SMU Central University Libraries Digitization Guidelines and Procedures

Best Practices for Digitization

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Introduction

This document outlines best practices for digitization for the SMU Central University Libraries (CUL). These guidelines and procedures are designed so that all CUL units can digitize resources and archive digital items using similar methodologies, create economies of scale, achieve consistency in output, and obtain a higher degree of interoperability.

At the same time, these recommendations cannot account for all the variables involved in a digital project. Accordingly, it is strongly suggested that you consult nCDS before undertaking a digital project in order to determine the proper standards and procedures for your project.

In developing these guidelines and practices, nCDS consulted a number of sources, including the:

- BCR's CDP Digital Imaging Best Practices Version 2.0
  - www.bcr.org/cdp/best/digital-imaging-bp.pdf

- Bienecke Rare Book and Manuscript Library's Maintenance, tools, & scanning guidelines:
  - beinecke.library.yale.edu/brbltda/dpm/index.asp

- Indiana University Digital Infrastructure project:
  - wiki.dlib.indiana.edu/confluence/display/INF/Infrastructure+Project

- Library of Congress's Technical Standards for Digital Conversion Of Text and Graphic Materials:
  - memory.loc.gov/ammem/about/techStandards.pdf

Model for Digital Services

Within CUL, digital resources will be provided by a variation on the centralized/non-centralized distribution model, where nCDS will provide both digital services and managed technology resources, and individual library units have access to their own local digitization equipment and labor resources as required. Library units can pick and choose which projects to execute using nCDS services or technology and which projects to execute "in house", though the standards described in this document remain the same (see Appendix for further explanation).

Definitions

"Digitization" refers to the process of converting something from an analog format to a digital format.

"Digital Services" are the individual services provided by nCDS. Examples include scanning, digital photography, analog to digital video conversion,

telecine, creating .pdfs and web derivatives, as well as metadata planning and cataloging, creating a CONTENTdm interface, digital archiving, etc. Services are provided to CUL and on an informal basis to the rest of the campus (for a fee).

- *An example of a digital service would be creating a digital version of a slide that a patron needs. nCDS scans the slide on a slide scanner, delivers the file to the patron via locker and returns the slide to collection holder.*

A **"Digital Project"** generally refers to more than one item to be processed using digital services. Digital projects require more planning, management and labor than a simple digital service request. Digital projects sometimes become digital collections.

- *An example of a digital project would be digitizing an archival album of photographs and uploading the files created to the archive server. Another example would be digitizing several audio clips from different tape formats for the Bridwell library for one of their public displays.*

A **"Digital Collection"** is typically a digital project that results in a managed and/or web published collection. Online digital collections are curated and managed by the CONTENTdm interface. Copyright diligence is performed before publishing collections to the web. Digital collections usually require some digital services.

- *An example of a digital collection is the Video Archive Series (http://digitalcollections.smu.edu/all/cul/vas/)*

Digitization

The purpose of digitization is to create a digital representation of a physical or analog item that embodies the original item as closely as possible.

Typically, the process of digitization results in the creation of a "Master" file. "Derivative" files are any files that are "derived" from the master file. "Original files" are files that are "born digital" and as such are not digitized, since they originated in a digital form. Original files should not be confused with original physical ***objects***.

Factors such as the quality, type and size of the object; the needs of the users; long-term storage requirements; and the amount of time the collection will be used affect what decisions are made in the digitization process. Experimentation using the minimal guidelines and baseline digitization equipment must be conducted prior to the production phase of a project so that procedures and techniques can be developed to insure high quality consistent results.

Master Files

The “master” file is the highest resolution digital representation of the physical or analog object. Best practices usually recommend that an object be digitized once at a specified high resolution, and then derivatives (or surrogates) be derived from the resultant master as required without additional rescanning of the original object.

Since the master is the basis for all other digital versions of the object, great care should be taken to ensure that the file created is of a high quality and accurately reflects the object at the time of capture. Proper imaging techniques will reduce the need for the creation of service master files.

Accordingly, master image files should contain a complete capture of the physical image with no part cropped or edited. The background should be of a neutral composition and contain no additional picture information. Master files should be saved as uncompressed files.

