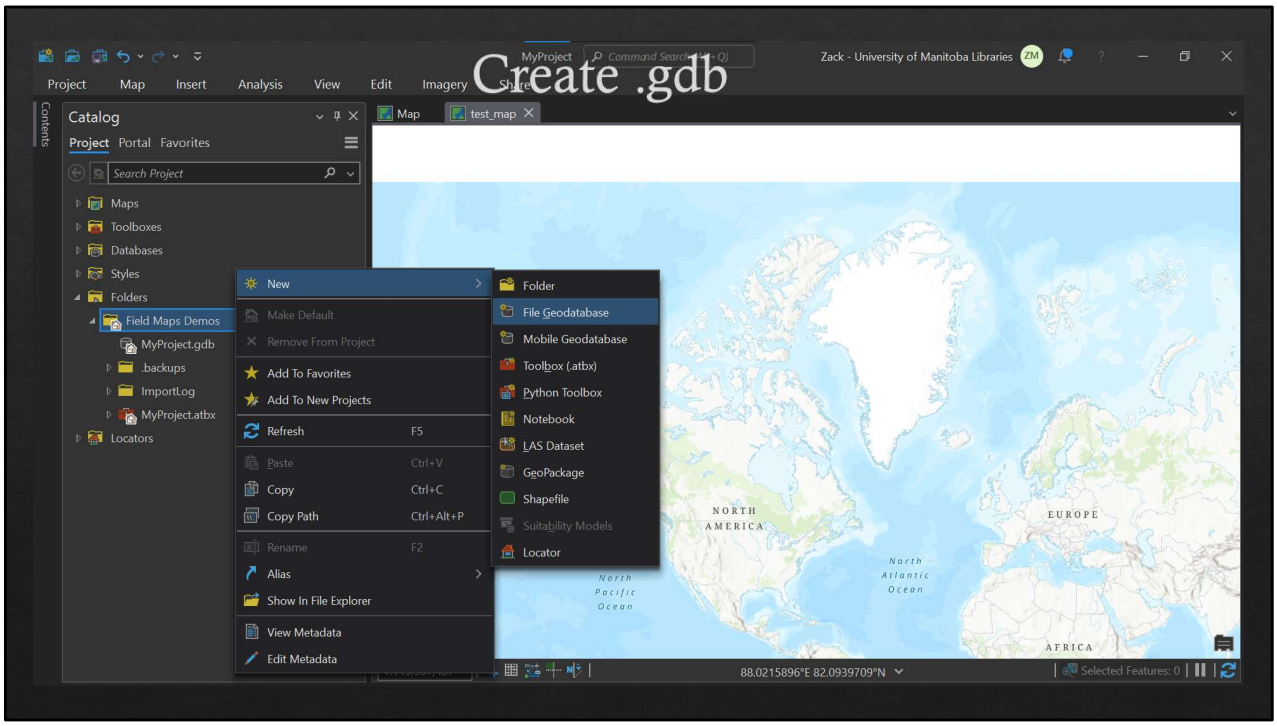
Navigate to the map in the portal section of contents and Add and Open



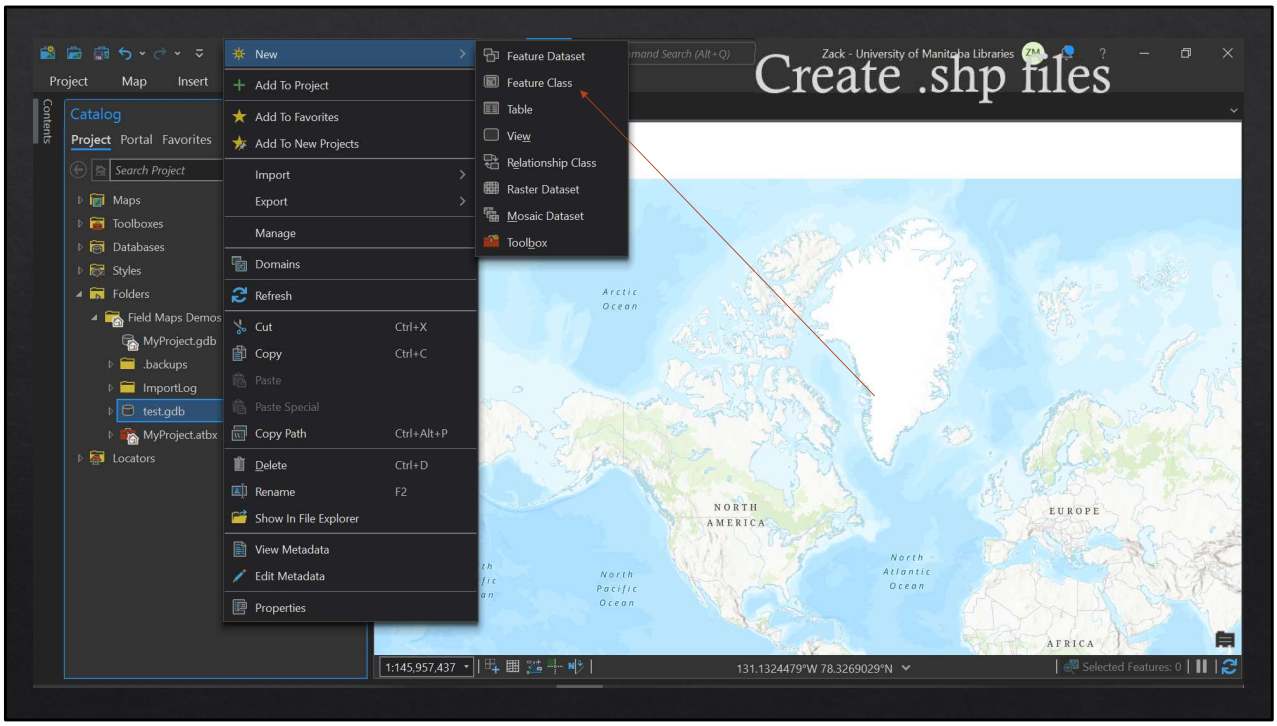
Then you will have access to your map!

Process for Creating New Layers on Desktop

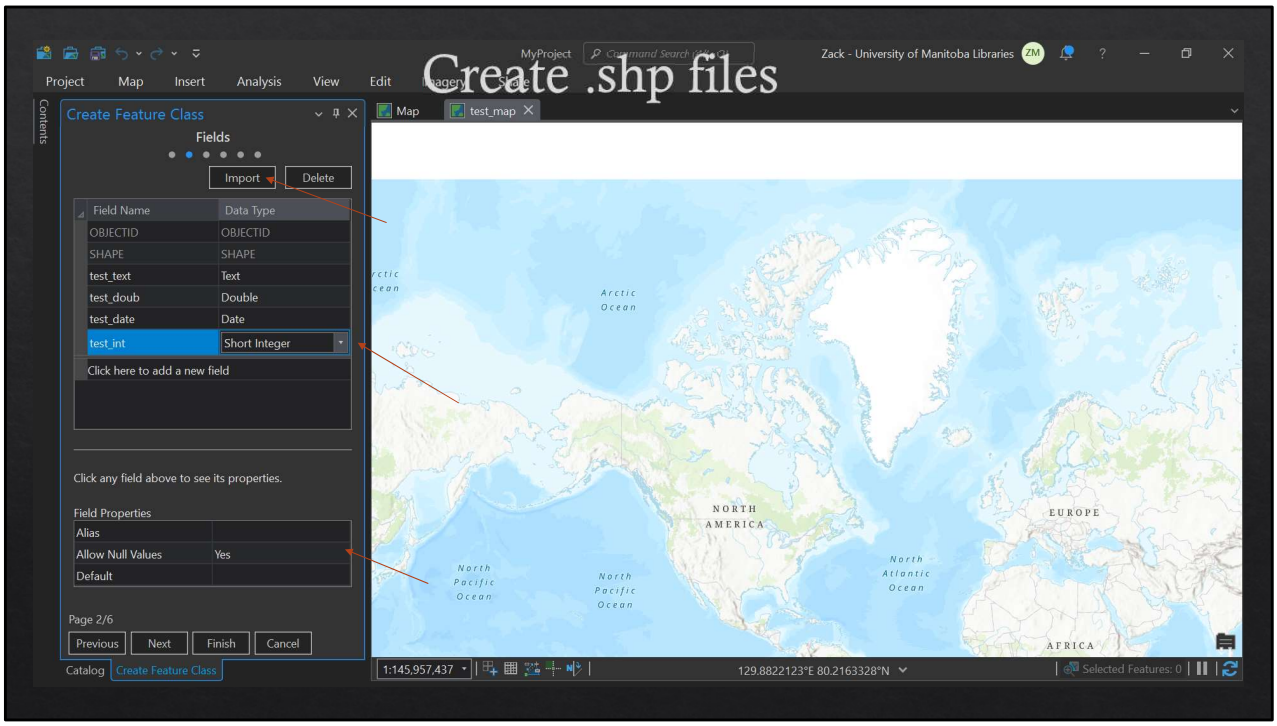
- Create .gdb (geodatabase) for ALL your layers in ArcGIS Pro Desktop
- Create .shp layers for each thing you want to collect in the .gdb.
- Format the fields so they match the type of information you want to collect
- Format domains for fields you want to validate
- (don't bother with visualization here, won't translate to Online)
- Upload the .gdb to your Online
  - Will upload ALL the gdb layers into 1 feature class. (You can of course do this separately if you want, but this allows you to add everything to a map all at once)
- Format Visualization in Contents
- Format Map
- Format FieldMaps forms



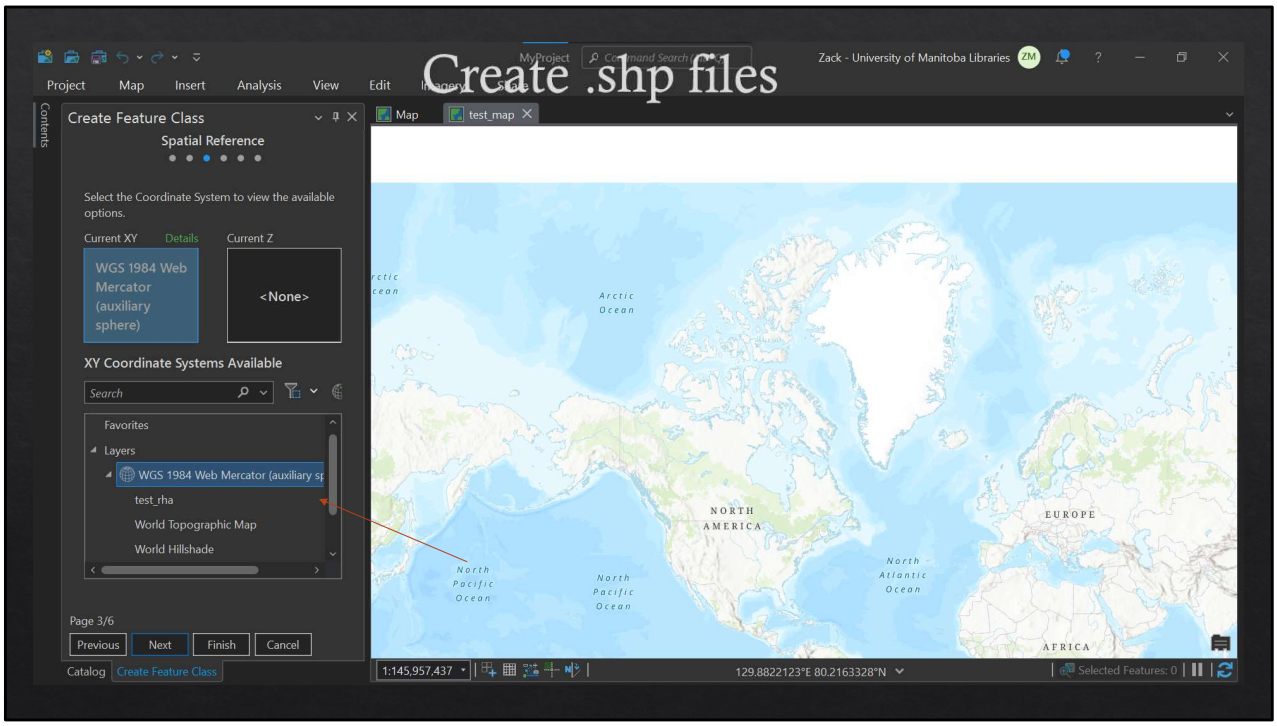
In Catalog, navigate to the local folder you want to create the database, right click > new > file geodatabase. You can probably also create this geodatabase in the portal contents, but I've found it more reliable to set up everything in desktop and then upload to the portal.



