

Understanding Sizes

Standard web tileset structures that you create in TNTmips for use in Google Maps, Microsoft Bing Maps, NASA World Wind, or Google Earth contain several tiers or levels of tiles at different spatial resolutions covering the entire area of the tileset (see the Technical Guide entitled *Tilesets: Setting Zoom Levels*). These pre-rendered pyramids of tile files ensure rapid retrieval and display of the required tiles at any zoom level, but contribute significantly to the stored size of the overall tileset. Each additional higher-resolution zoom level adds up to 4 times the number of tiles found in the next lower zoom level. Thus the higher resolution zoom levels (i.e., higher zoom number) have the most significant impact on the stored size of the tileset in these structures. The Export Raster Tilesets and Auto Mosaic processes in TNTmips automatically determine and set a default maximum tileset zoom level that captures the full spatial detail of your input image or images. If your tileset requires this level of detail, as you plan your activities you should take into account the stored size and number of files required to retain that level of detail.

The relationship between tileset zoom level, the number of tiles and tile folders, and stored size is shown in the table below using a Google Maps Tile Overlay as an example. (over)



1-meter Natural Color Orthoimage Mosaic, State of Tennessee, USA
(state boundary outlined in yellow)

Dimensions: 201,487 Lines x 786,557 Columns
(includes null cells)

Image Area: 115,000 square kilometers

Coordinate Reference System:
NAD83 / UTM Zone 16 N

Uncompressed size of image: **352 GB**

Tennessee Orthoimage Google Maps Tile Overlay
Image clipped to Tennessee state boundary

Google Maps Zoom Levels: 5 to 17
Tile Size: 256 x 256 Pixels (required)
Tile Formats: JPEG with PNG for edge tiles
Image area: 109,185 square kilometers
Coordinate Reference System: WGS84 / Spherical Web Mercator (required)

Folders, Tiles, and File Size by Zoom Level

Zoom Level	Pixel Size at Equator	Pixel Size in TN**	Number of Folders	Number of Tiles	Size on Disk
5 [*]	4.9 km	4.0 km	1	2	32 KB
6	2.4 km	2.0 km	2	5	92 KB
7	1.2 km	1.0 km	2	7	308 KB
8	611 m	496 m	3	18	0.98 MB
9	306 m	248 m	4	43	2.86 MB
10	153 m	124 m	7	143	6.96 MB
11	76 m	62 m	13	516	17.1 MB
12	39 m	31 m	25	1,871	58.8 MB
13	19 m	15 m	49	7,236	201 MB
14	10 m	7.7 m	96	28,388	750 MB
15	5 m	3.9 m	192	112,485	2.88 GB
16	2.4 m	1.9 m	382	447,836	10.6 GB
17 [†]	1.2 m	1.0 m	762	1,786,429	40.5 GB

^{**} computed at the latitude of the center of the state
^{*} minimum zoom level: lowest level requiring more than one tile to cover the image area
[†] maximum zoom level: pixel size equal to or less than the spatial resolution of the input image.

Total Number of Folders: **1,551**
Total Number of Tiles: **2,384,979**
Total Size on Disk: **55.1 GB**



Tennessee orthoimage Tile Overlay shown in Google Maps at zoom level 5. This tileset was created by the Export to Tilesets process from a single Tennessee TNT tileset raster object that is a mosaic of USDA/NAIP individual county orthoimages.



The same Tile Overlay shown in Google Maps at the maximum appropriate zoom level of 17 (Google Maps resolution of 1 meter at this latitude).

This structure was created from a statewide orthoimage mosaic of the state of Tennessee with 1-meter spatial resolution. This tileset covers an image area of over 109,000 square kilometers (42,150 square miles) and contains over 2 million tiles. It requires 55 GB of storage space even with the majority of the tiles in lossy-compressed JPEG format (see the TechGuide entitled *Tilesets: Tile Image Formats*). About 74% of the stored size of this tile overlay is taken up by the tiles in the highest zoom level (level 17 = 1 meter spatial resolution).

Copying a tileset as large as the Tennessee Google Maps Tile Overlay described above can be quite time-consuming, as current Windows and Mac operating systems do not efficiently cope with copying thousands of directories and millions of files. To allow more efficient

copying of large tilesets (such as moving the tileset to your web space), the Export Raster Tilesets, Merge Tilesets, Auto Mosaic, and other tileset processes in TNTmips provide the option to archive each tile row subdirectory in a separate Zip file. The Tileset Manager in TNTmips can be used to automatically unzip all of the zipped directories. You can choose this option if you plan to relocate a completed tileset to a different drive or computer where TNTmips can be run. Alternatively, you can simply use a third-party file compression utility to archive the entire tileset directory to a Zip or RAR file that can be moved to the destination computer and then uncompress it there using the same utility application.

A TNT tileset raster object of the same Tennessee statewide orthoimage can use the more efficient, larger *.JP2 files. Even at 15 to 1 lossy JPEG2000 compression, this tileset raster object has higher visual quality and is much smaller than a Google or Microsoft Bing Maps tileset using the mandatory lossy JPEG tile files and lossless-compressed PNG edge tiles (22.9 GB versus 55.1 GB). A TNT tileset raster object can also use lossless compression for the JP2 tile files, or use tiles in other lossless-compressed formats (GeoTIFF, PNG).

All standard web tilesets are optimized for rapidly viewing a color image from the Internet at predetermined scales. A TNT tileset raster object can be used for rapid viewing in the TNT products either locally or via a LAN or the Internet at any scale and in any Coordinate Reference System. It can not be used in the common web geoviewers. However, this 22.9 GB TNT tileset of Tennessee uses fewer, larger tile files that do not bog down copy and delete operations in operating systems. A 4-band orthoimage or a satellite image with any number of bands can also be converted to a multiband TNT tileset that stores all of the image data efficiently in a single set of multiband tile files. The bands in the multiband tileset can then be used in the TNT products to view various band combinations (e.g. color-infrared, natural color, ...).

If lossless GeoJP2 tile files are used in a multiband TNT tileset, these tileset raster objects are suitable for analysis by any TNT process (band ratios, geoformulas, classification, ...). They can also be used directly as input to the Auto Mosaic and Export Raster Tilesets processes to prepare the color-composite tilesets used for web geoviewing of that same area. This procedure results in a pair of image tilesets: a Google/Bing Maps tileset used for fast viewing in familiar Internet geoviewers, and a matched TNT tileset that can be analyzed in TNTmips processes or geospatial analysis scripts (SML) using Job Processing (see the TechGuide entitled *System: TNTmips Job Processing System*).

Tennessee Orthoimage TNT Tileset Raster Object

Tile Size:	2048 x 2048 Pixels
Tile Format:	JPEG2000 15:1 Lossy Compression
Dimensions:	201,487 Lines x 786,557 Columns (includes null cells)
Image Area:	115,000 square kilometers
Coordinate Reference System:	NAD83 / UTM Zone 16N
Number of Folders:	101
Number of Tiles:	30,026
Size on Disk:	22.9 GB

