WMS 11.2 Tutorial

Images

Import images in a variety of formats and register the images to a coordinate projection

Objectives

Import various types of image files from different sources. Learn how to work with online maps in the WMS interface. Register the images to a real-world projection and save an image world file.

Prerequisite Tutorials

- None

Required Components

- Data
- Map

Time

- 15–30 minutes

1 Introduction

Images are an important part of most projects developed using WMS. An image is composed of pixels. The size and number of pixels in an image determines the level of detail visible in the image.

WMS uses images to derive data such as roads, streams, confluences, land use, and soils, as well as to provide a base map—or backdrop—to a watershed. Images must be georeferenced in order to be useful in WMS. Georeferencing an image defines appropriate *x* and *y* coordinates so that distances and areas computed from the image will be accurate.

Because images are commonly used in Geographic Information System (GIS) programs and modeling systems like WMS, data developers often store the georeferencing information as either part of the image file (a GeoTIFF file for example), or in a separate file commonly referred to as a "world" file.

This tutorial gives an overview of the primary ways to import and georeference (or register) images in WMS. Using GeoTIFF files, online images, and world files will be discussed and demonstrated. Image resolution and registering scanned images will also be discussed and demonstrated.

1.1 Getting Started

To reset the data, display options, and other WMS settings to their defaults, do the following:

1. If necessary, launch WMS.
2. If WMS is already running, Press *Ctrl*-*N*, or select *File* | **New…** to ensure that the program settings are restored to their default state.
3. A dialog may appear asking to save changes. Click **Don't Save** to clear all data.

The graphics window of WMS should refresh to show an empty space.

2 GeoTIFF Files

GeoTIFF image files include georeferencing information. This means it is not necessary to specify coordinates when images are read in because it is done automatically. Multiple images can be tiled together and shown as a single image.

2.1 Tiling Images

1. Select *File* **| Open…** to bring up the *Open* dialog.
2. Browse to the *images\images* directory and select "redridge.TIF".
3. Click **Open** to import the image and exit the *Open* dialog.

The image will appear in the Main Graphics Window and "redridge.TIF" will appear under the "GIS Data" folder in the Project Explorer.

4. Click **Open** to bring up the *Open* dialog.
5. Select "josephspeak.TIF" and click **Open** to import the image and exit the *Open* dialog.

A new map should appear adjacent to the "redridge.TIF" image in the Graphics Window. Notice that the adjacent images are georeferenced. This can be determined by the latitude and longitude information to the right of the cursor coordinates below the Graphic Window.

3 Online Images

WMS has tools for loading various types of online images from the internet that are both high-quality and seamless (they do not contain collars). Online images require an internet connection. This tool uses a web map service to download and view various types of images in the WMS Graphics Window. These images are pre-registered to the display projection (or if no data exists, the projection is set to the image's native projection) and more than one online image can be imported at a time.

The advantages of online images are that they are seamless, data is available throughout the world, and that they can be reprojected to the display projection without needing to georeference the image. The disadvantage of online images is that the image can take longer to refresh when zooming or panning the display in the Graphics Window.

3.1 Getting Online Images

1. Click **Get Online Maps** at the top of the WMS window to bring up the *Get Online Maps* dialog (Figure 1).
2. While pressing *Ctrl,* select *World Imagery* and *USA Topo Map* (scroll to the right to locate this one).
3. Click **OK** to close the *Get Online Maps* dialog and load the *World Imagery* and *USA Topo Maps* online maps into WMS.

The process of loading the maps may take a few minutes.

Figure 1 Get Online Maps dialog

Notice that the online images are imported and displayed based on the current screen coordinates. Two new layers, "World Imagery" and "USA Topo Map" were created in the Project Explorer under the "GIS Data" folder.

4. Turn off "World Imagery" under the "GIS Data" folder in the Project Explorer. Images can be turned on and off by unchecking the box next to the image in the Project Explorer.

5. **Zoom** into various areas of the USA Topo Maps image and compare it with the topographic map image imported earlier in this tutorial.

Notice that the display of the online images takes time to update when panning or zooming in and out. The display takes time to update because WMS downloads an updated image from the internet every time zooming in or framing the image. While the image is downloading, it is possible to continue to work, but some or all of the current view of the image may not be shown until the image is downloaded.

6. **Frame** the project.

This centers and redraws all the data in the graphics window so that all currently visible objects fit and can be seen at once.