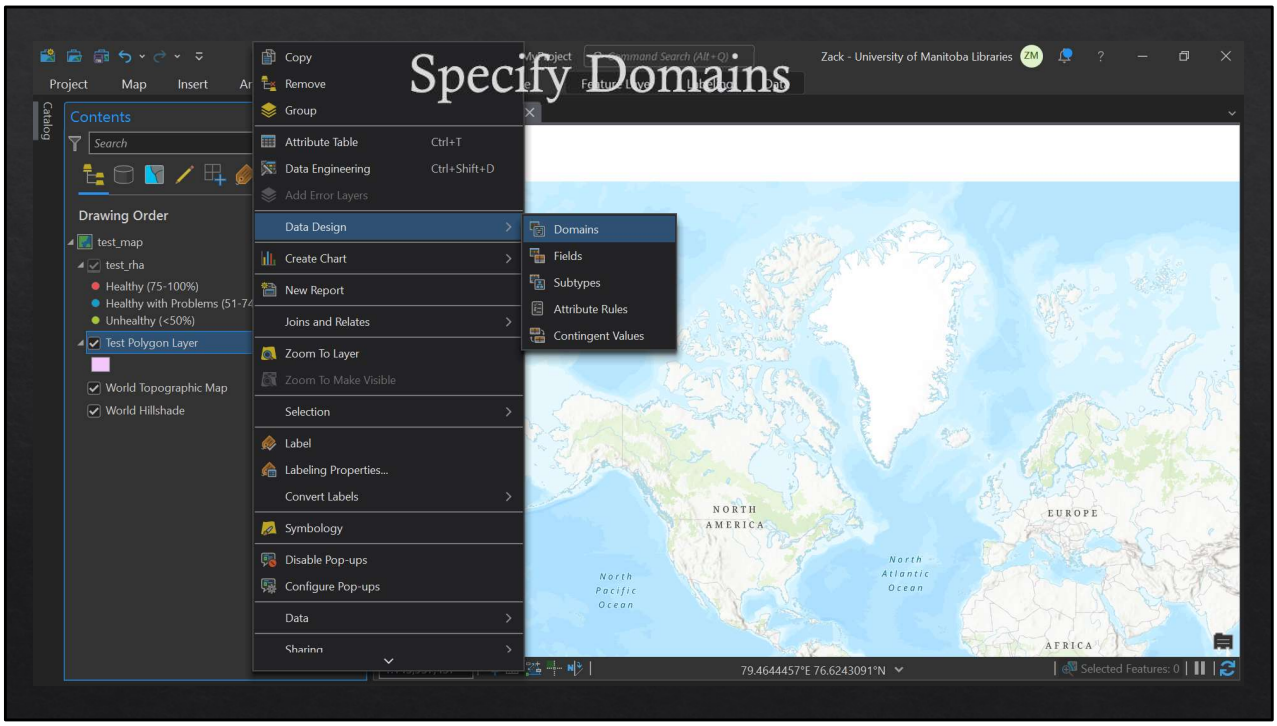
In contents, right click gdb > new > feature CLASS. Name and select point, line, or polygon. Click NEXT



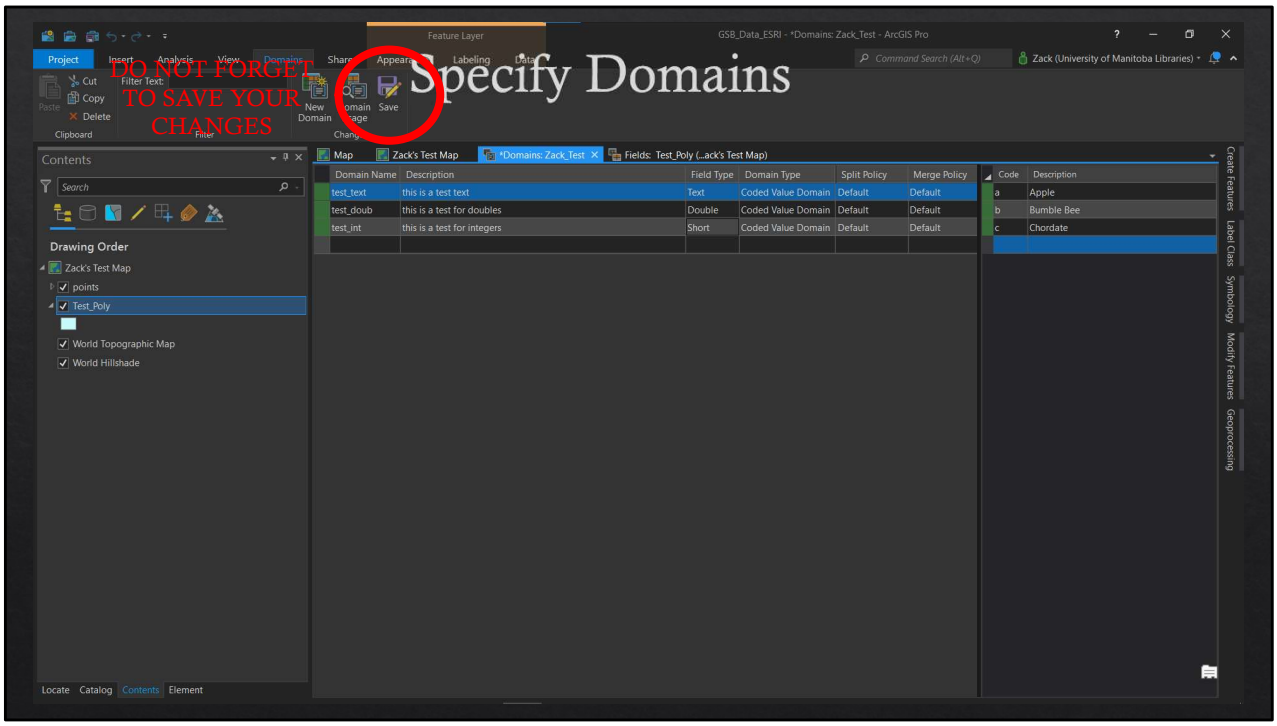
Add fields and types wanted! Double = decimal values. Date is very valuable for anything where you want to collect a date and a time. Check field properties! Change as necessary to specifiy an alternative Name, a default value, or if NULL values are allowed. Here, the Alias will be the display name, so you'll want to do these carefully. You can also IMPORT from a table if you set up the right file type. Click NEXT



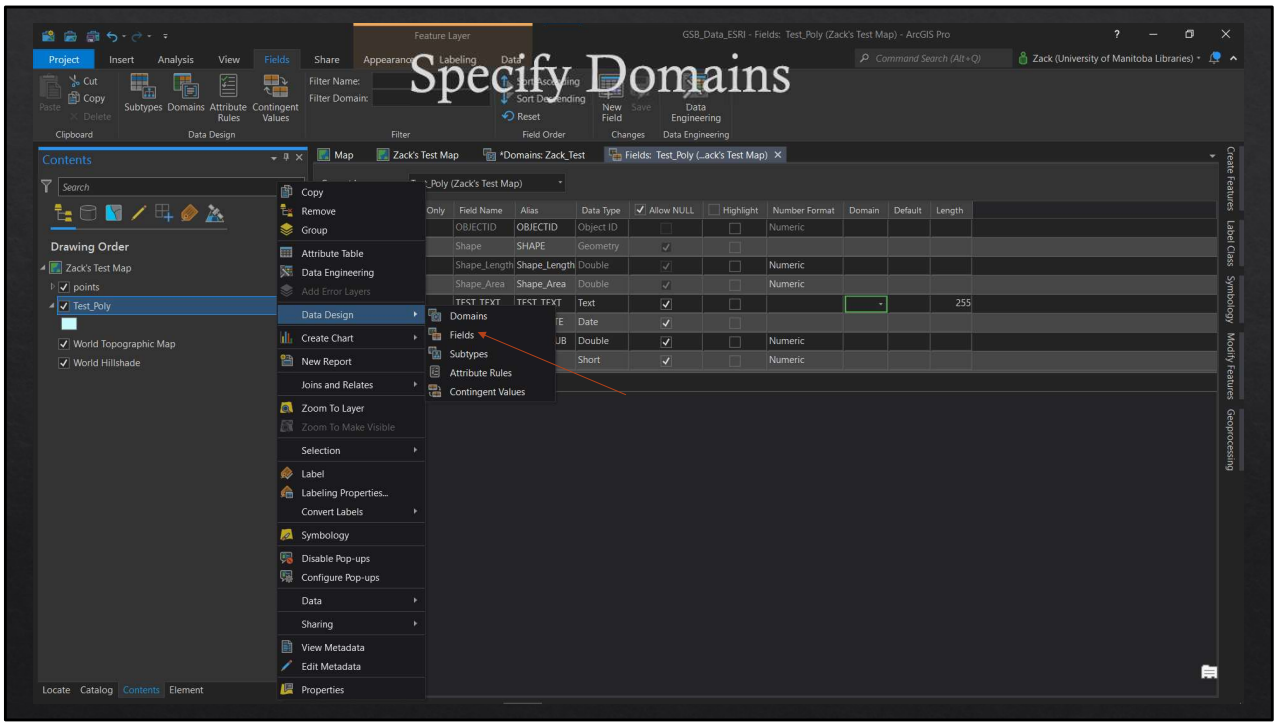
Select your coordinate system. You can use the map default, or you can pick another layer to match. You can click FINISH after this, as the next fields are likely less important!



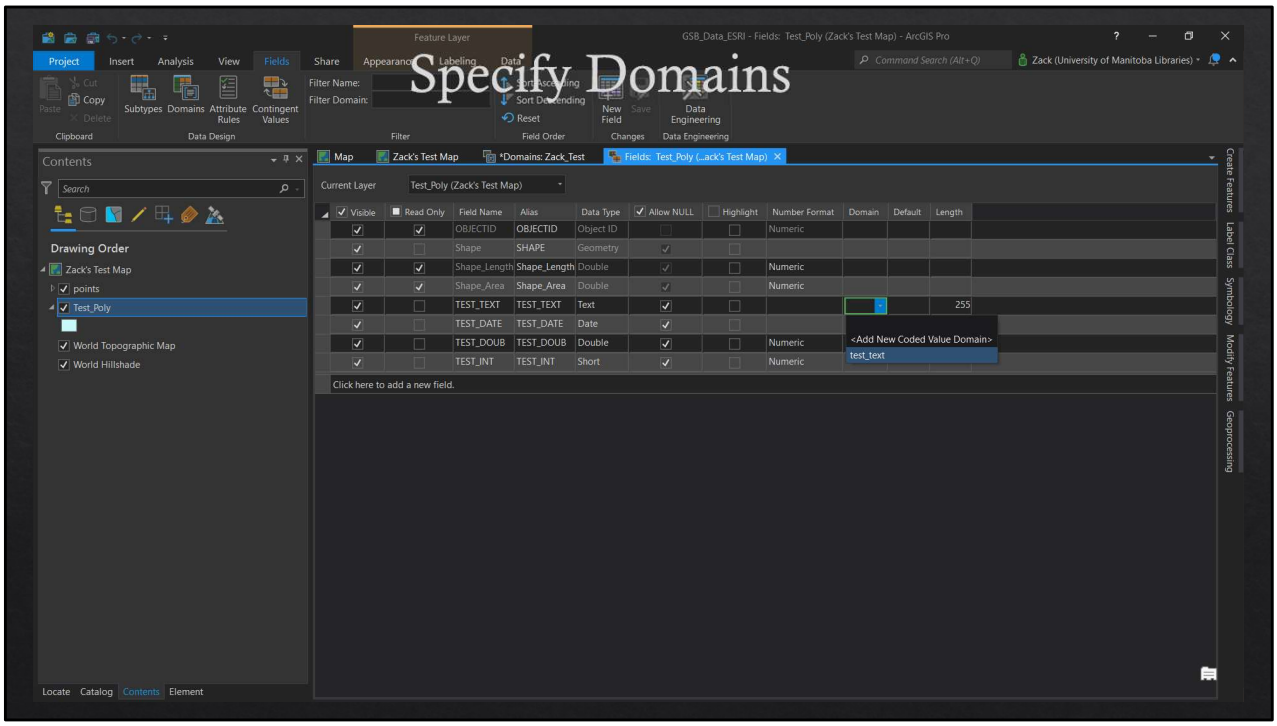
Your new layer will be added to the current map. Right click the layer in CONTENTS > Data Design > Domains



When in domains, you can manually create lists and then assign them to fields within your .shp files. This is done for given field types (text, integer, double). Code is the stored value, and Description is the value that will be visible in the drop downs.



