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WHITE PAPER

12 Hidden Gems in LizardTech GeoExpress

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Introduction:

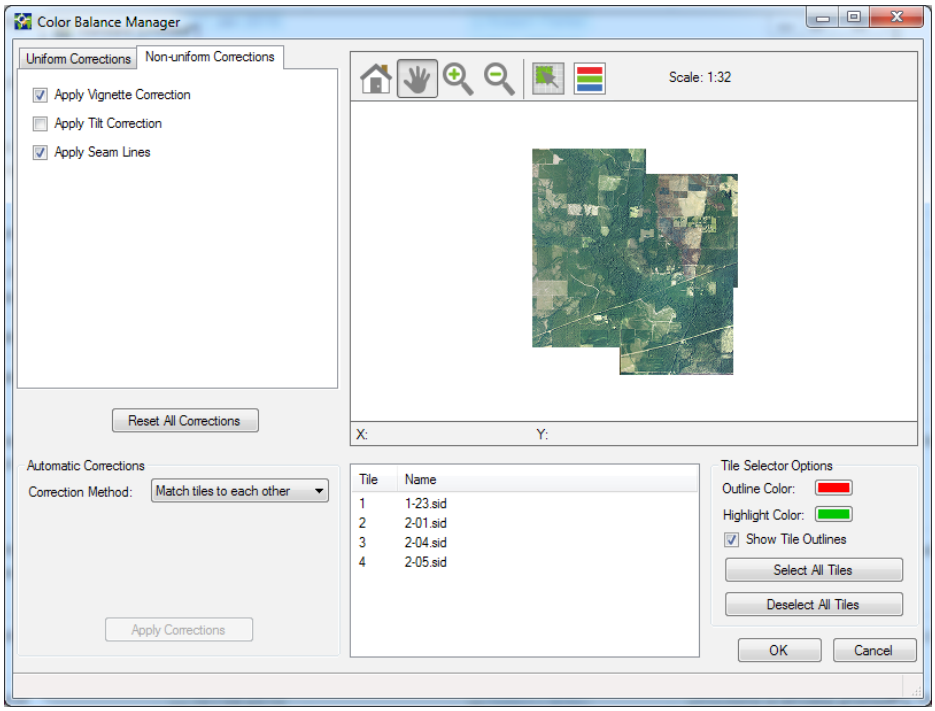
There's More to GeoExpress Than Just Compression

Users of raster imagery and LiDAR point clouds rely on LizardTech's GeoExpress software to compress massive data sets into high-quality MrSID files. Compressed in a ratio of 20:1, data files can be opened and viewed immediately with the same resolution quality. The smaller data sets are easier to process and share, making GeoExpress a popular tool in the geospatial workflow.

However, GeoExpress does a lot more than just compress data files. In fact, there are a dozen powerful, yet less-well-known, data manipulation and enhancement features built into the software package right now that can further improve your efficiency when working with raster imagery and LiDAR data. Most can be applied to a data file during compression to simplify a complex processing workflow.

Color Balancing

Image mosaicking almost always requires color balancing to compensate for visual differences that occur from one scene to the next. GeoExpress offers three different color balancing options. The first is Correction, which eliminates the 'checker board' look and gives the overall mosaic a consistent appearance, as if the entire mosaic was originally captured as one image.



Correction eliminates differences in contrast or brightness among individual scenes that may result from distortions and variations in lighting or ground conditions during image acquisition. This tool allows the user to adjust the brightness and contrast histogram for a single scene and then have the other scenes match it. Or the histograms for all of the scenes can be averaged to generate a consistent appearance. The correction tool can even balance the color across a single scene where, for example, a vignetting distortion has darkened its corners.

In addition, the color balancing tool called Seam Line can be used to eliminate the lines that are often visible at the edges of scenes where they are joined during the mosaic process. And the third tool within color balancing is called Tilt. As the name implies,

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it removes a common distortion from aerial imagery in which tall features, such as buildings and towers, appear to lean away from the center of the scene. This tool gives the appearance that every point in the mosaic was imaged from directly overhead.

