Exercise 3: Preparing Data for Import into ScienceBase (25 minutes)

Goals for this exercise:

- Understand the data preparation steps necessary for import into an online mapping platform, including working with metadata, reprojecting, and creating symbology.
- Learn how to create and manage service definition files in ArcMap.

Steps for the workflow:

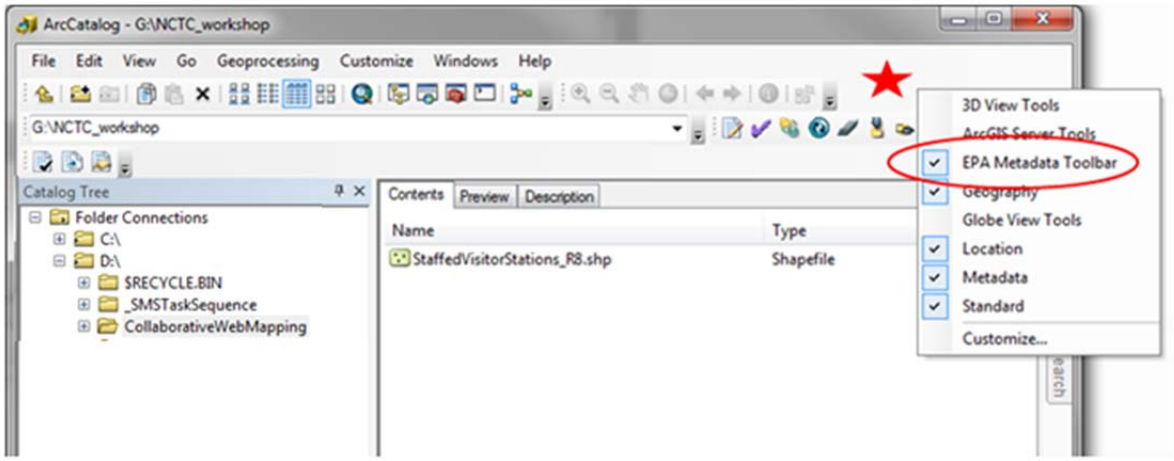
1. Develop/complete metadata for the dataset
2. Create a zipped version of the shapefile for download
3. Project the dataset to the Web Mercator Auxiliary Sphere coordinate system
4. Add the dataset to ArcMap and symbolize
5. Create a Service Definition file

Step 1. Develop/Complete Metadata for the Dataset

Metadata is often something that people working with GIS put off to the very end, but in this workflow, we are actually going to address it first. The reason for that is twofold: first, it is a **requirement** that all data stored in ScienceBase and Data Basin have metadata. Second, it is the most efficient workflow. In this example, we are going to create two versions of the same dataset: one with geographic coordinates and one with the web mercator projection. Therefore, if we complete the metadata now, it will transfer over when we do the projection and we won't need to import it again.

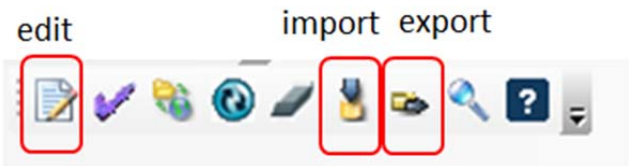
We are helped in this process because ScienceBase is capable of reading FGDC-formatted metadata in an xml file (as well as other formats). That means if we create an external xml file we won't have to manually type in the metadata every time we upload a dataset. For this exercise, we will use the EPA Metadata Editor (EME) tool to check and/or create metadata (the main goal of this exercise is to create a Service Definition (SD) file so we are not going to focus too much on metadata, due to time constraints). For more complete instructions on using the EPA Metadata Editor, you can view this site https://fishnet.fws.doi.net/projects/gisnew/gisinfo/SitePages/Metadata.aspx. The EME tool creates FGDC compliant metadata, integrates with ArcGIS and is very easy to use. You can also customize it with your own personal and office information, which makes filling in a lot of the fields as simple as pushing a button.

To view the metadata with EME, first open ArcCatalog. Browse to the location of the ***StaffedVisitorServices_R8.shp*** dataset. It should be located in ***D:\CollaborativeWebMapping*** and then right click in the upper right corner of ArcCatalog, in an area where no buttons are located, as indicated below by the red star below. You should see a window pop up with the names of toolbars. Make sure that the EPA Metadata Editor toolbar is checked on. You can also check and uncheck the box to see where the tools are located on your version of ArcCatalog. Checking the box off and on will turn the tools off and on as well.

