



# 2023 THE YEAR OF OPEN SCIENCE





First Video of NASA's Ingenuity Mars Helicopter in Flight, Includes Takeoff and Landing (High-Res)



Watch later



Share



0:00 / 0:57



YouTube



# What is Open Science?

“Open Science is the principle and practice of making research products and processes available to all, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and equity.”

- *Adapted from the 2022 Nelson Memo*



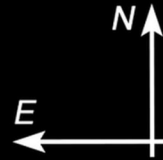
# Looking ahead at really big challenges

**“We need more WE science rather than ME science.”**

-Harlan Krumholz  
Yale School of Medicine at 2022 CZI Meeting

Join us in advocating for the open sharing of data, software and results!

Dimorphos  
HST WFC3/UVIS  
F350LP



Credit: Science: Nasa, ESA, Jian-Yang Li (PSI); animation: Alyssa Pagan (STScI)



# YEAR OF OPEN SCIENCE

*To Change Everything, We Need Everyone!*



## Goals:

1. Develop a strategic plan for open science
2. Improve the transparency, integrity, and equity of reviews
3. Account for open science activities in evaluations
4. Engage underrepresented communities in the advancement of open science



# Get NASA Open Science Certified!

## Take the first module at AMS Room 401



Workshops are limited to 60, so sign up early!

- Monday 1:30-4:00 PM
- Tuesday 9:00-11:30 AM
- Wednesday 9:00-11:30 AM
- Thursday 1:30-4:00 PM



Enroll now!





# Moderator

Yvonne Ivey, NASA

# Panelists

Chris Marcum, White House

Michael Cooke, DOE

Eric DeWeaver, NSF

Tony LaVoi, NOAA

Kevin Murphy, NASA

Geoffrey S. Plumlee, USGS



# Open Science Coordination in the Federal Government

**Chris Marcum**

Assistant Director for Open Science and Data Policy  
White House Office of Science and Technology Policy







U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

# Year of Open Science

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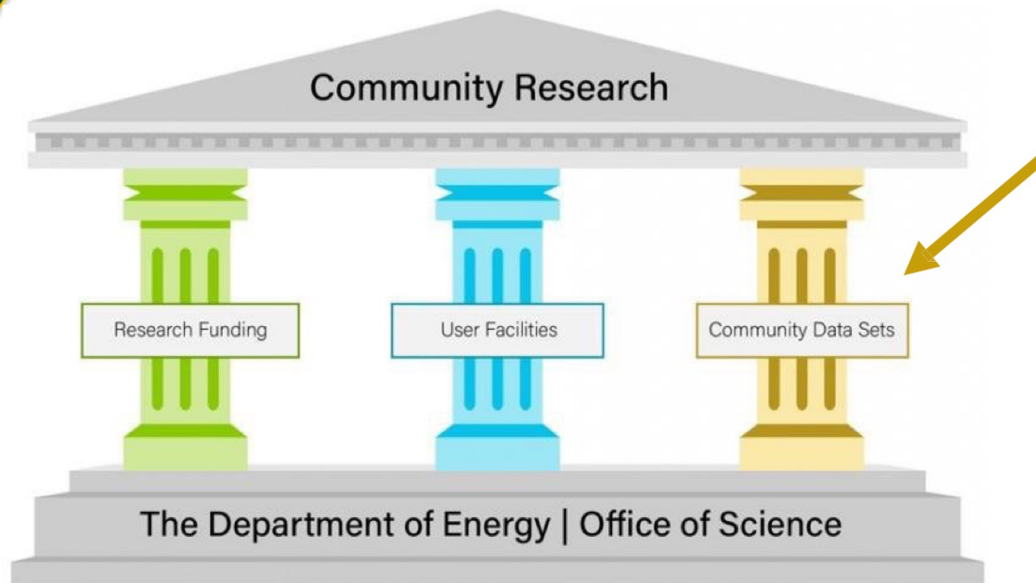
AMS 2023

*Dr. Michael Cooke*

*Senior Technical Advisor*

*Office of the Deputy Director for Science Programs*

# Data: The Third Pillar of the Office of Science Enterprise



<https://www.energy.gov/science/office-science-pure-data-resources>

## Public Reusable Research (PuRe) Data Resources are:

- data repositories,
- knowledge bases,
- analysis platforms,
- and other activities

that aim to make data **publicly available** in order to advance scientific or technical knowledge.

**PuRe Data Resource** designations **highlight** and **improve stewardship** of Office of Science supported community data efforts with strategic impact on the Office of Science mission.



