Updated September 10, 2020

Environmental Review Tool Map Service Specifications

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Background

Map services in ArcGIS Server 10.x (AGS) revolve around the map document (MXD). In AGS, it is the MXD that forms the exact specification of the contents, symbology, scale dependencies, etc, that are exposed via a Map Service. The MXD also influences the functionality that is exposed by the service.

This document specifies the required features of map services for consumption by the Environmental Review Tool (ERT). This applies equally to services published by the user or via the ERT itself. If the latter, please see the additional requirements for the packaging of data.

Consult your maintenance agreement for the specific version of ArcGIS Desktop and Server used to prepare map document updates.

Layers used in spatial analysis

Layers used for spatial analysis must be provided according to the following instructions.

In a single file datestamped geodatabase named **SpatialCalculations_YYYY_MM.** See

- Appendix I for more detailed instructions.
- In a single state projection (**NOT** in **WGS_1984_Web_Mercator_Auxiliary_Sphere,** the projection used for Reference Layers), to ensure proper calculation
- Provide geodatabase to NatureServe

Reference Layers

One Layer per MXD/Service

While there is no technical problem with publishing an MXD with multiple layers, doing so means that each layer appears as a 'sub-layer' within the resulting service. The main disadvantages of sub-layers are the inability to either alter the drawing order of the sub-layers or independently control their opacity. A single layer MXD produces a map service which is much cleaner to work with online.

What this specification really warns against is the creation of a single 'convenience' map document that includes lots of disparate layers for quickly publishing en masse. This will result in one service that provides an unwieldy mass of sub-layers, each having very little relation to any other.

There are cases, however, where carefully designed multiple layer MXDs make sense, such as when there is a lot of tightly related data. For instance, a single 'Water Bodies' service could include sub-layers providing different levels of detail at different zoom levels. Zoomed way out, the sub-layer for large lakes and rivers is visible. Zooming further in, smaller rivers become visible as lines, still further and they become polygons, and so on. In such cases, where each sub-layer represents one scale view of a coherent set of data, a multiple layer MXD is entirely appropriate.

In the majority of cases, a single layer per service strategy is required.

Coordinate Systems

The 'standard' coordinate system for web maps is 'Web Mercator'. Unlike layers used for spatial analysis, reference layers should be projected to Web Mercator to maximize performance. The map service should be authored in this projection, which can be found in ArcMap as 'Projected Coordinate Systems/World/WGS 1984 Web Mercator (auxiliary sphere)' (**WKID = 3857**). By having reference layers in the Web Mercator projection, performance is maximized, as the server load involved in reprojecting the source data is reduced.

Please note that when the ERT calculates measures it reprojects to the state projection in which the spatial analysis layers are provided, in order to ensure accuracy.

Define the map projection Coordinate System - View menu, Data Frame Properties, Coordinate System tab. Utilizing the **WGS_1984_Web_Mercator_Auxiliary_Sphere** (found in ArcMap as 'Projected Coordinate Systems/World/WGS 1984 Web Mercator (auxiliary sphere)' **(WKID = 3857**)) coordinate system will reduce the server load involved in reprojecting the source data.
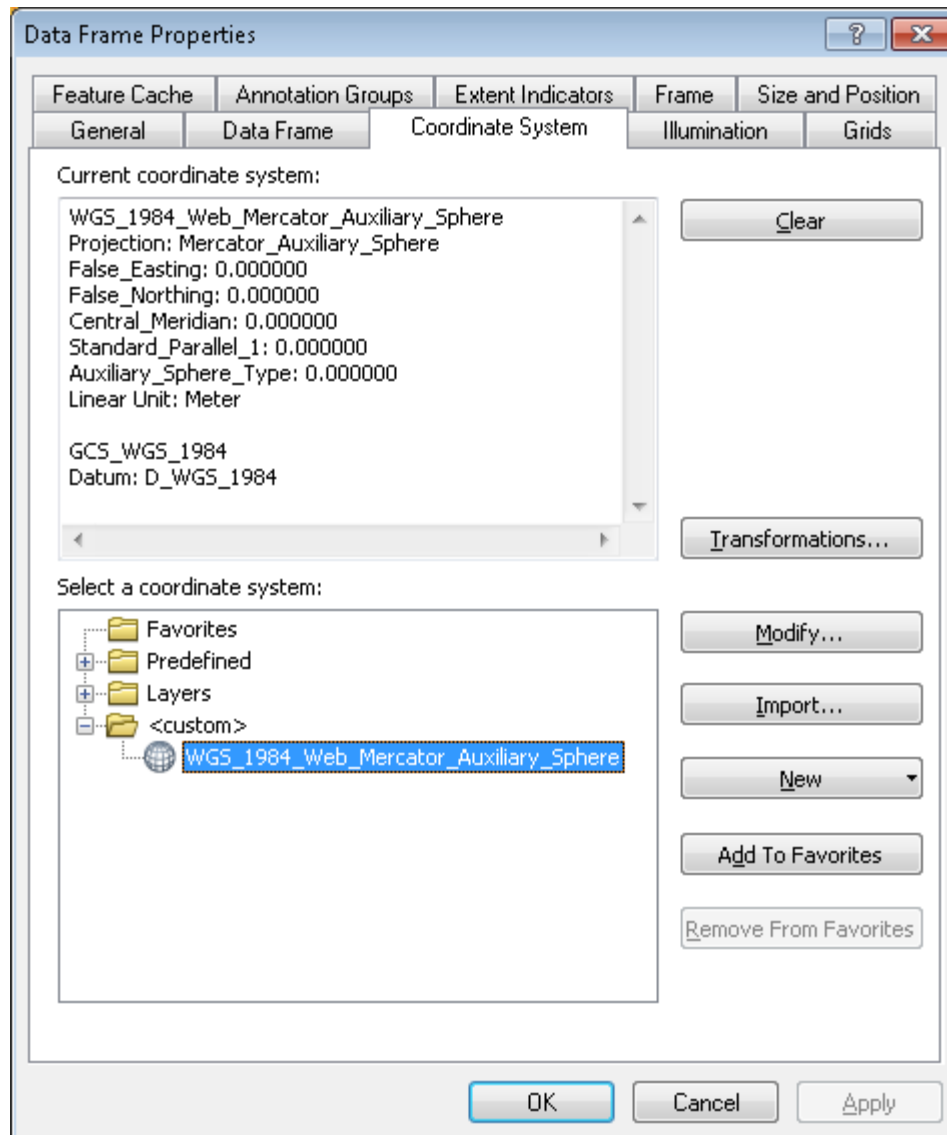
Data Source

