

# NHDS

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National Heritage  
Digitization Strategy

## **Digitization Best Practices and Recommendations**

**April 2019**

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# Introduction

## Purpose

The purpose of this document is to help institutions with digitization standards. It is not meant to create a new digitization standard, but instead summarize and recommend standards already published. Additionally, it includes some considerations for the different format types to help archivists understand, interpret and use these recommended standards.

All standards were selected from Canadian resources where possible. They were selected by conducting an environmental scan, then evaluating the resources based on criteria set by the National Heritage Digitization Strategy (NHDS) such as: introductory vs. detailed information, standards that are institution specific or that were created for widespread use, age of the resource, adherence to widespread digitization practices, uptake by the community, etc.

As well, *Other References* have also been identified. These show examples of common digitization standards and practices, but could not necessarily be a *Recommended* standard by NHDS because they may be specific to a particular institution or are some other way topical. Nonetheless, they are still great resources with examples that may help archivists embarking on digitization projects.

Although the purpose of this document is to guide NHDS funding recipients, it was written as a document that can be used by any institution seeking digitization best practices.

## Scope

The scope of this document is limited to digitization standards for media types eligible for funding by the NHDS.

## Note on Recommendations

Because this document does not create new standards (but instead relies on the many valuable resources and published standards that can be found online), the standards listed below do not go into detail, and instead link to these offsite resources if further information is required.

The recommended file formats and capture specifications provided are purposefully narrow and only one or two of the most common formats are recommended. However, there are other commonly used standards that institutions may already have adopted which are perfectly acceptable. These recommendations were chosen so that they are broadly applicable to any institution.

# Best Practices

## Digitization Project Management

Unlike some of the more technical aspects of digitization (such as file formats), there are no widely accepted standards for digitization projects management. Each institution, project, and media type will require slightly different workflows. However, many common elements of any digitization project include selection of material, movement of material to be digitized, digitization lab setup and digitization process (or digitization vendor selection), quality control, and deposit into a digital repository.

Below are some references for digitization project management that provide useful information when planning and executing a digitization project.

- **Capture Your Collections - Planning and Implementing Digitization Projects**  
Canadian Heritage Information Network, 2000  
<https://www.canada.ca/en/heritage-information-network/services/digitization/capture-collections-guide-managers/planning-implementing-projects-guide-managers.html>
- **Digitization and Archives**  
Canadian Council of Archives, 2002  
[http://www.cdncouncilarchives.ca/digitization\\_en.pdf](http://www.cdncouncilarchives.ca/digitization_en.pdf)
- **Indigitization Toolkit**  
Indigitization, Irving K. Barber Learning Centre, et. al. (no date)  
<http://www.indigitization.ca/indigitization-toolkit/>
- **Guidelines: Digitizing Activities - Project Planning**  
Federal Agency Digital Guidelines Initiative, 2009  
<http://www.digitizationguidelines.gov/guidelines/digitize-planning.html>
- **Guidelines for Digitization**  
University of Mass Amherst, 2011  
<https://www.library.umass.edu/assets/Digital-Strategies-Group/Guidelines-Policies/UMass-Amherst-Libraries-Best-Practice-Guidelines-for-Digitization-20110523-templated.pdf>

## Documents

This section includes recommendations for books, theses, newspapers, scientific publications and scholarly journals, archival fonds and finding aids (including genealogical material), and government records.

Format Recommendations: Documents		
	Master/Digitization	Access Copy
<b>File Format</b>	-TIFF or PDF/A	-JPEG, PDF/A, PDF
<b>Bit Depth</b>	-1 bit bitonal -8 bit grayscale -24 bit colour	-same
<b>Resolution/Dimensions</b>	Variable: -Minimum: 300 ppi, with 3000 pixels on longest dimension -Recommended: 400 ppi, with 4000 pixels on longest dimension -600 ppi, with 6000 pixels on longest dimensions is also common, especially for fragile "scan once", graphic, small print, etc.	Variable: Minimum: 72ppi, with 1024 on longest dimension (average computer monitor size, minimal zoom capability). Recommended: 300ppi, with 3000 on longest dimension.

