

Feb 5th, 9:00 AM - 11:20 AM

Presentation Panel on Preservation Best Practices

Lisa Johnston

University of Minnesota - Twin Cities

Francis Pierce-McManomon

Arizona State University

Kieron Niven

University of York

Follow this and additional works at: <https://ir.uiowa.edu/cs3dp>

Recommended Citation

Johnston, Lisa; Pierce-McManomon, Francis; and Niven, Kieron, "Presentation Panel on Preservation Best Practices" (2018).

Community Standards for 3D Preservation (CS3DP). 1.

<https://doi.org/10.25820/efvk-te22>

This Presentation is brought to you for free and open access by Iowa Research Online. It has been accepted for inclusion in Community Standards for 3D Preservation (CS3DP) by an authorized administrator of Iowa Research Online. For more information, please contact lib-ir@uiowa.edu.



Data Curation Best Practices

Community Standards for 3D Data Preservation, Documentation, and Dissemination



Research data have value beyond their original purpose

How big is big?

Re
pl

-
-
-
-

- Byte: one grain of rice
- Kilobyte: cup of rice
- Megabyte: 8 bags of rice
- Gigabyte: 3 Semi trucks
- Terabyte: 2 container ships
- Petabyte: Blankets
Manhattan

- Source: David Wellman, LinkedIn
 - https://www.slideshare.net/dwellman/what-is-big-data-24401517/34-So_what_isvalue



al

book and page numbers

make indexes your work easier

sea_for_mfdfa.csv

100%

Home Layout Tables Charts SmartArt Formulas Data Review

Edit Font Alignment Number

Calibri (Body) 12

General

A	B	C	D	E	F	G	H	I	J	K	L	M
0.296	-0.55	-0.243	-3.04	-2.885	0.071	1.847	-0.521	0.107	-3.528	-3.089	2.45	-.
0.354	-0.487	-0.193	-2.974	-2.933	-0.029	1.951	-0.506	0.061	-3.643	-3.162	2.131	-1.
0.438	-0.449	-0.099	-2.979	-2.901	-0.09	2.051	-0.501	-0.005	-3.647	-3.34	1.713	-1.
0.519	-0.431	-0.018	-3.042	-2.831	-0.13	2.107	-0.452	-0.027	-3.616	-3.42	1.322	-1.
0.696	-0.37	0.023	-3.065	-2.832	-0.187	2.202	-0.415	-0.072	-3.648	-3.504	0.831	-1.
0.939	-0.332	0.083	-3.089	-2.815	-0.233	2.314	-0.342	-0.119	-3.603	-3.648	0.38	-1.
1.188	-0.295	0.171	-3.08	-2.753	-0.295	2.431	-0.197	-0.186	-3.598	-3.619	-0.07	-1.
1.503	-0.284	0.279	-3.129	-2.746	-0.363	2.52	-0.116	-0.298	-3.487	-3.5	-0.608	-1.
1.826	-0.288	0.36	-3.183	-2.743	-0.496	2.59	-0.012	-0.316	-3.318	-3.456	-0.989	-1.
2.153	-0.289	0.369	-3.162	-2.632	-0.615	2.653	0.197	-0.345	-3.249	-3.388	-1.33	-0.
2.59	-0.244	0.359	-3.205	-2.51	-0.761	2.761	0.412	-0.416	-3.204	-3.296	-1.58	-0.
2.97	-0.196	0.319	-3.218	-2.463	-0.944	2.933	0.643	-0.421	-3.143	-3.089	-1.746	-0.
3.269	-0.222	0.297	-3.148	-2.454	-1.045	3.051	0.904	-0.356	-2.983	-2.829	-1.813	-0.
3.512	-0.266	0.274	-3.157	-2.429	-1.147	3.119	1.116	-0.286	-2.783	-2.595	-1.927	-0.
3.684	-0.271	0.289	-3.214	-2.396	-1.255	3.052	1.222	-0.227	-2.627	-2.292	-2.081	-0.
3.824	-0.275	0.233	-3.289	-2.4	-1.262	2.996	1.39	-0.16	-2.475	-2.019	-2.286	-0.
3.889	-0.294	0.186	-3.295	-2.303	-1.306	2.961	1.545	-0.083	-2.293	-1.825	-2.461	-0.
3.896	-0.295	0.158	-3.289	-2.266	-1.383	2.93	1.645	-0.095	-2.195	-1.606	-2.573	-0.
3.838	-0.283	0.152	-3.286	-2.273	-1.352	2.876	1.615	-0.074	-2.086	-1.385	-2.672	-0.
3.712	-0.338	0.139	-3.328	-2.23	-1.302	2.778	1.637	-0.007	-1.971	-1.328	-2.759	0.
3.526	-0.363	0.125	-3.387	-2.198	-1.275	2.604	1.624	-0.019	-1.814	-1.35	-2.817	0.





Research data have value beyond their original purpose, but....

- There is a lot of data! For example...
- Data can be messy and incomprehensible (lack context!)
- Digital file formats are constantly at risk
- Most data never leaves their author's laptop ⇒ benign neglect

Res
pu

-
-
-
-



nal

Large Schedule, with space for 40 names.

CENSUS OF ENGLAND AND WALES, 1911.

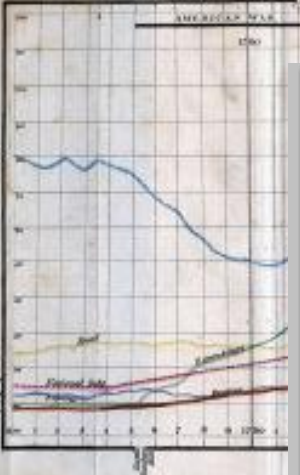
Number of Schedule **66**
(To be filled up by the Enumerator after collection.)

Before writing on this Schedule please read the Examples and the Instructions given on the back of page 2, as well as the headings of the Columns. The entries should be written in Ink.

The contents of the Schedule will be treated as confidential. Strict care will be taken that no information, or for any other purpose

NAME AND SURNAME RELATIONSHIP to Head of AGE (last Birthday) PARTICULARS as to

Lower Chamber Exhibiting the Revenue Schedule



- 13 Kate Wall
- 14 Lottie Champ
- 15 Marion Yell
- 16 Eleanor Doo
- 17
- 18
- 19
- 20

(To be filled up by the Enumerator.)
Total to be carried forward to foot of page 2 ...