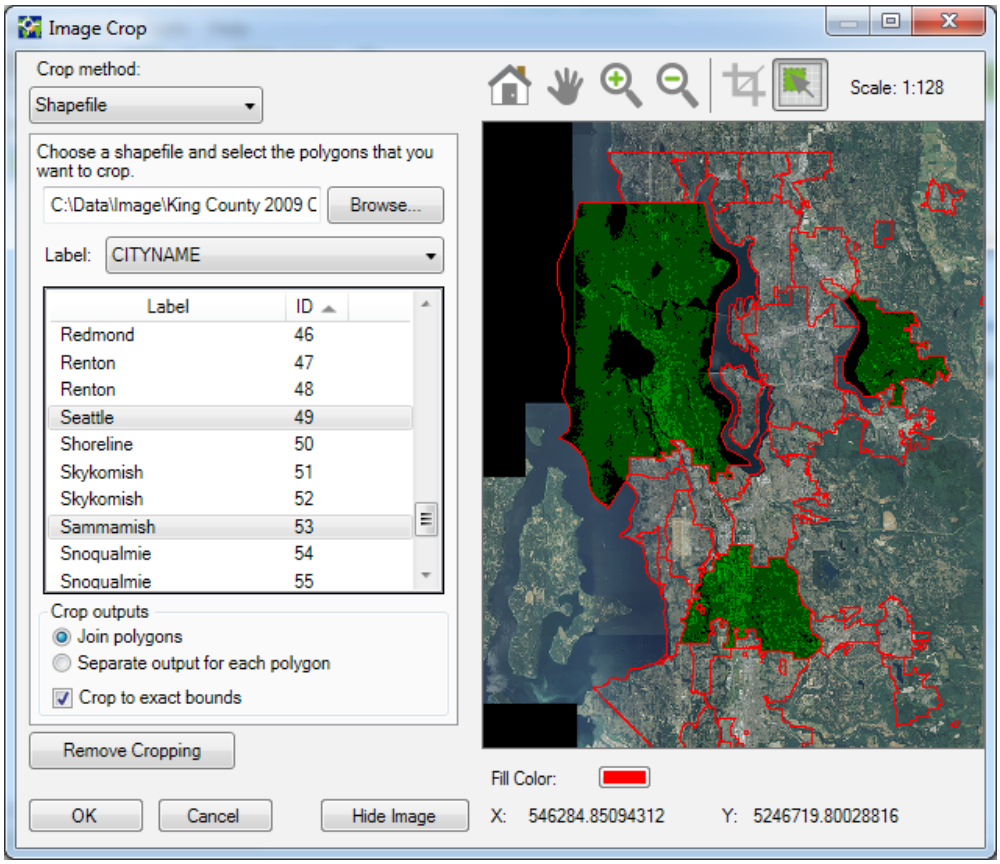
It's worth noting that color balancing can be used independently of mosaicking. The three tools can be applied to any image that is being compressed.

Cropping

Even after a large image has been compressed, it's convenient to be able to crop out one or more smaller segments of the overall scene. Whether to further process the subset or simply share it easily with a colleague, cropping may be one of the most frequently used image manipulation tools in any geospatial workflow. GeoExpress offers two different cropping methods.

Users can simply eyeball their area of interest within the larger raster image, draw a rectangular bounding box and extract that part of the image. Alternately, if the raster image is part of a GIS data set, the user can crop by selecting one or more shapefiles, such as those defining the political boundaries of cities or counties, and extract them as polygons from the large image. The advantage of this is that the polygon edges perfectly match the shapefile boundaries as represented in the GIS.

In the example below, the city of Seattle is precisely cropped as a polygon from the larger Washington state mosaic. The actual extraction usually takes just a few seconds in GeoExpress.