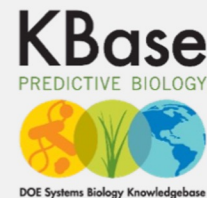
# PuRe Data Resources at a Glance



<https://science.osti.gov/Initiatives/PuRe-Data/Resources-at-a-Glance>

## ▶ Current designated resources:

- ▶ Atmospheric Radiation Measurement Data Center
- ▶ Joint Genome Institute
- ▶ Materials Project
- ▶ National Nuclear Data Center
- ▶ Particle Data Group
- ▶ Systems Biology Knowledgebase (KBase)



# PuRe Data Resources: Community Benefits

## Advancing Your Science



Highlights authoritative providers of data or capabilities in their respective subject area.

Makes data easier to find, access, and reuse across the broader scientific community.

Publicly available data and tools help to accelerate your research efforts!

## Supporting Your Data



Enables better sharing and preservation of digital research data.

Supports high standards in data management, operations, and scientific impact.

Provides options for responsive Data Management Plan for research funding proposals.

## Recognizing Your Impact



Streamlines your participation in the open science ecosystem.

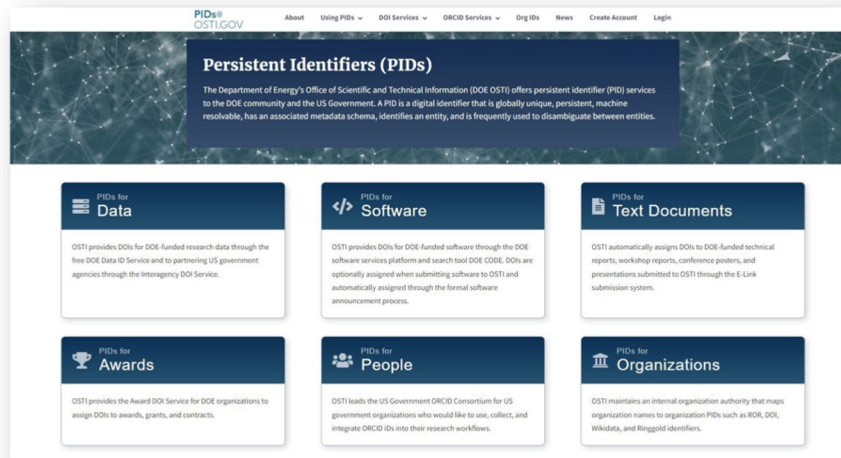
Enables making your data more Findable, Accessible, Interoperable, and Reusable to the scientific community.

Resources use persistent identifiers to enable linking data to connected scientific results.



[PIDs@OSTI.GOV](https://www.osti.gov/pids/) brings together information about persistent identifiers (PIDs) and the services DOE's Office of Scientific and Technical Information ([OSTI](https://www.osti.gov/)) provides for the DOE community and more broadly for U.S. government agencies

- ▶ PIDs deliver value to the broader research community by **enabling greater discovery and reuse** of research components through unique identification and **providing appropriate credit** through citation and identification of contributors
- ▶ [PIDs@OSTI.GOV](https://www.osti.gov/pids/) provides general information about PIDs, details about the OSTI provided PID services, community resources, and through visualizations, demonstrates the [power of PIDs](#)
- ▶ OSTI offers services and support for assigning and using PIDs for research components:
  - ▶ [DOIs assignment for research outputs](#) – software, text documents, and data (through the [DOE Data ID Service](#) and [Interagency DOI Service](#))
  - ▶ [Support of ORCID iDs through the US Government ORCID Consortium](#)
  - ▶ Assignment of DOIs for awards through the [Award DOI Service](#)



<https://www.osti.gov/pids/>

Watch for this and more YOS news at:  
<https://www.science.gov/>



# Open Science and Open Data Access at NSF

*Eric DeWeaver*

*Program Director, Climate and Large-scale Dynamics (CLD)*

*Atmospheric and Geospace Division (AGS)*

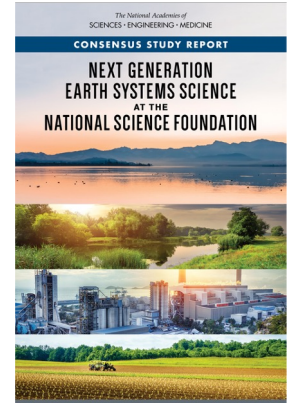
*Geosciences Directorate (GEO)*

# Open science and open data access at NSF

NSF supports basic science and basic science is open science. The NSF Act (1950) directs us to “Foster the interchange of scientific information” (Sec. 3(5)).