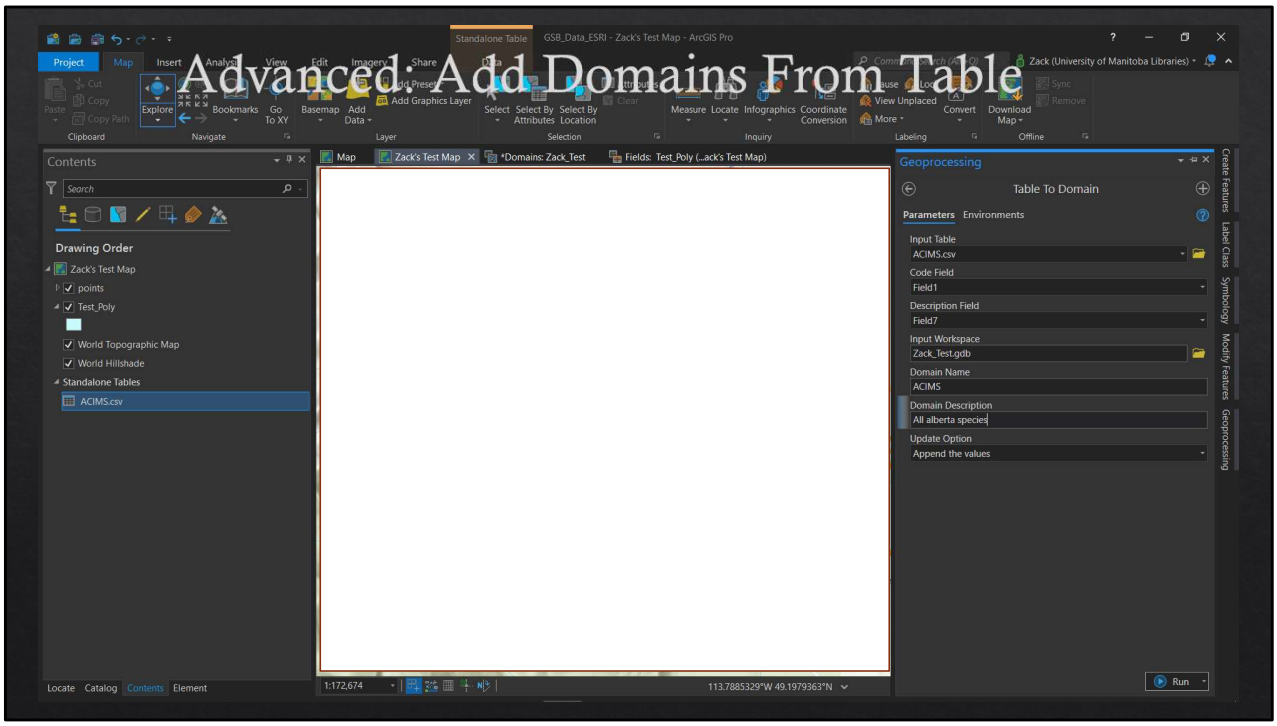
Right click the layer > Data Design > Fields to assign your newly created domains to a field in the domain section



Right click the layer > Data Design > Fields to assign your newly created domains to a field in the domain section. Now, when you use the file in field maps, it will autopopulate the drop downs with your values!

Advanced Lesson: Add Domains from Table

- You can add a domain for a complicated or long list!
- Open the list as a table in your map.
- Open the “Table to Domain” Tool
- Specify the input table as your list, which column to use for Code and which for Description
- Choose your Geodatabase as the Input Workspace
- Enter your domain name and description
- Run Function.
- It’s now a domain, and you should be able to select it as a domain in the fields page.



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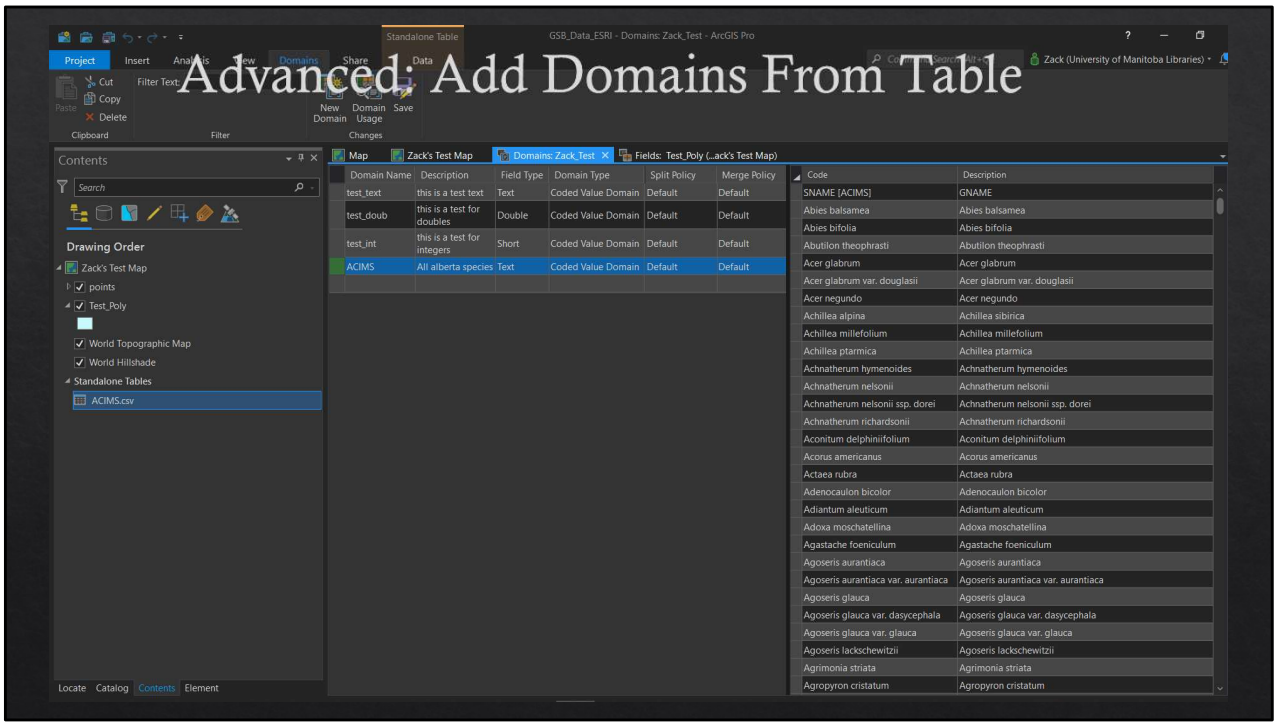
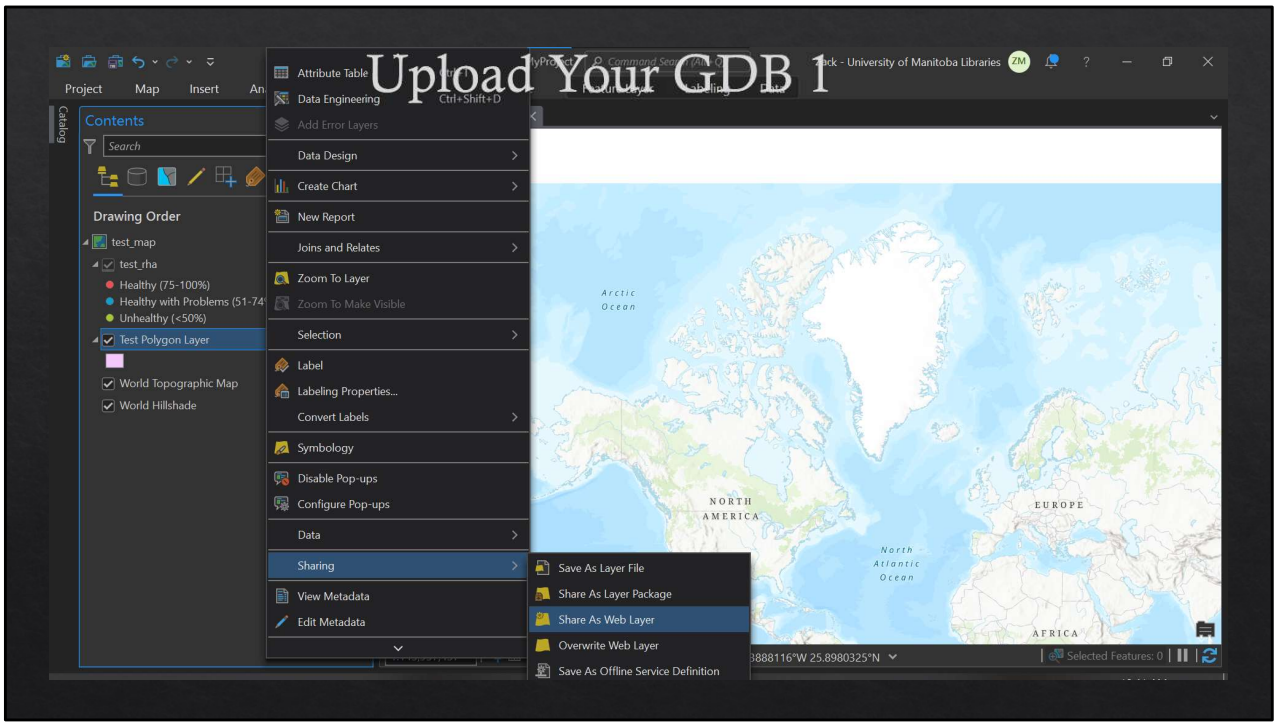
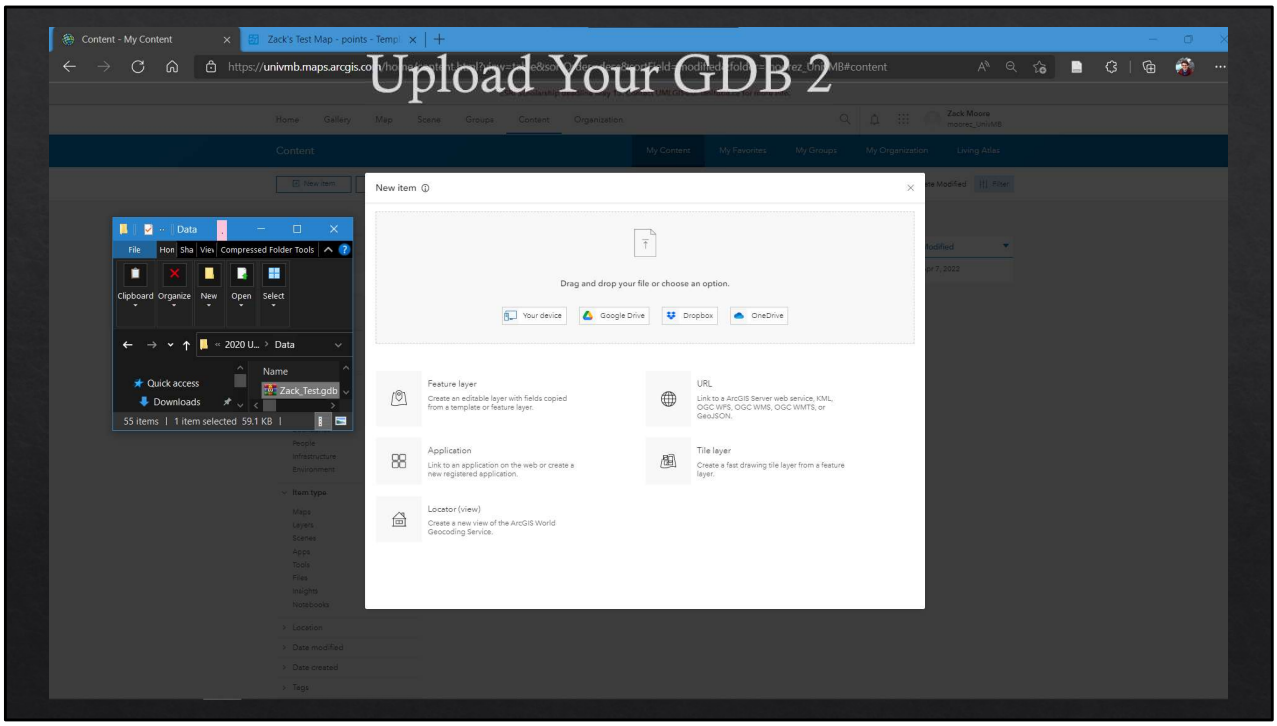


