Web GIS with ArcGIS Online

Objectives

In this two-day course, you will learn to:

- Administer ArcGIS Online organizational accounts.
- Connect to REST services.
- Publish data from ArcGIS Pro to your ArcGIS Online content.
- Create new hosted feature layers that can be edited by multiple users.
- Symbolize data and configure pop-ups.
- Use web templates to generate web pages.
- Use Web AppBuilder for ArcGIS to create web apps.
- Use AppStudio for ArcGIS to create native mobile apps.
- Create dashboards to monitor your data.

Introduction

Welcome to the WVAGP two-day course on web mapping using **ArcGIS Online**. After this course, you should be able to use ArcGIS Online and related technologies to create effective and dynamic web and mobile apps using your own data. This course has been designed for professionals that are familiar with GIS technologies, such as desktop applications, but may be less familiar with web mapping technologies. This course does not require coding or scripting. Instead, we will use the tools made available in the ArcGIS Online environment.

This course has been structured into four separate modules. Two modules will be completed each day, one in the morning and one in the afternoon.

Module 1: ArcGIS Online Administration and Working with Data

In the first module we will focus on how to administrate ArcGIS Online organizational accounts, and we will start working with data layers in web maps. You will also learn how to publish data layers to your ArcGIS Online content, change layer symbology, and configure pop-ups.

Module 2: Hosted Feature Layers and Web App Templates

Next, you learn to produce an empty **hosted feature layer** that can be edited in a web or mobile app. You will then create a web app using a template.

Module 3: Creating Web and Mobile Apps

Starting on the second day, you will learn to produce **operations dashboards** to monitor your data and create Geoform and mobile apps to collect data. By the end of this session, you will have developed desktop and mobile apps to monitor your data and collect new data.

Module 4: Working with Web AppBuilder for ArcGIS and Adding Maps to Webpages

The last module will focus on more advanced techniques for generating apps. You will create a new web app using **Web AppBuilder for ArcGIS**. Lastly, you will embed a map into a HTML webpage.

Now that you know the goals and structure of this short course, let's get started.

Module 1: ArcGIS Online Administration and Working with Data

Background

You will be provided with an ArcGIS Online account that will allow you to work through this course. This account will be linked to the West Virginia University organization. If you would like to implement the techniques you will learn here within your own organization, they will be applicable to your own organization's ArcGIS Online account.

This first section is just a demonstration. Since it requires administrative privileges within an ArcGIS organizational account, you will not be able to follow along.

Within an organization, members can be assigned to different **user types** based on how the member will use ArcGIS Online. The following user types are available:

Viewer: allows member to view items that have been shared with them by other ArcGIS Online users.

Editor: allows member to view and edit items that have been shared with them by other ArcGIS Online users.

Field Worker: allows member to view and edit items that have been shared with them by other ArcGIS Online users with a primary focus on field apps.

Creator: allows member to view, edit, create, and share content.

GIS Professional: allows member to view, edit, create, and share content. Member also has access to the ArcGIS Pro desktop application.

Members can also be assigned to **roles**, which define the set of privileges assigned to a member within the organization. The following roles are available:

Viewer: allows member to view items that have been shared with them by other ArcGIS Online users. The member will also be able to join groups within the organization.

Data Editor: allows the member to view and edit data. The member will also be able to join groups within the organization.

User: allows member to view items that have been shared with them by other ArcGIS Online users. Users can also create maps and apps, edit features, add items, share content, and create groups.

Publisher: allows member to have all the privileges of users plus the ability to publish features and map tiles as hosted web layers.

Administrator: allows member the same privileges as publishers plus the ability to manage the organizational account and other users.

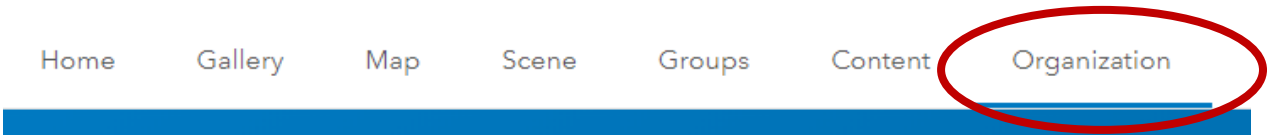
In this course, you will be assigned to the creator user type and to a publisher role. This will allow you to create content and apps. If you would like to learn more about user types and roles, please reference the following ESRI webpage: https://doc.arcgis.com/en/arcgis-online/reference/roles.htm.

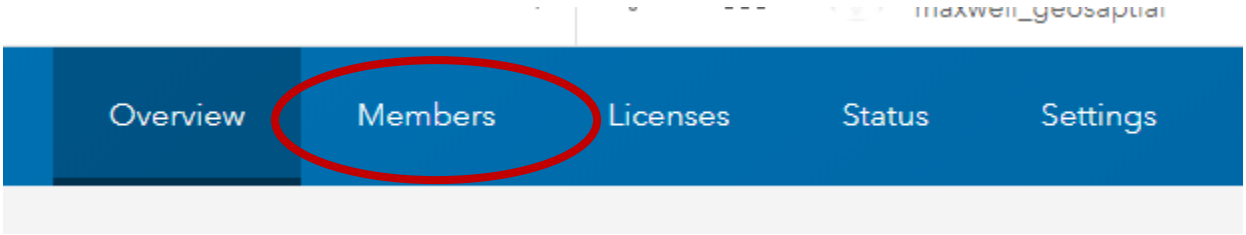
Adding Members

Administrators are able to add members to an organizational account. In order to be added to an organizational account or have your user type or role changed, you will need to contact one of the administrators for your organization. Administrators have additional roles, including the ability to manage and allocate credits, manage add-on licenses, delete content or user accounts, and change user passwords. Here, I will describe the process of adding a new user.

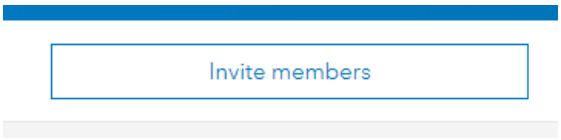
- To add a new user or multiple new users, an administrator will first need to log into ArcGIS Online: https://www.arcgis.com/home/index.html.

- Once logged in, the administrator will then need to navigate to the Organization Tab followed by the Members Tab. Note that if you are an administrator, ArcGIS Online should automatically load to the Organization Tab.





- Within the Members Tab, all current members will be listed with their remaining credits, last login date, user type, and role. To add new members, click on the Invite Members Button.



There are three options for adding members:

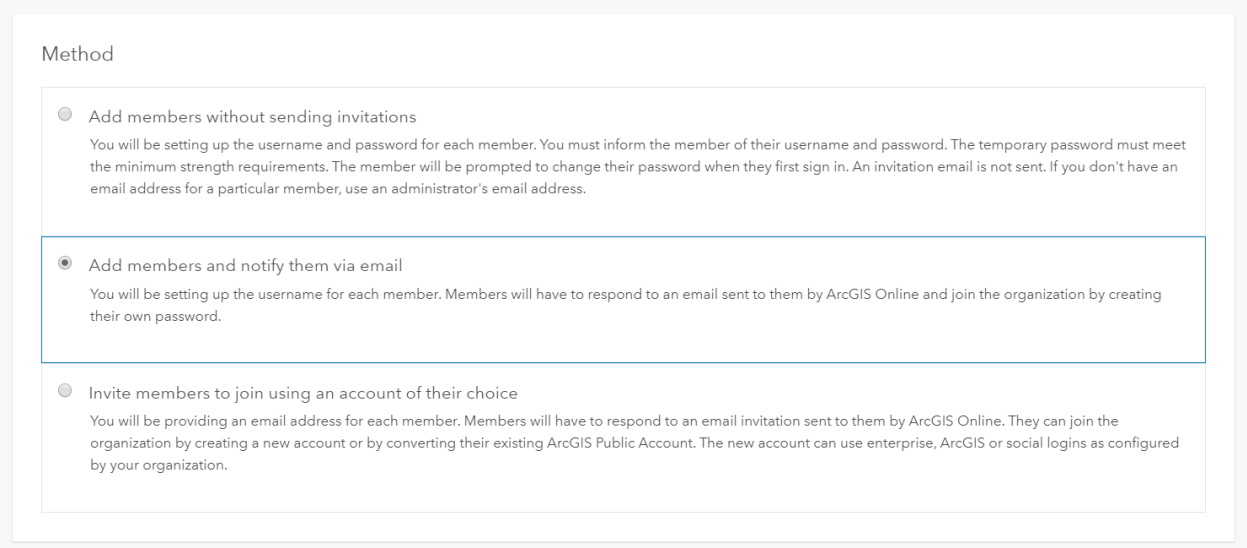
Add Members Without Sending Invitation: you will setup a username and password for each new member then notify the member manually.

Add Members and Notify them Via Email: you will set up a username for each member. The member will then respond to an email to finish setting up the account, including creating a password.

Invite Members to Join Using an Account of Their Choice: you will provide an e-mail address for each new member. The member will then select their own username and password.

Here, I will demonstrate Add Members and Notify them Via Email for multiple new users.

- Select Add Members and Notify them Via Email.



- On the next screen, select New members from file.

The next screen will ask you to provide a CSV file with the appropriate information to invite the new users. This CSV file must contain the following fields: First Name, Last Name, Email,

Username, Role, and User Type. The image below provides an example of an appropriately formatted CSV file generated using Microsoft Excel.

	A	B	C	D	E	F
1	Last Name	First Name	Email	Username	Role	User Type
2	A last name	A first name	email@something.com	newuser1	Publisher	Creator
3						

- Upload your correctly formatted CSV file then select Next.
- Review the new account information on the next page to make sure it is correct. If it is correct, select Next.

The next screen (Set member properties) allows you to manage licenses, groups, credits, and settings. Under the Add-On Licenses, you can allow access to additional ESRI products, such as the ArcGIS Pro desktop application and ArcGIS AppStudio for ArcGIS. Note that your accounts have been enabled to allow access to ArcGIS Pro and AppStudio for ArcGIS, which we will use in this course.

The Groups area allows you to add a new user to a group. We will not be using groups in this course. The Esri Access area allows you to grant access to ESRI resources, like GeoNet. The Set credit allocation area allows you to set a credit allocation for the new users. This is good practice, especially if you want to avoid a single user using too many credits. If a user needs additional credits, more can be added at a later date.

- Make any necessary changes then select Next.

The last page allows you to review and confirm the new members. You can also generate an e-mail to send to the new members.

- Click Add Members to finalize the process.

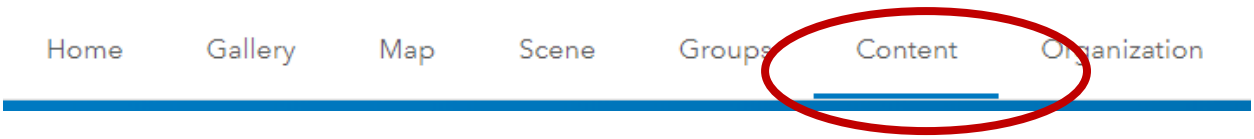
That's it! Following this process, you can add new members to your organization and manage their account settings and access if you are an administrator.

Working with Content and Data in a Web Map

You can complete the rest of the exercises in this document with the provided ArcGIS Online account.

We will now move on to some common tasks performed by publishers, namely creating new data and linking to existing content. Throughout this course, you will create several web maps and apps that allow users to view, edit, and add points of interest across the state. You will begin by creating a new web map.

- Log into ArcGIS Online using the account that was provided to you (https://www.arcgis.com/home/index.html).
- Once logged in, navigate to the Content Tab.



The Content Tab lists all of the content that you have stored within ArcGIS Online including: web maps, web scenes, web map applications, native applications, hosted feature layers, tile layers, vector tile layers, and dashboards. Since this is a new account, you will not have any content listed. You will start by creating a new web map.

- Create a new folder in which to store your products by selecting the new folder icon on the left side of the screen. I named mine webgis_wvagp.

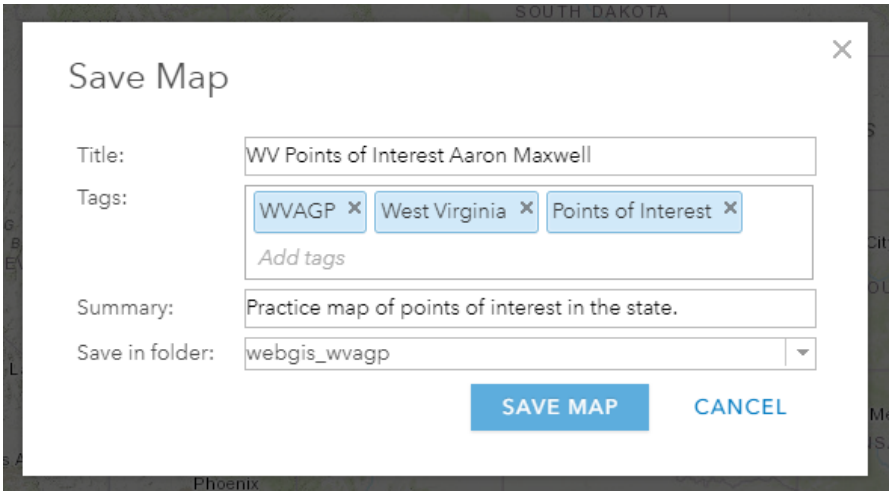
We will now explore creating a new web map.

- Click on the Map Tab. This will initiate a new map.

In ArcGIS Online, similar to the desktop software, maps store 2D projected maps while scenes store 3D local or global scenes.

