

GIS Tutorial for Atmospheric Sciences

J. Greg Dobson, University of North Carolina at Asheville

Jennifer Boehnert, National Center for Atmospheric Research

Section 2: Intermediate GIS Functionality

Exercise 2

Web Mapping with Climate Data

Use Case: Using ArcGIS Online to access climate data for creating web maps

ArcGIS Online is an online, collaborative web GIS that allows you to use, create, and share maps, scenes, apps, layers, analytics, and data. You get access to ready-to-use maps, apps, and Esri's secure cloud, where you can add items and publish web layers. Because ArcGIS Online is an integral part of the ArcGIS system, you can use it to extend the capabilities of ArcGIS for Desktop.

ArcGIS Online is the place to explore data, create maps, and share stories. With ArcGIS Online, you can use and create maps and scenes, access ready-to-use maps, layers and analytics, publish data as web layers, collaborate and share, access maps from any device, make maps with your business data, customize the ArcGIS Online website, and view status reports.

ArcGIS Online includes everything you need to create maps, create scenes, and create apps. Through the map viewer and scene viewer, you can access a gallery of basemaps and tools for adding your own layers and configuring mashups that you can share with others. You also have access to easy-to-use tools for creating apps that you can publish to ArcGIS Online.

Thousands of data layers are already available and discoverable in ArcGIS Online, including climate-related data. In this exercise we will create some basic web maps and add them to a simple story map web app.

Sub-Sections in Exercise 2:

1. *Establishing a free ArcGIS public account*
2. *Creating basic web maps with ArcGIS Online*

Establishing a free ArcGIS public account

Step 1 Getting started with ArcGIS Online

In order to access Esri's ArcGIS Online, you need to have a free ArcGIS public account. If you already have a free ArcGIS public account, please skip to Step 2 in the next section.

If you are not sure if you have an ArcGIS public account but you do have an Esri Account, then you already have an ArcGIS Public Account and you can just sign in.

Otherwise, complete Step 1 to create a free ArcGIS public account.

- Open a web browser and navigate to <http://www.arcgis.com/home/index.html>.
- In the upper right, click the **Sign In** button.
- Click **CREATE A PUBLIC ACCOUNT**.
- Click **ENTER YOUR INFORMATION**.
- Enter your information, check the “....terms of use” box, and click the **CREATE MY ACCOUNT**.

Your new account is created.

The screenshot shows the ArcGIS Online user profile page for Greg Dobson. At the top, there is a navigation bar with links for Features, Plans, Gallery, Map, Scene, Groups, and My Content. A search bar and a user profile icon labeled 'Greg' are also present. Below the navigation bar, the user's name 'Greg Dobson' is displayed. A button labeled 'EDIT MY PROFILE' is visible. The main section is titled 'Greg's Profile' and contains a profile picture placeholder. To the right of the picture, there are fields for First Name (Greg), Last Name (Dobson), Email (dobsonjg@gmail.com), Username, and a Bio section with a list of bullet points: 'Your organization', 'Contact information', 'Areas of expertise', 'Interests', and 'Any other information you'd like others to know'. To the right of the bio, there are fields for 'Who can see your profile?' (Everyone (public)), Language (English-English), Region (World), and Units (Metric). At the bottom, there is a section for 'Manage Your Mail from Esri' with a link to 'Set your preferences for the type of email you get from Esri.' The footer contains links for Esri.com, ArcGIS Marketplace, Help, Terms of Use, Privacy, Contact Esri, and Report Abuse.

Creating basic web maps with ArcGIS Online

With a free ArcGIS public account you can use ArcGIS Online to create and share web maps.

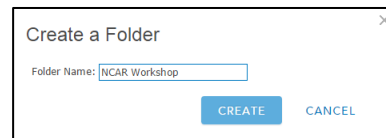
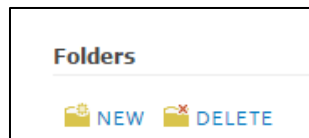
Step 2 Adding basic content to a new map

- Click the **My Content** tab at the top of the page.