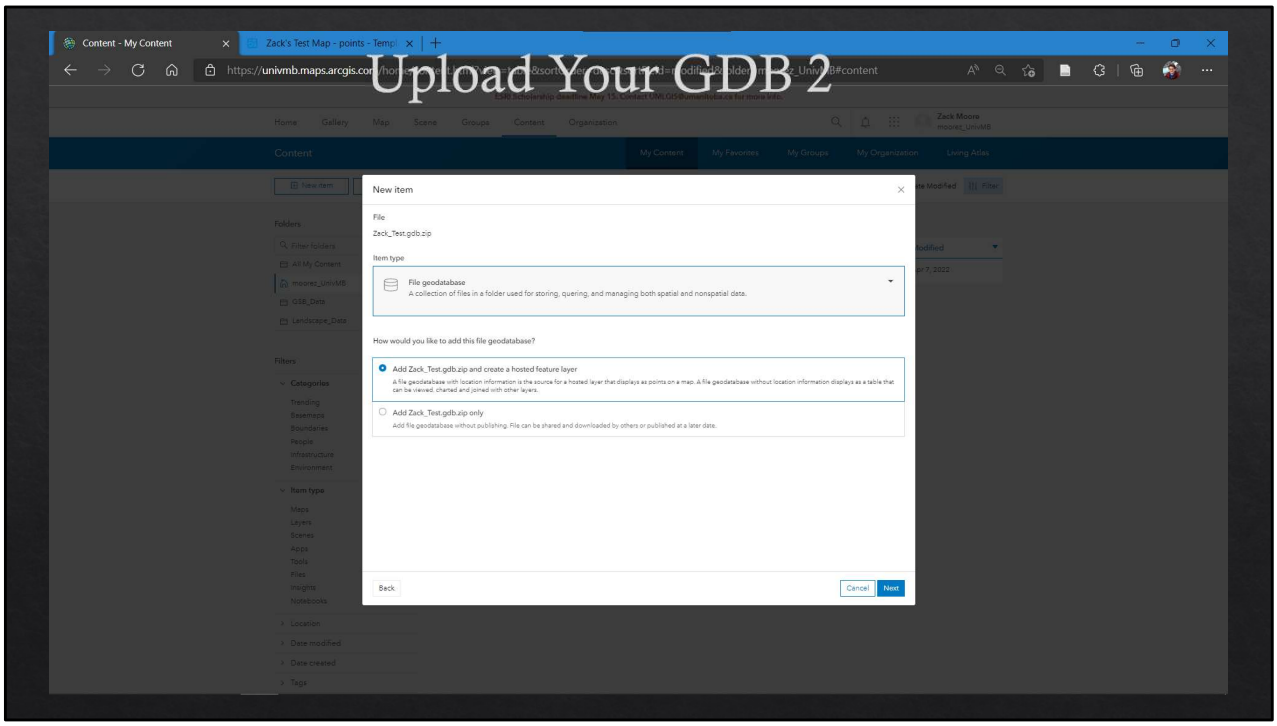
Now, it's a domain, and when you go to enter data in the field, your drop list will be populated with all the species in Alberta! You can then search for the right species as you start writing!



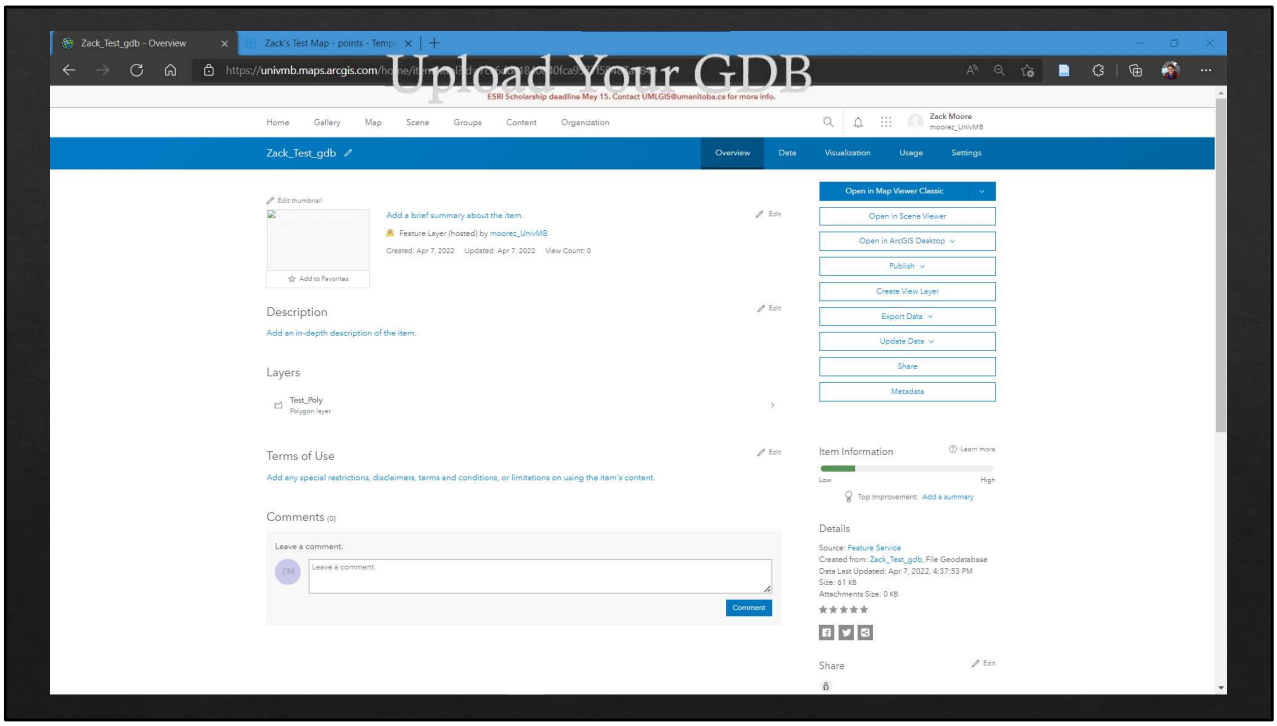
Right click your layer in contents > sharing > share or overwrite web layer. Easy! Now you can use it in the webmaps and then format for field maps.



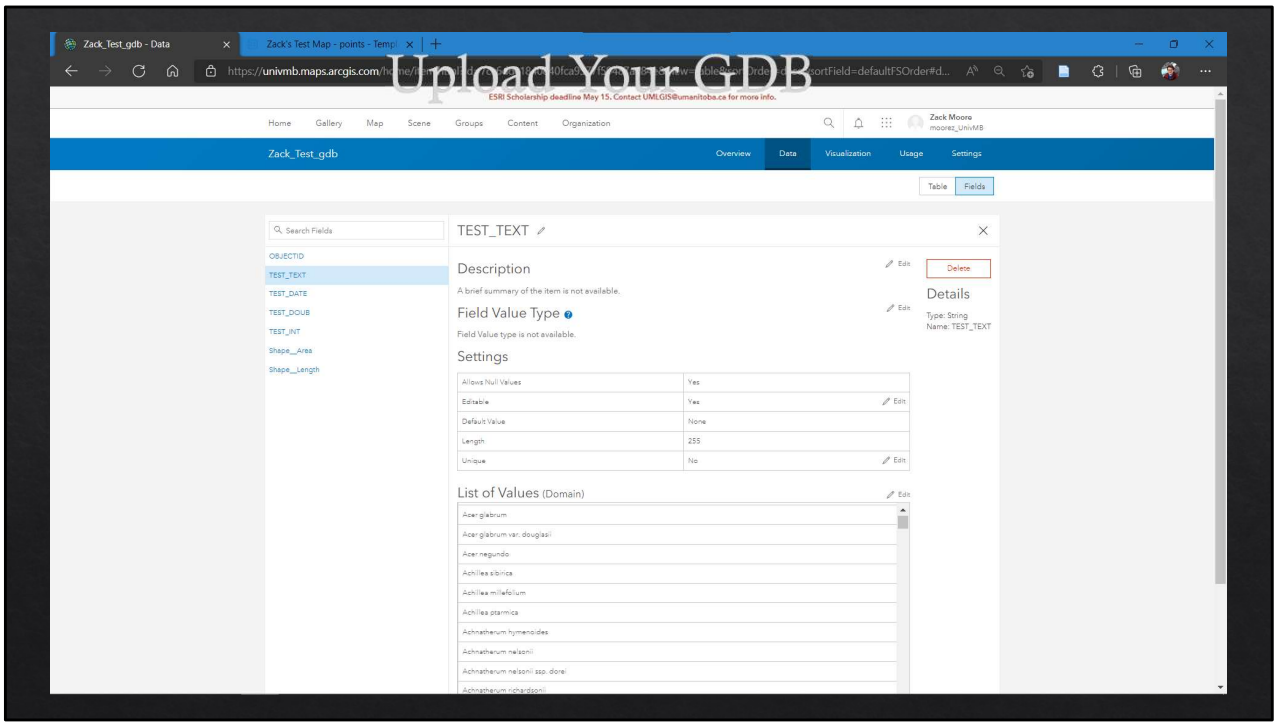
Zip your GDB into a compressed folder, and then you can drag and drop it into the New Item upload in ArcGIS online