### Considerations

- PDF/A is a version of the PDF file format that meets ISO standardized conformance criteria. You cannot tell a PDF/A file format by looking at the document or by the extension, you must use tools, such as veraPDF or Adobe Acrobat to ascertain whether a PDF document is PDF/A conforming.
- There are multiple types of PDF/A. Generally speaking, the higher the number (1, 2, 3) the more features or functionality are allowed within the file. A higher number is a different version of PDF/A conformance, not necessarily a successive version. If you have a PDF/A-1a, you do not need to migrate to a higher number unless you wish to add functionality to the document. The two most basic types which are intended to provide visual representation with some accessibility features are:
  - PDF/A-1a: document's visual appearance with some accessibility features (ex: OCR text)
  - PDF/A-1b: document's visual appearance only
- For multipage documents, it is common to scan each page as a TIFF to save as a preservation master of each page, while also creating a PDF/A as a preservation master for the whole document.

## Digitization Recommendations

- **La numérisation des documents**  
Bibliothèque et Archives nationales du Québec, 2012 (French only)  
[http://www.banq.qc.ca/documents/archives/archivistique\\_ged/publications/Numerisation\\_des\\_documents.pdf](http://www.banq.qc.ca/documents/archives/archivistique_ged/publications/Numerisation_des_documents.pdf)
- **Government of New Brunswick Digitization Standard**  
Provincial Archives of New Brunswick, 2013  
<http://archives.gnb.ca/Archives/RecMan.aspx?culture=en-CA&Section=2>
- **Indigitization Toolkit - C2 Standards**  
Indigitization, Irving K. Barber Learning Centre, et. al. (no date)  
<http://indigitization-toolkit.sites.olt.ubc.ca/files/2012/04/C2.pdf>

## Other References

- **Digitization best practices**  
York University (no date)  
<https://www.library.yorku.ca/web/collections/digitalscholarship/digitization-best-practices/>
- **Guidelines for Planning the Digitization of Rare Book and Manuscript Collections**  
International Federation of Library Associations and Institutions, 2014  
<https://www.ifla.org/files/assets/rare-books-and-manuscripts/rbms-guidelines/guidelines-for-planning-digitization.pdf>
- **Digitisation: Quality Management (digitization of medieval manuscripts)**  
Europeana Regia 2011  
<https://pro.europeana.eu/project/europeana-regia>
- **Indigitization Toolkit - Document Digitization**  
Indigitization, Irving K. Barber Learning Centre, et. al. (no date)  
<http://indigitization-toolkit.sites.olt.ubc.ca/files/2018/03/E-2018.pdf>

## Microfilm and Microfiche

Format Recommendations: Microfilm - Microfiche		
	Master/Digitization	Access Copy
File Format	TIFF or PDF/A	JPEG, PDF/A, PDF
Bit Depth	8 bits grayscale	8 bits grayscale
Resolution / Dimensions	-Variable depending on size of - original document. See <a href="#">Digitization Recommendations</a> for further details and <a href="#">Documents</a> for resolution/dimension guidelines.	-Variable depending on size of original document. See <a href="#">Digitization Recommendations</a> for further details and <a href="#">Documents</a> for resolution/dimension guidelines.

### Considerations

- PDF/A is a version of the PDF file format that meets ISO standardized conformance criteria. You cannot tell a PDF/A file format by looking at the document or by the extension, you must use tools, such as veraPDF or Adobe Acrobat to ascertain whether a PDF document is PDF/A conforming.
- There are multiple types of PDF/A. Generally speaking, the higher the number (1, 2, 3) the more features or functionality are allowed within the file. A higher number is a different version of PDF/A conformance, not necessarily a successive version. If you have a PDF/A-1a, you do not need to migrate to a higher number unless you wish to add functionality to the document. The two most basic types which are intended to provide visual representation with some accessibility features are:
  - PDF/A-1a: document's visual appearance with some accessibility features (ex: OCR text)
  - PDF/A-1b: document's visual appearance only
- Microfilm and microfiche being *copy formats* may make it difficult to tell the original size of a document copied. This may have an affect on the resolution and dimensions required. Nonetheless, easy legibility and ability to zoom are key factors to determining resolution and dimension.

### Digitization Recommendations

- **La numérisation des documents**  
Bibliothèque et Archives nationales du Québec, 2012  
[http://www.banq.qc.ca/documents/archives/archivistique\\_ged/publications/Numerisation\\_des\\_documents.pdf](http://www.banq.qc.ca/documents/archives/archivistique_ged/publications/Numerisation_des_documents.pdf)
- **Government of New Brunswick Digitization Standard**  
Provincial Archives of New Brunswick, 2013  
<http://archives.gnb.ca/Archives/RecMan.aspx?culture=en-CA&Section=2>