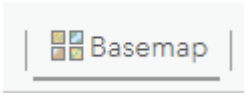
- Before editing the map, click Save followed by Save to save it to your content. Fill out the Save Map window with the information below then click Save Map.
  - Title = "WV Points of Interest YOUR NAME"
  - Tag = West Virginia, WVAGP, Points of Interest (Click enter between each tag to add them as separate tags)
  - Summary = "Practice map of points of interest in the state."
  - Folder = Save to your new folder.

In ArcGIS Online, titles and tags are required. However, the summary is not required. Tags are used to search for content within your organization and within ArcGIS Online as a whole.

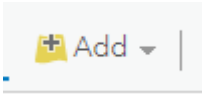


You now have a web map! However, there's not much going on yet. The map loads with a default basemap, the ESRI topographic basemap. However, there are no operational layers. Before we move on, here are some explanations of buttons within ArcGIS Online.

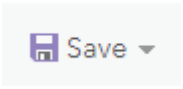
- The basemap can be changed using the Basemap Button.



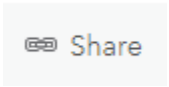
- New data layers or basemaps can be added using the Add Button.



- Maps can be saved using the Save Button. You can also save a copy using Save As.



- Maps can be shared using the Share Button.



Before we start adding layers, let's discuss some of the different types of layers that can be used in web maps. Due to file size and transfer speeds, it is generally not possible to use traditional vector and raster data layers for all layers within a web map. So, new data types have been defined for use on web maps.

Hosted Feature Layer/Feature Layer: allows web clients to retrieve vector features and update feature data on the server. These data are vector data layers that can be symbolized and edited. Feature layers stored on ArcGIS Online under your account are called **hosted feature layers**.

Raster Tile Layer: map tiles are generated in advance and return data in an image format, such as JPG, PNG, or GIF. Think of these as pictures of your data that are tiled, can change with scale, and cannot be updated as the data changes. When using raster tile layers, you do not have access to the raw geospatial data.

Dynamic Raster Tile Layer: generates maps on the fly and return data in an image format, such as JPG, PNG, or GIF. Think of these as pictures of your data that are tiled, can change with scale, and can be updated as the data changes. When using dynamic raster tile layers, you do not have access to the raw geospatial data.

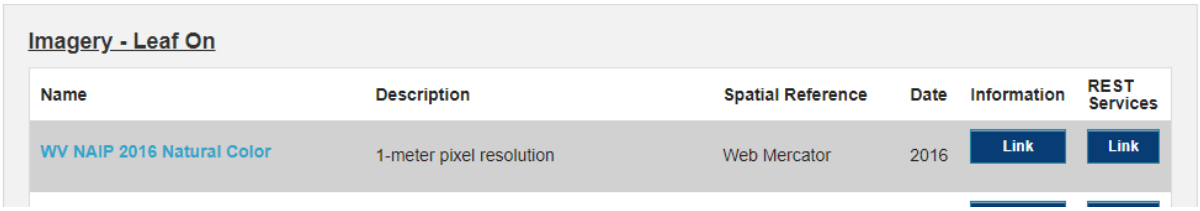
Map Image Layer: pictures or tiles of the data are sent to the client. However, the vector data from which the tiles originate are still available, so that data can be visualized and queried.

Imagery Layer: allows clients to access raw raster data.

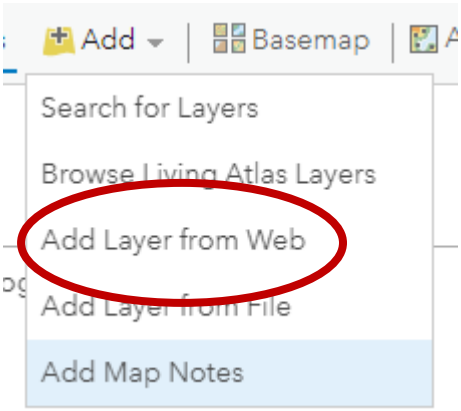
Vector Tile Layers: Cached vector graphics data and the information for rendering the vectors. This allow you to change the symbology of the layers, which is not possible with dynamic and tiled map services.

This is not an exhaustive list. However, it highlights some of the available layer types that are commonly used in web maps.

You will start by adding a new data layer to the map from the West Virginia GIS Technical Center GIS Data and Services page: https://www.mapwv.gov/gis_services.html. This page uses **REST**, or **representational state transfer**, which allows for web services, such as map services, to be provided from a server to a client. Specifically, you will add a raster tile layer of summer 2016 aerial imagery from the National Agriculture Imagery Program (NAIP) for the entire state. If you navigate to the West Virginia GIS Technical Center GIS Data and Services page, this layer is listed as WV NAIP 2016 Natural Color under Imagery – Leaf On. Clicking on the Link Button associated with this layer under REST Service will load a page dedicated to this layer. This URL can be used to link to the data in your web map.



- In your new web map, click Add followed by Add Layer from Web.



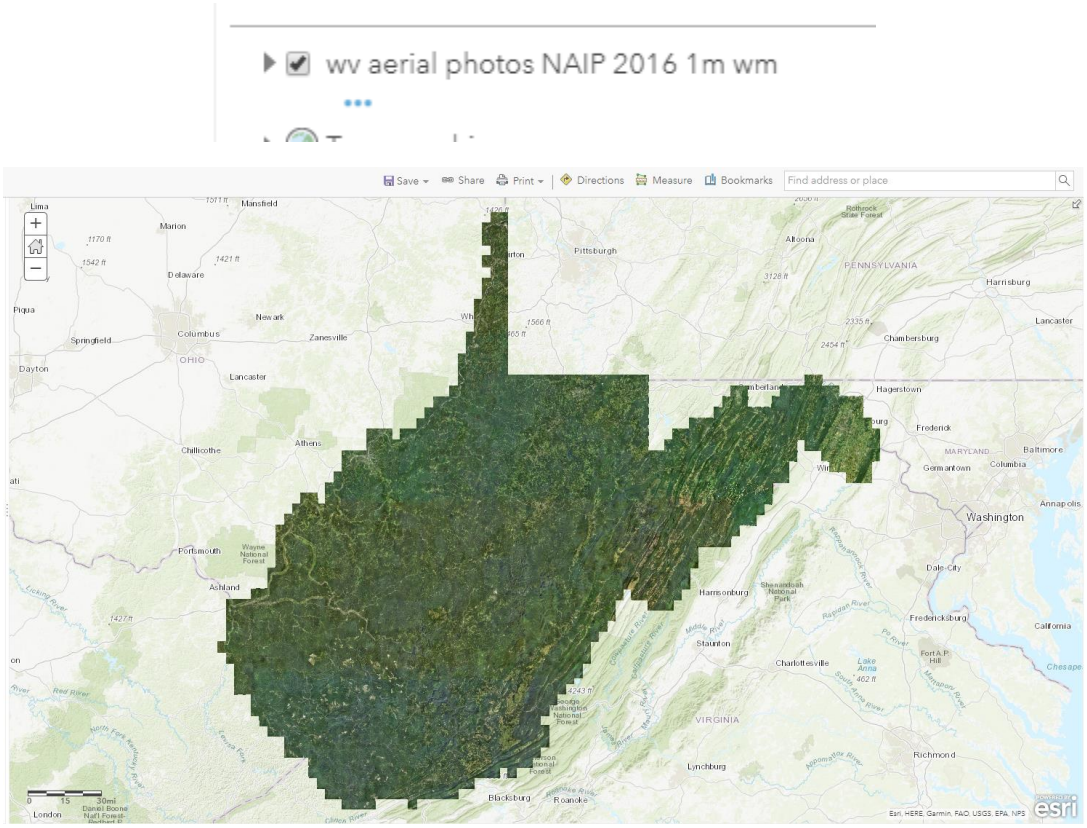
- Make sure that ArcGIS Server Web Service is listed under What type of data are you referencing? This should be the default. Copy and paste the following URL to the URL box:

  https://services.wvgis.wvu.edu/arcgis/rest/services/Imagery_BaseMaps_EarthCover/wv_imagery_NAIP_2016_1m/MapServer

Note that you could choose to use the imagery as the basemap by clicking on the Use as Basemap Button, but we will not do so here.

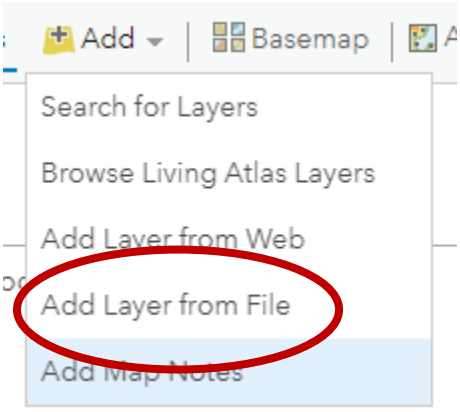
- Click Add Layer to add the imagery to the map.

Your map should now contain the imagery layer provided by this service. The imagery will also be listed in the Contents.

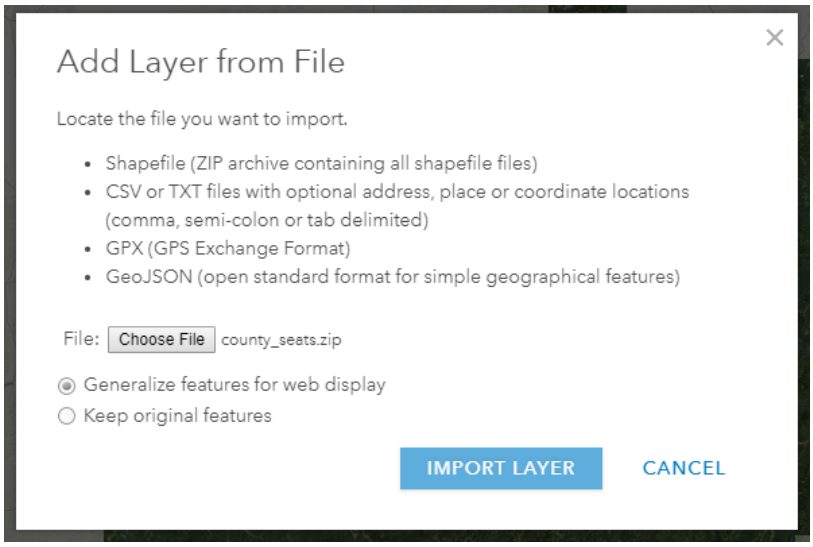


Next, you will add a layer to the map from a file on your computer. The data for this course has been provided in the following folder: wvagp_webgis. You will add a point layer representing the county seats in the state. These data can be accessed from the West Virginia GIS Technical Center: http://wvgis.wvu.edu/data/dataset.php?ID=83. Data can be added to a map from a **CSV** file or from a vector layer. However, **shapefiles** must be compressed to a zipped file before being uploaded. This file has already been compressed. Additionally, all layers should be referenced to the WGS84 geographic coordinate system or the Web Mercator projection. All the layers you will use here are projected to the Web Mercator projection. If you have layers that use a different geographic or projected coordinate system then WGS84 or Web Mercator, they should be reprojected before adding them to a web map.

- In your new web map, click Add followed by Add Layer from File.

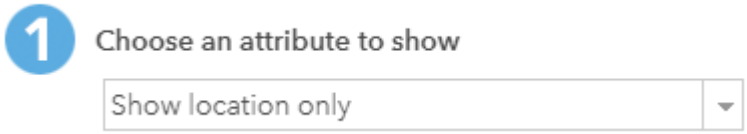


- Select Choose File. Navigate to the wvagp_webgis folder and choose the county_seats.zip file. Select Import Layer to add it to the map.

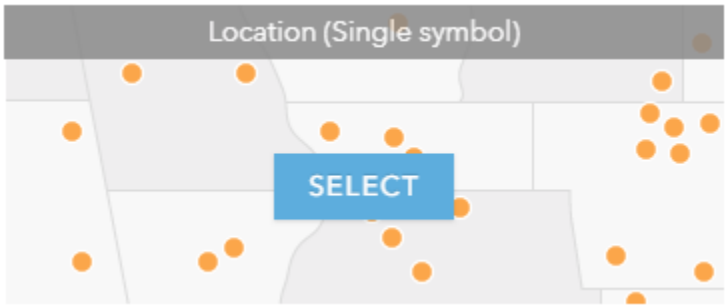


Points representing county seats should now be added to the map. Also, the Change Style options should automatically load.

- Under Choose an Attribute to Show, select "show location only."



- Under Select a Drawing Style, choose "Location (Single Symbol)". Click OPTIONS to change the symbology.