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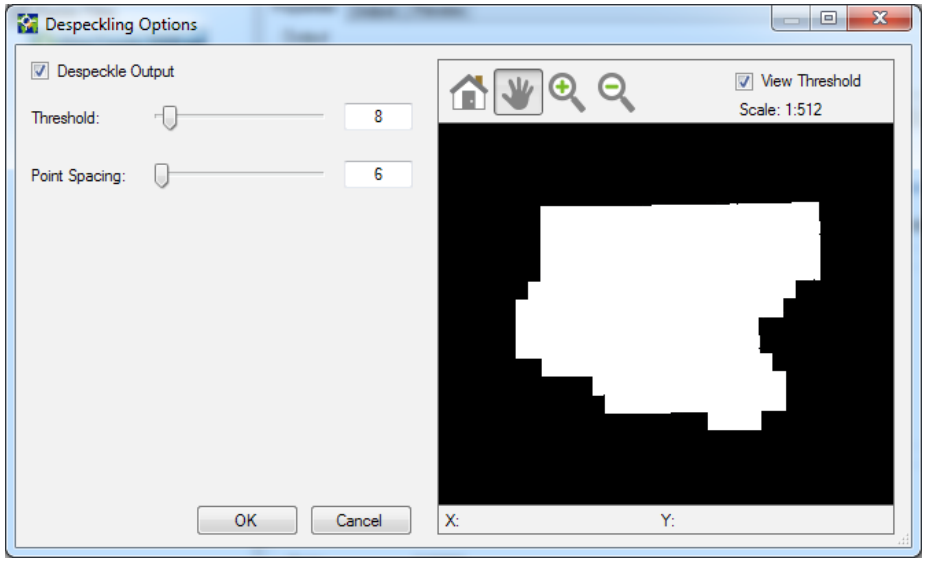
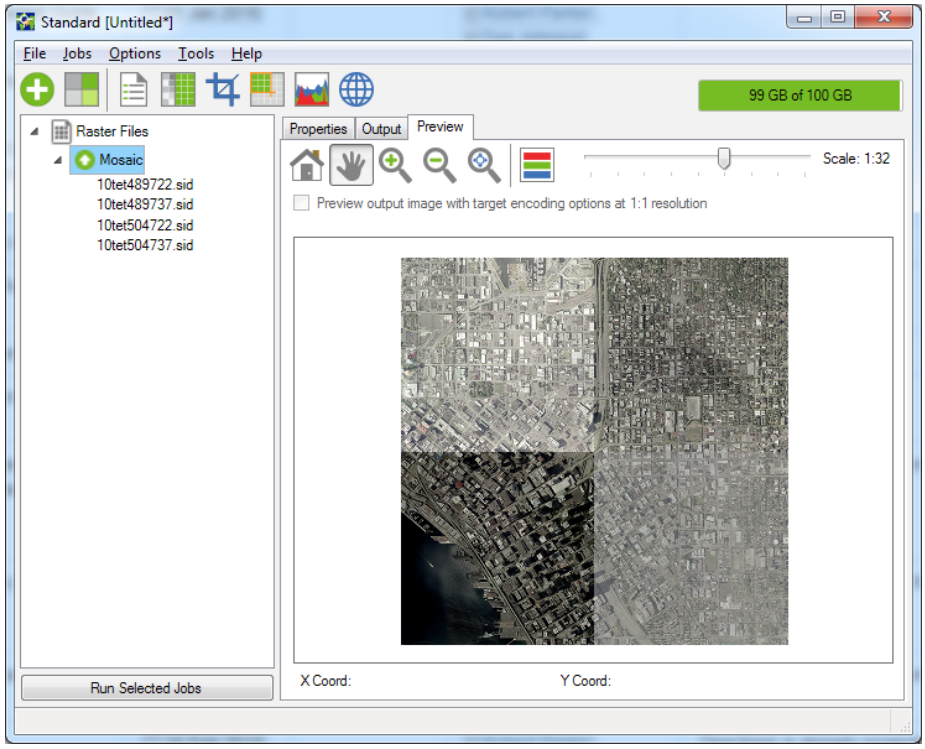
Despeckling

From a visual perspective, compression of a raster data file can leave behind a pattern of black spots along the edge of the image, called speckles. The speckling can be unattractive and becomes especially annoying when laying one image over another. The Despeckle tool in GeoExpress removes the spots and results in a clean edge along the image border. During mosaicking in GeoExpress, despeckling occurs automatically.



Mosaicking

GeoExpress can stitch together multiple raster images and LiDAR files into a geographically continuous mosaic while the data is being compressed. The software automatically trims away overlap in the scenes and determines precisely where to join them so there is no gap in the mosaic. The user can mosaic scenes in different projection systems and spatial resolutions. The software allows the user to choose which project or resolution the final mosaic will match. GeoExpress can mosaic an unlimited number of images and LiDAR data into a single seamless image.