File geodatabases are strongly recommended for publishing services and are the *required* data format if the ERT will host the service. File geodatabases provide access to advanced AGS query functionality not available if published from an Esri shapefile, and also seem to have improved performance for larger datasets.

Other geodatabase solutions such as ArcSDE or native spatial data accessed with a query layer also give access to such advanced functionality, but these can only be used for user published services.

If a service is hosted by the ERT, a file geodatabase datestamped with the name **VisualizationLayers_YYYY_MM.gdb** should be zipped and shipped alongside the MXD(s) and other required components.

Extent

The map service's initial extent will equal that which was current when the MXD was last saved. This subsequently controls where the web 'Zoom To Layer' tool will take you. Set this extent before saving and publishing.

Layer Name

Name the layer as it should appear within the map's Layers table of contents. This should be a user-friendly name.

Scale Dependencies

Layer scale dependencies must be set appropriately, where it does not make sense to show a layer at a certain scale. This will reduce server load and web traffic to the web map viewer and make it more responsive.
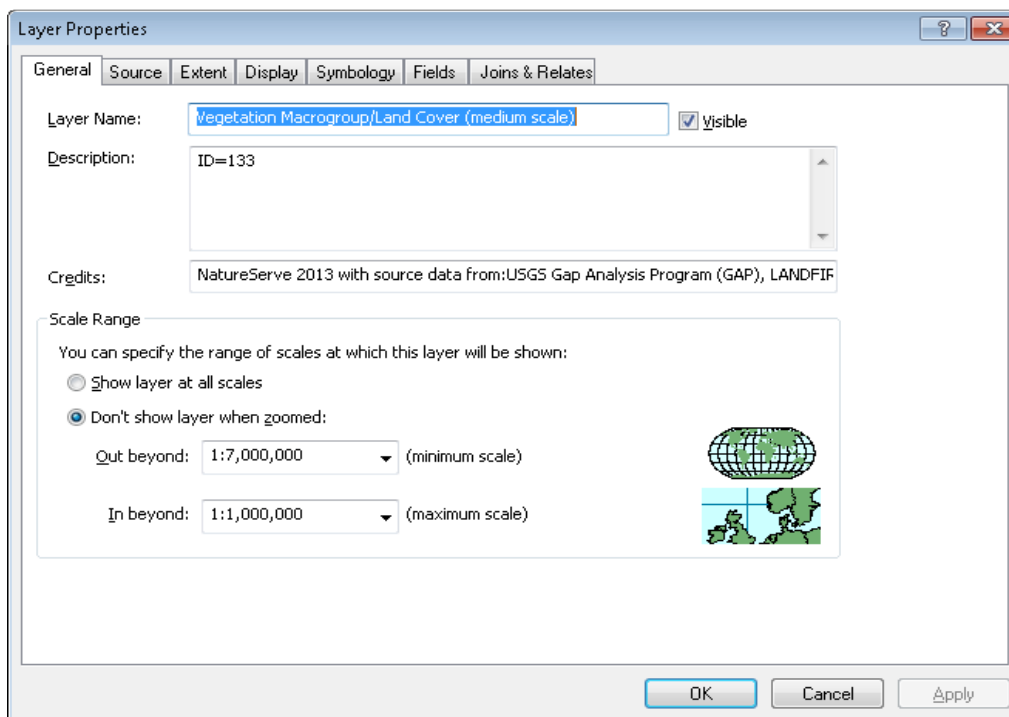

Display Field

When viewing a list of features returned from a web service query, the Display Field is the default attribute field returned. This must therefore be something which indicates meaningful identity or grouping for that layer's results, such as a unique identifier.