## Other References

- **Minimum Digitization Capture Recommendations**  
American Library Association, 2013  
<http://www.ala.org/alcts/resources/preserv/minimum-digitization-capture-recommendations#microforms>
- **Document Digitization (Scanning) Standards**  
Environmental Protection Agency, 2018  
<https://www.epa.gov/sites/production/files/2015-08/documents/2155-s-01.0.pdf>
- **Library of Congress, The National Digital Newspaper Program**  
Library of Congress, 2017  
Deliverables  
[http://www.loc.gov/ndnp/guidelines/NDNP\\_201820TechNotes.pdf](http://www.loc.gov/ndnp/guidelines/NDNP_201820TechNotes.pdf)  
Overview  
[http://www.loc.gov/ndnp/guidelines/NDNPTechSpecs\\_Overview.pdf](http://www.loc.gov/ndnp/guidelines/NDNPTechSpecs_Overview.pdf)



## Film and Video

Best practices for digitizing film and video are directly linked to an institution's digital capacity and preferences. The recommendations below are common but not the only options.

Format Recommendations: Film - Video			
	Master/Digitization		Access Copy
	Video/Film: <i>Stream</i>	Film: <i>Image + Audio</i>	
<b>File Format</b>	Stream: Uncompressed / MOV Uncompressed / AVI JPEG2000 / MXF OP1a  Audio: LCPM	Image: DPX Audio: LCPM / BWF	<p>Access file formats and specifications, such as dimension, will vary depending on institutional needs.</p> <p>It is recommended that you check the supported file formats of your access platform(s) and test each for playback quality, upload, download and streaming speed, and select the format that best suits the capabilities of your platform and audience.</p> <p>Common formats are: H.264 / MPEG-2 or MPEG-4</p>
<b>Bit Depth</b>	Stream: 8 bit Audio: 16 bit	Image: 10 bit Audio: 16bit	
<b>Sample Rate</b>	Stream: variable, 30-50mbps (see NPTAC document) Audio: 48khz	Image: n/a Audio: 48khz	
<b>Resolution and Dimensions</b>	Stream: match original, ex: 720 x 480 (NTSC analog video) (see NPTAC document)	Image: 4k- 4,096 ppi (35mm) 2K - 2,048 ppi (16 mm)  Audio: n/a	
<b>Colour</b>	4 Y, 2 Cb, 2 Cr (4:2:2)	RGB	

### Considerations

- Video or moving image *formats* have two elements: *codec/encoding* and *container/wrapper*. The *codec* is the algorithm used to render the analogue video stream into, and out of, a digital bitstream. The *wrapper* wraps or contains the encoded video bitstream, the audio bitstream and file metadata into a file. The *container/wrapper* is the file extension you see.
- For film, there are two ways to digitize: *stream* or *image + audio*. *Stream* digitization works by playing a film/video and capturing it as it plays. I.e. you digitize the film as it would have been viewed. *Image and*

*audio* digitization is only done with film, not video. It is done by scanning each film frame as an image. By doing this you recreate the film strip digitally. Secondly, you digitize the sound stream of the audio. You later reconstitute the frames and sync the audio. *Image and audio* is often considered higher quality and a preservation level reproduction of the film strip. However, due to the size and complexity of reconstituting the film, image and audio digitization is only recommended for high value, high risk materials or for institutions with the capacity to manage such digitized objects.

- There is not as much consensus with digitized film and video formats as other archival collections. Institutions must match their ability to create, manage and render with an appropriate format.
- Older video and motion picture film may have been filmed at 4:3 aspect ratio, unlike the current 16:9 ratio. As a result it is normal to “pillar box” the video output. This adds black pillars on either side of the film.
- Audio may or may not be a separate file when digitizing film. Specifications for audio have been provided above, however, more detail can be found in the *Audio* section.

#### Digitization Recommendations

- **Recommendations on Preservation Files for Use in the Digitization of Analog Audio and Video Recordings and Motion Picture Films**  
National, Provincial and Territorial Archivists Conference Audiovisual Preservation Working Group, 2018  
<https://www.bac-lac.gc.ca/eng/about-us/publications/Documents/preservation-file-formats.pdf>

#### Other References

- **IASA-TC- 06 Guidelines for the Preservation of Video Recordings**  
International Association of Sound and Audiovisual Archives, 2018  
<https://www.iasa-web.org/tc06/guidelines-preservation-video-recordings>
- **Digitizing Motion Picture Film: Exploration of the Issues and Sample SOW**  
Federal Agencies Digitization Guidelines Initiative, 2016  
[http://www.digitizationguidelines.gov/guidelines/FilmScan\\_PWS-SOW\\_20160418.pdf](http://www.digitizationguidelines.gov/guidelines/FilmScan_PWS-SOW_20160418.pdf)

