# Creating Infrastructures For Long Term Digital Preservation

For Libraries, Museums and Memory Institutions


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**October, 2021**

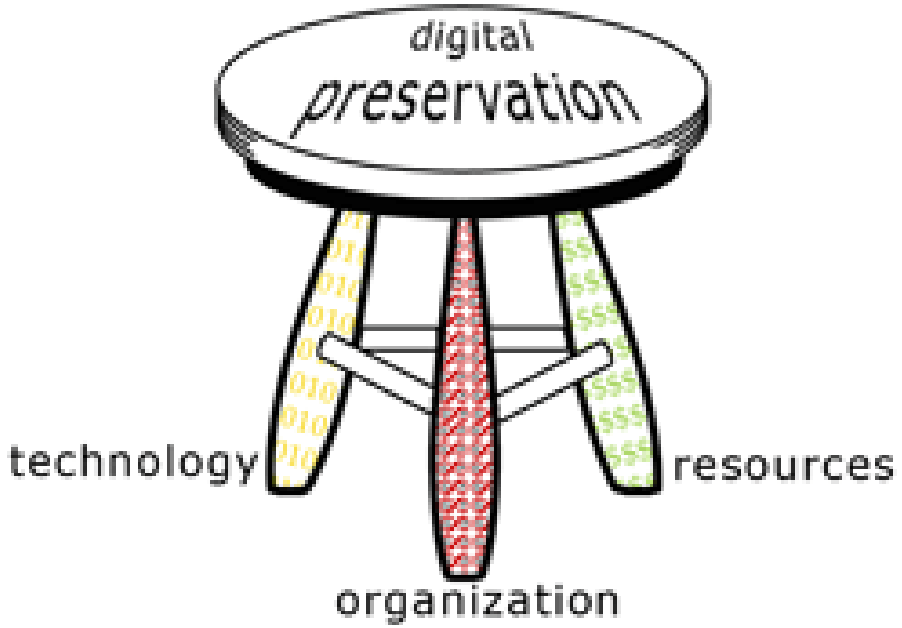


# What is Long Term Library Digital Preservation Storage?

- Libraries, Special Collections and University Archives collect Print & other media and increasingly gather and collect digital information, media and data.
- Simply put, Long Term Library Digital Preservation Storage **Very** long-term Digital Storage (10 years +).
- For which there are digital storage standards in line with Research library national standards (ISO standards: **16363, 16919, 14721**) and longer-term new millennia archival perspectives

# Digital Preservation in Research Libraries follows a Unique **3-Legged** Library Model

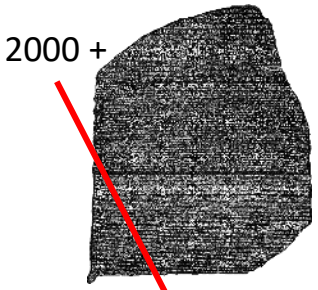
- **Organization**
  Leverages existing human resources in libraries to build on their archival/stewardship expertise for the digital age
- **Technology**
  Synthesizes Technological Capabilities to meld with Traditional Library Archival/Collection Preservation Models
- **Resources**
  Utilize Both Library Human Resources and Library Network resources.




Anne Kenney/Nancy McGovern, 2007

# Different Communications Media Possess Different Lifespans

(in years)




