# Wisconsin Heritage Online
# Digital Imaging Guidelines

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# INTRODUCTION

## Purpose

The purpose of this document is to assist Wisconsin Heritage Online Content Contributors in the creation of digital representations of their collections.  This guide was prepared in light of general principles specified in *A Framework of Guidance for Building Good Digital Collections* *(http://www.framework.niso.org)*.  The document provides a set of scanning and image processing guidelines for digitization projects that can be undertaken in-house by participating organizations.  These guidelines are not intended to be used as the standard for digital imaging, but rather as a set of flexible recommendations for image capture, enhancement, presentation, and storage. As indicated in *A Framework of Guidance for Building Good Digital Collections* *(http://www.framework.niso.org)*, there are no absolute rules for creating good digital collections. Inherent or unique characteristics of source materials often require different approaches to the digitization process and should be considered on a case-by-case basis.

## Scope

This document focuses on tasks and specifications necessary to produce digital images for immediate use and high quality archiving. It provides recommendations for digitizing two-dimensional non-digital formats, such as handwritten manuscripts, typescript works on paper, bound volumes, photographic prints, slides, glass plate or film negatives. This document does not provide guidelines for audio, video, or three-dimensional artifacts at this time. Original source collections differ widely in their types of material, audience, and institutional purpose; therefore, specific practices may vary from institution to institution as well as for different collections within a single institution.

## General Principles
*A reminder:  If you encounter unfamiliar terms in this document you may consult the Glossary.*

Image capture and delivery capabilities are changing very rapidly. This document includes guidelines that we think are fairly universal and assume an approach that is not dependent on use. We will use the phrase "use-neutral" in this document.These guidelines are based on the following general principles:
- To create digital objects that are accessible and interoperable across platforms and devices
- To ensure a consistent, high level of image quality across collections and institutions
- To create digital objects that support both intended current uses and potential future uses by:
    - Building a repository of digital master files to facilitate reprocessing and the maintenance of digital collections over time
    - Providing derivative access files for current use

The use-neutral approach to digitization ensures support for both current and future use. It implies that an image is digitized once and at the highest level of quality affordable to meet the needs of a variety of future uses. The goal of this approach is to create high-quality digital master files and avoid rescanning in the future. For more information on the use-neutral approach see Colet's "Planning an Imaging Project" *(http://www.diglib.org/pubs/dlf091/dlf091.htm#visguide1)* in *Guides to Quality in Visual Resource Imaging*. The use-neutral approach includes the notion of digital master files and derivatives.

### *Digital Masters*

Digital master files are created as a direct result of the image capture process either through scanning or photographing with a digital camera. The digital master files should represent as accurately as possible the visual information of the original material. General recommendations for digital master file creation include:

- Scanning at the highest quality affordable
- Lossless compression
- Non-proprietary formats, such as TIFF or JPEG2000

Because the process of creating digital masters usually results in large file sizes, digital masters are not used for online display. Their primary function is to serve as a long-term archival file and a source for derivative files. Digital masters, also referred to as archival master files, are stored in a digital repository that requires a long-term preservation policy and a strategy for identification, storage, backup, and migration to new media.

Digital masters are NOT intended to serve as preservation files to replace original objects. Although digitization can reduce handling of original items, it is not considered a preservation strategy.

### *Derivative Images*

Derivative files are created from digital master files for specific uses including access to images for online delivery and creation of high-quality prints. Lossy compression techniques, such as JPEG, can be applied to derivative files to reduce file size. Derivative files serve specific, immediate use and must not be used for archiving purposes.

# PLANNING

Several issues need to be addressed in the planning phase to ensure the success of a digitization project.  The selection and configuration of appropriate hardware and software is an important part of the planning process.  The overall assessment of the original source collections influences the selection of scanning equipment and has implications for storage and preservation of digital masters.  Other issues, such as establishing a file naming convention, assist project managers in organizing and archiving digital objects.

## Assessment of the Source Collection

The physical characteristics of the source items need to be evaluated in order to determine the scanning method and select the most appropriate equipment.  The medium, format, and size are the primary factors affecting the equipment selection.  Original source collections need to be evaluated with respect to:

- Number of images to capture
- Size of the original items
- Format and medium – reflective material (print) vs. transparent (film)
- Condition and unique characteristics of the original items
- Requirements for handling fragile originals

## Original versus Intermediate

In addition to the above considerations, the decision must be made whether to digitize from an original or from an intermediary, assuming both are available.  For example, in some cases cultural heritage institutions hold both original negatives and photographic prints in their collections. In general, it is best to digitize from the most original source, because every generation of photographic copying involves some quality loss. There are, however, some exceptions to this rule, especially in cases where there are substantial differences between the negative and the print. In some cases, photographic prints have been custom made, and scans from these derivatives will surpass a straightforward scan from an original negative.  The negatives also can be in poor condition due to deterioration.  In such situations, scanning from an intermediate is a better solution. For more discussion on this issue check Frey's "Measuring Quality of Digital Masters" *(http://www.diglib.org/pubs/dlf091/dlf091.htm#visguide4)* in *Guides to Quality in Visual Resource Imaging*.

## File Naming Conventions

File names for digital masters and derivatives need to be established before the scanning process. Systematic file naming helps not only to manage the project, but also ensures system compatibility and interoperability.  It is generally recommended to assign an eight-character file name and a three-character extension, e.g. aa000001.xxx.  This is sometimes called 8.3.  File names should adhere to some general requirements.  They should be:

- Unique and consistent
- Alphanumeric (consist of only letters and numbers)
- Lowercase

- Free of spaces and tabs
- Numbered sequentially using leading zeroes (i.e. 001, 002, 003, not 1, 2, 3)

The files can be named after an original source collection or per project, depending on the needs of the local institution. Up to four letters can represent the project abbreviation or original collection name, e.g. **hf** for Harrison Forman Collection or **sccl** for Shawano City-County Library. The remaining digits indicate a unique file number. This is often simply sequential numbers prefaced with leading zeros. For example, digital images from the Harrison Forman collection project are named hf000001, hf000002, etc.

