

Exercise 11: 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.
- Create dashboards to monitor your data and Geofoms to collect data.
- Use Web AppBuilder for ArcGIS to create web apps.
- Use ArcGIS Experience Builder to create webpages.

Introduction

Welcome to the WVAGP two-day course on web mapping using **ArcGIS Online**. After completing this course, you will be able to use ArcGIS Online and related technologies to create effective and dynamic web 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, you 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 and 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 configurable 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 **Geoforms** to collect data. You will also be introduced to mobile apps.

Module 4: Working with Web AppBuilder for, Adding Maps to Webpages, and using ArcGIS Experience Builder

The last module will focus on more advanced techniques for generating apps. You will create a new web app using **Web AppBuilder for ArcGIS**. You will embed a map into an HTML webpage and be introduced to editing **ESRI Vector Tile Basemaps**. Lastly, you will be introduced to the **ArcGIS Experience Builder**.

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 ArcGIS Online account tied to your organization depending on the user type and role that is assigned to your 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.

Data 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**.

Insights Analyst: special type for those that primarily use **ArcGIS Insights**.

Storyteller: special type for those that primarily use **ArcGIS StoryMaps**.

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.

Facilitator: same as publisher but allow for inviting partner collaborators.

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 **GIS Professional** 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

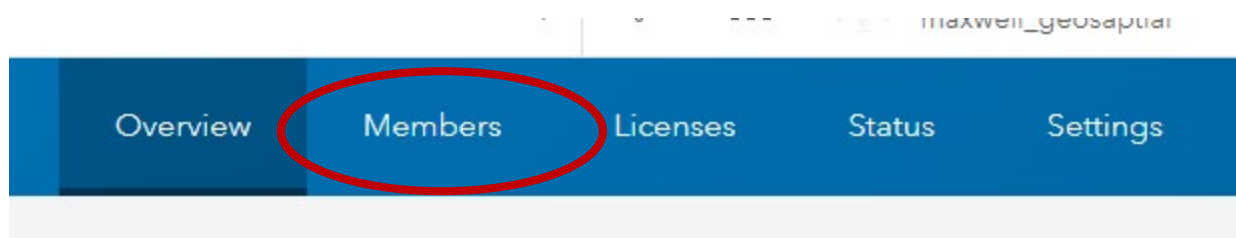
Administrators are able to add members to an organizational account. In order to be added to an organizational account or have your user type or role changed, you will need to contact one of the administrators for your organization. Administrators have additional roles, including the ability to manage 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>.

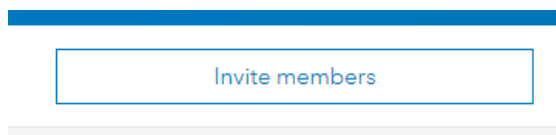
- ❖ Once logged in, the administrator will then need to navigate to the Organization Tab followed by the Members Tab. Note that if you are an administrator, ArcGIS Online should automatically load to the Organization Tab.



Home Gallery Map Scene Notebook Groups Content **Organization**



- ❖ 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:

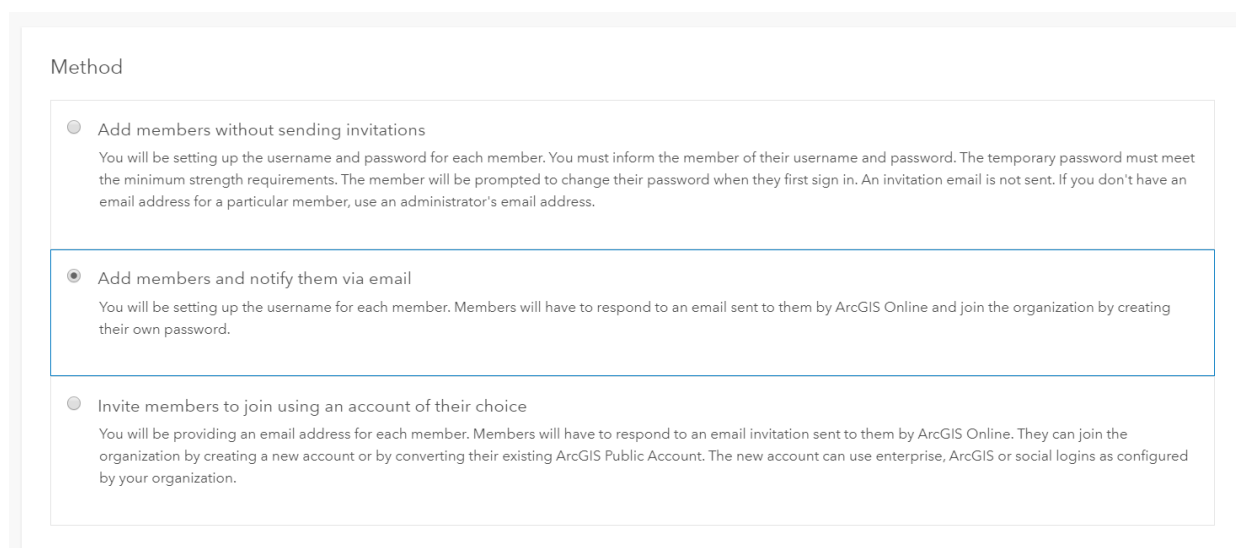
Add Members Without Sending Invitation: you will setup a username and password for each new member then notify the member manually.

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. Note that your accounts have been enabled to allow access to ArcGIS Pro, 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 or GIS professionals, 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 of West Virginia. 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.

Home Gallery Map Scene Notebook Groups **Content** Organization

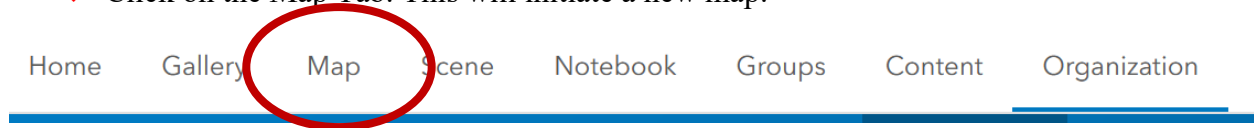
The Content Tab lists all of the content that you have stored within ArcGIS Online including web maps, web scenes, web map applications, native applications, hosted feature layers, tile layers, vector tile layers, and dashboards. Since this is a new account, you will not have any content listed. You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



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 the Save and Open button on the left side of the map followed by Save. Fill out the Save Map window with the information below then click Save Map. This will save the map to your Content and within the specified folder.
 - 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.

A screenshot of the 'Save Map' dialog box in ArcGIS Online. The dialog has a title bar with 'SOUTH DAKOTA' and a close button. The main area contains the following fields:

- Title: WV Points of Interest Aaron Maxwell
- Tags: WVAGP, West Virginia, Points of Interest (each tag is in a blue box with an 'x' to remove it). Below the tags is an 'Add tags' link.
- Summary: Practice map of points of interest in the state.
- Save in folder: webgis_wvagg (shown in a dropdown menu)

At the bottom right, there are two buttons: 'SAVE MAP' (in a blue box) and 'CANCEL'.

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

- ❖ New data layers or basemaps can be added using the **Add Button**. 
- ❖ The **Layers Button** closes and opens the Layers Pane. 
- ❖ The **Tables Button** allows for viewing and adding tables. 
- ❖ The basemap can be changed using the **Basemap Button**. 
- ❖ The **Charts button** allows you to add and configure charts. 
- ❖ The **Legend Button** closes and opens the Legend Pane. 
- ❖ The **Open and Save Button** allows you to save changes, save a copy of the current map (Save As), initiate a new map, and open an existing map. 
- ❖ The **Map Properties Button** allows you to change map properties, such as setting a background color or preserving the map scale. 
- ❖ The **Share Map Button** allows you to change the sharing settings (Owner, Organization, Everyone). You can also share with groups within your organization. 
- ❖ The **Create App Button** allows you to create an app from your map using different methods: **Instant Apps**, **Experience Builder**, **StoryMaps**, and **Dashboards**. 
- ❖ The **Print Button** allows you to print a layout from the current map. 

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 within 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 raster tiles 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 change. 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 originated are still available so that data can be visualized and queried.

Imagery Layer: allows clients to access raw raster and image data.

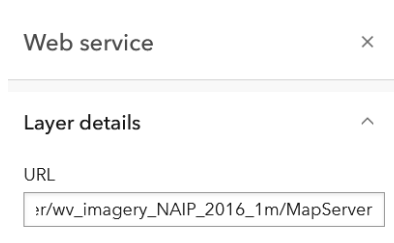
Vector Tile Layers: cached vector graphics data and the information for rendering the vectors. This allows you to change the symbology of the layers, which is not possible with dynamic and tiled map services.

