Administration Guide

South Carolina Stream Assessment
Conservation Planning Tool

South Carolina Department of Natural Resources
Clemson University

Version 1

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1. General

1.1 Setup work environment

It is recommended that this step be repeated for each model.

1. Create a model run working folder. It is recommended that the folder name corresponds to the model name, e.g., C:\SCSA\cp_groups\
2. Copy the 'Model_Publish.mxd' file into the working folder.
3. It is recommended that the 'Model_Publish.mxd' be renamed to correspond with the model name, e.g., C:\SCSA\cp_groups\cp_groups.mxd.
4. Copy a catchment feature class to the working folder. Optionally, you can substitute a wadeable catchments feature class specific to the physiographic region the model is designed for, e.g., 'Wadeable_Catchments_CP.shp' for Coastal Plain.

2. The R statistical computing environment

2.1 Create serialized model (*.rds)

This step should be repeated for each model.

1. Using R, create an R object for RandomForest.
2. Save RandomForest object using the saveRDS() command. Save the *.rds file with a descriptive name without spaces, e.g., cp_groups.rds. It is recommended that the *.rds file be saved to your working folder.

```
> saveRDS(<random forest object>, file = "<serialized model>.rds")
```

2.2 Generate catchment predictions

This step should be repeated for each model.

1. Locate the serialized model file (*.RDS) and wadeable catchments data table (*.csv).
2. Issue the following commands through an R script or R console:

```
> model <- readRDS('<serialized model>.rds')
> catchments <- data.frame(read.table(file='<wadeable catchments>.csv', sep=',', header=TRUE))
> rownames(catchments) <- catchments$COMID
> results.RF <- predict(model, newdata=catchments, type='response', norm_votes=TRUE,
                        predict_all=FALSE, proximity=FALSE, nodes=FALSE)
> results <- data.frame(results.RF)
> write.csv(results, file='<model results>.csv')
```

3. Save the output CSV be saved to a model run working directory.

3. SCSA resource API

3.1 Upload Drainage Area Attributes

The loading of attributes requires that no data or models are present in the repository. Remove all models and data before uploading attributes. This step should only be performed once. If drainage area data changes, it will be necessary to delete existing drainage area data and repeat this step.

1. Locate the 'Upload Attributes' form by navigating to the 'Attributes' section of the 'SCSA Resource API' client and selecting the 'Admin' tab. **Note:** You must be logged in with the 'Administrator' role to perform this step. See Figure 1.
   - 'Attribute File' contains a row for each attribute and columns for metadata. See Table 1 for required metadata. This file must be in a comma separated values (*.csv) format. Fields should be enclosed in quotes.
2. Click 'Upload Attributes'.

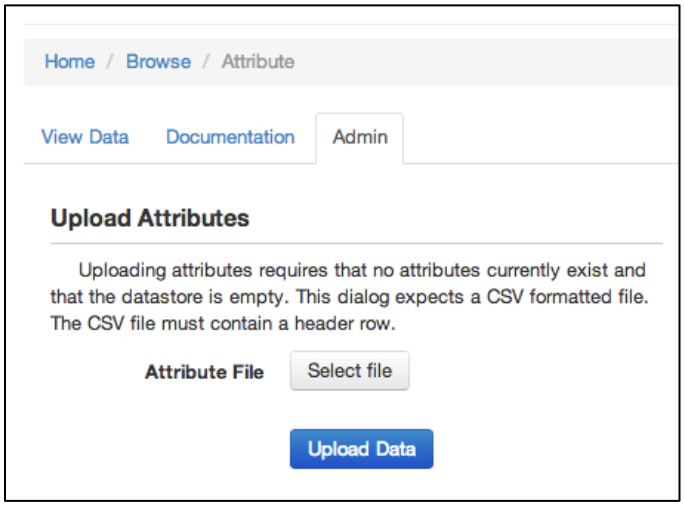

Figure 1 Upload Attributes

Table 1 Attributes Required Metadata

Column	Explanation
Name	Attribute name. No spaces. Specific to coverage. E.g., Road_crC
Coverage	'LOCAL' or 'CATCHMENT'
Type	'Physical' or 'Human Disturbance'
Production	Dataset origin. E.g., NFHAP
Variable	Attribute Name. Not specific to coverage. E.g., Road_cr
Units	Attribute Units
Description	Description of the attribute
Source	Citation for attribute

3.2 Upload Drainage Area Data

The loading of drainage area data requires that 1) attributes exist, and 2) no models are present in the repository. Remove all models before uploading drainage area data. Columns corresponding to the attributes loaded in the previous section must be included.

1. Locate the 'Upload Attributes' form by navigating to the 'Attributes' section of the 'SCSA Resource API' client and selecting the 'Admin' tab. **Note:** You must be logged in with the 'Administrator' role to perform this step. See Figure 2.
   - 'CSV Data' contains a row for each drainage area and columns for each attribute. This file must be in a comma separated values (*.csv) format. Text fields should be enclosed in quotes.
2. Click 'Upload Data'.

