Title:	**Digital Processing Standards and Best Practices, University of Notre Dame, Hesburgh Libraries**
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Status of Document:	This is a Digital Standards Team recommendation.
Description of Document:	This best practices document recommends the implementation of a core set of standards for use in digital projects to be preserved in the digital repository at the University of Notre Dame Hesburgh Libraries. The document relates guidelines on the best way to obtain a digital derivative from an analog original item. The document describes the best color spaces, resolutions, cropping, naming conventions, quality control, technical information as well as preservation concerns for the collection. The document is modeled on the NISO Framework for Building Good Digital Collections and the Stanford University Libraries Digital Production Services Quality Assurance Guides.
Change Log:	

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Digital Processing Standards at a Glance

Rev. APP20130205

Color Space:

Always scan in Color in the Adobe RGB 1998 Colorspace.

Resolutions:

Photographs, medium and large format negatives, and glass lantern slides:

Bigger than 8x10: 800 dpi (Minimum recommended 400 dpi)
8x10 and smaller: 1000 dpi (Minimum recommended 600 dpi)

Text based materials:

Bigger than 8x10: 600 dpi (Minimum recommended 400 dpi)
8x10 and smaller: 800 dpi (Minimum recommended 400 dpi)

Small format negatives and slides (ex. 35mm):

2800 dpi

Maps:

600 dpi (Minimum recommended 300 dpi)

Formats:

Scanned Photographs and images (text, art, pamphlets etc.): Preservation: TIFF/JPEG2000 Display: TIFF, JPEG2000, JPEG

Audio: Preservation: WAVE, AIFF, Broadcast WAVE Display: WAVE, AIFF, Broadcast WAVE, MP3, MP4

Video: Preservation: MPEG4 (until a more sustainable format can be indentified) Display: MPEG4

Born Digital Text (word processing documents, spreadsheets etc.): Preservation: PDF, PDF/A, Original format (ex. Word Document)

Machine Readable Texts: Preservation: XML, DTD

Born Digital Images: Preservation: TIFF, Digital Negative, JPEG2000

Archival Collections:

Collection number_box number_file number_item number (MS1_01_01_001)(add a or b for front and back if needed)

Personal Papers:

Lastname and first initial_Journal or event_citation or date (DoeJ_ALAPoster_Midwinter 2012, DoeJ_JAMA_Vol1No1Pg100)

Lastname and first intitial_shortened title_date (DoeJ_DigitalStandards_20121108, DoeJ_DigitalStandards_201211, DoeJ_DigitalStandards_Fall2012)

Cataloged Items:

Use Aleph system numbers? with an e for electronic resource, e.g, e003356476

Crop:

Make items square and crop close to the edge but let the entire item be in view to show that nothing has been removed.

Square center image for uneven cut items and crop to outer edge of the paper still.

Crop book pages to opposite side of gutter to show the entire page.

Quality Control:

Review all materials to make sure they are accurate to the original and there is not any debris on the image. Check that all standards for project are met.

Storage:

Back up all files to external hard drives; do not rely on computer hard drive alone.

Scanning Sheet:

Document the process for technical, descriptive, and preservation metadata and future conservation of the item.

Digital Processing Standards Best Practices

REV APP20121108

These scanning guidelines are recommendations and should be followed for all projects. The goal is to have the digital copy look like an exact match to the original item. If a specific collection calls for a different set of guidelines to follow, please consult with the Digital Programs staff prior to scanning.

Preservation:

All digital projects should be completed to the preservation level whenever possible. The standards set in this guide will follow preservation guidelines. It is important to set high resolution to help capture all of the information in the image plus if the digital file starts to degrade the higher resolution will hopefully provide enough information to save the image with less loss. The higher resolution will also help the patron or researcher to see more information in the image and therefore identify more about the image, which helps preserve the history.

File formats should be a non-lossy format such as TIFF or WAVE. A JEPG is a compressed file that every time it is saved the file is compressed further by stripping away what the computer sees as extra information that is not needed. As a result over time the file will start to reduce in size and certain tones and colors will be less vibrant or clear. The files should be stored on a secure device and backed up to other devices preferably not in the same location. This will preserve the files incase there is a natural disaster, human error, or if equipment fails.

Cropping the images closely but still showing the entire item is important to help preserve the overall view of the item being digitized. It is important to prove that nothing has been cropped off of the original so that the patron or researcher knows that they are getting the entire item if they want it.

Scanning spreadsheets will help with capturing information used in preservation metadata. The metadata captured in the spreadsheet can provide a map showing each person that has altered or manipulated a file and for what reason. It will also provide technical information captured at the time of the scan so that it can be reviewed over time to see if there is any issues with the file. It will also allow for future review of materials scanned on specific equipment or at a specific computer if a problem arises that should be reviewed in previous files.

The color space should be set to Adobe RGB instead of the standard SRGB. SRGB is meant for screen use only so that the image will present well on screens but if printed it will not look nearly as crisp or clean. Adobe RGB has a wider color gamut so when the image is on screen or printed it will look equally as good. This is best to preserve the original look and feel of the item for patrons interested in digital and analog copies.

Quality control can help with the preservation process as well because it will guarantee that the digital copy is accurate and set to the required standards. The following guide will detail each step of the process.

The room where the scans are being produced should have the ambient light and temperature controlled as much as possible. The light should ideally be set at 6500 Kelvin which is the same color of light at noon on a clear and sunny day. The room should not have too many lights on and preferably be on the darker side so that accurate color representations can be captured. It is also best to avoid having the scanners near a window or in a room with multiple windows. The temperature and humidity should be controlled as well so that the items being scanned and the equipment have a lower chance for damage.

Assessment:

Items should be scanned from the best copy available and from the closest derivative to the first generation, if a first generation item is not available. The digital copy should be created at the set resolution for its size if possible for preservation purposes and to allow for the best opportunities for future changes and conversions. The item should be reviewed for the current condition noting the damage to the item, how fragile it is, what will it need to be digitized, how can we digitize the item, amount of time it will take to get a good digital copy, if the item has already been digitized and if so is it worth a rescan, and how will the item be displayed.

If an item or a whole collection requires stabilization, then the Preservation Department should be consulted to guarantee that items are not damaged or put at unnecessary risk during the digitization process. Items should be stabilized for scanning or imaging to obtain the best copy. If the stabilization method appears to be a problem for the best scan, then the Preservation Department should be consulted. An example of this would be an item that is encapsulated in mylar and as a result the mylar will create Newton rings across the image. (See Quality Control below for an example of Newton rings).