1000
900
800
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Years

Stone | Vellum | Paper | Microfilm | Magnetic tape | CD | Disc | Internet

# Many Considerations For Long-Term Digital Preservation Solutions

- Technological Considerations

- Disaster Planning

- Institutional failure

## Any Solution Must Allow For

Technological diversity

Digital Replication

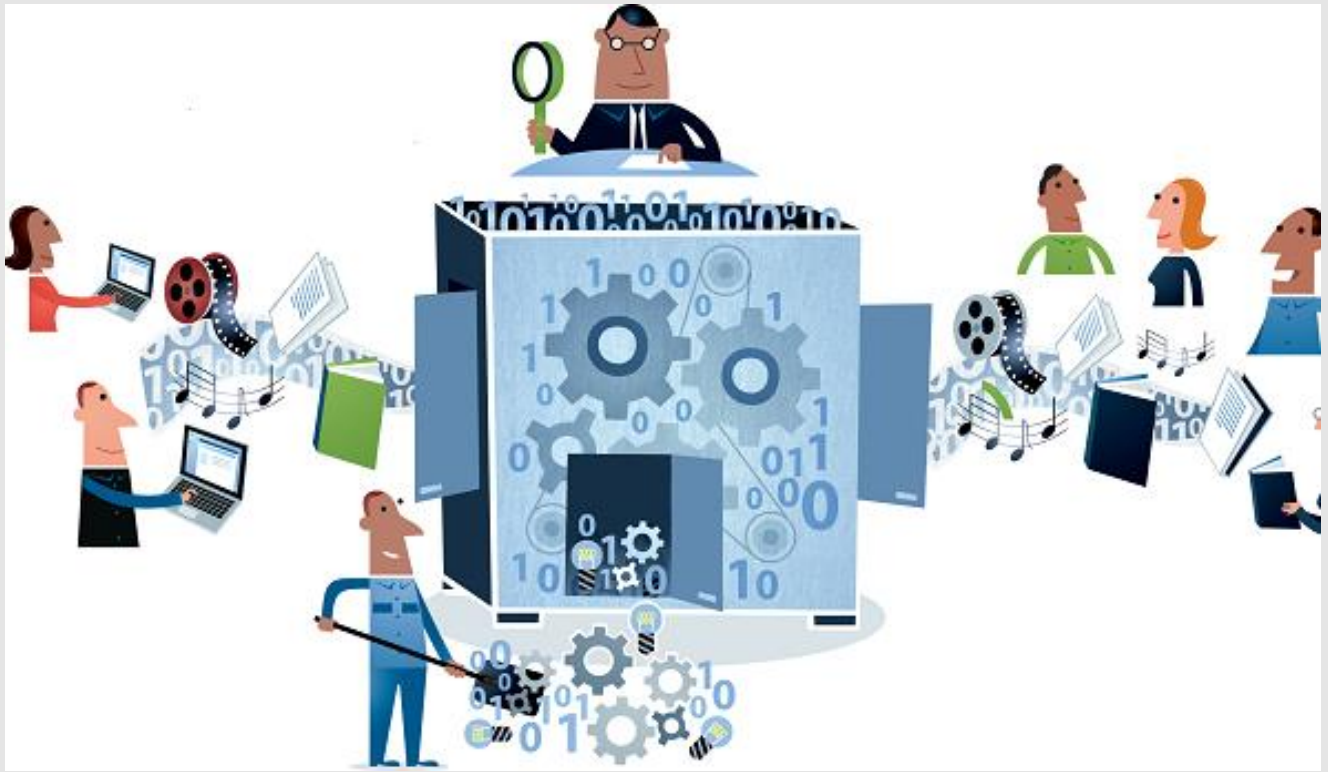
Digital Auditing and repair

Be Geographically distributed

Meets best practices for repositories

Possesses Succession Agreements

# Unique Characteristics of Technology of Long-Term Digital Preservation



**Any Digital Preservation Technology Must Allow for:**

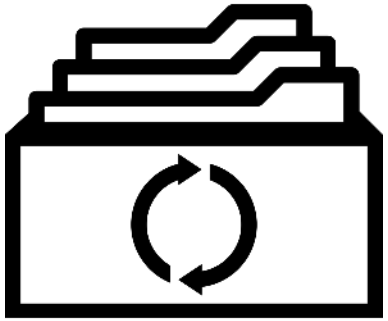
- Migration and Preservation of Formats for Long Term Storage (Normalization of Files, Migration Forward)
- Risk Mitigation for Data and Content.
  Multiple bit-level copies, stored in disparate locations geographically, administratively, and technologically.
- Leverage the libraries' role and in academic environments as keeper of the scholarly record in a digital arena

# Primary Steps

Step 1: Form a Digital Preservation Working Group
(Texas State University Libraries Example)
TXU DPWG Background & History

**Purpose:** The **DPWG** Group will provide oversight, direction and responsibility for Digital Preservation, Technology and Policy Infrastructure

- **Group Formed 2015** and consists of members of Libraries' Digital and Web Services (Digitalization Lab, Institutional Repositories) University Archives, Wittliff Collections, Library General Collections
- Group began by investigating and then authoring the Libraries' first Digital Preservation Policy Document (August 2016), benchmark minimums for preservation Masters etc.
- Created Dedicated Local Server Space for Preservation Files and Use Files with Library IT/University Technology Resources