It is recommended that the same file naming convention be maintained for digital masters and their derivatives. Derivatives can be indicated by adding a letter "l" to large access files and a letter "t" to thumbnails. Using the example of the Harrison Forman Collection, digital masters will be named hf000001.tif, hf000002.tif, and derivative images created from these masters will be named as follows: hf000001l.jpg, hf000002l.jpg for large access images, hf000001t.jpg, hf000002t.jpg for thumbnails.

## Archival Storage of Digital Masters

Digital master files need to be carefully stored and preserved over time. Storage of digital master files must be addressed in the planning phase because digital images take up a large amount of space. It is important to provide sufficient space on the computer or local network to manage the project. Once the files are processed and access images are created for online delivery, digital master files need not be stored on the local network. Depending on the budget and local institutional policies, digital masters can be stored on dedicated remote servers or offline media, such as CDs, RAID devices, or magnetic tape. The current practice varies among the Wisconsin cultural heritage institutions. It is important to develop a preservation policy that addresses the issues of file identification, backup, and migration to new media. Consult the *[Preservation Recommendations](#)* prepared by the WHO Preservation Working Group for recommendations on preservation strategies for digital master files.

# HARDWARE

## Computers

Critical to the success of any digitization initiative is the purchase of a computer with a balance of reliable components, speed and storage that will increase productivity and overall effectiveness. When planning the purchase of computer hardware consider the following general principles:

- Purchase a computer dedicated solely to digitization initiatives.
- Purchase as much Random Access Memory (RAM) as your budget allows. More memory allows the computer to more quickly process large amounts of image data.
- Purchase computers with processors optimized for image manipulation.
- Purchase computers that support high-speed data input through serial connections: USB 2.0 or IEEE 1394 "Firewire."

## Monitors

The investment in a large display monitor (19" – 21" viewable) will increase the productivity of your project by providing more "screen real estate" to view and evaluate images. Each type, size, and quality of monitor can interpret and display colors and tonal values differently. Without careful and frequent color calibration, project managers should exercise caution when adjusting and manipulating images since you may be introducing color and tonal biases of your equipment into your images. Even with careful calibration there is no guarantee that images will appear the same on other computers, particularly when delivered across the Internet to a wide variety of end-users.

### *Monitor calibration*
Computer monitors must be calibrated and profiled before they can be part of a professional workflow. Monitors should be profiled with software or hardware.  The software solution, although considerably less expensive, is not as accurate as various hardware calibration methods. On a Windows machine, the Adobe Gamma utility *(http://www.adobe.com/support/techdocs/321608.html)* installed with Adobe Photoshop, and located in the Control Panel, can be used to calibrate the monitor. For Macintosh users, the monitor can be calibrated using the calibrate button in System Preferences/Displays.

A gamma of 2.2 for both Macintosh and Windows, with a color temperature between 5000K and 6500K is standard. Usually, 6000K or 6500K will offer the closest match to actual print output viewed under daylight. Tests show that all monitors give smoother gradations, with less chance of banding or posterization, at gamma 2.2.

Hardware-based monitor calibrators provide far more accurate and repeatable results.  Accurate monitor calibration requires a hardware device, such as the X-Rite i1Display *(http://www.xrite.com/product_overview.aspx?ID=788)* or the Datacolor Spyder *(http://spyder.datacolor.com/product-mc-s2e.php)*.

# Scanning Equipment

The selection of a scanner will have the greatest impact on image quality for the majority of digitization projects. Recent developments have increased the challenges in selecting a quality scanner by increasing variety and availability while reducing the costs of equipment. Which scanner is right for your project depends on numerous factors including overall project goals and the format, size, and condition of materials to be scanned as well as available budget.

It is impossible for this document to review all types and brands of scanners; therefore, these guidelines are kept very general. For more information, consult the WHO resources wiki *(https://wiheritage.pbworks.com)* and the archives of listservs such as imagelib *(http://elearn.arizona.edu/imagelib).*

### *Flatbed scanners*
Flatbed scanners are suitable for single leaf text documents and most photographic prints, provided the material does not exceed the scanner's maximum imaging area. Large format flatbed scanners and sheet-fed scanners can capture single leaf oversized materials. Sheet-fed scanners should never be used for fragile or rare materials.

### *Digital cameras*
Together with book stands and weights, digital cameras provide versatile options for image capture of bound volumes, oversize formats, and rare materials. Digital cameras with sufficient resolution, and appropriate lighting, filters, and a set of lenses, however, are more expensive and more difficult to operate.

### *Film scanners*
Digitization of transparent media, such as 35mm slides and film negatives, benefits from using dedicated film and slide scanners. Some flatbed scanners include transparency adapters, but their resolution and dynamic range is limited in comparison to film scanners. Dedicated film scanners offer higher resolution, appropriate for small size of the original transparent material. They also enable scanning without glass. Glass attracts dust which becomes very visible at high resolutions.

## Technical Factors

Several technical factors will also influence the selection of a scanner including available optical resolution, bit depth, size of scan area, speed, connectivity, and ability to handle different formats and materials in your collection. We will examine optical resolution and bit depth in more depth.

### *Optical resolution*
Most scanners use a grid-like array of light sensors that translate light into the 1s and 0s of your digital image. The number of sensors in the array determines the optical resolution of a particular device. The optical resolution is normally expressed in scanner specifications as "pixels per inch" (ppi) or "dots per inch" (dpi). Dots per inch actually refers to *printer* resolution. The optical resolution of any equipment you purchase should exceed the maximum resolution needed to accurately capture the types of material in your collections. For example, a flatbed scanner with an optical resolution of 1200 dpi has sufficient optical resolution to scan an 8x10" print at 600 dpi, but insufficient optical resolution to scan a 2x2 slide at 4000 dpi.