The items to be scanned should be organized properly so that they can be scanned in an appropriate order. It should be determined how the collection will be displayed so that the scans will match the display choices. For instance, if the collection has newsletters with articles it is important to decide if the whole newsletter will be put in or if each article will be extracted and displayed with reference to the original newsletter. In this circumstance it is still best to scan the entire newsletter to preserve the original formatting and style.

A scanning guide should be created for each collection describing the entire digital process that should be taken for the collection.

Preparation and Handling Materials:

During the assessment , an item's condition will be determined. Some collections may require certain guidelines such as wearing cloth gloves to protect items from the oil on your skin or certain protective measures such as cradles or supports. These guidelines should be followed at all times to ensure that the materials will be secure and prevent any further damage.

Scanner beds should be cleaned regularly to clear off dust and debris that can show up on the scans. Materials in Mylar covers should be removed under the guidance of Preservation staff to obtain the best digital copy possible. The Mylar cover can often leave reflections or other digital artifacts on the image that will cause the digital copy to look different from the original.

If the item has information on the front and back, both sides should be scanned to capture the entire piece. This is will be done for descriptive and preservation purposes more so than for viewing purposes, unless the information is vital to the item.

When scanning a book, blank pages should be included so that the book or publication can be shown in its entirety and so that a patron knows that nothing has been cropped or edited out.

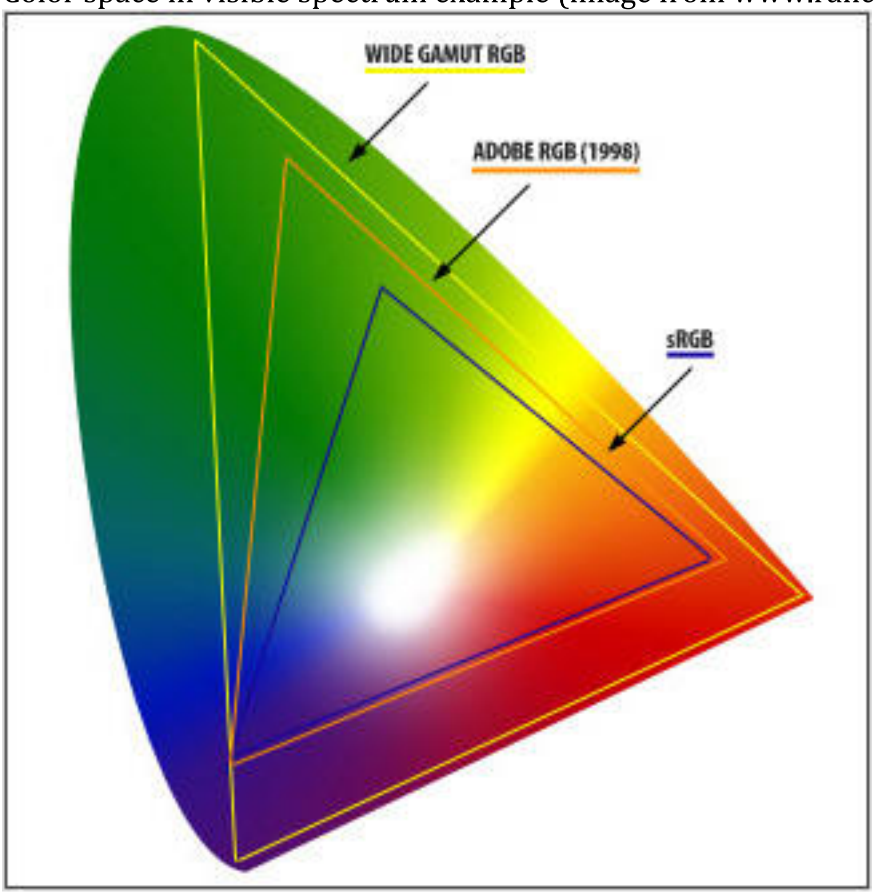
All items should be scanned to show their current condition. If the materials are damaged in any way, a note should be made in the condition field of the scanning spreadsheet describing the condition of the item. If a paper item has dog-eared corners, talk to a staff member about what steps need to be taken to prepare the item and note the condition in the scanning sheet. If the item has staples or old paperclips on it, talk to a staff member to determine what steps need to be taken to handle the materials. The items should not be corrected in Photoshop or any other photo-editing program. If a patron requests that an item be corrected, a staff member can determine if that is possible and how it should be done. If possible items should be removed from mylar sleeves to be scanned so that the mylar does not create a newton ring affect or cause other problems that could make the image fail a quality control inspection.

Color Spaces:

All scans and digital objects should be captured in the Adobe RGB 1998 color space. This color space will allow for a wider gamut so that if the item is printed or viewed off screen, it will render the closest colors to the original item. (See Color Spaces in visible spectrum example below) SRGB is a very narrow color space and should only be used for items that are being strictly viewed on screens with no potential of being printed.

For preservation purposes, images should be scanned or captured in color and then later converted to gray scale or black and white if needed. This will allow for the broadest range of tones to be captured and for the most accurate representation of the image. The resulting larger file size will also allow for the best opportunity to preserve the digital item and for future rendering.

Color space in visible spectrum example (image from www.ranchographix.com):



Calibration:

Calibration is important for accurate color capture and for obtaining the closest likeness to the original item. Monitors, scanners, and printers should be calibrated as frequently as possible so that all equipment involved in the digital process will match and allow for accurate quality control from one device to another. The calibration process should be done monthly or between imaging of major collections. The calibration process will also allow the ICC profiles to be shared with patrons that are interested in having a specific item printed to match the original. All devices should be set at the same color space (Adobe RGB1998) to guarantee that the colors are accurate. Most of the monitors, printers, and scanners can have the color space set in the system settings or under the options menu.

The lighting of the room where the digitization is being completed should be considered prior to starting projects. The best practice is to control the lighting by reducing the amount of light in the room and by setting the lights to a specific temperature. The standard is usually to use lights that are 6500 k(kelvin) temperature so that the light in the room mimics a sunny day at noon. The monitors on the computers can then be set to the same temperature. Ambient light in the room should not affect the display by casting a different color of light on the monitor or original item being digitized. Limiting the amount of light in the room is a good practice as well so that there is less glare and color shift, and a more accurate representation can be created. It is also a better environment for rare materials.

The best way to calibrate the equipment is by using a set calibration tool similar to the X-rite Eye One system or Datacolor Spyder system. The calibration tool is programed to know the exact specifications of each color in a color reference target. The calibration software will compare the color of the reference target on your screen to the set standards for that same color and adjust the monitor, scanner, and printer color accordingly. This process is far more accurate than using the built in settings on the monitor. The software will also adjust the brightness and contrast of the monitor so that the screen is at the optimum viewing conditions. The software can also check the monitor's delta E. For more information on the delta E please visit this site: http://www.colorwiki.com/wiki/Delta_E:_The_Color_Difference By tracking the monitor's delta E over time you can determine if the monitor is starting to go bad or to see if it is losing power and shifting colors.