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 the **Add Button** followed by Web Service.
- ❖ Copy and paste the following URL in the URL box:

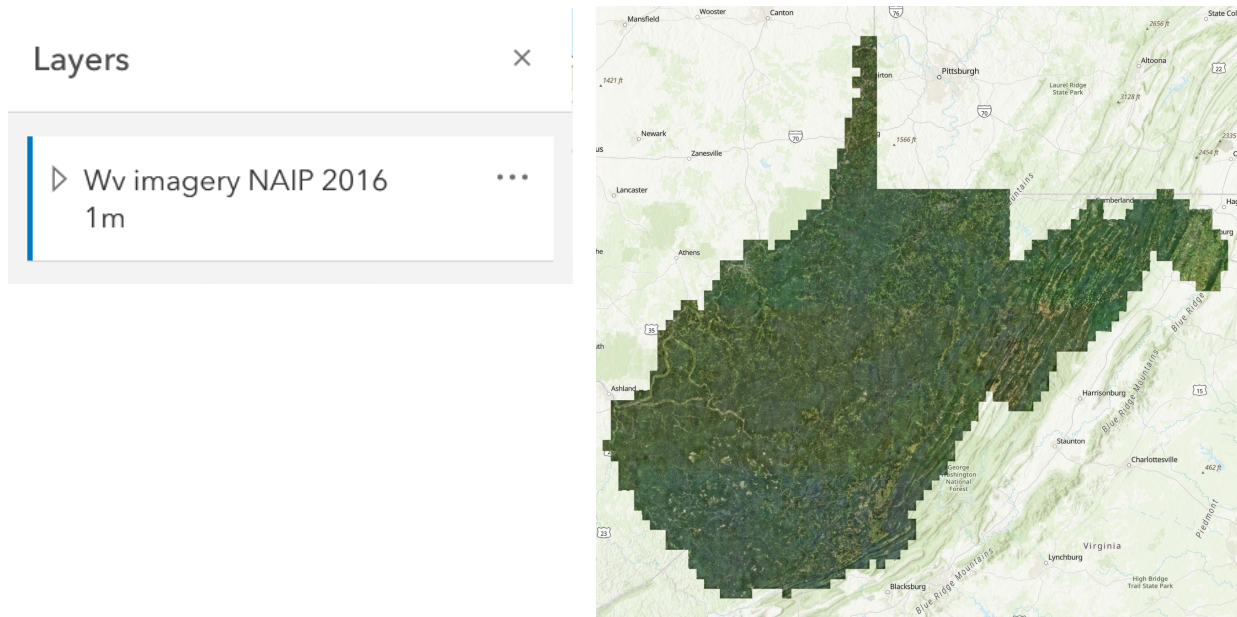


https://services.wvgis.wvu.edu/arcgis/rest/services/Imagery_BaseMaps_EarthCover/wv_imagery_NAIP_2016_1m/MapServer

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

- ❖ Click Add to Map 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 Layers list, which you can activate with the **Layers Button**.



Next, you will add a layer to the map from a file on your computer. The data for this course have been provided in the following folder: wvagn_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.

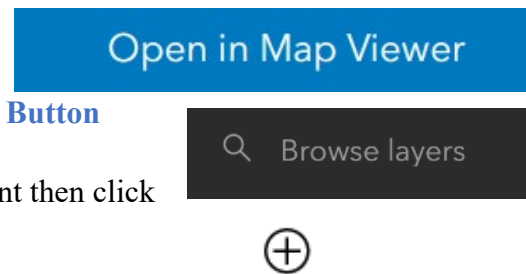
- ❖ Save your map by clicking the **Open and Save Button** followed by Save.
- ❖ Use the hamburger menu at the top left corner of the page to navigate back to your content.
- ❖ On the My Content page, click on New Item.

 New item










- ❖ Drag and drop the county_seats.zip file into the New Item pane. It should automatically recognize that this is a shapefile. Make sure the “Add county_seats.zip and create a hosted feature layer” option is selected then click Next.
- ❖ In the next window, provide a name for the layer, save it to your webgis_wvavgp folder, and provide tags and a short summary. Click Save.

Once the file has been uploaded, the new hosted feature layers landing page should load. You will now share this file with Everyone.








- ❖ Click on the Share Button. Change the setting to Everyone (public). Click Save. This means that anyone with ArcGIS Online access can use this layer.
- ❖ Navigate back to your map. This can be accomplished by going back to your Content page, clicking on the web map object, then selecting Open in Map View on the map’s landing page.
- ❖ To add the new layer, click on the **Add Data Button** followed by Browse Layers.
- ❖ Locate your county seats layer in your Content then click Add to add it.



The layer has now been added; however, its symbology and pop-up has not been edited. The tools/icons on the right side of the map can be used to refine layers. Here is an overview of the tools. Note that whatever layer is selected or active in the Layers List will be available for editing. The buttons available will depend on if a layer is selected and the type of layer selected.

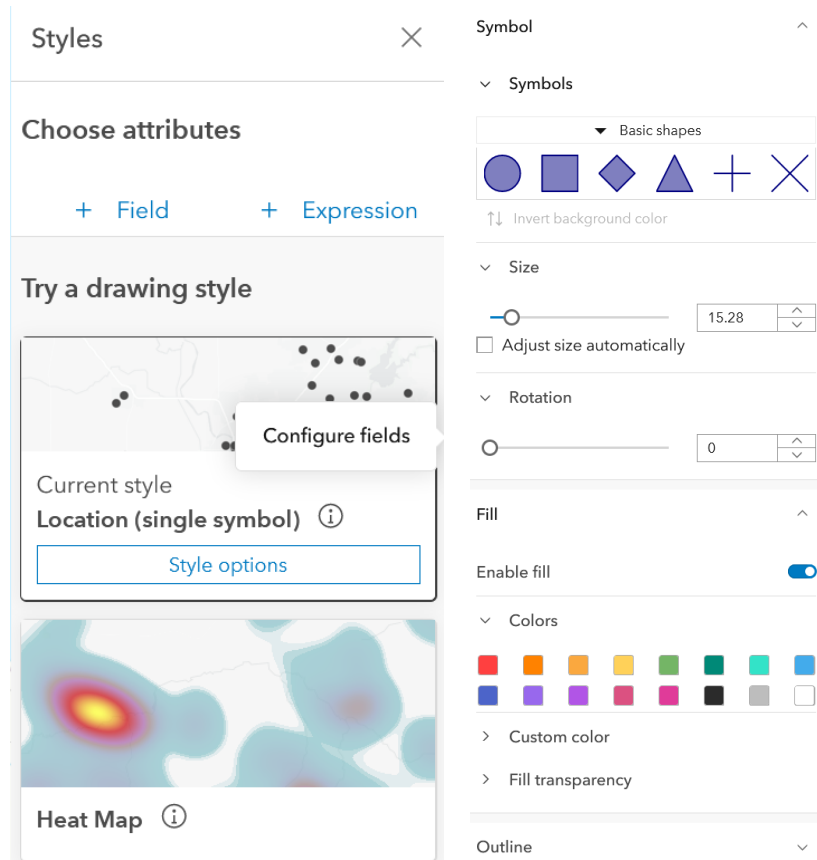
-  **Properties:** change the symbology, transparency, visibility range, and refresh interval
-  **Styles:** further customization of symbology
-  **Filter:** query features based on attributes to highlight key features
-  **Effects:** apply effects, such as drop shadows, blur, saturation changes, and sepia
-  **Clustering:** define clustering options for display of congested data
-  **Configure Pop-Up:** configure or disable the layer pop-up
-  **Configure Fields:** configure or rename fields
-  **Labels:** work with labels
-  **Charts:** build and configure charts

The other buttons on the right-side are not layer specific.

-  **Search:** open and close search bar to search with keywords or addresses
-  **Sketch:** sketch or draw into a layer
-  **Measurement:** make measurements of length or area
-  **Directions:** get directions using built-in network analysis tools
-  **Location:** navigate to your location if location services are available
-  **Edit:** Edit layers that are editing enabled
-  **Time:** use a time slider to view time-enabled data (the data used in this course are not time enabled, so we will not explore this option).

Let's explore some options by changing the symbology of the county seats layer.

- ❖ Make sure the county seats layer is selected in the Layers List then navigate to the Properties options. Click on Edit Layer Style in the Symbology section. Alternatively, you can click on the Styles option. Either method will open the same styles menu.
- ❖ Make sure the Location (single symbol) option is selected then click on Style Options.
- ❖ In the Style Options Pane, experiment with changing the symbol, symbol color, and symbol size. You will need to click on the pencil associated with Symbol style.



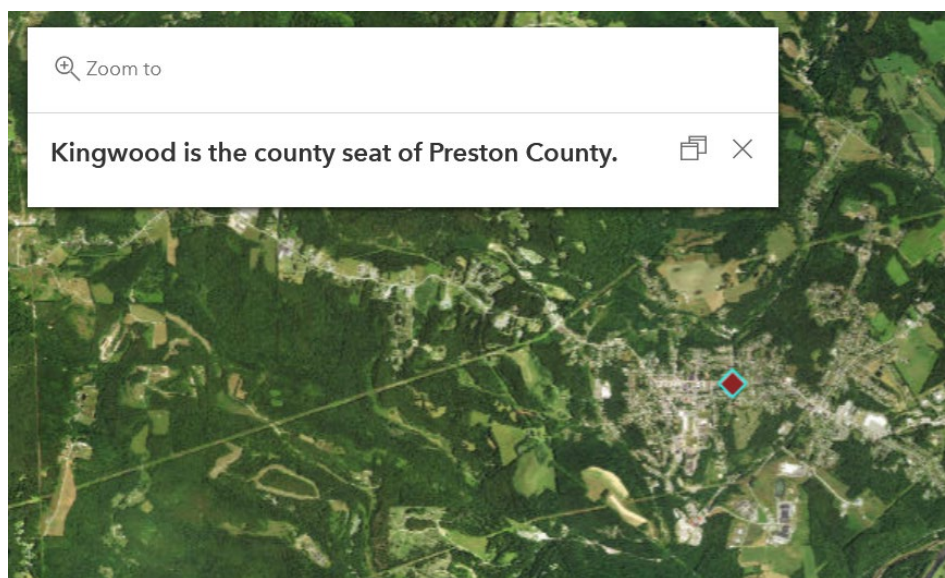
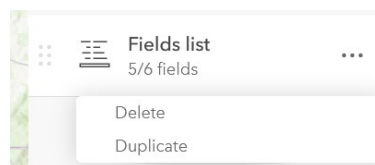
Once you are satisfied with the symbology, you will move on to edit the attributes.