Many models of scanners are advertised with very high resolutions that represent the interpolated resolution. To increase the resolution the equipment uses a mathematical algorithm to "guess"

what color and light values exist in the spaces that the light sensors can't see. Make sure to select equipment based on its optical resolution and not the interpolated resolution since scanners with adequate optical resolution will produce more accurate scans.

Scanner specifications often include the size of the array (i.e. 1600 x 3200). The first value indicates the optical resolution of the array and the second value represents the capacity of the array to capture information as it moves across the scan area (how much distance the array moves before taking another sample). If the second number is smaller than the first number the samples are interpolated. For most professional-quality scanners the second value will be higher than the first.

### *Bit depth*
The greater the bit depth, the more information about the source is captured by the array, resulting in a more accurate digital representation of the original. A bit depth of 8 can capture enough information to represent 256 colors or shades of grey. A bit depth of 24 (8 bit channel Red + 8 bit channel Green + 8 bit channel Blue = 24 bits) captures over 16 million colors or shades of grey. Since higher bit depths capture more information they increase the overall file size of an image.

Scanners generally sample at a higher bit depth and sample down to a lower bit depth for final output. Sampling at a higher bit depth aids in reducing noise, extends the possible tonal range of the image, and allows the scanner to capture a larger density range without loss of detail. Many scanner models available at this writing have bit depths between 36 and 48 bits and output a 24-bit image. As with resolution, any equipment that you purchase should meet or exceed the bit depth required by the types of materials being digitized.

# IMAGE CAPTURE GUIDELINES

*The examples and screen shots used in these guidelines have been prepared using Adobe Photoshop. Your image editing software may not use exactly the same steps or words, but most have the same functionality.*

## Photoshop Configurations

The digital master should represent as accurately as possible the visual information contained in the original object. Before doing any image editing, check the Color Settings menu (*Figure 1*) and verify that Working Space and Color Management Policies are correct according to these guidelines or to specific instructions you have received from a Project Manager. The Color Settings dialog may be under the Edit or Photoshop menus, depending on the software version.
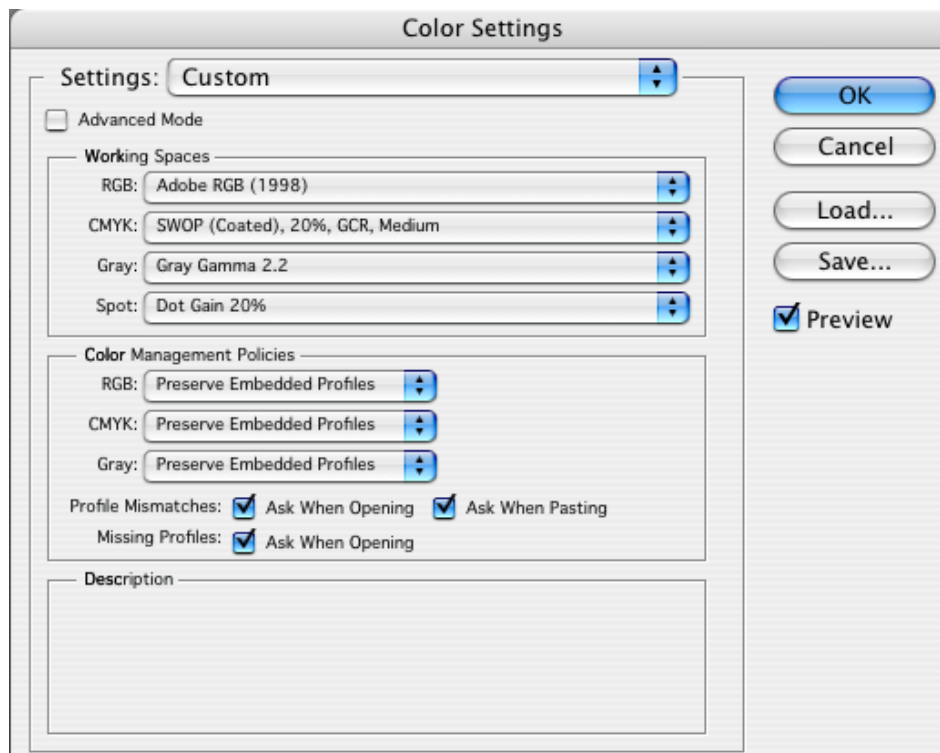


*Figure 1.* Color Settings in Photoshop

*Choose a wide gamut*
Use a wide-gamut RGB color space for capturing and editing RGB master files. Scanning software allows a choice of color space for the resulting files. A wide-gamut space for print (such as Adobe RGB) and the smaller sRGB color space for web are the standards. sRGB is the default color space of Windows XP, Web browsers, numerous image browsers, image editors and other software on the Windows platform. If your camera doesn't include an option for choosing a color space, it's almost certainly sRGB. sRGB is a small gamut color space and you will shortchange your images where a wider gamut is supported. **Use Adobe RGB, not sRGB.**

*Embedded profiles*
All digital files should have embedded profiles (should be "tagged"), unless otherwise noted. Photoshop's Color Management should be set to "always preserve embedded profiles," and the "ask when opening" boxes should be checked to alert you to profile mismatches and missing profiles. When profile mismatches occur, you should elect to preserve the embedded profile.