MALES	FEMALES	PERSONS
4	12	16

INTERNATIONAL NIAGARA COMMITTEE Year 2010

Summary of Monthly Report of flow over Niagara Falls and of Diversions from the Niagara River and Welland Canal

Maid of Mist Ashland Ave Gauge	Power Diversions, cms						Water Trans. cms	Treaty Share used in cms		Outflow from Chippewa Grass Island Pool, cms	Water of fall terms of Treaty, cms	Flow over Niagara Falls, cms				K C H E W C A N A L	(2) NYS Barge Canal	(1) W E L L A N D C A N A L	
	Month Day/ Night	Dis- charge cms	De- Caw Falls	Sir Adam Beck	Total CDN Plants	Robt. Moses		Canada	USA			Horse- shoe	Amer- ican	Total flow	Min- imum hour				15
Jan	1845	183	1735	1918	2009	6	-9	1909	2018	6589	5772	1596	249	1845	1427			(0)2	(2)8(3)
1901										6280	5456	1410	229	1639	1418			(0)2	(3)0(3)
2014										5444	5624	1359	256	1615	1418			(0)2	(3)8(3)
1958										6936	6129	2560	299	2859	2833			12(2)	19(3)
1994										5429	5620	1403	302	1705	1468			12(2)	19(3)
1623										6071	6250	2584	290	2875	2832	R		31(2)	43(3)
2031										5508	5593	1353	303	1655	1417			31(2)	43(3)
1670										6199	6332	2548	322	2870	2833	V		31(2)	53(3)
2112										5716	5852	1387	336	1723	1420			31(2)	53(3)
1653										6115	6309	2551	301	2852	2834			31(2)	53(3)
2102										5614	5807	1334	320	1654	1418			31(2)	53(3)
1515										5885	6033	2550	300	2850	2832	R		31(2)	50(3)
1947										5342	5513	1335	313	1649	1443			31(2)	50(3)
1412										5562	5827	2557	294	2852	2794	V		31(2)	52(3)
1849										5136	5303	1307	312	1619	1416	R		31(2)	52(3)
1377										5598	5761	2546	311	2856	1868	V		31(2)	50(3)
1810										5088	5251	1333	329	1662	1436			31(2)	50(3)
1923										5304	5436	1286	281	1567	1418			16(2)	50(3)
2015										5447	5516	1307	280	1587	1418			(0)2	47(3)



Signature Wood Modifications Reveal Decomposer Community History

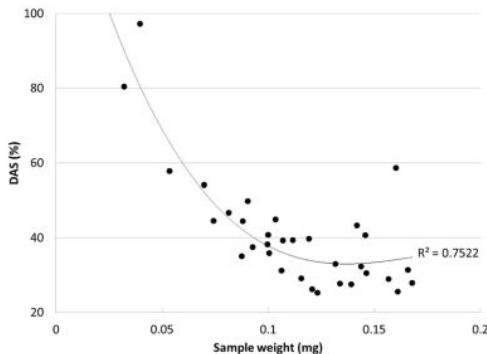


Fig 5. DAS sample size correlations. The DAS (wt%) values from wood collected with a 3/16ths Imperial drill bit from Radiata pine in New Zealand revealed obvious value inflation with smaller sample weights, a pattern shown here among all replicate samples including natural variability and some brown rot. This supports conservatively using more than 100 mg of material for DAS, as suggested by Shortle et al. 2012 [40].
doi:10.1371/journal.pone.0120679.g005

wood sawdust extractable in some cases with the drill bit showed a biasing effect on DAS, an important consideration in sample weight requirements that corroborates the 100–101 mg sample size used by Shortle et al. [40] (Fig. 5). If coupled with L.D, sample size requirements would be limited by Klason lignin needs, likely best with at least 1 g of field material (fresh wt).

Collectively, the results from this trial reinforces the decay class II/III target from the lab trials (given proper field identification when sampling logs) and it demonstrates how a prelimi-

R - minimum required flow over Falls. V - Treaty violation

NATIONALITY of every Person born in a Foreign Country.	INFIRMITY.
State whether— (1) "British subject by parentage." (2) "Naturalized British subject," giving year of naturalisation. (3) "Or (3) If of foreign nationality, state whether "French," "German," "Russian," etc.	If any person included in this Schedule is— (1) "Totally Dead," or "Dead and Dumb," (2) "Totally Blind," (3) "Lunatic," or "Imbecile," or "Feeble-minded," state the infirmity opposite that person's name, and the age at which he or she became afflicted.
1A.	1B.
000	
270	
1	
330	
270	
1	
090	
080	
230	
4000	
150	
270	

[Continue on page 2.]

Some journals require data sharing

The logo for the Proceedings of the National Academy of Sciences (PNAS), featuring the letters "PNAS" in a blue, serif font with a thin blue underline.The logo for PLOS ONE, featuring a stylized globe icon to the left of the text "PLOS | ONE" in a bold, sans-serif font.The logo for the journal Nature, featuring the word "nature" in a white, lowercase serif font on a dark red rectangular background.The logo for the journal Science, featuring the word "Science" in a white, serif font on a red rectangular background, with the AAAS logo below it.

Example policy from PLOS

- *Make all data underlying the findings described in their manuscript fully available without restriction.*
- *When submitting a manuscript online, authors must provide a Data Availability Statement.*
- *Refusal to share data and related metadata and methods in accordance with this policy will be grounds for rejection.*
- *Methods acceptable to PLOS journals with respect to data sharing are:*
 - *Deposit data into appropriate repository (strongly recommended).*
 - *Include data in Supporting Information files.*
 - *Data made available to all interested researchers upon request.*
 - *Data available from third party. The reasons for restrictions on public data deposition must be specified.*

Public

35

Reproducibility Project: Psychology

Contributors: Alexander A. Aarts, Christopher Jon Anderson, Joanna Anderson, Marcel A.L.M. van Assen, Peter Raymond Attridge, Angela Attwood, Jordan Axt, Molly Babel, Štěpán Bahník, Erica Baranski, Michael Barnett-Cowan, Elizabeth Bartmess, Jennifer Beer, Raoul Bell, Heather Bentley, Don van den Bergh, Leah Beyan, Bobby den Bezemer, Denny Borsboom, Annick Bosch, Frank Bosco, Sara Bowman, Mark Brandt, Erin Braswell, Hilmar Brohmer, Benjamin T. Brown, Kristina Brown, Jovita Brüning,

Affiliated institutions: Center For Open Science, University of Virginia, Laura and John Arnold Foundation

Date created: 2012-04-01 10:49 AM | Last Updated: 2016-12-08 03:45 PM

Category: Project

Wiki



Estimating the Reproducibility of Psychological Science

Open Science Collaboration

Abstract: Reproducibility is a defining feature of science, but the extent to which it characterizes current research is unknown. We conducted replications of 100 experimental and correlational studies published in three psychology journals using high-powered designs and original materials when available.

<https://osf.io/ezcuj/>

Citation

osf.io/ezcuj

Components

Estimating the Reproducibility of Psychological Science

Nosek, Cohoon, Kidwell & 1 more

42 contributions



What is data curation?

Data curation is the active and on-going management of data through its lifecycle of interest and usefulness to scholarship, science, and education; curation activities enable data discovery and retrieval, maintain quality, add value, and provide for re-use over time. (UIUC, 2007)

- Based in archival best practice (GLAMs know how to do this!)
- Data repositories provide a technological foundation
- But many curation activities are not easily automated ⇒ need curators (people)



Well-curated data are...