The My Content section of ArcGIS Online is where all of your content is stored. Your content consists of “items”, which can include layers you upload such as shapefiles, web maps and scenes, apps, tabular data, and other types of data. You can organize your content through the use of folders similar to how you organize your files in a Windows Explorer environment.

Next we want to create a new folder.

- Click **New** under Folders in the upper left of the page.

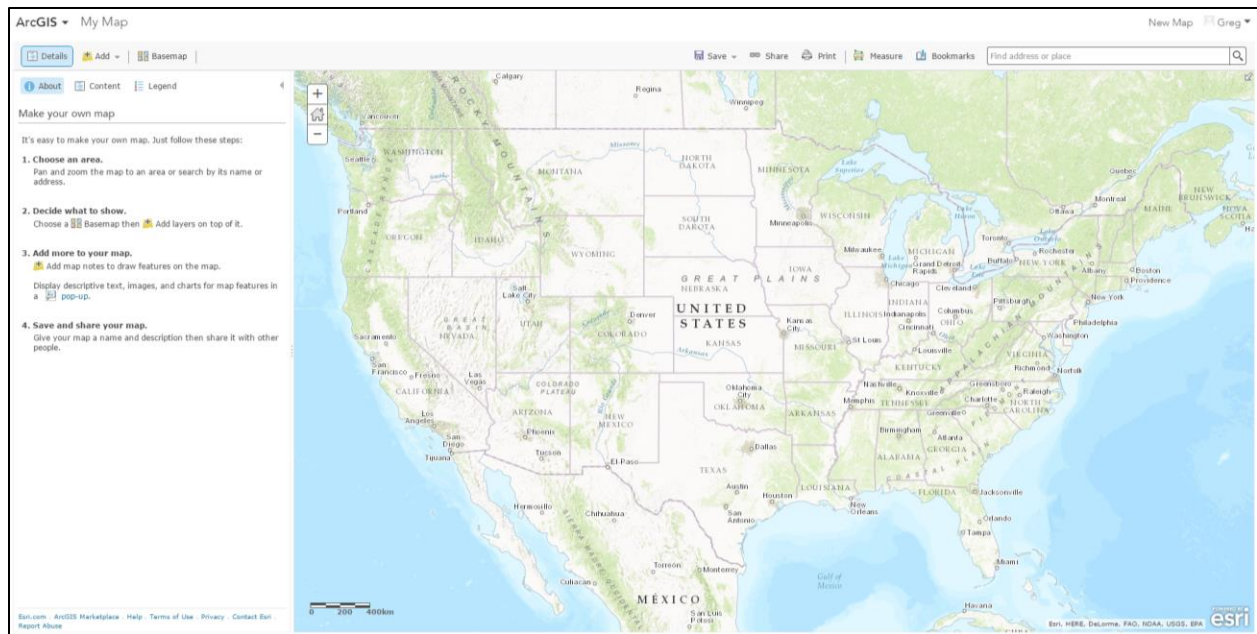


- Name the new folder *NCAR Workshop*.

One of the main features of ArcGIS Online is the Map. The Map is a web map that you can add content to, explore content, perform basic analysis, control map symbology, and create custom web maps.

- Click **Map** at the top of the page.

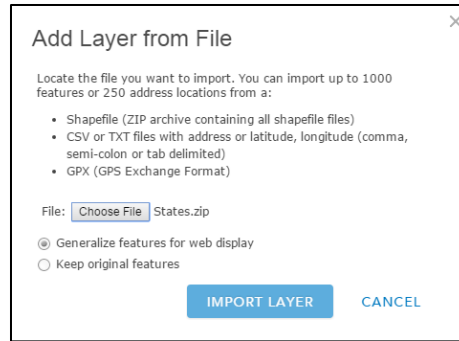
The default web map appears with the Esri Topographic basemap.



- In the upper left, click the **Basemap** button to activate basemap selection window.
- Choose a different Basemap.

Next you will add some basic content to our map. There are multiple methods for adding content to your map. You can search for layers in ArcGIS Online that have been shared publicly, stored in your My Content folders, by searching on a known GIS Server. You can also add layers from the web that are available through a web server, such as through an ArcGIS Server Web Service or through an OGC web service. Additionally you can add a KML or CSV file. Perhaps the most basic method of adding content to a map is to directly add a layer from a file on your computer. This could include a shapefile, CSV or TXT file, or a GPX file.