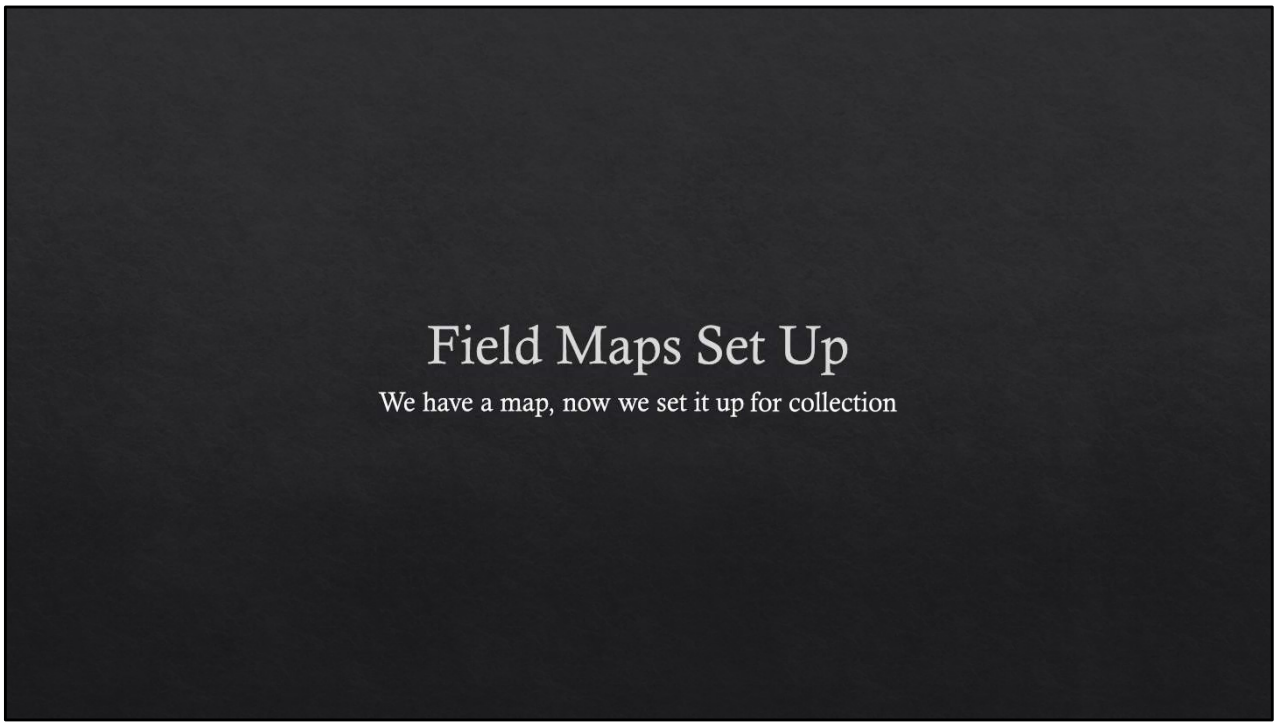
Make sure you set the item type to file geodatabase, and click add the zip and the hosted feature layer. The next screen will let you choose where to upload and add information

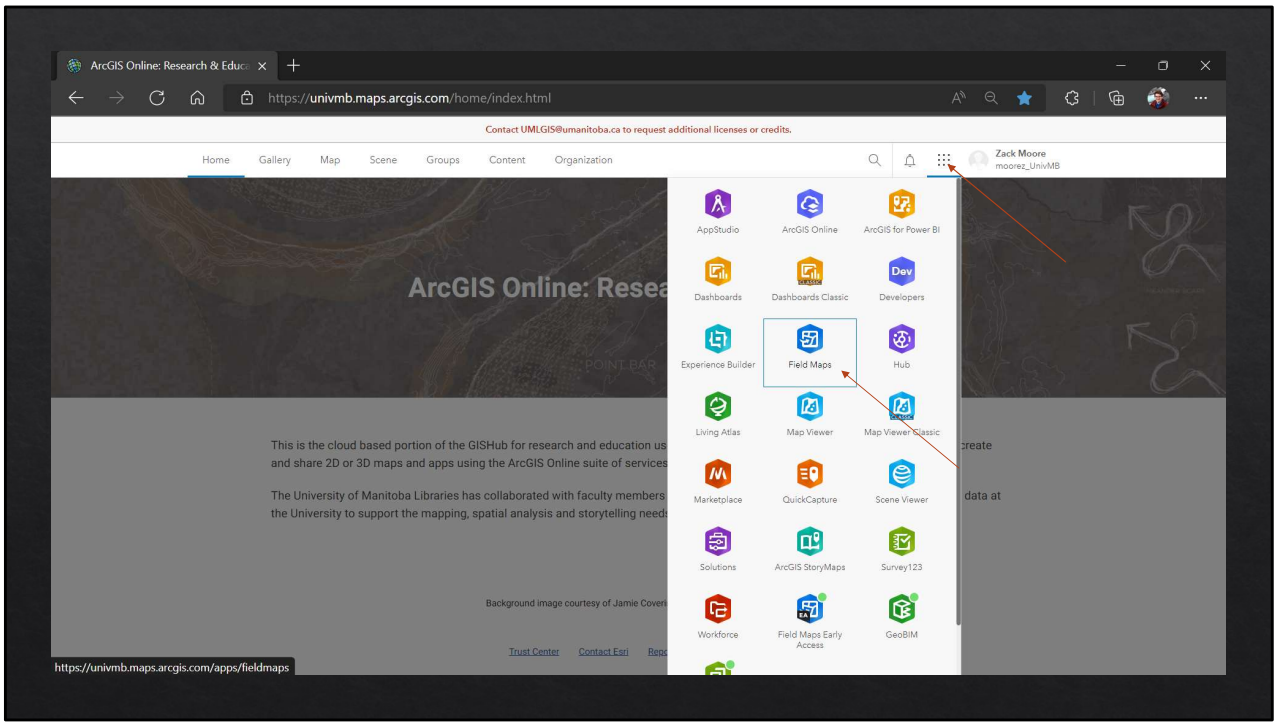


Now, your newly created SET of .shps will be in a single feature class. I've only added one here as an example, but you can put however many you want!

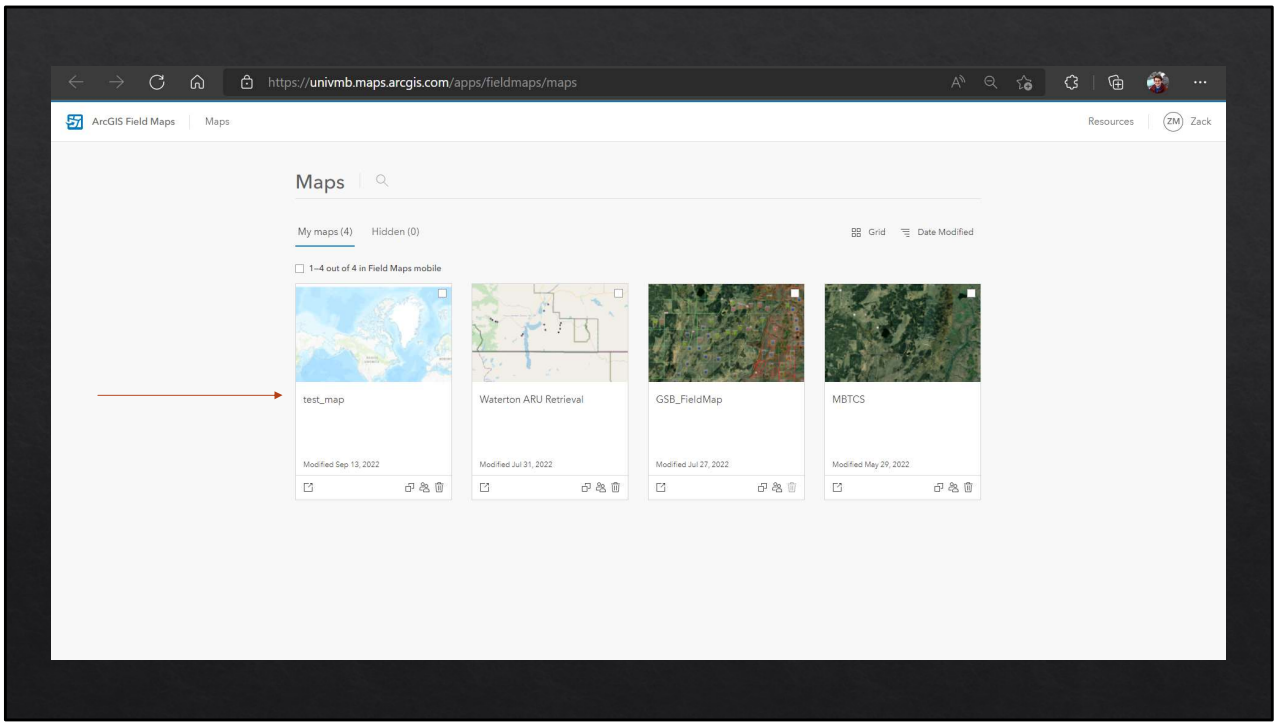


Here, if you go into the TEST_POLY layer and the TEST_TEXT field, you can see that I set the domain to be all of the species in AB! When you load this layer into a webmap, and then open that webmap in Field Maps, you will be able to select from the domains you've created!

