2021

Create Basemaps For Offline Use: (TPKs and GeoTiffs)

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About Basemaps

Basemaps can be used to display reference information in the S1 Mobile Mapper application. The S1 Mobile app allows users to download or sideload via usb cable; esri or user created basemaps for offline use. Each basemap can be used in S1 as a "basemap", or "additional basemap" that sits on top of the basemap. This strategy allows users to use transparency settings when creating basemaps to allow a layered approach to display reference information needed while collecting field data or navigating in an offline environment.

S1 supported basemap file formats include; multi-scale tile packages .tpk, (tpkx; a newer compressed tile package format), Vector Tile Package (.vtpk - **ArcPro only**), Mobile Map Package file (.mmpk **- ArcPro only**), or geo-referenced GeoTIFF image file. Basemaps can be shared to ArcGIS Online (AGOL) and downloaded to mobile devices connected to WiFi or a cellular network or connected to a PC and side-loaded to the mobile device.

> **NOTE:** For ArcGIS Pro users, S1 Mobile now supports **Vector Tile Packages (.vtpk)**. There are several advantages to using .vtpk files, such as smaller file size and better resolution for devices with high dpi**.** This file type is optimized for vector data. Share them the same way you would a TPK file, as basemaps. This documents does not cover how to create them in ArcPro though.

Assumptions:

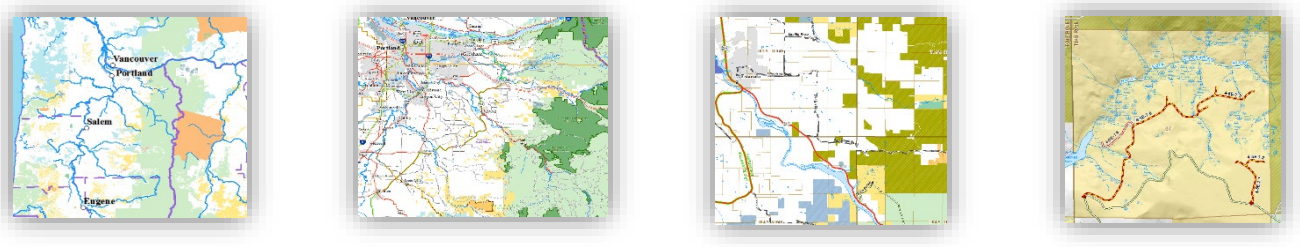
- Access to ArcGIS 10.2 or later (this tutorial was made using ArcMap v10.7.1).

About Tile Packages (.tpk) in ArcMap

Tile packages are a bundle of pre-rendered image tiles, generated for a specific area based on a user defined tiling scheme at multiple scales. The tiles are zipped into a single .**tpk** file to facilitate sharing. Unlike a paper map or a single digital image file, which presents a map at a single scale, a tile package can present reference information at multiple scales and resolutions.

You may need to do extra design work on your map document to set up scale dependencies and symbol sizes at differing scale levels to get the most out of the .tpk file format.

Below is an example of a tile package presented at different scales to demonstrate the use of scale dependencies. Showing how adding more detailed information as you zoom in and setting label size and symbol size appropriately will give a much more refined map product



How to create a tile package (tpk)

A tile package (.tpk) can take a considerable amount of time and resources to create, therefore it is important to fine-tune the map document (.mxd) prior to publishing the tpk file. Once the tile package is created, it can be used to quickly render lightweight image files to applications.

Step 1: Preparing the Map Document (.mxd)

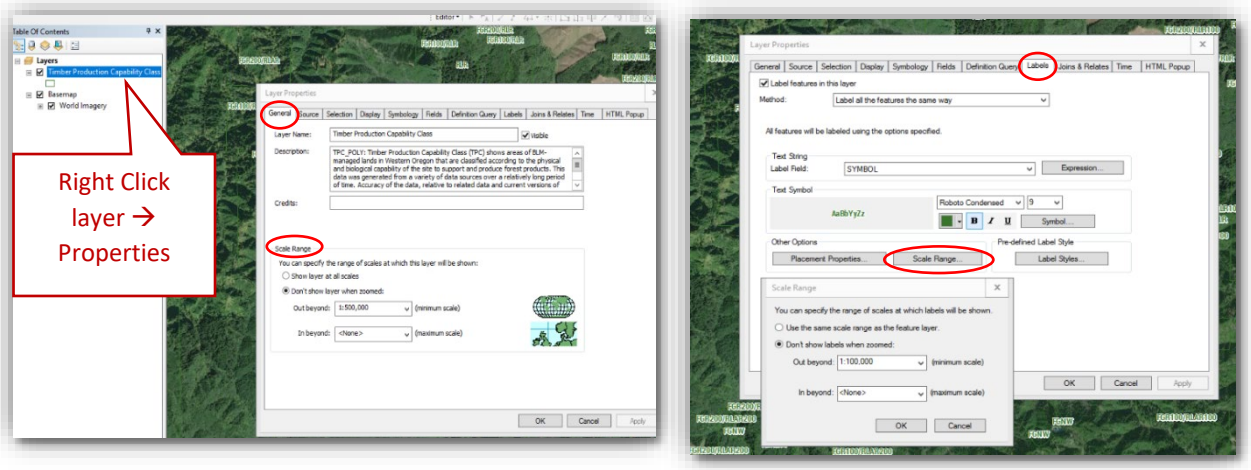
a. It is recommended that you start using a New Map Document, rather than an existing one.

b. Add all the needed layers to the map.