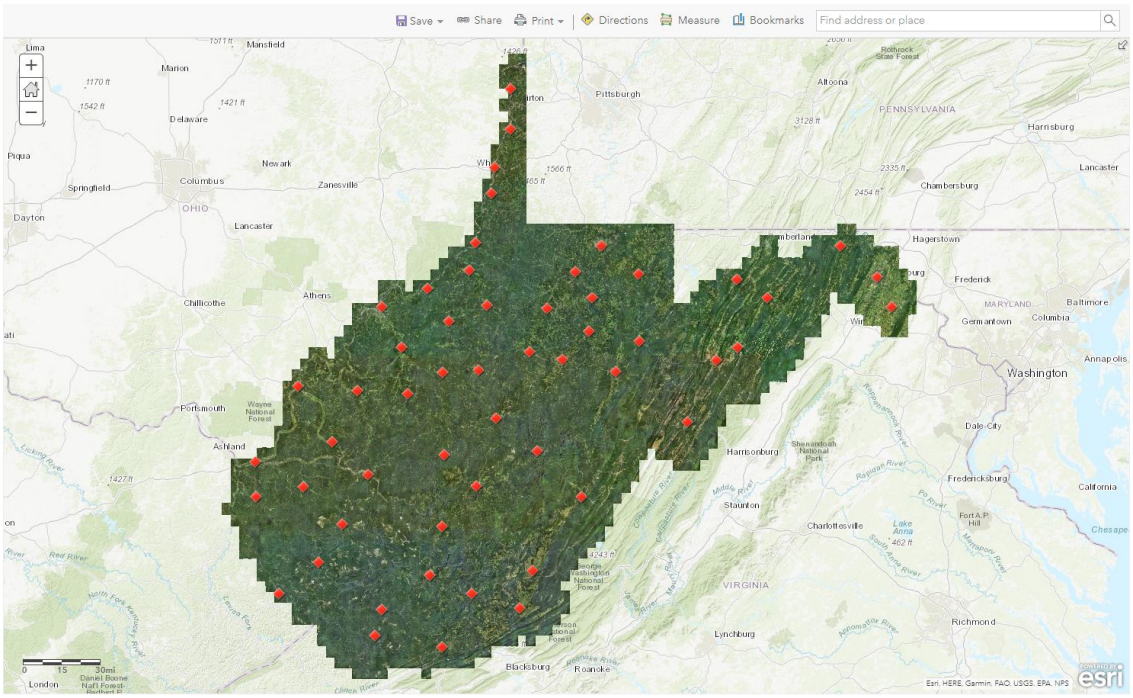


- Change the symbol and symbol size to something you feel is appropriate for the map. You can do this by selecting Symbols.

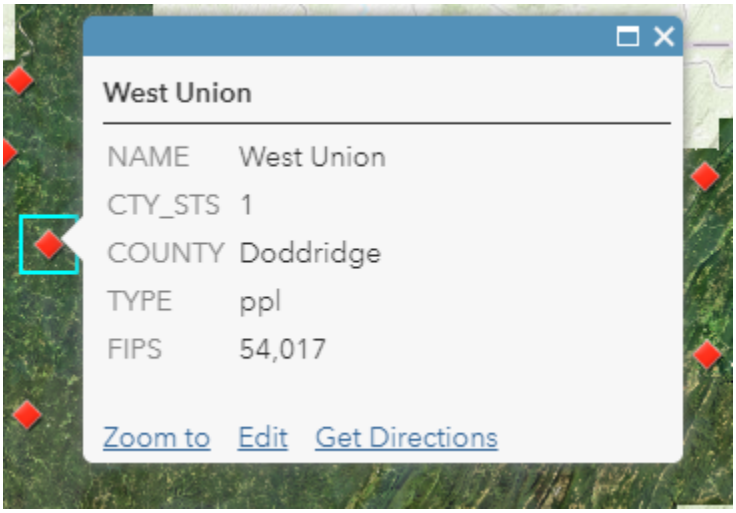
Note that you can also apply transparency and change the scales at which the layer is visible. However, we will not do so here.

- Within the Change Style options, select OK followed by DONE to finalize the layer symbology.

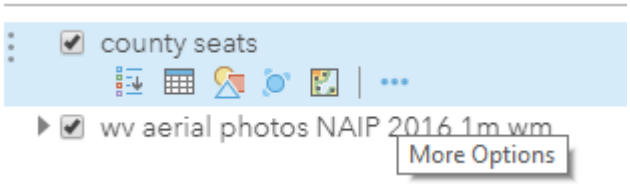
Below is an example of my map after changing the symbol.

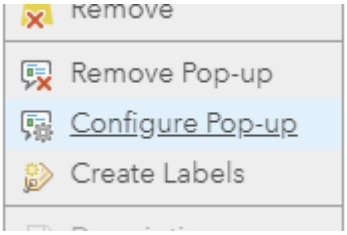


If you click on a county seat, a pop-up will display. However, this pop-up has not been configured. All fields are being shown and an alias has not been applied to make the field names more interpretable. So, you will now edit the pop-up.



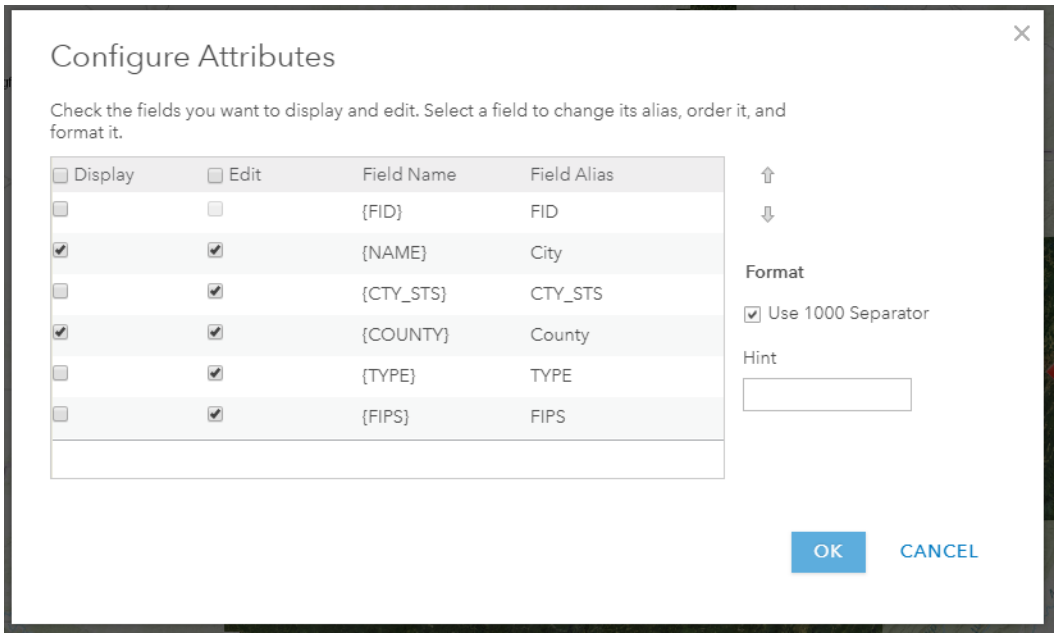
- Hover over the county_seats layer in the Contents list. Select More Options (the three dots.)
- Select Configure Pop-up.





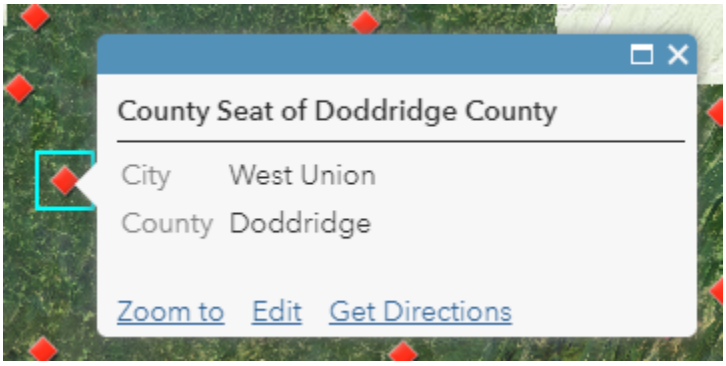
- Within the Configure Pop-Up Options, change the Pop-Up Title to "County Seat of {COUNTY} County". Brackets indicate attribute names.

- Within the Configure Pop-Up Options, selection Configure Attributes. Make the following changes:
  - Only display the NAME and COUNTY fields.
  - Change the Field Alias for NAME to City.
  - Change the Field Alias for COUNTY to County.



- Select OK on the Configure Attributes Window followed by OK on the Configure Pop-ups Options.

If you click on a pop-up now, you should see that your changes are being honored.

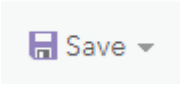


Next, you will change the layer names in the Contents and the Legend.

- Hover over the county_seats layer in the contents list. Select More Options (the three dots) followed by Rename. Change the name to County Seats.
- Repeat this process for the imagery. Change the name to 2016 NAIP Imagery.
- Also for the imagery layer, select Hide in Legend under More Options so that the imagery layer will note be displayed in the legend.

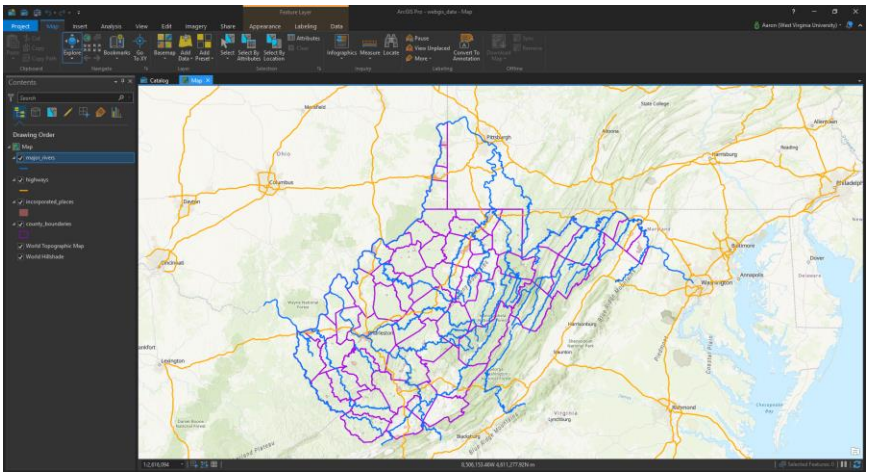
You have now made some substantial changes to your web map. Now would be a good time to save your work.

- Click on Save followed by Save to save the map. Note that Save As can be used to save a copy of the map under a new name.



You will now add some additional layers by publishing web layers from the ArcGIS Pro desktop application. I have provided a map project file in the wvagp_webgis folder. You will now switch to the desktop software to import these layers.

- Navigate to the wvagp_webgis folder and click on the webgis_data.aprx file. This will load ArcGIS Pro and this map project.



The data have already been symbolized. However, if you want to alter the symbology, feel free to do so. Also, these layers have already been converted to a Web Mercator projection. Below I have provided the source of each of these layers.

major_rivers: http://wvgis.wvu.edu/data/dataset.php?ID=204

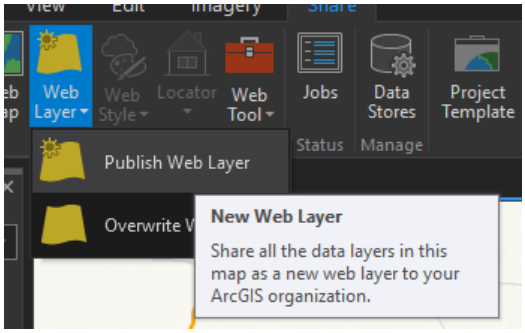
highways: http://wvgis.wvu.edu/data/dataset.php?ID=107

incorporated_places: http://wvgis.wvu.edu/data/dataset.php?ID=429

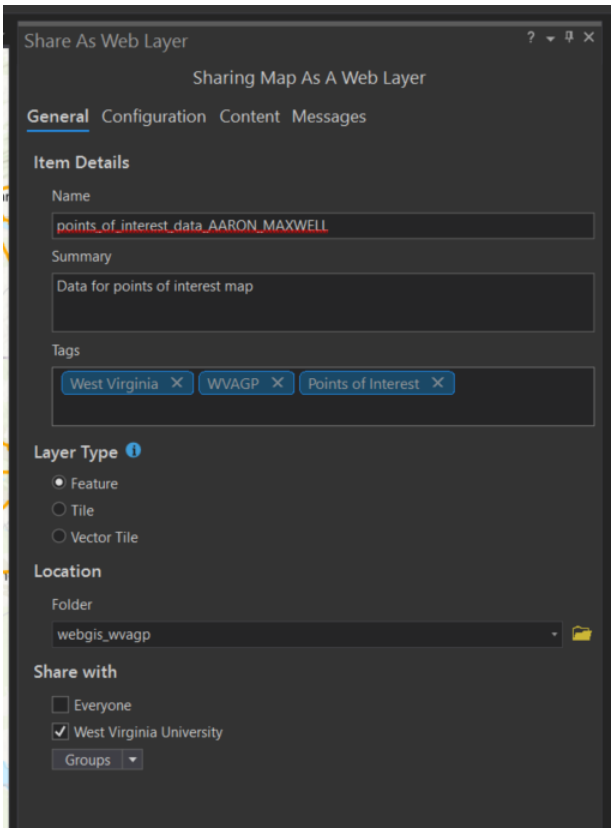
county_boundaries: http://wvgis.wvu.edu/data/dataset.php?ID=136

- In order to be able to publish data layers to your ArcGIS Online content, you will need to log in to your account in ArcGIS Pro. You can do so at the top of the page.

You are now ready to publish these data to your ArcGIS Online content.



- Navigate to the Share Tab.
- Select Web Layer followed by Publish Web Layer.
- In the Sharing Map As A Web Layer Tool, make the following changes:
  - Change the name to points_of_interest_data_YOUR_NAME.
  - Provide a summary.
  - Provide tags.
  - Make sure the Layer Type is set to Feature.
  - Make sure the location is set to your new folder within your ArcGIS Online content.
  - Share the data with West Virginia University.
- Click Analyze to see if there are any issues. You will get some warning, but none that matter.
- Click Publish to Publish the data. This will take several minutes.
- You can save your changes and exit out of ArcGIS Pro.
- Return to your web map in ArcGIS Online.