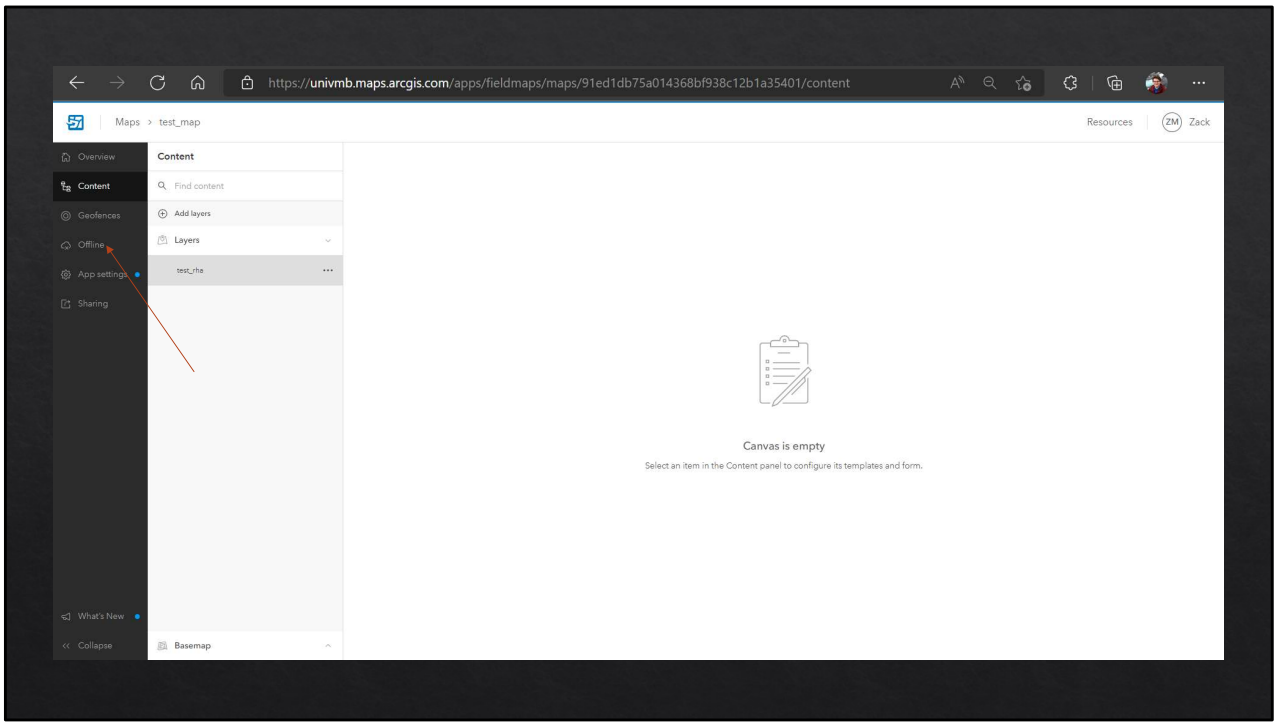

Field Maps Set Up
We have a map, now we set it up for collection



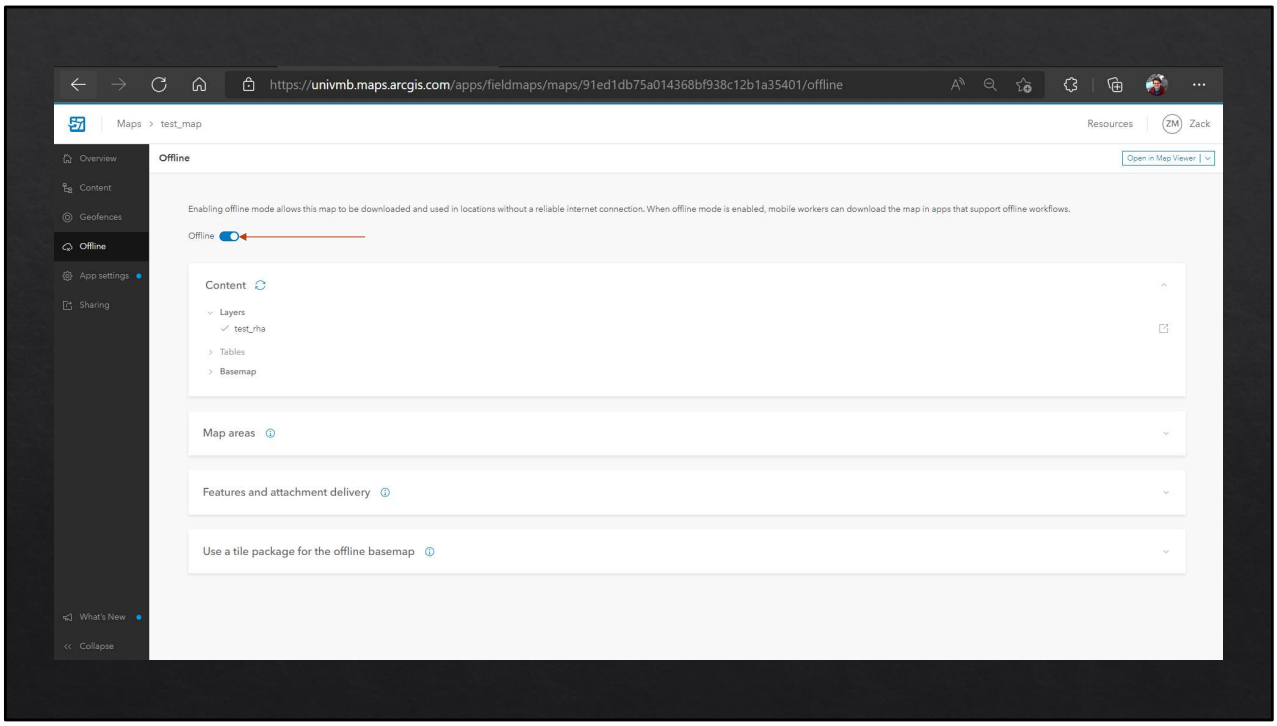
You can get to field maps from the Home tab.



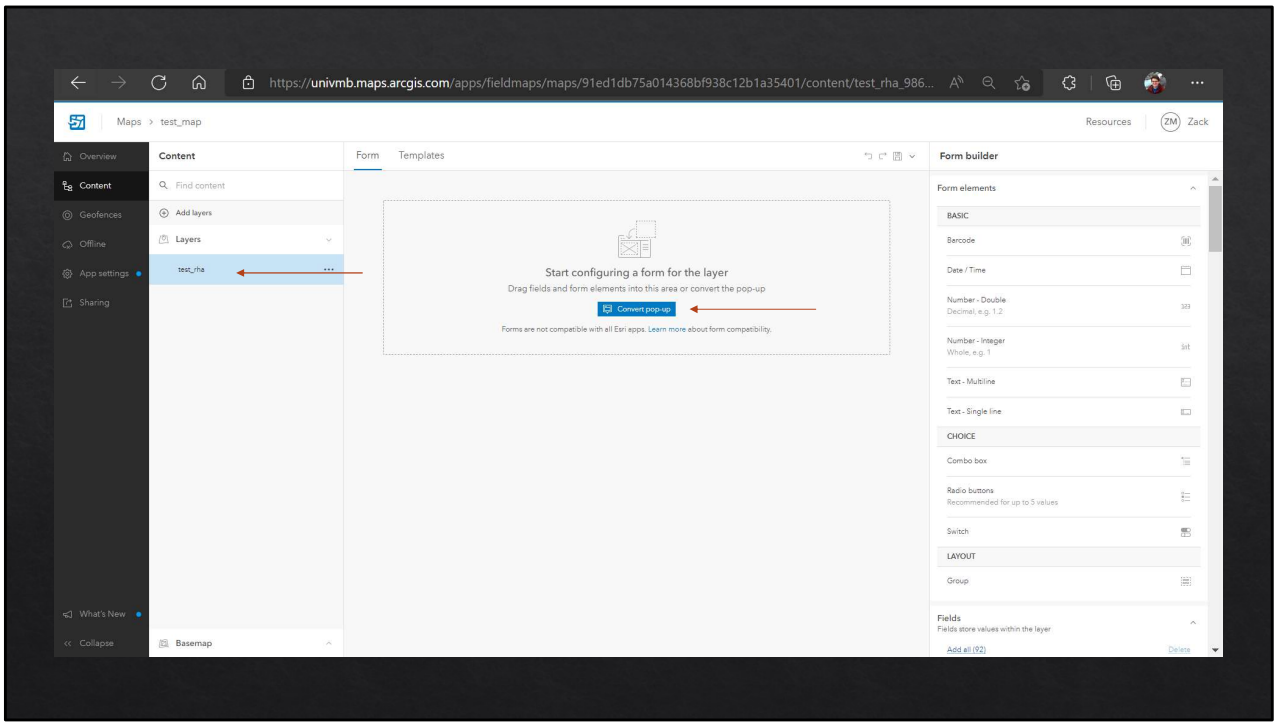
Now, your new map will be available to edit.



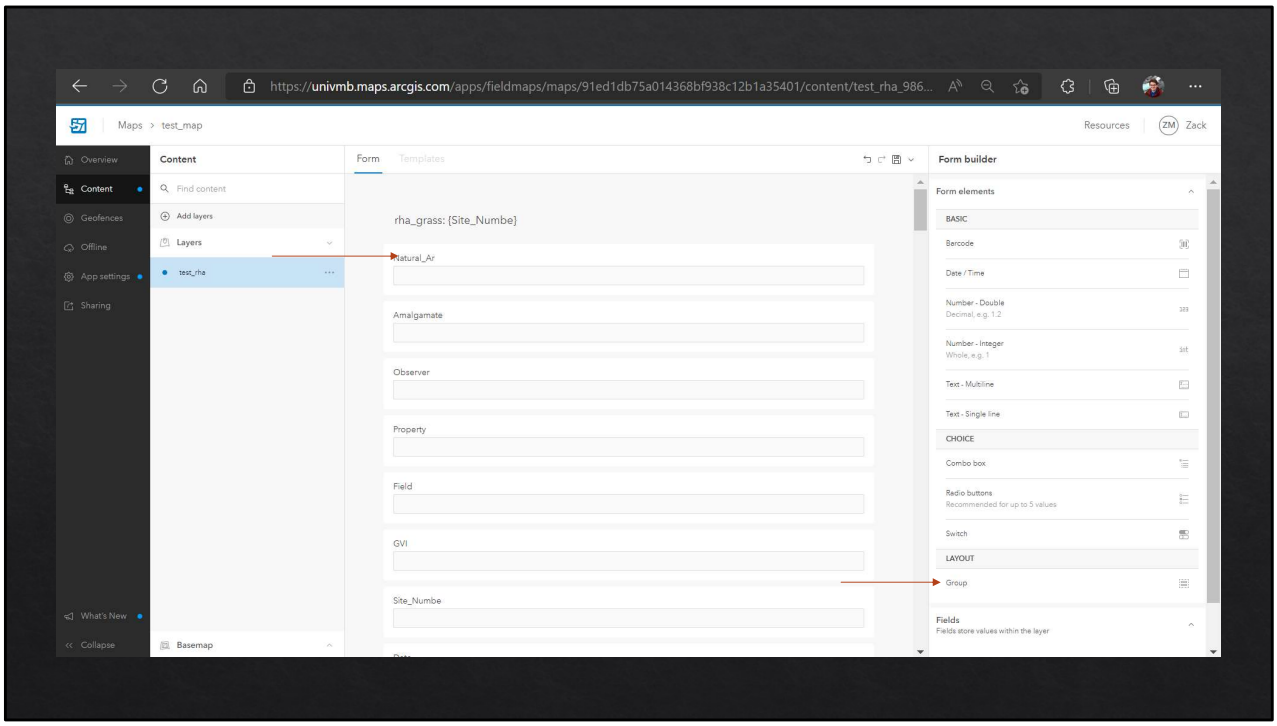
The first thing we'll do is check the offline settings.



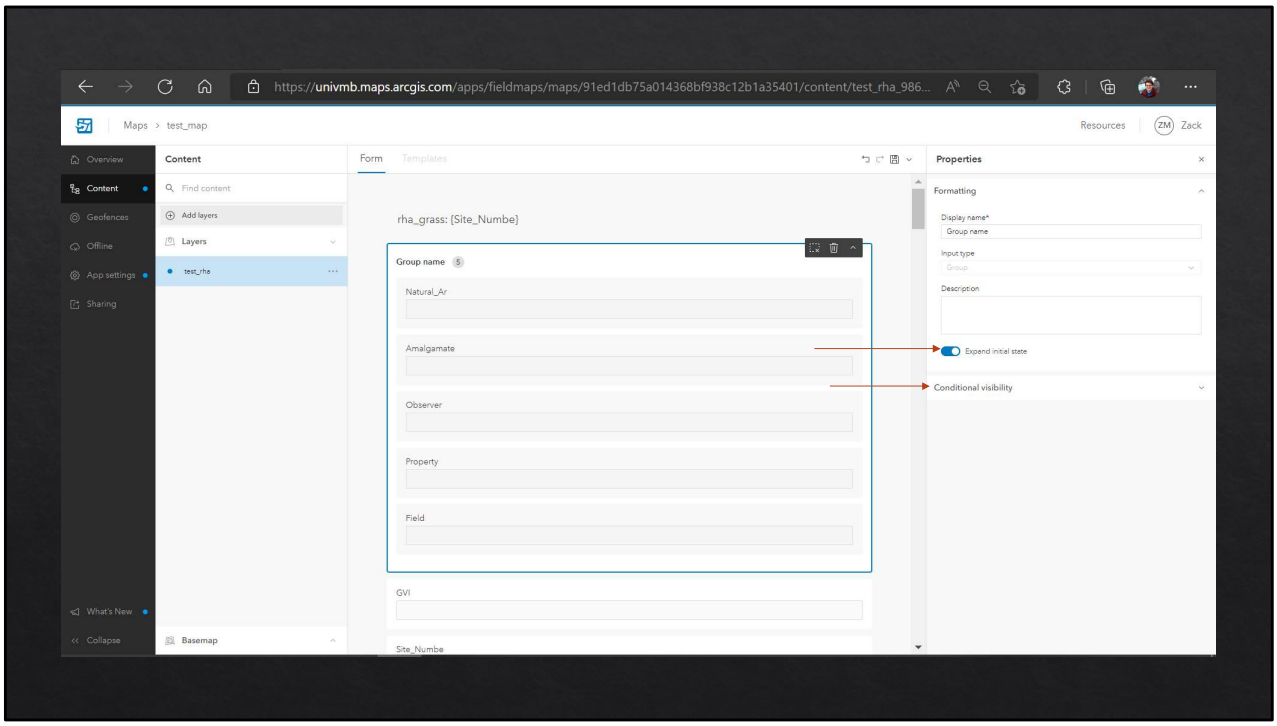
The Offline toggle allows one to download or ‘check-out’ portions of the map in the mobile app for offline use, collect data without an internet connection, and then ‘sync’ the data later. If the Offline toggle is off, there will be an issue with one of the layers. You should be able to automatically select an option to fix this.