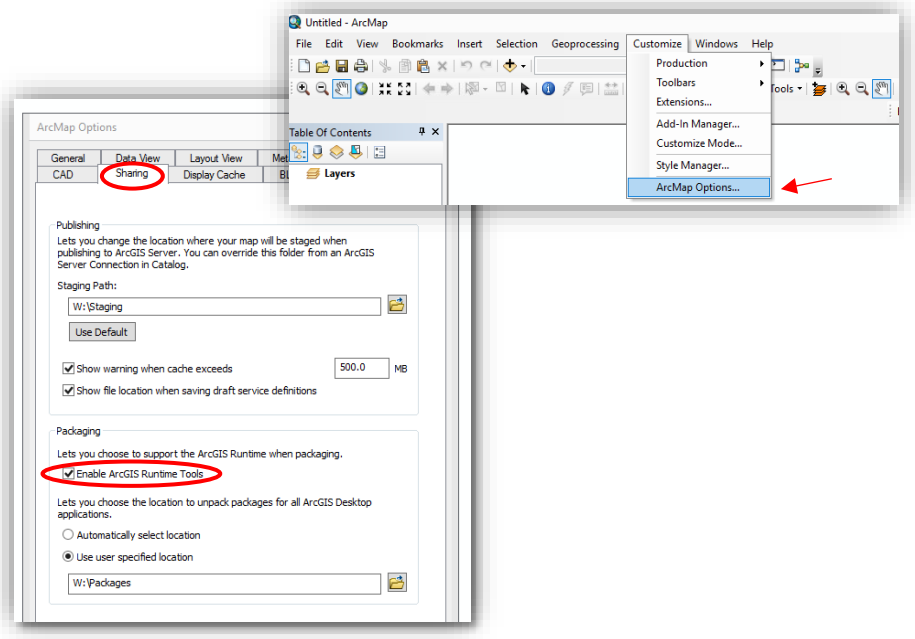
c. **Set the minimum and maximum Scales Range for <u>each layer</u> and label visibility under Layer Properties. For example**, small roads may not be visible Out beyond: 1:150,000 minimum scale and IN beyond: <None> Maximum scale and labels can be "Use the same scale range as the feature layer". Some Highway symbols show scale Up to 1:249,000, then another set of symbols for highways show scale at 1:250,000 and above.

d. **To set scale ranges** → right click the layer → click properties → General tab for layer scale and Label tab for the label scale setup.

Display layers at certain scales
https://pro.arcgis.com/en/pro-app/latest/help/mapping/layer-properties/display-layers-at-certain-scales.htm



e. **ArcGIS Runtime Tools must be enabled before creating a TPK**. Click Customize →ArcMap Option → Click the Sharing tab → check the box to Enable ArcGIS Runtime Tools, then click OK.



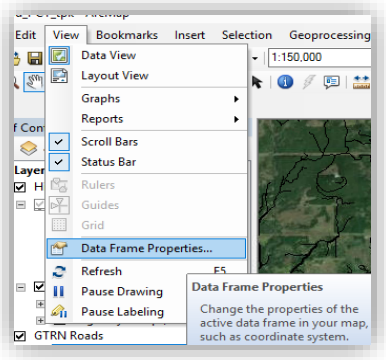
Step 2: Set the Data frame Coordinate System and Datum Transformation

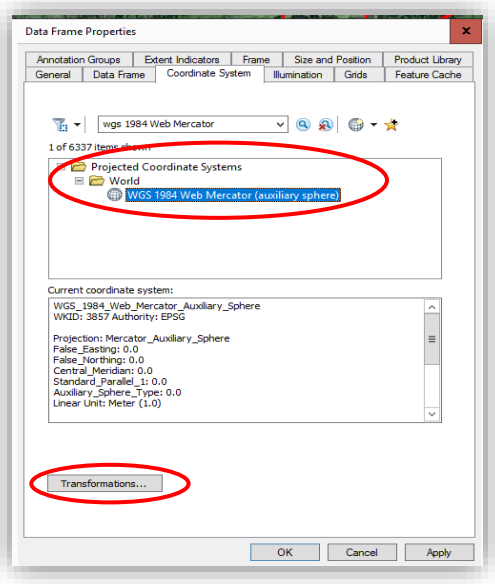
a. Select **View → Data Frame Properties → Coordinate System tab.**

b. In the search bar type: **WGS 1984 Web Mercator** and hit Enter or the search icon.