- Click the dropdown menu next to the Add button at the top of the left pane.
- Click **Add Layer from File**.
- Click the Choose File button and browse to the **C:\GIS_Course\exercise2\data** directory.
- Click on the **States** zip file and then click **Open**.



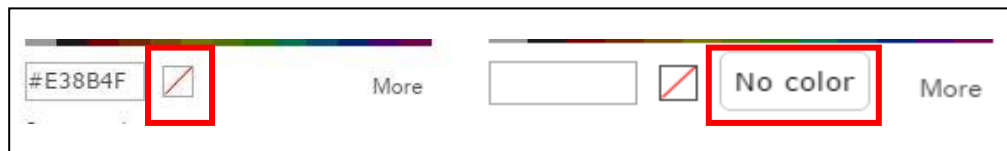
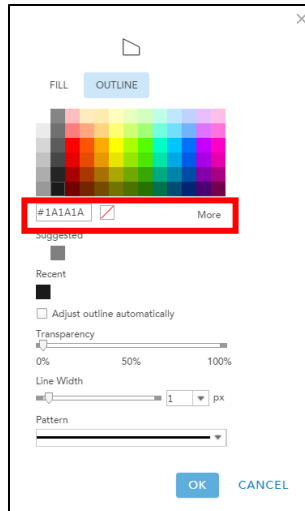
Shapefiles need to be in a zip file in order to be directly added to a map in ArcGIS Online. You can have more than one shapefile in the zip file, but they all must be contained in the root. That is, do not organize your zip file with sub-folders. Note that you are limited to shapefiles with no more than 1000 features.

- Click the radio button to generalize features for web display.
- Click **IMPORT LAYER**.

The layer is added to the map.

When you directly add a shapefile to your web map, the **Change Style** window on the left is automatically activated. The Change Style window is where you can change and edit map layer symbology. We now want to change the symbology of the **States** layer to be hollow with black outlines.

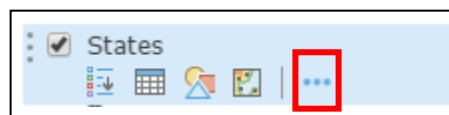
- Click the **SELECT** button on the “Location (Single symbol)” drawing style option.
- Click **OPTIONS**.
- In the upper left, click **Symbols**.
- Click the FILL tab at the top of the Symbols window
- Under the color palate, click the box that has a diagonal red line through it to set the fill color to “No color”.



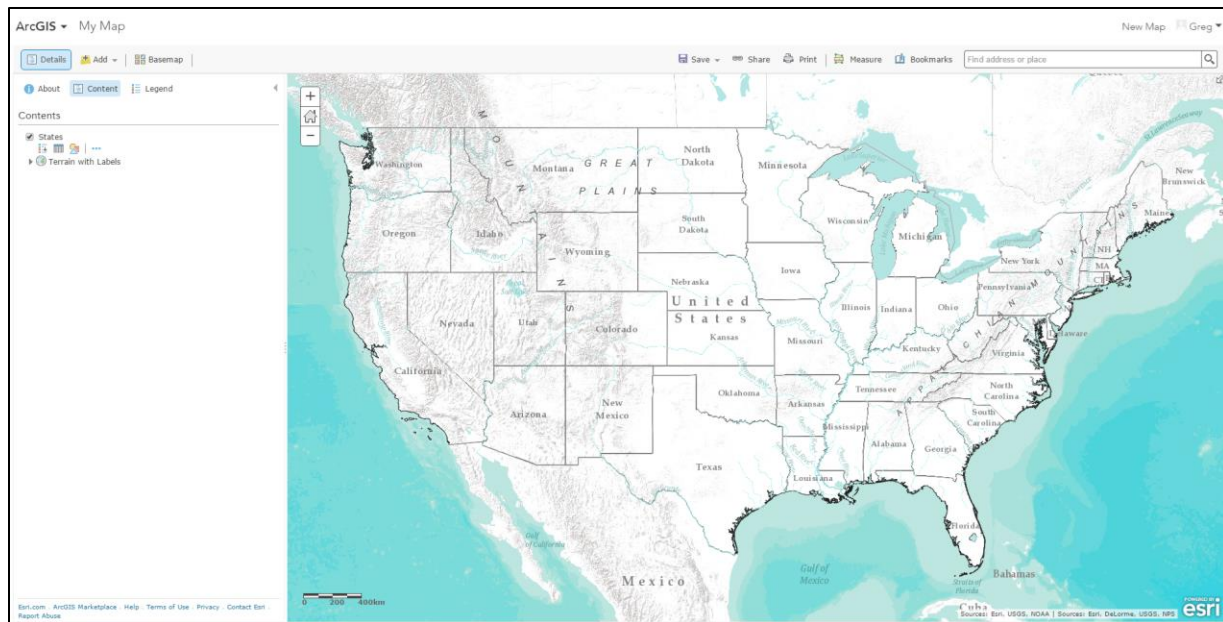
- Next, click the **OUTLINE** tab.
- Choose a black color from the color palette.
- Click **OK** at the bottom of the Symbols window.
- Click **OK** at the bottom of the Change Style window.
- Click **Done** at the bottom of the Change Style window.