Calibration software will walk you through step by step to set the calibration for each device. The monitor will be measured by placing the device on the screen and telling the software what type of monitor it is (CRT, LCD). You may need to set the monitor temperature (6500 k.) and possibly other settings, which you can set at the manufacturers recommended value. For the monitor you will hang the calibration tool over the front of the screen and then the software will flash set colors over the screen for several minutes. The tool will be able to determine by the shade of the color where the monitor is currently set. You will then access the monitor's color settings and adjust the RGB until they are as close to the set temperature for the monitor as possible. The first time you do this it will be laborious, but after that the monitor should not shift that drastically so it will be much easier to calibrate. It is best to try to calibrate at least once a month to keep the color profiles accurate. The scanner and printer will be calibrated by using the tool to measure a reference target compared to the output of the machine. The software will then adjust the device automatically to obtain accurate color. The calibration tools usually come with a tutorial that you can review and then follow the step by step instructions.

Scanners or cameras should also be assessed monthly to guarantee that they are still scanning at an optimal resolution. The resolution tests will determine if a scanner is starting to fail and show precisely what resolution the scanner is truly creating the image at. This test may determine the set resolution for a digital project if it is lower than the set preservation level. Software such as Golden Thread can be used to analyze the scanner and determine the optical resolution.

Resolutions:

Photographs and images including glass lantern slides, large and medium format negatives:

Bigger than 8x10 = 800 dpi Preferred
400 dpi Minimum Recommended
8x10 and smaller = 1000 dpi Preferred
600 dpi Minimum Recommended

35mm Film and Slides and other small formats for images:

2800 dpi

Text Materials:

Bigger than 8x10 = 600 dpi Preferred
400 dpi Minimum Recommended
8x10 and smaller = 800 dpi Preferred
400 dpi Minimum Recommended

(Display images should be set to 800 pixels wide on the long side of the image and 100 dpi)

Large scale items (Posters, Maps, Oversized Photographs):

Filmed by camera at highest resolution possible in Camera RAW. The type of camera will determine how high the resolution can be set, so this should be considered early in the digitization process. The end result should be a high quality, professional image with a solid resolution.

Maps:

Maps with small details should be scanned at the highest resolution possible, up to the 600 dpi preferred resolution.

600 dpi Preferred
300 dpi Minimum

Legacy Projects should remain at the resolution that they were scanned at, and should be reviewed for future rescanning if needed. If a project is currently ongoing, the collection should be reviewed and determined if the resolution needs to be increased or if it can remain at the current standard for that project. All future projects are recommended to adhere to these standards.

Cropping:

When digitizing materials it is important to keep them square in the frame if possible for easy cropping. Use a neutral grey background if possible to help capture an item's color and tones accurately. Keep the item near the center of the scanner so that the scanner is at the optimal strength for the scan. When the bounding box is set around the scan it is important to keep it roughly ¼ inch or less from the item. You do not want the bounding box to touch the edge of the item, so that the preservation copy shows that nothing has been cropped off of the original. See the Stanford Digital Imaging Cropping Guide (https://lib.stanford.edu/digital-production-services/quality-assurance-cropping-guide) for examples of appropriate cropping.

If the item being scanned has rough edges or the edges are not squarely cut, center the main image so that it is square to the frame and set the bounding box so that it is wide enough to include the edges of the item. The edges will appear to be crooked but the main focus of the item will be easily viewed and usable.

If the item being scanned is a book, the crop should extend past the gutter of the book and reveal the inside margin of the opposite page. This crop will show the entire page of the book for preservation purposes.

Books, pamphlets, letters, and other multipage materials should be cropped to the single pages following a sequential order. This will allow the digital copy to be rendered in the easiest format for viewing and understanding the flow of the document. Scanning a spread-out document once in its entirety and cropping from that scan is an acceptable measure, but make sure that the original spread-out image is saved as a preservation copy as well. The entire spread-out version will preserve the original layout and design of the item.

Slides should be scanned to show an image up to the outer casing. The entire slide case does not need to be viewed unless there is pertinent information on the case itself. If the slide is being scanned in a dedicated slide scanner, the information from the slide case can be recorded by the scanner operator in the scanning spreadsheet in the notes or description field noting that there is writing on the slide case.

Negatives should be cropped to the outer edge of the image to show that the image was captured in the full frame. For the preservation copy of the image it is acceptable for a small margin of black to be left around each image to show that the full frame has been captured.

Naming Conventions:

Store the collections as a whole in one folder designated for that collection and named after the collection title or collection number. (ex: MS1 Digital Standards, John Doe Papers, Law Symposium Fall 2012)

If an item was received digitally from the contributor, then the file name should be saved for preservation purposes. Thus if the contributor needs the file or needs to be contacted about the file, they can easily figure out which item is in question. The file names can be changed to better organize the collection and make it easier for the collection manager to keep track of all items.

A file name does not need to be excessive or extremely descriptive, but should be simple and clearly point to the original item. For example if the item is from an archival collection, you could create a naming convention similar to collection identifier_box number_folder number_item number (ex: MS1_01_01_001). If the item scanned needs to reveal both the front and back, then a letter a or b can be added to show the front and back files (ex: MS1_01_01_001a, MS1_01_01_001b).

If the item has an Aleph system number, this can be used as the unique identifier within the file name. A current call number can also be used as the file name to help relate materials to their analog components quickly.

If the item is received from an individual, the naming convention should indicate the person, the location, and the date of the item. The file name would look similar to last name and first initial_presentation or journal location_citation and date information. An example would be DoeJ_ALAPoster_Midwinter2012 or DoeJ_JAMA_Vol1No1Pg100. If the individual item is a thesis, dissertation or non-published paper, then the file name could be structured as Last name and first initial_portion of title_date written. For example: DoeJ_DigitalStandards_20121108, DoeJ_DigitalStandards_201211, DoeJ_DigitalStandards_Fall2012. By using a structure similar to this it will be clear and easy to determine what collection the item is from and where the original was first published. This can be useful for filling order requests and for multiple parties working on the collections to track of all the items.

If the naming conventions listed above do not fit the collection exactly, then try to mimic the established formats so that the file name is understandable and interoperable with the set formats. An example would be: Creator_Title_Date, where the creator and title are both shortened to keep the file name small but understandable.

Formats:

Digital items that are created from an analog version should be saved according to the best practices for the most stable format currently in use. The current standard is to save files as TIFF, Digital Negatives, or JPEG2000 for images. For machine readable texts the files should be saved as XML or DTD. Audio the files should be saved as WAVE, AIFF, or Broadcast WAVE. Video the files should currently be saved as MPEG4 until a more sustainable format is widely available.