## Scanner Configuration

*Your scanner software may operate differently.  Check your manual.*

A scanner should be profiled for maximum color accuracy (*Figure 2*). Devices and software such as the MatchRite iVue from x-rite *(http://www.xrite.com/product_overview.aspx?ID=1162&source=homepage&AdId=402)* are capable of producing excellent scanner profiles. This profile should be attributed in the ColorSync/Source dropdown with the Target color space Adobe RGB. If you choose not to profile your scanner select No Color Correction.
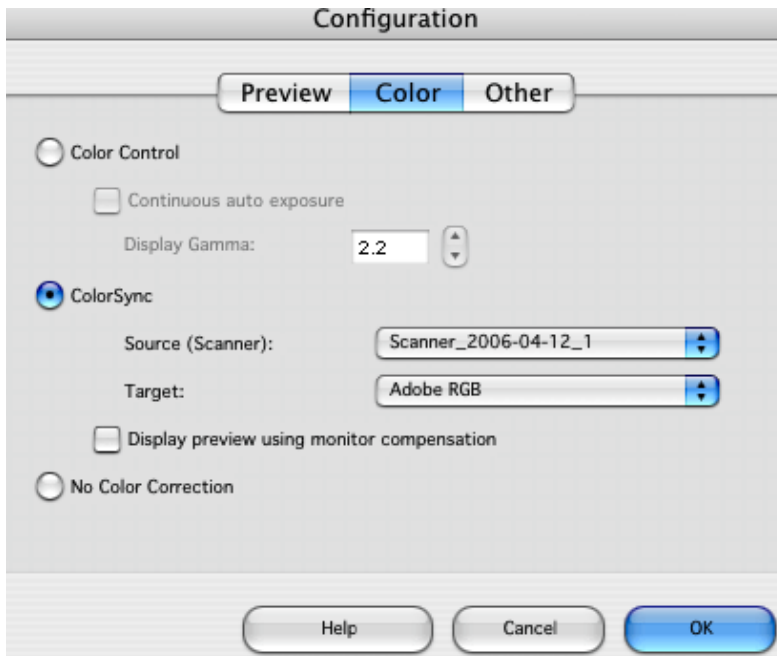


*Figure 2.* Adobe RGB


*Use standard targets*
A reasonably well-calibrated grayscale target should be used for measuring and adjusting the capture metric of a scanner or digital camera. For capturing reflective copy, we recommend that a standard target consisting of grayscale, centimeter scale (useful for end users to make sure that they are printing or displaying an image at the right size), and standard color patches be included along one edge of every image captured, to provide an internal reference within the image for linear scale and capture metric information. Kodak makes a set consisting of grayscale (with approximate densities), color patches, and linear scale which is available in two sizes: 8 inches long (Q-13, CAT 152 7654) *(Figure 3)* and 14 inches long (Q14, CAT 152 7662). An excellent grayscale target, consisting of a neutral black, midtone, and highlight patches, is available from

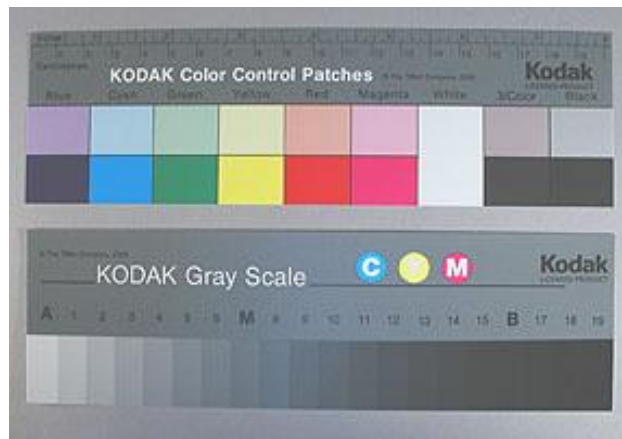QPCard *(http://www.qpcard.se/) (Figure 4)*.  See *Figure 6*, an illustration of a scanned image with targets.



*Figure 3.* Kodak Color Grayscale, Q-13 (from *Film Tools*, *http://www.filmtools.com/kodcolsepgui.html*)



*Figure 4.*  QP Card (from *QPCard*, *http://www.qpcard.se/*)

***Scan preparation***
The scanning hardware and software must be configured to ensure optimal image capture and image processing. Digital files should be evaluated by reviewing the image's histogram, which illustrates how pixels in an image are distributed by graphing the number of pixels at each color intensity level rather than by relying on how the image looks on a monitor. In a histogram, each pixel in an image file is assigned a numeric value between 0 and 255, with 0 representing black and 255 representing white. Do NOT use the default automatic settings when scanning, which will set the lightest area to 255 and the darkest area to a value of 0. This eliminates information in the highlights and shadow areas.

- Clean the scanner bed (the glass).