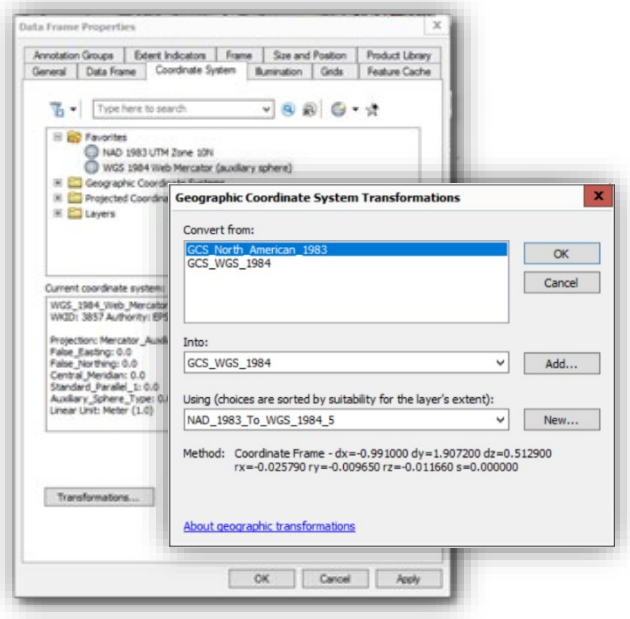
c. Select **WGS 1984 Web Mercator (auxiliary sphere).**

d. Click **Transformations button.**





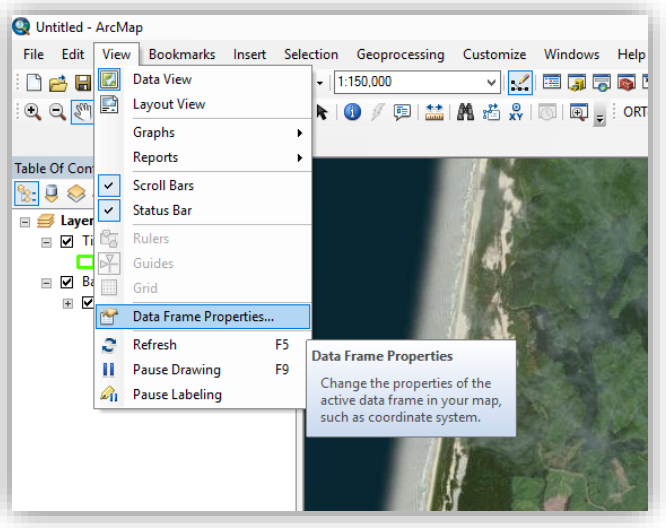
e. **Set applicable transformation**. In screenshot below, data is **Converting from** GCS_North_American_1983 → **Into** GCS_WGS_1984 transformation, **Using:** NAD_1983_To_WGS_1984_5 → (**NOTE**: transformations may be different where you are) then **Click OK** to close the transformations window and **OK** to save changes and close Data Frame Properties menu. This will take a few second to process.



Step 3: Set Full Extent Command and Clip to Shape

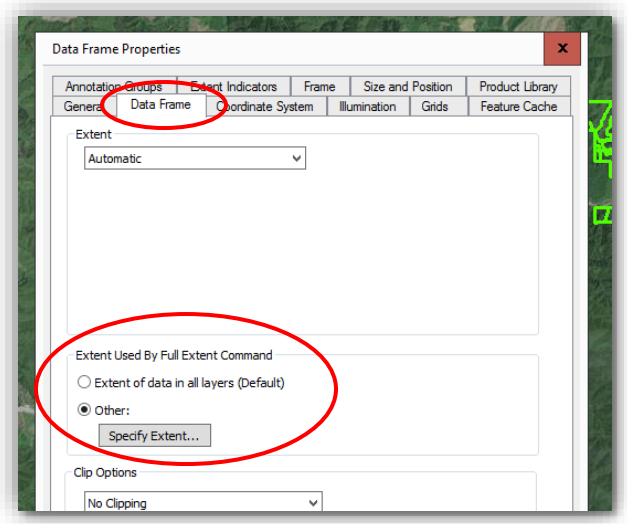
a. **Zoom and pan map to the maximum extent** (project area) **desired** in the output tile package. The larger the extent, the larger the output file. If a large extent is needed, consider making multiple TPKs to reduce the file size.