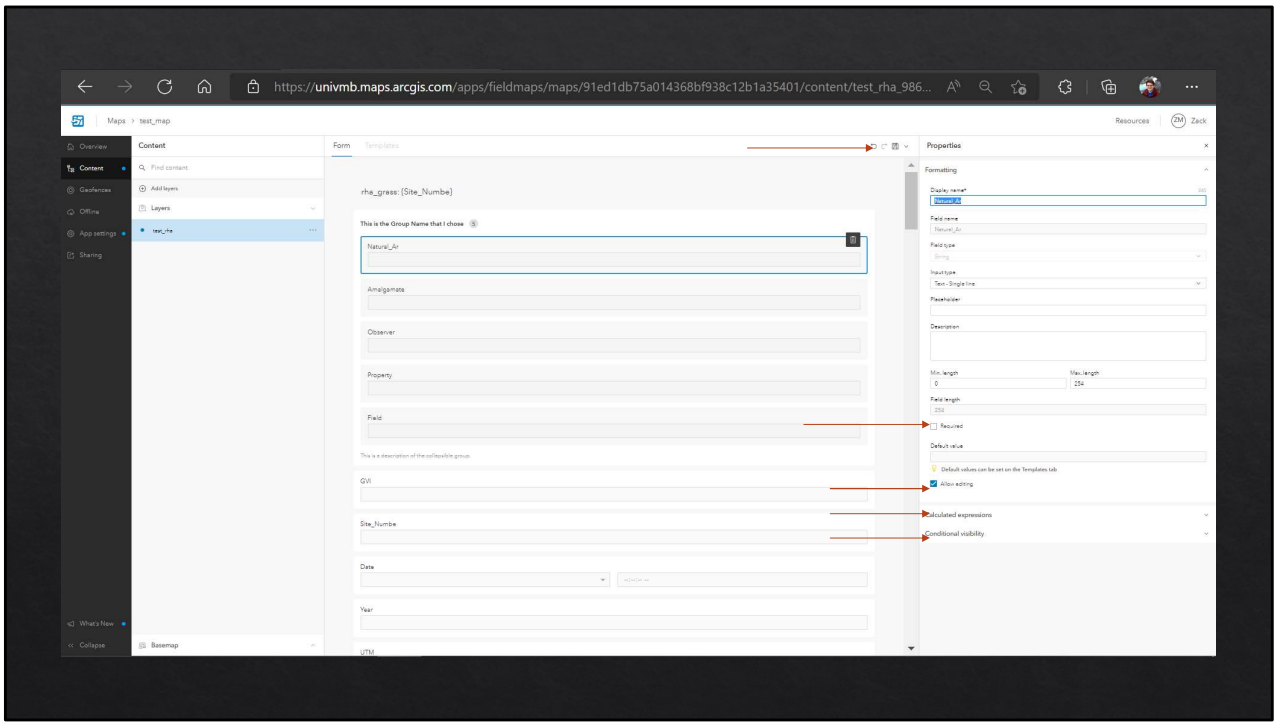
With offline settled, we can start to configure our forms. The easiest way is just to convert the pop-up, which you may or may not have edited in the “Visualization” section of the layer in question.



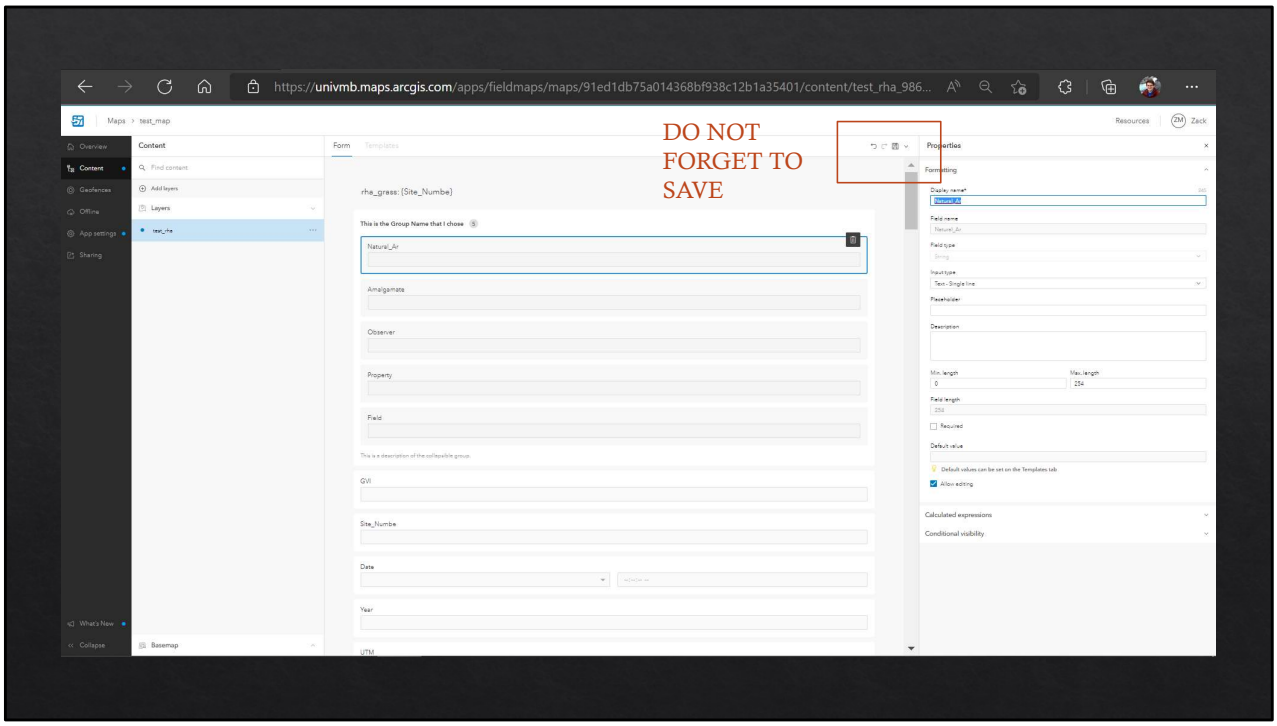
There are lots of options once you have a form started. It is important to note as well that the names here will default to the “Display Names” when you create the layer, so if you edit them there, they will pop up how you want to view them whenever you load the layer in Field Maps (and you won’t have to change them every time). My personal preference is to set up Groups, which allow you to collapse sets of fields into areas. You can drag the as many groups out as you want, and then drag fields into it.



With groups, you can toggle if you want the group to be expanded or collapsed when you first open the layer for entry in the app, and you can create dependencies for the values of a field using the Conditional Visibility. You can also add descriptions and change the name of the group.

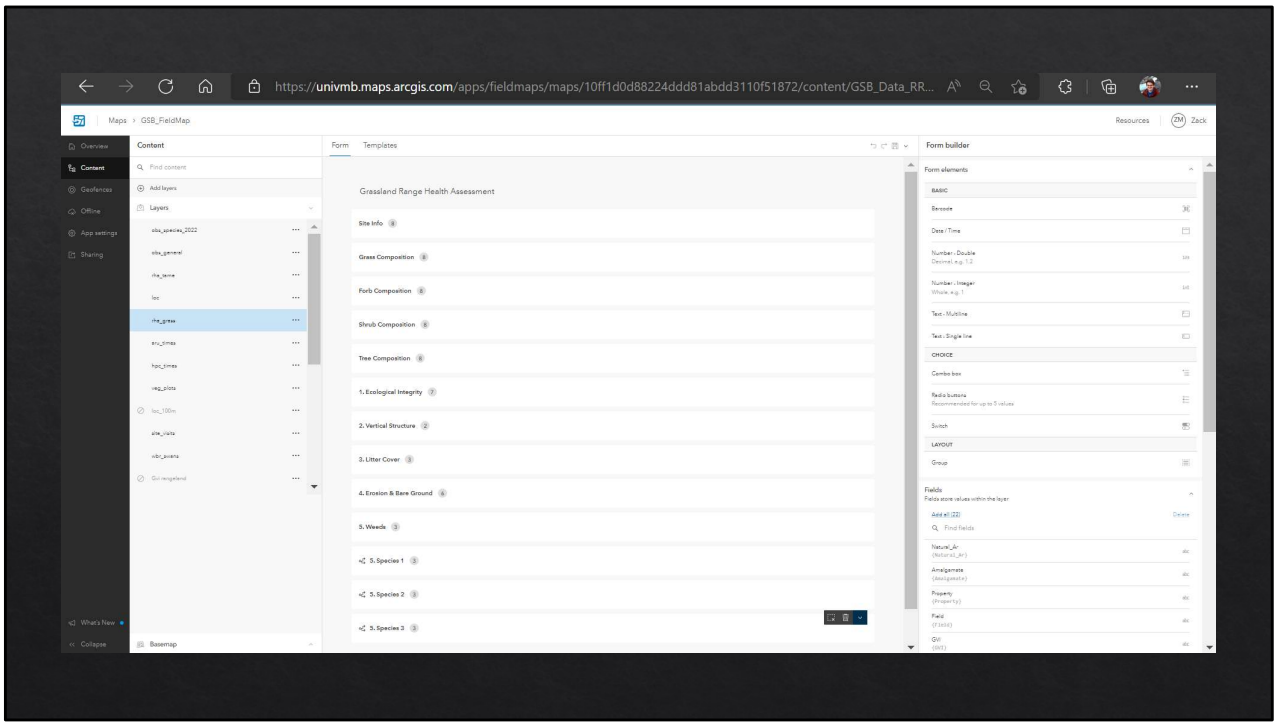


When you click on any individual field, you can change a lot of things. You can change the display name, add a description of the field, change the input type (depending on the field type), make it 'required' to submit the point, add a placeholder or default value, and add conditional visibility dependent on other fields or conditions. You can also set fields to autocalculate, which can be very helpful when you want to sum scores for different surveys. I know that reviewing lots of Range Health Assessments and other reports, people make mathematical errors in assessments, but this can help to solve that.



Don’t forget to save your changes REGULARLY. Sometimes the platform can glitch and erase your progress if you do too many edits without saving. It is also better to NOT have the Field Maps editor and the actual map open in ArcGIS Online at the same time because they can glitch and overwrite progress.

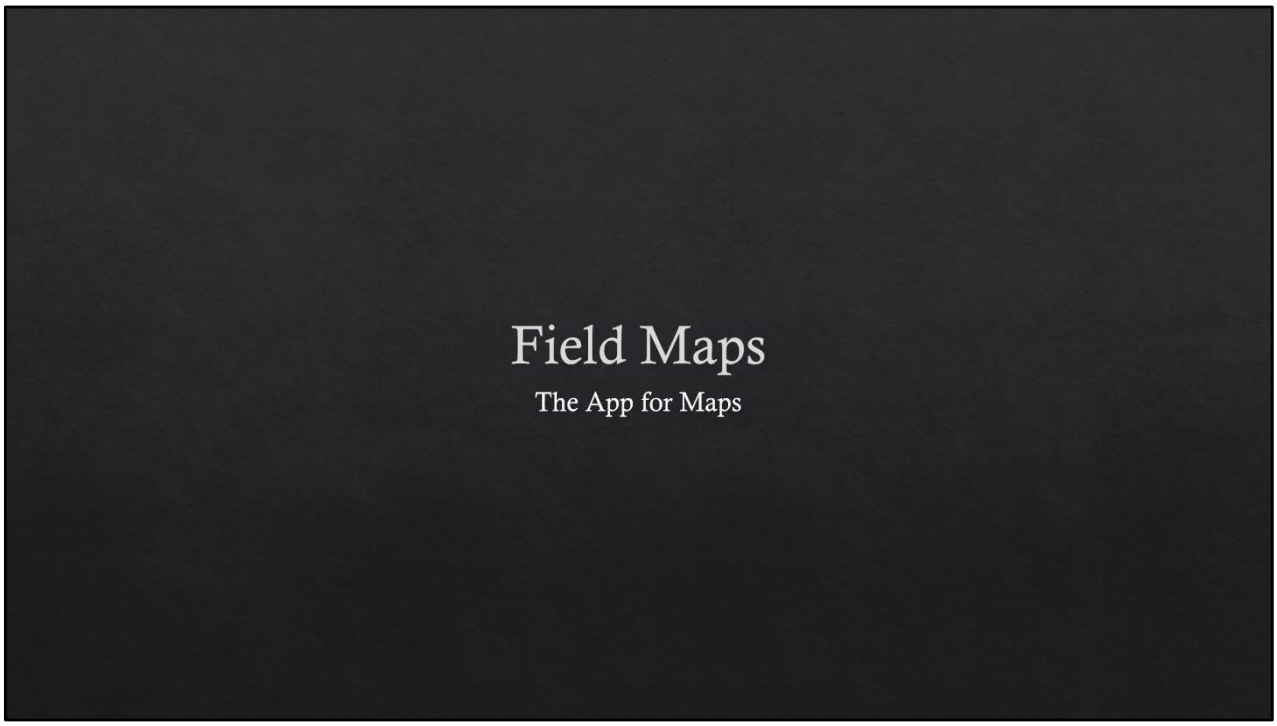
With some work, you can get to a very good looking, efficient form that will greatly increase the efficiency of your entry in field.