- Place the image and calibration chart on the scanner.
- Prescan.
- Fit the marquee (box) around the image and the calibration chart. Do not include the background color at this point to avoid reading a large white or black background value.
- Select the Histogram function.
- Adjust the levels by moving the sliders to each end point of the histogram (*Figure 5*). This sets the highlights and the shadows of the scan. It is a redistribution of the pixels, which can improve the image quality.
  - Do not move the left-hand and right sliders into the histogram. This will cause 'clipping', which takes pixels away, and is therefore a deterioration of the scan. You risk losing valuable digital information in your highlights and shadows.
- The left-hand slider moves to the black point. The right-hand slider moves to the white point. Moving the middle slider to the right makes the mid-range lighter, and moving it to the left makes the mid-range darker.
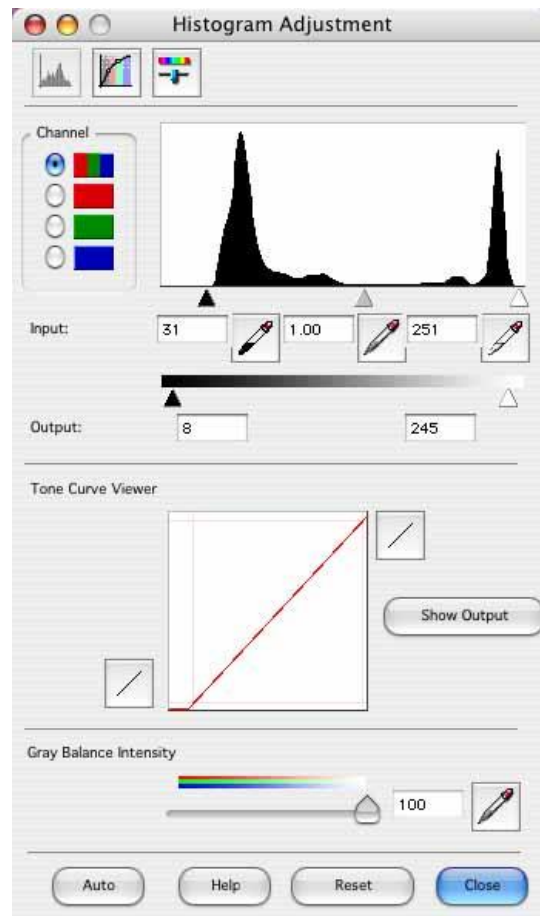


*Figure 5.* Setting the Histogram in the Scanning Interface

### Scan the image
- Before scanning, set resolution in scanning software according to Minimum Specifications and Resolution Chart (see below).
- Scan the image.

- Verify file size according to Minimum Specifications and Resolution Chart.
- Save two copies of the scan. One will serve as the archival master file. The other is the service master, which can be enhanced and used for web delivery. See Guidelines for Creating Digital Master Files and Image Enhancement Processes for more about working with archival masters and service masters.
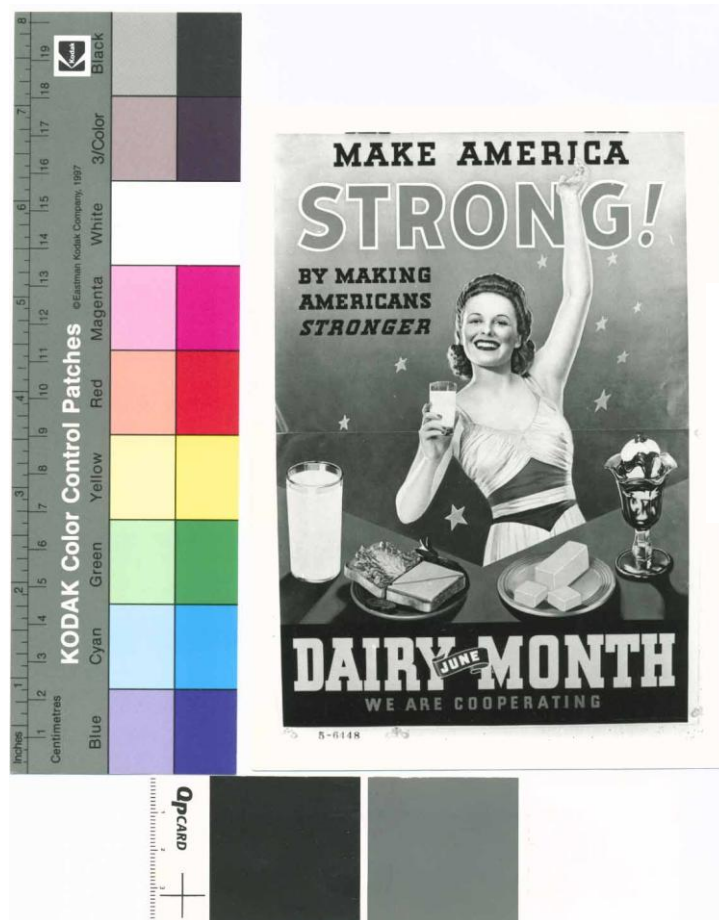


*Figure 6.* Scanned poster with calibration charts.

# SCANNING GUIDELINES

## Minimum Specifications and Resolution Chart

| Original material | Scanning resolution | Bit depth | Approximate scanned dimensions | Approx. size of preview image |
|---|---|---|---|---|
| *Photographs* | | | | |
| 16" x 20" + | 200 ppi | 24-bit color | 6400 x 8000 pixels | 146 MB |
| 8 ½" x 11"–16" x 20" | 300 ppi | 24-bit color | 3200 x 4000 pixels | 36 MB |
| 8" x 10" | 400 ppi | 24-bit color | 3200 x 4000 pixels | 36 MB |
| 5" x 7" | 625 ppi | 24-bit color | 3200 x 4000 pixels | 36 MB |
| 4" x 5" | 800 ppi | 24-bit color | 3200 x 4000 pixels | 36 MB |
| 4" x 2 ½" | 1200 ppi | 24-bit color | 3200 x 4000 pixels | 36 MB |
| *Text* | | | | |
| Print—no images | 600 ppi | 1-bit bitonal | Varies | Varies |
| Print—with images | 300 ppi | 8-bit grayscale or 24-bit color | Varies | Varies |
| Manuscript | 400 ppi | 8-bit grayscale or 24-bit color | Varies | Varies |

*Scanning notes*
- Save all scans as TIFFs with NO compression.
- Preview scanned image before adding calibration chart to see if pixel dimensions and file size are within recommended ranges. Then open up scanning selection to include calibration chart.
- If you wish to reduce file size, you can convert from color to grayscale or from grayscale to bitonal after scanning.

*Scanning chart rationale*
Scans that meet these recommendations will produce a print of reasonable quality up to 20" x 24" and should be sufficient for most publishing requirements. However, they are NOT intended to serve as preservation files to replace the original material.

## Scanning modes

Should digital files be created in RGB or grayscale? To some extent the answer depends on the characteristics of the original object and the information it contains.