## Audio

Format Recommendations: Audio		
	Master/Digitization	Access Copy
<b>File Format</b>	BWF (LPCM encoding)	MP3
<b>Sample and Bit Depth</b>	96kHz/24 bits	Mono: 44.1 kHz/128 Kbps Stereo: 44.1 kHz/256 Kbps

### Considerations

- The difference between BWF and WAV is slight. The audio encoding of BWF and WAV is the same (LPCM); however, BWF has additional data wrapped into the file. The advantage of BWF for archives is that BWF allows embedded metadata in the BEXT and INFO data chunks, similar to IPTC in TIFF images.

### Digitization Recommendations

- **Recommendations on Preservation Files for Use in the Digitization of Analog Audio and Video Recordings and Motion Picture Films**  
 National, Provincial and Territorial Archivists Conference Audiovisual Preservation Working Group, 2018  
<https://www.bac-lac.gc.ca/eng/about-us/publications/Documents/preservation-file-formats.pdf>

### Other References

- **Digitization Best Practices**  
 York University Libraries (no date)  
<https://www.library.yorku.ca/web/collections/digitalscholarship/digitization-best-practices/>
- **Indigitization Toolkit - Audio Digitization**  
 Indigitization, Irving K. Barber Learning Centre, et. al. (no date)  
<http://www.indigitization.ca/indigitization-toolkit/audio-digitization/>
- **Audio Standards**  
 Memorial University of Newfoundland (no date)  
[http://collections.mun.ca/PDFs/about/Audio\\_Standards.pdf](http://collections.mun.ca/PDFs/about/Audio_Standards.pdf)  
<http://collections.mun.ca/cdm/about>
- **Yukon Archives Sound Recording Digitization Standard**  
 Yukon Archives, 2015  
[http://www.tc.gov.yk.ca/pdf/Yukon\\_Archives\\_Sound\\_Recording\\_Digitization\\_Standard.pdf](http://www.tc.gov.yk.ca/pdf/Yukon_Archives_Sound_Recording_Digitization_Standard.pdf)
- **Minimum Digitization Capture Recommendations**  
 American Library Association, 2013  
<http://www.ala.org/alcts/resources/preserv/minimum-digitization-capture-recommendations#audio>

- **Guidelines on the Production and Preservation of Digital Audio Objects (web edition)**  
International Association of Sound and Audiovisual Archivists, 2009  
<https://www.iasa-web.org/tc04/key-digital-principles>
- **ARSC Guide to Audio Preservation**  
Association for Recorded Sound Collections, Council on Library and Information Resources, National Recording Preservation Board of the Library of Congress, 2015  
<https://www.clir.org/wp-content/uploads/sites/6/pub164.pdf>
- **Sound Directions, Best Practices for Audio Preservation**  
Indiana University and Harvard University, 2007  
[http://www.dlib.indiana.edu/projects/sounddirections/papersPresent/sd\\_bp\\_07.pdf](http://www.dlib.indiana.edu/projects/sounddirections/papersPresent/sd_bp_07.pdf)

## Photographs, Documentary Art, Historical Maps, Posters

Format Recommendations: Photographs - Art - Maps - Posters			
	Master/Digitization		Access Copy
	Printed: Reflective	"Film": Transmissive	
<b>File Format</b>	TIFF GeoTIFF (maps)	TIFF	JPEG, PDF JPEG, PDF, GeoTIFF, GeoPDF, KML (maps)
<b>Bit Depth</b>	8 bit bitonal 24 bit for colour (maps)	8 bit bitonal 24 bit for colour	Same as master.
<b>Resolution/Dimensions</b>	Variable: -Minimum: 300 ppi, with 3000 pixels on longest dimension -Recommended: 400 ppi, with 4000 pixels on longest dimension -600 ppi, with 6000 pixels on longest dimension for fragile "scan once", maps, art with fine detail, etc.	Pixels per inch (ppi) variable dependent on film size: -Minimum: 4000 pixels on longest edge. -Recommended 4000-6000 pixels on longest edge.	Variable: -match original, unless requested at a lower resolution.
<b>Colour Profile</b>	RGB		RGB or sRGB

## Considerations

- If a large scanner is not available large objects such as maps, art and posters may be digitized on a copy stand (with a camera).
- Dimensions and resolutions are often represented differently for printed materials than they are for standard film stock (i.e. 35 mm). Because of the standard dimensions of film stock sometimes only a resolution is provided, with the dimensions being 1:1 ratio. For example if you see a recommendation to scan 35mm (1.377 inch) film at 2400 ppi the resulting digital image would be 4131 ppi on the longest edge, which would fall into the recommended resolution in the table above.
  - Example: 1.377 inch x 2400 ppi = 4131 ppi.