- ❖ Click on the Configure Fields option. This will open the Fields Pane.
- ❖ If you click on a specific field, formatting options will be provided. Change the display names as follows:
 - NAME → Name
 - COUNTY → County

Fields	
<input type="text" value="Search fields"/>	
FID {FID}	
Name {NAME}	abc
County {COUNTY}	abc
CTY_STS {CTY_STS}	int
FIPS {FIPS}	int
TYPE {TYPE}	abc

Now, you will configure the pop-up.

- ❖ Click on Configure Pop-Up. This will open the Pop-Ups Pane.
- ❖ Click on Title and change the title as follows:
{NAME} is the county seat of {COUNTY} County.
Note that curly brackets are used to indicate field names. This allows for dynamic text.
- ❖ You do not need to show any additional fields. So, simply delete the fields list.
- ❖ Click on a county to test the pop-up. It should only display the formatted title with no displayed attributes.

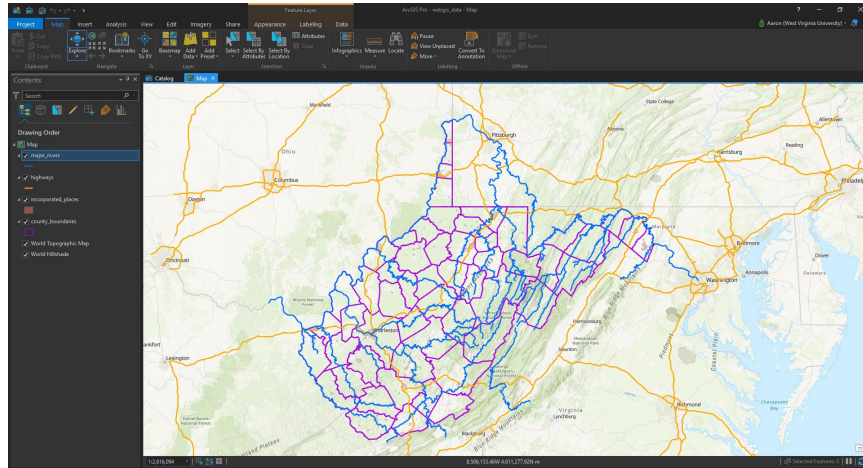


You have now made some substantial changes to your web map. Now would be a good time to save your work.

- ❖ Click on the **Open and Save Button** followed by Save to save the web map.

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

- ❖ Navigate to the wvapg_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>

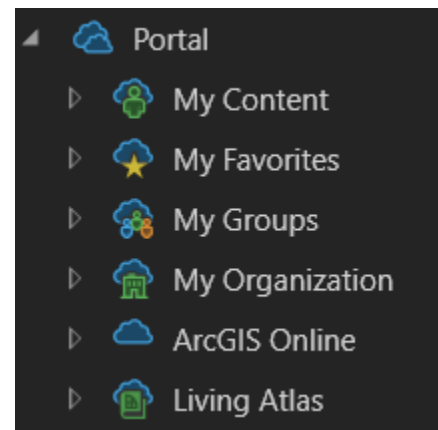
highways: <http://wvgis.wvu.edu/data/dataset.php?ID=107>

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

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

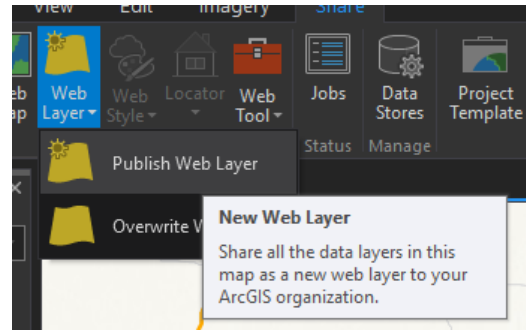
- ❖ In order to be able to publish data layers to your ArcGIS Online content, you will need to log in to your account in ArcGIS Pro.

Note: If you are logged into your ArcGIS Online account in ArcGIS Pro, you can access your web content for use in the desktop application. You can log in at the top right of the software interface. If you click on the Add Data button within the Map tab, your ArcGIS Online content will be available under the Portal area followed by My Content. You can also access layers that have been shared with you within your organization (My Organization), public layers on ArcGIS Online (ArcGIS Online), layers shared within groups in which you are included within your organization (My Groups), and layers shared by ESRI via the Living Atlas of the World. So, ArcGIS Pro is tightly integrated with ArcGIS Online.

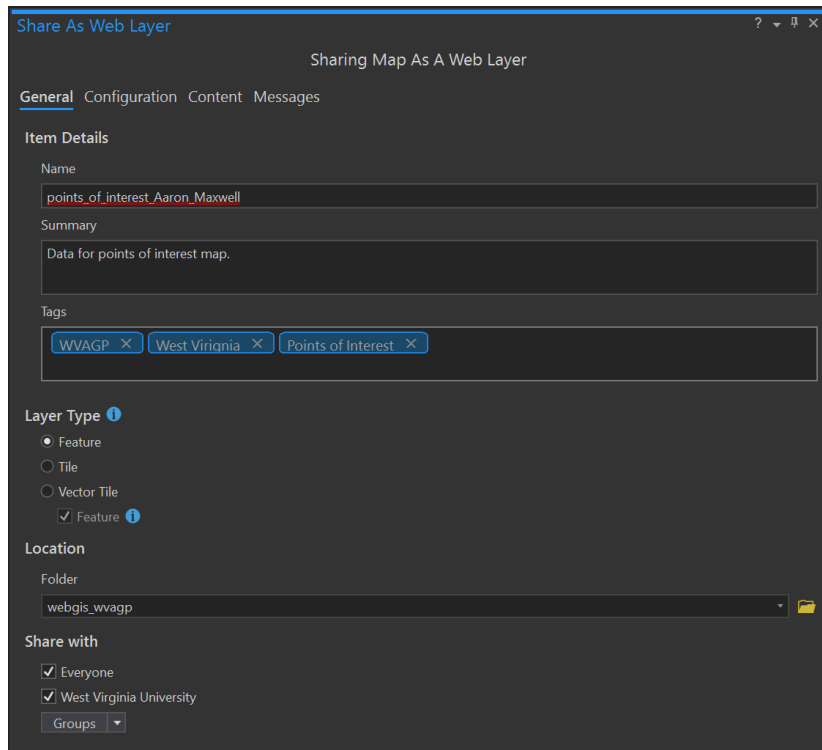


You are now ready to publish these data to your ArcGIS Online Content.

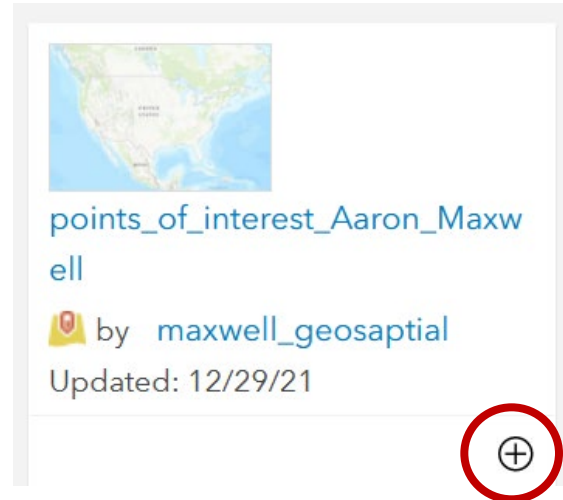
- ❖ Navigate to the Share Tab.
- ❖ Select Web Layer followed by Publish Web Layer.
- ❖ In the Sharing Map As A Web Layer Tool, make the following changes:
 - Change the name to points_of_interest_data_YOUR_NAME.
 - Provide a summary.
 - Provide tags.
 - Make sure the Layer Type is set to Feature.
 - Make sure the Location is set to your new folder within your ArcGIS Online content.
 - Share the data with Everyone.



- ❖ Click Analyze to see if there are any issues. You will get some warnings, but none that matter. If you get the following Error (00374 Allow assignment of unique numeric IDs for sharing web layers is disabled in Map Properties), click on the error message then select “Allow assignment of unique numeric IDs for sharing web layers” in the Map Properties: Map window. Once this change is made, click on Analyze again to make sure the Error is no longer flagged.

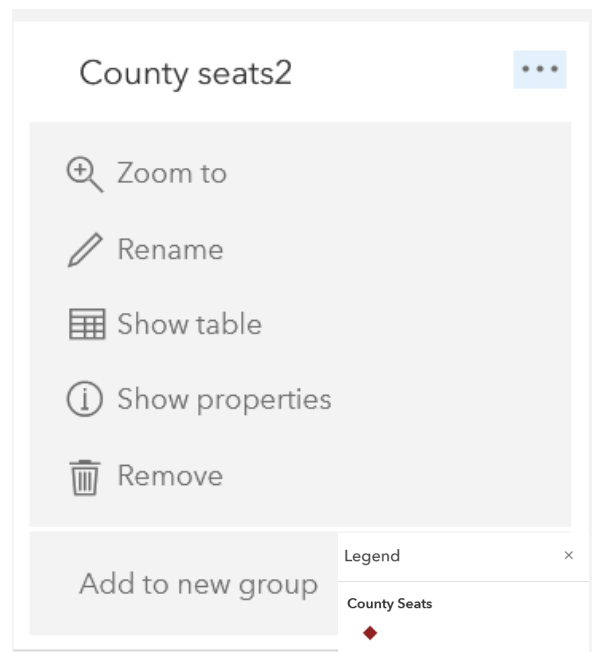


- ❖ Click Publish to publish the data. This will take several minutes.
- ❖ Once the data have been shared, you can save your changes and exit out of ArcGIS Pro.
- ❖ Return to your web map in ArcGIS Online.
- ❖ In your web map, click the **Add Button** followed by Browse Layers. Within your Content, you should see the points_of_interest data that have 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 now perform some clean up.