### *Photographic prints and negatives*
Most photographic images considered to be black and white actually are not truly neutral in value. Because scanning in greater bit depth creates larger files, each institution must weigh the value of the information contained in the image versus the increased file size. Generally, black and white prints and negatives will benefit considerably from scanning in RGB. If storage of these files is an issue, they may be converted to grayscale after scanning.

### *Text*
When scanning a book that has a lot of photographs, it may be preferable to scan the pages as grayscale or color, including the pages without images. In this manner, it is possible to retain the texture of the paper and type.

When working with bi-tonal (black and white) source material, in some cases, more detail can be captured by scanning text first in grayscale, and then converting to bi-tonal.

To convert to bi-tonal in Photoshop (*Figures 7a & 7b*):
- Have your screen resolution set to 100%.
- Go to Image / Adjustments / Threshold.
- Decide on the best place to set the threshold point. Do not drop out portions of letters or fill in letters. Setting the threshold point determines at what point gray pixels get changed to white vs. at what point they get converted to black. *(Figure 7a)*
- Change the mode to bi-tonal.
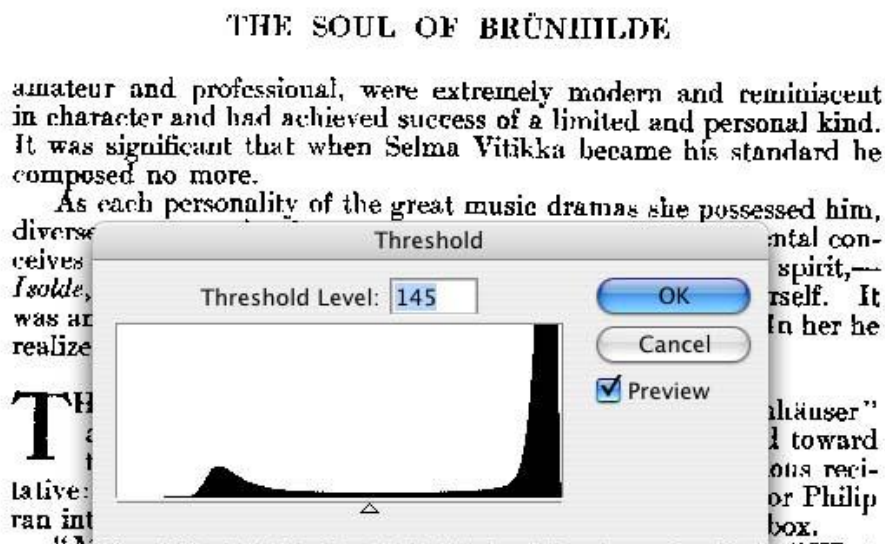- Be sure that the output resolution matches the input resolution (the resolution of the scan). *(Figure 7b)*
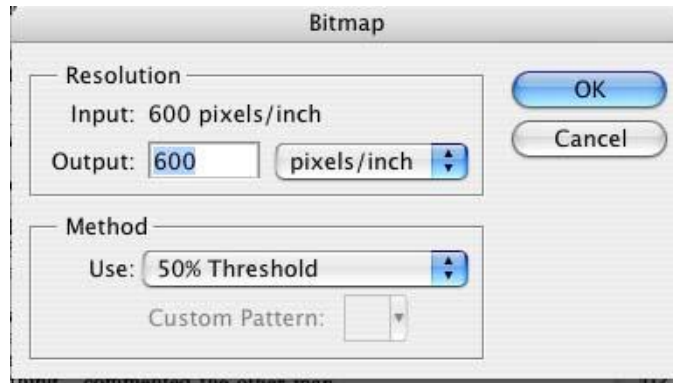


*Figure 7a* Photoshop Thresholding

*Figure 7b.* Photoshop Thresholding

# GUIDELINES FOR CREATING DIGITAL MASTER FILES

## Minimum Requirements

When non-digital materials are converted to digital through a scanning process, the files created as a direct result of image capture are digital masters.  The digital master file should represent as accurately and faithfully as possible the visual information in the original object.  If a digitization project is undertaken with use-neutral approach, digital masters should adhere to minimum requirements in order to constitute a digital repository and meet future needs.  The goal of this approach is to create files that can persist over time.  These files are often referred to as archival master files.  The following minimum requirements are recommended *(Figure 8)*:

- Save in non-proprietary format, such as Tagged Image File Format (TIFF)
- Save as an uncompressed file
- Use IBM PC encoding byte order[1]
- Use color rather than grayscale when color is an integral part of the original object
- Do not save any enhancements in an archival copy (see Image Enhancement Processes).
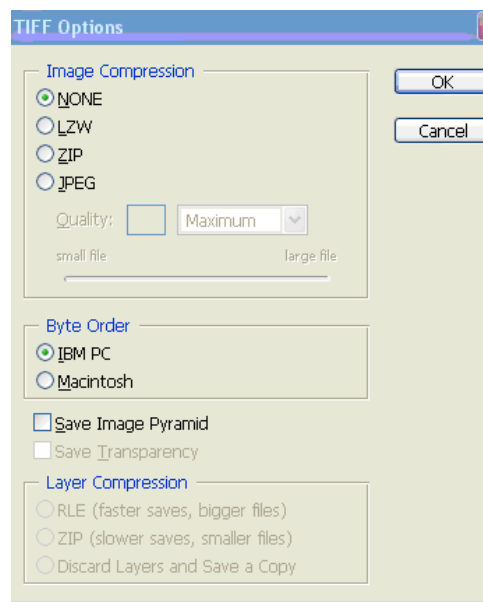- Use 8.3 file naming convention (See File Naming Conventions)



*Figure 8.*  Creating Digital Master Files

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[1] Processors can number the bytes within an image to make the byte with the lowest number either the leftmost or the rightmost one.  The convention used by a machine is its byte order.  Photoshop can read files using either Mac or PC byte order.  IBM PC is selected because it is assumed that more users will be reading files on IBM-compatible personal computers.