If the original item is born digital, it should be saved in the original format and converted to the most stable format possible. For born digital text files the preferred format is PDF or PDF/A and word processing files should be converted to the PDF or PDF/A format. Born digital images should retain the TIFF or JPEG format or be converted to TIFF, Digital Negative, or JPEG2000 formats. These file formats are currently the most stable for preservation copies, in that the files are non-compressed and should be non-proprietary. See the NISO Framework for Building Good Digital Collections for more details (http://www.niso.org/publications/rp/framework3.pdf).

Quality Control:

All items should be quality checked to guarantee that they are usable for any patron in the future and that all standards have been met. The first quality control check should be performed by the individual scanning the item. The person scanning should open the image once it has finished scanning and check the image for color accuracy, proper size, ensure it is straight in the frame, ensure the crop is set properly, check that the color space is set to Adobe RGB, ensure all letters and marks on the item are accurate (ex. pencil looks like pencil not marker), and that there is no debris caught in the scan. The scan should be as close to an exact duplicate of the original item as possible showing the current state of the materials. The person scanning the materials should zoom in on the image and scroll back and forth from top to bottom checking for any debris that might have landed on the item during the scanning process. Once the above checks are done the individual should save the image in the appropriate sequence.

If the item being scanned is being turned into a PDF as a text document, the above checks should still be preformed and the file should also be checked for searching accuracy, accessibility, the pages are in order, the PDF flows smoothly, and that everything is as uniform as it can be.

Another individual(s) that has not been working with the original images should perform a second and/or third quality check. The best way to make sure that the work does not get piled up is to designate time each day to review the previous day's work. This way if there is a consistent problem or error it can be caught early and corrected immediately before the person scanning continues through the collection. The same checks listed above should be repeated by at least one other person. The same checks should also be done for the PDF documents to make sure that items are working properly. It is best to pull the original item to compare with the digital item and to make sure that nothing has been missed or misplaced in the collection.

Stanford University has set up an image defects website so that people involved in quality control can see a wide range of issues with digital images that could be considered for re-digitizing. The site can be viewed here: https://lib.stanford.edu/digital-production-services/quality-assurance-image-defects

If the item fails quality checking, then the person failing it should list their initials in the scanning document and note why the item has failed. Once the item is fixed, the individual that is rescanning the item should note that the correction has been made. Once the item has passed the quality check it is ready to be set as the preservation copy and to be prepared for upload to the repository.

The final quality check should be done once the item is loaded into the repository. The item should be checked to make sure that it is accurate and working properly, that the metadata related to the materials is understandable and error free, and that the record and the image/item are aligned properly with each other and in the collection, and if the item is being mapped to multiple collections that it opens in each collection. It is also important to check that all items have been uploaded from the collection and that no duplication has occurred. The repository checks should occur occasionally over time to guarantee that the system does not accidently bump items or that items are not altered by accident.

Example: Failing scan because of Newton Rings (looks like wood grain) behind cat.

Image from: http://photo.net/nikon-camera-forum/00AUfk (NISO Framework Working Group 2007) (NISO Framework Working Group 2007)

Problems that may occur that will cause a scan to fail quality control are: the crop is not straight, the crop is too wide or narrow, dust or debris on the image, the color is not accurate, the size of the image or resolution of the image is not set properly, the file name is not properly set, the image is out of order in the collection, Newton

Rings are present on the image, page corners are folded over, the page is folded, a paper clip or staple is still attached to the item, the wrong color space is set, the image is backwards or upside down, or the digital image is missing from the collection.

Problems that will cause a PDF document to fail quality control are: the pages are not cropped properly, the item is not OCR or Accessible, the document does not match the original for color, pages are not cropped to have single page views, the language is not set, the text or characters are not rendering properly, the reading order is not accurate, or the file size is too large.

Problems that will cause an audio file to fail quality control are: the audio is not enhanced and useable, there is dead space in the file that will cause the user to think that the recording is blank, not working, or over before the actual recording is over, or file format is not a standard format that can be easily shared or open.

Problems that will cause metadata to fail quality control are: typos, grammatical issues, assumptions or information is present that is not backed up by primary sources, the item contains two few subject headings, narrow subject headings only, broad subject headings only, required fields are not all filled in, the record does not match the file, persons or things that have been identified previously are missed in subsequent items, description and text will not aid in discovery, or the record missing for an item.

Scanning Spreadsheets:

A scanning spreadsheet can help keep the scanned items organized and provide some basic metadata for each piece. The information gathered can be mostly be captured electronically, however having the person scanning enter each item helps to keep them accountable for their work. The scanning logs can also help provide some information about condition that can be shared with preservation or conservation to help identify items or collections with a variety of needed repairs. Fields that can be considered for the spreadsheet are:

Name of Person Scanning, Date of Scan, Size of Original, Size of Digital Copy, Item Title, Condition of Original, Description of Item or Notes on Item (markings on the item, page numbers, captions, a way to identify it visibly), Scanning Station, File Size, File Format, Digitizing Equipment, Digitizing Software, Resolution, Collection Name and information, File Name, Notes, Quality Control Person(s).

By filling this out daily it is possible to determine how much work an individual is able to get done in a set timeframe, which will allow for more accurate estimates in scanning future collections.

Storage:

As the collection is being digitized, scans should be stored on the computer's hard drive and backed up regularly to an external hard drive. Once the collection is complete, the entire set of items should be reviewed one final time and stored on several external hard drives or multiple tape backed-up servers. If external hard drives are the only available storage space, then the drives should be stored in separate secure locations to provide the safest environment. Once items are stored on the external hard drives or server then they can be removed from the scanning station's computer hard drive so that a new digitization project can begin.

Ideally it is best to collaborate with another institution in a different location and store each other's collections to provide for highest level of preservation storage. In the event of a natural disaster, hopefully one of the copies would survive at the other institution.

As time progresses and more collections are processed, it is a possibility that images could be saved to a scratch disk rather than stored on external hard drives.

Printing:

Items that are being printed should be checked for accuracy for color and that the resolution is adequate for the desired print size. It is important to note that images or items taken from the internet are generally low resolution and can not be printed at a larger scale successfully. It is important that patrons are aware of this prior to placing an order.

Printers should be calibrated for the type of paper being used and the computer sending the item to the printer should be calibrated as well. This will allow for the best opportunity for an accurate print. It is important to note the types of papers available and consult with the patron about the use of the materials. Glossy paper is the best for preservation but displays poorly because of glares from external light sources. Different papers will react differently to the printer ink as well so tests should be performed and samples should be readily available to show the patron so that they can choose the appropriate look and feel for their items.