In order to avoid issues with display, the Display Field must be set on the Layer Properties dialog within the Display tab, under Display Expression. Further, it should be ensured that the field chosen is one of those marked as *visible* on the Fields tab of the same dialog.
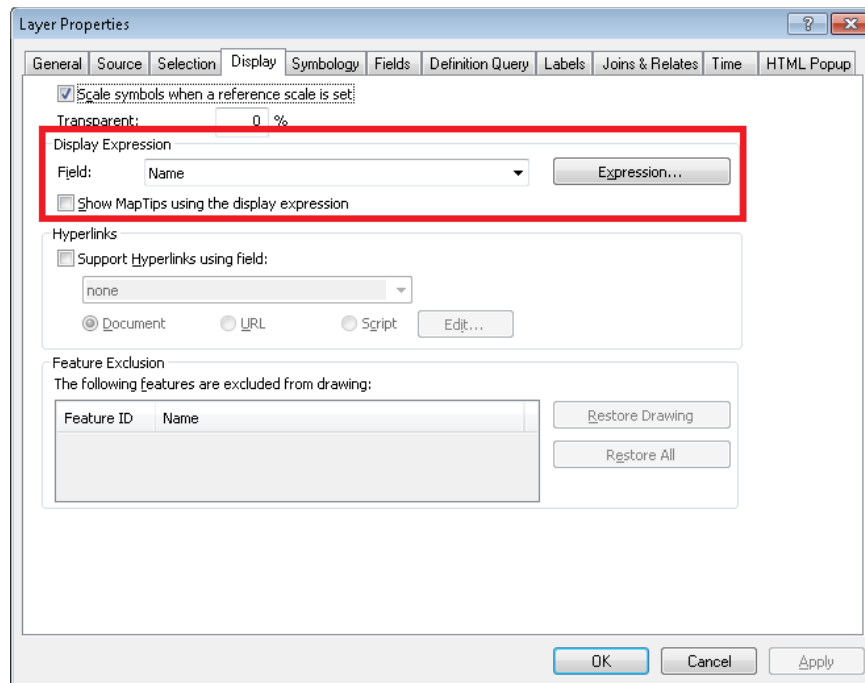
The Display Field will be shown in the header of the Details dialog as such: **Details:** *Service Name- Layer name- value of display field for the given record*.
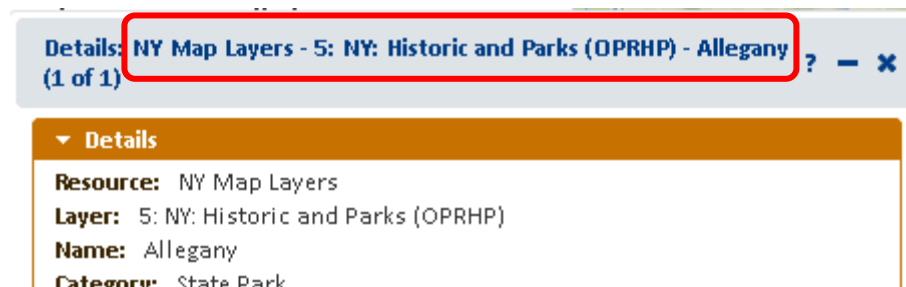
Symbologies

A map service will duplicate as closely as possible the symbology provided in the MXD. Ensure that color ramps, legend labels, etc, are just as you would like them published.

Ensure that your symbologies overlay well across all the layers you publish. For instance, if you have 'vascular plants' in two layers which might be overlaid, the symbologies must be at least minimally distinct.

- o Symbolize appropriately
- o Define Legend labels
- o Repeat layers within .mxd with various legends if more than one legend is desired

Layer Files

A layer file for each of your symbologies is required. This is used, for instance, where geoprocessing produces maps which show subsets of features from a layer. Here, the layer file is used to symbolize the outputs as unambiguously identical to the inputs.

Field Aliases & visibility

Layer attributes can have very terse names, such as CONSID. You must provide field aliases for attributes you might expose to the end user, for instance via the Identify tool. For instance, CONSID might be aliased to 'Conservation Site ID'. The ERT uses such aliases to label fields for display, meaning that you have control over the labeling.
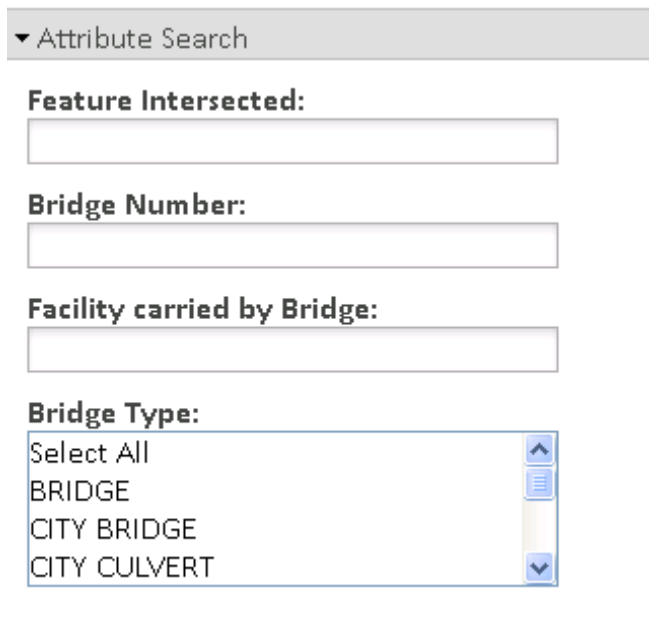
Fields of type **Geometry** and **ObjectID** must always be visible (typically **Shape** and **OBJECTID**). Other fields should only be marked **Visible** if they should be displayed. Fields lacking data or with coded data which is not meaningful should not be marked **Visible**. Field aliases and visibility are set via the Fields tab of the Layer Properties dialog in ArcMap.