Notice at the top of the left window that the Content tab is active. When this tab is active you can toggle layers on and off and access layer properties. The Legend tab will display the layer names and their symbology. Keep the Content tab active for now.

- Hover your mouse over the **States** layer.
- Click the three horizontally aligned dots to access more options for this layer.



- Click **Zoom to**.
- Switch your basemap back to "Terrain with Labels".

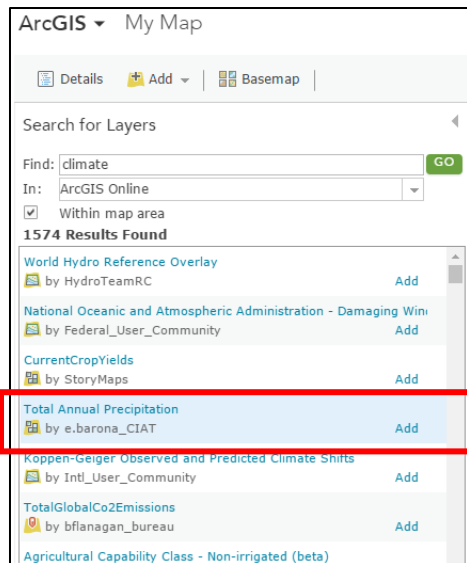


Step 3 **Searching for and adding climate-related content to your map**

As previously mentioned, another way for adding content to a map is to search for it in ArcGIS Online. Next we will search for climate data and add a precipitation layer to the web map.

- Click the dropdown menu to the Add button.
- Click **Search for Layers**.
- In the Search for Layers window, type “climate” into the Find: box.
- Be sure the In: box is set to ArcGIS Online.
- To the right, click **GO**.

Near the top of the list you should see the ***Total Annual Precipitation*** layer.



- To the right of this layer, click **Add**.

The layer is added.

- At the bottom of the Search for Layers window, click **DONE ADDING LAYERS**.

The Total Annual Precipitation layer shows annual average precipitation for the entire world. You can click the Legend tab at the top of the left window to see the precipitation values. Note that they are in millimeters. You can access more details about a layer the layer properties.

- Hover over the *Total Annual Precipitation* layer and click the three horizontally aligned dots.
- At the bottom of the list click **Show Item Details**.

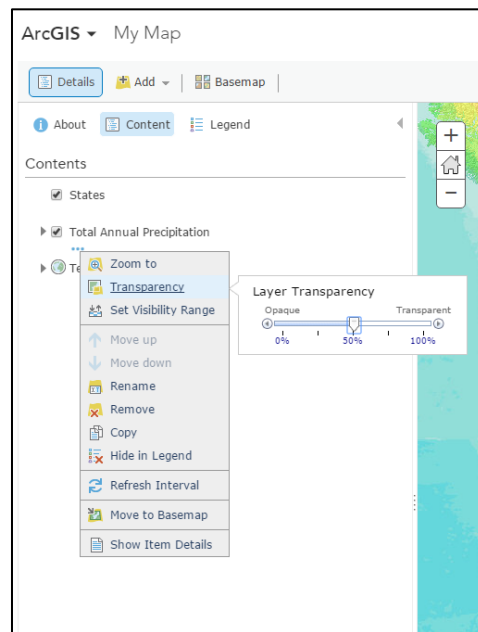
A new page appears displaying more information about this layer, including a description, author, date, and other additional metadata.