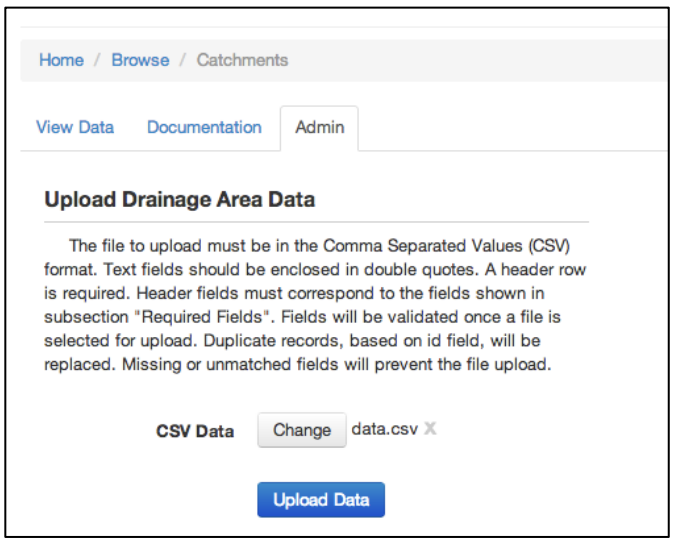

Figure 2 Upload Drainage Area Data

3.3 Upload Serialized Model

1. Locate the 'Upload Model' form by navigating to the 'Models' section of the 'SCSA Resource API' client and selecting the 'Admin' tab. **Note:** You must be logged in with the 'Administrator' role to perform this step. See Figure 1.
   - 'Name' is a short identifier for the model. This name must correspond to the 'Map Service' published with ArcGIS Server. Do not use spaces in this name. It is recommended that underscores be used to separate words.
   - 'Description' can be 1-2 sentences describing the model.

- ‘Editable Attributes’ are attributes that the end user is allowed to modify. It is recommended that the following criteria be used to select attributes:
    - Variable importance measure
    - Subject to human influence
    - Catchment (vs Local) variables are recommended
    - To select attributes, highlight one or more attributes in the list-box located on the right-side of the control group. Use the ‘<<’ buttons to move attributes into the left-side of the control group, indicating the attribute will appear to the user. Attributes can be deselected using the ‘>>’ button.
- ‘Long Description PDF’ contains a detailed description of the model. This PDF Is available to the end user.
- ‘Serialized Model File’ is an *.rds file containing the model object.

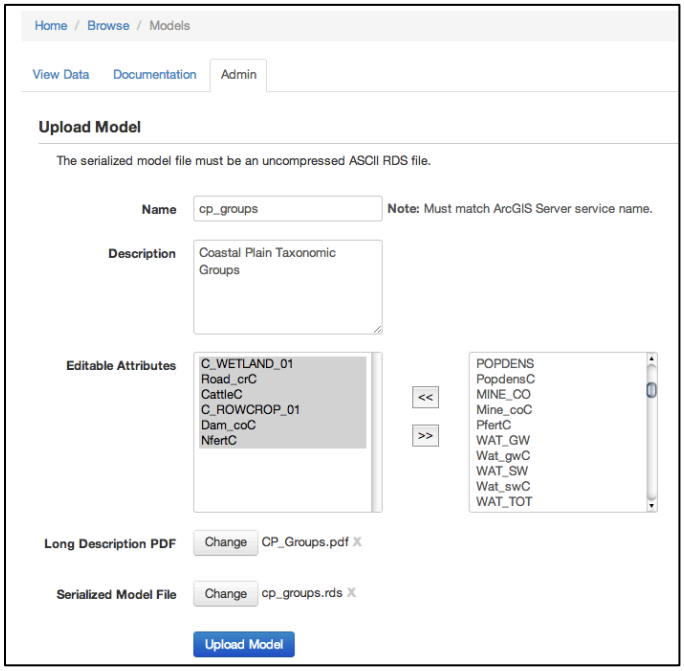

Figure 3 Upload Model Form

2. Click ‘Upload Model’.

4. ArcGIS Desktop

4.1 Coordinate Systems

For consistency and performance reasons, map and feature service data must be projected into the **'WGS_1984_Web_Mercator_Auxiliary_Sphere'** or (WMAS) coordinate system. (EPSG: 3857). WMAS is used for the web mapping services provided by ArcGIS Online and major map providers like Google and Bing Maps. Ensuring that map layers and map document coordinate systems are consistent will ensure that on-the-fly projection is not necessary.

Note: If performing a datum transformation, you will need to specify a 'Geographic Transformation'. For example, NAD_1983 to WGS_1984 transformations in the continental US should use: **NAD_1983_To_WGS_1984_1**

4.1.1 Set layer coordinate system (if applicable)

1. Verify input layers are in correct coordinate system. Right-click layer in 'Table of Contents', select 'Source' tab. Verify coordinate system is defined as: 'WGS_1984_Web_Mercator_Auxiliary_Sphere'.
2. If the coordinate system is not 'WGS_1984_Web_Mercator_Auxiliary_Sphere', use the 'Project' or 'Project Raster' tool to re-project to the correct coordinate system.

4.1.2 Set map coordinate system (if applicable)

1. Right-click 'Layers' in the 'Table of Contents' pane. Select 'Properties…'. See Figure 1.

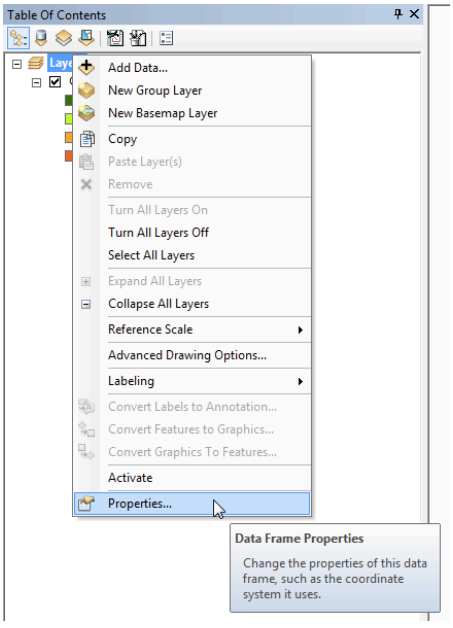

Figure 4 Data Frame Properties

2. Select the 'Coordinate System' tab.
3. Browse to 'Projected Coordinate System' -> 'World'
4. Choose: **WGS_1984_Web_Mercator_Auxiliary_Sphere**