- Easier for fellow scholars and future collaborators to understand
- More likely to be trusted
- The research they represent are more likely to be reproducible
- More likely to be properly cited
- Represent potential cost-savings
- Findable, accessible, interoperable, and reusable, or FAIR (Wilkinson et. al, 2016)



Lots of different repositories curating data in lots of different ways....

TABLE 4.3

Examples of kinds of data repositories found in the United States.

Kind of Repository	Examples
Federally Funded Data Centers	NASA Distributed Active Archives (DAAC), NOAA National Centers for Environmental Information (NCEI), National Snow and Ice Data Center (NSIDC), USGS Earth Resources Observation Systems (EROS) Data Center (EDC)
Federally Funded Research and Development Centers (FFRDC)	National Center for Atmospheric Research (NCAR), Jet Propulsion Lab (JPL), Oak Ridge National Laboratory (ORNL)
National Libraries	National Library of Medicine (NLM), National Agricultural Library (NAL), Library of Congress (LOC)
State and Local Agencies	State geological surveys, County planning offices
Thematic Repository	Long Term Ecological Research Network Information System (LTER NIS), Andrews Forest LTER (AND), National Snow and Ice Data Center (NSIDC), Maria Rogers Oral History Program
Domain Repository	Global Biodiversity Information Facility (GBIF), Inter-university Consortium for Political and Social Research (ICPSR), DataOne, Interdisciplinary Earth Data Alliance (IEDA)
Institutional Repository	Purdue University Research Repository (PURR), Data Repository for the University of Minnesota (DRUM)
Replication Repository	Dryad Digital Repository, Pangaea Data Library
Software Repository	GitHub, SourceForge
Commercial Archives	DigitalGlobe, Aerial photography companies, Resource exploration companies, Figshare
Private Archives	Huntington Library, Getty Research Institute

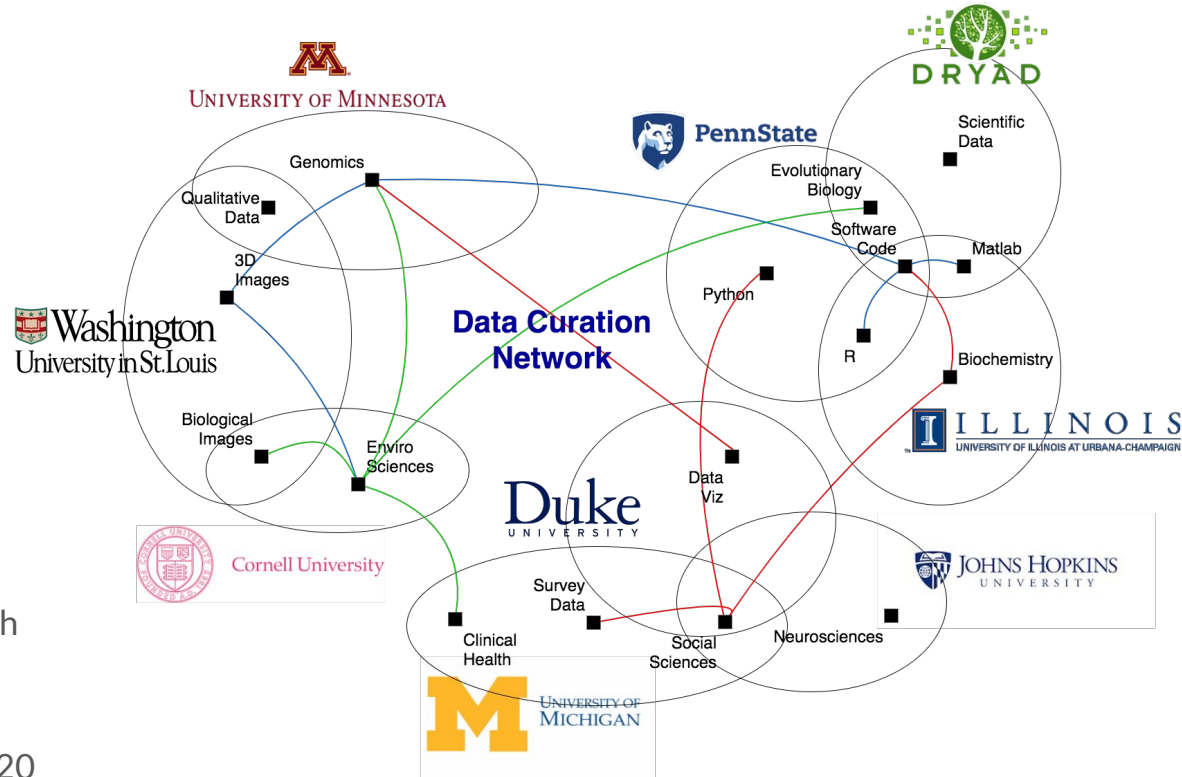


Data Curation Activities

Research performed by the Data Curation Network

Data Curation Network

- Collaborative staffing model for curating research data
- Launched in 2016 with six institutions.
- One year planning 16-17 phase funded by Sloan Foundation
- Implementation phase (aiming for May 2018) will pilot the model with nine partner institutions
- Goal is to expand to all users in 2020



What Curation Activities are Important?

DCN Researcher Study 2016 ⇒ identify where to invest focus of DCN

Method: Held focus groups (Oct-Nov 2016) at the 6 DCN partner institutions, asked researchers:

1. How important are data curation activities for your data?
2. What data curation activities are currently being done by you or a 3rd party?
3. If the data curation activity is being performed, how satisfied are you with the results?





Data Curation Activities

Code review
Contextualize
Documentation
Embargo
File Format Transformations
Persistent Identifier
Quality Assurance
Use Analytics

File Audit
File Inventory or Manifest
File validation
Metadata
Metadata Brokerage
Rights Management
Risk Management
.....more

**We identified and
defined 47 Data
Curation Activities**



Mixed Methods Approach

Rate how important this activity is to you.
(Write a number 1-5 with 5 = highest importance, 1 = not important)

Round 1	Round 2	Round 3	Round 4

Focus Group Discussion, Card Rating Exercise, and Worksheet Protocol

Research Data Curation Activities Worksheet for Illinois DCN Workshop
Please indicate the data curation activities you (or your library (e.g., a campus service, or an external service) perform for your data and discuss your reaction with the results.

Risk Management: The process of reviewing data for known risks such as confidentiality issues inherent to human subjects data, sensitive information (e.g., sexual histories, credit card information) or data regulated by law (e.g. HIPAA, FERPA) and taking actions to reject or facilitate remediation (e.g., de-identification services) when necessary.