7. Turn on "World Imagery" in the Project Explorer.

3.2 Exporting Images

Online images can be exported as static image files to the computer so the display updates faster.

1. Right-click on "World Imagery" in the Project Explorer and select **Export…** to bring up the *Resample and Export Raster* dialog.
2. Enter "2.0" as the *Resampling ratio*.
3. Turn on *Add to project after saving.*

4. Click **OK** to export the raster, close the *Resample and Export Raster* dialog, and bring up the *Save As* dialog.
5. Select the desired destination folder.

It is recommended to save related files (those from a specific project) in the same location. This ensures that needed files are easily found.

6. Select "GeoTIFF Files (*.tif)" from the *Save as type* drop-down.
7. Enter "Sample_exported_raster_world.tif" as the *File name* and click **Save** to save the file and close the *Save As* dialog.

It may take a few minutes for WMS to download the higher-resolution image.

8. Repeat steps 1–7 for the *USA Topo Maps* online image, entering "Sample_exported_raster_usatopo.tif" as the file name.

After the images have been downloaded, they will automatically open in the graphics window and in the Project Explorer under "GIS Data".

9. Turn off both "USA Topo Maps" and "World Imagery" in the Project Explorer.
10. **Zoom** in to various sections of the new images, and compare the images with the topographic maps that were opened earlier in this tutorial.

4 World Files

Many image files do not contain georeferencing information. For example, JPEG files do not have georeferencing tags in the file like GeoTIFF images have. Most organizations that make images available also distribute world files containing the georeferencing information along with the image files. These world files usually have the same name as the corresponding TIFF or JPEG file, but with the extension ".tfw" for TIFF files and ".jgw" or ".jpgw" for JPEG files. If downloading a world file and asked to supply a name for it, follow this naming convention. Use the following procedure to open a JPEG file and its corresponding georeferencing information in WMS:

1. Select *File* **| New** .
2. Click **Don't Save** if asked to save changes.
3. Click **Open** to bring up the *Open* dialog.
4. Select "richfield1.jpg" image file and click **Open** to import the image and exit the *Open* dialog.

Because there is a world file named "richfield1.jpgw" in the same folder as "richfield1.jpg", the image is automatically registered. If a world file for an image is not named with the TFW extension (or JGW or JPGW extensions), there is an option to import the world file from within the *Registration* dialog.

Properly georeferenced files overlap automatically, thereby avoiding tedious manual tiling of the images). It is not necessary to be exact in obtaining images and files from a source that distributes world files with images, as overlapping is not a problem.

5. Repeat steps 3–4 for "richfield2.jpg" and "richfield3.jpg".

Feel free to use **Zoom** and **Pan** and turn the different images on and off to explore how they can be viewed and used when overlapping.

Imagery can also be obtained using the **Get Data From Map** or the **Get Data Tool** tools in WMS.

5 Image Resolution

Images are usually available in different resolutions. In this part of the exercise, different topographic maps showing the same area at different resolutions will be opened.

1. Select *File* **| New**.
2. Click **Don't Save** if asked to save changes.
3. Select *File* **| Open…** to bring up the *Open* dialog.
4. Select "tm4m.jpg" and click **Open** to import the image and exit the *Open* dialog.
5. **Zoom** in on the image until the individual pixels of the image are visible.
6. Repeat steps 3–4 for "tm16m.jpg".
7. Select *Display* **|** *View* **| Previous View**, or use the **View Previous** tool, to switch back to the previous view.
8. In the Project Explorer, turn on and off "tm16m.jpg" to see the difference in resolution of the two images

Notice how much larger the individual pixels are in the "tm16m.jpg" image.

9. Repeat steps 3–4 for "tm32m.jpg".
10. Click **View Previous** to see the difference in resolution.

When zoomed in on the three images, as the map scale increased the map showed less detail. "tm4m.jpg" shows much more detail than either "tm16m.jpg" or "tm32m.jpg". Images are commonly available on a scale of 1:24000, 1:100000, or 1:250000. 1:24000 maps cover far less area than 1:100000 or 1:250000 maps, but they show much more detail (higher resolution). It would take thirty-two 1:24000 maps to cover the same area that is covered by one 1:100000 map.

If great detail is needed for a watershed, use the 1:24000 maps. If the watershed is very large, this size of map will provide too much detail. It would be difficult to see the big picture of the watershed, and a 1:100000 or 1:250000 scale map may be more appropriate in such a case.