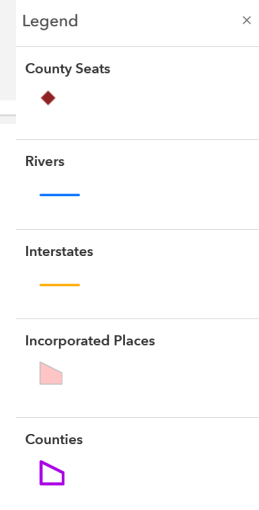
- ❖ Click on the **Layers Button** to open the Layer Pane. Move the County Seats data up to the top of the list to change the drawing order.
- ❖ Change the names of the layers. This can be accomplished by clicking on the layer options (three dots) for the layer and clicking Rename.
 - County_seats = County Seats
 - major_rivers = Rivers
 - highways = Interstates
 - incorporated_places = Incorporated Places
 - county_boundaries = Counties
 - Also, change the Imagery data name to "NAIP 2016 Imagery".



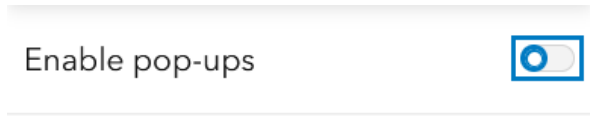
You also don't want the imagery layer to show up in the legend.

- ❖ Click on the NAIP layer in the Layers List then select the Properties icon on the right side. Turn off the Show in map legend option.
- ❖ Click on the **Legend Button** to see the edited legend.

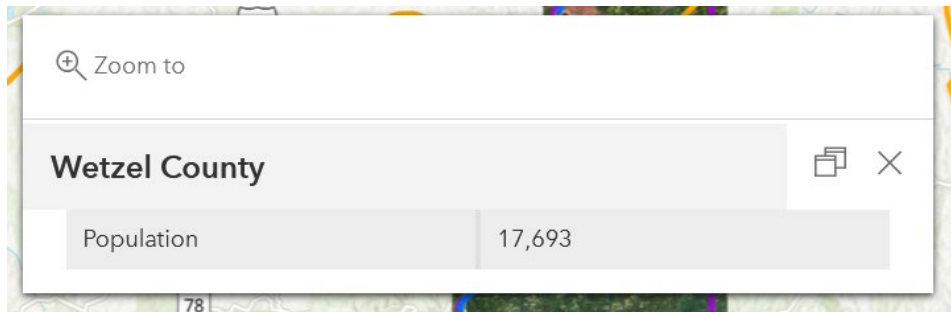
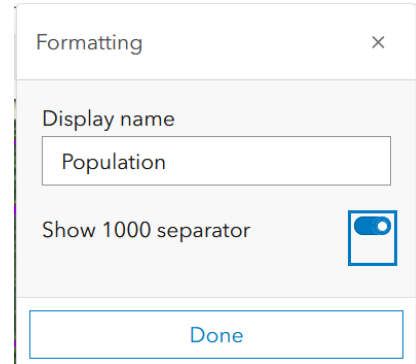
Next, turn off the pop-ups for the rivers, interstates, and incorporated places layers and format the pop-up for the counties layer.



- ❖ To turn off a pop-up, make sure the layer is selected in the Layer Pane then select Configure Pop-Ups on the right side. Click off Enable Pop-Ups.



- ❖ Format the pop-up for the counties layer as follows:
 - The pop-up name should be the county name followed by “County”.
 - Only one field should be shown with the following alias name: POP2000 as Population (also, add the 1000 comma separator).



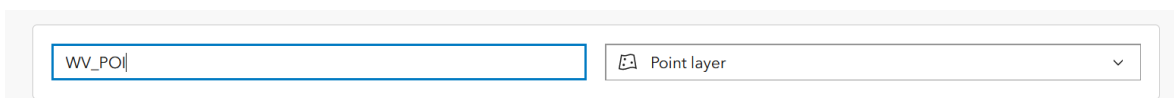
- ❖ Save your map again.

Module 2: Hosted Feature Layers and Web Apps

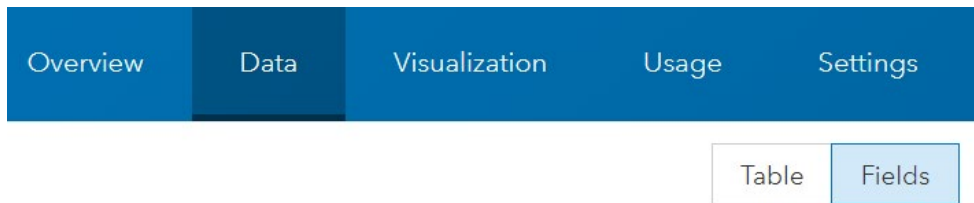
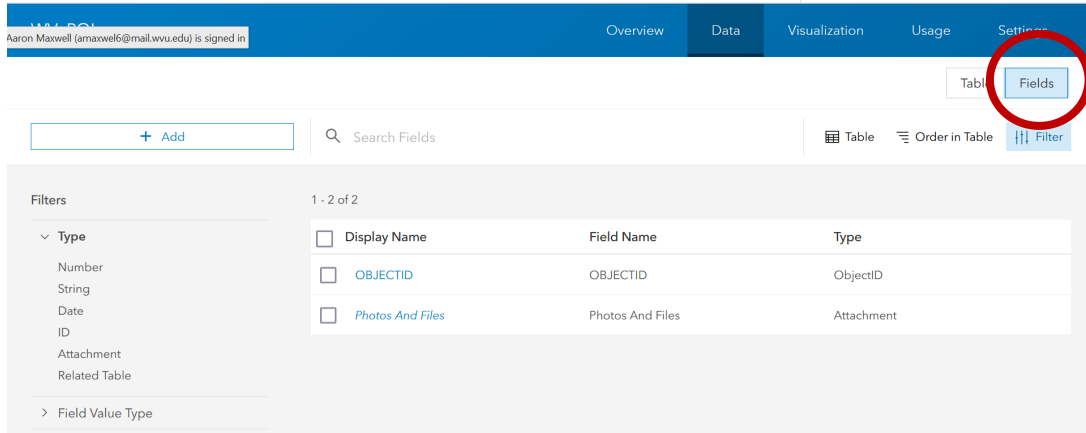
Create a Hosted Feature Layer

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. You will start by creating a new **hosted feature layer** that can be saved to your ArcGIS Online content. Let's make a new layer from scratch!

- ❖ Navigate to your Content on ArcGIS Online.
- ❖ Click New Item.
- ❖ In the New Item window, select Feature Layer.
- ❖ In the Create a Feature Layer window, select Create a blank layer.
- ❖ Name the layer WV_POI and set the type to Point Layer. You do not need to turn on Add GPS metadata fields or Enable Z-values.




- ❖ In the New Item window, provide a title, save the layer to your folder, and provide some tags and a summary.
- ❖ Once the layer is created, the drop page will load. Navigate to Data followed by Fields.



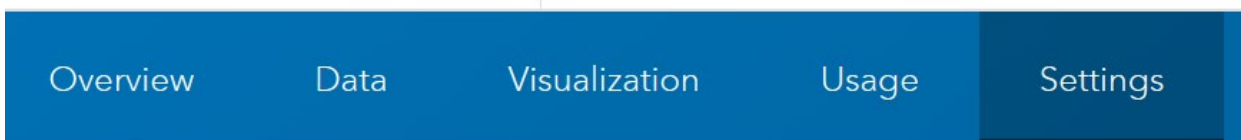
- ❖ Click Add to create a new field. Name the field poiType with a display name of Type. Set the Type to String, leave the Length as 256, do not set a Default Value, and click off the Allow Null Values option. Click Add new Field to add the field.
- ❖ Once the new field is created, click on it to open its settings. Click on Create List. This will allow you to define allowed categories to store in the field (i.e., a coded values domain). Create the following categories and save your changes.
 - Label = Nature, Code = 0
 - Label = Historical, Code = 1
 - Label = Pop Culture, Code = 2

The screenshot shows the 'Add Field' dialog box in ArcGIS Online. The field name is 'poiType', the display name is 'Type', the type is 'String', the length is '256', and the default value is 'Nature'. The 'Allow Null Values' option is unchecked.

- Label = Other, Code = 3

Label	Code	
Nature	0	
Historical	1	
Pop Culture	2	
Other	3	

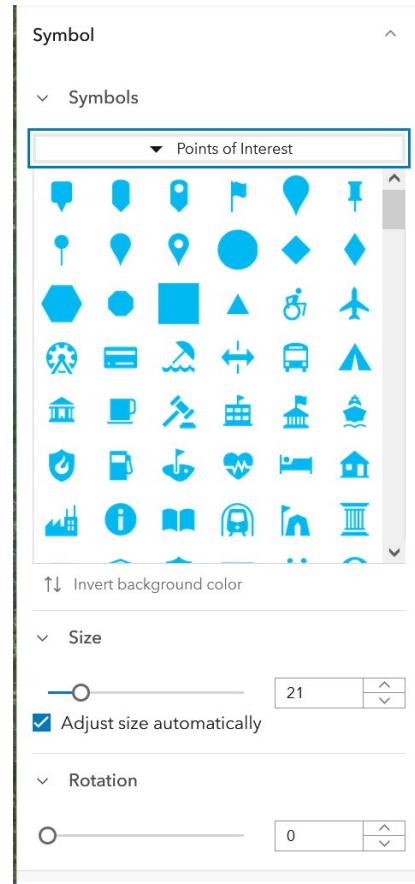
- ❖ Create another field called featName with an alias of Name. Set the type to String. You do not need to set a Default Value, but do not allow null values.
- ❖ Create another field called dateAdded with an alias of Date. Set the type to Date. You do not need to set a Default Value and you can allow null values.
- ❖ Create another field called description with an alias of Description. Set the type to string and increase the length to 1,000. You do not need to set a default value and you can allow null values.
- ❖ Create a new field called myRating with an alias of Rating and a type of Double. You do not need to set a Default Value and you can allow null values. Change the Field Value Type to Ordered or Ranked. Next, set a minimum value of 0 and a maximum value of 5. This will allow the user to provide a 5-star rating where only values between 0 and 5 can be entered (i.e., a ranged values domain).
- ❖ Navigate to the Settings page for the new layer. Make sure the following options are selected.
 - Enable editing
 - Add, Delete, and Update under What kind of editing to allow?
 - Select Approve this layer for public data collection under Public Data Collection.