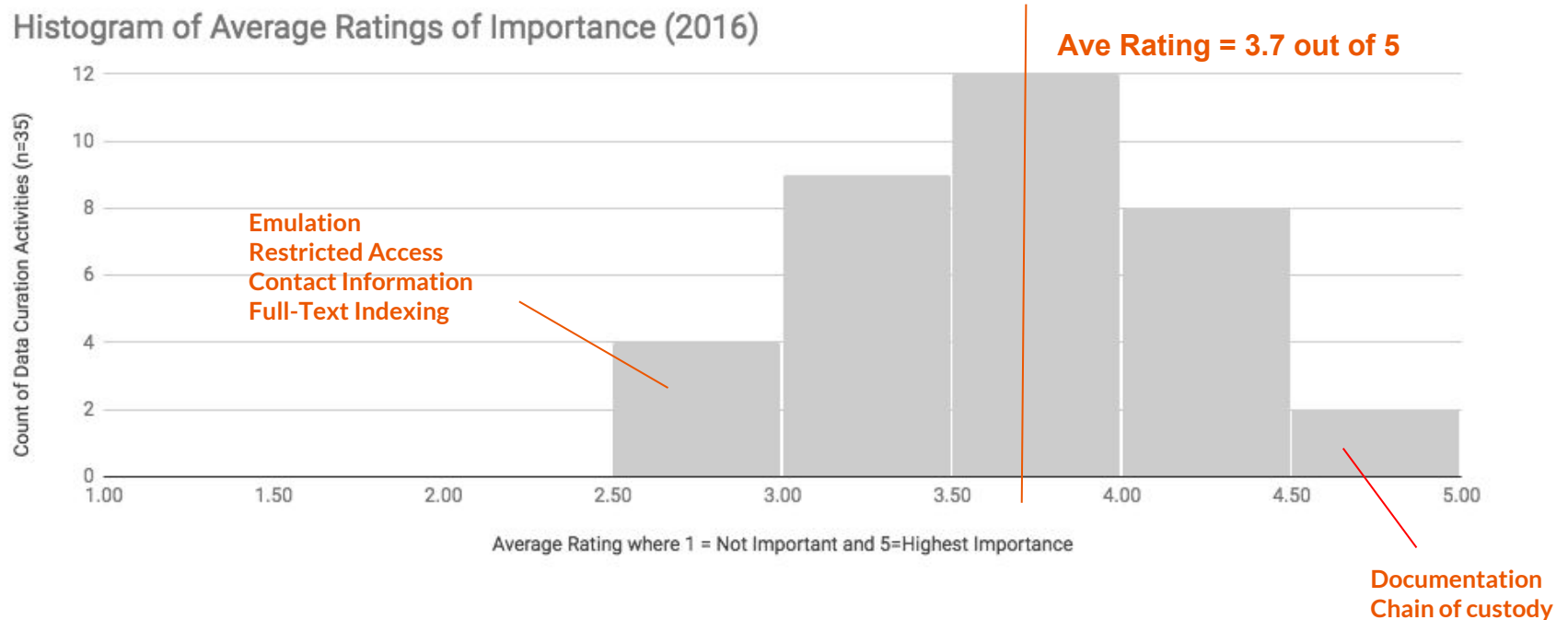
Do these happen for your data?	Yes	No	I Don't Know	N/A
If Yes, are you satisfied with the results?	Yes	No	Somewhat	

Comments:

File Inventory (File Manifest): Data files are inspected and the number, file types (extensions), and file sizes of the data are understood and documented. Any missing, duplicate, or corrupt (e.g., unable to open) files are discovered.

DCN Researcher Study 2016 (n=91)

Histogram of Average Ratings of Importance (2016)



DCN Researcher Study 2016 (n=91)



Most Important Activities* (4 out of 5)

- (Create) Documentation (4.6)
- Secure Storage (4.4)
- Quality Assurance (4.3)
- Persistent Identifier (4.3)
- Software Registry (4.1)
- Data Visualization (4.0)
- File Audit (4.0)
- (Create) Metadata (4.0)
- Versioning (3.9)
- Contextualization (3.9)
- Code Review (3.9)
- File Format Transformations (3.9)

* Rated by more than one DCN focus group from our 2016 Study

DCN Researcher Results 2016 (n=91)

Most Important Activities* (4 out of 5)

- (Create) Documentation (4.6)
- Secure Storage (4.4)
- Quality Assurance (4.3)
- **Persistent Identifier (4.3)**
- **Software Registry (4.1)**
- Data Visualization (4.0)
- **File Audit (4.0)**
- (Create) Metadata (4.0)
- Versioning (3.9)
- **Contextualization (3.9)**
- **Code Review (3.9)**
- File Format Transformations (3.9)

Not Happening for Majority of Researchers

- **Persistent Identifier** (37% happens)
- **Software Registry** (41% happens)
- **File Audit** (16% happens)
- **Contextualization** (38% happens)
- **Code Review** (38% happens)

* Rated by more than one DCN focus group from our 2016 Study

DCN Researcher Results 2016 (n=91)

Most Important Activities* (4 out of 5)

- **(Create) Documentation (4.6)**
- **Secure Storage (4.4)**
- **Quality Assurance (4.3)**
- Persistent Identifier (4.3)
- Software Registry (4.1)
- **Data Visualization (4.0)**
- File Audit (4.0)
- **(Create) Metadata (4.0)**
- **Versioning (3.9)**
- Contextualization (3.9)
- Code Review (3.9)
- **File Format Transformations (3.9)**