Current drivers of open science and open data at NSF:

- Maximal benefit to the nation/taxpayers
- Equitable access
- Reproducibility
- Interdisciplinarity
- Reciprocity



# Current Foundation-wide Efforts

## Public Access Repository (PAR)

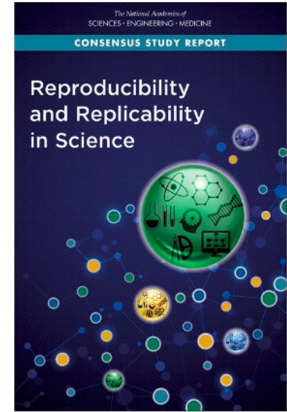
- **PAR 1.0** focused on peer-reviewed papers (1-year embargo period)
- **PAR 2.0** recently launched, PIs may now (optionally) index datasets resulting from NSF grants
- **Public Access Plan** to be released in February 2023, will address plans for further PAR updates in response to OSTP Nelson Memo

## FAIROS RCNs (NSF 22-553)

- New program supporting Research Coordination Networks (RCNs) that advance FAIR principles and open science (OS) practices

## Reproducibility & Replicability DCL (NSF 23-018)

- Emphasizes access to research data and metadata



Feedback: [publicaccess@nsf.gov](mailto:publicaccess@nsf.gov)



# Geosciences Open Science Ecosystem (GEO OSE)

- New funding opportunity for open science activities in the geosciences (NSF 23-534)
- Priorities include:
  1. Improving openness of cyberinfrastructure (CI)
  2. Democratizing access to data, software, physical collections, computing, etc. for geosciences
  3. Strengthening the capacity of geoscientists to utilize open science resources
  4. Advancing open science principles (FAIR, CARE, TRUST, Reproducibility & Replicability)
- Two funding tracks (by project scale):
  - Track 1 (2 years @ up to \$400k)
  - Track 3 (3 years @ up to ~\$1.6M)

The screenshot shows the top of a funding opportunity page. At the top left, the title "Geosciences Open Science Ecosystem (GEO OSE)" is displayed in white text against a dark background. To the right of the title, there is a link "View guidelines" and the number "23-534". Below the title, there is a search bar with the text "Search for more funding opportunities" and a "Print" icon. A blue arrow icon is visible on the left side of the page. The main content area is titled "Important Information for Proposers" and includes a sub-heading "A revised version of the NSF Proposal & Award Policies & Procedures". Below this, there is a "Synopsis" section with text describing the program's goals. On the right side, there is a "Upcoming due dates" section with the text "Full proposal" and "2023", followed by a "March 16 2023 - Deadline date".

- Key dates:
  - *Program Webinar*: Fri., Jan. 20, 1 PM EST
  - *Proposal Deadline*: March 16, 2023





# Thank You!

**GEO Cyberinfrastructure  
Opportunities**



**NSF Public Access**



[publicaccess@nsf.gov](mailto:publicaccess@nsf.gov)



# NOAA

*National  
Oceanic and  
Atmospheric  
Administration*

# NOAA and the Year of Open Science

## AMS 2023 Presidential Forum

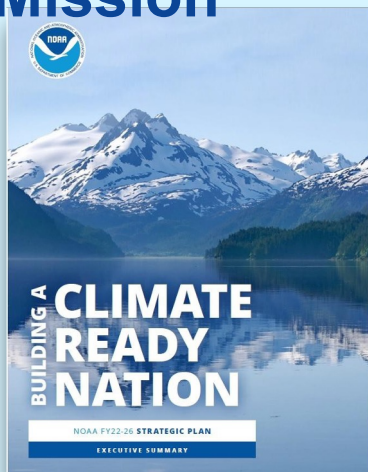
*Tony LaVoi, NOAA Chief Data  
Officer January 9, 2023*





**NOAA**

# Open Science is Foundational to NOAA's Mission

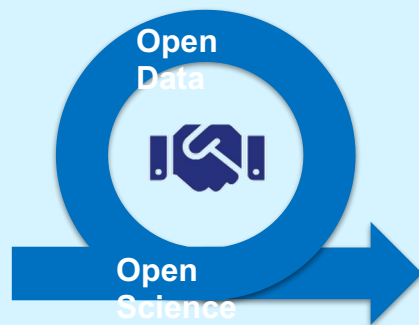
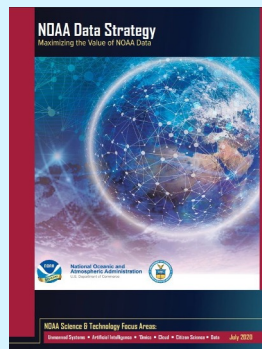