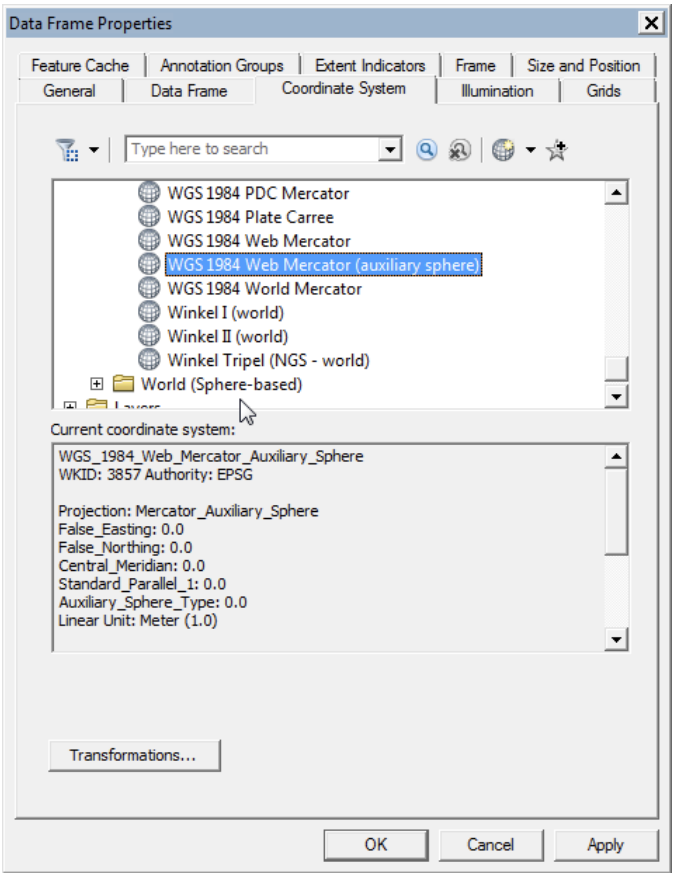

Figure 5 Data Frame Coordinate System

4.2 Create Raster from Model Output Table

1. Open the model map document in ArcGIS Desktop.
2. Add the catchments feature class from Section 1 to the map document.
3. Add the 'Catchment Predictions' data table to the map document.
4. Perform a 'Join' between the 'Catchment Predictions' table and the 'Wadeable Catchments' feature class. Right-click the 'Wadeable Catchments' layer, select 'Joins and Relates' -> 'Join…'. See Figure 17.

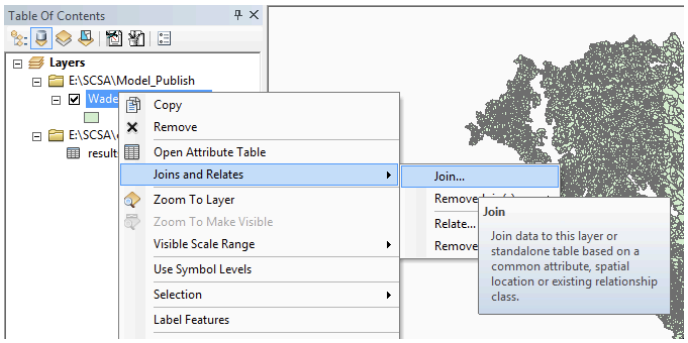

Figure 6 Create Join Menu Item

5. Specify the 'COMID' field in the '1. Choose the field…' control. Specify the 'comid' field in the '3. Choose the field…' control. Select 'Keep only matching records' under 'Join Options'. Click 'OK'. See Figure 18.

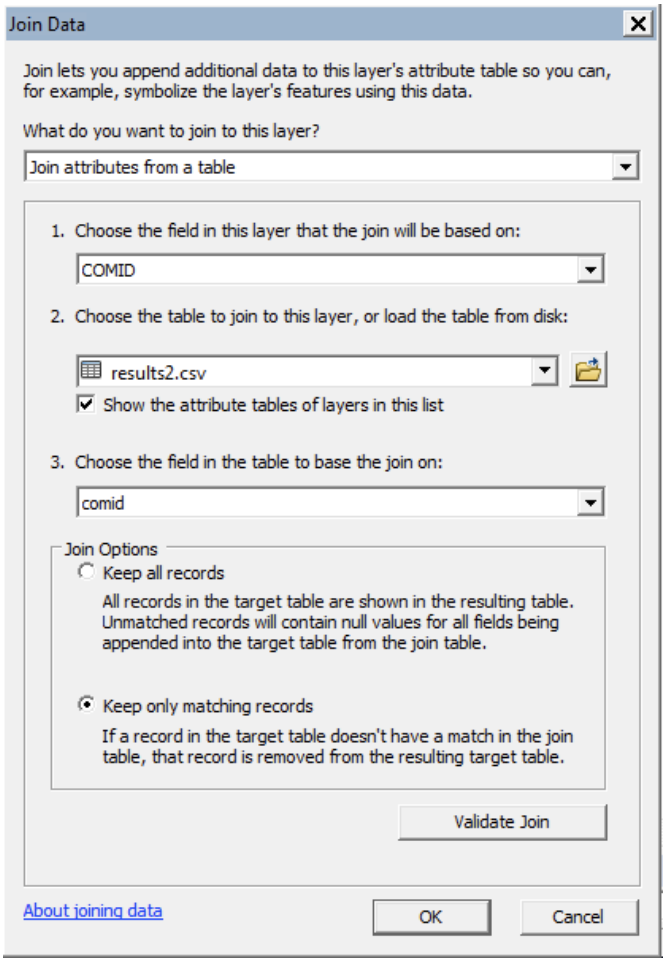

Figure 7 Join Data Dialog

6. Convert the polygon feature class to a raster dataset. Use the 'Polygon to Raster' tool located in the 'Conversion Tools' -> 'To Raster' toolbox. See Figure 19.