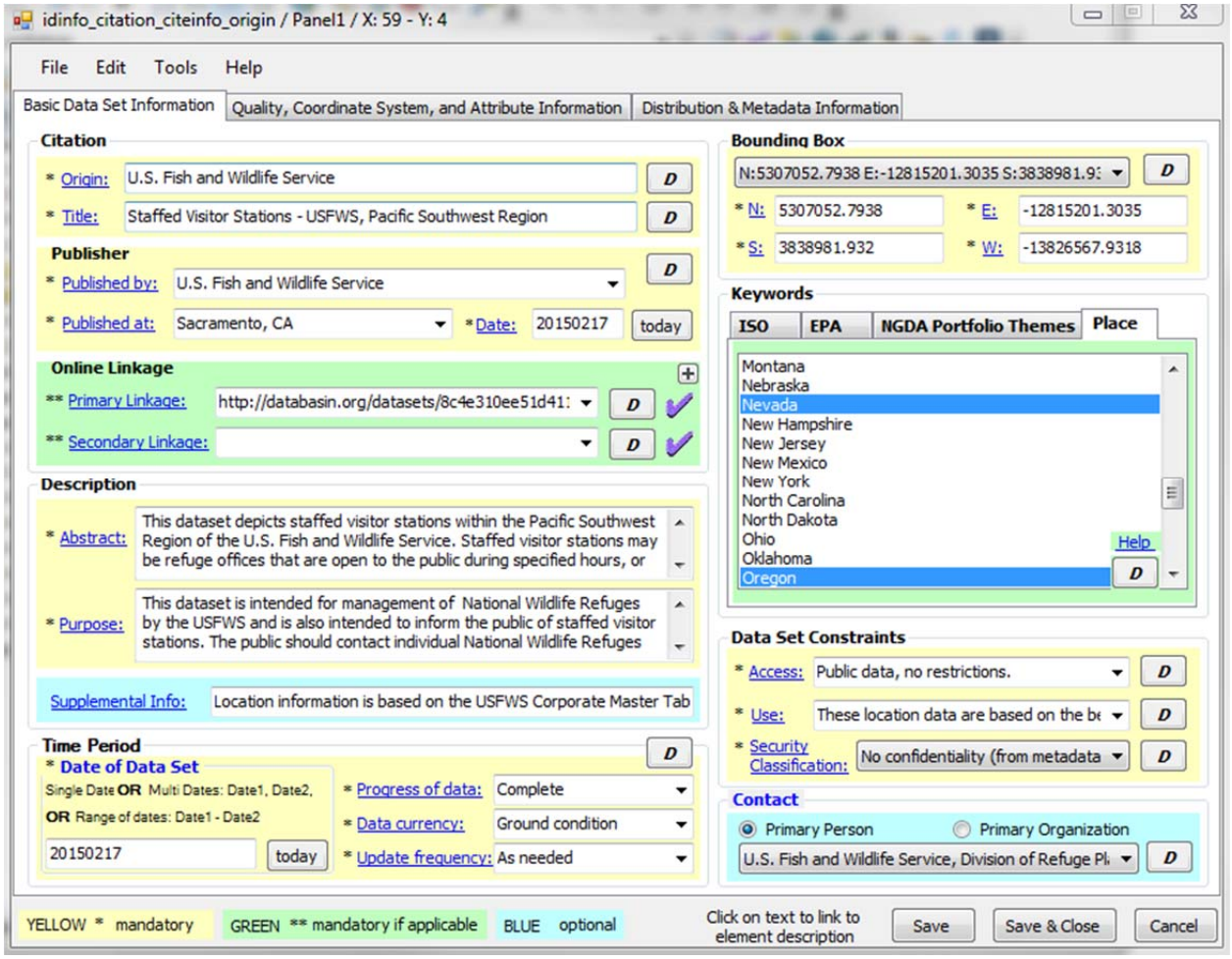


The toolbar looks like this:

Now hover your mouse arrow over each button and you should see a tooltip that describes what each button does. The buttons that we will use today are shown below:

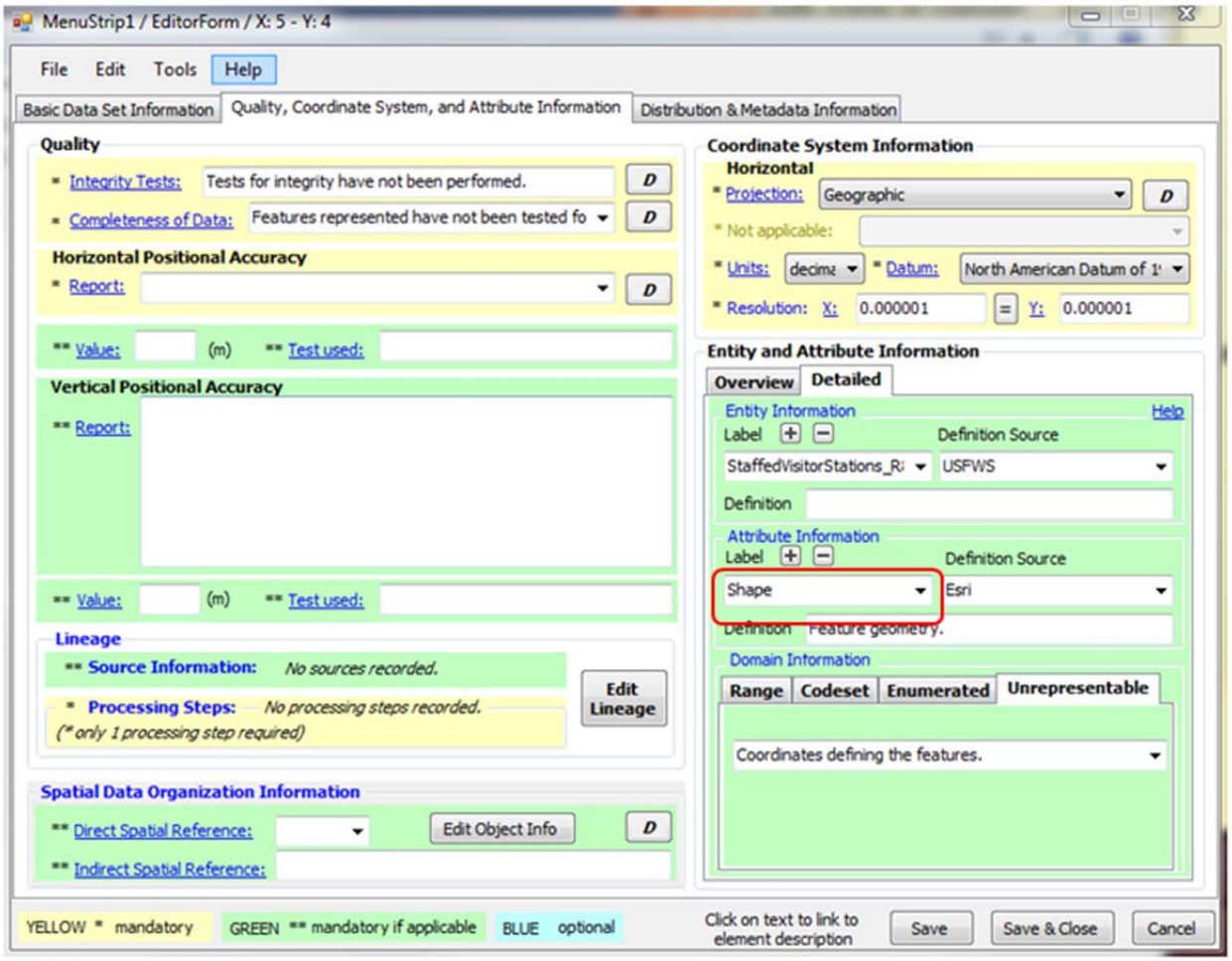


Next, highlight the ***StaffedVisitorServices_R8.shp*** dataset and select the 'edit' button in the EME toolbar. You should now see the EME window pop up and look something like this:



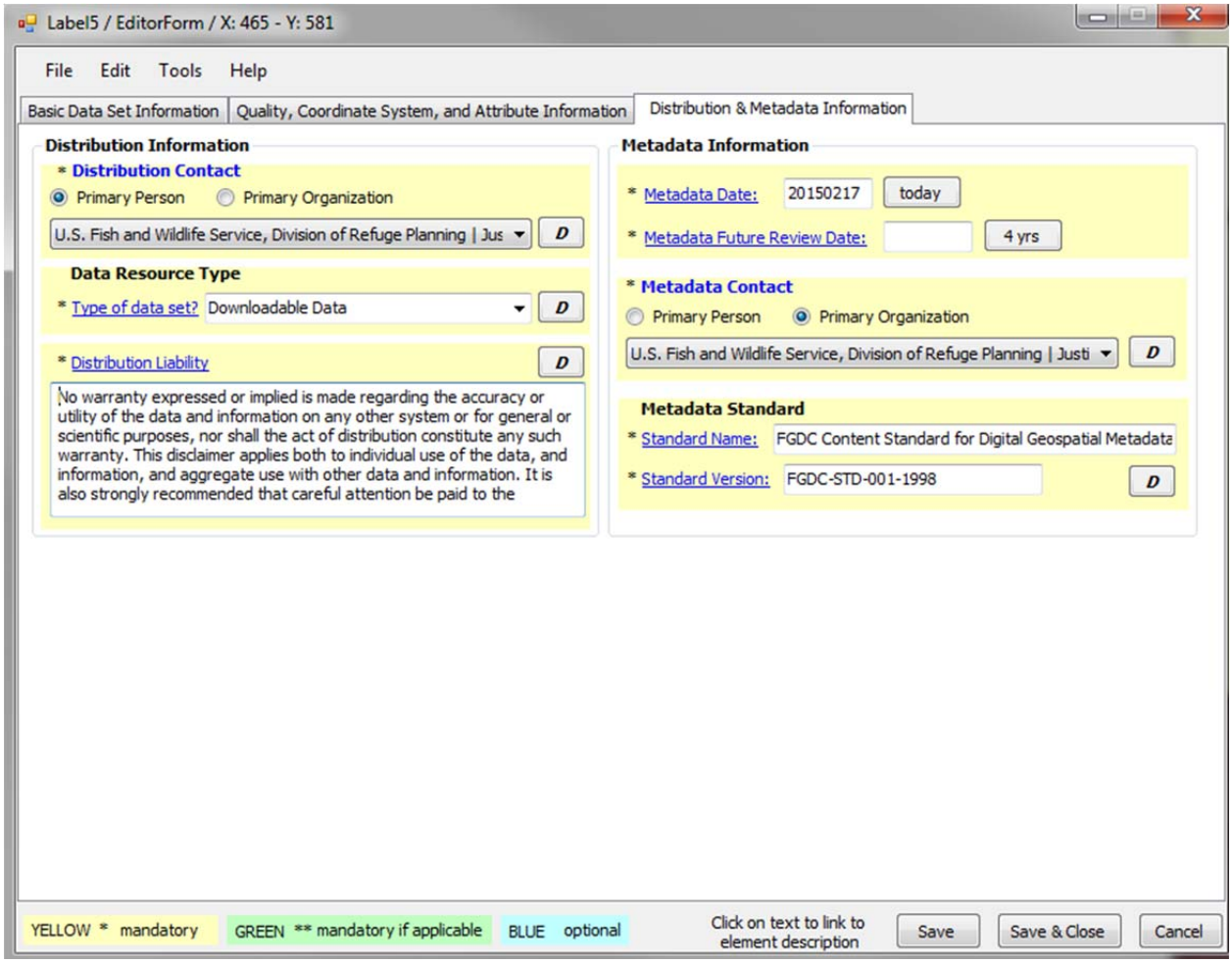
The EME interface contains three main tabs. The first tab has basic information about the dataset and many of the most important pieces of metadata, such as where the data came from, who created it, when it was created, a description of the data and the purpose for creating it. You will see that most of the fields in this tab have been completed.

The second tab contains information about the coordinate system of the dataset, the attributes and the quality of the dataset. Take a look at this tab and review it. You can see that the coordinate system for ***StaffedVisitorServices_R8.shp*** is geographic with the NAD 83 datum. You can also review the attribute definitions by scrolling through them in the field highlighted below.

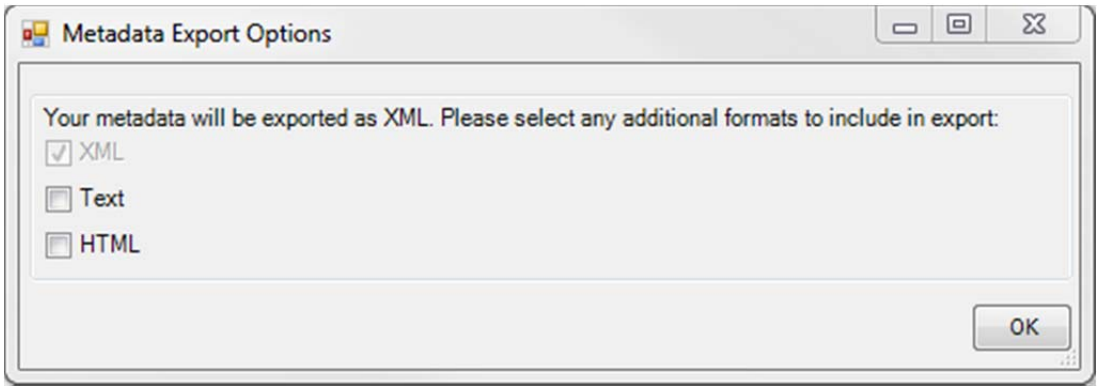


Notice that many of the green portions have not been filled in because the information on those qualities of the dataset are unknown.

Now click on the third tab. This tab contains information on the metadata itself, such as date and contact information as well as a liability statement that may be standardized for your agency. With EME, you can store this liability statement as the default and add contact information for the most common metadata editors in your office so that those items can be added to future datasets with the push of a button.



Now that we have reviewed and are satisfied with our metadata, we can export it to an xml file. First, exit out of the editing window, by clicking the 'Save & Close' button. Next click on the 'Export metadata' button in ArcCatalog. The following window should appear:

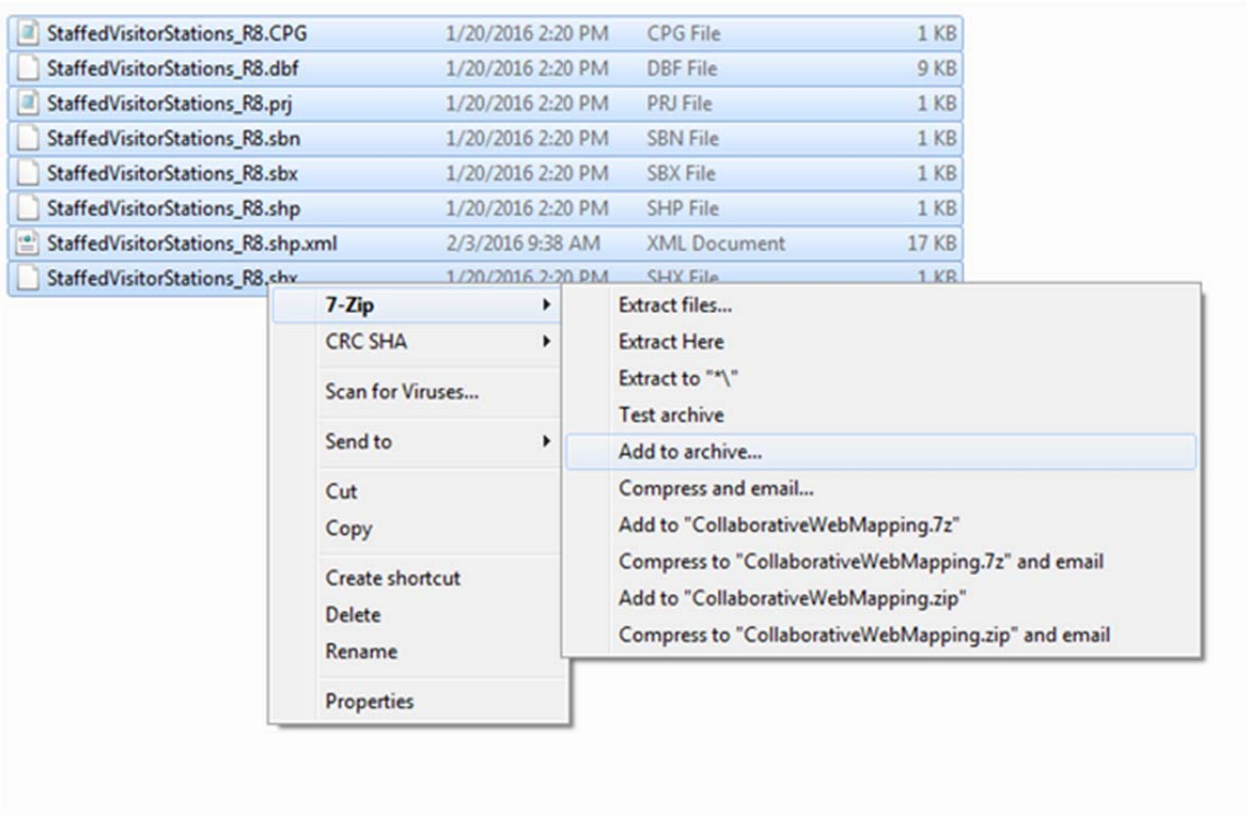


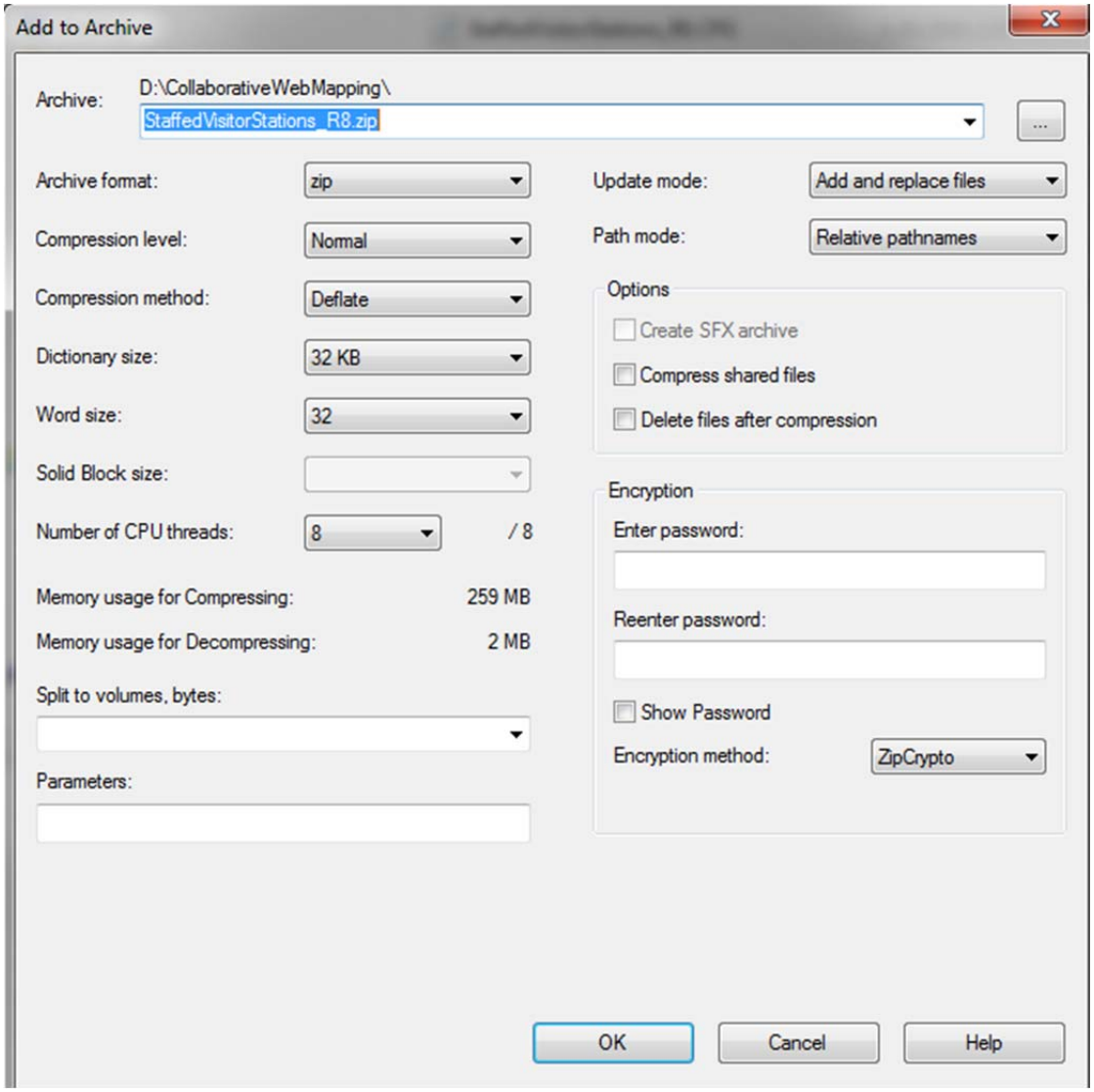
The xml format is already selected by default so we don't need to change anything on this window. Simply click 'OK'. The next window allows you to specify the location and name of the

file. Save it to ***D:\CollaborativeWebMapping\MyData*** and change the name to ***metadata_StaffedVisitorStations_R8.xml.*** Type the name and then click save.

Step 2. Create a Zipped Version of the Dataset for Download

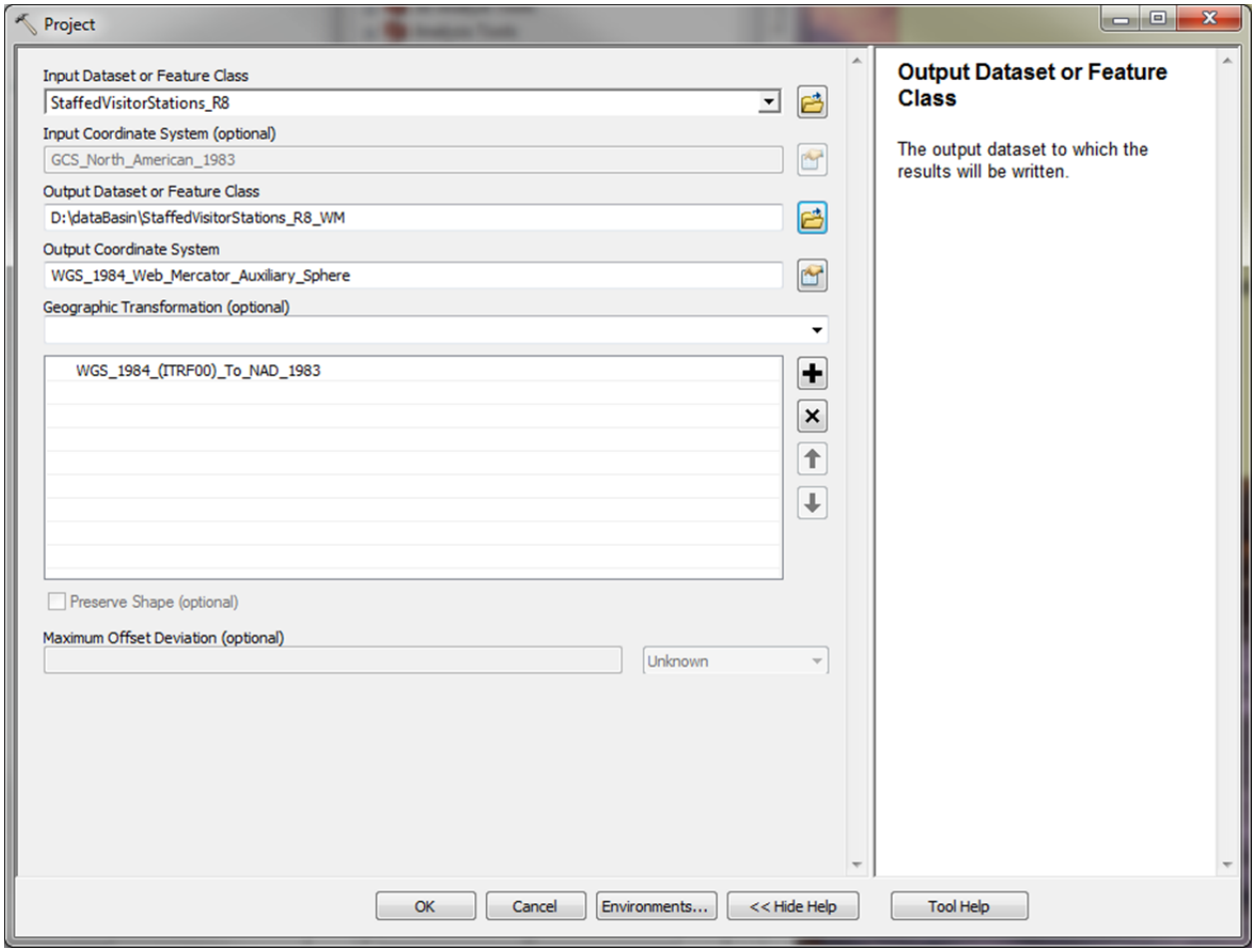
In the next step we will project the data to a coordinate system that is best suited for online web mappers. However, that projection is not as useful to a GIS user. In addition, it is difficult to access the GIS data through the SD file. Therefore, in this step we will zip the original version of the shapefile to make it available to upload later into ScienceBase. To do this, simply highlight the individual files of the shapefile, right click, go to the 7 Zip tab and select 'Add to archive'. Make sure that 'zip' is selected under 'Archive format' and save it to your individual folder as ***D:\CollaborativeWebMapping\MyData\StaffedVisitorStations_R8.zip***.