* Rated by more than one DCN focus group from our 2016 Study

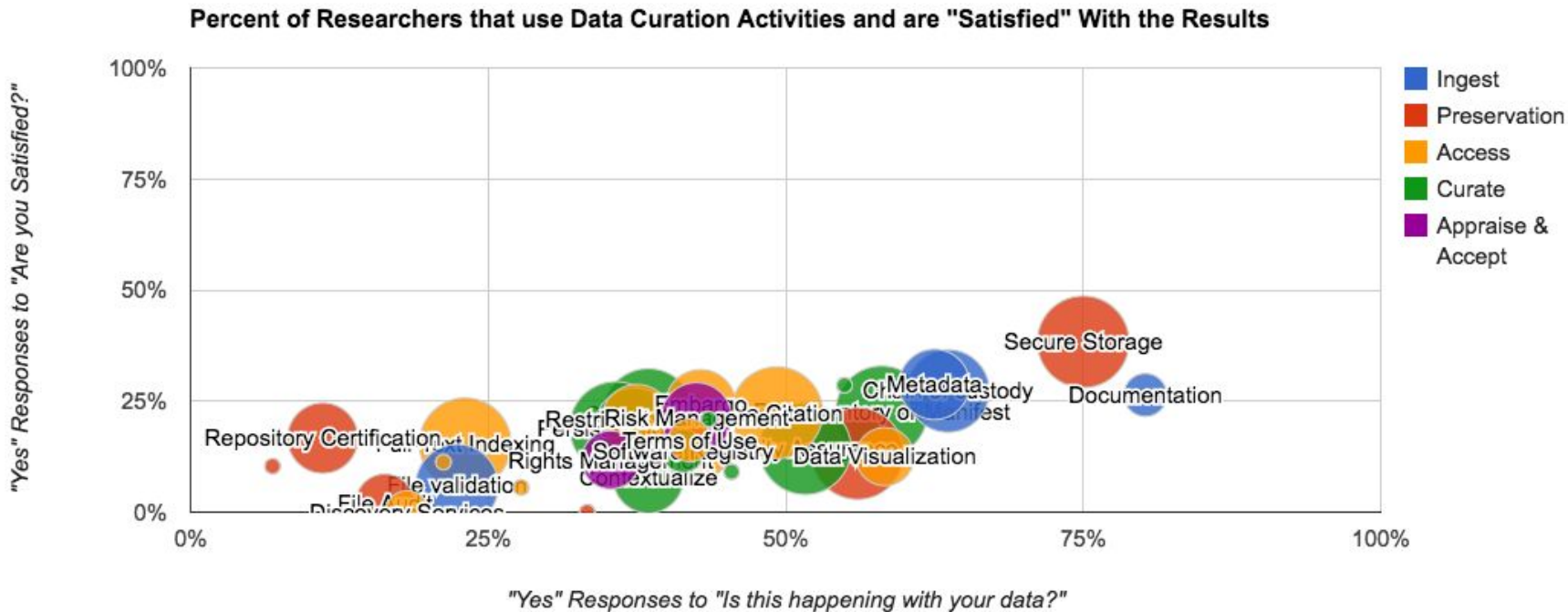
Not Happening for Majority of Researchers

- **Persistent Identifier** (37% happens)
- **Software Registry** (41% happens)
- **File Audit** (16% happens)
- **Contextualization** (38% happens)
- **Code Review** (38% happens)

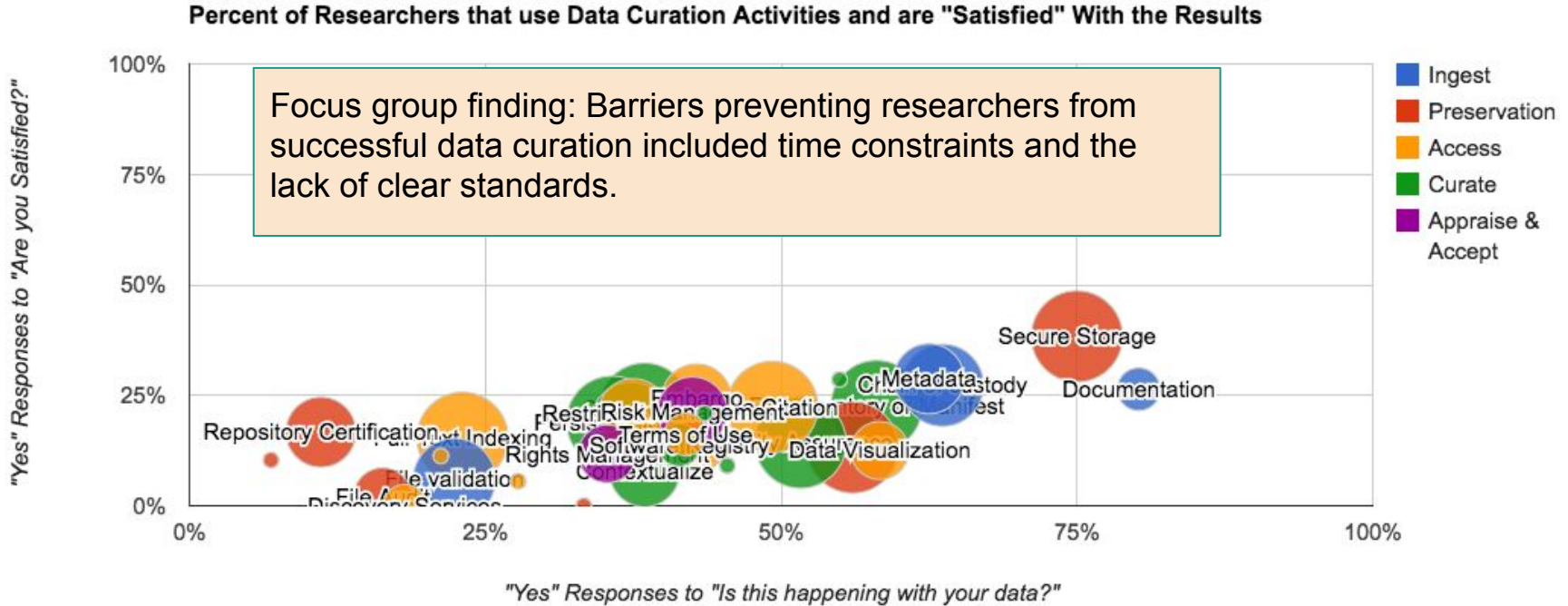
Happening, but not satisfactorily

- **Documentation** (26% satisfied),
- **Secure storage** (38% satisfied),
- **Quality Assurance** (14% satisfied),
- **Data Visualization** (12.5% satisfied),
- **Metadata** (29% satisfied)
- **Versioning** (13% Satisfied)
- **File Format Transformations** (29% satisfied)

