

Scanning Archival Images

A Guide for Community Heritage Projects



A Project of the Gimli Municipal Heritage Advisory Committee



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THIS GUIDE TO THE DEVELOPMENT OF DIGITAL VERSIONS of aged photographic images will enable community heritage groups to undertake this valuable archival process. A great deal of the information following has been adapted from *Preserving History: How to Digitally Archive and Share Historical Photographs, Documents and Audio Recordings* (<http://archivehistory.jeksite.org/chapters/chapter2.htm>).

Organizing

Before you scan the photos, consider the way in which you'll organize them. By date? By event? By image size? How will the files be named? The options are endless, but no matter which method you choose, choose a system before you scan, and organize your printed photos into stacks accordingly.

Handling and Cleaning the Scanner and Items

Good practice is to carefully handle historical items by their edges to avoid damage from fingerprints. Use an air blower to remove dust from an item, and use the air blower and a lint-free wipe or cloth to clean the scanning bed before scanning. Best practice is to wear cotton or latex gloves when handling historical items. Fingerprints are a significant threat to photographic materials and can be very difficult to correct. Fingerprints may not manifest in photographic materials until long after the actual incident of touching the surface.

Dust on historical items and scanning beds can significantly reduce the quality of an archival image. Dust is most noticeable on small items that are greatly enlarged, such as slides. Dust is inevitable and can be reduced but not eliminated. The first step in removing dust is to blow air on the item being scanned and on the scanning bed. Blowing with human breath is not acceptable due to moisture and potential contaminants. For historical items, a good hand blower will remove any dust that can be blown away without a blast of air that could threaten fragile items.

Carefully maintained soft brushes for photographic uses are another option for removing dust. An antistatic brush may remove some dust that an air blower does not remove. The brush should have a protective container and be handled carefully to avoid contact with potential contaminants, including human skin. Brushing a slide or negative should be gentle and slow, particularly on the emulsion side (the dull side).

Scanner Properties – Image Size and Resolution

The spatial resolution of a digital image is expressed by the number of *pixels per inch* (ppi). A pixel is a tiny rectangle that is set to one colour and is the smallest detail that can appear in a digital image. The term *dots per inch* (dpi) is often used interchangeably with pixels per inch. The resolution and overall size of an image determine the total number of pixels on each side. For example, scanning a 4 inch by 6 inch photograph at 500 ppi produces a digital image with 2000 pixels on the 4 inch side and 3000 pixels on the 6 inch side.

The total number of pixels on the sides of an image determines what level of detail is recorded in the image and how much the image can be enlarged. Detail in an image includes such things as letters on signs or calendars in the background, labels on merchandise in a store, and the characteristics of buildings

in an aerial photograph. Great enlargement of the image is needed to see the information in these details. In addition, enlargement may be needed for display. With extreme enlargement, *pixelation* occurs when the individual rectangular pixels become visible and the image no longer looks natural. Higher resolution is needed to avoid pixelation with great enlargements. Of course, the size of the image files also becomes larger with greater resolution.



With low level pixelation, the image on the cover of this guide loses a great deal of its resolution and clarity.

The maximum size an image can be printed is determined by the total number of pixels on a side. General guidelines are that digital images produce excellent results when printed at a size that has 300 ppi and acceptable results when printed at 150 ppi. For example, a digital image that has 3000 pixels on one side will have 300 ppi when printed with that side 10 inches long. At 150 ppi, that side of the print will be 20 inches ($3000 \text{ pixels} / 150 \text{ ppi} = 20 \text{ inches}$). If the same image is created with a higher resolution that has 4000 pixels on the side, then it can be enlarged to 13 inches and still have 300 ppi for an excellent print.

In general, resolutions greater than 800 ppi will not increase the amount of useful detail in digital images of paper photographs. However, higher resolutions may reduce pixelation with enlargement when the original photograph is small. For negatives and slides, the maximum useful resolution depends on the speed and grain of the film, the quality of the camera lenses, and the skills of the photographer. For medium format negatives, a resolution greater than 1200 ppi will rarely have increased useful detail for historical photographs by amateur photographers. The variability of images with 35 mm film is so great that I have not found a simple rule of thumb. Scanning an item with different resolutions and then comparing the amount of detail is a useful learning experience. For example, direct comparison of letters that can only be read at high enlargement shows when improvement does and does not occur.

