

**GEOG 4140/6140 – Winter 2021**  
**Lab 9: Web App Studio – Creation of a Citizen Science App**  
**Due Thursday, April 1<sup>st</sup> by 11:59 PM**

### **Overview**

In the past, field data collection was often relegated to the use of expensive and complicated GPS hardware and software. With today's prevalence of smartphones, geographic data collection is much simpler and accessible. In particular, the creation of mobile app-based services allows for quick and public access to free apps for a citizen science approach to data collection. For this lab, we will create a citizen science mobile app to record the location of trees throughout campus using Esri's AppStudio. Once built, we will field test the app by recording locations around campus for a variety of tree species.

The following resource may be of use in completing this assignment:

[Feature class basics](#)

[Create Feature Class](#)

[Add Field](#)

[Introduction to attribute domains](#)

[Domains view](#)

[AppStudio](#)

[Introduction to sharing web layers](#)

[Share a web feature layer](#)

[Configure Quick Report](#)

[Distribute your app](#)

### **Required Data (Sources)**

1. none

### **Workflow**

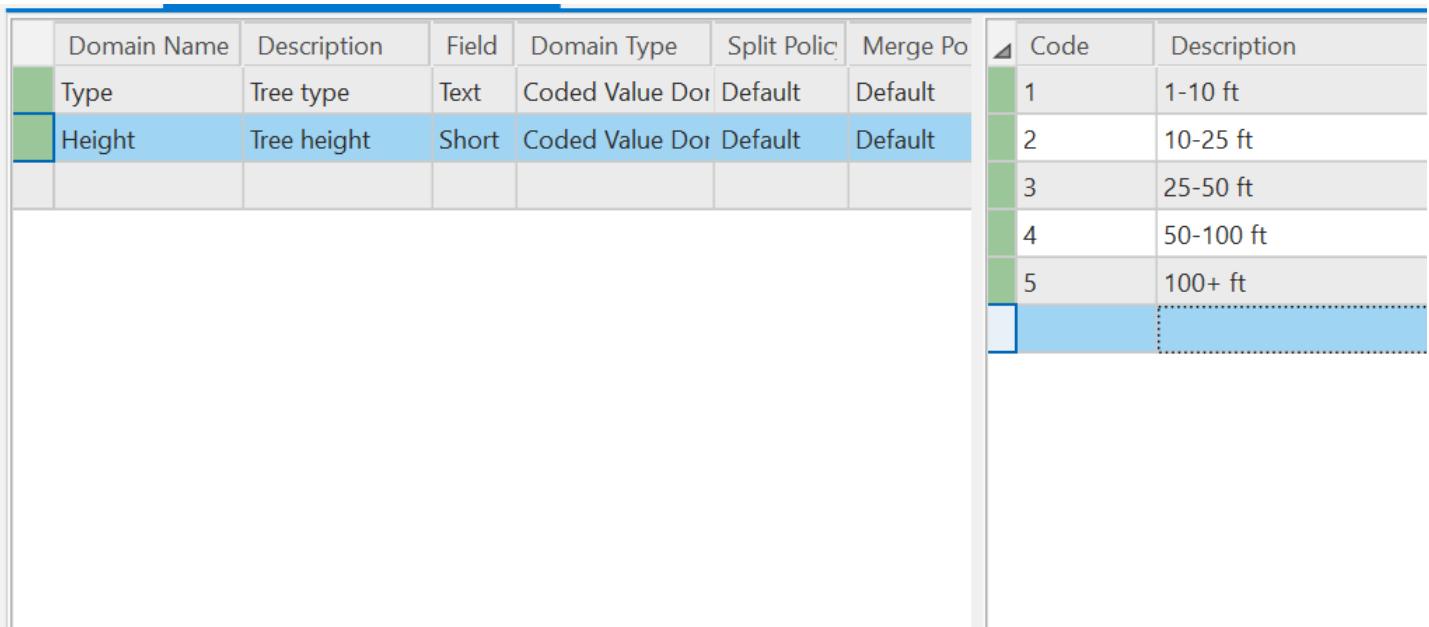
#### **Part 1: Local Data Creation**

1. Prior to creating the app, a public feature class needs to be created and hosted on ArcGIS Online. This public feature class will be used to record your geographic data from the field.
  - a. Create a new project in ArcGIS Pro titled *Lab09YourLastName* in your working directory for this lab.
  - b. Before starting any work on the feature class, login to your provided ArcGIS Online account in the top right of ArcGIS Pro. This will allow you to publish a feature service from your desktop to your online account.
  - c. Locate the **Create Feature Class** data management tool and create a new point feature class titled "UofU\_TreeSurvey\_YourLastName".
    - i. Make sure to choose a projected coordinate system focused on Utah.
    - ii. Add the following five fields to the point feature class:

Field Name	Field Type	Field Length
SPECIES	Text	50
SCIENTIFIC_NAME	Text	50

TYPE	Text	25
HEIGHT	Short	N/A
RECORDER	Text	20

- d. Add the point feature class to your map and set your symbology to be a tree or other green symbol that would best represent locations of trees around campus.
2. Next, we will create domains for the TYPE and HEIGHT fields. Domains are created within the working geodatabase and then applied to each field within a feature class.
- Open the Catalog pane and navigate to your working File Geodatabase where you created the point feature class.
  - Right click on the geodatabase and select Domains to open the domain view. Create a New Domain for TYPE (Text with either Coniferous or Deciduous) and another for HEIGHT (Short type, set at least 5 logical categories for tree heights, in feet).



The screenshot shows the ArcGIS Catalog pane with two domain tables. On the left, a 'Domains' table lists 'Type' and 'Height' domains. The 'Type' domain is a coded value domain with two values: 'Coniferous' and 'Deciduous'. The 'Height' domain is a short-coded value domain with five height categories: 1 (1-10 ft), 2 (10-25 ft), 3 (25-50 ft), 4 (50-100 ft), and 5 (100+ ft). On the right, a separate table shows the height categories with their corresponding codes and descriptions.

Domain Name	Description	Field	Domain Type	Split Policy	Merge Policy
Type	Tree type	Text	Coded Value Domain	Default	Default
Height	Tree height	Short	Coded Value Domain	Default	Default

Code	Description
1	1-10 ft
2	10-25 ft
3	25-50 ft
4	50-100 ft
5	100+ ft

- c. Save when finished.

3. Now, open the attribute table of your feature class and open the Fields View.
  - a. Assign the Type Domain to your TYPE field and the Height Domain to your HEIGHT field. Save the changes made to your attribute table.

The screenshot shows the 'Fields' view for the 'UofU\_trees' feature class. The title bar says 'Fields: UofU\_trees'. The current layer is set to 'UofU\_trees'. The table lists the following fields:

Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default
<input checked="" type="checkbox"/>	OBJECTID	OBJECTID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		
<input type="checkbox"/>	Shape	Shape	Geometry	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	Species	Species	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	Scientific_Name	Scientific_Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
<input type="checkbox"/>	Type	Type	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Type	
<input type="checkbox"/>	Height	Height	Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric	Height	
<input type="checkbox"/>	Recorder	Recorder	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>			

At the bottom, there is a message: 'Click here to add a new field.'

4. Create a test point anywhere on campus and check the attribute table to make sure your dropdowns work for Type and Height by clicking on the Null data entry and selecting an available option.
  - a. Add information detailing the test case so that it is obvious that this is not a real tree position recording.
5. Once satisfied with your feature class attributes, symbology, and domains, you will need to publish your map as a feature service layer for use in your app. Click on the Share tab on the top of the program and select Publish Web Layer.
  - a. First remove the basemap, as it will cause issues if left enabled.
  - b. Use the Share As Web Layer menu to add a Name and Description.
  - c. Make sure the Layer Type is set to Feature and that the Sharing Options are all selected.
  - d. In the Configuration tab, make sure “Enable editing and allow editors to: Add, update, and delete features” is checked.
  - e. Analyze the publication for any errors and then Publish when ready.
  - f. This will create a new Hosted Feature Layer in your ArcGIS Online account that will be used in your app to record field data going forward.
  - g. Save your project and close ArcGIS Pro.

## Part 2: Setting Parameters in ArcGIS Online

1. Open a browser and sign into ArcGIS Online ([www.arcgis.com](http://www.arcgis.com)). Under the Content tab, you should now see the Feature Layer you just created.

- a. Click on your Feature Layer to view the item details.
  - i. Scroll down to the Layers section to see the trees layer you created previously. Select “Enable Attachments” to allow photos and videos to be added to this layer.
  - ii. Continue to scroll down to the bottom of the page. Notice the URL found in the bottom right corner of the page. Make a note of this URL as we will need it when creating our app. This URL will link our feature layer to our app, which allows us to record data (in this case, we can record the location of trees found on campus).
- b. While still viewing the item details of your Feature Layer, scroll to the top of the page and select Open in Map Viewer.
  - i. Within the new map that opens, zoom to the University of Utah and click Save. Once you click Save, you will be asked to give your map a Title, Tags, and Summary.
  - ii. We now need to identify the map’s Web ID, which can be found in the URL of the map. In the example below, this particular Web ID is highlighted in yellow.