Master video files should match the standard of the video format as recorded and not be edited or altered in any way.

Master audio files should contain all of the audio recording and not be edited or altered in any way. Objects that have multiple tracks (like one side of an lp record) should be digitized as one item.

The technical metadata should be part of the file’s structure and/or recorded for metadata that is compiled in a separate database or system.

Master File Types

Master files will have different file types (or “extensions”) depending on the format of the object being digitized. nCDS recommends the following file types, though master file formats may vary depending on the needs of the project and/or change over time.

Images

The Tagged Image File Format (.tif file extension) is CUL’s standard file format for master images because of its interoperability, large data capture, and non-proprietary nature. Tif files are large, so adequate storage space for both archival and local files must be planned in advance of starting the production phase.

Video and Film

Quicktime (.mov file extension) is CUL’s preferred format for master video files. Within this format, a variety of master resolutions can be delivered, depending on the source.

For film sources, the master files should match the frame rate and be a frame-by-frame match of the source with no doubled frames. As with .tif files, video files are quite large in size and adequate archival and local storage space must be arranged in advance of a project.

MultiMedia Digitization
Procedures for the digitization of video, audio, and 16mm film sources are dependent on many factors, including formats of the originals, capture devices used and software techniques. Currently, nCDS uses the Digital Collections Video Procedures (http://digitalcollections.smu.edu/all/cul/VideoDigitizationProcedures.pdf) to create high-quality master files, and to adapt and format video and audio for the Web. However, given the complexity and unique parameters of these sources, as well as the various requirements of each project, nCDS recommends a customized approach to video and audio digitization.

Audio

The "Broadcast Wave" (.wav file extension) and the "Audio Interchange File Format" (.aif file extension) are CUL's preferred formats for master audio files. These formats are lossless, and store the data in an uncompressed pulse-code modulation format and can handle a wide range of audio resolutions.

Service Master Files

A "service master" file retains the quality and resolution of its master file, but is processed to create a more pleasing file for subsequent derivatives (technically, service master files are themselves derivatives). As an example, images can be color corrected, sharpened, cropped to contain only the image and none of the scanner platen, etc. and videos can be trimmed to remove color bars, test tones and practice moves, etc.

Service master files can be very close in file size to master files, so storage space must be accounted for in advance. Accordingly, creating master files that represent all of the object and are

Service master files names should be noted with a "sm" appendage preceding the file type.

Derivative Files

A derivative file is any file that is created from the master file (including files referred to as "service master files"). Often derivative files are resized or reformatted for viewing on the web or in printed media. Derivative files can also be made from previously created derivative files as well.

Derivative file types vary according to the desired use of the file. File types such as .jpg, .gif, .mp4, .mp3, .wav, etc, are common. Accordingly, there is no CUL

standard for derivatives, since the derivative is created to suit the needs of the project.

The steps for creating derivatives vary depending on the type of master, purpose of the derivative and the amount of processing required of the master to create the derivative. Derivatives can be created per item or using batch processing.

When creating a derivative file from a master file that is located on an archival server, the master file first needs to be copied from the archival server to the local station before processing (unless the master resides locally). Under no circumstances should master files be processed into derivative files across a network or directly on an archival server. In some cases derivatives may be created before master files are transferred to the archival server, though there is a danger associated with this practice, as the master file is at risk of being lost or corrupted until it is stored in the digital archive.

Batch processing is possible when a group of images all require the same general manipulations. These include sharpening, size reduction and file format change. Instructions on how to run a batch process using Photoshop are generally provided within the software.

Derivative files should have a descriptor appendage preceding the file extension, for example: ***tower_av33_300.jpg*** (where "300" indicates a 300ppi derivative). See the section on file naming for more information.

Original Files

Original files are files that were created digitally ("born digital") and do not have analog components requiring digitization. Digital video, cd tracks, and Word documents are examples of "original" files that have digital originals. Digital originals are not "digitized", *per se*, but rather are transferred digitally as a lossless process.