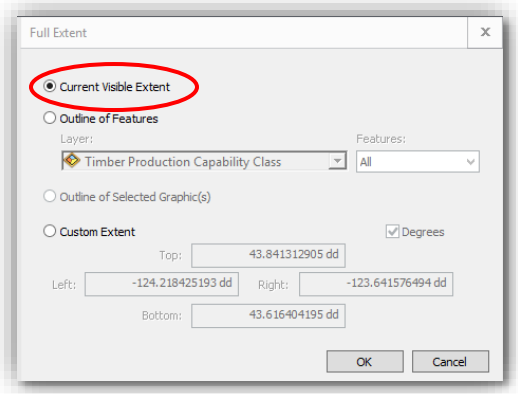
b. Select **View** → Data Frame Properties → Data Frame Tab.



c. In the **Extent Used by Full Extent Command**, click the **Specify Extent button.**

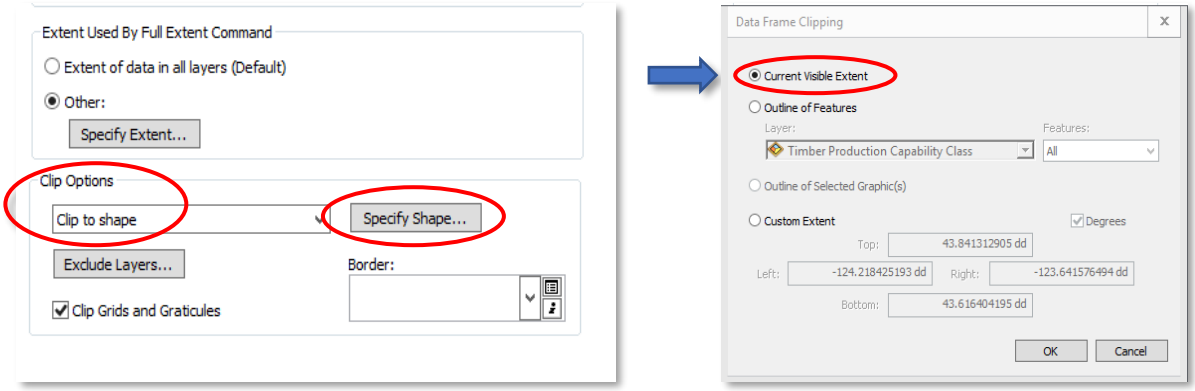
d. Select **Current Visible Extent** and click OK **(do not close the main Data Frame Properties).**



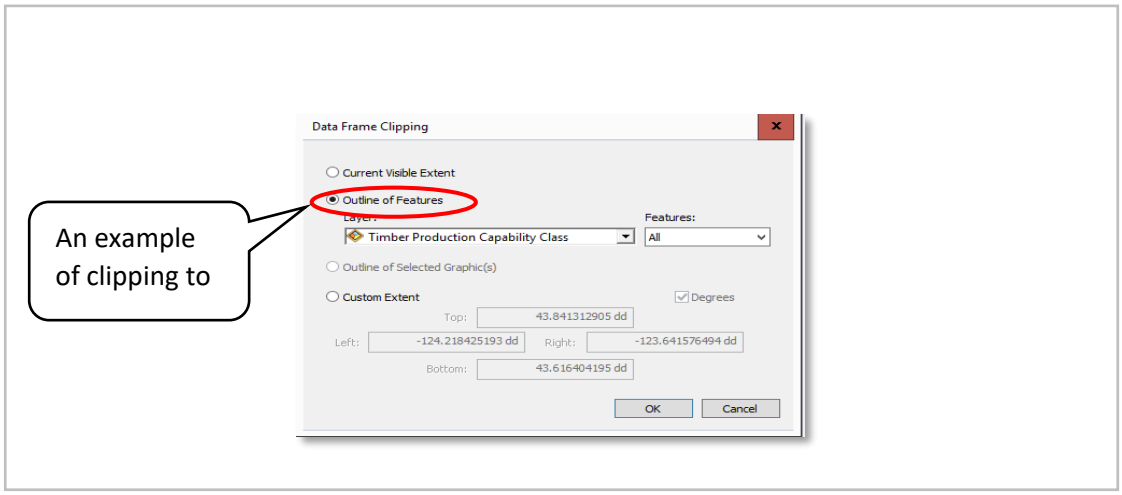


e. Back on the Data Frame Properties → Data Frame tab → under the Clip Options → choose Clip to Shape → then click Specify Shape.

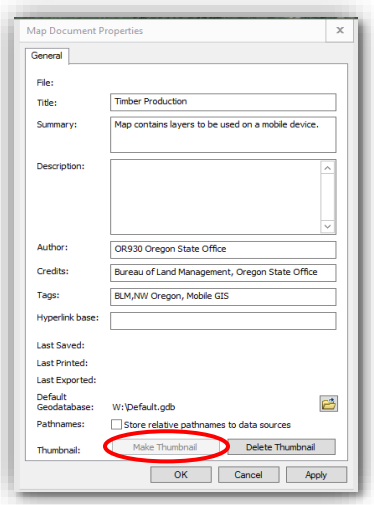
f. Choose **Current Visible Extent** to clip to the current view, and then click OK→ then OK to close.