- Use the 'Wadeable Catchments' feature class as 'Input Features.
- Specify the 'results' field of the 'Catchment Predictions' table for 'Value field'.
- Specify the 'Output Raster Dataset' folder to be the working folder for model run. The TIF format is recommended.
- Set 'Cellsize'. A cellsize of 30 (linear unit is meters) is recommend.

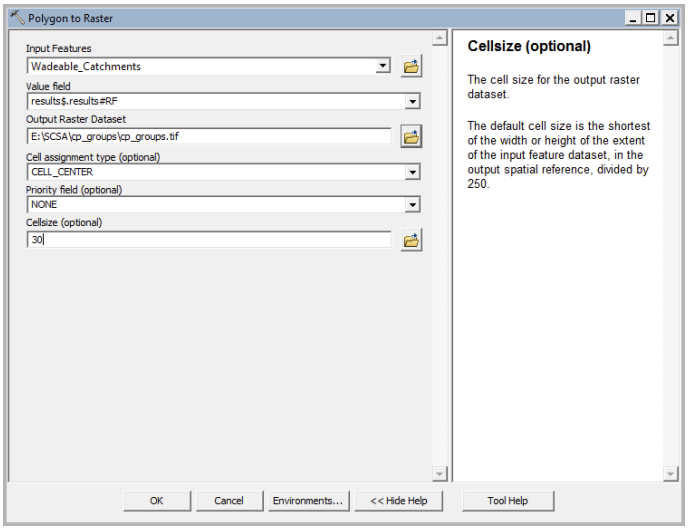

Figure 8 Polygon to Raster Tool

7. Adjust 'Symbology' of new raster layer.
8. Remove layers you do not want to appear on published map, e.g., remove everything except raster from step 7.
9. Save your map document to the working folder for the model run.

4.3 Legend and Layer Names

Map legends and layer names that appear in the map service are determined by the map document (MXD).

4.3.1 Layer name

1. Right-click layer in 'Table of Contents'. Select 'Properties…'
2. Select the 'General' tab. Enter a short, descriptive name for the layer. The purpose of the layer name is to convey the meaning of the layer to the end user. It is not used as a unique identifier or referenced by any software components. See Figure 3.

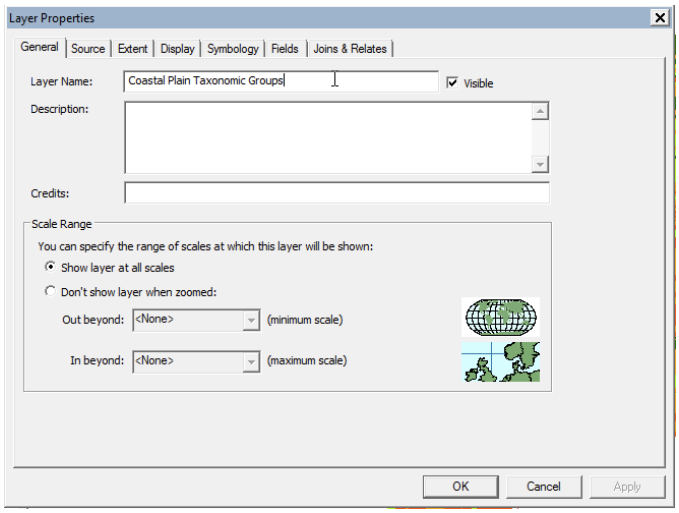

Figure 9 Layer Properties

4.3.2 Legend

1. Right-click layer in 'Table of Contents'. Select 'Properties…'
2. Select the 'Symbology' tab.
3. Ensure that 'Label' fields are filled out. If 'Unique Values' symbology is used, it is recommended that the '<all other values>' item is left unchecked. See Figure 4.

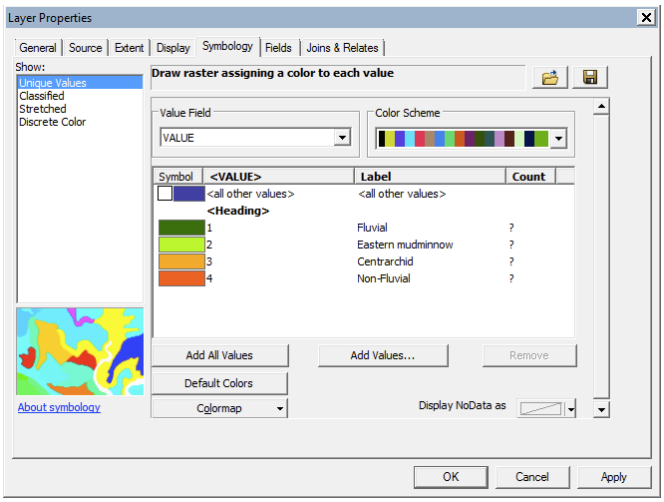

Figure 10 Unique Values Symbology

4.4 Analyze Map

Check the map document for inconsistencies that may negatively impact performance or prevent the document from being published by using the 'Analyze Map…' tool in ArcGIS Desktop.