Table 2.1 below gives the resolutions for good and best practices for scanning typical paper photographs and other reflective materials such as tintype photographs. These are photographs that are 10 inches or less on the longest side. The resolutions that will be used for different sizes of photographs are given in the table. When the longest size of a photograph is between the resolutions given in the table, an intermediate resolution can be calculated, or the higher resolution can be used. For example, using the good practice column, a photograph that is 5.5 inches on the longest side can be scanned at 600 ppi, which is the resolution for 5 inches.

The column for best practice in the table is particularly appropriate for important images with much detail such as photographs inside a store. Those wanting to minimize storage space and scanning time may use the good practices for less detailed images or when the original is not sharp.

Table 2.2 below gives the resolutions for good and best practices for negatives and slides, and for large paper photographs. For important high detail images with these types of originals, the safest practice is to make and compare images at different resolutions to be sure that detail is adequately captured.

Scanner Properties – File Types and Resolution

An archival master image should be made with the assumption that it will be used for many purposes and that the original item may not be available in the future. Archival images should be of sufficient quality for virtually any use, as well as in a format that will be reliably accessible at least 50 years in the future. This approach would suggest that digitized images be of the highest quality and resolution. Following are best-case and good-case scenarios, developed with a mind to limits on computer storage capacity.

Best practice is to save archive master images in uncompressed TIFF format. High quality JPEG can also be used if the image is from a camera that does not produce TIFF or if storage space is limited.

Good practice is to use the default sRGB colour space for colour images and use whatever is the default colour space for grayscale images. Best practice is to use Adobe sRGB (1998) colour space for colour images and Grayscale Gamma 2.2 for grayscale images, and to carefully manage working colour space on all equipment and software.

The automatic default image adjustments for scanners should be turned off or modified for archival scanning. Special handling of tone and colour adjustments is needed for historical projects.

Good practice is to digitize typical photographs at 3000 pixels on the longest side. Best practice is 4000 pixels on the longest side. The best practice is recommended for images with much detail such as aerial photographs or photographs inside a store. Greater resolution than these may be appropriate for large originals, particularly for negatives. The default display size of the master image should match the size of the original item.

At the same time, it is important to note that images stored at these high levels of resolution take up considerable computer storage space. It is recommended that external storage be considered, and that lower resolution images (for example 500 pixels on the longest side, a common standard for internet use) be maintained on a primary computer.

As noted above, the standard format for archiving master images is uncompressed TIFF. It is virtually certain that TIFF files will be universally accessible for more than 50 years in the future. TIFF is a lossless format that does not involve any degradation of the quality of the image. These files have a file name extension of .tif on a Windows computer.

The JPEG format may be appropriate for master images in certain situations. However, the JPEG format compresses the image and produces slight degradation each time the image is modified and re-compressed. Repeated editing of an image can cause significant degradation with JPEG.

The PDF format is increasingly used to share and store electronic documents, but the best practices documents recommend TIFF or JPEG for master images from scanners. Typically, PDF files from scanning are basically images in compressed formats with parameters that are not easily understood or controlled. Documents archived as TIFF or JPEG files are much more reliably understood and controlled, and more easily adjusted or enhanced later.

Scanner Properties – Grayscale and Colour

Scanners usually have three possible modes for handling colour in images: colour, grayscale, and black and white. *Grayscale* refers to the typical black and white photographs that have continuous shades of gray between the extremes of black and white. On scanners, *black and white mode* usually refers to images that have only pure black or pure white with no shades of gray. In theory black and white mode can be used for things like typing on white paper.

There are a few cases that require some judgment in deciding whether to use grayscale or colour. One case is when a black and white photograph or document that would normally be scanned as grayscale has damage that has colour. Typical situations are brown or yellow spots or stains. In these cases, scanning in colour makes the damage easier to recognize and much easier to correct later if desired. Another case is sepia photographs that are basically black and white photographs with a brown tint. Scanning these as grayscale will not lose content, but scanning in colour more accurately represents the original state of the photograph.

Grayscale images are usually used when appropriate because the computer file size for a TIFF grayscale image is one-third the size of the same image in colour. Writers sometimes recommend that images be scanned in colour and then converted to grayscale utilizing image-editing software such as Photoshop. This provides more sophisticated options for the conversion and is usually recommended for artistic creativity. However, for historical items, the originals are monotone (grayscale or tinted grayscale) and the conversion during scanning produces good results. If more sophisticated methods for conversion to grayscale are needed for a historical image, the master image would be best kept in colour.