## File Formats

### *TIFF*
Digital master files should be saved in TIFF (Tagged Image File Format) file format, and should not be compressed, altered, or resized. Uncompressed TIFF retains all of the original image detail. TIFF is the most commonly used format for storing digital masters at this time. For more information on this issue, see Frey's "[File Formats for Digital Masters](http://www.diglib.org/pubs/dlf091/dlf091.htm#visguide5)" (*http://www.diglib.org/pubs/dlf091/dlf091.htm#visguide5*) in *Guides to Quality in Visual Resource Imaging*.

### *JPEG*
JPEG is the most common format for viewing images on the Web, but it is NOT recommended for digital masters. JPEG uses lossy compression, which means that significant amounts of image detail and information are lost during the compression process. JPEG format can be used for saving derivative images for web delivery.

### *JPEG2000*
JPEG2000 is a new international standard that is often used for access images in large formats. Some institutions are also beginning to use JPEG2000 as a format for archiving digital masters.

# IMAGE ENHANCEMENT PROCESSES

## Introduction

Digital images should reflect the characteristics of the original. Artifacts introduced by the scanning process as well as tears, scratches, dust marks, ink spots, and other defects can be corrected to improve the quality of the image. It is recommended, however, that an original scan (the digital master) be saved intact, without any changes. The enhanced image should be saved as a separate file. These enhanced copies are often called **service master** files or working files and serve as a source for derivative files. They are saved, like archival digital master files, as uncompressed TIFF files. They can be saved with a similar or corresponding file name as archival masters. Save service masters in a separate directory from the archival masters or use a suffix such as "s" in the name to denote "service copy."

Another approach is to keep both the archival master file and the service master file in the same file, but in separate layers. The file should be saved with the layers intact. This method retains an original scan that has had no enhancements made to it, as well as separate layers containing enhanced images. Both practices approximately double the amount of storage that is required.

***Make all image enhancements on the service master only, never on the archival digital master.*** Before starting any image enhancement, think about the entire project, and what adjustments you want to make. There are many judgment calls to be made at this point. Some steps, such as rotation and cropping, require minimum intervention, while others require more experience in image processing. It is recommended that you use separate adjustment layers for every step in the image enhancement process. *Do not rotate and crop the archival master. Leave the calibration (grayscale) target on the archival master.*

## Minimum Enhancements

*Rotation and cropping*
- Rotate image to the correct orientation.
- Crop the image in one of two ways:
    o Leave a border (1/4"-3/8") around the image to show the edge of the object (*Figure 9*).



*Figure 9.* Crop with Border

(Courtesy of UW-Madison Archive)

o Crop to the edge of the image. This method crops a slight amount of the image when there is not complete symmetry (*Figure 10*).



(Courtesy of UW-Madison Archive)

*Figure 10.* Crop without border

## Optional Enhancements

*The following techniques employ Adobe Photoshop.*

### Adjust levels

It is NOT recommended to use auto corrections to adjust the levels. This approach can degrade the quality of the scan. In addition, do NOT use Brightness/Contrast to adjust the image.

Instead, adjust the tonal range through **Levels**. This will improve the way the pixels are distributed across the range from black to white. The goal is to have the digital image look as similar to the original as possible. Move the sliders to each edge of the histogram (*Figure 11*). Moving the right-hand slider in to the edge of the histogram will make the image whiter or lighter. Moving the left-hand slider in to the edge of the histogram will make the image blacker or darker. Moving the midpoint slider to the left will lighten the midrange of the image, moving the slider to the right will darken the midrange. Experiment and look closely to see if more detail is revealed or taken away.
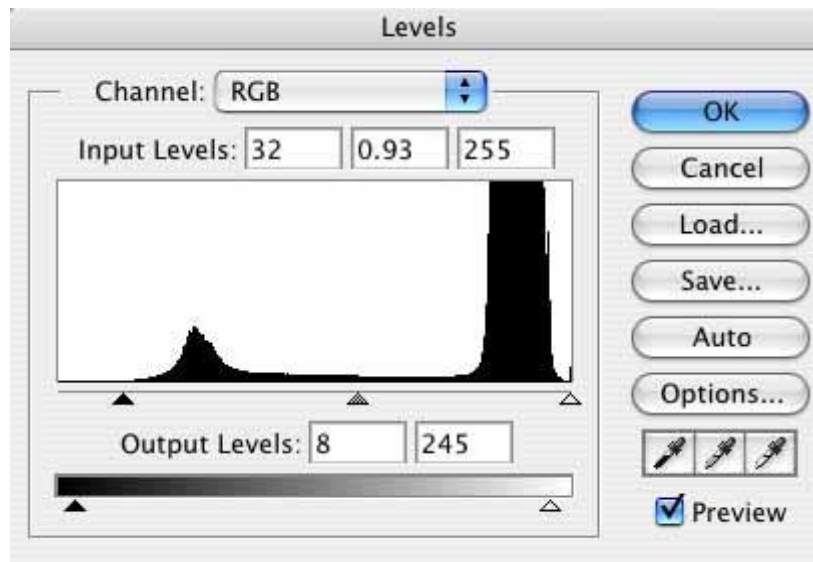
*Figure 11*.  Adjusting Levels

There is sometimes a decision to be made about having the image look as much like the original as possible, or improving the images.  For instance, a photo that is very gray without much contrast can be changed to have more contrast and more clarity of detail.

### *Adjust color balance*
Color correction is important for accurate representation of the archival original.

If you do want to do color correction, it can be done through Curves, Color balance or Levels. The color channels are adjusted separately.  First, take a reading of the whitest white and the blackest black on the image. You ask *how* to take a reading of the whitest white and blackest black?

