

- Electronic watermarks are imbedded in the image file, and they are invisible. They usually use a numeric code licensed by an electronic watermarking firm. The numeric code is specific to the institution that owns the files. Electronic watermarks are usually applied as part of the filter mechanism in programs like Adobe Photoshop. In some cases, upon very close inspection, the file will appear grainy after an electronic watermark is applied. Electronic watermarks do not stop users from downloading files, and they can be easily overcome through manipulation.

The cost of watermarking varies. Visible watermarking is virtually free, but invisible watermarking can be costly. If you are debating whether or not to watermark, consider controlling the use of your images by limiting the quality and size of publicly accessible files. Be sure metadata concerning ownership and copyright information travels with your images, either in embedded file information or associated metadata records.

An advantage to using watermarks, visible or electronic, is that they can assist in controlling the use and distribution of images. A disadvantage is that, when embedded they will degrade the image and when layered on top, will most certainly obscure image content. Watermarks may suggest the institution's intent to protect its collections, but they do not prevent theft or misuse.

Guidelines for Source Type

For the following source types, recommendations are made for master, access and thumbnails. Be aware that access files should be made from an optimized master file — see Service Master Files described above.

- **Text** — When scanning text documents, spatial resolutions should be based on the size of text found in the document and resolutions should be adjusted accordingly. Documents with smaller printed text may require higher resolutions and bit depths than documents that use large typefaces. Projects that will have Optical Character Recognition (OCR) applied, may wish to test pages at several resolutions to find the most satisfactory results. Images that produce the best results for OCR may not be pleasing to the eye and may require separate scans for OCR and human display.

Projects with large amounts of textual materials, particularly hard-to-read materials such as manuscripts, should provide transcriptions of the materials in addition to the digital image. Access to textual material can be further enhanced through SGML/XML markup schemes such as the Text Encoding Initiative (TEI). As rekeying text can be cost prohibitive, projects considering transcriptions should investigate including Optical Character Recognition (OCR) software in their toolkit.

Text			
	Master	Access	Thumbnail
File Format	TIFF	JPEG	JPEG
Bit Depth	1 bit bitonal 8 to 16 bit grayscale 48 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	Adjust scan resolution to produce a minimum pixel measurement across the long dimension of 6,000 lines for 1 bit files and 4,000 lines for 8 to 16 bit files	150 – 200 PPI	144 PPI
Spatial Dimensions	4000 to 6000 pixels across the long dimension	600 pixels across the long dimension	150 to 200 pixels across the long dimension

- Photos** — Photographs can present many digitization challenges. We recommend digitizing from the negative (or the earliest generation of the photograph) to yield a higher-quality image. However, in the case of photographs developed according to artist specifications, the photograph itself should be digitized rather than the negative.



Cowboys on a ridge in northern Wyoming, undated. Charles J. Belden Papers, American Heritage Center, University of Wyoming.

When considering whether to capture sepia-tone photographs in color or black and white, we recommend digitizing them as color images to create a more accurate image. Digitize the backs of photographs as separate image files if there is significant information on the back of the photo (which may be of interest to users) that may not be included elsewhere. If an image of the verso of the photograph is available, the digital image will serve as a more successful surrogate for the original.

Photographs			
	Master	Access	Thumbnail
File Format	TIFF	JPEG	JPEG
Bit Depth	16 bit grayscale 48 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	400 to 800 PPI	150 to 200 PPI	144 PPI
Spatial Dimensions	4000 to 8000 pixels across the long dimension, depending on size of original, excluding mounts and borders	600 pixels across the long dimension	150 to 200 pixels across the long dimension

- **Graphics** — Graphics include the various techniques used to reproduce words and images from originals such as engraving, lithography, line art, graphs, diagrams, illustrations, technical drawings and other visual representations. Nearly all graphics will be two dimensional and should be scanned using the following guidelines.

Graphic Materials			
	Master	Access	Thumbnail
File Format	TIFF	JPEG	JPEG
Bit Depth	16 bit grayscale 48 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	600 to 800 PPI	150 to 200 PPI	144 PPI
Spatial Dimensions	6000 to 8000 pixels across the long dimension, excluding mounts and borders	600 pixels across the long dimension	150 to 200 pixels across the long dimension

- **Artwork/3-Dimensional Objects** — For projects where the physical dimensions of the non-3D artwork matches the equipment available, the following standards can be used. If scanning photographic copies of objects and artifacts, see recommended requirements in the appropriate photo and film charts above.

Artwork/3-Dimensional Objects			
	Master	Access	Thumbnail
File Format	TIFF	JPEG	JPEG
Bit Depth	48 bit color	24 bit color	24 bit color
Spatial Resolution	Device Maximum	300 PPI	144 PPI
Spatial Dimensions	100% of original	600 pixels across the long dimension	150 – 200 pixels across the long dimension

- **Maps** — Scanning maps may involve items that vary widely in size, condition and amount of detail. Small maps may fit easily onto a flatbed scanner, while large plat maps may need to be scanned in sections using a large format scanner or captured by a camera. The size of the image can become a problem for storage, but also for viewing, serving over the web or processing.

Smaller maps (less than 36 inches on the longest dimension) should be digitized at 600 PPI, 48-bit color or 16-bit grayscale if possible. For larger maps, 300-400 PPI may be more practical. If it becomes necessary to digitize a map in sections and stitch the image together in Photoshop, keep both the original images of the sections as well as the combined image.

Maps			
	Master	Web	Thumbnail
File Format	TIFF	JPEG	JPEG
Bit Depth	16 bit grayscale 48 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	600 PPI 300 to 400 PPI for larger maps	150 to 200 PPI	144 PPI
Spatial Dimensions	6000 to 8000 pixels across the long dimension	1078 pixels across the long dimension	150 to 200 pixels across the long dimension

- **Film** — For duplicates (negatives, slides, transparencies), match the original size. However, if original size is not known, the following recommendations are supplied: For a copy negative or transparency, scan at a resolution to achieve 4000 pixels across the long dimension. For duplicates, follow the scanning

recommendations for the size that matches the actual physical dimensions of the duplicate.



Master scans of camera originals may be captured and saved in RGB, particularly those negatives that

contain color information as a result of staining, degradation or intentional color casts. Derivative files could later be reduced to grayscale in the scanning software or during post-processing editing.

<i>Film</i>			
	Master	Access	Thumbnail
File Format	TIFF	JPEG	JPEG
Bit Depth	16 bit grayscale 48 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	Resolution to be calculated from actual image format and/or dimensions - approx. 2800 PPI for 35mm originals, ranging to approx. 600 PPI for 8x10 originals	150 to 200 PPI	144 PPI
Spatial Dimensions	4000 to 8000 pixels across long dimension of image area, depending on size of original and excluding mounts and borders	600 pixels across the long dimension	150 to 200 pixels across the long dimension

Quality Control

Numerous factors play an important role in the final outcome of a digitization project. Original condition of materials, quality and maintenance of equipment, staff training and external lighting are some factors that can influence the quality of images.

A quality control program should be conducted throughout all phases of the digital conversion process. Inspection of final digital image files should be incorporated into your project workflow. Typically, master image files are inspected online for a variety of defects. Depending on your project, you may want to inspect 100 percent of the master images or 10 percent of the files randomly. We do recommend that quality control procedures be implemented and documented and that you have clearly defined the specific defects that you find unacceptable in an image. Images should be inspected while viewing at a 1:1 pixel ratio or at 100 percent magnification or higher. Quality is