- Maintain a leadership role in the Year of Open Science initiative
- Build on NOAA's substantial experiences and investments in open science and open data
- Engage actively with a diverse community of partners and stakeholders to increase transparency and access to NOAA science and data

# NOAA Open Science is Built on Open Data



**NOAA**



## Vision: Maximizing the value of NOAA's data

1. Align data management leadership
2. Govern and manage data strategically
3. Share data as openly and widely as possible to promote maximum utilization of NOAA data
4. Promote data innovation and quality improvements to facilitate science and support data-driven decisions
5. Engage stakeholders and leverage partnerships to maximize the value of NOAA data to the Nation

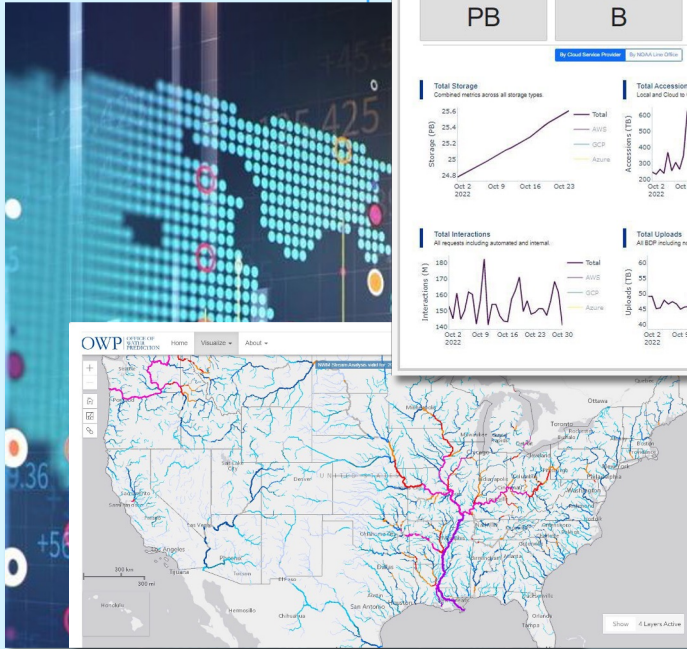
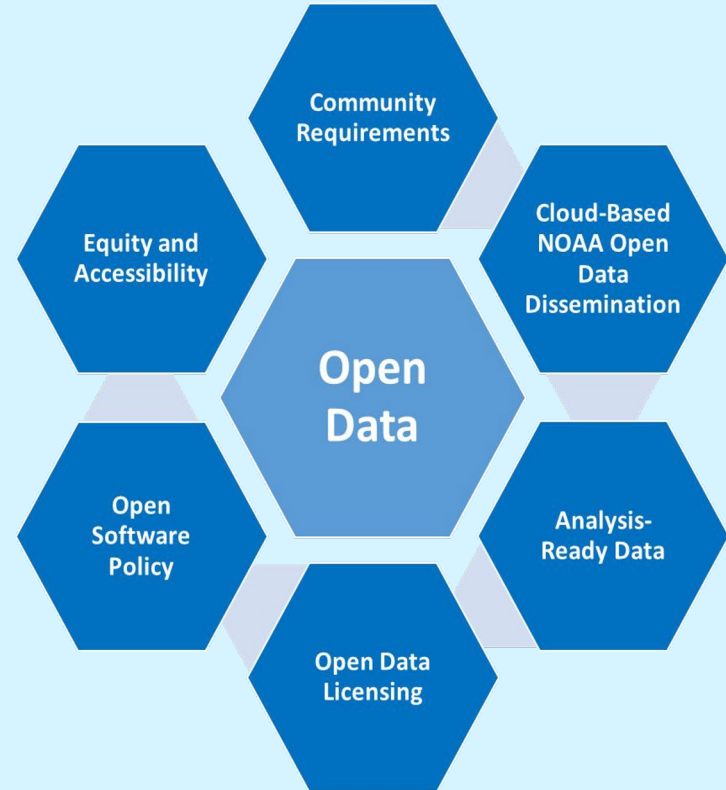
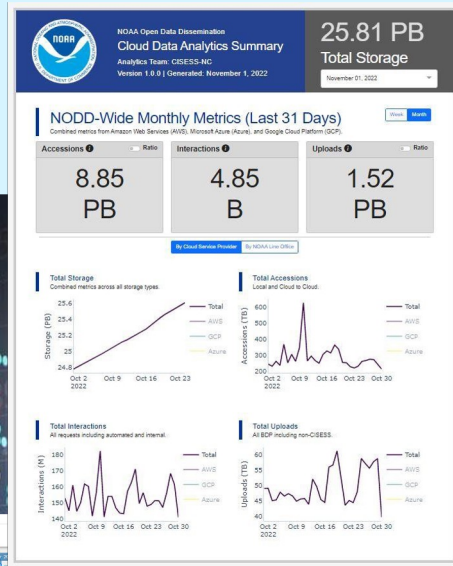
## NOAA Science Advisory Board Report Recommendations