Result: No Activity was Satisfying the Majority

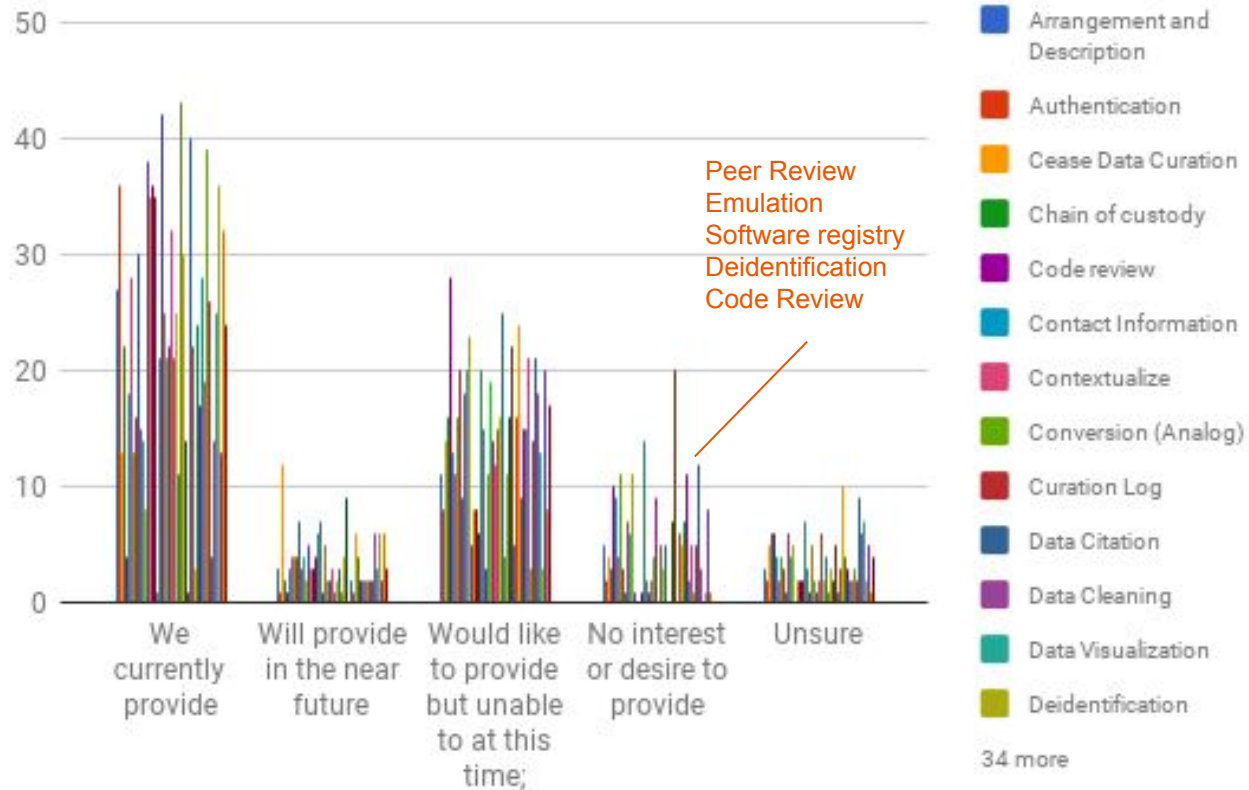


Result: No Activity was Satisfying the Majority

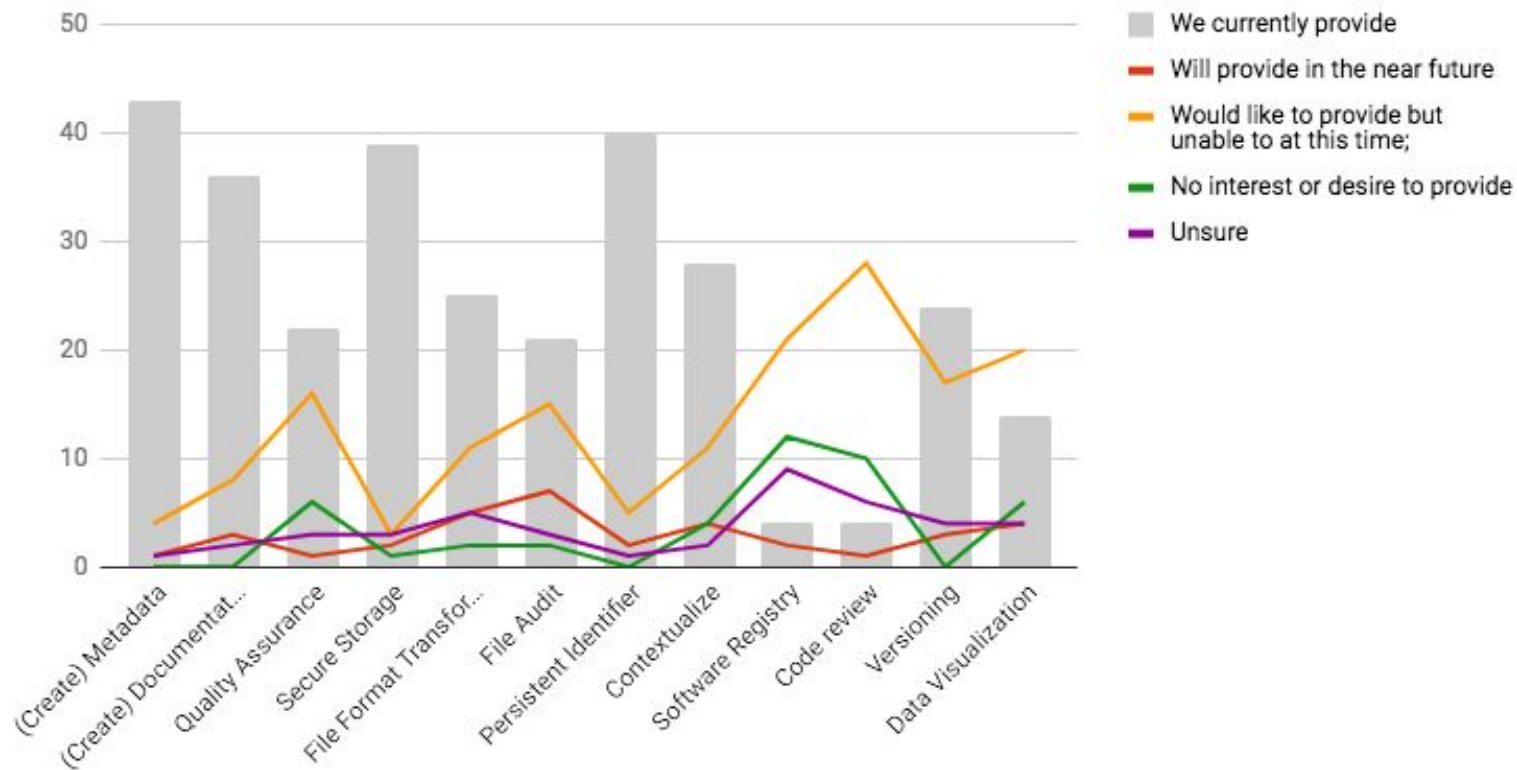




SPEC Kit #354: We asked 80 ARL Institutions to self-assess their support for 47 different data curation activities ranging from ingest activities to preservation actions.



How are the most important Data Curation Activities* supported at n=49 ARL institutions?