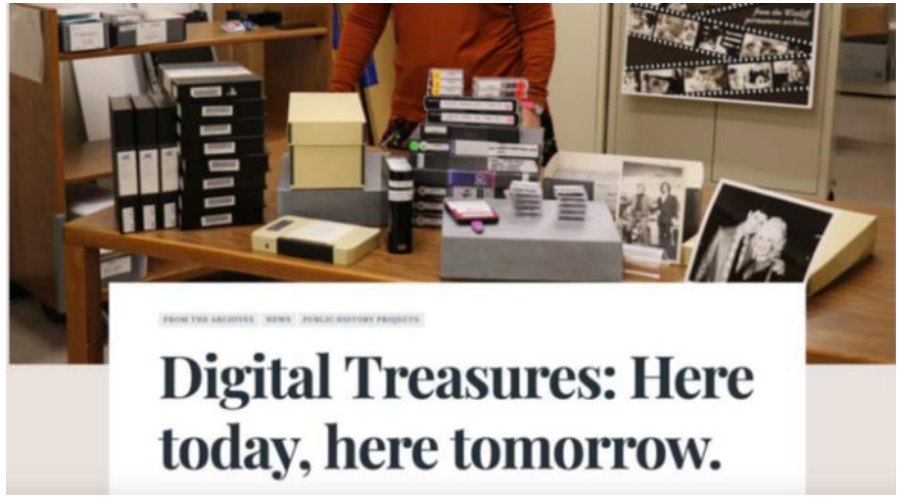
Technology


Policy

# Investigation of New Digital Preservation Tools, Platforms and Resources (2016-2018)

- **Archivematica**: Middleware standard for Digital Preservation Metadata and Integrity
  - Archivematica bundles micro-services for normalizing files, managing metadata and verifying file types, bit-level integrity (checksums) etc.
  - Texas State Began R&D with Archivematica on Linux Ubuntu and first deployed production level instance on a Linux Red Hat platform
  - University Archives and Special Collections began experimenting with, learning and utilizing Software
  - All areas gained expertise in Metadata, middleware workflow process (Archivematica) to create AIP's (Archival Information Packages) to safely store, archive and retrieve files and metadata for later use

archivematica



# Step 2: Conduct Initial Digital Storage Needs Estimate (DPWG)

- **Conclusions:** 10-12 TB/year for all access files needed Initial Digital Storage, requiring ~ 60-70 TB

- **University Archives:**
  - Thesis & Diss. project: 500 GB per year
  - Yearbook/Football negatives: 235GB per year
  - San Marcos Daily Record Negatives 1500 GB per year
  - Audio digitization: 500 GB per year.
  - Misc imaging: 500GB per year

- **Special Collections (Wittliff):**
  - Unique digitization projects. Lonesome Dove Dailies (20 TB), Powers (10 TB) , Broyles (300 GB). Jerry Jeff Walker 2# reel tapes .
  - O'Connor Collection/New Major Donation example (2TB).
  - Austin Film Festival: 1.5 TB per year, (2+ years).
  - Misc imaging: 2 TB per year
  - Audio digitization: Wittliff: 200 GB / year

- **General Collections:**
  - **Theses and Dissertations**
  - Streaming media archive: 2 TB per year, General Collections (Not Covered by LOCKSS, PORTICO Memberships)

# Texas Digital Library (Consortium)

## Forms First State Digital Preservation Resource Infrastructure (2016-2018)

- **2016 TDL Preservation Services Initiated**
  (Hires Courtney Mumma from Internet Archive (Wayback Machine, Brewster Kale) to Focus on State Digital Preservation Services
- **2016 TDL Forms Alliance with DuraCloud**
  (Digital Preservation focused Non-Profit Duracloud @ TDL )
- **2017 TDL Creates Digital Preservation Services**
  Members receive "Space" in DuraCloud@TDL for ingesting content, based on membership level.
- **2018** Texas wide TDL Archivematica Users Group Formed
- **2019** TDL State Digital Preservation Committee Formed