- ❖ Back on the Overview page for the layer, select Share and share the layer with Everyone.

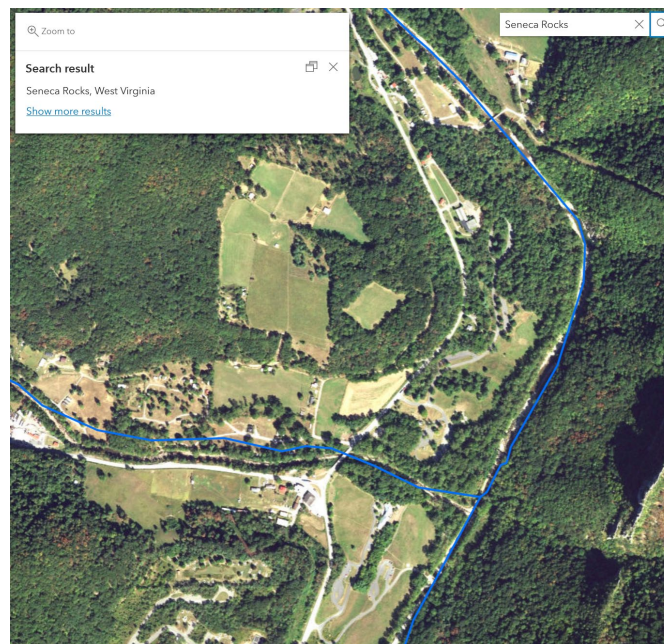
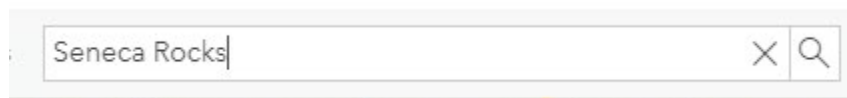
Now that the new hosted feature layer has been created, you need to add it to your map and define the symbology.

- ❖ Navigate to your Content followed by the landing page for your map. Open your map using Open in Map View.
- ❖ Click the Add button followed by Browse Layers.
- ❖ Add your points of interest layer to the map.
- ❖ Use the Properties or Styles icon to edit the properties symbology for the layer. To symbolize using unique values you will need to:
 - Click + Field in the Styles Window followed by type.
 - Select Types (unique symbols).
 - Select Style Options.
 - Select unique symbols for each type. You can change the symbol, color, and/or size.



Once you have chosen and edited symbols for each category, you can test that your new layer is working properly.

- ❖ Activate the Search toolbar by clicking on the Search Icon. Search for “Seneca Rocks”. This will zoom your map to Seneca Rocks in Pendleton County.



- ❖ Make sure the points of interest layer is selected in the Layer List then select the Edit icon on the right side of the page.
- ❖ Click Add Feature then add a point to the map near Seneca Rocks. Fill out all of the fields.
- ❖ You have now successfully added a point to the map. If you navigate out of the Add Features window and then click on Edit Feature, you can add an attachment to the point. Click on the Seneca Rocks points followed by + Add under the Attachments section. Attach the seneca_pic.JPG image that was provided in the data folder. If you click on the point on the map, you can then click on the attachment to view it in a new window or tab.
- ❖ Take some time to generate a few more points across the state. Remember to save the map when you are done.

Untitled Feature

Type: Nature

Date: 12/29/2021 7:30:00 PM

Description: Great Hike

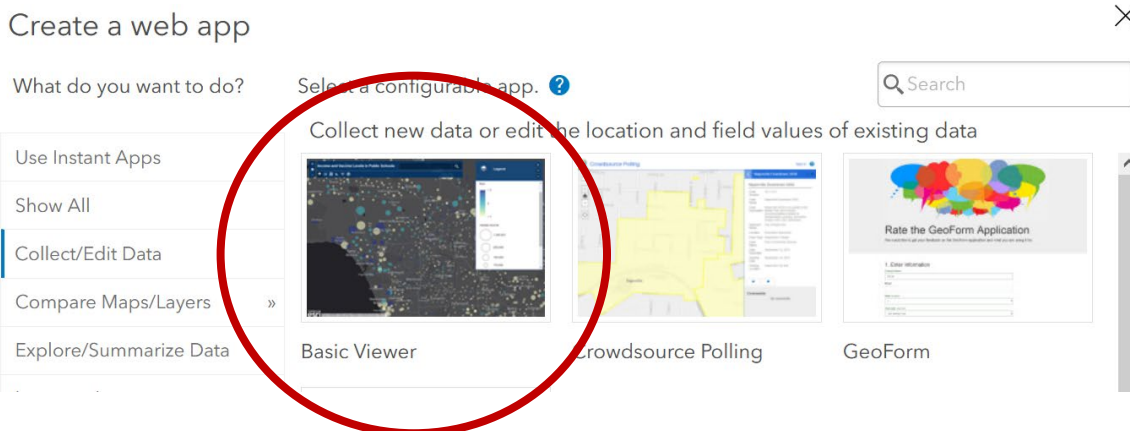
Rating: 4.7


Add

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 using an ESRI template that will allow you to access your map and edit the point layer.

- ❖ Navigate to your Content on ArcGIS Online.
- ❖ Navigate to the landing page of your map.
- ❖ Select Create Web App followed by Configurable App.
- ❖ Under the Collect/Edit Data group, select Basic Viewer followed by Create Web App.



- ❖ In the Create a Web App window, provide a title, tags, and summary. Save the app to your folder. Click Done.
- ❖ In the Configure page:
 - Make desired changes to the Theme under the Theme tab.
 - Under Options, click on Legend, Measure Tool, and Display Editor. The Display editor option is really important as users will not be able to edit the points of interest layer without this selected.
- ❖ Once you are satisfied with your changes, click Save followed by Launch to view the App.
- ❖ Make sure that you are able to use the widgets and add some new points of interest to the map using the Edit Tool. 

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 create 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: Create Dashboards and 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 how to generate a web app from a configurable app that uses your map and data. In this section, you will expand your skills to include creating **dashboards** to monitor your data and creating a **Geoform** app in which to collect data.

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

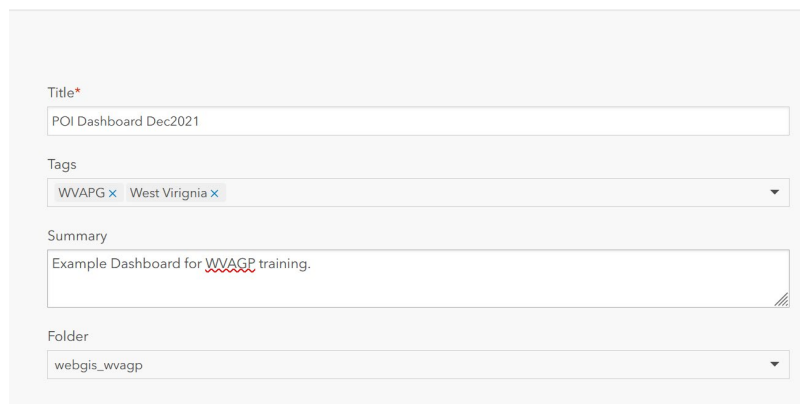


Dashboards

Create a dashboard with data visualizations that provide key insights.

- ❖ 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 Create Dashboard.