6 Registering Scanned Images

It is not always possible to obtain a GeoTIFF image or an image with a world file. In such cases, register the image manually. The coordinates— in a projected or geographic system—of three points on the image must be known. Before scanning a paper image or downloading an image from the Internet, mark the three points in order to easily find them when registering the image in WMS.

Here, a part of a soils file is used as a "scanned image". This file will be used in a later tutorial to develop a soils coverage and to compute a composite curve number.

1. Click **New**.
2. Click **Don't Save** if asked to save changes.

3. Click **Open** to bring up the *Open* dialog.
4. Select “soils.tif” and click **Open** to exit the *Open* dialog and bring up the *Register Image* dialog (Figure 2).

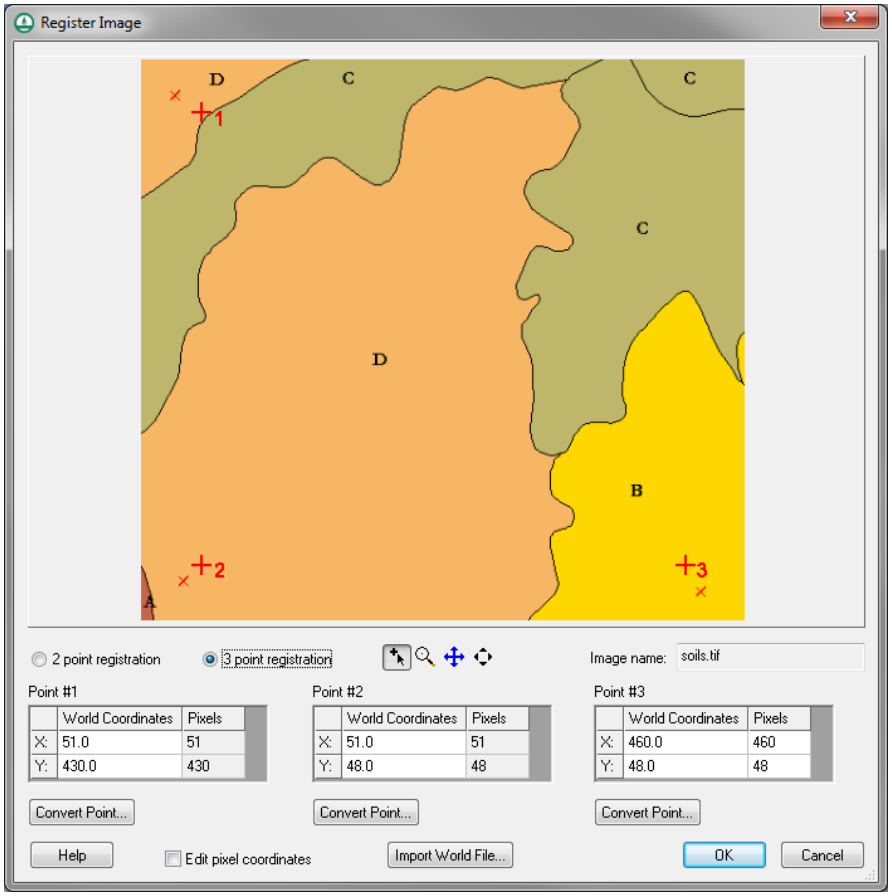

Figure 2 Register Image dialog

An image representing soil types will appear in the *Register Image* dialog. Three small red X's are marked on the image. Near each red X is a plus sign with a number “1”, “2”, or “3” by it.

5. Using the **Zoom** tool, zoom in over the area containing the red X and the plus sign mark (+) labeled “1”.
6. Using the **Register Points** tool, drag the plus sign mark (+) labeled “1” over the nearby X. Make sure that the plus sign is directly over the X.
7. Click **Frame** to restore the image back to its original state.
8. Repeat steps 5–7 for the plus signs labeled “2” and “3”.

6.1 Registering in Geographic Coordinates

The three points are known in geographic coordinates, or latitude and longitude. They will be registered that way, and then converted to UTM in the following section. Notice that each longitude value is negative due to being west of the prime meridian.

1. For each point, enter the longitude and latitude from the table below into the *World Coordinates* column under each point number.

	Point #1	Point #2	Point #3
Longitude (X)	-112.481944	-112.477222	-112.330277
Latitude (Y)	38.68500	38.57667	38.57611

2. When finished, click **OK** to close the *Register Image* dialog.
3. **Frame** the project.

With the coordinates entered, a slight rotation from true north may be seen, which is expected (Figure 3). It will be rectified later when the display projection is changed to a UTM coordinate system. If the image appears distorted or extremely crooked, it's possible the coordinates were entered incorrectly or the plus sign marks (+) were placed inaccurately. Rectifying the image requires opening the *Register Image* dialog again and adjusting the location of the plus sign marks (+).