* Rated by more than one DCN focus group from our 2016 Study



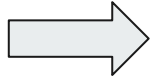
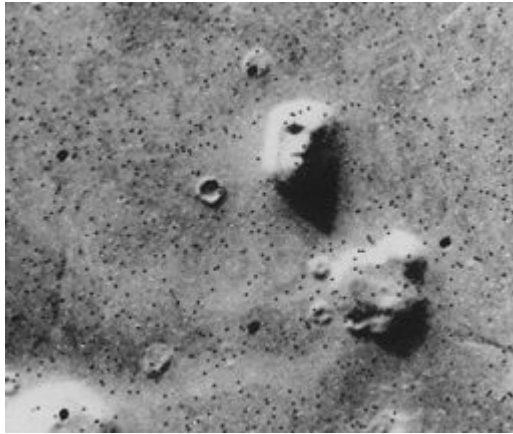
Some Observations to Get Us Started

3d Data Preservation, Documentation, and Dissemination

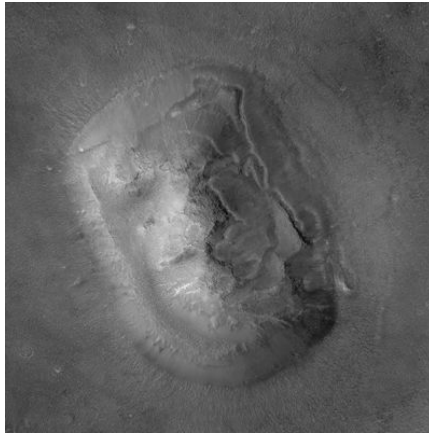


3D Data Preservation Observations

(1976, NASA)



(2001, NASA)

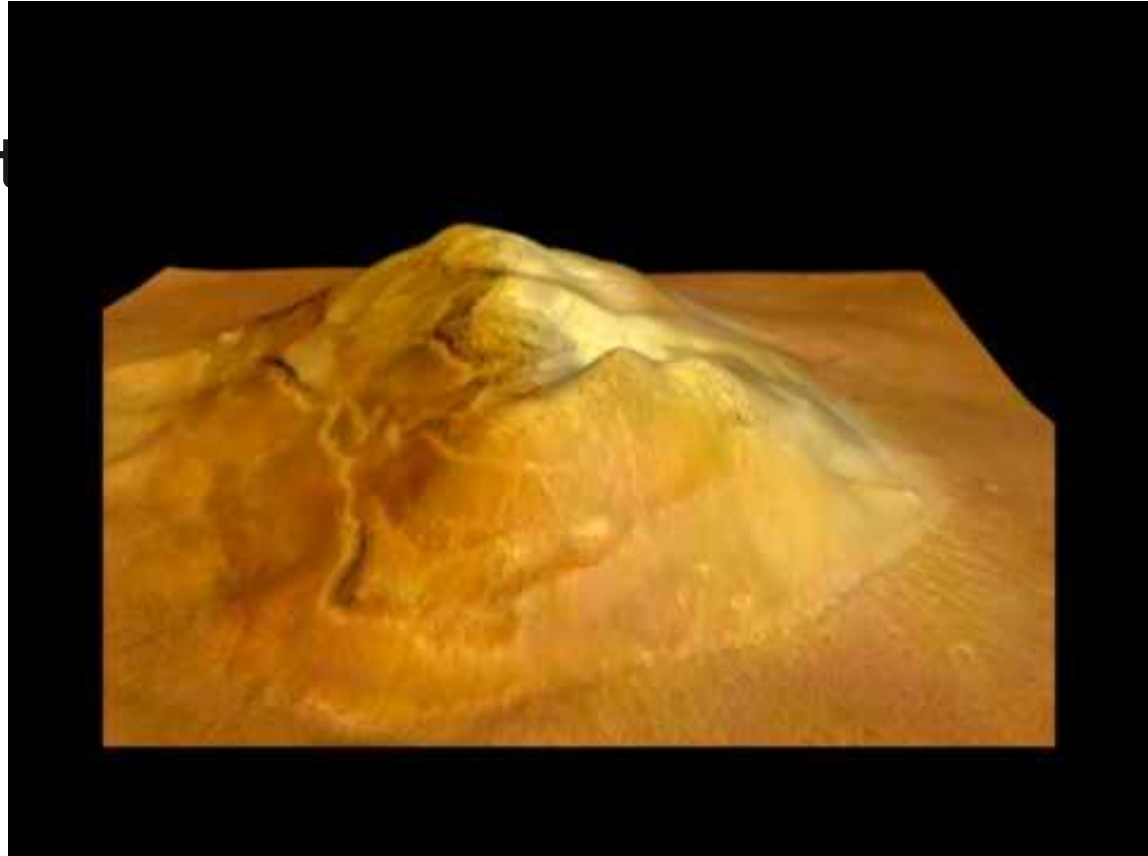


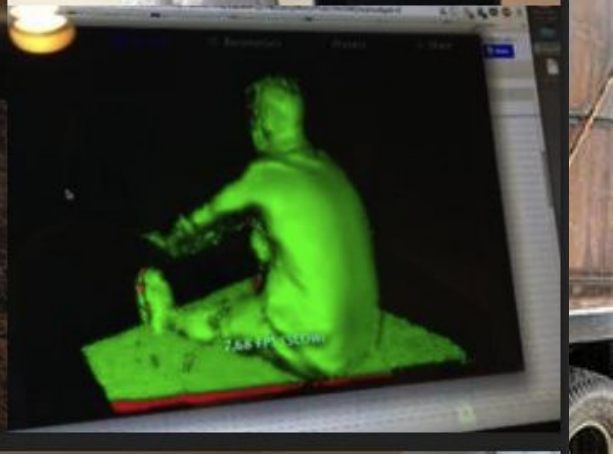
With 3D Data (2006, ESA)