- Define Aliases for fields
- Only make those fields VISIBLE which you would like available via the Identify/Query tools.
- Fields of type **Geometry** and **ObjectID** must always be visible (typically **Shape** and **OBJECTID**)
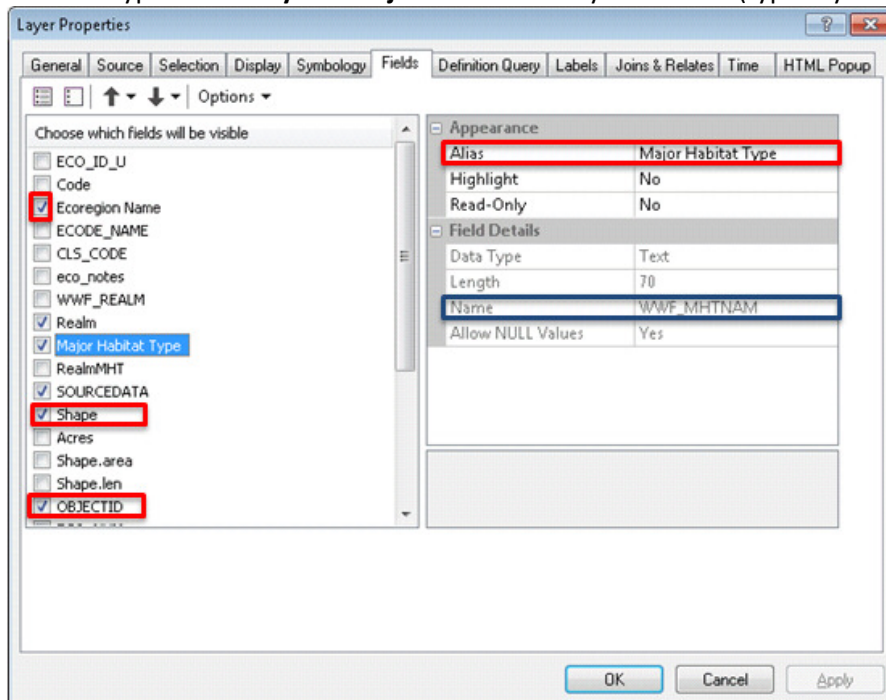
Domain Tables

By default, the **Feature Search** tool utilizes text searches of all visible fields. Given that the data within the layers are not readily exposed, this makes successfully performing an Attribute Search difficult. The following screenshot shows an example of a layer which contains 3 attributes which are searchable followed by the fourth, **Bridge Type**, which utilizes a domain list.


To utilize a dropdown/domain list, such as with Bridge Type in the example above, rather than an open search:

1. Create the domain table(s) via the **Frequency** tool (ArcToolbox – Analysis Tools – Statistics – Frequency) for the given attribute(s).
2. Use the datestamp suffix in the name of the table (e.g., **BridgeType_Domain_2016_01**)
3. Save the table(s) within the same File Geodatabase (**VisualizationLayers_YYYY_MM.gdb**) as the layer.
4. Add the domain table to the map document (this will happen automatically if the tool is run from within the map document) prior to publishing.
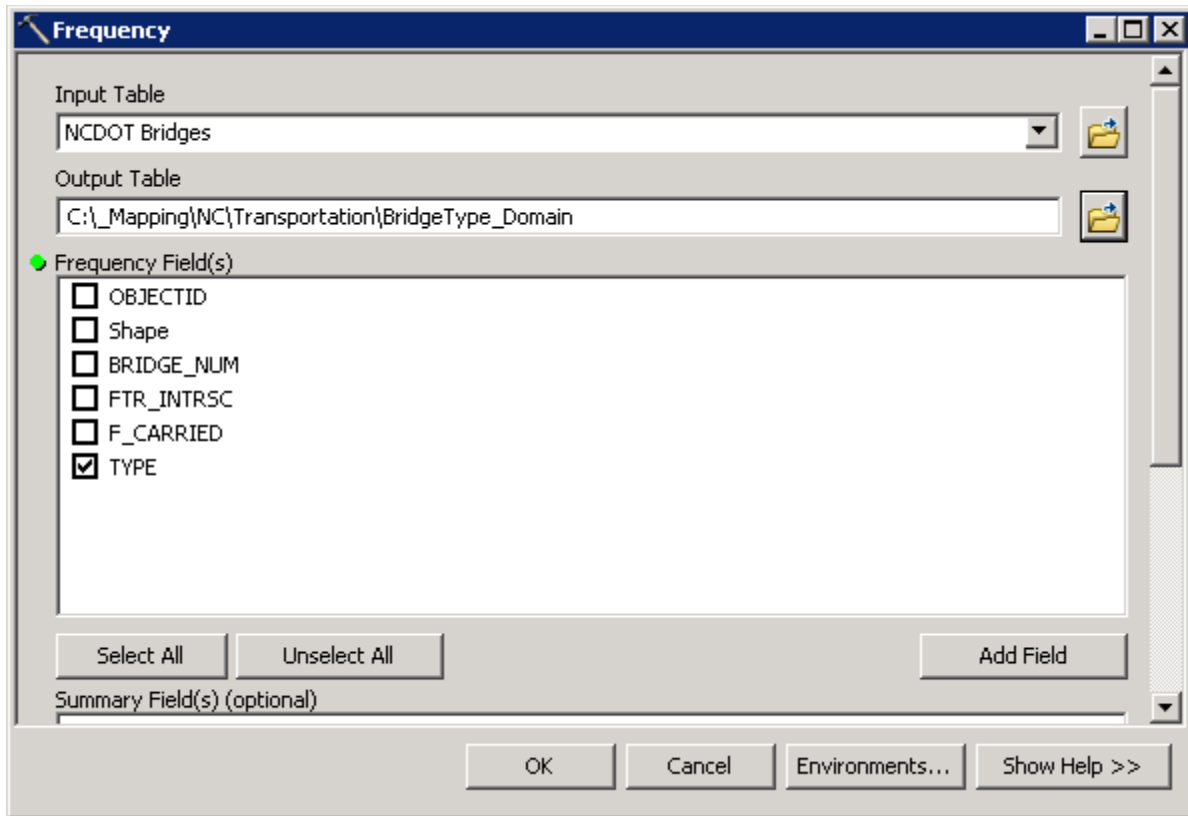
Map Data Integrity

We request all map data intended to be used in the review process to have geometries checked and passing without any warnings. If warnings are noted, the repair geometries tool could be used, or if necessary, features may need to be repaired manually. Warnings may result in inadequate review results, therefore when we receive map data, we will check geometries before publishing and using the new data. If any warnings are noted, we will request new map data for those data sets.