Move the eyedropper tool to the calibration chart with the info palette opened (found under Window). Neutral values such as black, white, and grays should have equal values of red, green, and blue, i.e. the white value could read: red 245, green 245, blue, 245.

Go into each channel, and adjust these points (*Figure 12*).  For example, if the highlight in the Info Palette reads Red channel 230, Green channel 219, Blue channel 240, put these numbers into Input.  Always set Output value to 245.  This will neutralize the highlights.  Use a similar process with the midtones and shadows to achieve a neutralized grayscale.  This will improve the color balance.
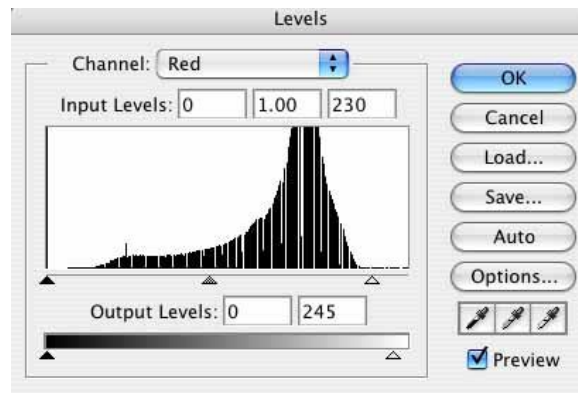
*Figure 12.* Adjusting Color Balance

There are many web resources on this subject, i.e. PhotoShop for Photographers
(*http://graphicssoft.about.com/gi/dynamic/offsite.htm?zi=1/XJ/Ya&sdn=graphicssoft&zu=http%
3A%2F%2Fepaperpress.com%2Fpscolor%2Findex.html*)

### *Sharpen*
If sharpening is done, it should be done last.  Digital capture softens the image, making it look
slightly less sharp than the original.  Tonal adjustments also cause some resampling.  The most
common correction for this is to select Filter/Sharpen/Unsharp Mask (*Figure 13*).  Have the
Preview option selected.  To evaluate the amount of sharpening to be used, zoom to 100 percent.
Look at the image in the preview window to see how the image looks without the sharpening.
Drag to different places in the preview window to see different parts of the image, and click + or -
to zoom in or out.

To sharpen do one of the following:
- Drag the Amount slider to increase the contrast of pixels.

- Drag the Radius slider to determine the number of pixels surrounding the edge
  pixels that affect the sharpening.  A lower value sharpens only the edge pixels, whereas a
  higher value sharpens a wider area of pixels.

- Drag the Threshold slider to determine how different the sharpened pixels must be from the
  surrounding area before they are considered edge pixels and sharpened by the filter.  The
  default value (0) sharpens all pixels in the image.

The amount of sharpening that you apply depends on the resolution of the scan.  Different
amounts of sharpening will be required if you are outputting to a web derivative or for a print.
Try to avoid a look that is over-sharpened.  The effect should be subtle, and result in a slightly
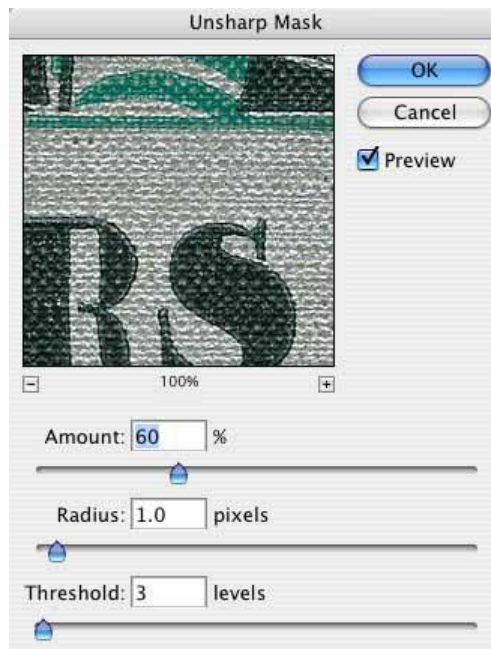clearer image.

*Figure 13.* Using Unsharp Mask

***Image quality***
There are no broadly accepted standards for image quality. Much of the outcome depends on a variety of factors, including equipment and visual subjectivity of the person working with and reviewing images. Establish the basic practices that you intend to use to assure quality of a given project. Take the time at the start of the project to look at the range of conditions in your project.

Then, as much as you are interested, research the topic on the web. There is in-depth information on every topic. You can learn more about digital imaging by working through Cornell University's Moving Theory into Practice: Digital Imaging Tutorial (*http://www.library.cornell.edu/preservation/tutorial/contents.html*).

# CREATING ACCESS FILES FOR WEB DELIVERY

Access images are derivative files created from digital master files for online presentation. They can be created from an archival copy or, if an image was enhanced, from a service master. See the discussion on page 20 for more information about service masters. Some content management systems, including CONTENTdm, generate these access files automatically.

## Access Files Chart

|  | Format | Longest dimension | Bit depth | Resolution | Compression | File Type Indicator (within file name) |
|---|---|---|---|---|---|---|
| Thumbnail | jpeg | Maximum 120 pixels (height) or 160 pixels (width) | 4-bit grayscale or 8-bit color | 72 ppi | High to medium | t |
| Large Access | jpeg | Maximum 1600 pixels (height or width) | 8-bit grayscale or 24-bit color | 72 ppi | High to medium | l |

### *Watermarking*

The Wisconsin Heritage Online Governing Board has established a policy that does not advocate watermarking and does not provide a technical solution or training for watermarking. However, WHO will not exclude watermarked collections.

## **Digitization and Scanning Glossary**