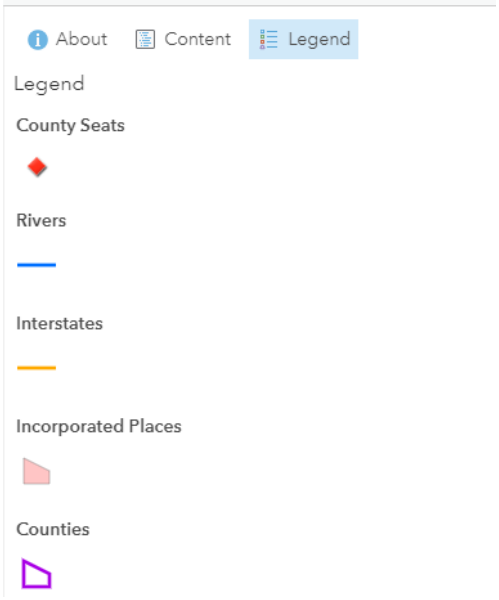


- In your web map, click Add followed by Search for Layers. Within your content, you should see the points_of_interest data that has been published as a hosted feature layer to your ArcGIS Online content.
- Click the small plus sign associated with the layer to add it.

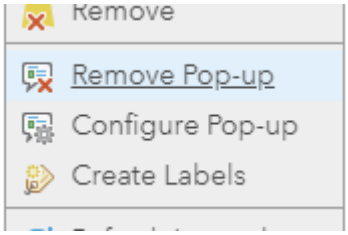
Your map should now contain the four layers that were published from ArcGIS Pro. Let's perform some clean up.

- In the Contents list, move the County Seats data up to the top of the list.
- Change the names of the for new layers as follows:
  - major_rivers = Rivers
  - highways = Interstates
  - incorporated_places = Incorporated Places
  - county_boundaries = Counties

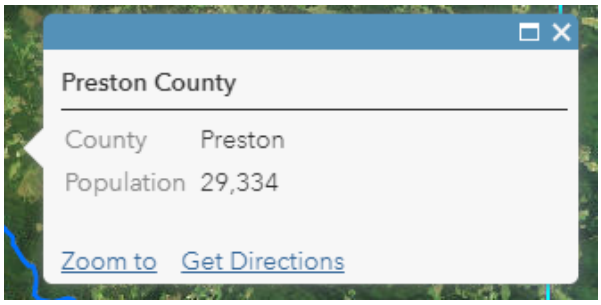
If you switch from Content to Legend, you can see that these names are honored in the legend.



- Turn off the pop-up for the rivers, interstates, and incorporated places layers. This can be accomplished by hovering over the layer in the Contents list then selecting More Options (the three dots) followed by Remove Pop-up.



- Format the pop-up for counties as follows:
  - Only two fields should be shown with the following alias names:
    - NAME as County
    - POP2000 as Population
  - The pop-up name should be the "county named" followed by "county".



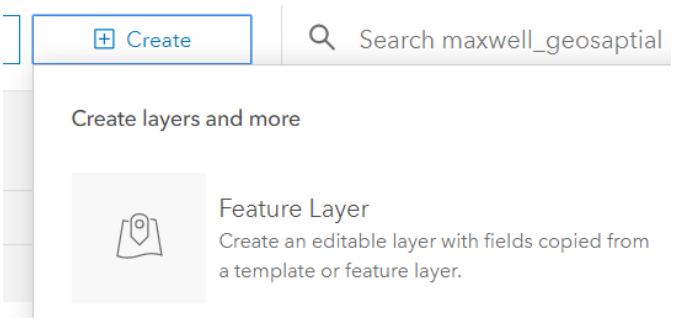
- Save your map again.

Module 2: Hosted Feature Layers and Web Apps

Create a Hosted Feature Layer

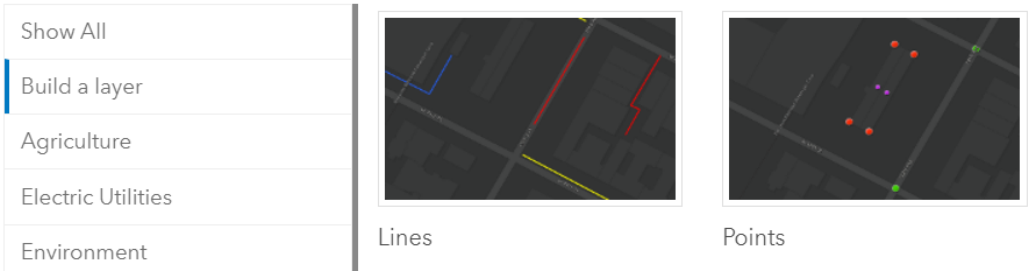
You have now generated a web map with data layers from many sources. However, the goal of our web app is for users to be able to add points of interest across the state. You have yet to produce a layer in which these data can be collected. You have also not produced an actual web-based application yet. You will accomplish both of these tasks in this module.

- Navigate to your Content Tab in ArcGIS Online.
- Click Create followed by Feature Layer.

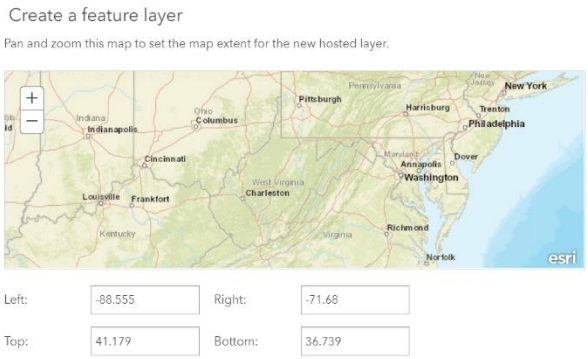


This option can be used to produce a new **hosted feature layer** that can be saved to your ArcGIS Online content. Let's make a new layer from scratch!

- In the first window select the Points option under Build a layer. Note that ESRI provides many templates for common use cases if you want to explore them.

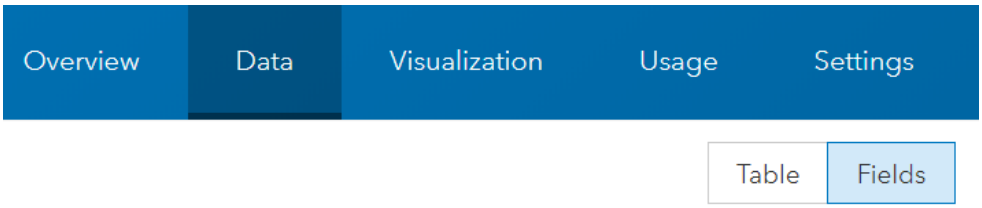


- Select Create followed by Next on the first window screen.
- On the next screen, navigate the map to change the extent to center over West Virginia. Click Next.
- On the next page, provide a title (POI_YOUR_NAME) and tags then click Done to create the feature layer. Make sure to save the layer in your new folder.

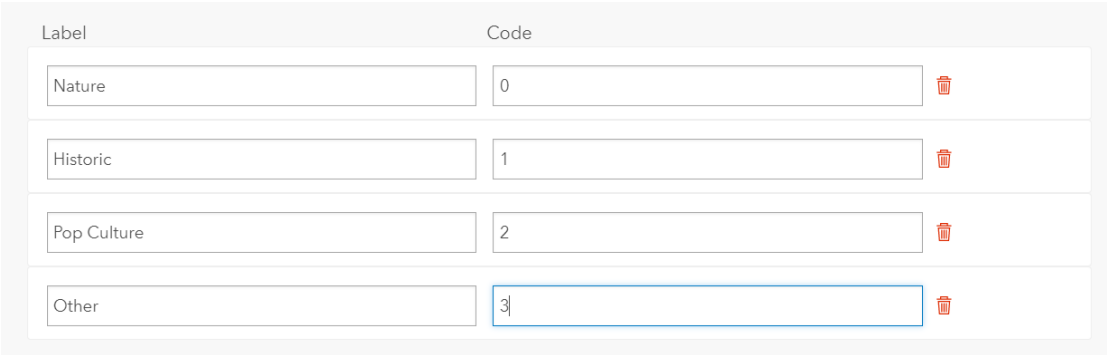


The landing page for the new hosted feature layer should load automatically.

- Navigate to the Data Tab then select Fields.



- Use the Add Button to create a new field. Name it poiType with an alias or Display Name of Type. Change the Type to Integer. Click Add New Field to finalize the process.
- Once the field is added, click on it then select Create List. This will allow you to generate a **coded values domain** so that only allowed categories can be entered into the field. Generate the following categories and associated codes. Click Save to create the coded values domain.
    - Name = Nature, Code = 0
    - Name = Historical, Code = 1
    - Name = Pop Culture, Code = 2
    - Name = Other, Code = 3



- Create another field called dateAdded with an alias of Date. Set the type to Date.

- Create another field called description with and alias of Description. Set the type to string and increase the length to 1,000.

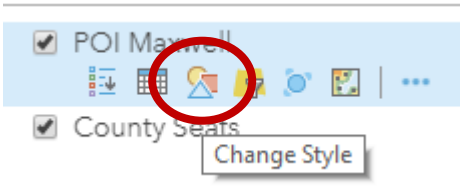
As a note, domains can be used to specify allowed values. Here, you are using domains to specify the allowed types for your points of interest. The domain was defined using coded values, where a number or code represents a category. A **range domain** could be used if you wanted to limit numbers that could be entered into a field to be within a certain range.

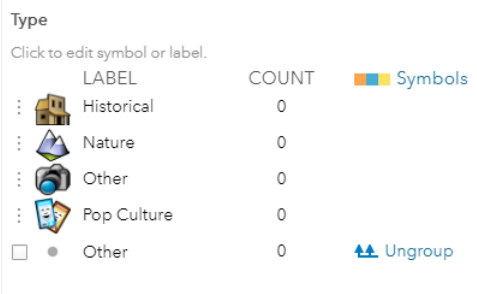
You will need to make the following changes to the settings.

- Navigate back to the landing page for the layer then open the Settings options.
- Make sure that the following options are selected (you should not need to make any changes):
  - Enable editing
  - Keep track of who created and last updated features
  - Enable sync
  - Add, update, and delete features
  - Editors can see all features
  - Editors can edit all features
  - The same as signed in editors
- Click Save to accept the changes if any changes are made.
- Return to your map.
- Select Add followed by Search for Layers.
- The new layer should appear in your Content list. Add it to the map.

The new point layer will be added to your Content list. However, no features will be added to the map because you have not add any features to this layer yet. Before you test to see if features can be added to your new layer, let's change the symbology.

- In the Content list hover over your POI layer then select Change Style.
- Under "Choose an attribute to show" select Type.
- Under Select a drawing style, select Types (Unique symbols) by clicking OPTIONS.
- Select symbols that you feel are appropriate for each of the four points of interest types. The symbols I selected are available under Outdoor Recreation and People Places.
- Within the Change Style options, select OK followed by DONE to finalize the layer symbology.
- Rename the Layer to "POI".
- Now, let's configure the pop-up for the new layer.

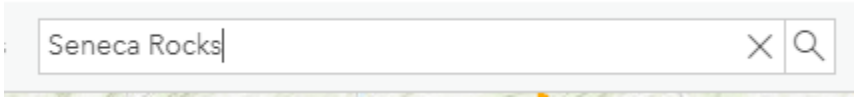


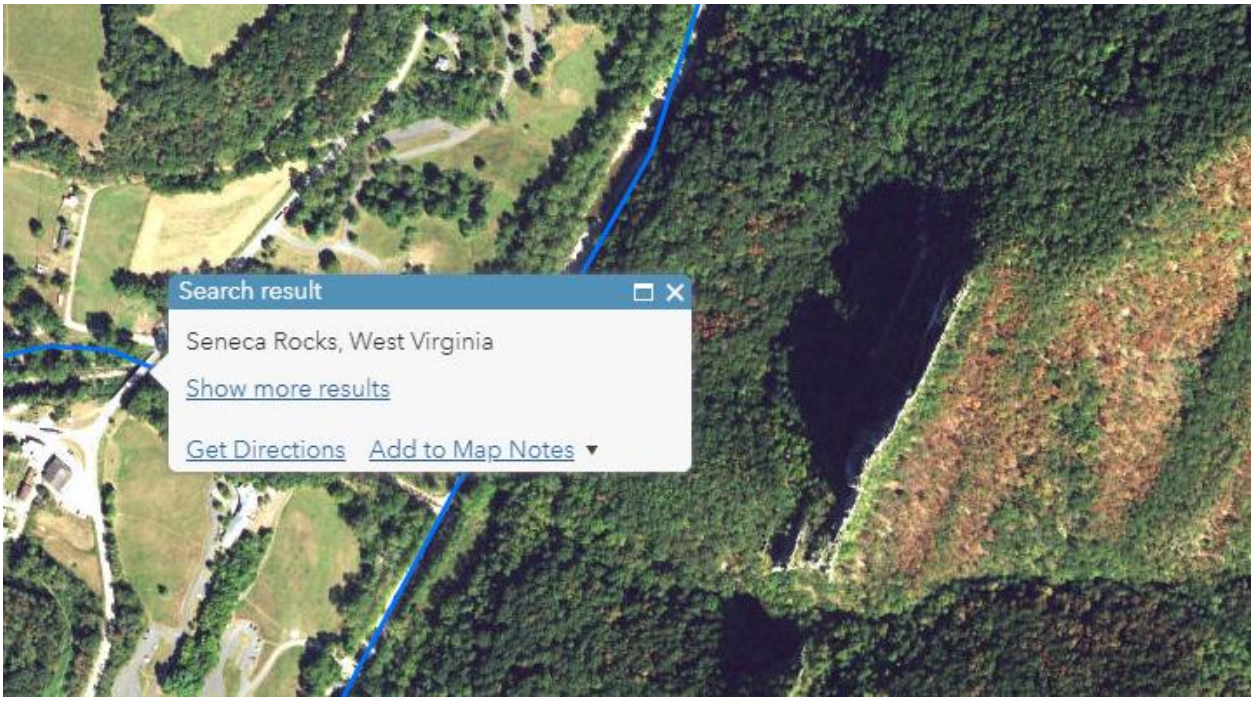


- Change the pop-up title to “Point of Interest”.