# Step 3: Storage Infrastructure Recommendation Charge

2018-2019 Digital Preservation Working Group
Continually Changing Landscape


## Charge 4 Pillar Methodology

**1) Conduct Environmental Scan**: to Identify Library Digital Preservation Storage Options

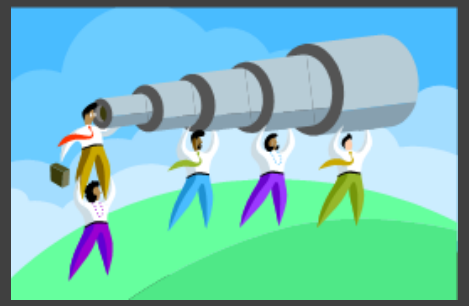
**2) Compare Peer Groups** (TDL) and National Best Practices for Research Libraries

**3) Narrow Focus** to Pragmatic options suitable for University Libraries Needs

**4) Forward Recommendation**: for AVP and VPIT Review and Approval

# Digital Preservation
# **Storage Focus**
2019

- Investigation begins into various Historic, Library Centered, University and Commercial Solutions
- DPWG Group gaining recognition, awareness  of permanent digital preservation storage needs, capabilities of libraries
- Resource possibilities maturing and widely available commercially and in the library space
- Possible solutions ranged from new to historical models to In-House and Outsourcing  possibilities



# Pillar 1: Environmental Scan
# Digital Preservation Solutions (Peer Institutions)

| Texas Peer Institutions | University of Texas at San Antonio | University of Houston | UT Rio Grande Valley | University of Texas (Austin) | Texas A & M University |
|---|---|---|---|---|---|
| **Digital Preservation Solutions** | Duracloud Directly (not via Texas Digital Library, TDL) | Amazon S3 and Glacier Directly (Not via Texas Digital Library, TDL) | Chronopolis via DuraCloud through TDL | LTO Tape, moving to Texas Advanced Computing Center | Chronopolis and Amazon via Duracloud @ TDL |

# Pillar 2: Narrow Focus

## Three Final Candidates for Texas State University Libraries Preservation Storage

**Option 1**: **Outsource** Preservation Digital Storage

- **Preservica**

**Option 2: In-House** Texas State Data Center Solution

- **files.txstate.edu**

**Option 3**: Mixed Duracloud through TDL/Other

**Options**

- AmazonS3
- Amazon Glacier
- Chronopolis

- (Azure)



DURACLOUD™

# Option 1: Outsource

## (All in One Outsource Option, Preservica)

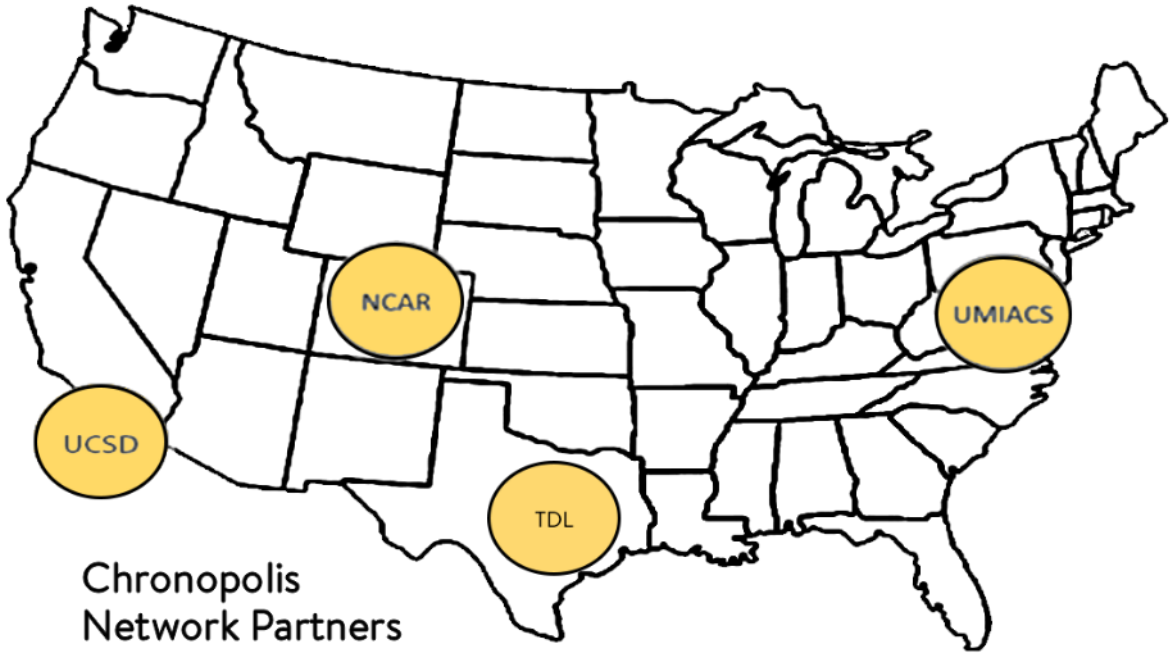
| Benefits | Considerations |
|---|---|
| **Preservica** creates AIP's (Archival Information Packages, Metadata) and provides all technology set-up and support | Costs: $35,000.00/year for 20TB |
| Established Archival Best Practices | No local control or entrance to underlying technology (black box) |
| Recognized Library Peer and Community of Practice | Variable Response to Local Needs (similar considerations to @mire) |