Note: Alternatively, if you wanted to clip to a specific area (ex: District or Forest boundary), rather than Current Visible Extent, specify **Outline of Features.** Then choose the Layer and specify which features in the layer (set a definition quesrry on the).



Step 4: Set Map Document Properties



a. Select **File → Map Document Properties.**

b. Fill in the **Summary, Description, Author, Credits, and Tags** sections.

c. Click **Make Thumbnail** and then **OK.**

d. Then select File again → **Save,** to save the map document.

Step 5: Create Tile Package

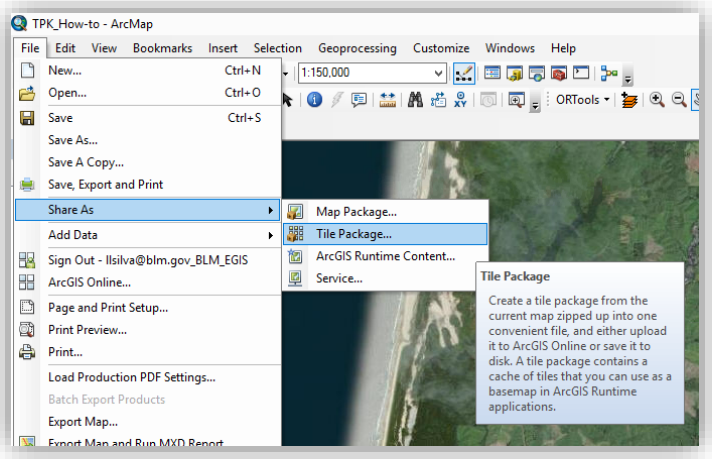
There are two ways you can create and share a tile package from ArcMap.

- From the file menu method, described below.

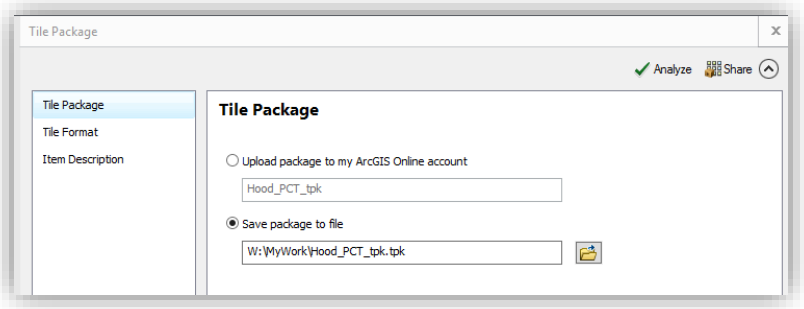
- Or, a second option, especially if you have trouble with publishing from the file menu option is to use the "Create map tile package" tool in the data management ArcMap toolbox. This option gives a little more control over the setup of the tile package and also allows you to select the .tpkx file format as an output option. Which is a compressed format that outputs smaller file sizes for the same extent and tiling scheme (The toobox method is not in this tutorial, but may be added later)

For additional information on tile packages for ArcGIS 10.7, see this ESRI help article here: https://desktop.arcgis.com/en/arcmap/10.7/map/working-with-arcmap/about-tile-packages.htm

a. Select **File → Share As → Tile Package…**



b. Select the **Tile Package** tab, then specify the location on the network (If you plan to sideload file to mobile device) or upload package to AGOL account (if users will download to mobile device from an AGOL group.

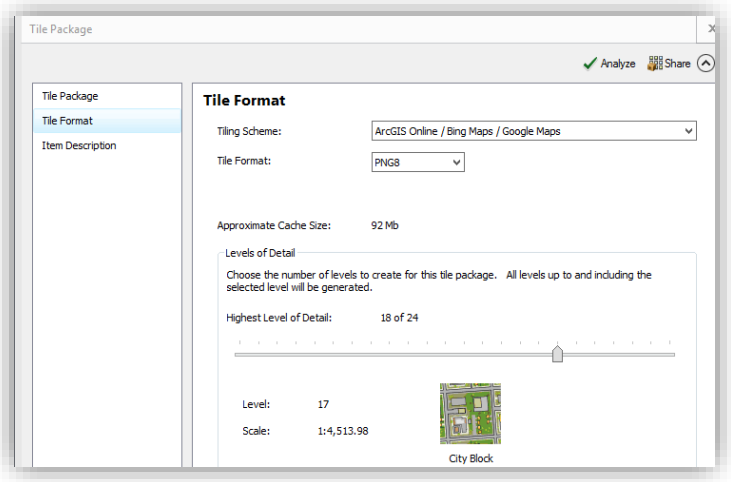


c. Next, select the **Tile Format** tab. Then **set the Tiling Scheme** to ArcGIS Online/Bing Maps/ Google Maps.

d. **Set the Tiling Format** to PNG8.