File Naming

A file may move through various servers and content management systems during its lifespan. In order to ensure ease of identification and consistency across collections, as well as make processing of the files easier, it is important that new collections follow some basic conventions when creating file names.

The absolute requirement to consider is that each file created must have a unique name, and not be dependent on location within a directory structure for context. Two (or more) files should never share the same name, no matter what collection, folder or server they reside.

Requirements for File Names

Each collection may use its own conventions for filenames, but there are some basic requirements that should be met. At a bare minimum, file names must combine information as to where the item belongs, a unique identifier, usage indicator and a file type extension. Information to the left of the item identifier will refer to location information about the file (e.g., collection, folder, ascension number, etc.) and information to the right of the item id will provide information about the usage of the file (e.g. kind and type, etc.) File names can also provide information as to what the file is, though it is not a requirement.

Accordingly, nCDS recommends the following file name structure:

[item location] _ [item identifier] _ [usage] . [type]

- "Item location" is information related to collection or call number.
- "Item identifier" is descriptive information about the file that is unique to the item.
- "Usage" is an appendage that describes how the file is used (derivative, master file, service master, etc)
- "Type" is the file extension that describes what the file is (image, document, sound, etc).

Underscores are reserved to separate the different types of information in the file name. Other conventions include:

- The first character of the filename must be an ASCII letter ('a' through 'z' or 'A' through 'Z').
- Filenames may include only ASCII letters ('a' through 'z' and 'A' through 'Z'), ASCII digits ('0' through '9'), hyphens, underscores, and periods. No other characters or spaces are permitted.
- Filenames must be followed by a single period and a suitable extension to specify the type of file. The extension usually consists of three letters (e.g., tif, mov, wav, aif, mpg)
- Filenames should be limited to 31 characters (not counting the extension). Accordingly, the use of acronyms to replace full words is allowed as long as the acronyms are created in a consistent fashion.
- Derivative files have the same file names as their master files, with the addition of a usage indicator appended to the item number. Examples of appendages include "300" for a 300ppi version, "sm" for "service master" and "opt" for a file optimized for ContentDM ingestion.
- Master files require no usage appendage.
- If a digital object consists of multiple files, each filename must contain the object's identifier, appended with a unique sequence number. The sequence number should contain enough digits to account for all items in the collection. If the items are from pages in a book or volume, the sequence number should match the page number.

Example #1

John G. Tower collection

The Tower project ("Tower") is a collaborative project between the A. Frank Smith, Jr. Library Center of Southwestern University and CUL, and contains 850 multimedia items including audio, video and 16mm film formats. The collection is in the process of being digitized into digital video and audio files, consisting of both master files and streaming derivatives. The collection has no original digital ("born digital") material. Southwestern University holds the physical collection of items, while CUL hosts the digital items.

At a minimum, the file naming structure for a Tower master file could look like:

Collection	**Item (Unique)**	**Usage**	**Type**
Tower	16mm film "clean air act" "av146"	master	Moving image
Tower	001	n/a	.mov
"tower_001.mov"			

This file name is perfectly acceptable, since all four requirements are met:

- The item location, in this case the Tower collection
- a three digit identifier is appropriate for less than 1000 items
- The item usage, an archival master (no usage appendage required)
- The item type, an moving image, in this example a Quicktime movie.

A derivative file using this schema may look like:

Collection	**Item (Unique)**	**Usage**	**Type**
Tower	16mm film clean air act "AV146"	Streaming video file	Moving image
Tower	001	stream	mov
"tower_001_stream.mov"			

In the case of Tower, each object has been issued a unique identification number by Southwestern. This information could be also used to create a file name. Accordingly, the file naming structure for Tower could also look like:

Collection	**Item (Unique)**	**Usage**	**Type**
Tower	16mm film clean air act "AV146"	Streaming video file	Moving image
Tower	Av146	stream	mov
"tower_av146_stream.mov"			

This file name tells us significantly more information about the item:

- The item location, in this case the Tower collection
- What the item is, object “av146”
- The collection contains less than 1000 items
- The item usage, a streaming video file
- The item type, a moving image

Though both file names indicated above are acceptable, a strong case could be made to utilize the “tower_av146” scheme, since “av146” has particular meaning, especially to Southwestern, and “001” is an arbitrary identifier based on the order of digitization.