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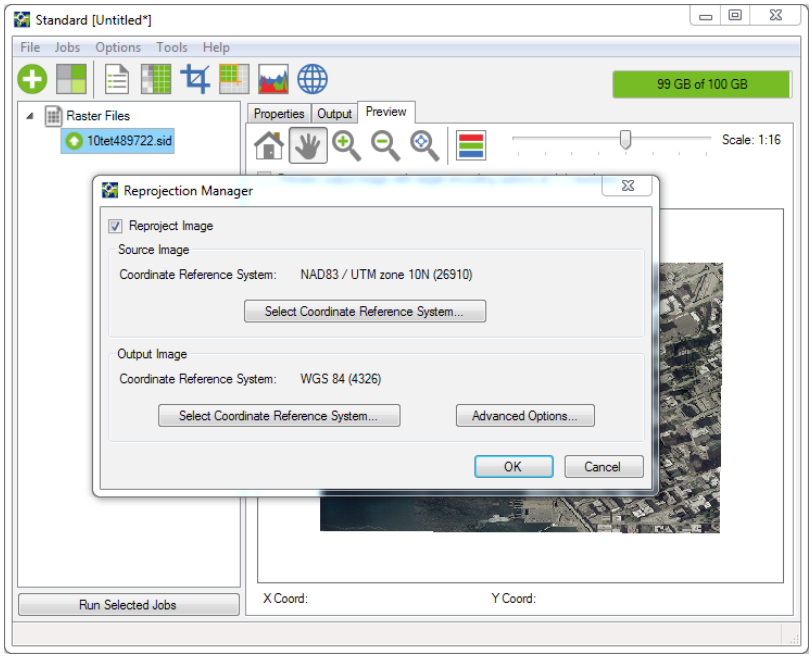
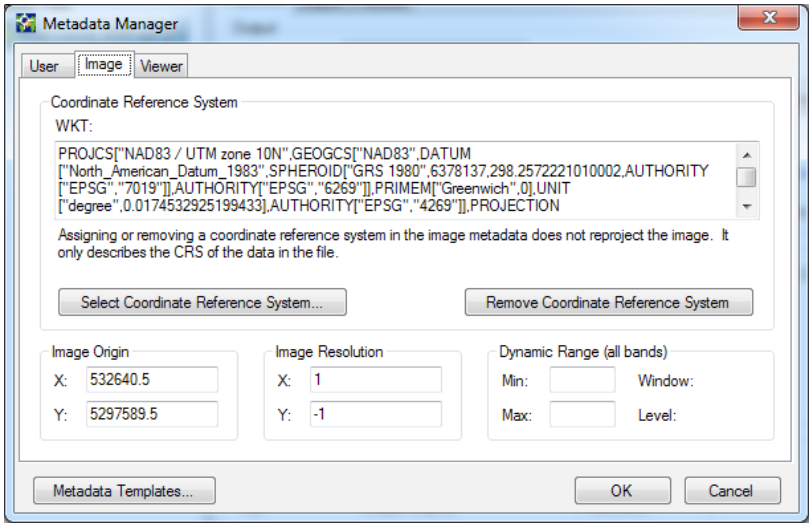
Reprojection



The days of worrying about incompatibility among projection systems are over. GeoExpress contains a library with hundreds of the most commonly used map projections. In a matter of seconds, any raster data set can be transformed on the fly from one projection to another -- from UTM to State Plane and meters to feet, for example. And if the favored projection isn't in the library, the software has a robust search tool that can find the right projection and its definition online for immediate application. In those rare instances when a custom projection is required, GeoExpress can handle that too. The user can edit a projection in Well Known Text (WKT) and apply it on the fly, watching the transformation take place in the preview window.

Metadata Editing



Every raster data file comes with attached metadata that contains information about the data. Common elements in the metadata include details of the map projection, dynamic range, location description, acquisition sensor, data owner, spatial resolution, processing level, collection date and many other factors describing the file. GeoExpress lets the user edit any of these metadata fields.

One of the most common uses of the editing function is to add a 'tag' such as 'Michigan' to the metadata to make a particular data file easier to find in the future. But the editing tool can also be used to correct mistakes in the file. Coordinate reference systems are often mistakenly named in the metadata and must be changed. In addition, editing metadata can help future users get more out of the data set. The editor can change the minimum or maximum values in the dynamic range so the image will display better when viewed onscreen. In all cases, edits can be made with a few mouse clicks and keystrokes.