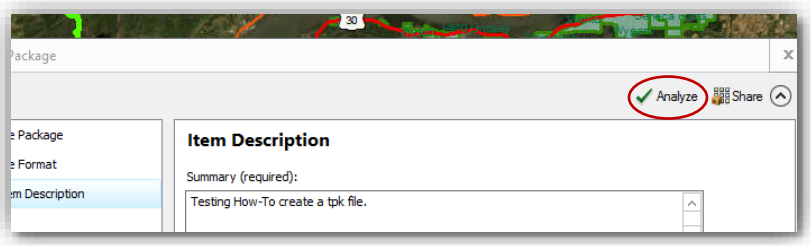
e. **Set Level of Detail** by moving the slider bar. The greater level of detail, the larger the tile package size and the longer it will take to generate the package. It is recommended that a package be no more than 1gb in size if uploading and sharing via AGOL. Though larger files are allowed, larger

files impact download times. Saving the file locally and sideloading to the mobile device is a better option for large files.



f. Select the **Item Description** tab→ Populate any fields missing required information in the form.

g. After filling in the Item Description fields→ Click **Analyze** on the top right side.



h. A table will appear displaying any Errors or Warnings about your map document.

i. Fix all Errors  before proceeding. Most errors can be corrected automatically by double clicking on the Error Icon. Then click Analyze again to see if the error was corrected.

***Pro tip**; Large extents with high level tiling schemes can take a long time to create. Set a small map extent area once you think you have your map set up with scale dependencies and symbol sizes etc. Then share this small area initially to verify the output file symbology and scale dependencies turn out as you expected. Once this is verified, go ahead and set the real extent that you want to export the basemap at and share again.*

j. After all red errors are corrected, **click** 

on the top right, to create the tile package. Depending on the level of detail you chose, this tool will run for several minutes to several hours to complete.

Creating a GeoTiff - Geo-referenced Image File

Unlike tile packages, which present a map at multiple scales, a GeoTIFF is a single image at a single map scale. These are very quick and easy to generate and share, however, they may not be appropriate for viewing on the mobile device at all map scales (blurry upon zooming in or too cluttered when zoomed out). Not recommended for geographic areas larger than a section or two

Create Basemaps For Offline Use: TPKs and GeoTiffs

Due to certain limitations, **GeoTIFF files cannot be added directly to a web map or applications**. But can be added to ArcGIS Online (AGOL) as a shared download only.

Step 1: Open a New Blank Map Document

a. When preparing the Map Document**,** it is recommended that you **start with a New Map Document**, rather than an existing one. Add only the layers needed to create this image.

b. Open ArcMap → Select Blank Map → Click OK.

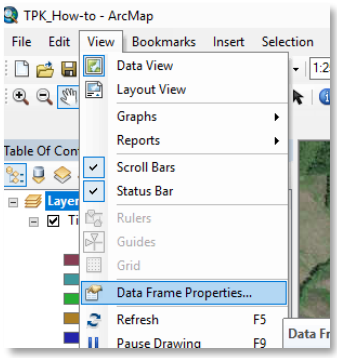
c. Name and Save the New Map Document.

Step 2: Set Data Frame Coordinate System and Datum Transformation

Note: A Map Document's Data Frame properties must include:

- Set the **Coordinate System** to **WGS 1984 Web Mercator (auxiliary sphere)**.
- Apply a datum **Transformation** if map contains data using another Coordinate Source (ex. NAD83 data).
- Set the **Frame Background** color to **No Color**.