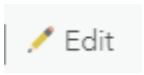
Now, you will see if you can successfully edit the new layer. I have provided a picture of Seneca Rocks. You will now create a point for this feature, fill out the attributes, and attached the photo.

- In the Search Bar, type “Seneca Rocks.” This will zoom your map to Seneca Rocks in Pendleton County.

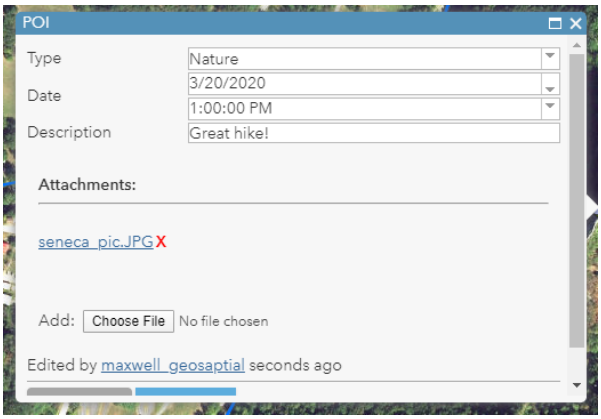




- Click on the Edit Button.



- In the Add Features window, select Nature then place a point on the map. The type should already be set to Nature. Select a date and provide a description. To add the picture, select Choose File. Attach the seneca_pic.jpeg image form the wvag_webgis folder.



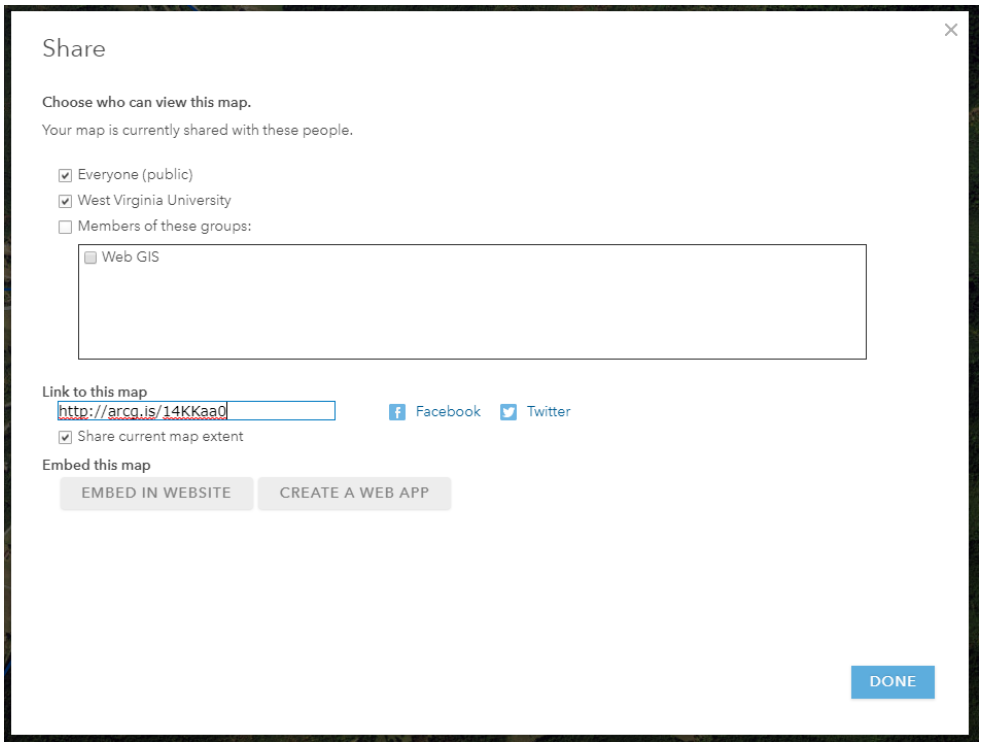
You have now successfully added a point to the map. If you navigate out of the Add Features window and back to the Content list, you can click on the new point and see that your attributes and attachment have been saved. You can even open the picture in a new tab.

- Take some time to add some more points of interest to your map.
- Save your map.

Create a Web App Using a Template

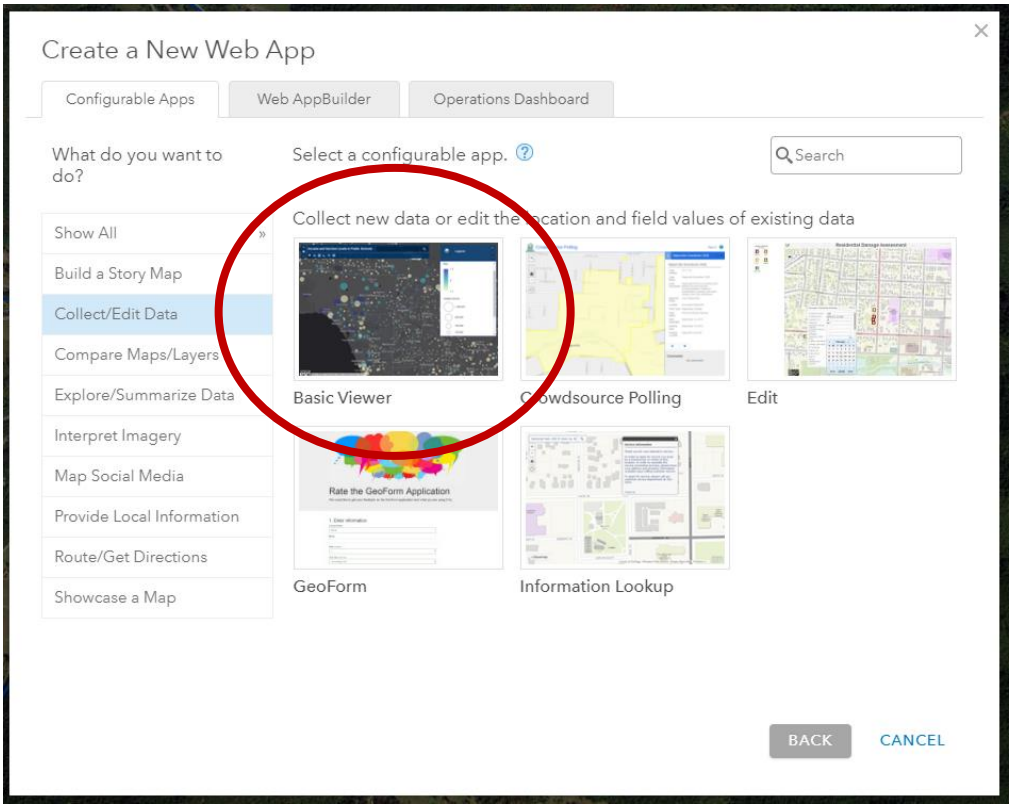
You now have a web map. However, a web application has not been configured that uses this map. You will now create an app as a webpage that will allow you to access your map and edit the point layer using an ESRI template.

- Make sure that you web map has been saved.
- Click on Share. This will open the Share Window. Share the map with Everyone then click CREATE A WEB APP.
- Since the map was only shared with WVU, you will need to update the sharing of the map so that it matches the app.

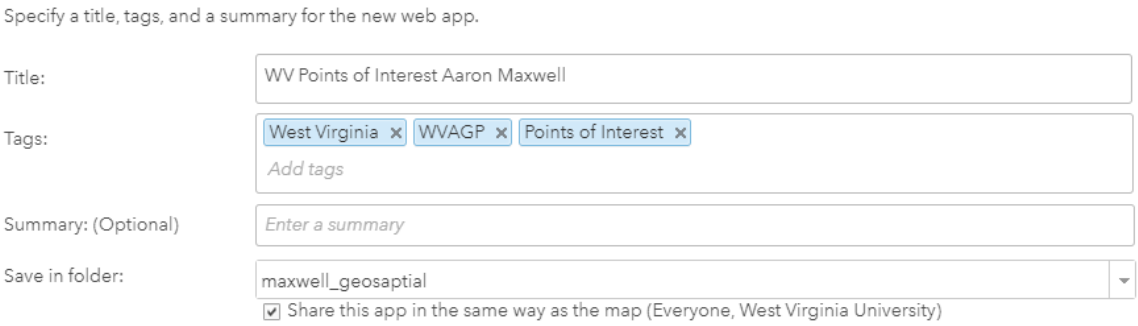


Note that you can also produce a map from this page that can be embedded in a webpage. The required HTML and CSS will be generated that can be added to an HTML document. This will be explored in the last module.

- In the Create a New Web App Window, select Collect/Edit Data followed by the Basic Viewer template.
- Select CREATE WEB APP.



- Create a title for your web map. Note that the map tags have already been added. You can add additional tags and a summary if you'd like.
- Click DONE.



- The next screen will allow you to configure your web app. Experiment with changing the title, themes, and options. Note that you will have to turn on the Display Editor under Options in order to edit your point layer. Once you have made your desired changes, select Save followed by Launch to view your new app.

- Experiment with your app and make sure that you can successfully edit your points of interest.

You have now successfully created a web app as a web page! This app allows users to input points of interest across the state.

Your Turn

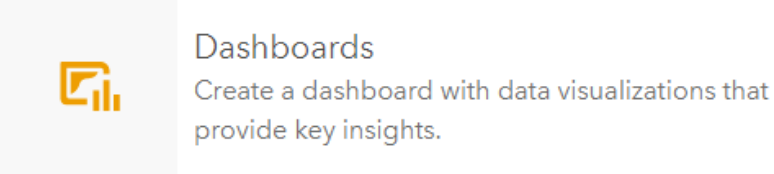
Create a web app from scratch. Find some data that are of interest to you. Import the data into your ArcGIS Online content using one of the methods demonstrated here. You can also create a new hosted feature layer in which you can draw points, lines, or polygons; however, this is not required. Take some time to symbolize the data and configure the pop-ups. Save your map then created a web app from it using one of the ESRI templates. Once your app is complete, send me a link. Make sure to share it with at least WVU so that I can see it.

Module 3: Creating Web and Mobile Apps

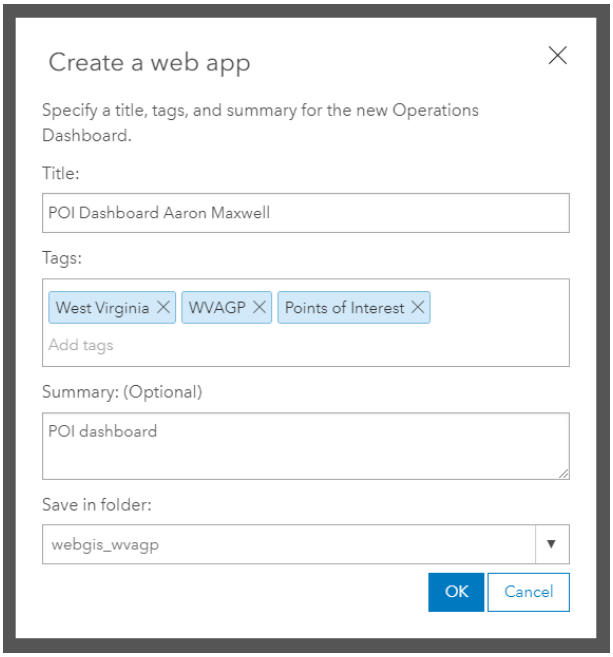
Create Dashboard

You now know how to get data into a web map using several different methods, how to change layer symbology, how to configure pop-ups, how to create a new hosted feature layer with the required geometry and fields, and generate a web app that uses your map and data. In this section, you will expand your skills to include creating **dashboards** to monitor your data, creating web apps using the **Web AppBuilder for ArcGIS**, and creating mobile apps using **AppStudio for ArcGIS**. We will start with creating a dashboard.

- Log back into ArcGIS Online (https://www.arcgis.com/home/index.html) and navigate to Content.
- Click on Create followed by Dashboards.

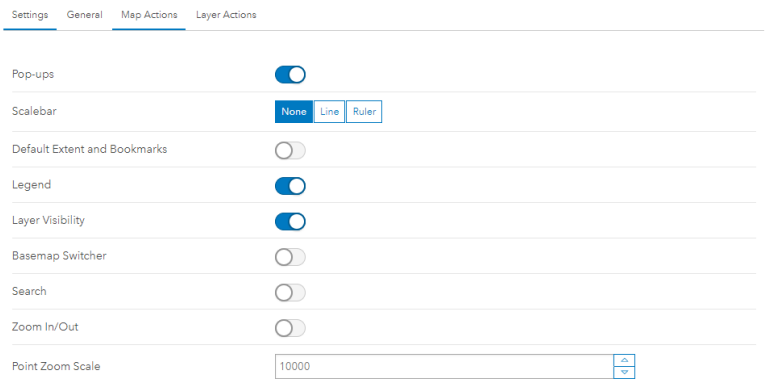


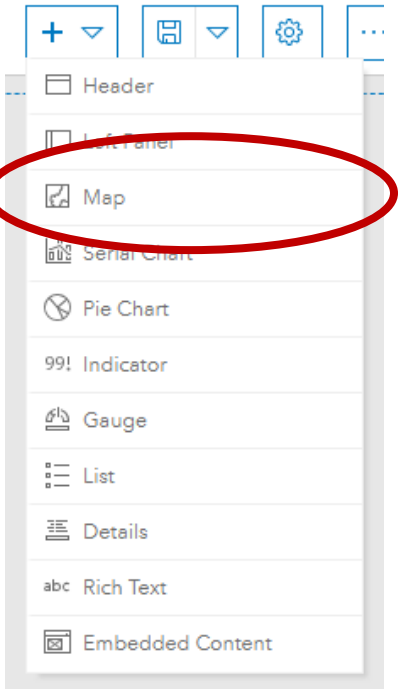
- Provide a title of "POI Dashboard YOUR NAME"
- Provide tags of: West Virginia, WVAGP, and points of interest.
- You can provide a summary if you'd like.
- Make sure it is saved in your new folder.
- Click OK.