In order to see how terrain and elevation influence precipitation, we will next apply transparency to this layer so that we can see the terrain on our basemap underneath.

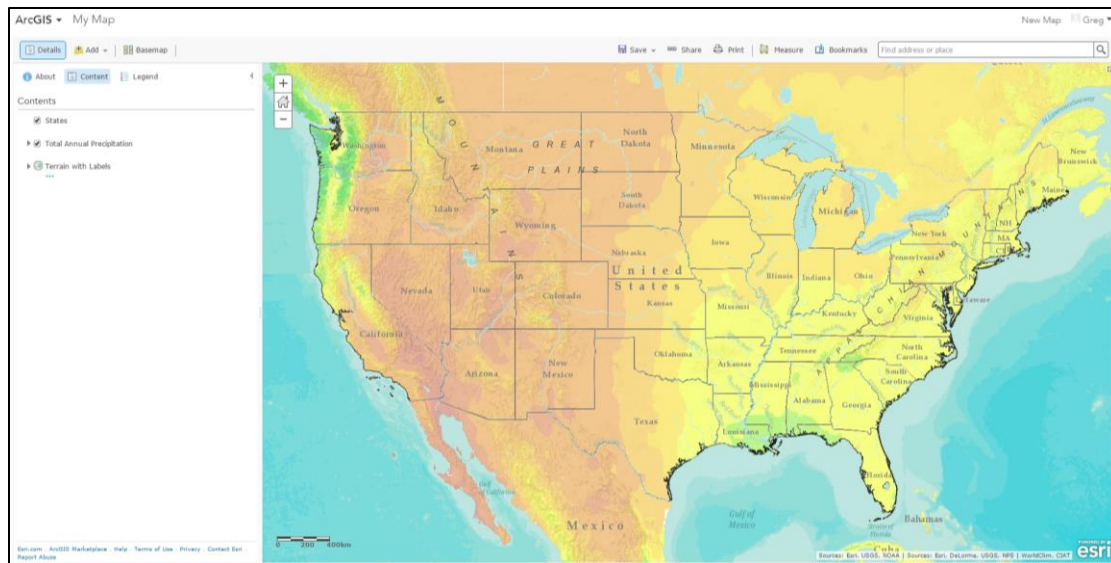
- Back in the Map Display, make sure the Content tab is active.



- Hover over the *Total Annual Precipitation* layer and click the three horizontally aligned dots.
- Click **Transparency**.
- In the Layer Transparency window, drag the slider to 50%.



You can now see the terrain through the precipitation layer.



- Above the center of the map, click the dropdown next to **Save** and then click **Save**.

The Save Map window appears. All of the boxes require information, even if it is very short and brief.

- In the **Title:** box, type “Total Annual Precipitation”.
- In the **Tags:** box, type “NCAR Workshop 2016” and hit **Enter** on your keyboard
- Also type “Precipitation” and hit **Enter** on your keyboard

Tags can be used to search for your content items in ArcGIS Online. You can create new tags as you just did, or you can choose from already stored tags.

- In the **Summary:** box, type “A web map displaying total annual precipitation”.
- In the **Save in folder:** box, be sure to select the NCAR Workshop folder that you created earlier.

Save Map

Title: Total Annual Precipitation

Tags: NCAR Workshop x Precipitation x
Add tag(s)

Summary: A web map displaying total annual precipitation

Save in folder: NCAR Workshop

SAVE MAP CANCEL

- Click **SAVE MAP**.

Once you have created a web map in ArcGIS Online, you can share it so that it can be disseminated to others through a web link, embedded in a website, or used to create a web app.

- Above the center of the map, click **Share**.