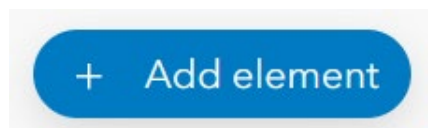
Create new dashboard



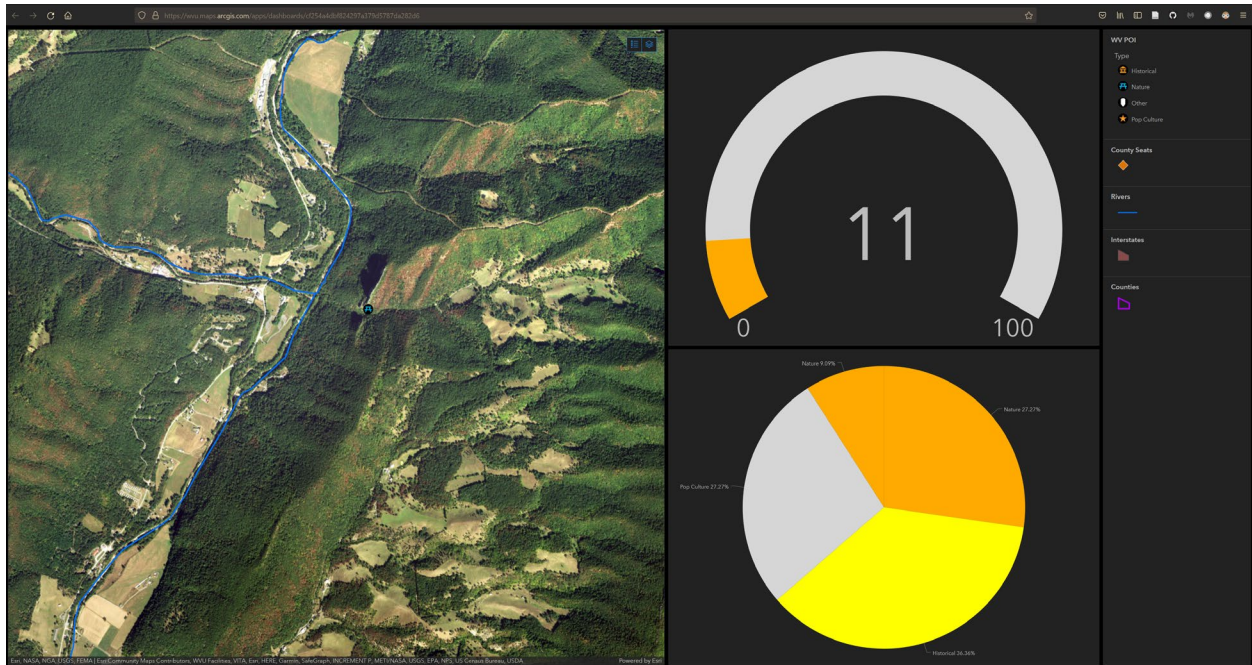
The screenshot shows the 'Create new dashboard' form. It has four main sections: 'Title*' with the text 'POI Dashboard Dec2021'; 'Tags' with a dropdown menu showing 'WVAPG x' and 'West Virginia x'; 'Summary' with a text area containing 'Example Dashboard for WVAGP training.'; and 'Folder' with a dropdown menu showing 'webgis_wvapg'.

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

- ❖ Click the Add Element button. Select map and choose your points of interest Map. For the map options, make sure the pop-ups are enabled and the Legend and Layer Visibility are included. Click Done.
- ❖ Add a map Legend. Feel free to make any changes you desire.
- ❖ Add a Pie Chart that shows the count of each type of category. This will require you to set the Category Field to Type and the Statistic to Count.
- ❖ Add a Gauge that shows the number of points of interest added. Feel free to change any settings.
- ❖ Under the Settings options, experiment with changing colors and themes.
- ❖ Make sure to save your Dashboard.



You have now created and 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 additions.

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 or Dashboard. You can find the map in your Content list. Click on the map to open the landing page. Select Create a Web App followed by Configurable App.
- Create Web App ▾
- ❖ Select the GeoForm option under the Collect/Edit Data group followed by Create Web App.
 - ❖ Provide a title, tags, and summary, and save the app to your folder. Click Done.
 - ❖ Click Next on the Getting Started page.
 - ❖ Your web map should already be selected on the Webmap page. Click Next.
 - ❖ On the Select Editable Layer(s) page make sure only the points of interest layer is selected. Click Next.
 - ❖ On the Details page, make the following changes.
 - Set the title to “WV POI GeoForm”
 - Set the logo image to the following URL:
<https://www.wvagp.org/resources/Pictures/WVAGP200HiRes.jpg>

- Provide the following Form Instructions & Details: “Use this form to enter points of interest within the state of West Virginia. You can also provide a rating and upload a picture. Remember to submit your points of interest before leaving the page. Thanks for your input.”
 - Change the Submission Button Text to “Submit POI”
 - Change the Submission Text to: “POI Submitted!”
 - Click Next.
- ❖ On the Fields page, add the following text to the Attachment Button Label: “Add an Attachment”. No other changes are necessary. Click Next.
 - ❖ Select a style of your choosing on the Select Form Theme page. Click Next.
 - ❖ You do not need to make changes on the Viewer page. Click Next.
 - ❖ You do not need to make changes on the Options page. Click Next.
 - ❖ Review the app on the Preview page. Make sure there are no issues. Click Next.
 - ❖ On the Save Application page click Save.
 - ❖ Click close in the pop-up that indicates that the submission is complete.
 - ❖ Navigate back to your Content on ArcGIS Online. Click on your GeoForm app to go to the landing page. Click View Application to view the app.
 - ❖ Test your app to make sure it works as expected. You can also use your Dashboard to monitor any changes.

The screenshot displays the ArcGIS Online GeoForm app interface, divided into four main sections:

- 1. Select Form:** A dropdown menu is set to "WV POI".
- 2. Enter Information:** Includes a "Type (required)" dropdown set to "Select...", a "Date" field, a "Description" text area, a "Rating" field with a star icon, and an "Attachment" section with a "Select File" button.
- 3. Select Location:** Features a search bar with "Lat/Lon" and "Find address or place" options, and a "Locate Me" button. Below is a map showing a blue location pin on a satellite view of a wooded area.
- 4. Complete Form:** Shows two buttons: "Submit POI" and "POI Submitted!".

Collecting Data with Collector for ArcGIS

We will not experiment with mobile apps in detail in this short course. However, I did want to note that **ArcGIS AppStudio** (<https://www.esri.com/en-us/arcgis/products/arcgis-appstudio/overview>) is a powerful tool for making mobile apps. These apps can be linked to your data and/or your ArcGIS Online maps. However, the ArcGIS AppStudio must be licensed. It offers templates that can be configured. To create custom mobile apps, you will need to make use of the Qt language/widget toolkit for creating graphical user interfaces (GUIs). Specifically, ArcGIS AppStudio is used to create native apps that can be installed on different operating systems (iOS, Android, Mac, Linux, and Windows). These apps can be made available on app stores, such as Google Play or the Apple Store.

As an alternative to creating a native app, you can also collect data into a hosted feature layer using **ArcGIS Field Maps**. I will briefly describe that process now. **You can skip this section if you'd like since this will require using a smart phone and installing a new app.**

- ❖ If you have not already done so, you will need to install **ArcGIS Field Maps** 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 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 using the blue add button. The app will be able to make use of your phone's GPS if you allow it to use your location services. You will be able to select a point, fill out the attributes, and upload a picture.
- ❖ Once you've added a new point, you may want to check your map or operations dashboard to confirm that it was submitted.

Module 4: Working with ArcGIS Web AppBuilder, Adding Maps to Webpages, and Introduction to ArcGIS Vector Tile Style Editor and Experience Builder

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. Next, we will briefly explore the **ArcGIS Vector Tile Style Editor** for creating custom base maps followed by the **ArcGIS Experience Builder** for creating webpages.

Working with Web AppBuilder for ArcGIS

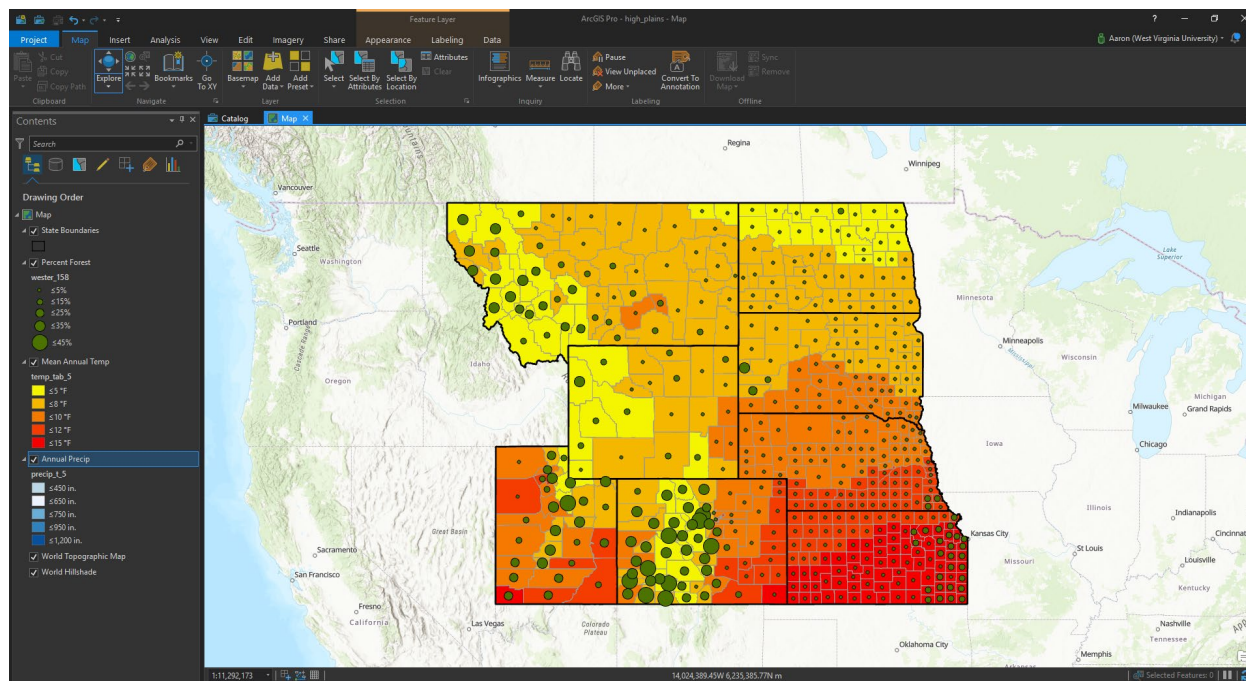
I imagine that you are now pretty tired of working with the points of interest data. So, for this section we will make use of a different map. In the `wvaggp_webgis` folder, a second ArcGIS Pro project file has been provided in the `high_plains` folder called `high_plains.aprx`. This map contains climate 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 Celsius, and the annual precipitation is provided in millimeters. 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 in ArcGIS Pro if you are not already logged in.

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.