1. Under the 'File' menu item, select 'Analyze Map…'. See Figure 5.
2. Correct all 'Errors' and 'Warnings' before publishing.

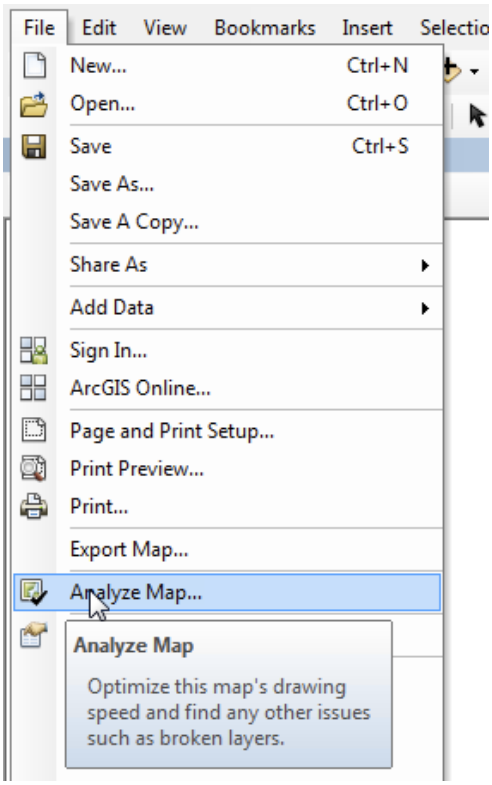

Figure 11 Analyze Map

4.5 Create Service Definition

1. Under the 'File' menu item, select 'Share As' -> 'Service…' See Figure 6.

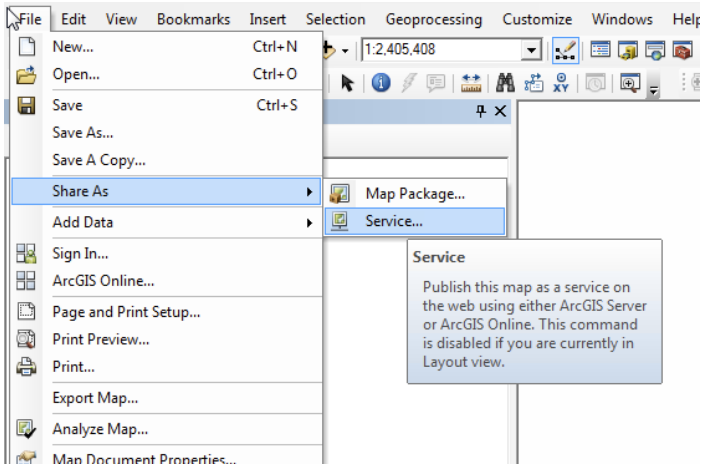

Figure 12 Share service dialog

2. Choose the 'Save a service definition file' option. Click 'Next >'. See Figure 7.

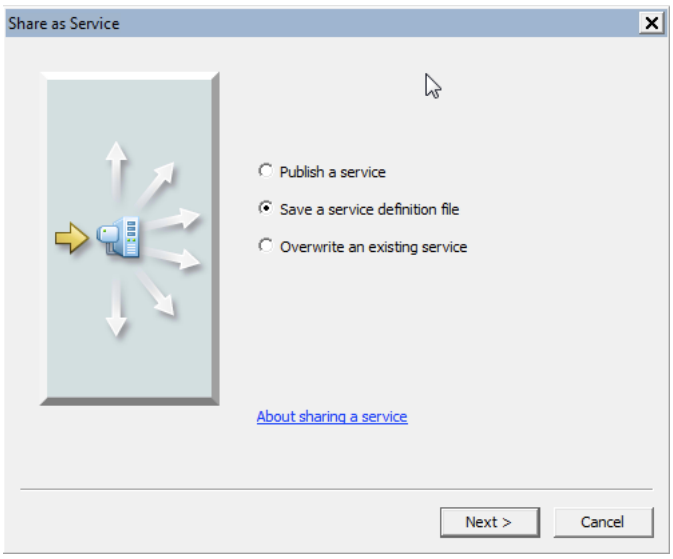

Figure 13 Service Definition

3. Select 'No Available Connection'. See Figure 8.
4. Check 'Include data in service definition when publishing. See Figure 8.
5. Enter the 'Service Name'. **Important: This name must match the model name defined in the SCSA Resource API.** See Figure 8.
6. Click 'Next >'. See Figure 8.