# Option 2: In House

## Expand TR/Texas State Data Center Relationship

| Benefits | Considerations |
| --- | --- |
| **Proven relationship** with TR. | **Specialization not in place**: Metadata Infrastructure, Normalization of Formats, library-related expertise or best practices for this type of Digital Preservation |
| **Storage for working files**, access copies, preservation files and associated metadata established | **Requirements for geographic, administrative and technological distribution** (even if multiple copies) currently not met |
| Building on our current temporary solution of files.txstate.edu and increasing capacity. Growth estimate of 10-12 TB/year | **30-day window for recovery is currently not sufficient** for maintaining long term preservation files and associated infrastructures needed |

| Benefits | Considerations |
|---|---|
| **Geographic Distribution** at any 3 technologically diverse partner nodes | **Subscription cost**:<br>$2500 annual fee includes 2TB/year storage and ingest<br>$1000 initial setup *(1st year only)* |
| **Non-Commercial solution rooted in libraries and cultural heritage community** | Storage $165/year/additional TB<br>$120 ingest fee/additional TB |
| Library community of practice around this (TDL/Duracloud/Chronopolis) | **Significant Human resources/time investment** for initial technological integration |
| **File Fixity and Data Integrity processes are transparent** | |




# Option 3: Duracloud through TDL (Texas Digital Library) to Chronopolis Option

## Chronopolis: Geographically Distributed Preservation Network

- UC San Diego
- National Center for Atmospheric Research
- University of Maryland, Institute for Advanced Computing Studies
- TACC (Texas Advanced Computing Center)

# Option 3: Duracloud Component

- **Duracloud** is a hosted middleware service from DuraSpace that lets organizations control where and how digital content is preserved.
- The parent organization **Duraspace** is a non-profit organization providing academic library leadership for open source technologies focused upon durable, persistent access to digital data.  (i.e. Fedora, Dspace).
- Currently, Duraspace is part of **Lyrasis**, a longstanding library related organization supporting libraries and technology initiatives



# Option 3: Duracloud Through the Texas Digital Library (TDL)

- Duracloud would be administered through our TDL membership with these consortial relationships, advantages (usergroups, networks etc.) and constraints

- The Texas Digital Library is a Consortial Organization consisting of 22 Texas University Library Organizations

- Focused on enabling Texas Libraries Digital Infrastructure and new digital technology Projects.

# Option 3: Duracloud through TDL

## Amazon S3 and Glacier Option

| Benefits | Considerations |
| --- | --- |
| Amazon S3 suitable for streaming, dynamic access.<br>Amazon Glacier suitable for long-term dark archive needs | Commercial: not tailored to cultural heritage institutions. Does not meet requirements for geographic, administrative and technological distribution |
| Amazon Glacier and Amazon S3 are both part and options within the Duracloud Suite if we ever chose to use them | File fixity and data integrity is a black box (process hidden from owners) |
| TDL and Duracloud both possess established community of library best practices. | Subscription cost<br>$2500 annual fee includes 2TB/year<br>$1000 initial setup *(1st year only)*<br>S3 $265/year per additional TB<br>Glacier $50 / year per additional TB |
| | HR/Time Investment for Initial Technological Integration |

