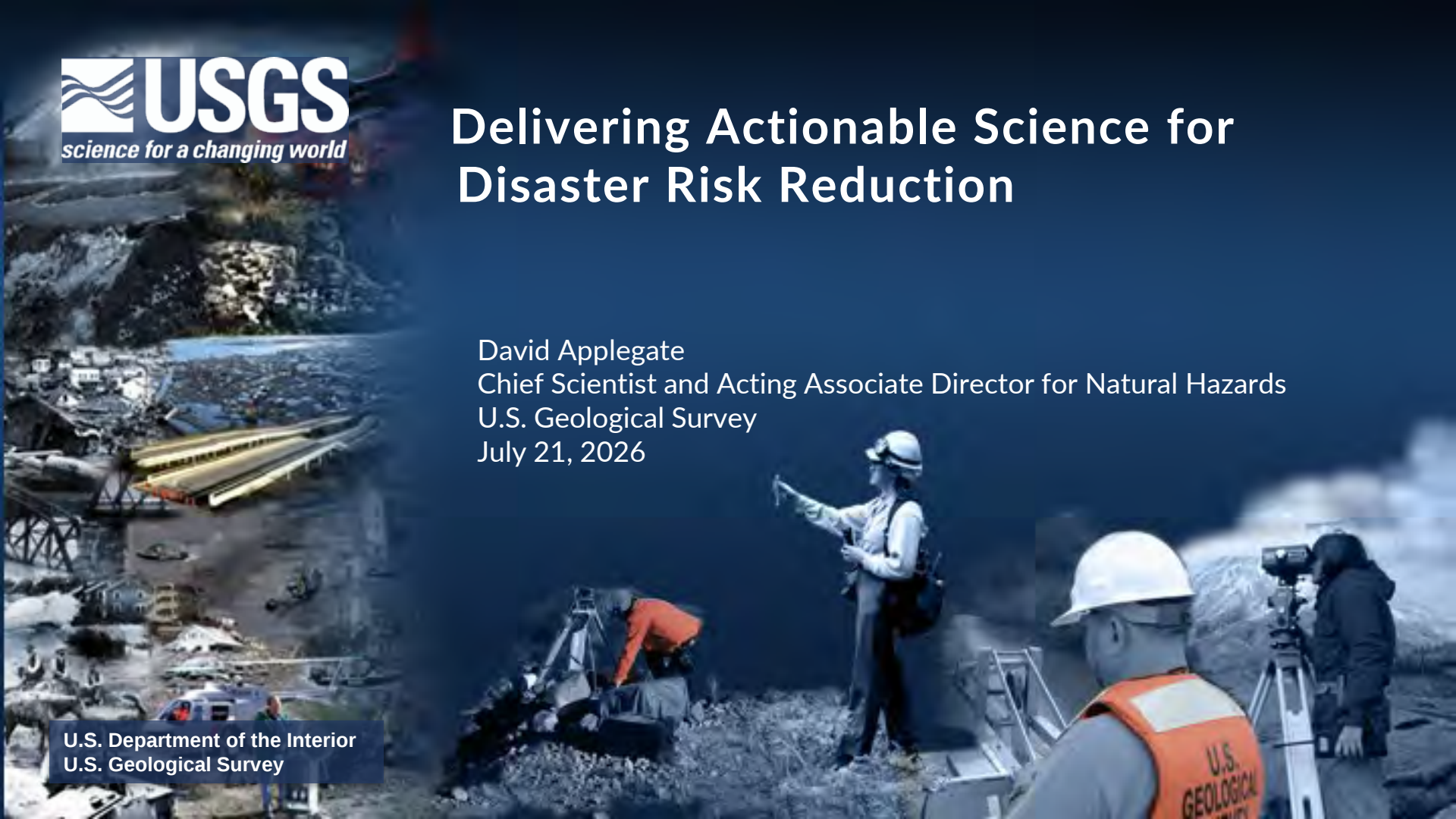




Delivering Actionable Science for Disaster Risk Reduction

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





USGS is working towards a more Hazard Ready Nation by delivering science that informs impact-based decision-making



Focus USGS hazards and risk work on **end-user needs**



Expand USGS **hazard and risk science** that informs decisions to protect lives, property, and resources



