AN INTRODUCTION to
Identifying and Preserving Motion Picture Film

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Connecting to Collections Care
Film Identification
Film vs. Video

FILM

VIDEO
Film Gauge and Base

- Nitrate Film
  - 35mm
- Acetate Film
  - 7.5mm to 105mm
- Polyester Film
  - 16mm and 35mm
Film Elements

- Negatives
- Positives
- Color
- Black & White
- Soundtracks
- Magnetic tracks

Types of Deterioration
Nitrate Film Decay

Five Stages

1. Sweet Stinky odor
2. Honey-like gooey blisters
3. Bubbling and hardening of yellow goo
4. The hockey puck – complete hardening of the film
5. Film begins to deteriorate into a brown powder (use extreme caution if handling)

Vinegar Syndrome

Most common preservation problem related to film

1. Diacetate – smells like camphor
2. Butyrate – smells like rancid butter
3. Propionate – smells like rotting fish

Contagious to other films

images –
www.imagepermanenceinstitute.org
Mechanical Decay

Deformation in size and shape

- Shrinkage
- Swelling
- Brittleness
- Cracks and Tears
- Softening
- Warping
  - Edgewave
  - Twist and Curl
  - Spoking
- Emulsion Fogging
- Ferrotyping
- Crazing
Chemical Decay

- Image fading
- Dye fading
- Silvering Out

Biological Decay

- Mold
- Insects
- Animals
- Bacteria

# NARA At-Risk Matrix

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Immediate</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acidity</strong></td>
<td>3+</td>
<td>2+</td>
<td>1+</td>
<td>1-</td>
</tr>
<tr>
<td><strong>16mm Shrinkage</strong></td>
<td>1.3% +</td>
<td>1% - 1.3%</td>
<td>.7% - 1%</td>
<td>.7%</td>
</tr>
<tr>
<td><strong>35mm Shrinkage</strong></td>
<td>1.9% +</td>
<td>1.6% - 1.9%</td>
<td>1.3% - 1.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td><strong>Fading</strong></td>
<td>Present</td>
<td>Present</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Emulsion Fogging</strong></td>
<td>Present with evidence of layer separation</td>
<td>Present</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ferrotyping</strong></td>
<td>10 ft. or longer sections</td>
<td>3 to 10 ft. sections within reel</td>
<td>1 ft. to 3 ft. sections within reel</td>
<td>Evidence of small spots</td>
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<td>Silvering Out</td>
<td>10ft. or longer sections</td>
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<tr>
<td>Mold</td>
<td>Large areas with evidence of etching</td>
<td>Large areas with some underlying damage</td>
<td>Large areas easily removed with no underlying damage</td>
<td>Small spots easily removed</td>
</tr>
<tr>
<td>Brittleness</td>
<td>Present</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Film Base</td>
<td>Nitrate</td>
<td></td>
<td></td>
<td>Polyester</td>
</tr>
<tr>
<td>Use (No. of pulls per year)</td>
<td>7+</td>
<td>3+</td>
<td>2-</td>
<td></td>
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Intrinsic Value Considerations

1 - Aesthetic or artistic quality
   ○ Is this a unique item to a specific filmmaker, event, etc?

2 - Age that provides a quality of uniqueness
   ○ Is this a hand colored nitrate print from 1904?

3 - Value for use
   ○ “impressively convey the immediacy of an event, depict a significant issue, or impart a sense of the person who is the subject or originator of the record.”
Intrinsic Value Considerations

4 - Questionable authenticity, date, author, or other characteristic that is significant and ascertainable by physical examination
   ○ “Some records are of doubtful authenticity or have informational content that is open to question. Although it is impossible to foresee which documents will be questioned in the future, certain types of documents are well known to have the potential for controversy and, if the original records are extant...l tests can be performed. In some cases the controversy can be resolved by recourse to the original item... while in other cases the item will not be conclusive but will provide the researcher with the best evidence from which to draw conclusions.”
   ○ Project Blue Book for example

5 - General and substantial public interest because of direct association with famous or historically significant people, places, things, issues, or events

6 - Significance as documentation
   ○ This is how the mill in Small Town, USA celebrated on July 4, 1952

7 - It is unique
   ○ No need in preserving Casablanca. Warner Bros. has that one covered
Preservation
Photochemical vs. Digital
Photochemical Preservation

- Photochemical = making a new physical copy
- Also known as film to film preservation

Inspection of lamp house on a motion picture film printer
A new copy is created by using a film printer to create a negative from your print or a print from your negative.