1. Follow the FAIR Principles
2. Encourage open-source software development and use
3. Engage and collaborate with the open science community & support workforce development
4. Communicate best practices & monitor performance

# Expanding Open Science on an Open Data Foundation



**NOAA**



National Aeronautics and  
Space Administration



# NASA's Year of Open Science

## NASA Science Mission Directorate (SMD)

Kevin Murphy, Chief Science Data Officer SMD

9 January 2023



# Open-Source Science is NASA's method to put Open Science into practice

- **Open** the entirety of the scientific process, *from start to finish*
- **Broaden** community involvement in the scientific process
- **Increase** accessibility of data, software, & publications
- **Facilitate** inclusion, transparency, and reproducibility of science







# Policy



# Infrastructure



NASA's  
Open-Source  
Science Initiative  
\$20M/year



# Funding



# Community



# SPD-41a is SMD's updated Scientific Information Policy.

- [SPD-41a](#) updates the previously released [SPD-41](#), which consolidated existing Federal and NASA policy on sharing scientific information.
- Policy updates were developed with:
  - Science Mission Directorate (SMD) community input via workshops and RFIs
  - National Academies studies
  - OSTP Memo on Ensuring Free, Immediate, and Equitable Access to Federally Funded Research
- One component of NASA's broader [Open-Source Science Initiative](#) (OSSI)



[Scientific Information Policy Website](#)



# Infrastructure: Core Services

[Science Discovery Engine](#)

Science Search and Discovery

Data and Computing  
Infrastructure

□ **Details** □

Develop and implement an SMD data catalog to support discovery and access to complex scientific data across Divisions.

Create a community of practice around data & information standards.

Extend the primary digital library portal for researchers in astrophysics, planetary science & heliophysics, the Astrophysics Data System (ADS), to support Earth and Biological and Physical Sciences

On-going [Data & Computing Architecture](#) study to identify scientific data and computing capabilities and architectures that enable Open Science and opportunities that will ensure long-term evolution and sustainability to enable open science.

# NASA Funding

## F.2 Topical Workshops, Symposia, and Conferences

Events, Hackathons, un-conferences, and challenges that build open science skills, Training in open science. Rolling deadline.

## F.7 Support for Open Source Tools, Frameworks, and Libraries

Support and maintain open source tools, frameworks, and libraries that are significantly used by the SMD community. \$2M awarded in ROSES20 to 8 programs. Once every 3 years

## F.8 Supplemental Open Source Software Awards

Supplemental award to encourage the conversion of legacy software to open source. \$200K awarded in ROSES20 to 6 awards. Yearly, \$250K available, rolling deadline.

## F.14 Transform to Open Science Training

Tutorials showcasing open science in action and NASA cloud data, summer schools, virtual cohorts. Budget of \$4.5M per year. Once every three years.

## F.15 High Priority Open-Source Science

Supporting innovative open source tools, software, frameworks, data formats, and libraries. Budget ~\$1M. Yearly, rolling deadline.

## F.16 Supplement for Software Platforms

Supplemental support to existing awards for usage of scientific platforms. Budget TBD.





# Community Building

NASA's Transform to Open Science (TOPS) is a \$40 million 5-year mission to accelerate adoption of open science

## TOPS' Strategic Goals:

- Support 20K researchers to earn NASA's open science badge
- Double the participation of historically excluded groups across NASA science
- Enable five major scientific discoveries through open science principles



Engagement



Capacity Sharing



Incentives



Coordination



*Join us as we embark on the 2023 Year of Open Science with NASA TOPS!*



# Exemplar: Open-Source Science Policy for Earth Science Missions



- A. All mission data, metadata, software, databases, publications, and documentation shall be available on a full, free, open, and unrestricted basis starting in Phase B with no period of exclusive access.
- B. Science workshops and meetings shall be open to broad participation and documented in public repositories.

**1** Software shall be developed openly in a publicly accessible, version-controlled platform using a **permissive software license allowing for community use and contributions.**

**2** Manuscripts shall be published with open access licenses; versions of as-accepted manuscripts shall be made available as open preprints and deposited in a NASA or [Partner] **repository upon publication.**

**3** All mission data, calibration information, and simulated products supporting development and validation of algorithms shall be made available without any conditions to use.