The Share window appears. Note that the Link to this map, embed in website, and create a web app options are greyed out. You first must share your map to have these options.

- Check the box to share with Everyone (public).

Share

Choose who can view this map.
Your map is currently shared with these people.

☒ Everyone (public)

Link to this map
<http://arcgis.com/2814022> Facebook Twitter

☒ Share current map extent

Embed this map
EMBED IN WEBSITE CREATE A WEB APP

DONE

Now you have the option to link to your web map or share it on Facebook and Twitter, embed it in a website, or create a web app, such as a story map.

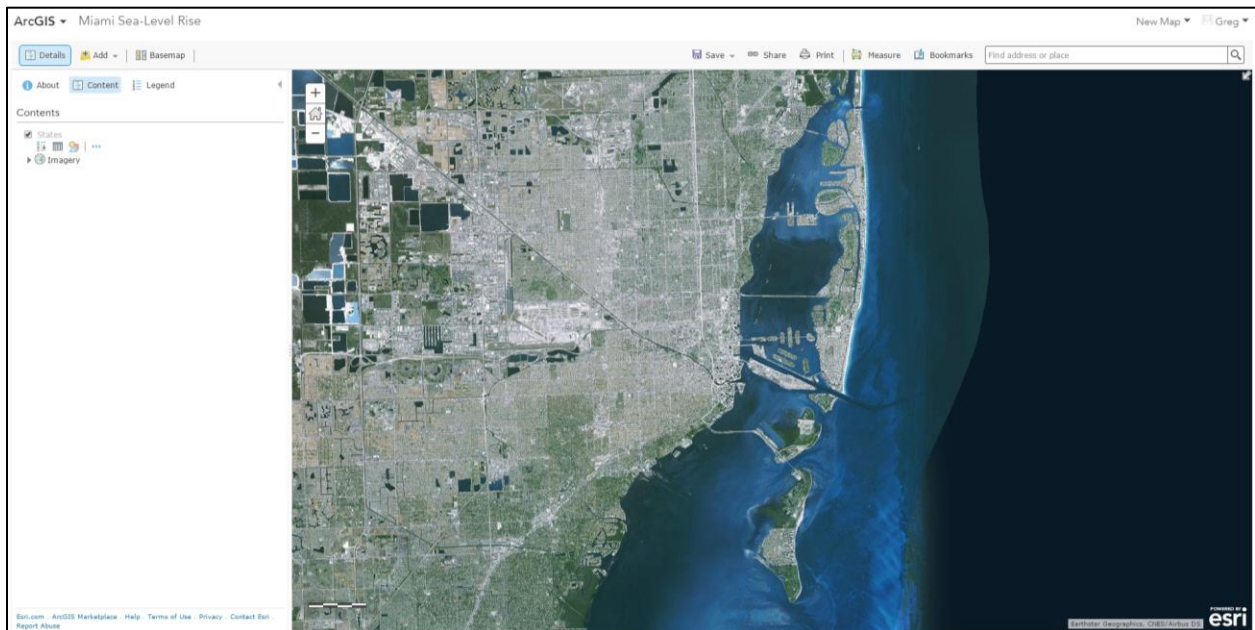
- Click **DONE**.
- Save your map to save the “share” changes you just made.

Now we will create a second web map that displays sea level rise data for Miami, Florida. Since we already have an open web map that contains a layer we would like to include in the new map (**States**), we can save it with a new name, remove the precipitation layer, and add a sea level rise layer.

- Click **Save As**.
- Change the Name to “Miami Sea-Level Rise”.
- Change the Summary to “A web map displaying sea-level rise data for Miami, FL”.
- Click **SAVE MAP**.

Notice in the upper left that the name of the map has changed.