Packaging of Reference Layers for Publication by ERT

A consistently datestamped zip file should be produced which includes:

- Single file geodatabase (**VisualizationLayers_YYYY_MM.gdb**) containing all source data (layers & domain tables) with datestamps (e.g. **NCDOT_Bridges_2016_01**) in **WGS_1984_Web_Mercator_Auxiliary_Sphere** projection
- Map MXD document
  - o Use relative path names (*File* menu, *Map Document Properties, Pathnames*: **Store relative pathnames to data sources**)

- Layer file
- Readme.txt, including:
  - Indication of whether the service can be made publically available or is restricted to certain groups of users
  - Contact information for any questions on file contents
  - Notes as relevant

Appendix I: Create File Geodatabase

The following instructions cover creating a file geodatabase in general, and apply to both the reference and spatial analysis layers.

Create File Geodatabase

1. In ArcCatalog*, right click on folder in which to create the file geodatabase

2. Choose **New**

3. **File Geodatabase**

4. Name the geodatabase with a datestamp (e.g., YYYY_MM):

   - Layers to be displayed in the map: e.g., **VisualizationLayers_2016_01.gdb**

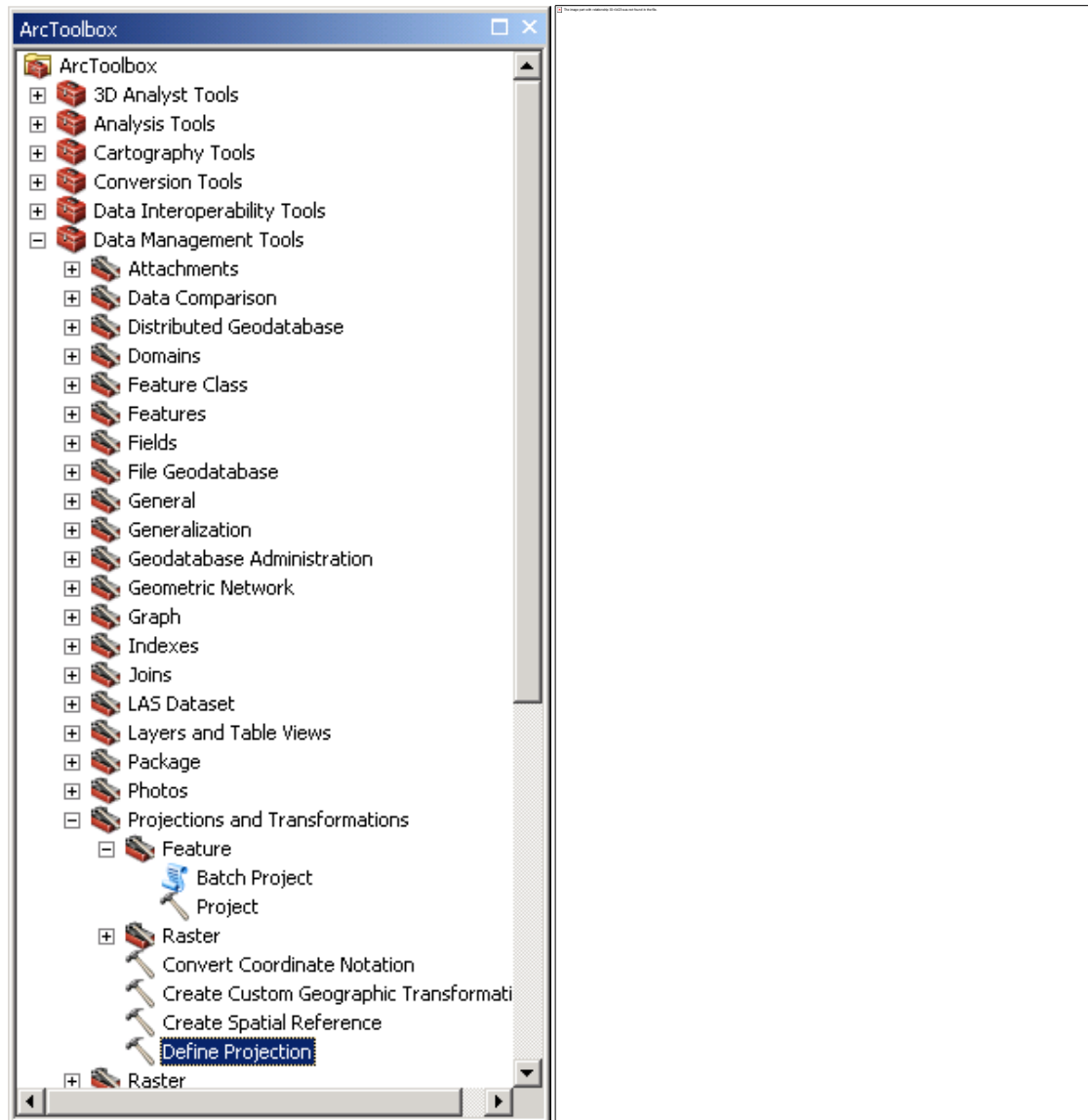   - Spatial analysis layers: **SpatialCalculations_2016_01.gdb**
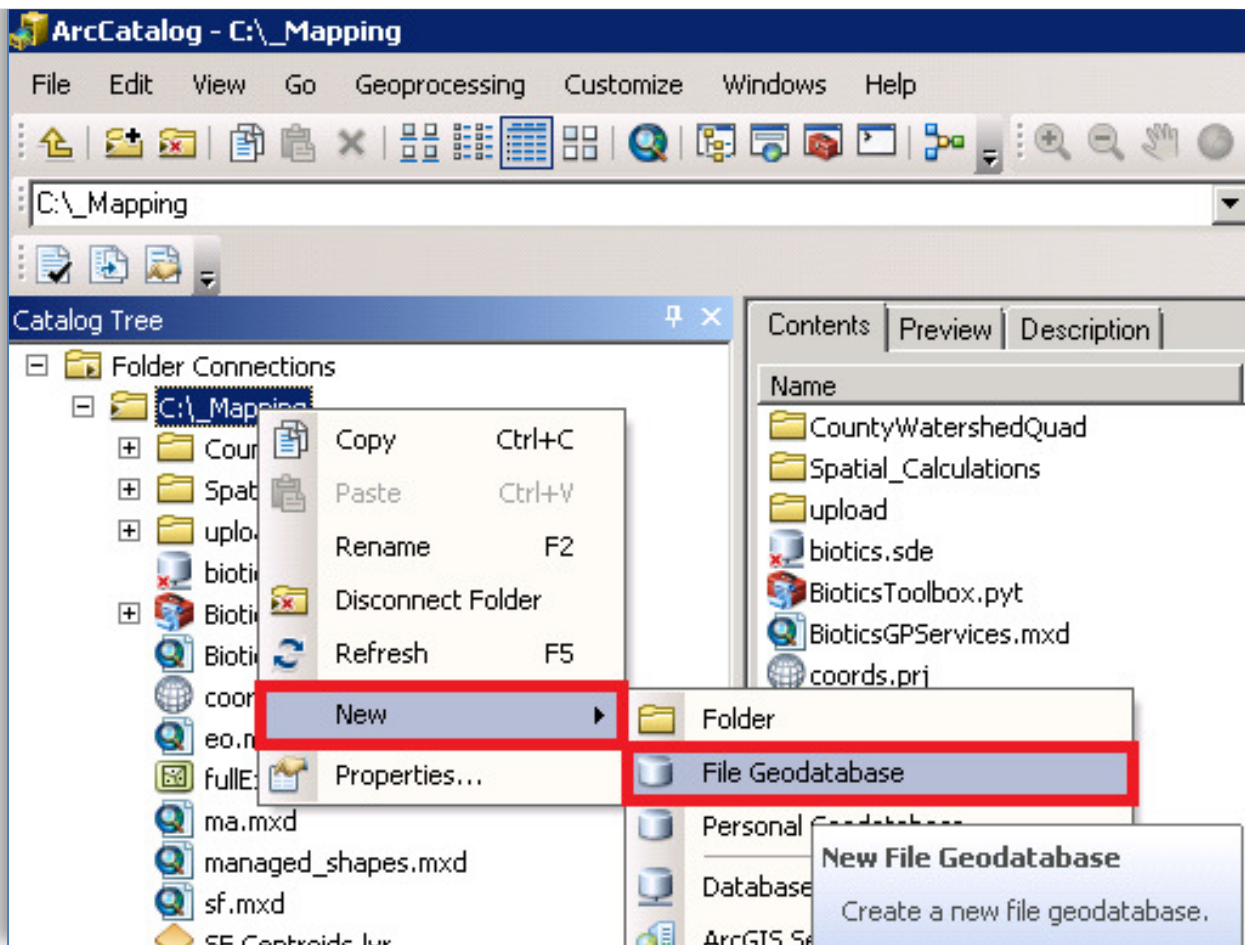
Verify Projection of Shapefile