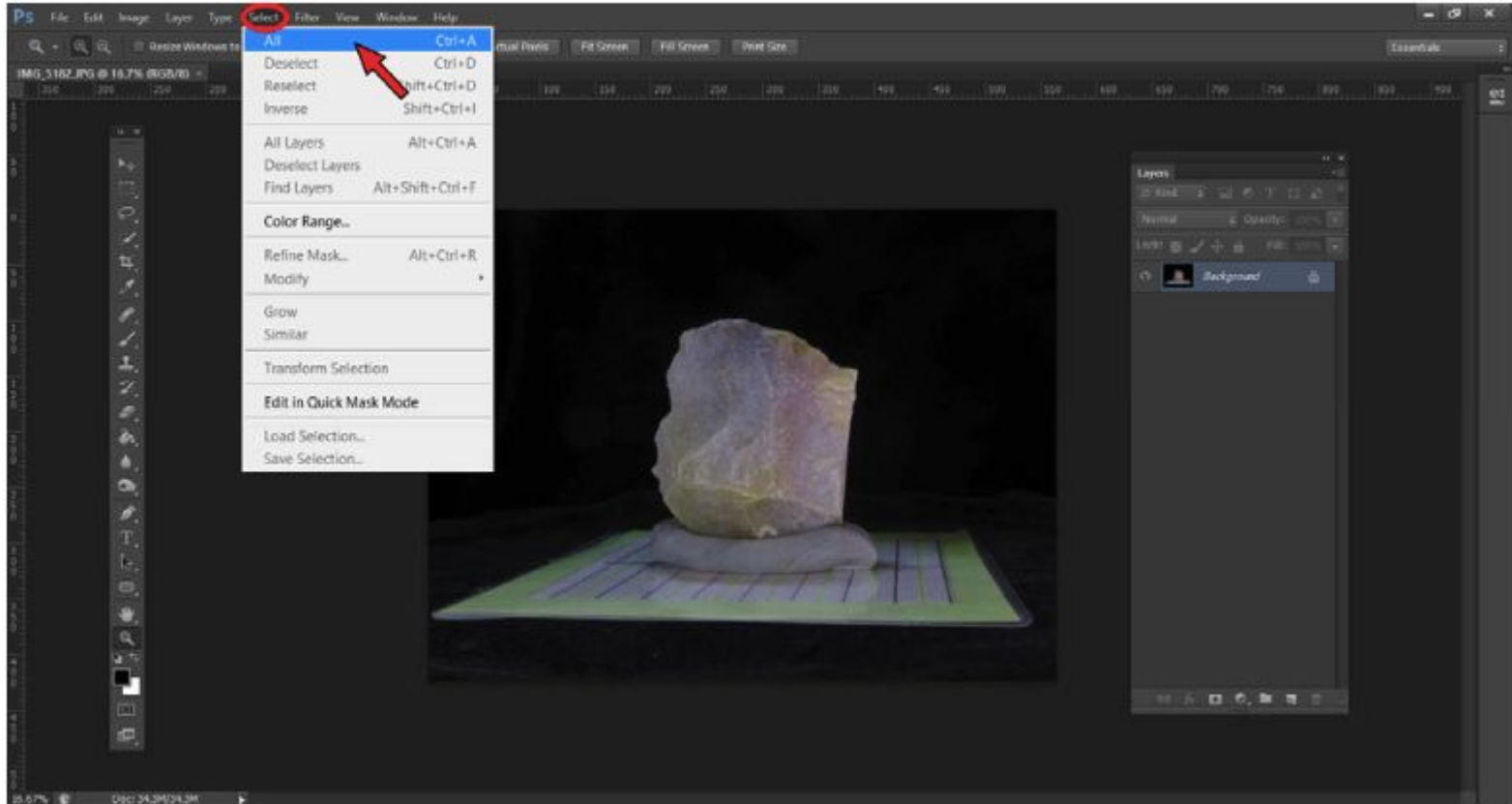
3D Data Preservation

(1976, NASA)





3. Click *Select* → *All*.





3D Data Preservation Observations

1. Preservation starts at ingest.
2. You can't preserve what you don't have.
3. **Can I run the files? Can future users?**
 - What software is required. Is this documented?
 - Will this software be around for future users?
 - What OA alternatives exist?

3D file format

Contents [\[hide\]](#)

- 1 Introduction
- 2 List of file formats
 - 2.1 3DS - 3D Studio
 - 2.2 BLEN - BLENDER
 - 2.3 DAE - COLLADA
 - 2.4 DXF - AutoCAD
 - 2.5 FBX - Autodesk exchange
 - 2.6 geoTIFF
 - 2.7 glTF
 - 2.8 LWO - Lightwave
 - 2.9 OBJ
 - 2.10 OFF
 - 2.11 PLY
 - 2.12 PTS
 - 2.13 PTX
 - 2.14 SC1 - Sculptris
 - 2.15 SCL - Pro/engineer
 - 2.16 SKP - Google sketchup
 - 2.17 STL
 - 2.18 TRI
 - 2.19 V3D
 - 2.20 WRL - VRML
 - 2.21 X3D
 - 2.22 X3DV

3D Data Preservation Observations

1. Preservation starts at ingest.
2. You can't preserve what you don't have.
3. Can I run the files? Can future users?
4. **What exactly is the plan for long-term preservation?**
 - Digital Preservation Framework
 - Establish a policy for various data formats and understand how 3D data fit within this broader policy. Update often! (e.g., don't ignore the new)



Digital Preservation Management: Implementing Short-term Strategies for Long-term Problems

[Workshop Home](#)

[Registration](#)

[Instructors](#)

[Topical Workshops](#)

[Digital Preservation Management Model Document](#)

[Version 3.0 Digital Curation and Preservation Framework: Outline](#)

Developed by Nancy McGovern, last revised September 2014

Trusted Digital Repositories: What are they and how you become one

Contacts:

John Faundeen
Clara Brown
Keith Kirk

The **Trusted Digital Repository Working Group** is part of the USGS Fundamental Science Practices Advisory Committee (FSPAC) Data Preservation Subcommittee

How to apply for TDR Certification:

1. Obtain TDR application from TDR WG,
2. Organizational unit completes application,
3. Submits to TDR WG,
4. Submission Review,
Keith Kirk, Clara Brown & John Faundeen (Representing FSPAC Data Preservation Subcommittee and TDR WG)
5. TDR status granted or submission returned for process modification,
6. Submission Status Spreadsheet
 - Maintained by TDR WG
 - Trigger for Re-Certification in Three Years

*"A **trusted digital repository** is one whose mission is to provide reliable, long-term access to managed digital resources to its designated community, now and in the future."*

(source: <https://www.oclc.org/content/dam/research/activities/trustedrep/repositories.pdf>)

To obtain certification as a Trusted Digital Repository (TDR) the repository must meet the following criteria:

1. The repository has an explicit mission to provide access to and preserve data in its domain.
2. The repository maintains all applicable licenses covering data access and use and monitors compliance.
3. The repository has a continuity plan to ensure ongoing access to and preservation of its holdings.
4. The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.
5. The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission.
6. The repository adopts mechanism(s) to secure ongoing expert guidance and feedback (either in-house, or external, including scientific guidance, if relevant).
7. The repository guarantees the integrity and authenticity of the data.
8. The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for data users.
9. The repository applies documented processes and procedures in managing archival storage of the data.
10. The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.
11. The repository has appropriate expertise to address technical data and metadata quality and ensures that sufficient information is available for end users to make quality-related evaluations.
12. Archiving takes place according to defined workflows from ingest to dissemination.
13. The repository enables users to discover the data and refer to them in a persistent way through proper citation.
14. The repository enables reuse of the data over time, ensuring that appropriate metadata are available to support the understanding and use of the data.
15. The repository functions on well-supported operating systems and other core infrastructural software and is using hardware and software technologies appropriate to the services it provides to its Designated Community.
16. The technical infrastructure of the repository provides for protection of the facility and its data, products, services, and users.

WG Members

Lance Everette
Ben Wheeler
Clara Brown Co-chair
David Boldt
John Faundeen Co-chair
Keith Richmond
Kelly Haberstroh
Natalie Latysh
Rex Sanders
Sofia Dabrowski
Tara Bell

Criteria Sources Reviewed:

- ✓ U.S. Federal RIM Maturity Model,
- ✓ Digital Curation Centre Checklist for Evaluating Data Repositories,
- ✓ NOAA Unified Framework,
- ✓ Data Seal of Approval,
- ✓ ISO 16363-2012 Module 8, Becoming a Trusted Digital Repository,
- ✓ LoC National Digital Stewardship Alliance,
- ✓ Data Seal of Approval / World Data System



Thanks!

<https://sites.google.com/site/datacurationnetwork>