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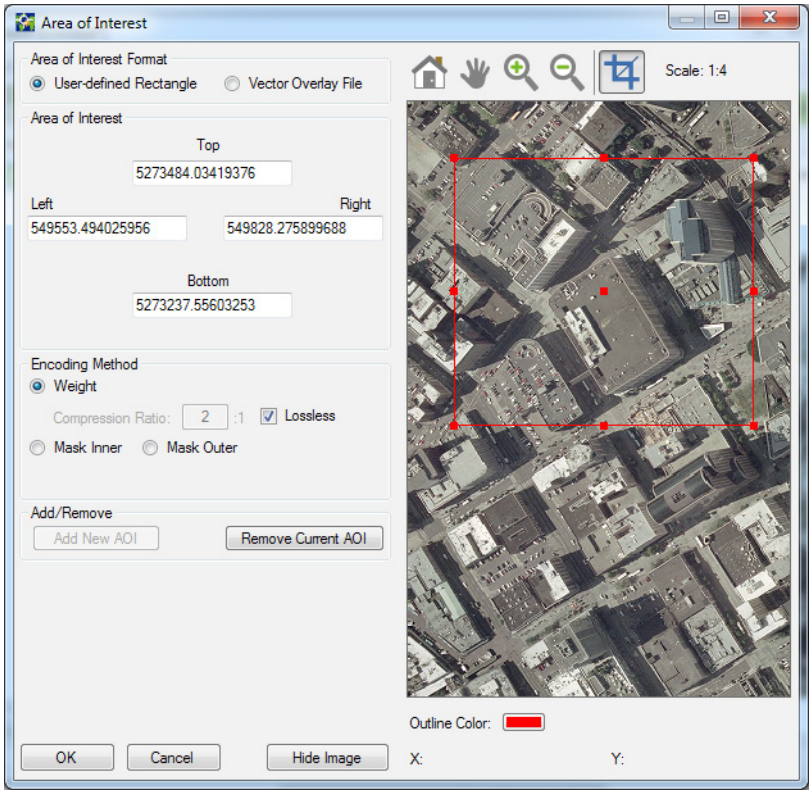
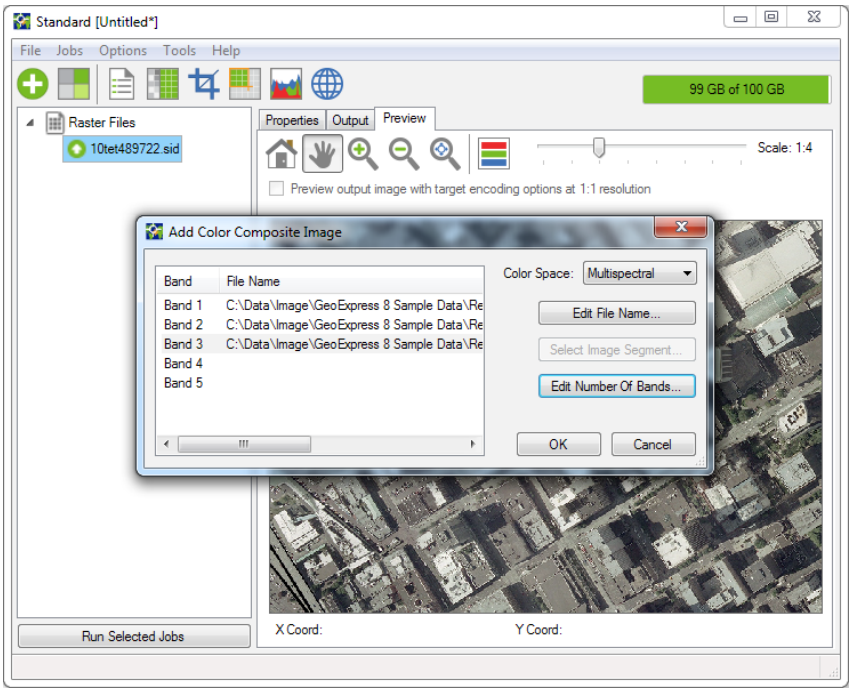
Area of Interest



The Area of Interest tool may just be the most under-rated, yet valuable, function in GeoExpress. This tool allows the user to define an area of interest within a larger image and apply lossless compression just to that area. Lossless compression means that absolutely no spatial or spectral data will be lost during compression, and original information content will be maintained. The user can direct GeoExpress to perform normal 20:1 compression to surrounding data. As a result, the area of interest can be exploited in further processing and enhancement for maximum extraction of information content and interpretation.

Multispectral Color Composite



Possibly one of the most powerful tools in GeoExpress, the Color Composite function enables users to easily combine multiple individual spectral bands into a single multispectral image. For instance, individual gray-scale images covering the Red, Green and Blue visible light wavelengths can be fused with just a few mouse clicks to create one three-band natural-color multispectral image, ready for viewing. More than three bands can be combined into a single image for analysis purposes. This is a fast and simple tool to use with Landsat data or any other multispectral imagery sources.