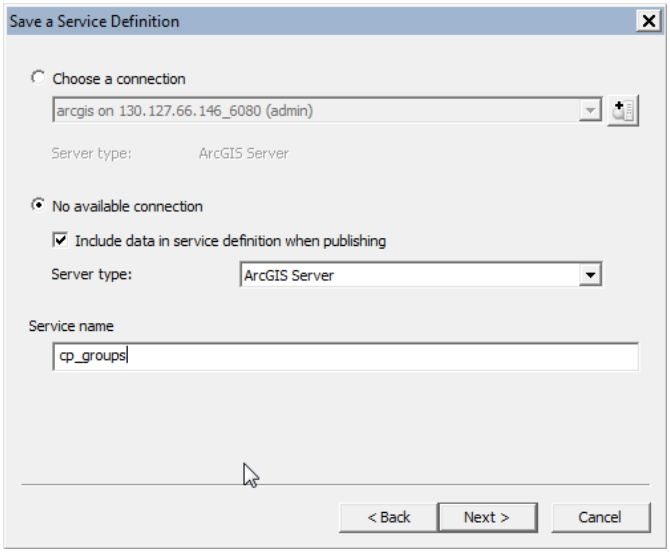

Figure 14 Service Properties

7. Choose a location to save the service definition. Click 'Continue'. See Figure 9.

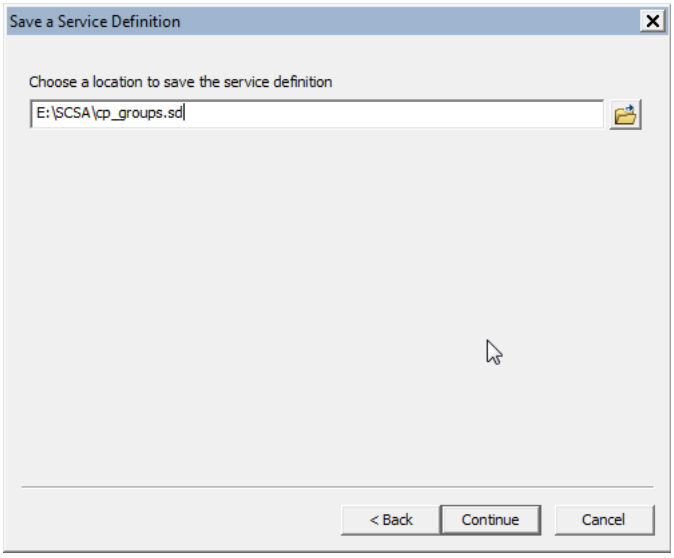

Figure 15 Save Location

8. Set 'General' service properties. Service name was set previously. Defaults should be appropriate. See Figure 10.

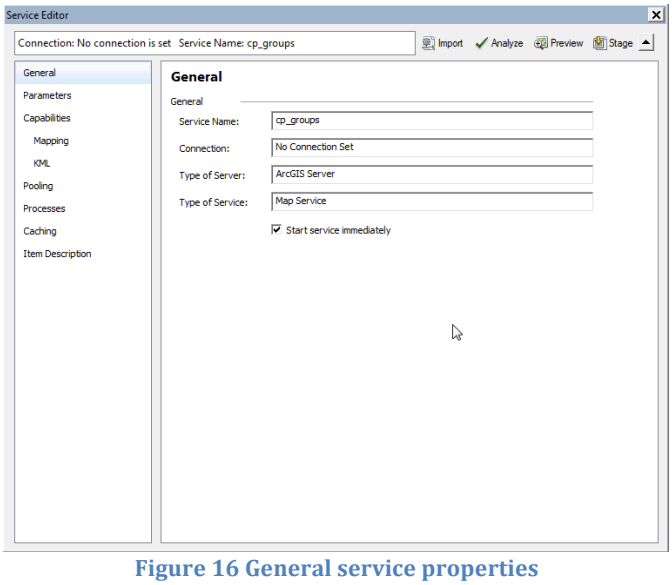

Figure 16 General service properties

9. Select the 'Parameters' service property option. See Figure 11.
10. Set 'Anti-Aliasing' to 'None'. See Figure 11.
11. Set 'Text Anti-Aliasing' to 'None'. See Figure 11.

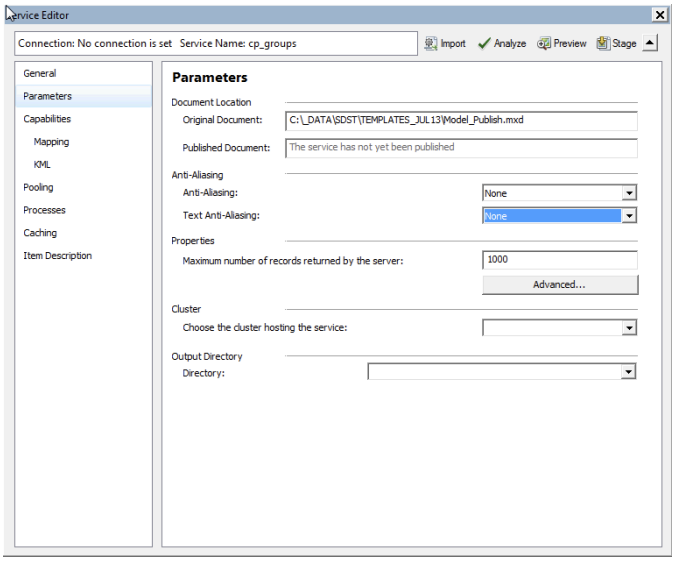

Figure 17 Service parameters

12. Select 'Capabilities' service property option.
13. Ensure 'Mapping' is checked. Other service capabilities are optional.
14. Select 'Capabilities'->'Mapping service property option.
15. Ensure 'Data', 'Map', and 'Query' operations are checked.
16. Note: The default settings for the 'Pooling' and 'Processes' service properties require no changes.
17. Select the 'Caching' service property option. See Figure 12.
18. Select the 'Using tiles from a cache' option under 'Draw this map service'. See Figure 12.
19. Under 'Tiling Scheme' select 'ArcGIS Online / Bing Maps / Google Maps'. See Figure 12.
20. Set the 'Levels of Detail'. See Table 1 and Figure 12.

Table 2: Levels of detail.