Contact Printer  Printer Gate  Lamp House
# Photochemical Preservation

## Cons

1. Expensive
2. You still have a physical object
3. Still needs adequate storage
4. Playback equipment

## Pros

1. Maintains the same carrier type
2. You still have a physical object
3. Exceptionally stable
4. If you have a flashlight you can ascertain the content
Digital Preservation

A digital copy is created by scanning your film

**PRESERVATION** = 16mm in 2K and 35mm in 4K (right now)

DFT Spirit 4K Film Scanner  
Spirit 16mm Scanner Gate  
Network Attached Storage (NAS)
Digital Preservation

Cons

1. Expensive

2. You need adequate redundant file storage

3. Playback hardware and software

4. You have multiple digital objects

5. Metadata

6. Fixity & Checksums

7. File Migration

8. You’re going to do it all over again when technology changes

Pros

1. Everyone else is doing it

2. Derivative files allow for ease of access
For Real Digital Preservation

File Formats Matter
A LOT
True Digital Preservation File Format = DPX

~ Film Gauge = Resolution Level
  16mm - 2K
  35mm - 4K

~ DPX specification designed to capture inherent motion picture characteristics

~ Allows for continuance of native frame rate

~ 1 file per frame
  16,000 frames in a 10 minute reel of 35mm

~ Data Volume
  1 hour of 2K = 1 TB
  1 hour of 4K = 6 TB

~ Cross platform compatible

~ Can overscan the image to capture as much film information as possible

~ Could stand in the place of the original film
Digital “Preservation”

File Formats Matter
A LOT

~Most other file formats are VIDEO formats

~Film Gauge = Resolution Level
  16mm - 2K
  35mm - 4K

~These file specifications are designed to capture inherent video characteristics (interlacing, color, etc)

~Does not necessarily allow for continuance of native frame rate (29.97)

~Proprietary

~Cross platform compatibility issues

~Data volumes can be large or smaller depending on the level of compression

~Should not stand in the place of the original
In my official capacity as a Federal Employee and as a representative of the National Archives I cannot tell you what to do.

- If you are able, choose a robust *preservation* file format (DPX or TIFF)
- If you are unable to accept said format due to size choose an adaptable, robust file format with few known issues - good examples include AVI and MKV - a full list of file types can be found at the LoC site.
- Acquire smaller files that you can share for access – MOV and MP4 are good examples

What Does This All Mean – AKA Tell Me What To Ask For!
In my official capacity as a Federal Employee and as a representative of the National Archives I cannot tell you what to do.

- Be ready to store copies in multiple places (servers, cloud storage, drives)
- Be ready to maintain the data and regularly check for fixity
- Be ready to migrate data over the course of time

*Do. Not.*

Throw. Away.
Your. Film!*

*unless it’s truly toast and you created a 2K to 6K preservation file*
2 ½ Examples

~ Ex. 1 – Deteriorated Film
● Film Copy
● Preservation File
● Robust Derivative Files

~Ex. 2 – Film in Good Condition
● Preservation File
● Robust Derivative Files

~Ex. ½ – Film in Good Condition
● Robust Derivative Files
Project Guidance
1 – Background – This should include a brief overview of the institution’s overall mission and why this particular group of materials has been selected for digitization.

2 – Objectives – State the goals of the project including deliverables, defined responsibilities, and expectations for the vendor and institution.

3 – Definitions – Provide definitions for appropriate terms and definitions used within the Statement of Work

4 – Description of Source Material – Describe the characteristics (format, gauge, condition, etc.) of the film to be scanned.
Information for Vendors

5 – Description of Services/ Requirements – Describe the place of performance, the institution and the vendor’s roles and responsibilities in regards to material handling, shipping and transport, digitization workflows, required metadata, and deliverables.

6 – Specifications for File Deliverables – describe requirements for file deliverables in detail including file naming conventions.

7 – Administrative – Describe responsibilities for tracking, customer service, points of contact, etc.
Information for Vendors

8 – Payment – Outlines terms of payment, invoice submittal, etc.

9 – Timeliness – Describe the turnaround time required by the project

http://digitizationguidelines.gov/guidelines/FilmScan_PWS-SOW_20160418.pdf
Quality Control Across the System

- Evaluation of your files is important!
  - Self evaluation – visual QC
  - Vendor evaluation – vendor provides a report and/or a manifest with checksum hashes
  - You generate checksums as soon as files arrive (open source tools to the rescue)

- Storing your files in a managed environment is important!
  - Geographic separation
    - Partner with a local college or university
    - Store sets in the clouds
    - Store a set on LTO tape
  - Regular backups

- Giving your files a checkup is important!
  - Monitor the integrity of your files on a regular, ongoing basis by checking fixity
  - Compare checksums
Continued Collection Care
Long Term Care – Film Reel

- Temperature and Humidity Control
  - Cool and Dry for All
    - Frost Free Freezer option for smaller amounts of film
- Visit your film once every five years or so if in a stable environment
- Visit your film once a year if it isn’t in an optimal storage environment
  - Monitor A-D Strip Readings over time
- Donate your nitrate
Giving your files a checkup is important!
  ○ Set a schedule up to monitor the integrity of your files and stick to it
    ■ The sooner you find an issue the more likely it is that you can recover it

Budget costs for equipment refresh
  ○ If partnering with an institution make sure you know what their plans are

Be prepared to migrate data

Have a metadata plan for continued access
Thanks so much,

And I like helping!

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