You have now created a new, blank dashboard. You will now start adding widgets to the dashboard.

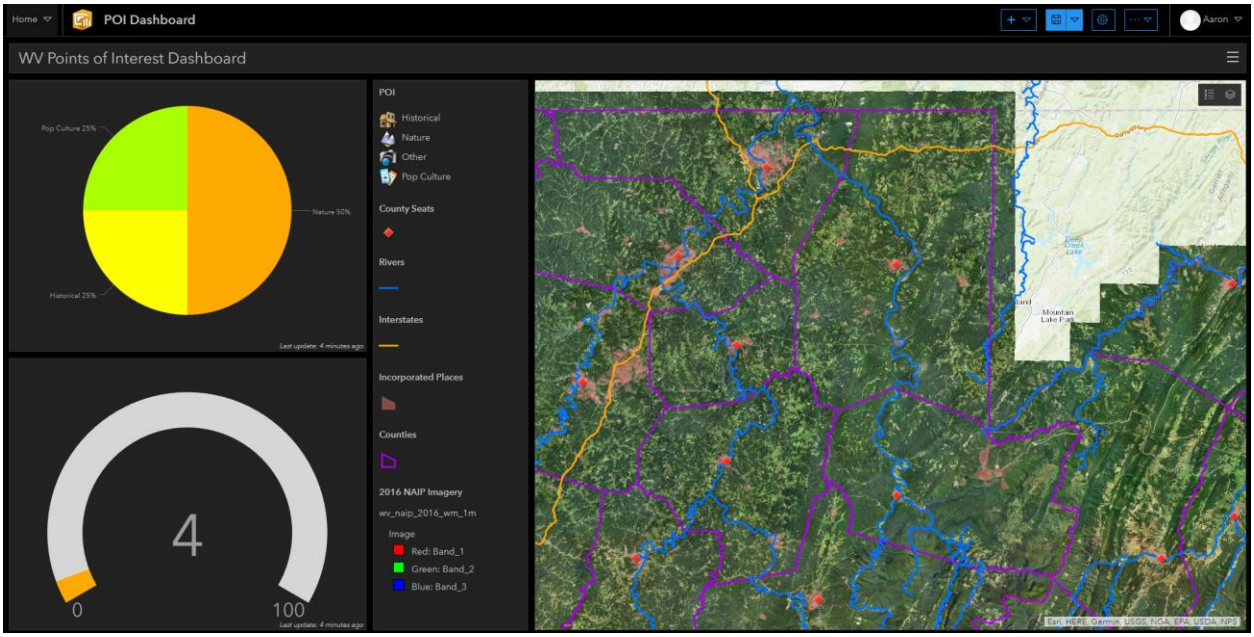
- Under Add, select Map. A window with the maps stored in your content should load. Select your points of interest map.
- For the map options, make sure Pop-ups, Legend, and Layer Visibility are turned on.





- Click Done to add the map to the dashboard.
- Under Add, select Map Legend. You can make changes to the settings if you'd like. Click Done to add the legend.
- Under Add, select Gauge and select your POI layer. You can make changes to the setting if you'd like. Click Done to add the gauge.
- Under Add, select, Pie Chart and select your POI layer. Set the Category Field to Type. You can make changes to the settings if you'd like. Click Done to add the pie chart.
- Under Add, select Heade. Change the dashboard title to a title of your choosing. You can make changes to the settings if you'd like. Click Done to add the header.
- Click on settings and change the theme to Dark. You can make additional changes if you'd like. Click Done to accept the settings changes.
- Take some time to arrange the tools on the page.

You have now created and operations dashboard that allows you to monitor edits and editions to a layer. The map will display your web map and will be populated with new points of interest as they are added. The Legend provides a legend of the available layers, the gauge provides a count of the number of features that have been generated, and the pie chart will show the proportion of the data within each type. As data are added to your hosted feature layer, this dashboard will update to reflect the changes.

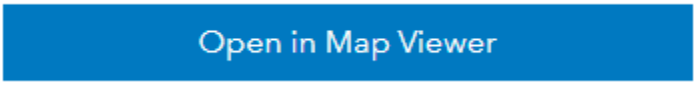


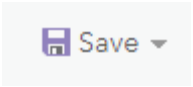
- Feel free to experiment with adding more features or making additional changes to your dashboard.
- Using the web app you built in Module 2, create a few more points of interest. Notice how the information presented in your dashboard changes to reflect the changes.

Create a GeoForm App

In the last module, you created an app using a template that allows a user to add points of interest by interacting with a map. You will now build a second app that allows users to collect data by filling out a form. To accomplish this task, you will use the **GeoForm** template.

- Navigate to your points of interest map in ArcGIS Online. Make sure to navigate to the map not the app. You can find the map in your Content list. Click on the map to open it.
- Click on Open in Map Viewer. The map should load.





- Click on Share.
- Make sure to share the map with Everyone (public) and West Virginia University. Click on CREATE A WEB APP.
- Navigate to Collect/Edit Data and select the GeoForm template. Click CREATE WEB APP.
- Title the new app WV POI GeoForm YOUR NAME. You can add additional tags and a summary if you like.
- Click Done.
- Click Next on the Getting Started page.

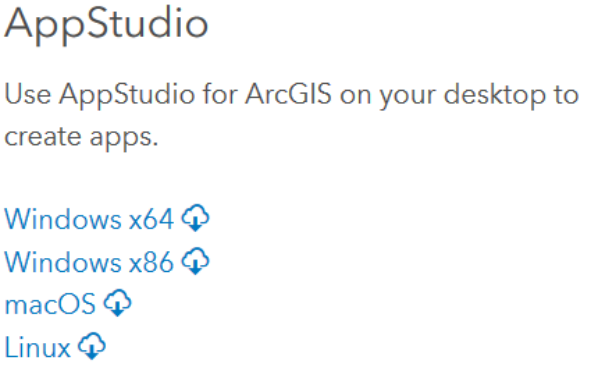
GeoForm

- Click Next on the Select a Webmap page. The app should already be connected to your POI map.
- On the Select Editable Layer(s) page, make sure your POI layer is selected. Click Next.
- If you prefer, on the Form Details page you can change the title, logo, provide instructions and details, and change the submit button text and view submissions text. When you are done, click Next.
- You should not need to make any changes on the Select Form Fields page. However, do make sure that all the fields and attachments are enabled. Click Next.
- You can explore the available styles and change the style if you like on the Style page. Click Next.
- You do not need to make any changes on the Select Form Theme page. However, feel free to change the theme. Click Next.
- You do not need to make any changes on the Options page. However, feel free to make changes if you prefer. Click Next.
- You should not need to make any changes on the Configure Viewer or Options pages. Click Next for both.
- Make sure nothing looks weird or incorrect or the Preview Application page. Click Next.
- On the Save Application page, click Save and Exit to publish the app.
- ArcGIS Online should automatically return you to the page for your new application. Click View Application to experiment with the app. Add a new point to test it out.

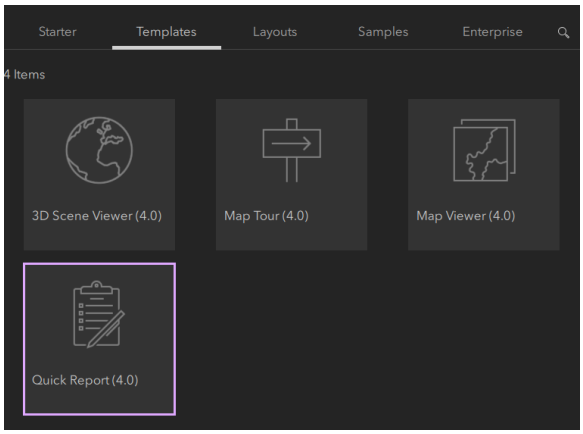
Create a Mobile App

The app you just created is a desktop application that allows users to collect data using a form in their web browser. However, a user may want to collect data from a mobile device. So, you will now create a native app to collect points of interest on a mobile phone.

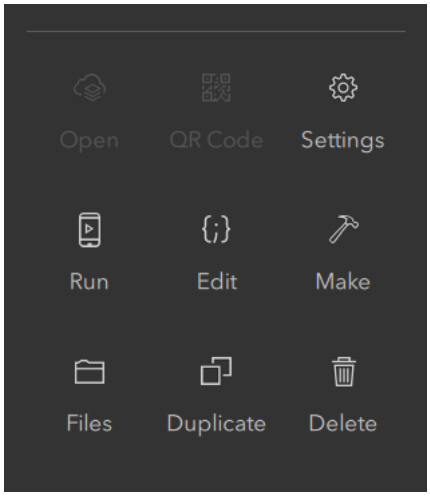
- Navigate to the AppStudio for ArcGIS webpage: https://appstudio.arcgis.com/.
- Log in using your ArcGIS Online account.
- Click on Download then download and install the AppStudio program to your device using the appropriate build.



- Once the application is installed, it will be available in the ArcGIS folder in your programs list if you are using a Windows computer. Open the application. You may also need to sign in with your ArcGIS Online account.
- Select New App.
- Navigate to the Templates Tab and select Quick Reporter 4.0. Provide a title (POI Reporter YOUR NAME) then click Create.
- A new app should be added to your app list. Right-click on it then select Settings. Alternatively, you can select Settings from the side menu.

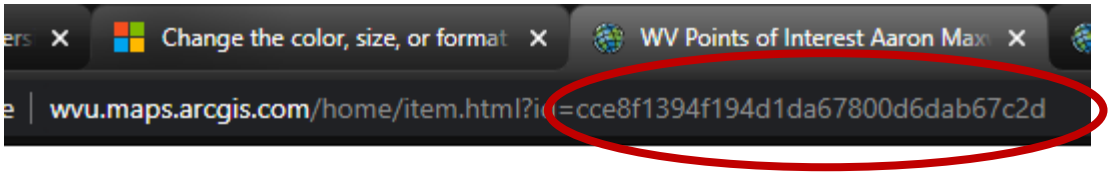


- You will need to make the following settings changes:
  - Under Details, provide a Summary, Description, and Tags.
  - Under Resources, change the App Icon to the provided icon.png file, the background image to the background.png file, and the overlay image to the wvagp_logo.png file provided in the wvagp_webgis folder. When you select these images it will ask if you want them to be added to the project folder. You

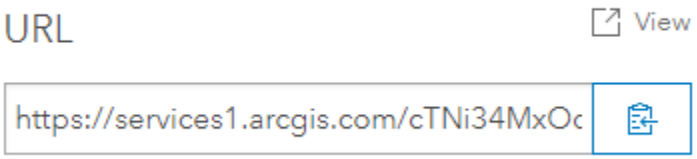


should add them to this folder by selecting Yes. You can change the background color if you'd like.

- Under Properties and the Start Screen Tab, you can change the Background image to the backgound.png file. You can also change the Logo to the icon,png file.
- Under Properties and Form, you need to set the "Webmap ID for the Map to choose location" as the portal ID for your points of interest map. Do not use the apps. The portal ID is the string of numbers and letters after "id=" in the URL for the map. Do not include "id=".

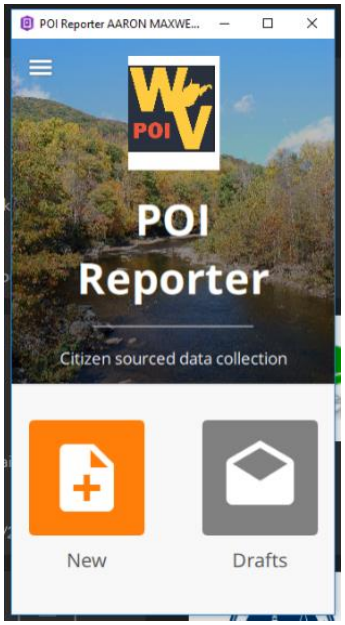


- Under Properties and Form, change the "Feature service address" to the address for your points of interest hosted feature layer. This is the URL at the bottom left of the landing page for the hosted feature layer.



- Click Apply to accept these changes.

❖ To test your app, back on the main AppStudio Window select Run. This will load the app. Make sure you can add a point using the app.



If you would like to render the tool you can select Make followed by Local Make. You will then need to select an operating system and allow the tool to generate the installation file. You can then install the file and test out the program. You can also test the app on a mobile device using the QR Code option. You do not need to do so here.

Collecting Data with Collector for ArcGIS

As an alternative to creating a native app, you can also collect data into a hosted feature layer using **Collector for ArcGIS**. I will briefly describe that process now. You can skip this section if you'd like.

- If you have not already done so, you will need to install Collector for ArcGIS from the Google Play or Apple Store.
- Once the app is installed, you will need to log in using your ArcGIS Online account.
- From the All Maps list, you should see your POI map that was created on ArcGIS Online. Click on the map to open it.
- Once the map is open, you can add a new point to the hosted feature layer. Attempt to add a new point using the Collector app. You should be able to define a location, provide attribute information, and attach a media file.
- Once you've add a new point, you may want to check your map or operations dashboard to confirm that it was submitted.