amazon web services

S3 Simple Storage Solution

amazon web services | Glacier

# Digital Preservation Storage Working Group Final Recommendation

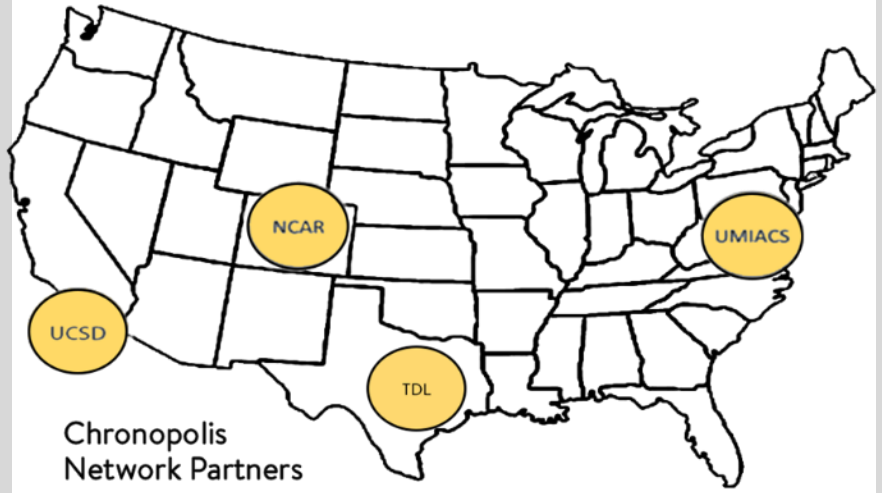
# Option 3: Duracloud through TDL (Texas Digital Library) to Chronopolis Option

- **Provides strong library support through four academic library focused organizations** (Chronopolis, Duraspace, TDL, Lyrasis) for long term viability and peer support networks

- **Anticipated Budgetary Request:**
  - **Year 1**: **$3500.00** ($2500.00 TDL Preservation/year, $1000.00 Initial Set-up/Onboarding, Includes 2 TB Storage)
  - **Year 2-3: $2785.00/year** (includes additional 1 TB storage/year)

- Review Storage and Staff Needs Annually.

CHRONOPOLIS



Chronopolis Network Partners


DURACLOUD™

LYRASIS

DURASPACE™

# Future Directions 2022 +:
# Web Archiving, Digital Forensics, Email Archiving


**Web archiving** =The process of collecting portions of the World Wide Web to ensure information is preserved in an archive for future researchers, historians, and the public.

- Employs web crawlers for automated capture.
- Largest web archiving organization based on a bulk crawling approach is the Wayback Machine (Internet Archive) https://archive.org/web/

# Web Archiving Platforms – Archive-IT

- Launched in 2006
- Built by the Internet Archive (Wayback Machine)
- End-to-end hosted platform to create, store, and provide access to collections of web content
- Most widely-used platform for universities, https://archive-it.org/blog/learn-more/

- Pricing
  - Different pricing levels based on amount of data archived annually
  - TDL is investigating consortial discounts as well as other platforms (WebRecorder)