Level of Detail (ESRI)	Resolution	Scale
7	1222.99245256249	4622324.434309
8	611.49622628138	2311162.217155
9	305.748113140558	1155581.108577
10	152.874056570411	577790.554289
11	76.4370282850732	288895.277144
12	38.2185141425366	144447.638572
13	19.1092570712683	72223.819286

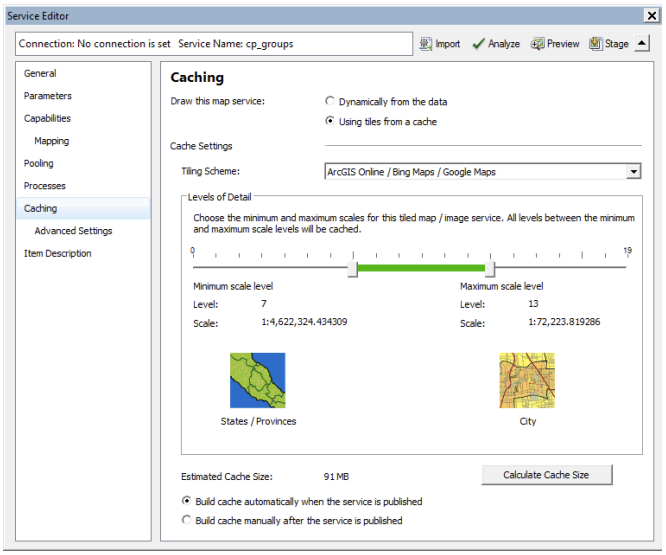

Figure 18 Service Caching

21. Select the 'Caching' -> 'Advanced Settings' service property option. See Figure 13.
22. Select 'Mixed' under 'Tile Format'. See Figure 13.

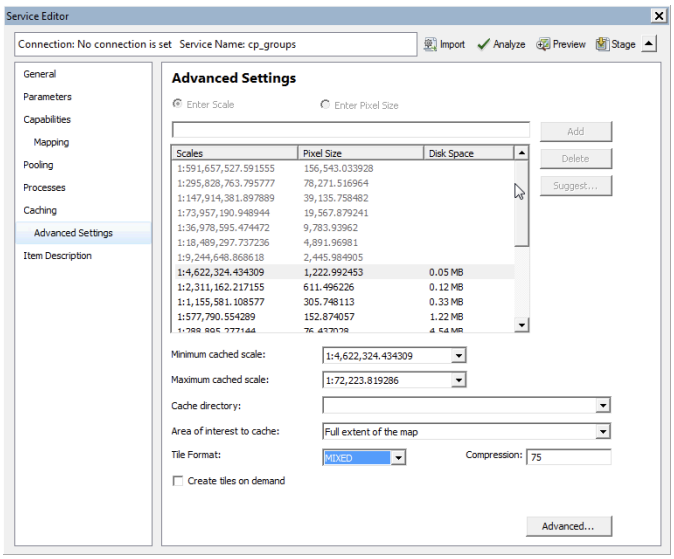

Figure 19 Service Caching Advanced Settings

23. Select the 'Item Description' service property option. See Figure 14.
24. Set appropriate text for fields. The 'Credits' field will appear along with the map layer when retrieved from the service. See Figure 14.

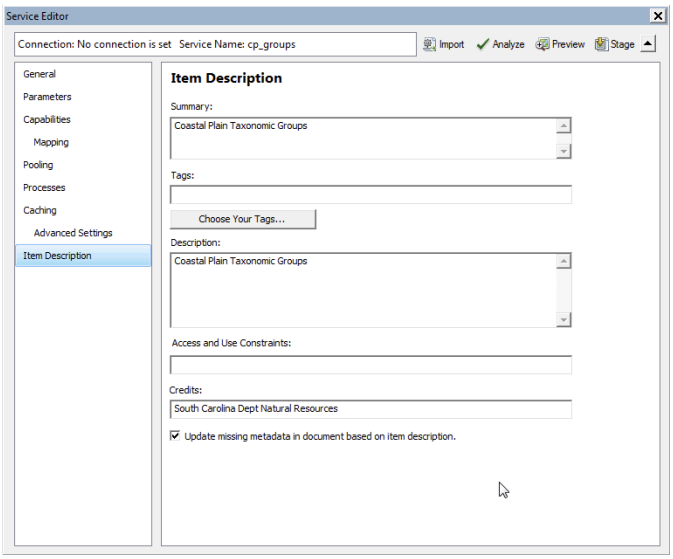

Figure 20 Service Description

25. Stage the 'Service Definition' by clicking the 'Stage' button on the 'Service Editor'. See Figure 15.

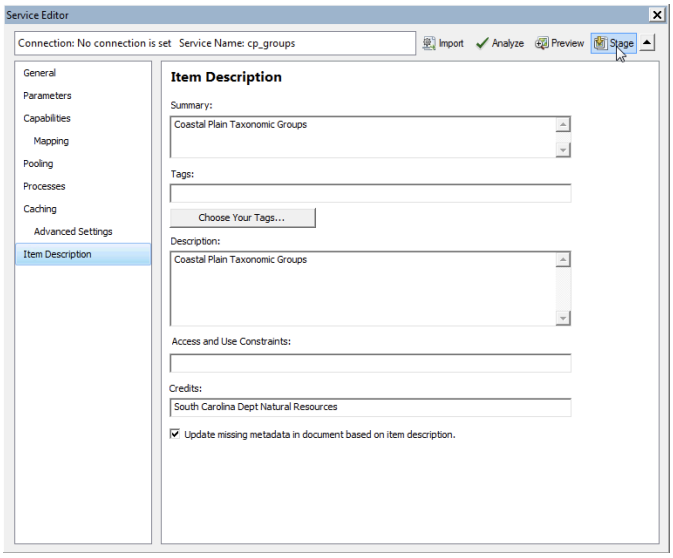

Figure 21 Stage service definition

4.6 Publish Service Definition

The 'Service Definition' file (*.sd) created in the previous section contains a description of the service and the data required to publish in a single file.