a. Select **View → Data Frame Properties → Coordinate System** tab**.**

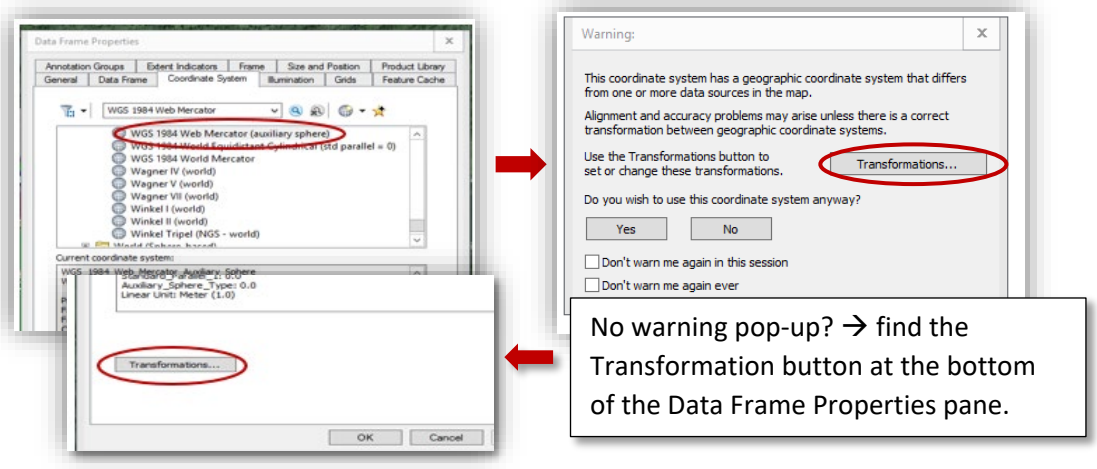


b. In the **Search bar → type: WGS 1984 Web Mercator** and click Enter **or** click the search icon .

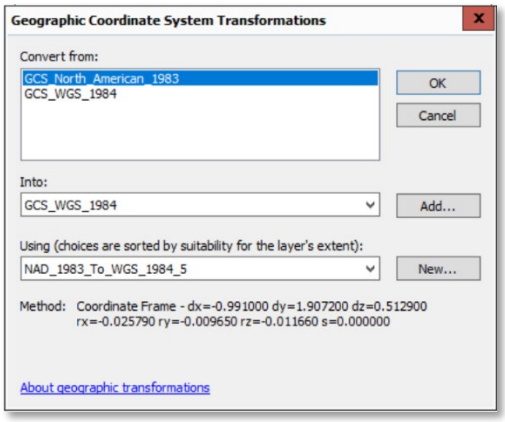
c. Select **WGS 1984 Web Mercator (auxiliary sphere)** → Click **Apply** (**do not click OK, yet**).

d. You may get a **Warning pop-up** →If so, click the **Transformation button** on that pop-up.

e. (If you **do not** get a Warning pop-up, you will still be on the Data Frame Properties pane → click on the **Transformation button** below).



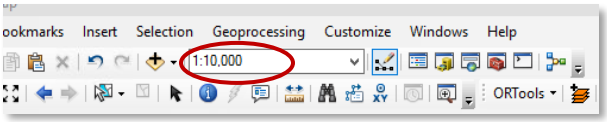
f. **Set applicable transformation.** After clicking the **Transformation button → Convert from:** GCS North America 1983 → **Into:** GCS WGS 1984 → Select → **Using:** NAD_1983_To_WGS_1984_5



g. **Click OK** to close the transformations window and **OK** to save changes and close Data Frame Properties menu.

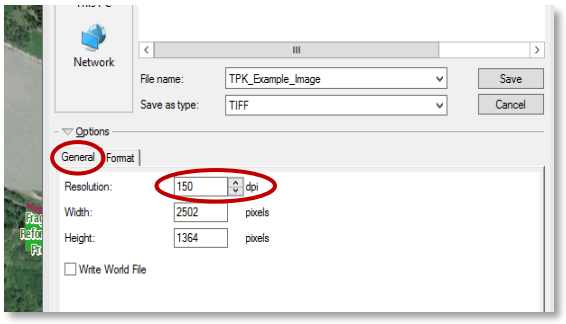
Step 3: Set Export Extent & Export Image

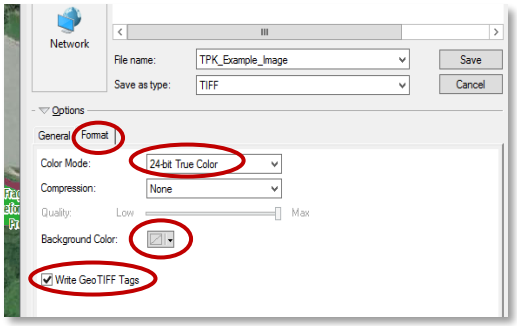
a. **Zoom or pan map to the desired extent to be included in export.** Do not have a map scale greater than 1:500,000 when exporting geo-referenced maps. In fact, it is recommended to have a map scale of 1:100,000 or better (1:50,000, 1:24,000, 1:10,000) to achieve a readable image file.



b. **Export Map document**. Select **File → Export Map.**

c. On the **General** tab, set the **Resolution** = 250 dpi

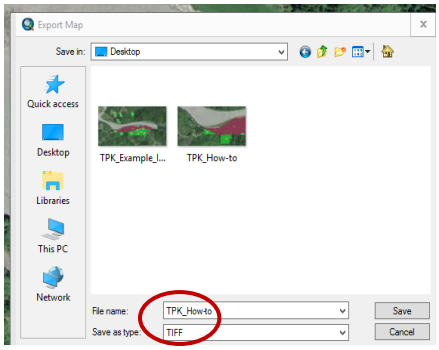




d. On the **Format** tab, set the Color Mode to **24-bit True Color**, Compression to **None**, Background Color to **No Color**, and check the box next to **Write GeoTIFF Tags.**

e. Give the output file a name → Set the **Save as Type** → **TIFF** or **Layout GeoTiff**

f. Select where to save your Image file from the upper window, then click **Save** to export the current map view to a geo-referenced map.