4. To make adjustments, right-click on "soils.tif" in the Project Explorer and select **Register Image…** to bring up the *Register Image* dialog.

   Note that the plus sign marks (+) reset to a default location in the dialog when the dialog is closed. This means opening the dialog requires adjusting the plus sign marks (+) again regardless of how accurately they were installed the first time.
5. Make the needed adjustments to the position of the plus marks over the red Xs and verify the coordinates as shown in the table above.
6. Click **OK** when done to close the *Register Image* dialog.

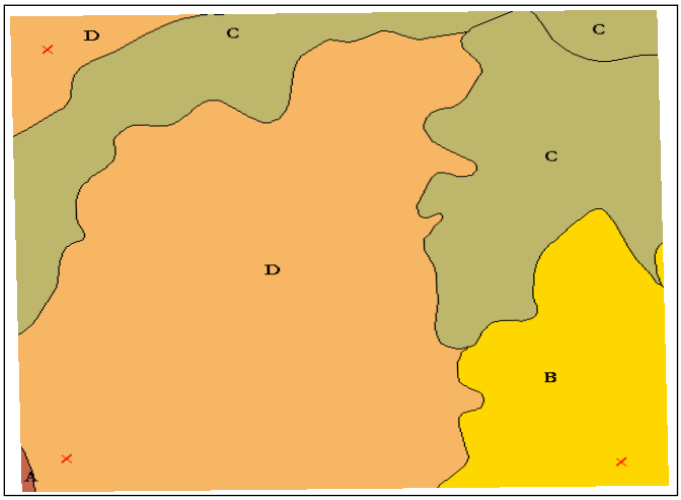

Figure 3 Slight rotation from true north visible

6.2 Converting the Coordinates to UTM

Geographic coordinates are commonly used on maps because they provide a global reference for any point in the world. For engineering work, a planimetric system is necessary. The Universal Transverse Mercator (UTM) projection is commonly used, so the coordinate system that the image file is currently in (Geographic) will be specified and the display projection will be set to UTM to work in that projection.

1. Right-click on the "soils.tif" image in the Project Explorer and select *Projection* **| Projection…** to bring up the *Projection* dialog.

2. In the *Horizontal* section, select *Global projection.*
3. The *Horizontal Projection* dialog may appear automatically. If it does not, click **Set Projection…** to bring up the *Horizontal Projection* dialog.
4. In the *Filter strings* edit field, type “Geographic NAD 1983”.
5. Select “Geographic Coordinate Systems | North America | NAD 1983” from the tree window at the top of the dialog.
6. Click **OK** to close the *Horizontal Projection* dialog.
7. Click **OK** to close the *Projection* dialog.
8. Select **OK** on the message about changing the projection of a raster. The *Save As* dialog will appear.
9. Enter “soils_exported.tif” as the *File name* and click **Save**.
10. Click **OK** at the warning message stating the display projection needs to be set. The *Display Projections* dialog will appear. If the dialog does not appear, select *Display* | **Display Projection** to bring up the *Display Projection* dialog.

The projection that the soils image file is in (Geographic) has been set correctly. The display projection will be set to UTM to make it the working projection.

11. In the *Horizontal* section, select *Global projection* and click **Set Projection…** to bring up the *Horizontal Projection* dialog.
12. In the *Filter strings* edit field, type “UTM Zone 12”.
13. Select “Projected Coordinate Systems | UTM | NAD 1983 | NAD 1983 UTM Zone 12N” from the tree window at the top of the dialog.
14. Click **OK** to close the *Horizontal Projection* dialog.
15. In the *Vertical* section, “Meters” should be selected from the *Units* drop-down. (The Datum and Units area in the *Vertical* section will be set according to the assigned projection.)
16. Click **OK** to close the *Display Projection* dialog.
17. **Frame**  the project

The original image object projection is still set to geographic and has not been changed, but the display of the image in the WMS display window has changed from geographic to UTM. Now, any measurements taken or data created from the image will have meters for coordinate values.

7 Conclusion

This concludes the WMS “Images” tutorial. The following key concepts were discussed and demonstrated:

- How to use GeoTIFF files.
- How to use online images.
- How to use world files.
- Image resolution.
- How to register images.