- iii. Make a note of your map’s ID number as we will need this when creating the app. By default, your app will display the contiguous United States; however, by applying this Web ID, we can have our app zoom immediately to the University of Utah which will be more convenient for the users of our app.

2. Go to the Contents tab and make sure that your map is saved as Public.
3. Now that you have the URL of your Feature Layer, the Web ID of your Map, and you’ve ensured your web map is public, you are ready to create your app in Part 3.

### **Part 3: Online Creation of App**

1. Open AppStudio ArcGIS and sign in using your ArcGIS account.
2. Click on “New App” and then select the Templates tab.
3. There are four pre-customized options when creating an app in AppStudio: 3D Scene Viewer, Map Tour, Map Viewer, and Quick Report. For this lab, we will focus on the Quick Report as a way to create and utilize a citizen-science reporting app for the easy collection of field data.
  - a. Select “Quick Report”, give your app a title, and then Create.
4. Now that the Quick Report template has been added to your App Gallery, make sure your app is selected and then click “Settings”. We will now customize the app, allowing viewers to immediately recognize that this app can be used to identify trees at the University of Utah.

- a. Under the Details tab, give your app a Title, Summary, and Description.
    - i. Change the thumbnail image of your app by uploading any free stock photos you feel would represent a tree reporting app.
      - 1. Utilize websites such as FreImages or Pexels for this part.
  - b. Under the Resources tab, update the icon of your app (you may want to use the same image used for your thumbnail).
  - c. Under the Properties tab, you may wish to change the background and/or logo image of your app, including background colors and text.
  - d. Most importantly, go to the Properties tab and then Form. Here, we will add our Web ID and Feature Layer to our app (see Part 2).
    - i. Paste your web map's ID under "Web Map ID for the Map to choose location."
    - ii. To add the Feature Layer, paste the URL under "Feature service address."
    - iii. Enter "0" under "Layer IDs of the feature service."
  - e. Make sure you select "Apply" to save your changes.
5. We will not be building the actual app to publish to the Google Play Store or iOS App Store due to both licensing and time constraints. However, we can test your constructed app using Esri's AppStudio Player, allowing for real world data recording.
- a. While in the App gallery of AppStudio, select the app you just created and click Upload so that you can test your app from your mobile device.

#### **Part 4: Data Collection**

1. Now that your app has been created and saved, it will be accessible via the AppStudio Player on your mobile device, which is available through either the Google Play Store or the iOS App store.
  - a. If you do not have a smart phone or are unable to access AppStudio Player, you will need to group up with someone who has it on their phone. The data entered will be placed into their feature class, so you will need to notify the Lab Instructor of whose feature class your records will be stored in.
  - b. Navigate to the store on your device, download, and install AppStudio Player (it is free).
2. After installation, open AppStudio Player and sign in with your ArcGIS Online credentials.
  - a. After signing in, you should be able to view the current version of your app by going to Cloud > My Apps, then download your app to your device. After downloading, the app will be viewable on the Home screen.
    - i. Alternatively, you can scan the QR code available from AppStudio to bring up the most current version of your app.
3. Test the app to make sure you can navigate through all options and save a feature as a test case.
  - a. The species and scientific name are text inputs (found on the trees around campus), while type and height will be drop downs based on the domains you created earlier.

The Recorder input will be your own name.

4. We will record the location of five different labeled trees around campus.  
COVID UPDATE!! (Due to COVID you don't have to go to campus. Head to the following website that maps campus trees. Select five tree and map them using your app.)
5. [https://universityofutah.maps.arcgis.com/apps/MapTour/index.html?  
appid=7c12aab3af204f35b74c22a8febcaf50](https://universityofutah.maps.arcgis.com/apps/MapTour/index.html?appid=7c12aab3af204f35b74c22a8febcaf50)  
OR  
<https://universityofutah.maps.arcgis.com/home/index.html>  
click on "tree tour"
  - a. President's Circle and the area in-between the Campus Store and the Office of Admissions will guarantee that you find at least five labeled specimens.
6. To check that your values were correctly saved, you can view your uploaded feature in the content tab of ArcGIS Online.

### **Deliverables**

1. The URL of a web map showing the UofU\_Trees\_YOURNAME feature class with at least five different tree species and the associated attributes for each. (10 points)
2. A short write up outlining another potential citizen science app that could be created using this tool. Detail the geographic feature class that would be ideal for this type of app including the attributes that you would want to record at each location. (5 points)