Step 3. Project the Dataset to the Web Mercator Auxiliary Sphere Coordinate System

We will now use the 'Project' tool in the Data Management Tools section of the ArcToolbox, to change the coordinate system to WGS 84 Web Mercator (auxiliary sphere). This coordinate system should be available in ArcMap under 'Projected Coordinate Systems' and 'World'. To find the 'Project' tool, you can use the Search tool or open ArcToolbox and go to the *Data Management Tools* and then *Projections and Transformations*.



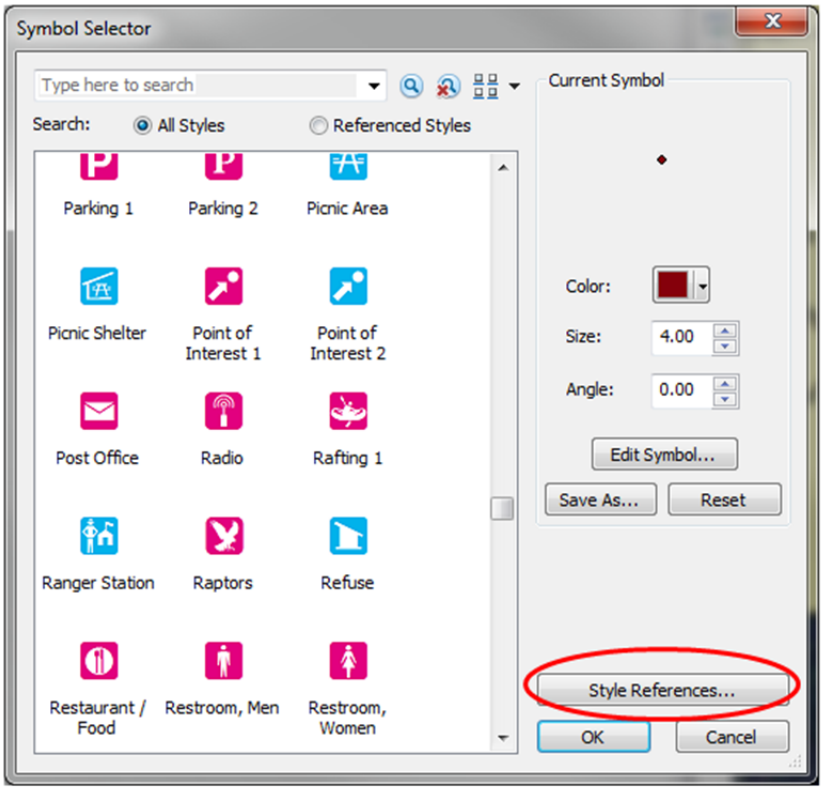
It is good practice to add '_WM' to the end of the filename so that you know this is the Web Mercator version of the dataset. The reason that this step is necessary is primarily for use in DataBasin or other web viewers. If we didn't project the data to Web Mercator, each time the map service was displayed in a web viewer, it would have to be reprojected on the fly and this slows down the system substantially. So this is a way to improve performance of our map viewer. However, because most GIS users will be working in another coordinate system, and because USFWS uses the NAD 83 datum, we will also attach a zipped version of the dataset in geographic coordinates using the NAD 83 datum in ScienceBase. Therefore, we want to keep these two versions distinct and identifiable in our folder structure. Save the projected file as ***D:\CollaborativeWebMapping\MyData\StaffedVisitorStations_R8_WM.shp***

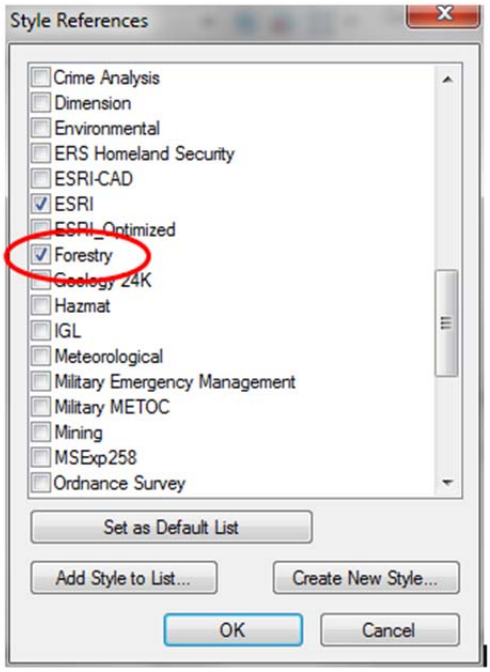
ou should now have the following files in your local directory:

1. StaffedVisitorStations_R8.shp
2. StaffedVisitorStations_R8_WM.shp
3. metatdata_StaffedVisitorStations_R8.xml

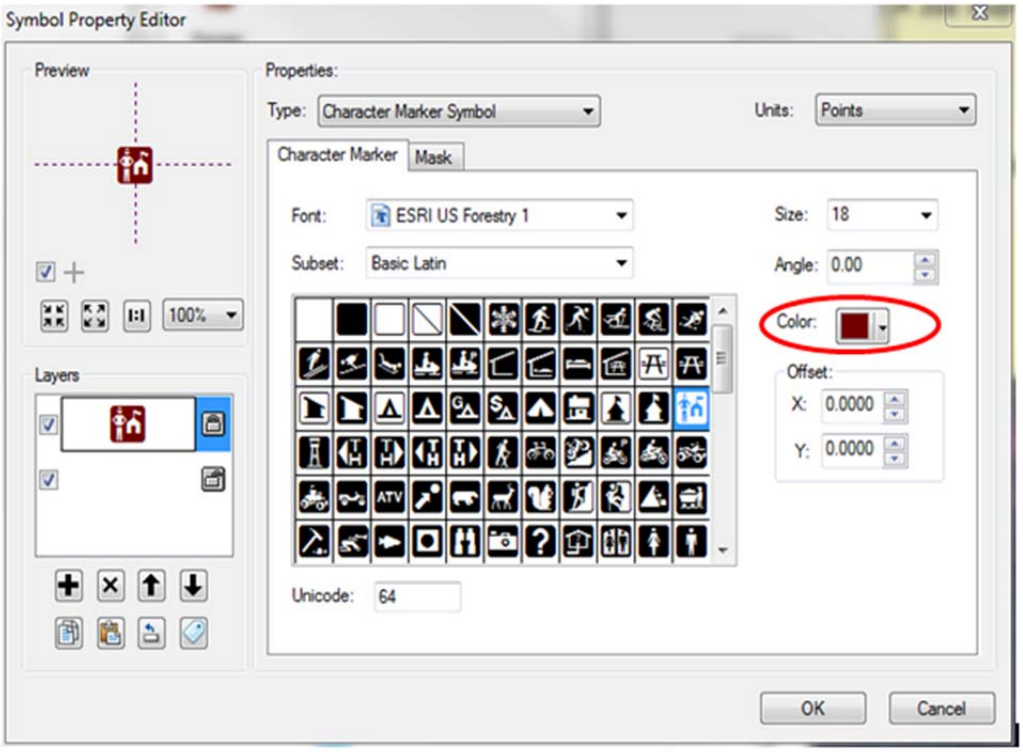
Step 3. Add the Dataset to ArcMap and Symbolize

This step should be very easy. Simply open ArcMap and add the staffed visitor stations dataset that you just projected to Web Mercator, ***StaffedVisitorStations_R8_WM.*** At this point, we could use the default symbology, but since this will ultimately be displayed in a map, let's make it look nicer as users will not be able to change symbology inside Data Basin. To do that, we will use one of the symbols from the 'Forestry' style reference so in the symbol selector window in ArcMap, click on 'Style References' and then check the 'Forestry' box.

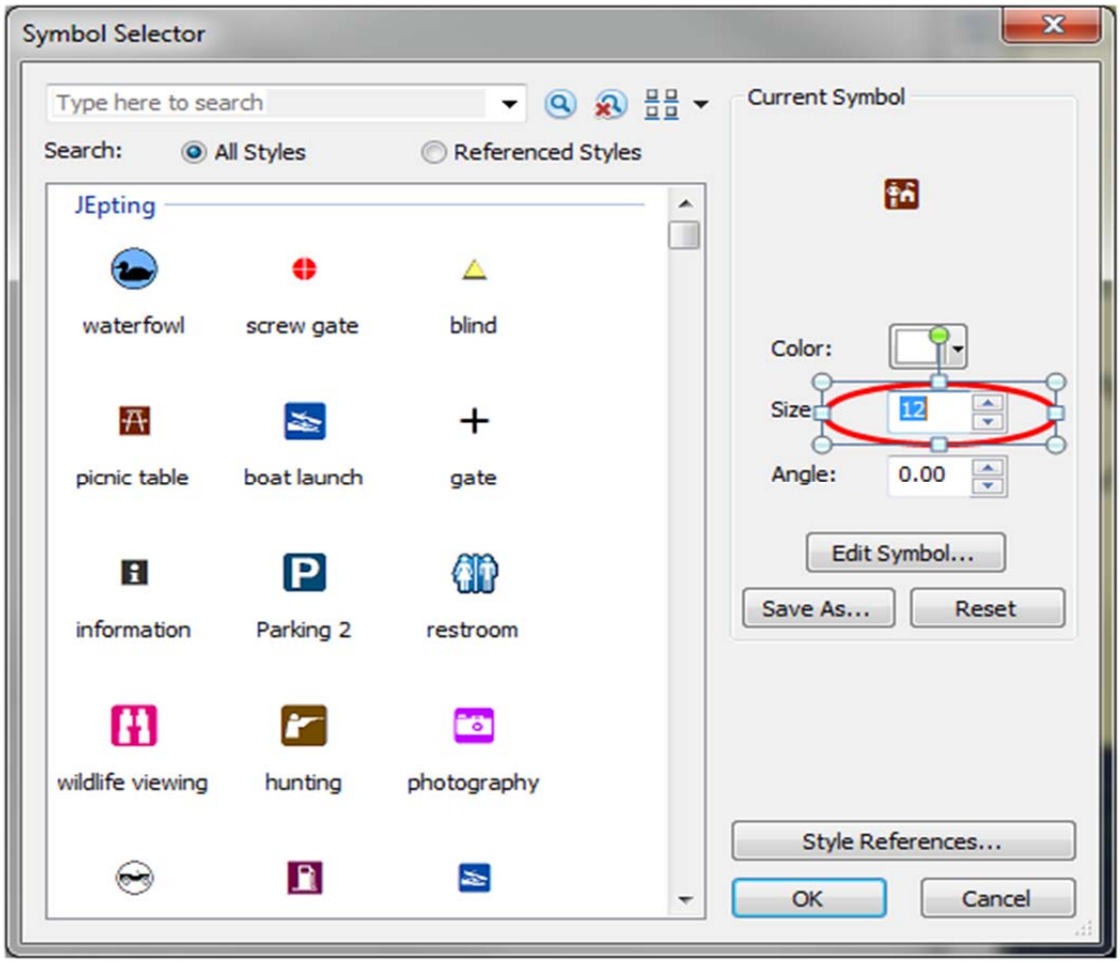




Next, scroll down to the symbol for the ranger station or search for 'Ranger Station'. This is an iconic symbol used in many public maps for the Park Service and others, so the public tends to identify with it already. The default color is not what we want, however, so let's change that. Click on 'Edit Symbol' to open the following window:



Click 'OK'.