1. In ArcCatalog, right click on shapefile

2. Choose **Properties**

3. Navigate to **XY Coordinates System** tab

4. Verify correct projection (for reference layers: WGS 1984 Web Mercator (auxiliary sphere) (WKID = 3857); for spatial analysis layers: your state projection).
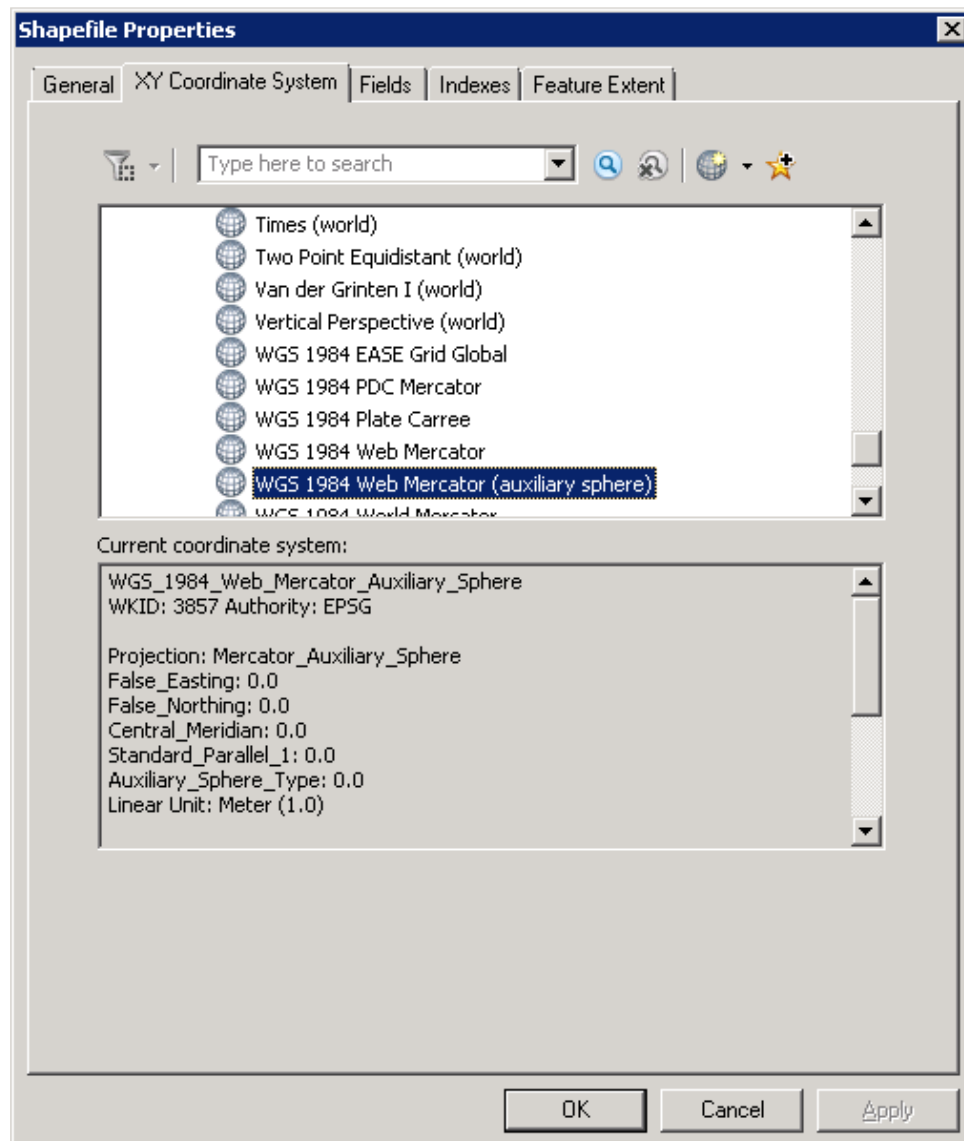
Project, if necessary

1. In ArcCatalog, open the ArcToolbox

2. Navigate to **Data Management Tools**, **Projections and Transformations**

3. If no projection has been defined, double-click **Define Projection**

4. If the shapefile needs to be reprojected, the **Project** & **Batch Project** tools are found within the **Feature** subfolder

Import into Geodatabase

1. In ArcCatalog, right-click on the appropriate geodatabase file (**VisualizationLayers_YYYY_MM.gdb** or **SpatialCalculations_YYYY_MM.gdb**) file

2. Datestamp ALL datasets (feature layers, tables, etc.) included (e.g., ER_Layer_2016_01)

3. Choose **Import**

4. **Feature Class (multiple)**

5. If the shapefile needs to be reprojected, the **Project** & **Batch Project** tools are found within the **Feature** subfolder
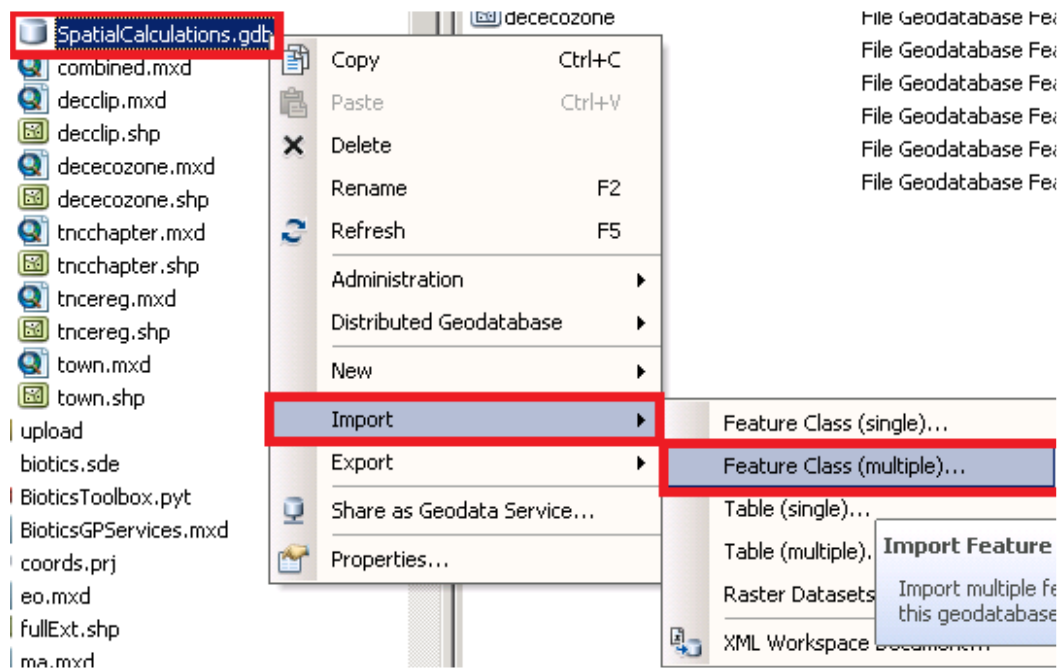
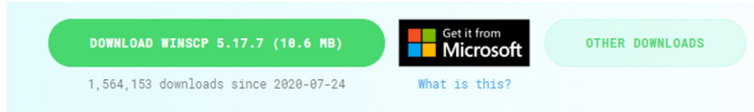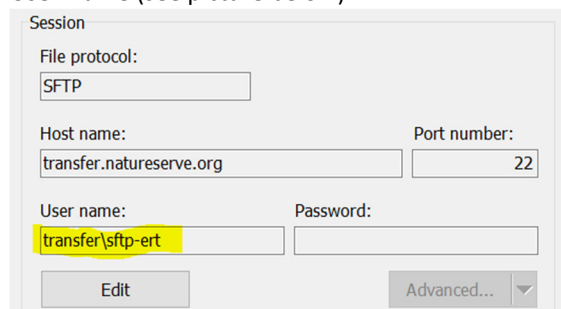# Appendix II: Instructions for uploading data to NatureServe's transfer site

SFTP (**S**ecure **F**ile **T**ransfer **P**rotocol) works over the Secure Shell (SSH) data stream to establish a secure connection and provide organizations with a higher level of file transfer protection. This is because SFTP uses encryption algorithms to securely move data to your server and keep files unreadable during the process, and authentication prevents unauthorized file access during the operation.