It is also important to find out how the patron wants the item trimmed and then to properly trim the print on a quality paper cutter. The patron should also be aware that images will not always print to an exact dimension so they should be prepared to accommodate for that change on their own. All prints should be created from a copy of the master file to guarantee that the master file is not altered and to give the best quality digital image to the patron.

Accessibility:

All items should be made as accessible as possible in order to allow a wide audience to access and use the materials. Photographs, images, and video should have a fairly detailed record so that the patron can get a general idea of what is going on in the image or what the video is about. Handwritten items, audio recordings, and older printed texts should have a modern transcription to attach as well to help with searching and for ease of reading compared to the original. All text documents should have an OCR layer and be fully searchable and the accessibility software in Acrobat run on the item. When possible video should include closed captioning.

Items that are pamphlets or fold-outs should be aligned in an organized fashion so that patrons do not have to scroll over the entire page trying to figure out where the next column begins or ends. It is best to include a version that is plain black text in a single column on a white background so that patrons can magnify the item and review it in an easy to follow pattern.

It can be argued that persons with disabilities have free access to a wide range of services so there is no need to make collections accessible. However, there are a large number of people that suffer from mild disabilities that do not qualify for the free services, so extra efforts on our part will help.

Adobe has multiple training resources on their Acrobat website that can be reviewed to help with the process:
http://www.adobe.com/accessibility/products/acrobat/training.html

Foreign language diacritics and special characters should be preserved at all times and a standard form should be maintained so that they is readable in the future. If problems occur that the characters cannot be recognized or created, then a more advanced piece of software should be employed to create the appropriate characters.

Orders and Demand Items:

It should be determined if patrons should be charged for scanning and quality control efforts or if these should be provided as free services. Will prints be a free or pay service? Will there be standard rates per size and standard setup fees? Once items are made available to the public through the repository it is almost certain that patrons will wish to order copies or prints at some point. .

A time frame should be set for all on demand and order projects of at least 2 weeks for scanning and metadata creation to allow for proper development and the best end result in case of technical difficulties.

Clean Workspace:

The environment that the scanning is being done in should be kept as clean as possible. The desk where the scanner and computer is located should be dusted regularly to reduce the chance for debris landing on the scanners and altering the scans. The scanner beds should be cleaned on a regular basis with a quality cleaner. The scanners will attract dust and often times the materials that are being scanned will fragment and leave debris on the scanner bed. Monitors should be checked for spots as well since this can at times lead the quality control person to believe something is on the digital image but it is not. Refrain from eating or drinking near the scanner stations so that debris does not land on or around the equipment or items being scanned.

Glossary

Adobe RGB: Adobe RGB is a Red-Green-Blue color space developed to display on computer monitors most of the colors of CMYK color printers. Adobe RGB specifies a D65 white point at a luminance of 160 cd/m2 and a gamma of 2.2. The Adobe RGB color space is significantly larger than the sRGB color space particularly in the cyan and green regions.

Ambient Light: Light existing in the environment that is not produced by the imaging system. Ambient light can be natural or artificial light. Ambient light is generally uncontrolled and can be highly variable, posing a possible risk to image quality. The level of ambient light should be minimized in relation to the level of light produced by the imaging system.

Archival Master File: File that represents the best copy produced by a digitizing organization, with *best* defined as meeting the objectives of a particular project or program. In some cases, an archive may produce more than one archival master file.

The terms used to name types of files vary within the digital library and digital archiving communities. In many cases, the best copies are called *preservation master files* rather than *archival master files*. In some cases, best-copy files are defined in qualitative terms, as part of an approach that requires all archival or preservation master files to meet the same specifications, without regard to objectives that vary by category.

Archival master files represent digital content that the organization intends to maintain for the long term without loss of essential features. For analog originals, archival master files are produced by reformatting to high standards. Practices vary from archive to archive regarding adjusting or cleaning up the content in the file. (This refers to adjustments like changing image tonality or reducing the audibility of clicks and pops in sound recordings.) Some archives may make such adjustments in real time when digitizing, but most apply such changes later in the workflow when production master files are created.

The digital formats for archival master files are selected in terms of sustainability factors. For born digital originals, if the existing format is deemed sustainable for the long term, the files are retained as-is and called *archival masters*. If the existing format is deemed unsuitable for long-term retention, e.g., it is an obsolescent format, then the content may be transcoded and the new version retained as the archival master. (If there is risk of data loss from the transcoding, files in the existing format may also be retained for possible future reference.)

Archival master files are the starting point when organizations produce the production master files and/or derivative files that will in turn support a wide range of objectives, e.g., the provision of end-user access; high quality reproduction; and the production of textual representations from OCR, voice recognition, or other similar process. It is again the case that practices vary, with some archives or projects seeing the creation of additional file types with nuanced differences in their characteristics. For example, according to the final report of the Sound Directions project, when the Indiana University team digitized analog sound recordings, they produced *preservation master files*, *preservation master-intermediate files*, and *production master files*, as well as *derivative files* (pp. 45 ff). A recent planning document from the National Archives and Records Administration notes that some projects will produce *preservation master files*, *production/AV intermediate files*, and *reference files*, in addition to *derivative files*.

Master files of all types have permanent value and should be managed in an appropriate environment, e.g., one in which read and write executions are minimized and other preservation-oriented data management actions are applied. In contrast, derivative files are frequently accessed by end-users and are typically stored in systems that see repeated read and write executions.

Artifact (defect): General term to describe a broad range of undesirable flaws or distortions in digital reproductions produced during capture or data processing. Some common forms of image artifacts include noise, chromatic aberration, blooming, interpolation, and imperfections created by compression, among others. In digital sound recordings, the effect of lossy compression is often cited as accounting for audible artifacts, although several other types of artifacts may also be present.

Automatic Document Feeder: An attachment that can be added to many flatbed scanners to allow scanning batches of loose sheets in an unattended manner, often referred to as an *ADF*.

Bit Depth (image): The number of bits used to represent each pixel in an image. The term can be confusing since it is sometimes used to represent bits per pixel and at other times, the total number of bits used multiplied by the number of total channels. For example, a typical color image using 8 bits per channel is often referred to as a 24-bit color image (8 bits x 3 channels). Color scanners and digital cameras typically produce 24 bit (8 bits x 3 channels) images or 36 bit (12 bits x 3 channels) capture, and high-end devices can produce 48 bit (16 bit x 3 channels) images. A grayscale scanner would generally be 1 bit for monochrome or 8 bit for grayscale (producing 256 shades of gray). Bit depth is also referred to as color depth.

Black Point: A radiometric reference point used to calibrate or define the minimum luminance value of interest in a scene or object.

