Image Compression
INFORMATION SHEET
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🍀 What is compression?

In computer terms, compression means to make file sizes smaller by reorganizing the data in the file. Data that is duplicated or has no value is saved in a shorter format or eliminated, greatly reducing the file size.

Probably the most common compression format is a zip file. Files within the zip file return to their original state when unzipped and viewed.

🍀 What is imagery compression?

Compressing imagery is different than zipping files. Imagery compression changes the organization and content of the data within a file. The data is not necessarily restored to its original condition upon opening. Image compression reorganizes the data and may degrade it to achieve the desired compression level. Depending on the compression ratio, the sacrifice of data may or may not be noticeable.

The amount of image compression can be affected by the type of imagery. Higher compression ratios can be achieved in portions of the image that have similar tone, such as water areas that are the same shade.

🍀 Why compress files?

Compression is done for a number of reasons:
1. Make files easier to send via email
2. Fit data on media
3. Save storage space
4. Archive data
5. Organize projects
6. Make files easier to open and use

For example, many images can be mosaicked together and compressed into one image to make the product more usable with image viewing software. Image file sizes without compression can be so large, that some computers are unable to store or process the data.

Conversely, compression can make a file size so small that image quality becomes extremely poor. This degree of compression can be useful in situations such as producing thumbnails for indexing, since it would save storage space. If it is necessary to see detail in the imagery, too much compression should be avoided.

🍀 Can imagery become better with compression?

If by "better", one means that a smaller file size can be more user friendly, then yes. However, imagery cannot be made "higher quality" or "higher resolution" through compression.

🍀 What is the downside of compression?

Compressed image files can lose data, even though it may not be apparent to the user. Sometimes this is an undesirable side effect, especially if compression is done incorrectly on high quality raster data. The resulting imagery may not be compatible with some software or analysis modules, or may be of degraded quality, obscuring features that were clearly identifiable on the uncompressed data.

🍀 What is a compression ratio?

The compression ratio is shown as 50:1 or 15:1, etc. For example a 900 MB file compressed at 15:1 would be reduced to a 60 MB file. Perhaps the easiest way to understand compression ratio is to think of it in terms of file size and quality. The higher the compression ratio, the smaller the file size (more data is packed into a smaller space), but the lower the quality of the compressed product.

🍀 Is prep work required to compress imagery?

Before compressing imagery, processing may be desirable. This can include orthorectifying or georeferencing the source images, mosaicking and color balancing the images, combining multi-resolution imagery, or adding vector data.

🍀 What is Lossless and Lossy Compression?

Lossless compression reduces an image so that its quality matches the original source, and mathematically nothing is lost. Although lossless sounds ideal, at times it doesn't provide enough compression, and files could remain quite large. The maximum ratio is usually about 2:1.

Lossy means that the compressed image isn't quite the same as the original. Lossy compression degrades images to some degree, and the more they're compressed, the more degraded they become. In many situations, such as posting images on the web or making small to medium sized prints, the image degradation isn't noticeable. However, if an image is compressed too much and then enlarged the degradation will be obvious.

Are there many compression formats?

Yes. However, in the geospatial arena three main formats dominate image compression. Two are proprietary and one is open source. The proprietary formats are: MrSID (Multiresolution Seamless Image Database) from LizardTech and ECW (Enhanced Compressed Wavelet) from ERDAS ER Mapper. JPEG 2000 is the main open source format used by geospatial software. The software from LizardTech and ER Mapper also support the JPEG 2000 format.

Some common compression file extensions are:
1. MrSID (.sid)
2. ECW (.ecw)
3. JPEG 2000 (.jp2)

What image formats does the Aerial Photography Field Office (APFO) use?

The USDA, Farm Service Agency (FSA) has used image compression for many years in order to save disk space as well as to distribute and/or package data in a more convenient form.

The MrSID format was originally selected for use by APFO, in large part because other federal agencies were already using this format. Many government agencies and private companies use compressed imagery. Some of the compression software can also mosaic multiple images into a single seamless, tone matched, compressed mosaic. FSA creates county mosaics, but other extents, such as a forest area, are also possible. This produces a GIS base layer or hardcopy print which is easy to use and pleasing to look at.

APFO has used several compression formats over the years for the NAIP program. For additional NAIP information go to: http://www.apfo.usda.gov
1. All Compressed County Mosaics (CCMs) from 2004 and earlier have the following specifications:
   a. MrSID MG2 format
   b. Compression ratio of 50:1 for 1-meter GSD and 20:1 for 2-meter GSD

2. All CCMs from 2005 through 2007 have the following specifications:
   a. MrSID MG3 format
   b. Compression ratio of 50:1 for 1-meter GSD and 20:1 for 2-meter GSD

3. 2008 compression specifications:
   a. All 4-band CCMs are JPEG 2000 format.
   b. All 3-band CCMs are MrSID MG3 format.
   c. Both formats have a 15:1 compression ratio.

4. 2009 - 2014 CCMs specifications are:
   a. MrSID MG3 format
   b. Compression ratio of 15:1.
   c. 2013 Idaho ½ meter GSD CCM's have a compression ratio of 60:1.

Note: Some compression software can do more than compress data; including reproject imagery to different coordinate systems, add imagery to or modify existing compressed files, or compress to a different compression format.

How do I view compressed imagery?

Most GIS software and no-cost image viewers can view the majority of compressed imagery formats. Listed below is information for no-cost viewers as well as software used by FSA and other organizations.

Links to no-cost data viewers and instructions for using the software can be found on the APFO website: http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prod&topic=vdi

APFO does not endorse or support these products. The information is provided as a service to users of the NAIP imagery or other data. The software listed are:
1. Tatuk GIS Viewer
2. Global Mapper
3. PCI Geomatica FreeView

Note: Tatuk and Global Mapper software can display 3-band imagery while Geomatica can display both 3-band and 4-band imagery. Each program has different capabilities. To meet your needs you may want to try more than one of the programs for viewing the NAIP imagery or other data.

ArcGIS 9.x & 10.x and other geospatial software can display the MG2, MG3, and JPEG 2000 image formats.

Who do I contact for more information?

For more information on compression, contact GIS Specialist, David Davis, at (801) 844-2933, or GIS Specialist, Nathan Pugh, at (801) 844-2927.