Example #2

Accession numbers

Accession numbers are sequential numbers given to a collection as it is entered in the library catalog. A single accession number may contain one or more items that would be digitized as separate items!

For example, call number “ag2002.1437” has the following record:

> *Author: Vachon, John, 1914-1975.*
> *Title: Railroad station at Arvilla, North Dakota, in the Red River Valley [graphic]*
> *Published: 1948*
> *Description: 1 photographic print*
> *Format: Visual Material*

Accordingly, this accession number contains one image, and if digitized into a master file might get the file name “**ag2002_1437.tiff”** since there is only one item in the accession.

However, call number “ag2002.1436” has the following record:

> *Author: Rosskam, Edwin, 1903-*
> *Title: Arecibo, Puerto Rico [graphic]*
> *Published: 1946*
> *Description: 2 photographic prints*
> *Format: Visual Material*

Since two images are referenced by one accession number, they would require distinct file names “**ag2002_1436_01.tif”** and “**ag2002_1436_02.tif”.** These examples show master files. A 300 ppi derivative of one of these files may be named “**ag2002_1436a_300.jpg”** for example.

File naming is somewhat of an art form and will vary from collection to collection. Please consult nCDS when considering a file naming schema for your project.

File Storage

Before embarking on any digital project, please contact nCDS to determine a file size estimate for the project so that space may be allotted on the archival server(s). Size estimates are sent to OIT periodically so that they can ensure enough space is available to maintain CUL digital files.

There are two types of file storage that apply to masters: temporary (or local) storage and long-term (or archival storage). Since master files are typically large in size, they should not be stored on the system drive (sometimes referred to as the "C:" drive) of the computer that is used for digitization. If a file must be stored temporarily on the system drive as part of the scanning process, it should be transferred to an external drive (or an additional internal "media" drive if installed) as soon as practical after the scanning is finished.

Once the quality of the master file has been approved, master files should be transferred to the archival server for long-term storage and preservation. Once the transferred files have been verified on the server, they may be deleted from the local internal and portable drives as desired. nCDS recommends that files be transferred to the archival server at weekly intervals as a minimum. It is recommended that files be transferred from a computer that has a gigabit connection. If your computer does not have a gigabit connection, please contact the director of nCDS for a consultation.

In order to protect the integrity of files on the archival server, files can only be deleted by server administrators. Please contact nCDS if you need to have a file deleted or adjusted on the server.

Master files may be kept on a portable external drives after the files have been transferred to the archival server if the user so desires (this is useful if one would like to make derivative files without having to retrieve the file from the server).

Derivative files should be saved on archival servers as well as master files. It is recommended that derivatives reside in the same folder as their masters or within a folder system for the overall project that contains separate folders for each file type.

Collection Management Systems and Databases

CONTENTdm is the collection management system used by CUL to publish curated collections of digital items. CONTENTdm can also be used to catalog and maintain unpublished digital collections. nCDS encourages CUL units to use CONTENTdm to publish digital collections. We are also available to consult with units to determine workflow procedures and technical requirements for using CONTENTdm to catalog and manage digital files that are not published. nCDS is

also investigating other collection management systems, such as dSPACE, for digital archiving and file management.

At the current time, CUL units utilize databases and/or spreadsheets to manage their digital files. Filemaker, Access, and Excel are familiar examples. If used, local databases should be backed up frequently to a server for protection.

Please contact nCDS to coordinate metadata standards for databases and spreadsheets, and/or to coordinate metadata in a standalone databases with metadata that will be used in digital collections. Currently, nCDS uses the metadata guidelines in the SMU ContentDM Guide: Framework for Building a Digital Collection:
http://digitalcollections.smu.edu/all/cul/SMU_ContentDM_Guide.pdf

Copyright

nCDS requires a written record of the copyright diligence performed for each item to be published in a collection that is accessible by the general public. Ideally, the copyright status of every item to be digitized will be determined by the collection holder before the item is digitized. The record of copyright diligence can include a scanned copy of the permission received, a description of the process undertaken (if no copyright information is successfully located), and/or the official record discovered.

nCDS has included the following table to use as a starting point when creating digital objects from materials for which SMU does not hold the copyright.