Upload & Share Basemaps to ARCGIS ONLINE FOR ORGANIZATIONS

If you created a local copy of a basemap and decide you want to share it to AGOL this section describes how to do that. To share a package to ArcGIS online, your Esri Account needs to have a minimum role of "Contributor" in the BLM org, and all Forest Service accounts should work. S1 Supported tile package file types include: Tile Package (.tpk or .tpkx; a newer compressed tile package), Vector Tile Package (.vtpk - ArcPro only), Map Package (.mmpk - ArcPro only), or a geo-referenced GeoTIFF image file.

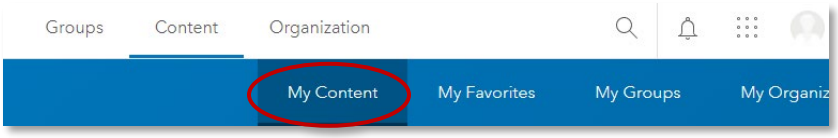
Step 1: Log into your ArcGIS Online (AGOL) for Organization account.

a. Login in to AGOL by going to:
BLM: https://blm-egis.maps.arcgis.com/home/content.html
FS: https://usfs.maps.arcgis.com/home/index.html

b. Then → **Sign in**.

c. Click **Content** at the top of web page.

d. Then click the **My Content** selection.



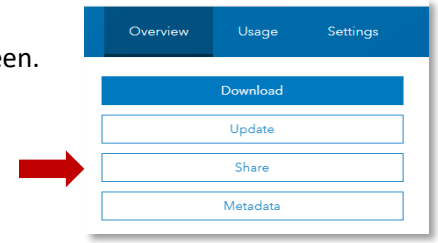
e. Click **New Item** → then **Drag and drop** your file in the window or select a file from **Your device** to add your geo-referenced image (TIFF) or tile package (.tpk) to the ArcGIS Online for Organizations.

f. Enter at least one **Tag** to identify your layer and a **summary** → Then click **Save**.

Step 2: Share Content

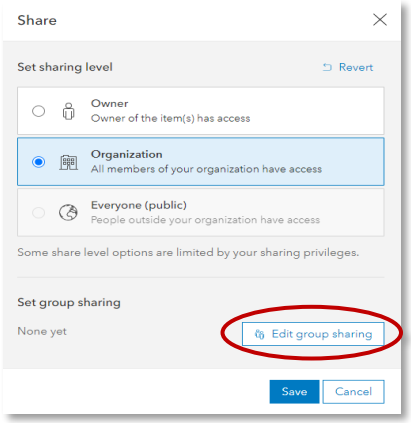
a. In AGOL, go to **My Content**, click on the name of your geo-referenced image (TIFF) or tile package (.tpk) to see its information.

b. Then click the **Share** button on the content properties screen.

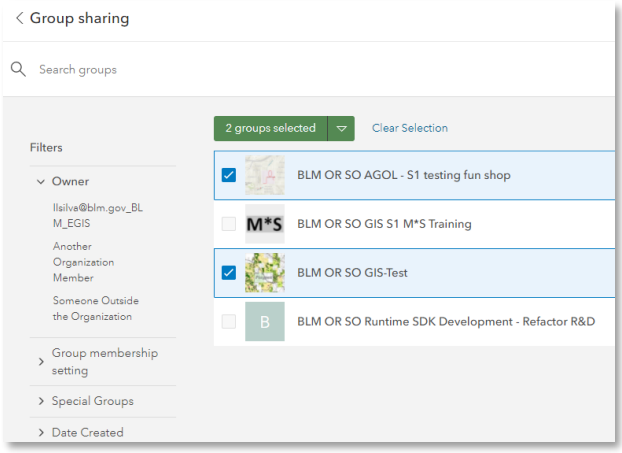


c. Select to be the owner, where only you see the data or choose the Group(s) you wish to share this layer with.

d. If you are choosing to share with groups in your organization → then select **Organization** for the sharing level → then click the **Edit group sharing button** to select which groups you want to share it with.



e. After selecting the **groups** in your **organization** that you want to share the data with, → Click OK and Save.



f. **Now when using the S1 Mobile Mapper application, users belonging to the Group will be able to see and download the** geo-referenced image (TIFF) or any of the supported tile package formats as a basemap.
When launching S1→ go to Download Data → Map Data → select a Group → select 'your new basemap'.