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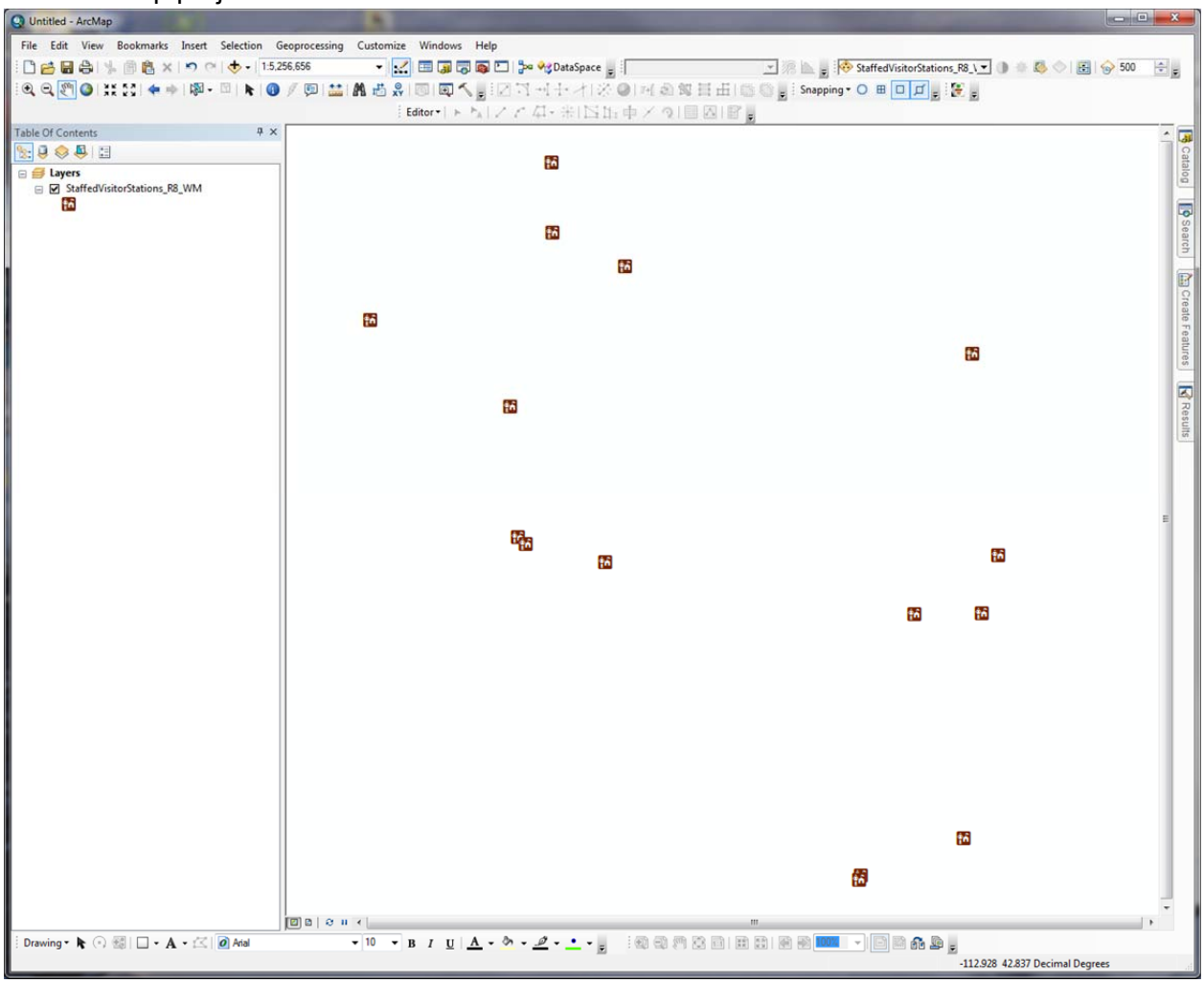
In the next window, let's change the size to 12. Click 'OK' when completed.

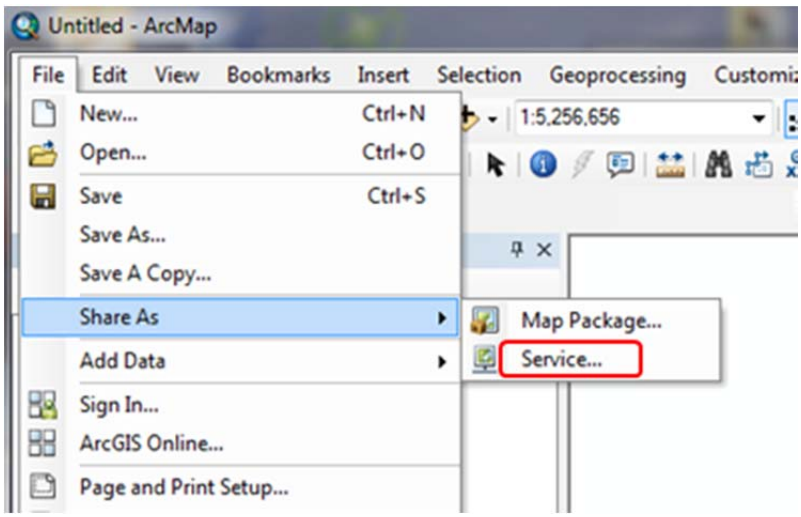
Your ArcMap project should now look like this:



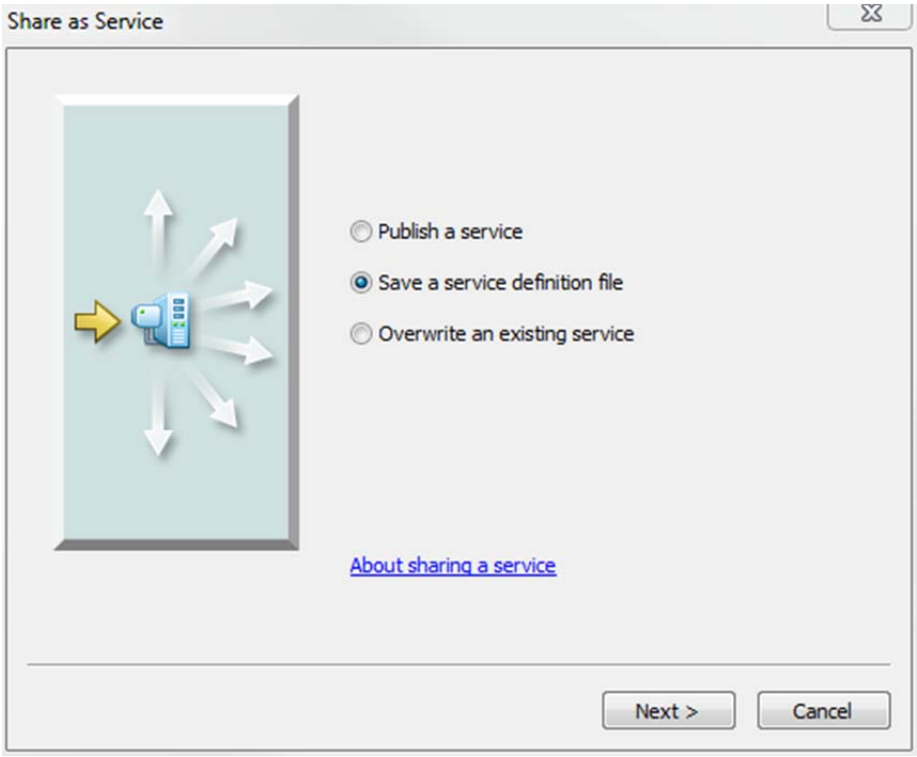
Step 4. Create a Service Definition File

The final step is to create the Service Definition (SD) file. This is an ESRI file format that will be imported into ScienceBase, along with our metadata xml we created earlier in Exercise 1. The SD file contains the data as well as the instructions for how to symbolize the data. In other words, when the map service is created from the SD file, it will look exactly as we have created it in ArcMap. That is why we symbolize it before creating the sd file. It is a good idea to make sure at this point that the data frame is also in the Web Mercator Auxiliary Sphere projection.