**4** Scientific data, metadata, software, publications and documentation shall be archived and made available by NASA and/or [Partner] starting in Phase B.

**5** NASA and [Partner] software, documentation and data shall be properly marked, cited, and/or attributed. Metrics to measure and acknowledge open-source science contributions will be developed.

**6** NASA and [Partner] will mutually develop an Open-Source Science Plan that specifies details of collaboration.

**Collaborative, accessible, inclusive, transparent, and reproducible from the beginning.**

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- Tuesday 9:00-11:30 AM
- Wednesday 9:00-11:30 AM
- Thursday 1:30-4:00 PM



**Enroll now!**

Can't make it? Find out  
about future opportunities





# USGS: Advancing Open Science

**Geoff Plumlee, PhD**  
Chief Scientist of the USGS  
[gplumlee@usgs.gov](mailto:gplumlee@usgs.gov)

U.S. Department of the Interior  
U.S. Geological Survey



# USGS Earth and Biological System Science: Interdisciplinary and Transdisciplinary

Expertise in Water, Ecosystems, Energy and Mineral Resources, Core Science Systems, Natural Hazards Mission Areas

Key expertise employed in smaller numbers to help "bridge the gap"

External expertise we engage via our many partners

Hydrology  
Geology  
Ecology  
Biology  
GIS  
Energy/mineral resources  
Chemistry  
Geophysics  
Remote sensing  
Microbiology  
Geochemistry  
Wildlife health  
Natural hazards  
Environmental science  
Botany  
Soil science  
Climate science  
Statistics  
Data science  
AI/ML  
IT

Global climate model downscaling  
Public health  
Planetary Sciences  
Fire science  
Engineering

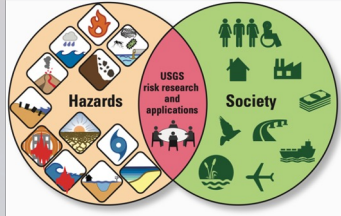
**Social sciences: Economics, Risk Communication, Structured decision making**

Global climate modeling  
Human epidemiology, toxicology, immunology ...  
Meteorology  
Industrial ecology  
Urban planning  
Landscape architecture  
**Other social sciences**  
**Indigenous and community knowledge**  
**Community partners (full co-design, co-production)**  
Many others...

# USGS has a longstanding and growing culture of Open Science

Office of the USGS Associate Chief Data Officer

Human Dimension CoP



Wildland Fire CoP

EJ Task Force

Risk CoP

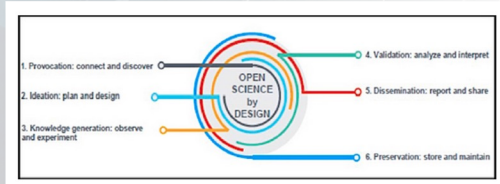
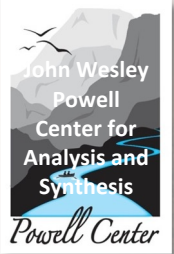


FIGURE 4-1 Phases of Open Science by Design in the research life cycle.

### Draft USGS Data Strategy

**Strategic Goals and Objectives**

**GOAL**  
 Goal 1: Maximize the utility of USGS data by addressing stakeholder needs and openly sharing analysis-ready data based on FAIR practices.

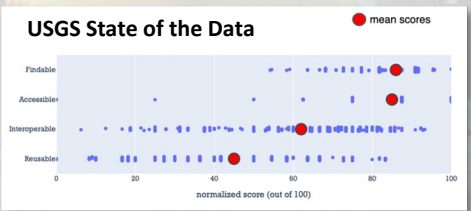
*This goal will: Ensure USGS data are collected, prepared, and made available to a diverse audience of decision makers, members of the scientific community, and the public in the most efficient, FAIR, and usable formats for those audiences.*

**OBJECTIVES**

1.1 Evaluate, monitor, and gather feedback from stakeholders (internal and external) about improvements needed to maximize the value of USGS data.

1.2 Enable processes and policies that ensure USGS data are shared appropriately inside USGS, with other Federal Agencies, with partners (Govt and non-Govt), and with the public.

1.3 Evaluate USGS data to determine how well data and databases meet FAIR Principles (e.g., the USGS State of the Data Assessment, assessing business operations information).