1. Select the 'Upload Service Definition' tool under 'ArcToolbox' -> 'Server Tools' -> 'Publishing'. See Figure 16.
2. Browse to the 'Service Definition' (*.sd) file you created from the previous section. See Figure 16.

3. Specify the 'Server' connection file. See Figure 16. **Note**: the connection must have the appropriate privileges to publish a service.
4. Activate the 'Override Service Properties' control. Set the 'Folder Type' to 'EXISTING. Set the 'Folder' name if applicable. See Figure 16.
5. Click 'Okay'. See Figure 16.

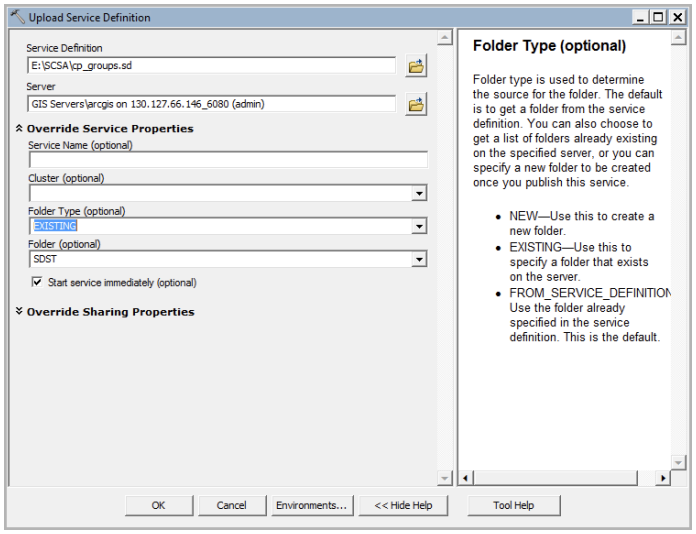

Figure 22 Upload service definition

6. The caching process should begin when the upload is complete. Verify this is the case by browsing to 'GIS Servers' under 'Catalog'. Locate the server folder you published the map service to. Right-click on the map service and select 'View Cache Status…'. See Figure 17.
7. If the cache status states that '0% of tiles are present' and 'Tile generation is not in progress', you will need to manually start the caching process. Right-click on the map service and select the 'Manage Cache' -> 'Manage Tiles…' item. See Figure 18.
   Set the following tool options:
   - 'Input Service' should be the map service you published.
   - 'Scales' should populate with the 'levels of detail' scales you specified previously. Make sure all scales are selected.
   - 'Update Mode' should be 'RECREATE_ALL_TILES'
   - 'Wait for job completion' should be checked.
   - Leave other controls with default settings.

   Click 'OK'

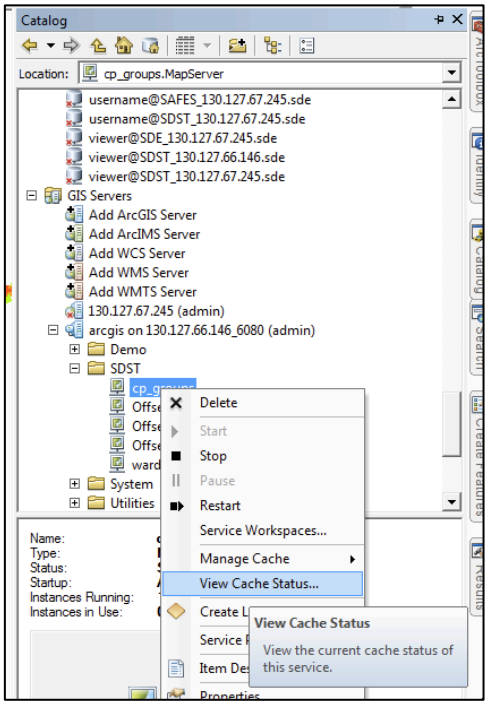

Figure 23 View Cache Status...

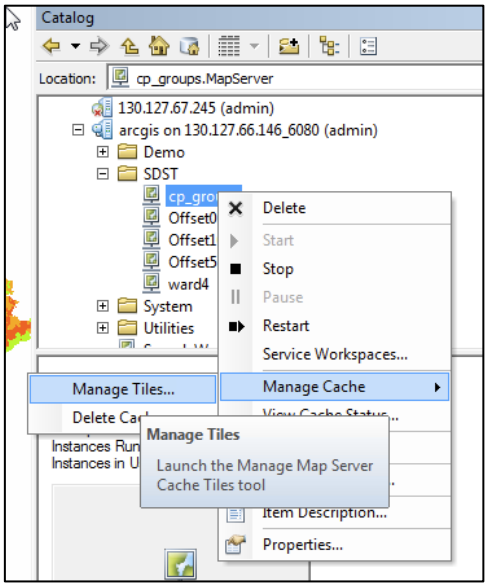

Figure 24 Manage tiles context item

10. **Troubleshooting:** If the caching fails, there may be a stale cache present on the ArcGIS server. Deleting a map service does not always delete its associated cache. If a new map service with the same 'service name' is published, it may use the stale cache. Navigate to the cache directory on the ArcGIS Server and manually delete the map service cache. Try Step 7 again.