Table 2.1 Spatial Resolutions for Good and Best Scanning Practices for Typical Paper and other Reflective Photographs

Type of Original ¹	Good Practice ²	Best Practice
Paper and other reflective photographs 10 inches or less on the longest side of the actual image	3000 pixels on the longest side Long Side - Resolution 2 inches - 1500 ppi 3 inches - 1000 ppi 4 inches - 750 ppi 5 inches - 600 ppi 6 inches - 500 ppi 7 inches - 430 ppi 8 inches - 375 ppi 10 inches - 300 ppi	4000 pixels on the longest side Long Side - Resolution 2 inches - 2000 ppi 3 inches - 1335 ppi 4 inches - 1000 ppi 5 inches - 800 ppi 6 inches - 670 ppi 7 inches - 575 ppi 8 inches - 500 ppi 10 inches - 400 ppi Minimum resolutions of 600 to 800 ppi are appropriate for sharp, high detail images such as aerial photographs.

¹ The sizes of the originals are based on the actual image dimensions excluding any borders and mounts.

² The column for best practices is particularly appropriate for important images with much detail such as aerial photographs or photographs of merchandise in a store. The good practices may be appropriate for simpler images or when the original is not sharp.

Table 2.2 Spatial Resolutions for Good and Best Scanning Practices for Negatives, Slides, and Large Paper Photographs

Type of Original ¹	Good Practice ²	Best Practice
35 mm film or smaller. 35 mm negatives are about 1.4 inches on the longest side and slides about 1.3 inches.	3000 pixels on the longest side <u>Long Side - Resolution</u> 1.3 inches - 2300 ppi 1.4 inches - 2150 ppi	4000 pixels on the longest side <u>Long Side - Resolution</u> 1.3 inches - 3000 ppi 1.4 inches - 2860 ppi
Medium format negatives about 2.2 inches on one side. The other dimension may be about 2.2 inches, 3.3 inches, 4.2 inches, or some other length.	At least 3000 pixels on the longest side and at least 1000 ppi ³ <u>Long Side - Resolution</u> 2.2 inches - 1370 ppi 3.3 inches - 1000 ppi 4.2 inches - 1000 ppi	At least 4000 pixels on the longest side and at least 1200 ppi ³ <u>Long Side - Resolution</u> 2.2 inches - 1820 ppi 3.3 inches - 1215 ppi 4.2 inches - 1200 ppi
Large format film, 4 x 5 inches to 8 x 10 inches.	3000 pixels on the longest side <u>Long Side - Resolution</u> 5 inches - 600 ppi 7 inches - 430 ppi	6000 pixels on the longest side <u>Long Side - Resolution</u> 5 inches - 1200 ppi 7 inches - 860 ppi Greater resolutions may be useful for high detail images.
Large format film – 8 x 10 inches or larger	3000 pixels on the longest side <u>Long Side - Resolution</u> 10 inches - 300 ppi	8000 pixels on the longest side <u>Long Side - Resolution</u> 10 inches - 800 ppi Greater resolutions may be useful for high detail images.
Paper photographs 14 inches or less, but greater than 10 inches on the longest side	3000 pixels on the longest side <u>Long Side - Resolution</u> 14 inches - 215 ppi	6000 pixels on the longest side <u>Long Side - Resolution</u> 14 inches - 430 ppi
Paper photographs greater than 14 inches on the longest side	3000 pixels on the longest side <u>Long Side - Resolution</u> 16 inches - 190 ppi 20 inches - 150 ppi 24 inches - 125 ppi	8000 pixels on the longest side <u>Long Side - Resolution</u> 16 inches - 500 ppi 20 inches - 400 ppi 24 inches - 335 ppi

¹ The sizes of the originals are based on the actual image dimensions excluding any borders and mounts.

² The column for best practices is particularly appropriate for important images with much detail such as aerial photographs or photographs of merchandise in a store. The good practices may be appropriate for simpler images or when the original is not sharp.

³ Minimum ppi is specified for medium format negatives because the long length relative to width for some of these films produce results that are not optimal with a simple specification of pixels on the longest side. The ppi criteria were set based on my experience with different resolutions for relatively high detail images.