In this previously completed form, you can see that I have been able to organize over 75 fields into groups and have created conditional visibilities that show groups only in situations where they are necessary. This will be how the form opens in the app, with all the drop downs you've populated.

Tips and things to avoid

- Set up visualization in the layer settings so every time you open the layer onto a new map it adopts that specific symbology.
- IF you remove a layer from a map, it deletes all the formatting you have put into your field maps. This can be super frustrating if you spent time on a well-crafted form!
- Always click the Prevent Accidental Deletion box in settings. Always.
- IF you have complicated drop down lists, don't arduously recreate them in ArcGIS Online. Make the layers in ArcGIS Pro and then upload them. You cannot edit domains in ArcGIS Pro Desktop if the layer is already online.
- Save your field maps forms regularly to avoid errors, and do NOT have the map in ArcGIS Online and Field Maps open at the same time, because this can cause glitches that erase your progress.



So that was the Online Portion. Where we go from here is loading the information on field maps so you can actually collect the data!

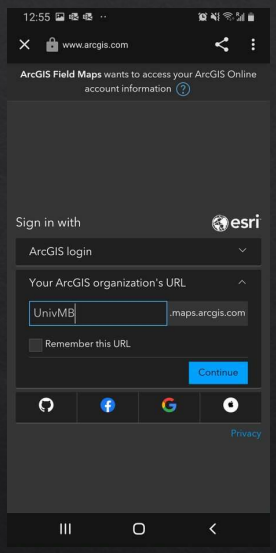
Open the App

Can download on Google Play or Apple Store onto a tablet or phone

As a special note: invest in a sizeable external battery and maybe a waterproof case. This will drain your battery super fast.

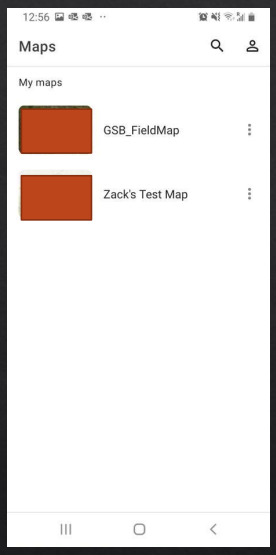
Sign In!

Same process as ArcGIS Online



Brings you to My Maps!

This is linked to all of the maps you have available for editing in your contents.

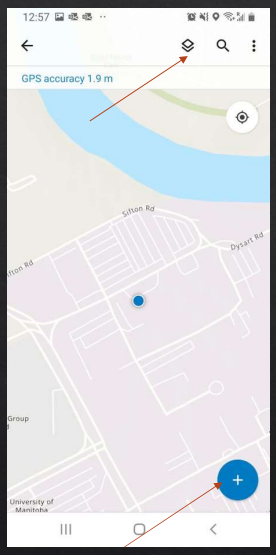


Open Map!

You're the blue dot.

You can look at the layers you have with the top button

You can add new features with the blue plus sign in the bottom



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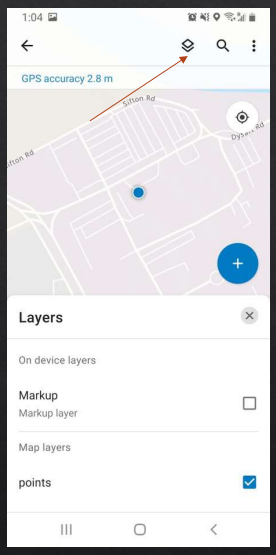


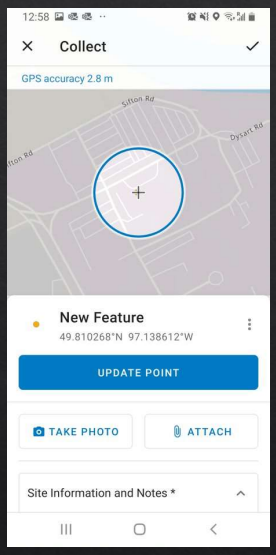
Collect Data!

Shows your GPS Accuracy

Allows you to attach photos (links to camera) or files

Shows your entry template as you entered in FieldMaps online

Drop downs populate to the domains you set up in ArcGIS Online



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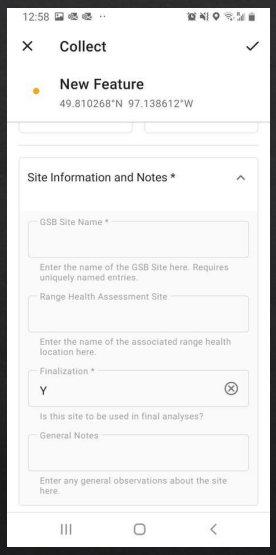

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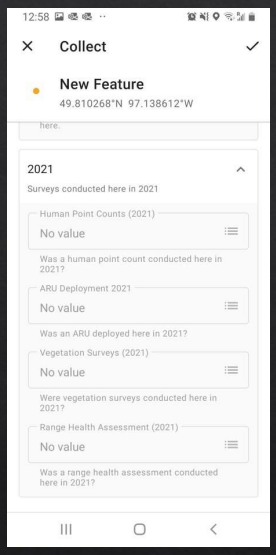

Collect Data!

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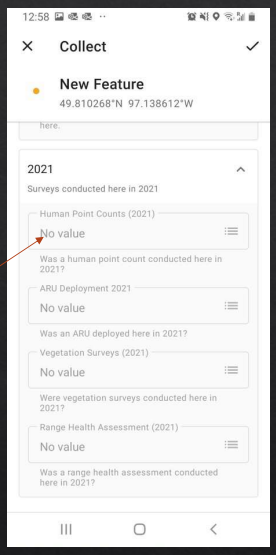
Drop downs populate to the domains you set up in ArcGIS Online

Click a field, enter some data!



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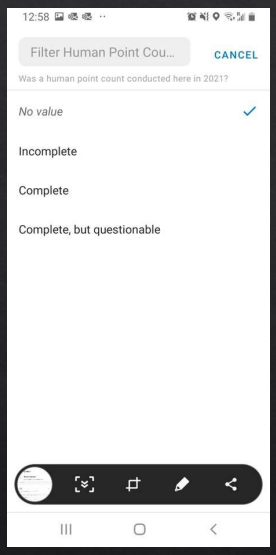

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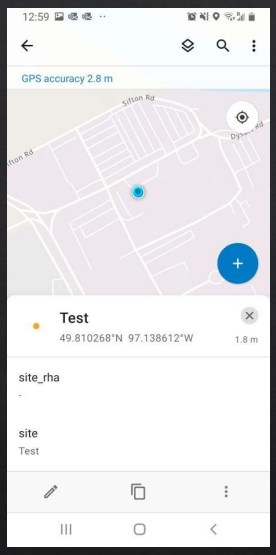
Shows your entry template as you entered in FieldMaps online

Drop downs populate to the domains you set up in ArcGIS Online

Click a field, enter some data!

View or edit any existing points!

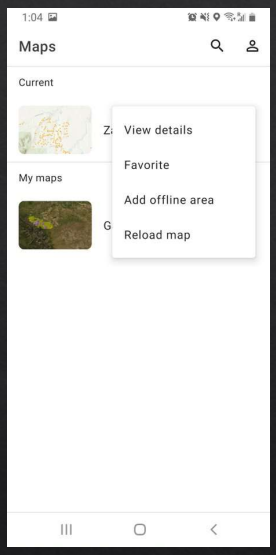


Add Offline Areas!

When an area is offline, you can collect data WITHOUT data!

TIP: In the field, keep your Wifi, Bluetooth, and Data OFF to save battery life.

Simply select Add Offline Area from the 3 Dots next to your map



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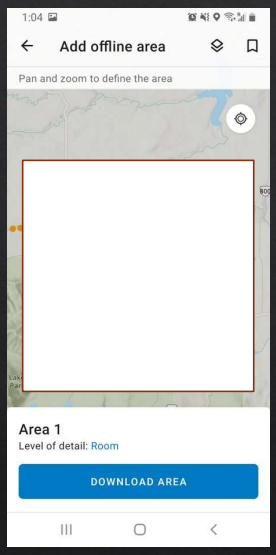
Put the box over the area you're going to be working



Add Offline Areas!

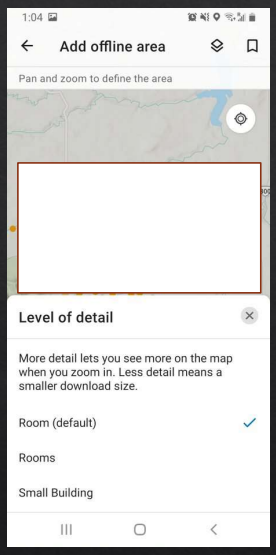
When an area is offline, you can collect data WITHOUT data!

TIP: In the field, keep your Wifi, Bluetooth, and Data OFF to save battery life.

Simply select Add Offline Area from the 3 Dots next to your map

Put the box over the area you're going to be working

And choose the level of detail (bigger thing, less memory required, quicker download)

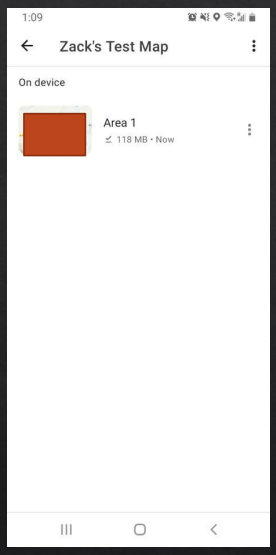


With Offline Areas

You can collect data in the field using just your GPS.

The data is stored locally until you SYNC

Click the three dots



With Offline Areas

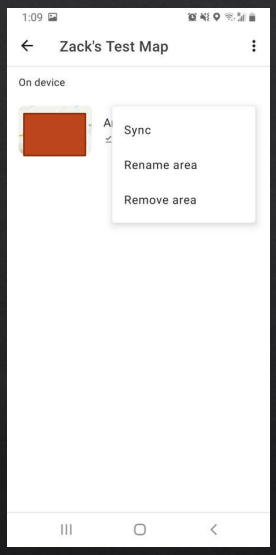
You can collect data in the field using just your GPS.

The data is stored locally until you SYNC

Click the three dots

And Select Sync to UPLOAD your data to the server

*THIS also DOWNLOADS updated data, but if you make changes outside of the App, it's best to REDOWNLOAD your offline area, or weird stuff happens



Connecting to R

- arcgisbinding package – Rdocumentation
  - Need to install into ArcGIS Pro, then download package 'arcgisbinding' in R
  - Can load layers from the online portal using their URLs in their info.
  - Uses different data class by default (.arcgis), but can be converted to your regular sp classes.

Dashboards

- Application accessible through ArcGIS Online Portal
- Can create visual depictions of data that updates in real time for public or internal viewing.

Survey123

- I have very little experience with this product, but it is definitely useful for public facing forms and for forms that don't explicitly need to incorporate a spatial component.
  - Vehicle checks
  - Observations at an existing monitoring station (ex. community science)
  - Quick surveys

Summary

- With this introduction, you now have the basics to:
  - Set up your database
    - From Scratch/ PreFab Template
    - Using an Excel Template
    - Using ArcGIS Pro Desktop
  - Get your database into ArcGIS Online,
  - Set-up your Field Maps data collection protocol, and
  - Collect your data in the App!

The possibilities from here are vast!

I am more than happy to help out in any other way that I can.

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