If an item (text, image, moving image)	**then…**
… was published before 1923,	the item is in the public domain and no copyright diligence needs to be performed.
… was published after 1923,	some copyright diligence will need to be performed.
… is an unpublished work by an author who died more than 70 years ago,	no copyright diligence needs to be performed.
…is an unpublished work by an author who died less than 70 years ago,	some copyright diligence may need to be performed.

The copyright on musical recordings is very complex, but generally assume that a copyright exists on materials that have been professionally produced.

If you have questions about copyright, feel free to contact the nCDS or George Finney, the director of Digital Interests for OIT. A useful copyright tool can be found here: http://librarycopyright.net/digitalslider/.

Items that appear to be protected by copyright and have no written record of copyright diligence may not be published in online collections available to the general public until the status of the items is at least discussed with nCDS.

Imaging Standards

All things being equal, files that have been created at a high resolution and high bit depth will represent the original image more accurately than those with lower resolution and bit depth, because a higher resolution capture process uses more actual pixels to represent the object. High resolution master files will also create better derivative products down the line.

Though it is better in terms of work process to scan at the highest resolution possible, and then create derivatives that suit the specific needs of a project, there may be cases where the creation of a high quality master file is not required or warranted (based on the condition of the original image, for example), and accordingly items may then be captured at lesser resolutions best suited to the intended purpose.

nCDS recommends the following standards for the creation of high resolution master image files.

Resolution

The more individual pixels that are used to represent an item, the higher the "resolution" will be for that file. Pixels do not have a physical size, and as a result an image file does not have a physical size – it is simply an array of pixels.

The resolution of an image file can be recorded in many ways. Examples include:

- 10,000 x 8,000 pixels
- 80 megapixels
- 1000ppi

Since the ultimate goal of digitization is to create the largest possible array of pixels, **the best descriptor of resolution is simply the size of the array** (*megapixel and PPI descriptors require additional information to describe the size of the array created. PPI requires information about the physical size of the object, and megapixel is dependent on the aspect ratio of the item.)* The digitization metadata should refer to the dimensions and quality of the array created, not the size of the physical object (which is noted elsewhere) or the "ppi" settings used on the imaging device that created the array.

For an image file to be considered of "master" quality, a minimum of 5,000 pixels is expected along the longest dimension of the array. Larger and/or more detailed physical objects may require an even more pixels to adequately represent the object digitally.

The following standardized language is preferred (7,000 x 4,000 pixel master file example):

Flatbed scanning:
Digitization Process: Master: Object scanned as 7000 x 4000 pixel, 48-bit, RGB .tif file. Derivative: Master file resampled as 3000 pixel wide, 24-bit, RGB .jpg file.

Bookeye scanner:
Digitization Process: Master: Object scanned as a 9071 x 7370 pixel, 24-bit, RGB .tif file and then cropped to a 7000 x 4000 pixel 24-bit, RGB .tif file. Derivative: Master file resampled as 3000 pixel wide, 24-bit, RGB .jpg file.

Digital photography:
Digitization process: Master: Object captured as 5616 x 3744 pixel .raw file. Converted to .tif using raw convertor and cropped to a 5000 x 3200 pixel 24-bit RGB .tif file. Derivative: Master file resampled as 3000 pixel high, 24-bit, RGB .jpg file.

Note: Also add whether an item has been color balanced, cropped, and/or adjusted in the section for Derivative, e.g. Derivative: Master file color balanced, cropped, and resampled as 3000 pixel high, 24-bit, RGB .jpg file.

When dealing with requests for files that refer to "ppi" (eg, "We need a 300 ppi version of this file") a physical dimension, or pixel pitch, MUST also accompany the requests. Please note that some requests can only be fulfilled by resampling or interpolating the image file. These terms are defined elsewhere in this document.