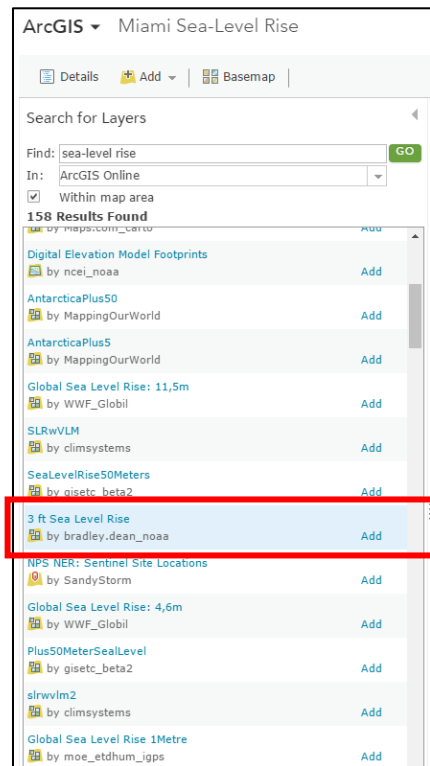
- Hover over the *Total Annual Precipitation* layer and click the three horizontally aligned dots.
- Click **Remove**.
- Zoom into the Miami, FL area.
- Change the basemap to *Imagery with Labels*.



- Click the dropdown menu to the **Add button**.
- Click **Search for Layers**.
- In the Search for Layers window, type “sea-level rise” into the Find: box.

- Be sure the In: box is set to ArcGIS Online.
- To the right, click **GO**.
- Scroll down till you see the layer **3 ft Sea Level Rise**.

Note that the author of the layer is bradley.dean_noaa



- To the right of this layer, click Add.

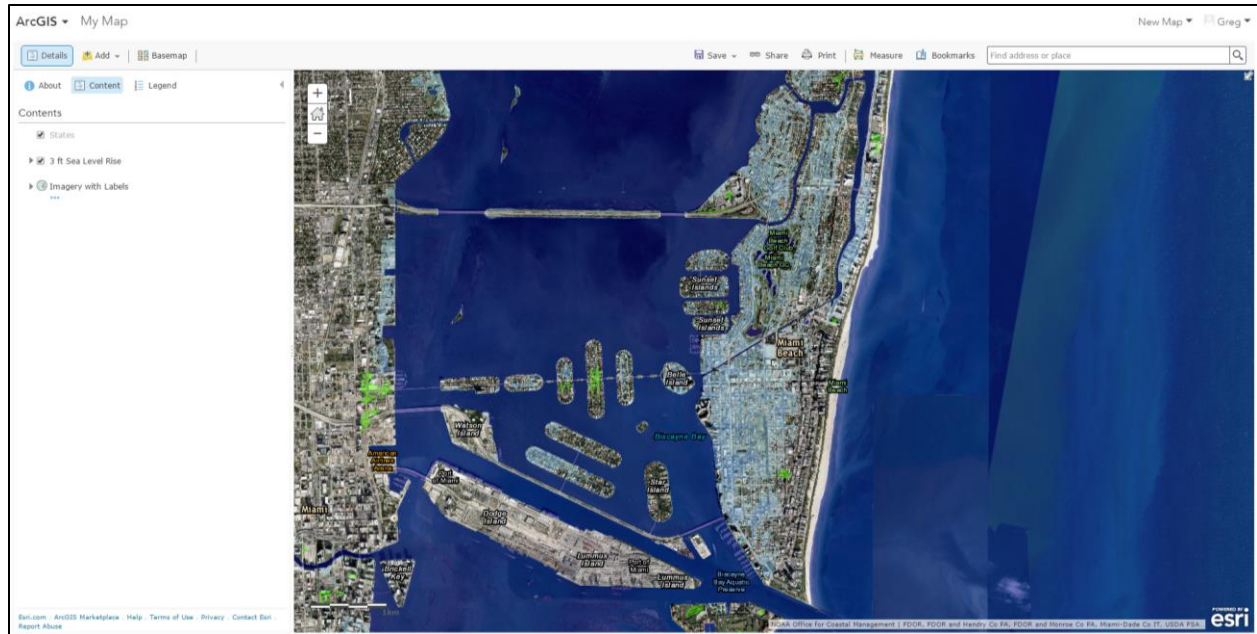
The layer is added.

- At the bottom of the Search for Layers window, click **DONE ADDING LAYERS**.