So, other than creating a native app, you can also collect data using Collector for ArcGIS.

Module 4: Working with ArcGIS Web AppBuilder and Adding Maps to Webpages

In this last section, we will investigate **Web AppBuilder for ArcGIS**, which allows for the production of more customizable web apps than templates but still requires no coding knowledge. Secondly, you will learn how to embed a map that was generated using ArcGIS Online to a webpage.

Working with Web AppBuilder for ArcGIS

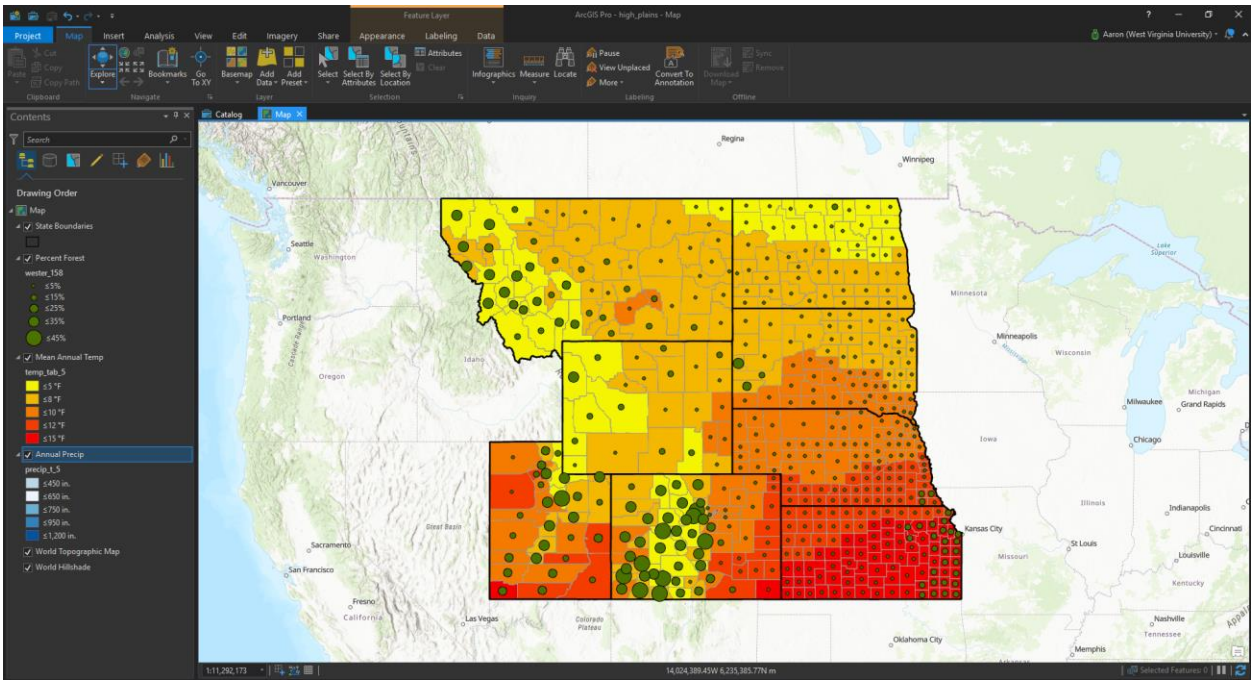
I imagine that you are now pretty tired of working with the points of interest data. So, for this final section we will make use of a different map. In the wvagp_webgis folder, a second map project has been provided in the high_plains folder called high_plains.aprx. This map contains climate and land cover data summarized for the counties of the high plain states. The climate data were derived from the 30-year normal data provided by PRISM (http://prism.oregonstate.edu/). The mean annual temperature is provided in Fahrenheit and the annual precipitation is provided in inches. The percent canopy cover data were derived from the 2011 National Land Cover Database (https://www.mrlc.gov/). Your goal here will be to make an interactive web map that allows users to explore these data layers.

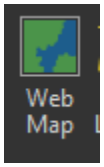
- Click on the high_plains.aprx file to open it in ArcGIS Pro. Also, make sure to log into your ArcGIS Online account.

Take some time to explore the data. Note that I have already configured the pop-ups and changed the symbology. However, feel free to make any additional changes. I have symbolized the mean annual temperature and annual precipitation using graduated colors. The percent forest has been symbolized using graduated symbols. The state boundaries are provided without any fill and a

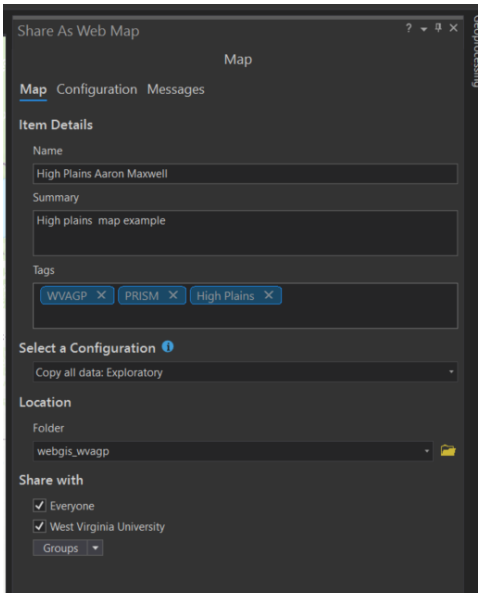
black outline. The pop-up for the state layer has been disabled. All of the data layers have been projected into Web Mercator.

You will now need to create a web map from this map. Note that this is different from what you did in Module 1. In Module 1, you published only the layers using Sharing Map As A Web Layer Tool. Now you will publish the entire map using the Share As Web Map Tool.

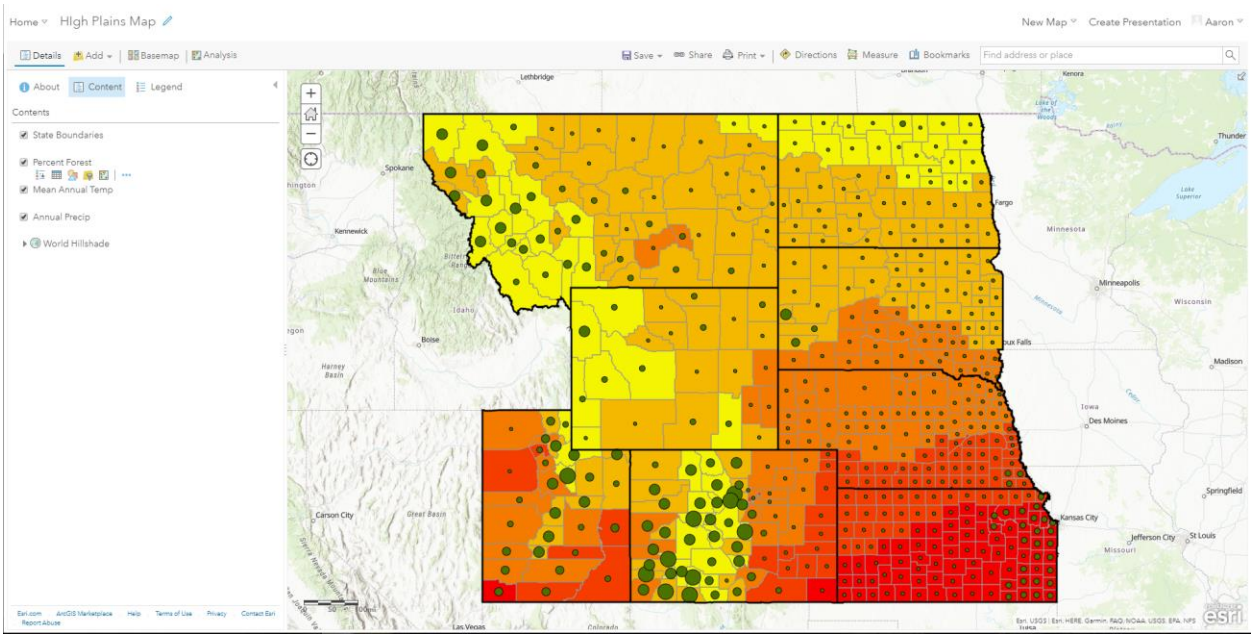




- Navigate to the Share Tab and Click on Web Map. This will launch the Share As Web Map Tool.
- In the tool, provide a name (High Plains YOUR NAME), summary, and tags. Make sure to share the map with Everyone. Save the map to your new folder on ArcGIS Online.



- Click Analyze to make sure there are no issues. The warnings are not an issue. No errors should be found. Click Share to publish the map. This will take several minutes.
- Back in ArcGIS Online, navigate to your Content. The web map should be available. Open the new web map.



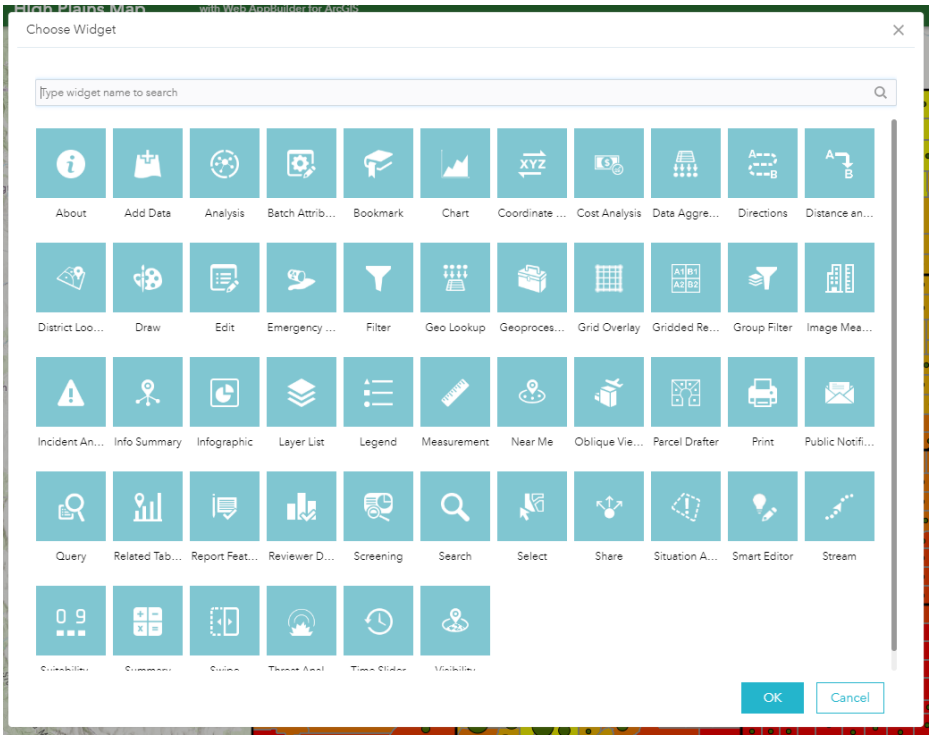
- If you would like, you can take some time to change any symbology, labels, or pop-ups in the map. However, this is not necessary.
- Click on Share. Make sure the map is shared with Everyone. This should be already defined since you set this up in ArcGIS Pro.
- Click CREATE A WEB APP.
- On the Create a New Web App window, switch to the Web AppBuilder Tab. You can make changes to the title, tags, and summary if you prefer. Click GET STARTED to start configuring your app.
- Under the Theme Tab, choose the Foldable Theme. Feel free to change the Style and Layout if you prefer.


Foldable Theme

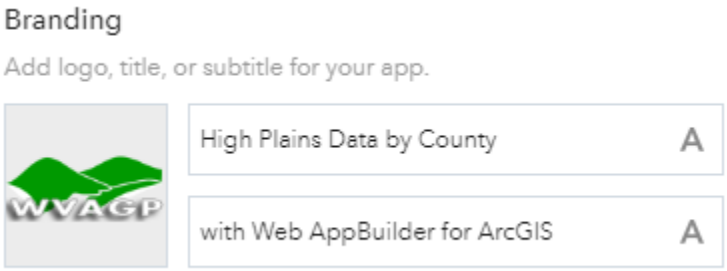
- You do not need to make any changes under the Map Tab. However, you can change the default extent if you prefer.
- Under the Widget Tab, you will need to add the following widgets: Layer List, Legend, Basemap Gallery, Bookmark, and Swipe. You can add widgets by clicking on the numbered boxes at the bottom of the page and selecting the desired widget from the list of available widgets. Configure each widget as follows:
    - Layer List:
        - Can accept the default settings
    - Legend
        - Can accept the default settings
    - Basemap Gallery:
        - Make sure "Always synchronize with the Basemap Gallery settings of the organization" is selected.
    - Bookmark:
        - Can accept the default settings.
    - Swipe:

- Make sure that only the Mean Annual Temp and Annual Precip are selected in the Swipeable layers list.

- Feel free to experiment with the settings for the widgets or add additional widgets.



- Under the Attribute Tab, change the icon to the WVAGP icon made available in the wvagp_webgis folder (wvagp_logo.png) by hovering over the icon and selecting Custom. Navigate to the wvagp_webgis folder to select the image. Change the title to a title of your choosing. You can also change the subtitle if you like.