Born Digital: Digital content that originated as a digital product. Born digital content is distinct from digital content, which is created through the digitization of analog content. Examples of born digital content include word processing documents, spreadsheets, and original images produced with digital cameras.

Brightness: The attribute of the visual sensation that describes the perceived intensity of light. Brightness is among the three attributes that specify color. The other two attributes are hue and saturation.

Calibration: The comparison of instrument performance to a standard of higher accuracy. The standard is considered the reference and the more correct measure. Calibrations should be performed against a specified tolerance.

CMYK: A subtractive color model used in printing that is based on cyan (C), magenta (M), yellow (Y) and black (K). These are typically referred to as process colors. Cyan absorbs the red component of white light, magenta absorbs green, and yellow absorbs blue. In theory, the mix of the three colors will produce black, but a black ink is used to increase the density of black in a print.

Color Management:	The use of software, hardware and procedures to measure and control color in an imaging system, including capture and display devices.
Compression (data):	The process of encoding data in a manner that reduces the amount of information required than required for the uncompressed data. Compression techniques can be categorized into two major categories: lossless and lossy.
Compression Ratio:	The ratio of a files uncompressed size over its compressed size. A file compressed ten-fold over its uncompressed size would be described as having a ten-to-one compression, expressed as 10:1. Some formats such as JPEG and JPEG 2000 allow the user to specify the compression ratio.
Compression Lossless:	Data compressed using a lossless compression technique will allow the decompressed data to be exactly the same as the original data before compression, bit for bit. The compression of data is achieved by coding redundant data in a more efficient manner than in the uncompressed format. The Compression ratios that can be achieved with lossless compression are generally much lower than those that can be achieved using lossy compression techniques.
Compression Lossy:	Data compressed using a lossy compression technique results in the loss of information. The decompressed data will not be identical to the original uncompressed data. Conservative lossless compression can result in a form of lossy compression referred to as visually lossless compression.
Contrast:	Any difference in luminance level between regions of interest.
Copy Negatives And Transparencies:	Pertains to the copying of pictorial works, maps, illustrative plates in books, posters, etc., i.e., items viewed by reflected light. In order to have the ability to produce prints that reproduce such works--in effect, to produce physical replicas--library and archive preservation programs formerly created photographic copy negatives (generally in black-and-white, rarely in color) or copy transparencies (generally in color).

(For many years, the Library of Congress copied maps as single items on color 105mm microfiche stock, a form of transparency.) Thus the ability to produce a physical replica of a pictorial item on paper was latent: if a stolen photograph was to be represented by a surrogate, a print would be made from the copy negative. In addition, copy negatives and transparencies were often used in lieu of the originals to produce prints for patrons, in order to reduce wear and tear on the originals. With the digital copies made today, the ability to produce a physical replica is also latent.

Cropping: Cropping is an image-editing/processing technique whereby an unwanted portion or portions of a digital image are removed. Cropping is usually performed to remove some portion of one or more outside edges of the image. Cropping may be performed in different manners to the same image depending on its intended use. For example, on a the original or master scanned image, a very conservative crop may be used to remove portions of the image outside of the borders of the object being imaged to remove empty space. An access derivative may be cropped more aggressively. For example, a book page may be cropped in a manner that preserves all the text of a page, but removes some of the bordering "white space." And finally, a thumbnail image may crop some of the actual content, to highlight a particular feature or "look."

Defect: An event or shortcoming that does not conform to specification. Defects are generally classed by severity, with class one being the highest severity.

Delta E: A color difference metric that is intended to correlate with human visual judgments of small differences in perceived color between two color stimuli. The independent variables for the calculation use the values for the two color stimuli under consideration, expressed in terms of L*a*b* color space (sometimes called *CIELAB*, from the International Commission on Illumination, or CIE). A number of derivative Delta E measures use a subset of the three L*a*b* values. For instance, the two-value Delta E (a*b*) is frequently used to measure the chromatic portion of the difference, omitting the intensity or brightness measurement.

Derivative File: Often called *service*, *access*, *delivery*, *viewing*, or *output* files, derivative files are by their nature secondary items, generally not considered to be permanent parts of an archival collection. To produce derivative files, organizations use the archival master file or the production master file as a data source and produce one or more derivatives, each optimized for a particular use. Typical uses (each of which may require a different optimization) include the provision of end-user access; high quality reproduction; or the creation of textual representations via OCR or voice recognition. In many cases, the derivatives intended to serve end-user access employ lossy compression, e.g., JPEG-formatted images, MP3-formatted sound recordings, or RealMedia-formatted video streams. The formats selected for derivative files may become obsolete in a relatively short time.

Descreen: The removal of Moire-pattern artifacts when scanning half-toned printed images. The Moire-pattern will resemble a screen laying on the image and is commonly seen on newspaper and text book images.

Deskew: An image processing method to correct the skew exhibited in a digital image. Automated deskew functions are often features of scanning or OCR software applications.

DNG: Digital Negative (DNG) is a digital image file format designed by Adobe Systems. DNG is a file format that wraps camera sensor data ("camera RAW data") plus metadata to support image reconstruction, adjustment, and display based on the TIFF/EP standard. Thus it can be seen as a means to "normalize" a RAW image. Adobe has submitted the format to ISO in order to establish a standard format that can be used in place of the dozens of different proprietary RAW formats currently in use.

DPI: DPI stands for dots per inch, and was originally used specifically as a term in printing, providing a measure of how many dots of ink are placed on a print in distance of one inch. The terms DPI and PPI (pixels per inch) are used somewhat interchangeably today, with scanner manufacturers often providing specifications on resolution in DPI.

Exposure: In digital imaging, exposure is the amount of light received by the image sensor. Exposure is determined by the intensity of light received by the sensor (number of photons), and the duration the sensor is exposed to the light; commonly referred to as shutter speed.