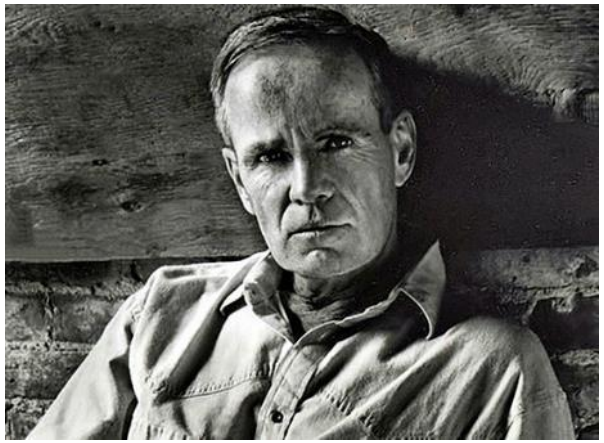

# Web Archiving Opportunities
# Archives and Special Collections, 2022-2027

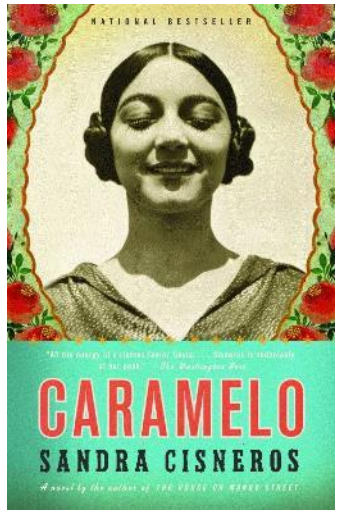
TEXAS STATE UNIVERSITY LIBRARIES

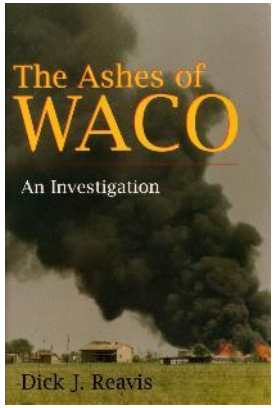
- Partnering with Texas State University researchers/colleges/departments
  - What sites/areas are of interest?

- Crawling *.txstate.edu*
  - Captures institutional records
  - Points to missed items
  - Potent archives Texas State Social Media
    Twitter, Facebook

Crawling Review, Fan and Other Sites of Areas of Interest Regarding Collection Priorities
(Southwest Writers, Photography, Music, Film)






# Conclusions and Deeper Rationale For Long Term Digital Preservation Storage Infrastructure

- Long Term Digital Preservation Provides a New Level of Service Expected by Donors, Researchers, Faculty and students.
- Necessary Focus Area for Research Libraries
- Connects Library with many State and National Library Technology Organizations now focusing on these Areas (Texas Digital Library, Digital Preservation Network, Coalition of Network Information, Lyrasis, Chronopolis, Duraspace)
- Places Texas State Libraries in Line with leading edge institutions we have joined, Association of Research Libraries, ARL, GWLA, Greater Western Library Association, HathiTrust, CNI etc.)

# Long Term Digital Preservation Standards, Resources, Articles and Presentations


ISO Policies. #16363 Audit and certification of trustworthy digital repositories. https://www.iso.org/standard/56510.html , #16919 Requirements for Trustworthy Digital Repositories. https://www.iso.org/standard/57950.html , #14721 Open archival information systems (OAIS). https://www.iso.org/standard/57284.html

Kenney, A and McGovern, N. A Digital Decade: Where Have We Been and Where Are We Going in Digital Preservation? RLG DigiNews April 15, 2007. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/60441/McGovern-Digital_Decade.html?sequence=4

Library of Congress. Digital Preservation at the Library of Congress. (Retrieved 2021) https://www.loc.gov/preservation/digital/

**Texas State Digital Preservation Working Group**. (Retrieved 2021) **Texas State University Libraries Digital Preservation Policy.** https://www.thewittliffcollections.txstate.edu/research/visit/policies/dig-pres-policy.html

**Uzwyshyn, R. (2021). Building Frameworks for Long Term Digital Preservation. Computers in Libraries. September, 2021.** Vol. 41, Number 7. pp. 4-8. ISSN: 1041-7915**.** https://www.infotoday.com/cilmag/sep21/Uzwyshyn--Building-Frameworks-for-Long-Term-Digital-Preservation.shtml

Uzwyshyn, R. (2020). Digital Preservation Storage Infrastructures Model Proposal Presentation. Texas State University. DOI: 10.13140/RG.2.2.14102.09289, https://www.researchgate.net/publication/339390854_Long_Term_Digital_Preservation_Storage_Infrastructures_for_Libraries_Archives_and_Research_Institutions?channel=doi&linkId=5e4f04dd299bf1cdb9391aeb&showFulltext=true

# Long Term Digital Preservation Software and Storage Related Links

**Archivematica.** https://www.archivematica.org/en/

**Amazon Web Services Cloud Storage**
https://aws.amazon.com/products/storage/

**Chronopolis Digital Preservation Network.**
https://aws.amazon.com/products/storage/

**Duracloud Digital Preservation**
https://duraspace.org/duracloud/

**Microsoft Azure https://azure.microsoft.com/en-us/**

**Preservica https://preservica.com/**

**Texas Digital Library Digital Preservation Services:**
https://www.tdl.org/digital-preservation/

# Questions and Comments

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