This **3 ft Sea Level Rise** layer from NOAA shows what 3ft of sea level rise would look like for the U.S. coast. You can click the Legend tab at the top of the left window to see the depth categories. You can learn more about this layer by clicking the **Show Item Details** in the layer properties as you did earlier.

Next let's change the transparency of the **3 ft Sea Level Rise** layer to be able to see the impacts on the ground.

- Make sure the Content tab is still active.
- Hover over the **3 ft Sea Level Rise** layer and click the three horizontally aligned dots.
- Click **Transparency**.
- In the Layer Transparency window, drag the slider to ~50%.
- Zoom into Miami Beach, just east downtown Miami.



Now you can see that with a 3ft rise in sea levels, a significant part of Miami Beach and the surrounding area would be inundated with water.

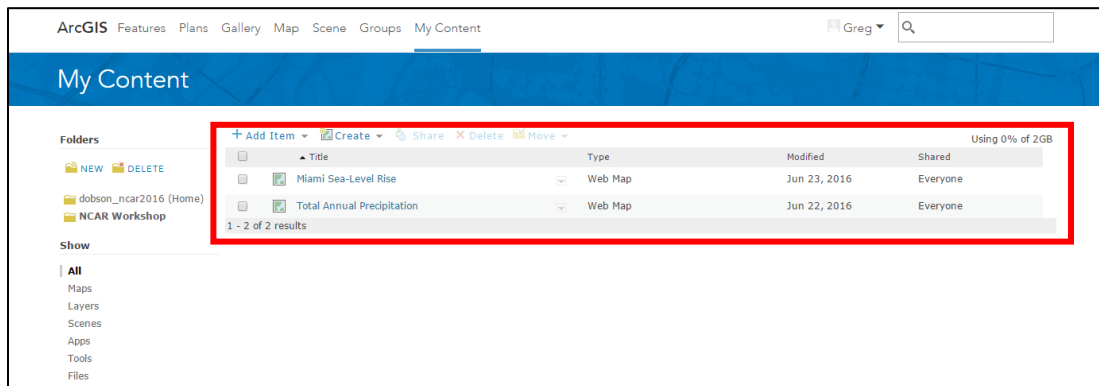


- Above the center of the map, click **Share**.
- Check the box to share with Everyone (public).
- Click **DONE**.
- Save your map.

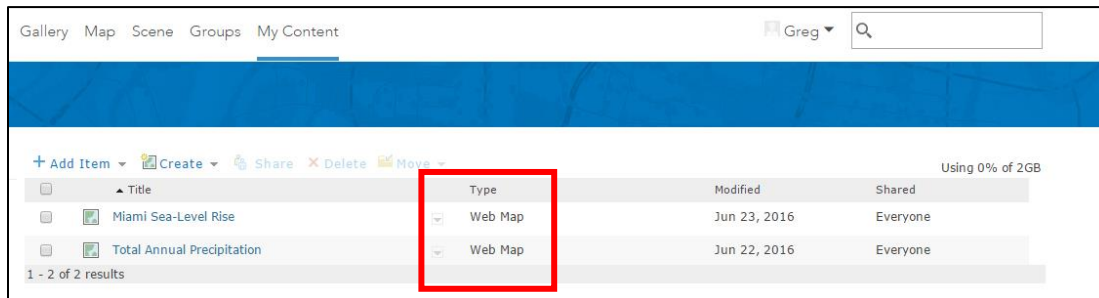
You have now created two web maps. They can be accessed through the My Content section of ArcGIS Online.

- In the upper left, click the dropdown next to ArcGIS.
- Click **My Content**.
- Be sure that your NCAR Workshop folder is the active folder.

Now you see the two web maps listed with some basic information about them. Again, you can have a variety of items stored in your My Content section of ArcGIS Online.



You can access individual items, such as a web map, by clicking the dropdown arrow to the left of the item type listed in the Type field.



The “View item details” option will take you to a page just for that item where you can add additional metadata, control the sharing, rename the item, access a web link directly to it, or create a web app. You can also choose to open the item in the map viewer or in ArcGIS for Desktop (ArcMap).

- Explore other searchable data on ArcGIS Online and make some maps that you are interested with.
- When you have finished, sign out of ArcGIS Online.
- Close your web browser.