Image Capture Modes

There are three modes for capturing an image digitally:

- Bitonal – usually limited to text documents. Used for documents such as reports, memos, or other items with black and white only.
- Grayscale – used for black and white photographs (although for older photos determination should be made whether color will capture the current state of the photograph more accurately - e.g., sepia tones).
- Color – suited to documents with continuous tone color information or. Used for color photos (and/or black and white photographs that have become sepia in color with age) and other documents with color representation.

nCDS recommends the following capture modes, unless otherwise specified or requested:

- color capture mode for all photographs and artifactual books and documents (in order to capture the object in its current condition)
- bitonal for documents being harvested for OCR or data retrieval
- grayscale for true black and white photographs (as so desired) and non-artifactual books, newspapers and documents

Bit Depth
Bit depth is determined by the number of bits used to define each pixel. The greater the bit depth, the greater the number of individual tones (grayscale or color) that can be represented.

nCDS recommends the following but depths:

- bitonal - usually books or documents being scanned for content, not image quality in black and white (no shades of grey)
- 16 bit (for grayscale images)
- 48 bit (16 bits per RGB color) for color images (or black and white images that have aged in appearance)

If your scanner cannot support 16/48 bit depth tonality, 12/36 bit depths are acceptable alternatives. Please use the highest bit depth supported by your specific scanner.

Scanners

An image scanner is a device that optically scans a physical object and converts it to a digital image. The objective is to reproduce the tonality of items as they currently exist with as little manipulation as possible. CUL uses several types of devices including flatbed, sheet-fed, book and film/slide scanners.

All scanning involves some form of image manipulation, because there is always some software that interprets the information captured by the scanner's "ccd" unit and translates that information into an image file.

Image manipulation can range from minimal adjustments within the scanner software to complete manipulation of the image's color balance, dynamic range, etc. after the image has been captured.

Large Format Objects
Procedures for the digitization of large format objects using the digital photography equipment are specialized and require a high level of skill and photographic expertise.

Please contact nCDS to devise a digitization procedure for your media and /or large format items.

It is accepted procedure to do a conservative amount of adjustment to the image during the scan in order to minimize the amount of post processing required.

Also note that it in terms of quality, is generally preferable to capture a negative instead of a print of the negative, especially if the negative is available and in good condition. There may be cases where the print contains unique information (handwritten notes, for example) which would require the capture of both items.

Color Management

In order to reduce the amount of image manipulation required, all hardware in the workflow should be calibrated in order to ensure integrity of color throughout the image capturing process. (Similar rules apply to video and film digitization as well). Scanner/monitor calibration must be performed regularly as well as before the beginning of a new project. Scanners are calibrated using the color targets provided with the scanning software (or in the case of video monitors, by using colorbars). The color management section of the scanning software and monitor must then be properly set to incorporate the scanner profile.

The Adobe RGB (1998) is the color profile recommended during the scanning process and post-processing in Photoshop. This color space is imbedded in the saved .tif images as well. It is also standard procedure to convert derivative images (i.e. web-based view and thumbnail images) to the sRGB color space, which is the most suitable for viewing images on web pages.

Quality Control for Images

The basic goal of a quality control process is to insure that consistent, high quality images are produced. This process is implemented in the following steps:

1. Controlling the scanning environment, including hardware, software, and viewing conditions (refer to the section on Color Management).
2. Establishing clear production procedures to ensure that consistent digital objects are created.
3. Before beginning production, test procedures and settings to verify that the digital images meet benchmark requirements.
4. Review output to insure consistent, quality results.

Scanner and Imaging Software

CUL uses a variety of scanners and scanning software across its organization. In addition, Photoshop software is used post-scan processing of images as well as the creation of derivatives.

Instructions for scanning vary according to manufacturer. Please follow the instructions as provided by the manufacturer of the scanner you are using. Feel free to create a help ticket at http://help.libraries.smu.edu if you have questions about the operation of your particular scanner or require assistance.

Conclusion

It is the intention of this document to lay the groundwork for new digital standards across the CUL organization. It is impossible to note every procedure or variation of process in a document of this size. Accordingly, the procedures

contained within are examples and may have to be tailored as practiced in a production environment.