What makes the Color Composite function even more valuable for analysis and interpretation of multispectral data is the ability to alter the compression ratio for individual bands during the fusion. For example, a user interested in near-infrared

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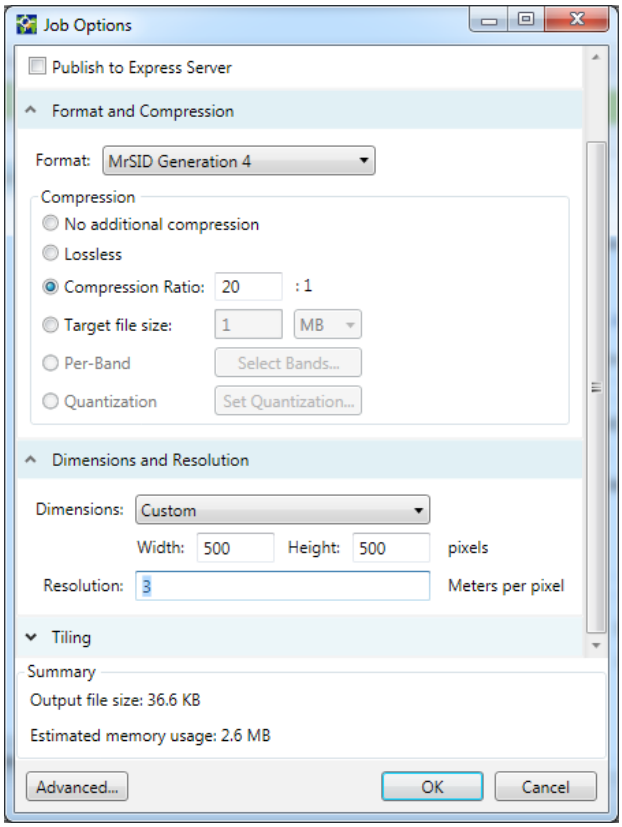
information content – useful in vegetative analysis – can adjust the compression of that band to be lossless, making its spectral detail stand out when combined with other bands. Compression ratios can be customized for each band fused with this tool.



Export Options

Once a raster image has been compress and manipulated in GeoExpress, the user has several options for exporting it in the pixel dimension and resolution that work best with the environment in which it will be used. An image that will be posted on a website, for example, might be exported in smaller dimensions and resolution than one that will be printed into a huge wall mural for a trade show booth. Both website and print resolution are specific options. The user can also select a custom dimension, such as 1000x10000, or a specific pixel resolution, such as 10 meters or 100 meters. This gives the end user complete control over how the image is exported.

Command Line

Do you think Command Line programming is so last century? Think again. GeoExpress has retained the command line option to enable users to create custom scripts with multiple functions. For instance, a user can build a script involving color balancing, cropping, reprojection and then output to a specific file format. The script can be saved so that a multitude of raster data sets can be compressed and manipulated in the exact same way to generate a series of identical images.

```
Using local license.  Up to 8 cores enabled for encoding
GeoExpress 9 Command Line - Version 9.5.1.4435.default
Copyright (c) 2014 LizardTech, Inc. All rights reserved.

Input file name: 10tet489722.tif
Output file name: test.sid
Output format: MrSID Generation 4 (Raster)
Estimated memory required: 19.7 MB
Threads: 4
Encoder version: 9.5.1.4435.default
Express Cartridge Manager: Local
Encode start time: Wed Jan 20 16:31:24 2016
Encode finish time: Wed Jan 20 16:31:34 2016
Total encode time: 10 seconds
Input image size: 71.5 MB (75000000 bytes)
Output file size: 3.6 MB (3757295 bytes)
Target compression ratio: 20.00:1
Actual compression ratio: 19.96:1
Data Cartridge decremented: 73242 KB
```