- Model Catalog: [data.usgs.gov/modcatalog](http://data.usgs.gov/modcatalog)
- ScienceBase: [sciencebase.gov](http://sciencebase.gov)
- DOI Creation Tool: [www.usgs.gov/oa/doi](http://www.usgs.gov/oa/doi)
- IPDS: [www.usgs.gov/ipds/home](http://www.usgs.gov/ipds/home)
- Online Metadata Editor: [www.usgs.gov/oa/ome](http://www.usgs.gov/oa/ome)
- Metadata Wizard: <http://tools.usgs.gov/apps/brt-gymb/wizard>
- Science Data Catalog: [data.usgs.gov](http://data.usgs.gov)
- code.usgs.gov



**USGS Data Management Overview**

Good data management enables the location, sharing, and reuse of data, and reduces the redundancy of data. These attributes of good data management reduce costs in terms of time and money.

**Why Manage Your Data?**

When data are well documented, you know how and where to look for information and the records you return will be what you expect. Accurate data are highly and scientifically defensible and easy and the agency by reducing litigation and appeals.

**Value of Data Management**

Pure data quality, redundant data, and low data use can compromise its processes to its process of data operating bridge. What would a 15 percent cost reduction by worth the your Project or Program?

**Data Lifecycle Overview**

Our data are corporate assets with value beyond our immediate need and should be managed through the entire data lifecycle. Questions of documentation, storage, quality assurance, and security need to be answered for each stage of the lifecycle.

**Data Management vs. Master Data Management**

Master Data Management are the processes that control management of master data values to enable consistent, shared, operational use across systems, of the most accurate, timely, and relevant version of truth about essential business entities (NASA, ONR/NL, and others, pg. 17). While this Web site addresses important aspects of Master Data Management, it will not guide the establishment of a full Master Data Management system.

What the U.S. Geological Survey Manual Requires:



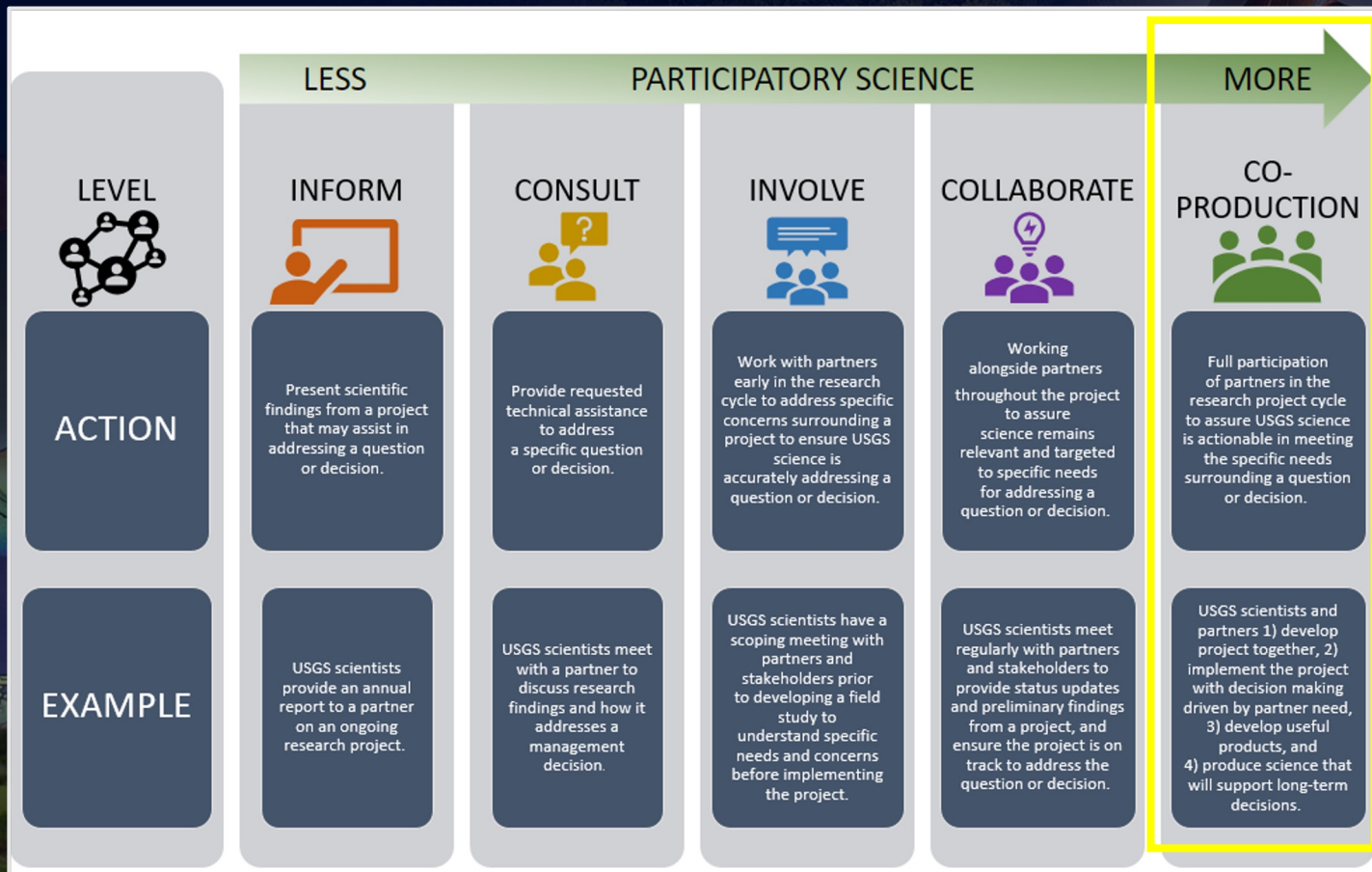
## USGS Fundamental Science Practices

<https://www.usgs.gov/office-of-science-quality-and-integrity/fundamental-science-practices>


# Participatory Research: Moving Towards Increased Co-production

## Adding People to the Equation...

- Earth and biological system sciences can contribute to consequential societal decision making; applying such contributions is challenging
- A concerted effort is required to bridge the gap between those generating the science and those who need it the most.



# Open Science Examples






## Guía sobre deslizamientos de tierra para residentes de Puerto Rico



Foto por Jeffrey Doe





Home Contact FAQ Messaging Toolkits News Education, Outreach, & Technical Resources Implementation Research



SCIENCE PRODUCTS NEWS CONNECT ABOUT Latest Earthquakes

### Open-Source Intelligence for Conservation Science



By [Forest and Rangeland Ecosystem Science Center](#) September 9, 2022



Open-source intelligence is publicly available data that can be used for investigations, often in ways different than originally planned.

For example, footage from urban security cameras can be used to study wildlife and contribute to conservation science. Even though open-source intelligence tools are occasionally used in conservation science, their origins and conceptual foundations are not well understood. In an essay in the *Journal of Conservation Biology*, researchers from the USGS and avian conservation organizations consider the history and foundations of open-source intelligence and review its applications in conservation science. The authors present examples of publicly available data, such as social media data or satellite imagery, that can be used to answer questions about environmental crime, human-wildlife interactions, and animal behavior. The essay is among the first to highlight the role of open-source intelligence for conservation science. This review could be relevant to a broad range of researchers looking to fill knowledge gaps that traditional data collection methods may not adequately capture.

Katzner, T.E., Thomason, E.C., Huhmann, K., Conkling, T.J., Concepcion, C.B., Slabe, V.A., and Poessel, S.A., 2022. Open-Source Intelligence for Conservation Biology: <https://pubs.er.usgs.gov/publication/70236278>

**Contacts**  
**Todd E Katzner**  
 Supervisory Research Wildlife Biologist  
 Forest and Rangeland Ecosystem Science Center  
 Email: [tkatzner@usgs.gov](mailto:tkatzner@usgs.gov)  
 Phone: 208-387-1348

**Tara J Conkling**  
 Wildlife Biologist

## Circle Round the River Flood Lunch and Learn Series

Fridays 12-1 pm

**Session 1: Friday, October 28th**  
 Science and Tech Room 207  
 Flooding and Environmental Careers: Pathways for Students with the USGS

**Session 2: Friday, November 18th**  
 Healing Room  
 Flooding and Communities: Sharing memories, traditions, and cultural connections to water

**Session 3: Friday, December 2nd**  
 Science and Tech Room 207  
 Flooding Through Time: Incorporating Indigenous historical knowledge to better plan for the future

# USGS Embraces the Year of Open Science



- We understand the enormous value of making research products and processes available to all who are interested and can put it to the best use.
- We support open science with robust fundamental science practices, data and software release policies and tools, open communities of practice, and ongoing partnerships with underrepresented groups.
- USGS will be engaging its scientists in activities to further improve accessibility, reproducibility, and transparency of our scientific work, through trainings, workshops, and internal and external communication



Thank you!



# Moderator

Yvonne Ivey, NASA

# Panelists

Chris Marcum, White House

Michael Cooke, DOE

Eric DeWeaver, NSF

Tony LaVoi, NOAA

Kevin Murphy, NASA

Geoffrey S. Plumlee, USGS