1. You need to download and install a Client, we recommend WINSCP which can be downloaded here: https://winscp.net/eng/download.php

   DOWNLOAD WINSCP 5.17.7 (10.6 MB)   Get it from Microsoft   OTHER DOWNLOADS
   1,564,153 downloads since 2020-07-24   What is this?
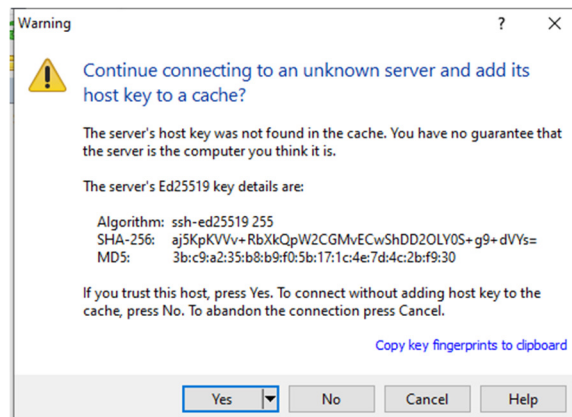
2. Once installed we connect using these settings
   a. File Protocol: SFTP
   b. Host Name: transfer.natureserve.org
   c. Port Number: 22
   d. User Name (see picture below)

   Session
   File protocol:
   SFTP
   Host name: Port number:
   transfer.natureserve.org   22
   User name: Password:
   transfer\sftp-ert
   Edit   Advanced...
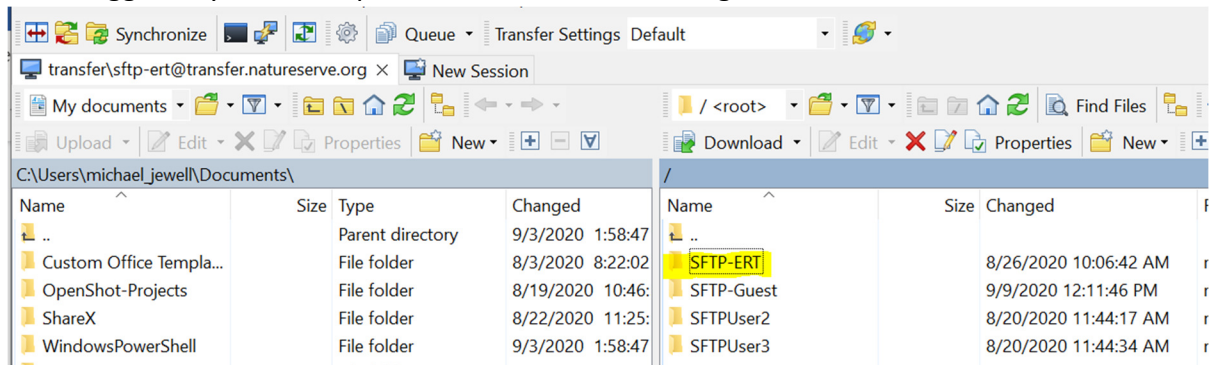
   e. Password: ert@NatureServ3

   f. And, Log in
   Note: you will be prompted with a warning the first time and you will choose "Yes" to establish a trust between the server and you

   Warning   ?   ×
   Continue connecting to an unknown server and add its host key to a cache?

   The server's host key was not found in the cache. You have no guarantee that the server is the computer you think it is.

   The server's Ed25519 key details are:

   Algorithm: ssh-ed25519 255
   SHA-256:   aj5KpKVVv+RbXkQpW2CGMvECwShDD2OLY0S+g9+dVYs=
   MD5:   3b:c9:a2:35:b8:b9:f0:5b:17:1c:4e:7d:4c:2b:f9:30

   If you trust this host, press Yes. To connect without adding host key to the cache, press No. To abandon the connection press Cancel.

   Copy key fingerprints to clipboard

   Yes   No   Cancel   Help

3. Once logged in you will be presented with the following screen

   a. The window on the left is "your" computer, on the right is our server
   b. Open the SFTP-ERT folder on the right
   c. Locate the file you wish to send us on "your" computer,
      And drag it(across) into the SFTP-ERT Folder (or subfolder as directed)

4. [X] out/ close the window when complete, and confirm you wish to terminate the session.
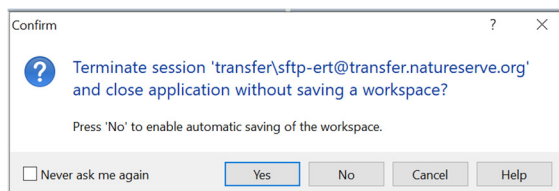
   You can choose to save the session/workspace if you will be using this service again

NatureServe Staff will have access these files from inside the network via file-share, or can download them from this site by dragging files from Right-to-Left on WNSCP
File Share: \\transfer\SFTP-Uploads\SFTP-ERT (\subfolder)