Gain (image): In practical discussions of digital cameras and scanning devices, gain is described as a means of increasing the ISO of

	the device and apparent sensitivity to light. In more technical terms, gain in a digital imaging device represents the relationship between the number of electrons acquired on an image sensor and the analog-to-digital units (ADUs) that are generated, representing the image signal. Increasing the gain amplifies the signal by increasing the ratio of ADUs to electrons acquired on the sensor. The result is that increasing gain increases the apparent brightness of an image at a given exposure.
Gamut:	The range of colors that can be generated by a specific output device (such as a monitor or printer), or can be interpreted by a color model. Often referred to as *color gamut*.
Gray Card:	A gray card is used as a reference point for assisting to determine the exposure of objects in reflected light. Gray cards normally reflect 18% of the light falling on them. Ideally, gray cards are designed to be spectrally neutral and produce a diffuse reflection. Often times the alternate side of a gray card will be white, reflecting 90% of the light falling on it.
Grayscale:	An image type lacking any chromatic data, consisting of shades of gray ranging from white to black. Most commonly seen as having 8 bits per pixel, allowing for 256 shades or levels of intensity.
Hue:	The attribute of color described by words such as red, blue and yellow. Hue, along with saturation and brightness are the three attributes that specify a color.
ICC:	The International Color Consortium (ICC) was established in 1993 to create, promote and encourage the standardization and evolution of an open, vendor-neutral, cross-platform color management system architecture. The resulting ICC specification (ISO 15076-1:2005) provides a cross-platform format to translate color data between devices in order to ensure color fidelity, and is specified in many international standards.
ISO (film speed):	Used colloquially in the context of film photography, *ISO* followed by a number (e.g., 400) represented the sensitivity of a given film emulsion to light, often referred to as "film speed." Higher ISO numbers indicated a greater sensitivity to light. The emulsion speed sensitivity was determined by the standards of the International Standards Organization (ISO), which is how the term ISO came to be used in this context. In digital cameras

and scanners, the image sensor has a fixed sensitivity or response to light, but the colloquial *ISO* is still used in a similar manner as with film. When changing the ISO on a digital imaging device, the gain is changed rather than the sensitivity of the image sensor. Increasing the gain increases the signal amplification from the sensor making it appear to be more sensitive. Increasing ISO on a digital camera or scanner increases the noise relative to the signal, decreasing the signal-to-noise ratio (SNR).

Jaggies: The visible "steps" of edges or lines around a pixel in a digital image, and is most notable in areas of high contrast. Anti-aliasing can reduce the visibility of the jagged features.

JPEG: The Joint Photographic Experts Group (JPEG) standard specifies the most common compression method applied to black & white and color images. JPEG compressed images can be viewed in any Internet browser and in hundreds of software applications available for all operating systems. JPEG generally provides a 10:1 compression ratio with minimum visual degradation, but the actual degree of compression can be adjusted, allowing the user to balance image quality and file size images created for the Internet. JPEG/Exif is the most common image format used by digital cameras and other photographic image capture devices.

JPEG2000: The Joint Photographic Experts Group developed JPEG 2000 as an open imaging compression and file format standard (ISO/IEC 15444-1:2000) with the intention of superseding their original JPEG standard. JPEG 2000 is a wavelet-based image compression method that provides much better image quality at smaller file sizes than the original JPEG method. The JPEG 2000 file format also offers significant improvements over earlier formats by supporting both lossless and lossy image compression within the same physical file. A full range of metadata may also be bundled within the file. Since the JPEG 2000 format cannot be viewed within most Internet browsers, acceptance has been slow but its advantages are increasing its use by the cultural imaging community.

Line Art: An image that consists of distinct straight and curved lines placed against a (usually plain) background, without gradations in shade or hue to represent two-dimensional or three-dimensional objects.

Megapixel: A megapixel is one million pixels, and is commonly abbreviated "MP." The megapixel count of a camera sensor is one of the most common characteristics used in describing and comparing digital cameras.

Metadata: Information about an analog or digital object, a component of an object, or a coherent collection of objects. Metadata describing digital content is often structured (e.g., with tagging or markup) and it may be embedded (Metadata, embedded) within a single file, incorporated within the "packaging" that is associated with a group of files (e.g., METS), placed in a related external file (e.g., XMP sidecar file), or in a system external to the digital file (e.g., a database) to which the digital file or files are linked via a unique key or association.

See the Metadata Profile for more information.

Newtons Rings: An interference pattern that appears as a series of concentric, alternating light and dark rings of colored light (when imaged in a color mode). This type of interference is caused when smooth transparent surfaces come into contact with small gaps of air between the surfaces. The light waves reflected from the top and bottom surfaces of the air film formed between the surfaces causing light rays to constructively or destructively interfere with each other. The areas where there is constructive interference will appear as light bands and the areas where there is destructive interference will appear as dark bands.

This often appears as an image defect when attempting to image transmissive media such as slides or negatives using glass carriers. The defect often is not apparent during imaging operations, and often is only noticed when making print enlargements.

Noise: Data that obscures or corrupts *signal*, as that term is used in the expression signal-to-noise ratio. Although noise is generally *unwanted* and signal is *wanted*, there are exceptions. In some circumstances, for example, dithering (Dither), which produces noise, is deliberately employed to counteract the aliasing that results when certain frequencies in a sound or image interact with the sampling frequencies applied by digital-capture systems. While noise is often thought of as a random phenomenon, it may be either random or systematic (patterned).

OCR: Optical Character Recognition (OCR) is a technology that allows dots or pixels representing machine generated characters in a raster image to be converted into digitally coded text. In addition to recognizing and coding text, OCR programs attempt to recognize and code the structural elements of a document page, such as columns and non-text graphical elements. Intelligent Character Recognition (ICR) is a related technology designed to recognize hand written characters.

OCR is generally part of a workflow that begins with the scanning documents. Scanned images may be further processed or "cleaned" (for example, see contrast stretching) prior to OCR to improve accuracy of the recognition process. Modern OCR applications are capable of producing multiple output formats such as ASCII, RTF, Microsoft Word or PDF. While some hardware applications for OCR exist, the vast majority of OCR is performed by software applications.

Panorama Image: An image that displays a wider than normal horizontal field of view up to 360°. Although there are specialized cameras for creating single panorama images, they are more commonly created from multiple images that are stitched to form a single wide field image.

PDF: Adobe's Portable Document Format (PDF) is a document encoding system that maintains the original content, structure and appearance of a document across many computer platforms and communications networks. Adobe has created a near universal document format that is device and resolution independent. A free and widely available PDF viewer allows users to open, view, navigate, and usually print an electronic document. As of July 1, 2008 PDF has been recognized as international standard - ISO 32000-1:2008.

Pixel: An abbreviation of *picture element*, this term may refer to a component of either a digital image or a digital sensor. In the case of a digital image, the pixel is the smallest discrete unit of information in the image's structure. Images based in raster data can be thought of as a grid in which each cell is called a pixel. The amount of data recorded for each pixel can vary, and is expressed as bit depth or bits per pixel, often also as *per channel* in order to indicate the allocation of bits to different color channels. In the case of the sensor in a scanner or digital camera, a pixel is the smallest photosensitive component or cell providing a response to light (or photons). The photons collected at each pixel liberate electrons, which register as an electrical charge. The strength of the charge or signal is proportional to the number of photons collected at the pixel location. A primary measure used in describing a digital imaging device is the number of pixels the sensor comprises, normally expressed as megapixels (MP) or millions of pixels.