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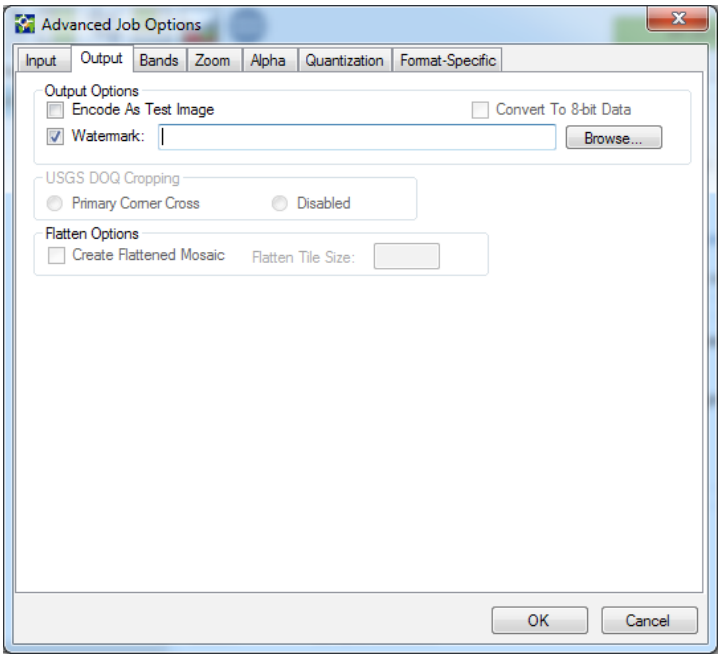
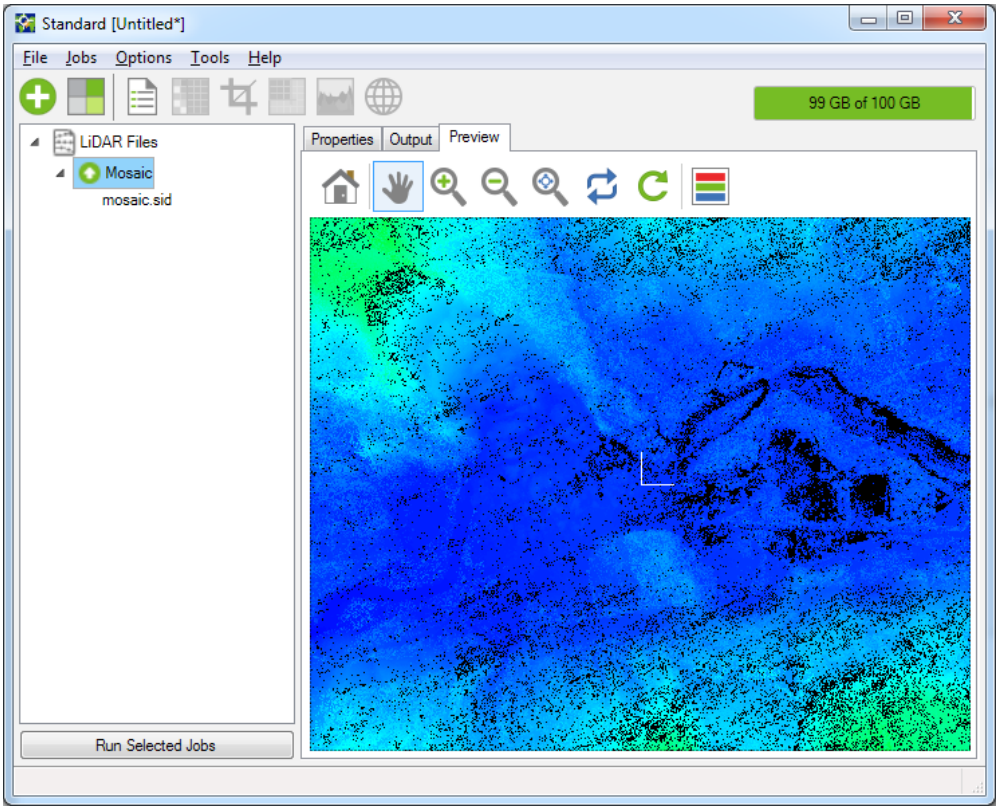
Watermarking

Possibly the most frequently under-utilized tools in GeoExpress is the watermarking function. This allows a user to place a barely visible mark on the image for a variety of purposes. Some organizations watermark images to display their ownership of the work, while others use the mark to denote the image is still in draft form.



LiDAR Format Conversion

GeoExpress now comes with the ability to compress LiDAR data files, which makes those massive point clouds significantly easier to handle, process, visualize and archive. In fact, GeoExpress lets users convert on the fly to and from any one of three popular point cloud file formats – MrSID Generation 4 (MG4), LAS and LAZ. Both MG4 and LAZ are compressed formats, the latter a very popular open source file.



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