Historical Aerial Photography: Bringing a Large Physical Collection into the Digital Age

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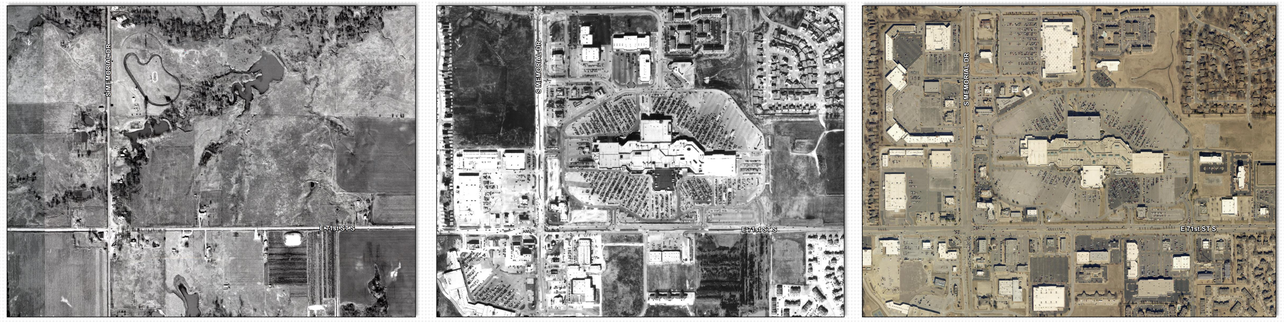
1951 1990 2018

31ST & RIVERSIDE

1950 1977 2018

61ST & YALE

1966 1985 2018



71ST & MEMORIAL

Historic aerial photography can be a great asset in a wide variety projects, including land development, planning, engineering, and environmental changes. However, some agencies and universities have large aerial photography collections that are not stored digitally. Currently INCOG has 36 aerial mosaics from 1943 through 2018. INCOG's collection also includes sets of aerial photography that are still present in physical mediums, such as prints and mylar sheets. The flight years in these sets range from 1950 to 1997. These aerials are currently being digitized and made available in mosaic form for both preservation and ease of use. Among these, prints from 1977, 1985 and 1990 are currently being scanned and georeferenced. Prints from 1950/1951, 1954 and 1966 have been completed and are ready to be made into mosaics for INCOG's GIS servers.

Indexing & Scanning

Creating updated indexes is an optional but useful step when converting a large set of aerials into a digital format. Since our aerials are accessed by multiple staff, indexing helped us locate any misplaced pieces so that we can divide the work up by flight year, making the project more efficient. From the indexes we were able to create worksheets to track which sections have already been completed. On flight years after 1966, most of the aerial images were captured section by section so a township/range/section grid of the Tulsa County area is used as the base of the index. On flight years up to and including 1966, a copy of the original index is made to make sure we have all of the same pieces. In order to determine which year to digitize next, we first created indexes for each of our years of photography. Since this is a long term project, we prioritize which years are most likely to be requested or needed for projects.

For scanning large sets of aerial mylars and prints, we use our Paradigm imagePRO Gx42HD Plus scanner which can handle large scale documents. Initially, differing settings for the mylars and the prints are established, but all of the images are scanned in as uncompressed tiff files at 300 dpi and in RGB 24-bit color. While there can differences in brightness when scanning mylar sheets, those color differences are corrected later when the images are edited, rather than changing the scanning settings for each image.

Cropping & Color Editing

We use Corel Photo-Paint X6 to crop and color edit the scanned aerial images. Each image undergoes the steps of cropping off the border of the aerial photo, straightening the image, and adjusting the brightness to match the other aerials of the same flight. Depending on the photosets, we include two additional steps: converting the image to grayscale and removing the the moiré pattern, which is an interference pattern that can sometimes be produced in digital images when they are created by scanning a printed image. We typically use these two steps when we edit the scanned images from the physical mylar sheets; these image inconsistencies have not occurred with the other scanned aerials.

Georeferencing & Creating Mosaics

Each image needs to be brought into ArcGIS and georeferenced individually. We use one of our more current years of aerial photography as a guide, and then review and adjust the photos as needed. When georeferencing, we use first-order polynomial transformation (affine) to align the images. Also, when saving the georeferenced photos we use "rectify" rather than "update geometry" so we have a separate file that can be georeferenced again, if necessary.

After the whole set of tiff images have been georeferenced for each flight year, we move on to turning them into mosaic raster datasets. The first step is to create a geodatabase to work within using ArcCatalog. For smaller projects, a personal geodatabase is sufficient, but it has a 2GB limit of workspace, which can be easily surpassed when making a raster dataset with large quantities of tiff files. To avoid this issue, we create our mosaics within our SQL Server, ArcGIS for Server Enterprise Standard, which has 256 GB of RAM and 1.85TB storage available for all of our databases.

Once the geodatabase is created, the next step is to create the new raster dataset. The spatial reference of the raster dataset should be set to what was previously used when georeferencing the images. Also, the number of bands will need to be depicted; 1 for black and white photosets and 3 for color photosets. Next, click on the raster dataset and select the "Load" option to choose which photos will be a part of the mosaic. This is done by selecting them in the "Input Rasters" field. This final step can often take us several days to complete when we process a whole flight year, but for smaller sets of photos it takes considerably less time.

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