PPI:	PPI stands for pixels per inch, commonly used in describing the resolution capabilities of an imaging device such as a scanner or the resolution of a digital image. The terms DPI (dots per inch) and PPI are used somewhat interchangeably today.
ProPhoto RGB:	ProPhoto RGB is a large gamut color space developed by Kodak primarily for photographic applications. The space encompasses 90% of the CIE L*a*b* color space - compared to Adobe RGB's coverage of about 50%. ProPhoto RGB is also known as ROMM RGB for Reference Output Medium Metric RGB.
Quality Assurance:	Quality Assurance (QA) is often confused with Quality Control (QC), but where QC activities are concentrated on detecting defects, QA is proactive and concerned with preventing defects by ensuring that the required levels of quality are achieved for a product or service. A QA program is heavily dependent on data from QC data to search for patterns and trends. QA activities also include controlled experiments, design reviews, and system tests. QA programs can influence quality through creating Quality Assurance Plans, quality-related policies, or creating and conducting trainings.
Quality Control:	Quality Control (QC) includes activities that examine products through observation or testing to determine if they meet their specifications. The purpose of this activity is to detect defects in products or processes where defects are defined as deviating from predetermined requirements.
Resolution:	An imaging system's ability to resolve finely spaced detail. The level of spatial detail that can resolved in an image. The maximum spatial frequency of any utility for an imaging system (limiting resolution).
RGB:	An additive color model based on the three primary colors of red (R), blue (B) and green (G).

Saturation: The attribute of color that expresses the degree of departure from a gray of the same lightness. When a color has no saturation, it is a shade of gray. Saturation describes the purity of a color, and along with hue and brightness is among the three attributes that specify a color.

Sharpness: The visually perceived quality of being crisp or of containing detail.

Sheetfed Scanner: A sheetfed scanner (also referred to as an *automatic document scanner* or ADF scanner) is a digital imaging system specifically designed for scanning loose sheets of paper, widely used by businesses to scan office documents and less frequently used by archives and libraries to scan books that have been disbound or other robust unbound documents. Sheetfed scanners may be compared in terms of the paper weight and size they are capable of handling, duty cycle rating, speed (pages per minute), and duplex capability.

Skew: The angle of deviation in a digital image from the paper edge, text lines or other visual reference elements. Skew is expressed numerically as the tangent of the deviation angle in degrees, either clockwise or counterclockwise. It applies to the angle of two-dimensional image orientation. Skew is a common occurance in automatic document feeder scanning when the paper deviates from the paper path.

sRGB: Standard RGB color space created by HP and Microsoft for use on monitors, printers, and the Internet. sRGB uses the ITU-R BT.709-5 primaries that are also used in studio monitors and HDTV, and a transfer function (gamma correction) typical of CRTs, all of which permits sRGB to be directly displayed on typical monitors. The sRGB gamma is not represented by a single numerical value. The overall gamma is approximately 2.2, consisting of a linear (gamma 1.0) section near black, and a non-linear section elsewhere involving a 2.4 exponent and a gamma changing from 1.0 through about 2.3.

Stitching: An image processing method combining multiple overlapping images to create a single image. Stitching can be used in scanning where a single scan of a large object is not able to produce sufficiently high resolution. Accurate digital alignment to create a visually seamless and uniform image from the individual component images is technically complex and challenging. Individual images comprising the stitched image are sometimes referred to as tiles.

Thumbnail Image: A small, low resolution file normally used as a preview of an image. A thumbnail image is often linked to a higher resolution version of the same image.

TIFF: TIFF is a file format for storing and exchanging bitonal, grayscale, and color images. The term is now used without reference to the original source phrase: *Tag* or *Tagged Image File Format*. Developed by Aldus as a universal format for desktop scanners in the 1980s, TIFF came under Adobe's control when Adobe acquired Aldus. TIFF combines raster image data with a flexible tagged field structure for metadata.

TWAIN: Although represented in all upper-case lettering, the word TWAIN is not an acronym, and was derived from Rudyard Kipling's *The Ballad of East and West* which contains the line "and never the twain shall meet." TWAIN is a freely available open protocol that manages the communication between imaging devices and software applications. When a scanner is listed as "TWAIN-compliant," it indicates that the scanner can communicate and function with TWAIN-compliant image processing applications.

Validation: The process of evaluating a process or product to ensure compliance with requirements or specifications.

Visible Spectrum: The band of electromagnetic radiation that human eyes can detect. This ranges from wavelengths of approximately 400 to approximately 700 nanometers (nm). Normal human vision responds slightly beyond this range to both shorter and longer wavelength radiation, but with very little sensitivity. Maximum sensitivity of the human vision in bright-light conditions is approximately 555 nm, corresponding to the perception of green. Visual sensitivity to wavelengths is dependent on luminance levels or levels of brightness, and is described as scotopic (dark-adapted) and photopic (light-adapted) sensitivities. A less common term is mesopic sensitivity, falling between dark and light-adapted sensitivity. The term "light" is equivalent in meaning to "visible spectrum." The section of the band of electromagnetic radiation with a wavelength shorter than that of visible light is termed ultraviolet and the section with wavelengths longer than that of visible light is termed infrared.

White Balance: The equivalence of large area color channel output responses to a range of spectrally neutral input stimuli.

References

Bogus, Ian. *The Association for Library Collections and Technical Services Preservation and Reformatting Section Minimum Digitization Capture Recommendations Draft Version*. Chicago: Association for Library Collections and Technical Services, 2012. http://connect.ala.org/node/185648 (accessed February 12, 2013).

Digital Photo Graphix. "Tips and Tricks Digital and Film Photography." Digital Photo Graphix. http://www.ranchographix.com/help.htm (accessed February 12, 2013).

Federal Agencies Digitization Guidelines Initiative. "Glossary." Federal Agencies Digitization Guidelines Initiative. http://www.digitizationguidelines.gov/glossary.php (accessed February 12, 2013).

Ledesma, Pablo. "Newton Rings on Image Scans." Photo.Net Nikon Forums. http://photo.net/nikon-camera-forum/00AUfk (accessed February 12, 2013).

NISO Framework Working Group, . *A Framework of Guidance for Building Good Digital Collections*. Baltimore, Maryland: National Information Standards Organization (NISO), 2007. http://framework.niso.org/ (accessed February 12, 2013).

Stanford University Libraries Digital Production Services. "Quality Assurance - Image Defects." Stanford University Libraries Digital Production Services. http://lib.stanford.edu/digital-production-services/quality-assurance-image-defects (accessed February 12, 2013).

Stanford University Libraries Digital Production Services. "Quality Assurance - Cropping Guide." Stanford University Libraries Digital Production Services. https://lib.stanford.edu/digital-production-services/quality-assurance-cropping-guide (accessed February 12, 2013).