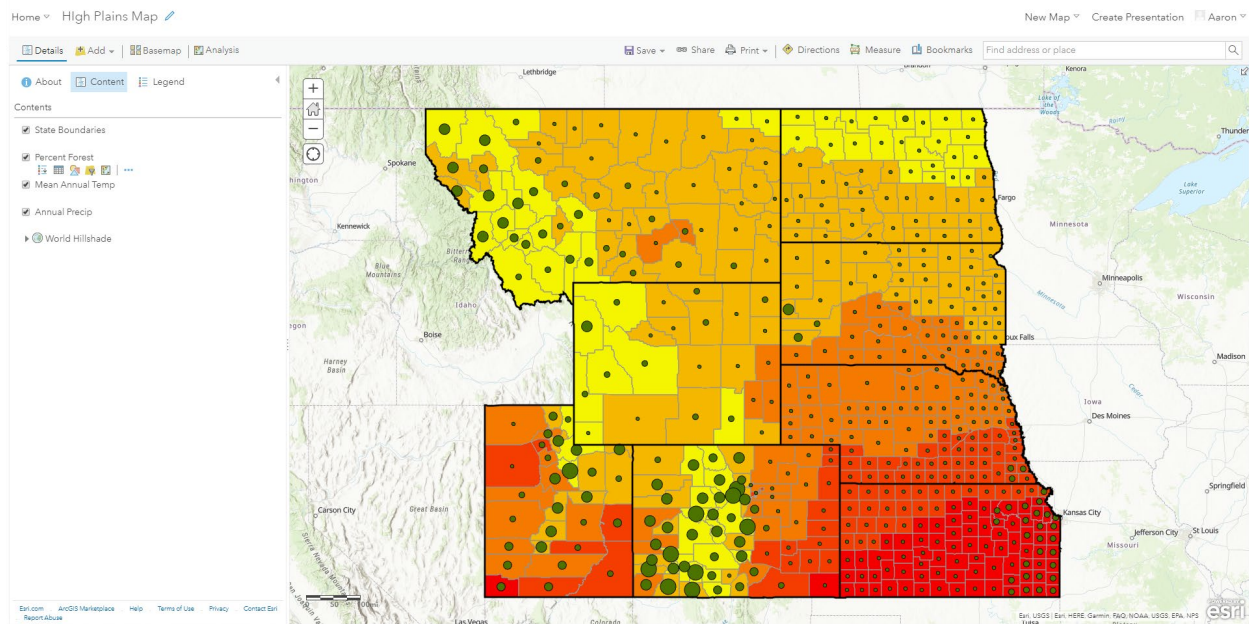
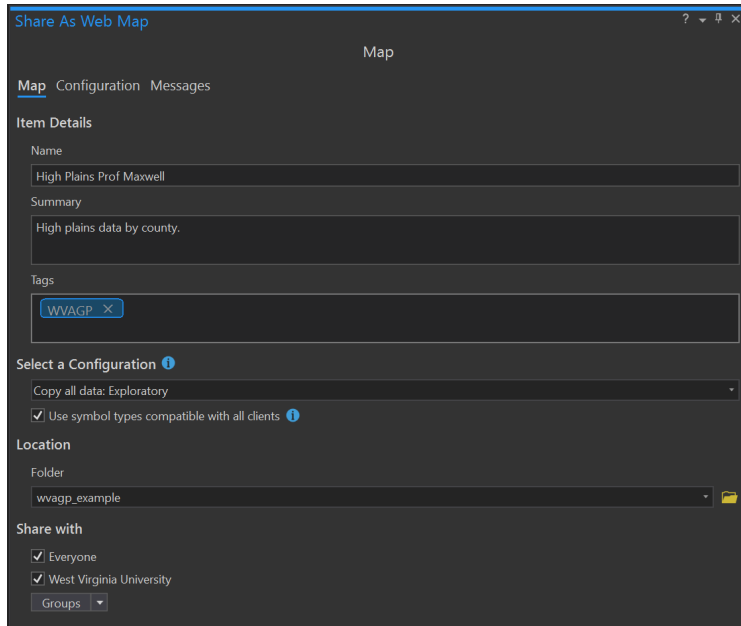
You will now need to create a web map from this map. Note that this is different from what you did in Module 1. In Module 1, you published only the layers using Sharing Map As A Web Layer Tool. Now you will publish the entire map using the Share As Web Map Tool. A web map, host feature layer with sublayers,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



- ❖ 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.

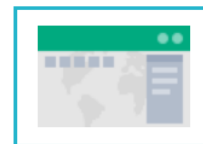


- ❖ Click Analyze to make sure there are no issues. Warnings are not an issue. No errors should be found. If you get the following Error (00374 Allow assignment of unique numeric IDs for sharing web layers is disabled in Map Properties), click on the error message then select “Allow assignment of unique numeric IDs for sharing web layers” in the Map Properties: Map window. Once this change is made, click on Analyze again to make sure the Error is no longer flagged.
- ❖ 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. Click on it to open the landing page for the map.
- ❖ Open the map in the Map Viewer.



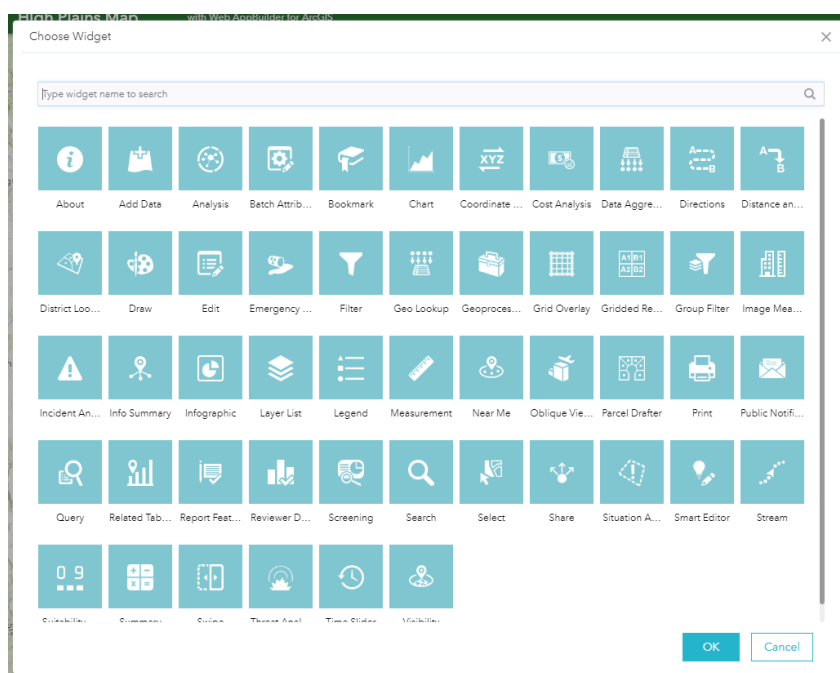
- ❖ If you would like, you can take some time to change any symbology, labels, or pop-ups in the map. However, this is not necessary.

- ❖ Back on the map landing page, click on Create a Web App followed by Web AppBuilder. Fill out the Create a New Web App window. Click OK. This will launch the ArcGIS Web AppBuilder in your browser.



Foldable Theme

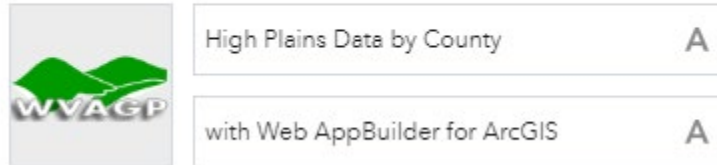
- ❖ Under the Theme Tab, choose the Foldable Theme. Feel free to change the Style and Layout if you prefer.
- ❖ You do not need to make any changes under the Map Tab. However, you can change the default extent if you prefer.
- ❖ Under the Widget Tab, you will need to add the following widgets: Layer 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 layers 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 wvagnp_webgis folder (wvagnp_logo.png) by hovering over the icon and selecting Custom. Navigate to the wvagnp_webgis folder to select the image. Change the title to a title of your choosing. You can also change the subtitle if you like.

Branding

Add logo, title, or subtitle for your app.



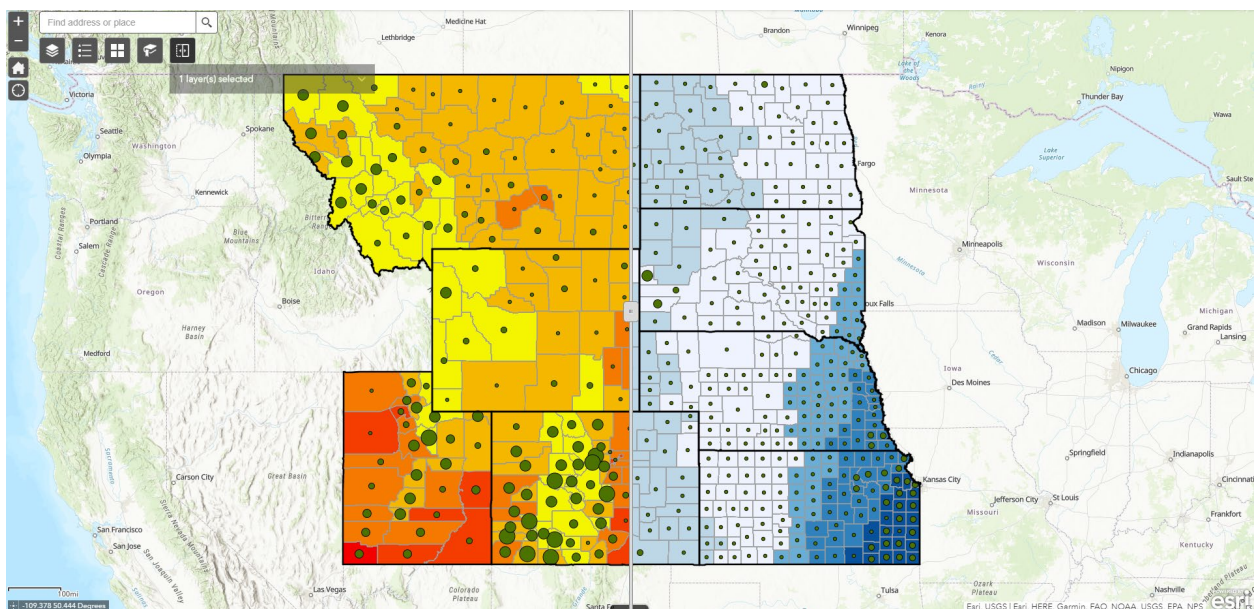
- ❖ Click Save to save the app. Click Launch to launch the app in a new window.