## Digitization Recommendations

- **Recueil de règles de numérisation**  
Bibliothèque et Archives nationales du Québec, 2014 (French only)  
[http://www.banq.qc.ca/a\\_propos\\_banq/publications/publications\\_electroniques/recueil\\_regles\\_numerisation/index.html](http://www.banq.qc.ca/a_propos_banq/publications/publications_electroniques/recueil_regles_numerisation/index.html)  
**(Photographs, documentary art)**
- **Indigitization Toolkit - C2 Standards**  
Indigitization, Irving K. Barber Learning Centre, et. al. (no date)  
<http://indigitization-toolkit.sites.olt.ubc.ca/files/2012/04/C2.pdf>  
**(Photographs, documentary art, film, negatives and slides)**
- **La numérisation des documents**  
Bibliothèque et Archives nationales du Québec, 2012 (French only)  
[http://www.banq.qc.ca/documents/archives/archivistique\\_ged/publications/Numerisation\\_des\\_documents.pdf](http://www.banq.qc.ca/documents/archives/archivistique_ged/publications/Numerisation_des_documents.pdf)  
**(Photographs)**
- **Capture Your Collections 2012 - Small Museum Version**  
Canadian Heritage Information Network, 2012  
<https://www.canada.ca/en/heritage-information-network/services/digitization/capture-collections-small-museum.html>  
**(Photographs)**
- **Historical Map Digitization in Libraries**  
Western University, 2016  
<https://ir.lib.uwo.ca/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1049&context=wpub>  
**(Historical Maps)**

- **Government of New Brunswick Digitization Standard**  
Provincial Archives of New Brunswick, 2013  
<http://archives.gnb.ca/Archives/RecMan.aspx?culture=en-CA&Section=2>  
(Historical Maps)

#### Other References

- **Technical Guidelines for Digitizing Archival Materials for Electronic Access: Creation of Production Master Files – Raster Images**  
National Archives and Records Administration (NARA), 2004  
<https://www.archives.gov/files/preservation/technical/guidelines.pdf>  
(For the Following Record Types- Textual, Graphic Illustrations/Artwork/Originals, Maps, Plans, Oversized, Photographs, Aerial Photographs, and Objects/Artifacts)
- **Indigitization Toolkit - Photograph Digitization**  
Indigitization, Irving K. Barber Learning Centre, et. al. (no date)  
<http://indigitization-toolkit.sites.olt.ubc.ca/files/2018/03/G-2018.pdf>  
(Photographs)
- **Historic Map Digitizing**  
University of Saskatchewan (no date)  
<https://hgis.usask.ca/services/digitizing.php>  
-Basic overview of how to digitize maps  
(Historical Maps)

## At-risk and Last Copy Material

Because **at-risk material** and **last copy** items are not physical formats there is no digitization standard for them. Instead considerations for digitizing this type of material centres more around digitization priorities, decision making and object handling. See *Digitization Project Management* for details on prioritizing collections for digitization and individual digitization best practices appropriate to the format for digitization recommendations.

## General

The following documents provide general information on digitization standards:

- **Minimum Digitization Capture Recommendations**  
American Library Association, 2013  
<http://www.ala.org/alcts/resources/preserv/minimum-digitization-capture-recommendations>
- **FADGI Guidelines**  
Federal Agencies Digital Guidelines Initiative (no date)  
<http://www.digitizationguidelines.gov/>

## **Acknowledgements**

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## **Appendix: NHDS Steering Committee**

### **Members**

David Alexander, Royal BC Museum

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Paul Durand, Canadian Museum of History

Loren Fantin, OurDigitalWorld Organization

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Geoffrey Harder, University of Alberta

Christopher Hives, University of British Columbia

Allison Lennox, Toronto Public Library

Gilles Lesage, Société historique de Saint-Boniface

Loryl MacDonald, University of Toronto

Katherine McColgan, Canadian Federation of Library Associations

Heather Menzies, The Writers Union of Canada

Andrea Mills, Canada Internet Archive

Lisa Miniaci, Bibliothèque et Archives nationales du Québec

Michael Moosberger, Dalhousie University

Kathryn Rose, Memorial University of Newfoundland

Kathryn Ruddock, University of Calgary

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