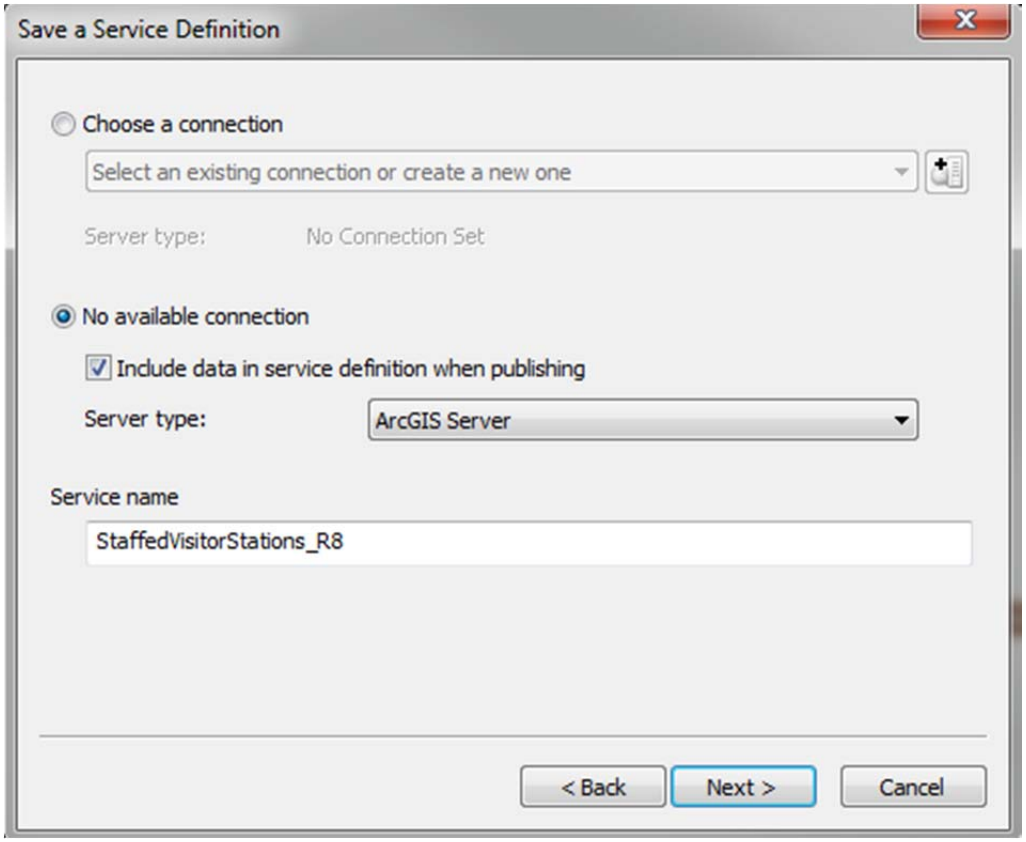
To create the SD file, first make sure that only the ***StaffedVisitorStations_R8_WM*** dataset is loaded in ArcMap. If you have multiple datasets loaded, they will all be included in the sd file. Next, go to '**File'**, then '**Share As'** and '**Service'**, as shown below:



In the next window, click on the 'Save a service definition file' radio button:

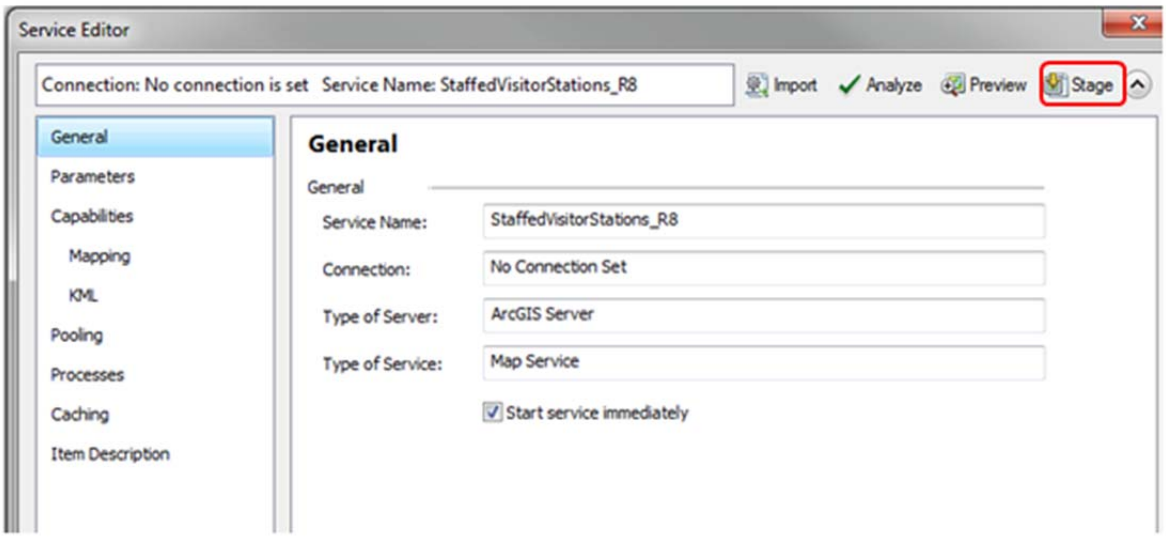


Click 'Next', then select the "*Include data in service definition when publishing*" Option. Put in the name of the dataset as the SD file name, as shown here:



On the next screen, you will browse to the location to save the file. Save it to ***D:\CollaborativeWebMapping\MyData*** and click 'Continue'.

At this point, a new window will appear. This window allows you to add metadata to the Service Definition file, if you choose, but since we will importing it to ScienceBase and working with metadata there, it is not necessary to enter comprehensive metadata in this step. Click on the 'Analyze' button and review the error messages. If no high priority errors are flagged, you should be fine to proceed. To complete the exercise and to create the service definition file, click 'Stage'.



Best Practice Tips for Creating Service Definition Files

- Do not use transparency. You can make the data transparent in DataBasin
- Avoid using highly complex, large datasets with many vertices. This may slow down the data viewing experience. You can also use the “Simplify” tool (ArcToolbox > Cartography Tools > Generalization > Simplify Line/Polygon) to reduce the number of vertices if you experience problems. Use the 'point remove' method and experiment to find the right balance of speedy performance versus accurate representation of the data.
- Set large, complex datasets to only display when zoomed-in to larger scales (scale display properties). Parcel data is a good example of when you might want to use this technique.
- Try to use simple symbology whenever possible. You may get an error if you use hashes or other types of symbology. They may display fine in DataBasin or you may experience problems.
- Make an attempt to fix 'warnings' and 'informational messages' in the 'Analyze' step to further improve performance. Warnings with the flag of ‘High’ are critical and must be fixed.
- Clip the data to the region of interest. In other words, use only the extent of the data that you need. This will speed display.

- It's strongly recommended to project the data to WGS 1984 Web Mercator (auxiliary sphere). Failure to do so can result in a Service slowed by on-the-fly projection. Also make sure that the data frame in ArcMap is set to this projection.
- If you need to make a change to an existing ArcGIS Mapping Service in ScienceBase, first delete the old .sd 'extension' and then add in the new one. This will preserve the ScienceBase url. You cannot add two Service Definition files to one ScienceBase item. The metadata should still be intact if you all you do is change the SD file.