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.



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 the WVU organization so that I can see it.

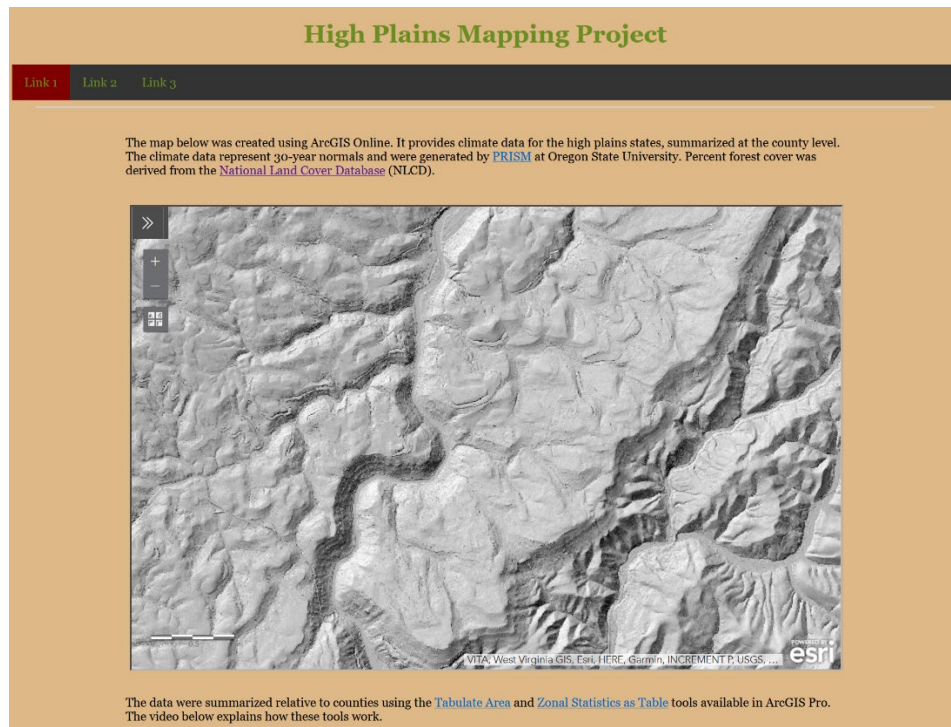
Adding Maps to Webpages

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 an HTML file in the HTML subfolder of the wvapp_webgis folder called embedded_webmap.html.

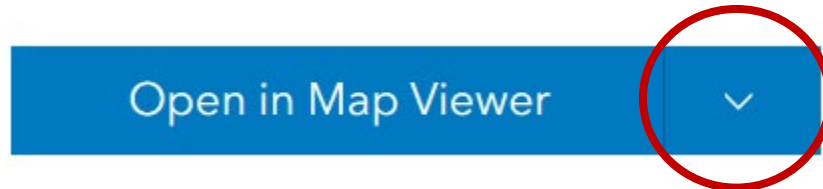
- ❖ Navigate to this folder and right-click on the HTML document. Select Open With followed by Google Chrome or another web browser.

The webpage should open in Google Chrome.

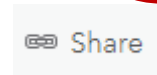


You can see that an ArcGIS Online map has already been embedded in the page; however, this is not the correct map. You will replace this map with the high plains map you created above.

- ❖ Log into ArcGIS Online and navigate to your Content.
- ❖ Navigate to your high plains map landing page then click on the dropdown arrow associated with Open in Map Viewer. Select Open in Map Viewer Classic. The functionality we need has not been integrated into the new Map Viewer yet, so we must use the older version.



- ❖ 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/>. VS Code is also a good free editor (<https://code.visualstudio.com/>).
- ❖ Back in the Embed in Website window in ArcGIS Online, click the COPY button next to the code. Paste the code into 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 where 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.
- ❖ Delete the code that was copied from ArcGIS Online now that you have extracted the URL to the existing code.

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

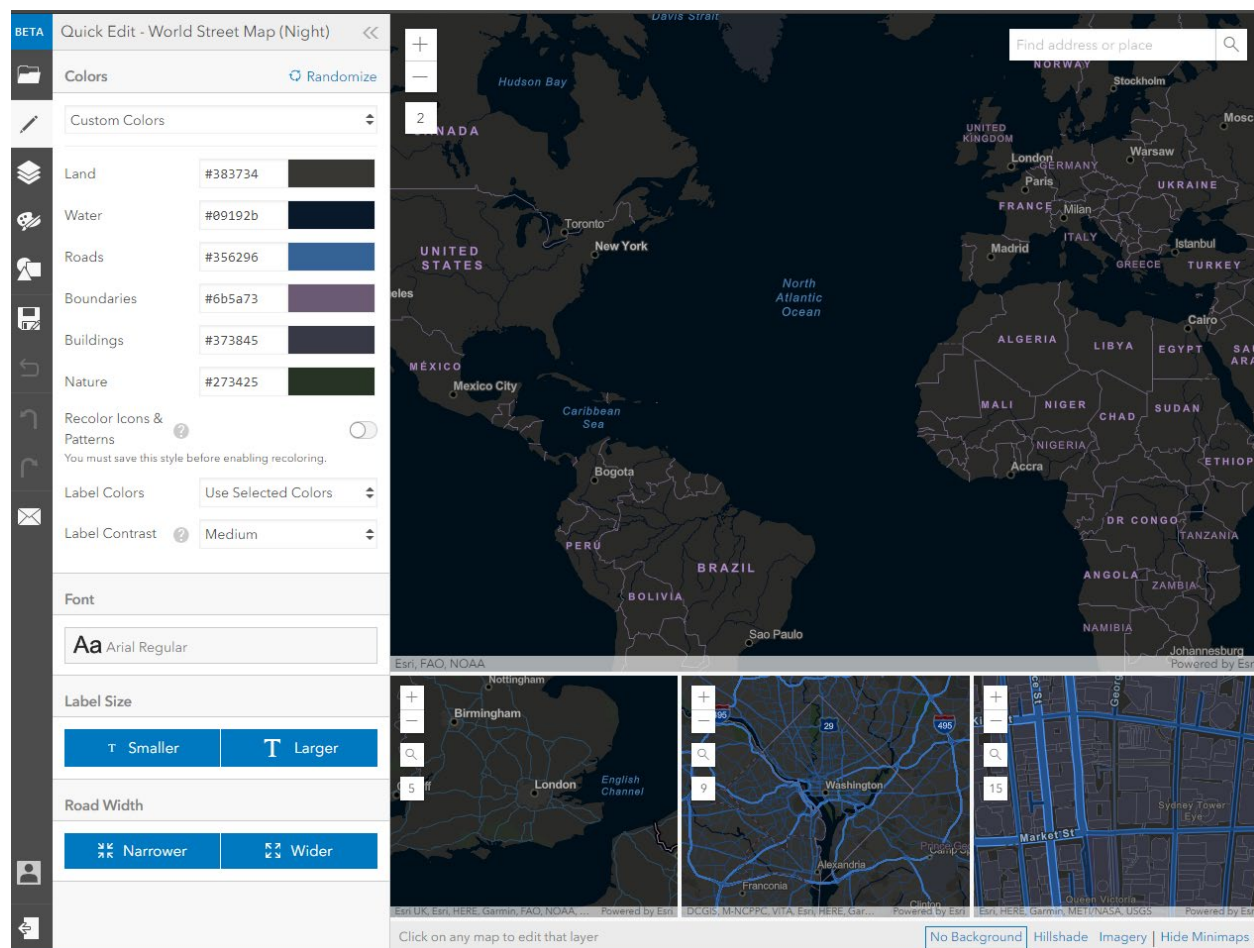
I wanted to provide a brief introduction to ESRI's **vector tile basemaps**. ArcGIS now allows you to edit their basemaps to create base maps that meet the needs and themes of your web maps. You can also use these base maps in ArcGIS Pro by connecting to your ArcGIS Online Content once an edited mapped is saved.

- ❖ Go to the following web address: <https://developers.arcgis.com/vector-tile-style-editor/>. You may need to sign into 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.



ArcGIS Experience Builder

The **ArcGIS Experience Builder** is a newer addition to the ArcGIS ecosystem. It allows for the creation of web apps, dashboards, and multi-page websites that are very customizable. A variety of content can be added including maps, widgets, text, images, embedded HTML, etc. The Experience Builder is linked to ArcGIS Online but can also be accessed at the following link:

<https://www.esri.com/en-us/arcgis/products/arcgis-experience-builder/overview>

Experience Builder provides more customization than **Configurable Apps** and the **Web AppBuilder**. However, it is easier to use than the **ArcGIS API for JavaScript**. For developers with experience with HTML, CSS, and JavaScript, coding can be used to further customize maps and pages generated with Experience Builder. Once the website is finalized, it can be published and saved to your **ArcGIS Online** Content.

The following link is for a YouTube video in which I walk through the process of creating a web app with the Experience Builder relating to the geology of the area around Canaan Valley, WV: https://youtu.be/cY_WSLmo_A. I have provided the associated data in the canaan folder in the class content if you'd like to give it a try.