Since technology changes at a brisk pace, this document will be updated regularly to keep current with new procedures and techniques, as developed.

Feel free to ask nCDS for a consultation on any part of your digital project. We are there to help.

Appendices

Minimum Digitization Standards (suggested)					
Original Type	**Bit-depth (Color Depth)**	**Pixel dimensions / Spatial**	**Resolution**	**Processing allowed**	**File Format**
Printed Text only	8-bit grayscale		300 ppi		Uncompressed TIFF
Artifactual text /manuscript	16-bit color		300 ppi – 600 ppi		Uncompressed TIFF
Negative / transparency - B&W	16-bit grayscale	5000-6000 pixels on the long side	1200 ppi	Sharpening, expansion of dynamic range	Uncompressed TIFF
Negative / transparency - Color	48-bit color	5000-6000 pixels on the long side	1200 ppi	Sharpening, expansion of dynamic range	Uncompressed TIFF
Photograph - B&W	16 bit grayscale or 48-bit color	5000-6000 pixels on the long side	300 ppi – 1200 ppi	Sharpening, expansion of dynamic range	Uncompressed TIFF
Photograph - Color	48-bit	5000-6000 on the long side	300 ppi – 1200 ppi	Sharpening, expansion of dynamic range	Uncompressed TIFF

Digital Services Models				
Service Type	**Equipment Cost**	**Digitization Quality**	**Speed**	**Description**
Fully Centralized	Lowest, all equipment and software resides in one location, no duplication of equipment within the library	Highest – machines calibrated and trained operators in managed environment ensure standards are followed.	Generally faster for larger projects and slower for smaller projects – depending on the queue.	nCDS provides all digital services, sets queue. nCDS would require additional resources to fulfill this model.
Centralized for digital collections only	Higher, as there may be equipment and software duplicated through the library.	Highest for digital collections, variable for all others.	Unknown, can vary due to project. "One offs" handled outside of centralized operation may be faster.	nCDS provides all digital services for digital collections; units provide their own digital services non-collection projects
Centralized Space/Shared Resources	Lowest, all equipment is in one location (or two locations based on building location – a Hamon "hub" and a Fondren "hub" for example)	Higher – machines calibrated, but ultimate quality depends on skill of operator.	Faster – as long as there are a sufficient number of machines.	nCDS (and Hamon in a "hub" model) provides facility for and help with digital services; units provide digitization labor for their projects
Centralized/Shared and Non-Centralized/Shared Resources	Higher, as there may be equipment and software duplicated throughout the library	Variable – quality may be higher in managed environment than in unmanaged environment	Speed will vary depending based on many variables. No generalization possible.	nCDS provides both digital services and managed resources, and library units have access to their own digitization equipment and labor resource as well. Units can pick and choose which projects to execute with nCDS and which to execute "in house".
Fully Decentralized	Highest as there will be equipment and software duplicated throughout the library	Lowest – machine standards and labor quality un-managed.	Generally fastest, for smaller projects, and slower for larger projects.	nCDS provides digital services solely for projects it is working on. Library units digitize independently of nCDS.

Quick Reference: Images

Minimum Scanning Parameters

Film Negatives/Positives

- Maximum optical resolutions (2400-4800 ppi)
- Naming should reflect collection/folder/file relationships, have a unique file name and suitable extension.

Photographic Prints

- For prints > 11”x17”, scans should be in the 300 ppi range unless specifically requested otherwise.
- For prints 8”x10” to 11”x17”, scans should be in the 600 ppi range
- For prints < 8”x10”, scans should be at higher optical resolutions available, preferably 1200 ppi.
- Naming should reflect collection/folder/file relationships, have a unique file name and a suitable extension.

Other Materials

- Other materials such as documents, maps, book illustrations or oversized materials too large for flatbed scanning may require digital photography for digitization…this is a special request and should be arranged with nCDS.
- Naming should reflect collection/folder/file relationships, have a unique file name or indicate location in publication (library catalog number/page number) and a suitable extension