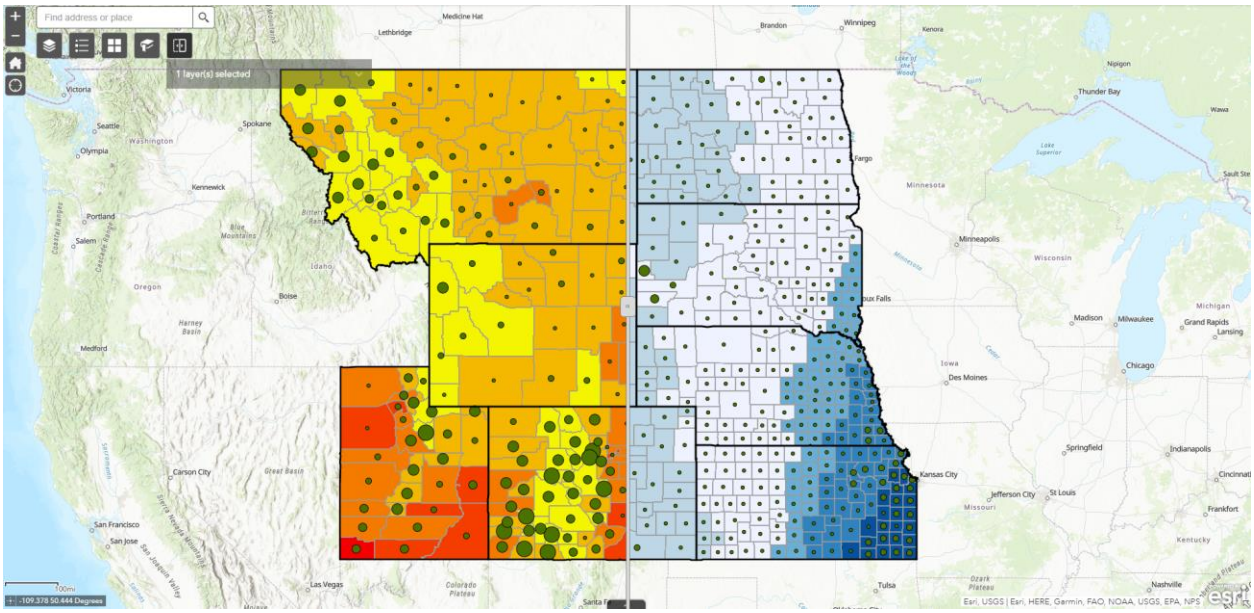
- Click Save to save the app. Click Launch to launch the app in a new window.

A couple of notes about this map and Web AppBuilder in general:

1. The app can be edited further by navigating to your Content on ArcGIS Online and selecting Edit Application on the page associated with the app.

Edit Application

2. Take some time to explore the widgets. The Layer List widget can be used to turn layers on and off. The Legend widget can be used to view the legend. The Basemap Gallery widget can be used to change the basemap. The Bookmark widget can be used to add bookmarks for certain locations and scales. The swipe widget allows you to view and compare the temperature and precipitation data.



Your Turn

Create a web app from scratch using Web AppBuilder. Find some data that are of interest to you. Import the data into your ArcGIS Online content using one of the methods demonstrated here. You can also create a new hosted feature layer in which you can draw points, lines, or polygons; however, this is not required. Take some time to symbolize the data and configure the pop-ups. Save your map then created a web app from it using Web AppBuilder. Make sure to add widgets that add to the functionality of your map. Once your app is complete, send me a link. Make sure to share it with at least WVU so that I can see it.

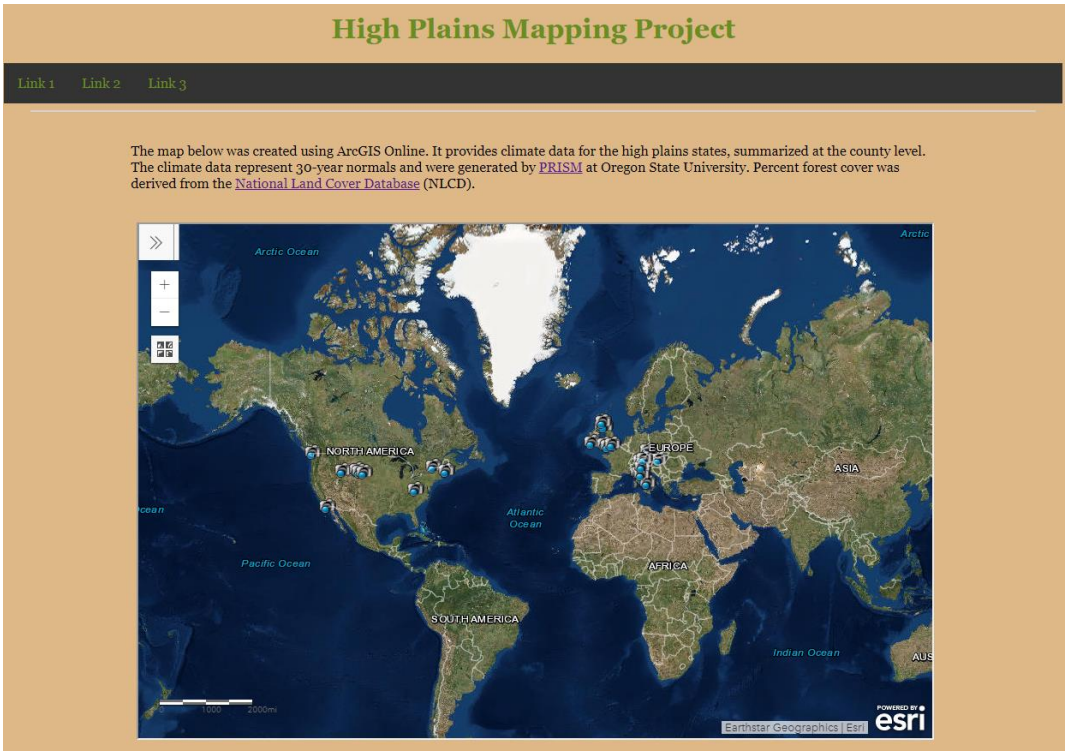
Adding Maps to Webpages

If you have an existing webpage for yourself, your organization, or a client, you may want to embed you map on this page as opposed to producing a new website or app. In this section, you will learn how to insert a web map into an HTML webpage.

I have provided a HTML file in the HTML subfolder of the wvagp_webgis folder called embedded_webmap.html.

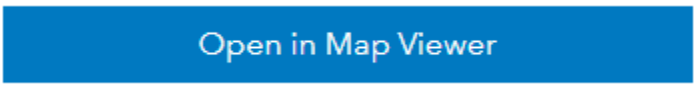
- Navigate to this folder and right-click on the HTML document. Select Open With followed by Google Chrome or another web browser.

The webpage should open in Google Chrome.

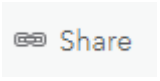


You can see that an ArcGIS Online map has already been embedded in the page; however, this is not the correct map. You will replace this map with the high plains map you created above.

- Log into ArcGIS Online and navigate to your Content.
- Navigate to your high plains map and open it using the Open in Map Viewer option. Use the map not the app.



- Once the map loads, click on the Share Button.
- In the Share window, click on EMBED IN WEBSITE.



- Make sure the following options are selected: Zoom Control, Basemap Selector, Scale Bar, and Legend. For Legend, select Layer Toggle.

ArcGIS Online will generate some HTML and CSS code that can be pasted into your HTML document. However, I have edited the code to meet the styling considerations of the page, so I will have you copy only the URL link to the map.

- Back in the HTML folder, right-click on the embedded_webmap.html file and open it in a plain text editor, such as NotePad or Brackets. Here, I am using Brackets. This software is free and can be obtained here: http://brackets.io/.
- Back in the Embed in Website window in ArcGIS Online, click the COPY button next to the code. Paste the code in the HTML document at the bottom of the page.
- Next, replace the web address of my map with the web address for your map. Do this by deleting the URL associated with src for the iframe. Copy the URL associated with src for your map and paste it were you deleted the URL for the original map. Make sure to include quotes. Next, delete the //wvu part of the URL and replace it with http://. Save the document then refresh the webpage to see your map.

You have now successfully added your own map to this simple HTML page. If you plan to work with web maps and web design, I would highly consider learning some HTML, CSS, and JavaScript.

Edit ESRI Basemaps

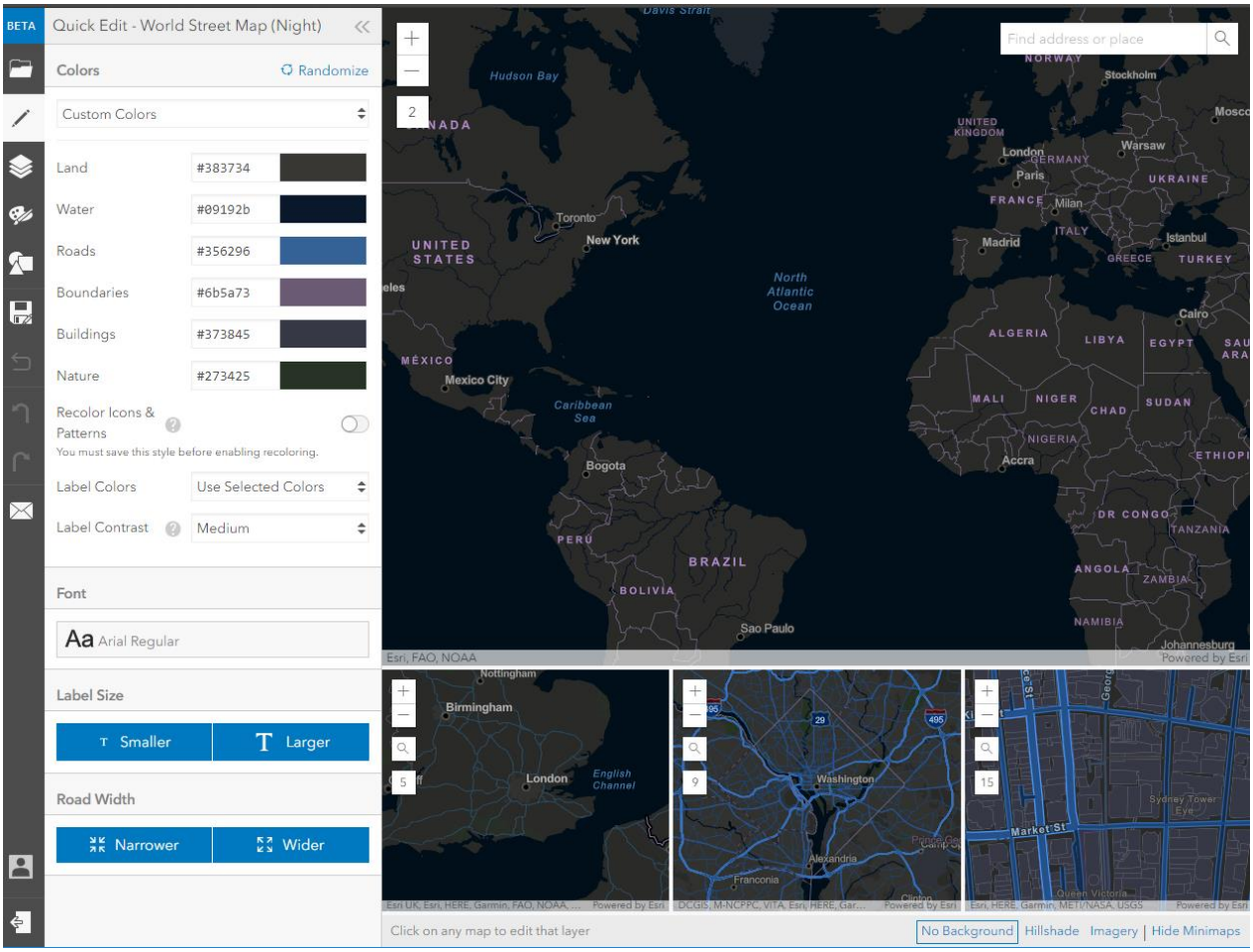
This is just a brief introduction to ESRI's vector tile basemap editor. You can choose not to complete it if you are not interested.

As a final note, I wanted to provide a brief introduction to ESRI's **vector tile basemaps**. ArcGIS now allows you to edit their basemap to create basemaps that meet the needs and themes of your web maps. You can also use these maps in ArcGIS Pro by connecting to your content.

- Go to the following web address: https://developers.arcgis.com/vector-tile-style-editor/. You may need to sign in to this page with your ArcGIS Online credentials.
- Click on Get Started.

On the next page you can select one of the ESRI basemaps and edit the symbology of the basemap layers. You have control over colors, labelling, and what is displayed at different scales. Once you've made changes to a basemap, you can save it to your ArcGIS Online Content. This can then be used as a basemap in online maps. Additionally, you can access these basemaps within ArcGIS Pro if you are logged into your account.

We will not be discussing these vector tile basemaps in detail here. However, I wanted to point out that they exist and encourage you to explore this tool. I have found that the ability to change the ESRI basemaps allows me to produce maps that are more "my own" and that have a consistent theme.


BETA
Quick Edit - World Street Map (Night)
Colors
Randomize
Custom Colors
Land #383734
Water #09192b
Roads #356296
Boundaries #6b5a73
Buildings #373845
Nature #273425
Recolor Icons & Patterns
You must save this style before enabling recoloring.
Label Colors
Use Selected Colors
Label Contrast
Medium
Font
Aa Arial Regular
Label Size
Smaller
Larger
Road Width
Narrower
Wider
Find address or place
Hudson Bay
Davis Strait
Toronto
New York
UNITED STATES
North Atlantic Ocean
Mexico City
Caribbean Sea
Bogota
PERU
BRAZIL
BOLIVIA
Sao Paulo
Johannesburg
Esri, FAO, NOAA
Powered by Esri
Nottingham
Birmingham
London
English Channel
Washington
Alexandria
Franconia
Market St
Sydney Tower Eye
Click on any map to edit that layer
No Background
Hillshade
Imagery
Hide Minimaps