Put USGS hazard and risk science to work in the form of **actionable products**

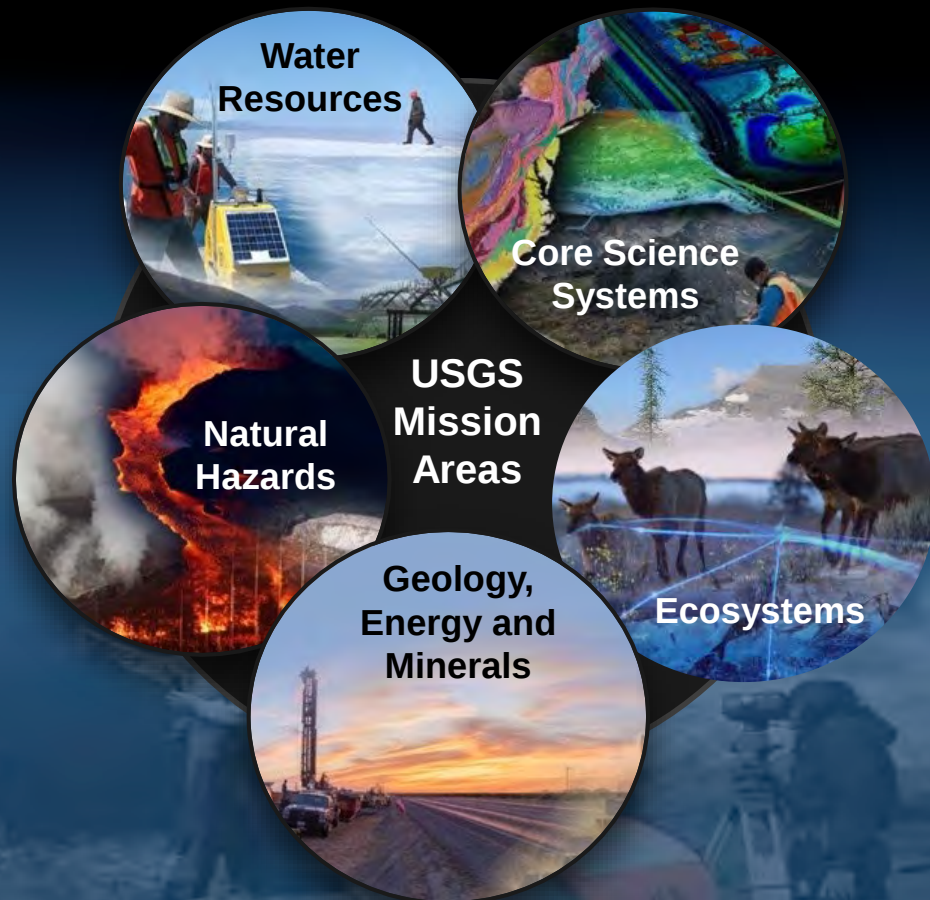


Prioritize consistent, collaborative, and actionable **communication**

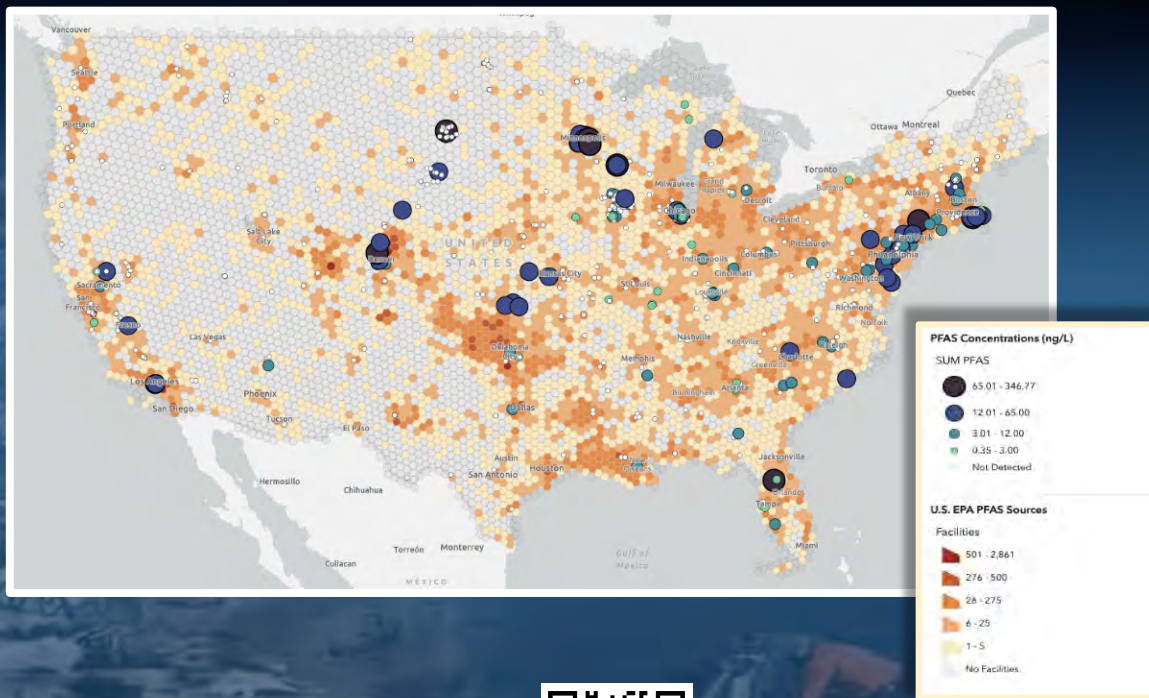
USGS Mission and Vision

The **USGS mission** is to monitor, analyze and predict current and evolving dynamics of complex human and natural Earth system interactions and to deliver actionable information at scales and timeframes relevant to decision makers.

Vision Statement: Lead the Nation in 21st-century integrated research, assessments, and prediction of natural resources and processes to meet society's needs.



Per- and Polyfluoroalkyl Substances (PFAS) in U.S. Tapwater



Smalling et al., 2023,
Environment International



USGS Hazard Roles & Responsibilities

- Responsible for providing assessments and alerting for **earthquakes**, **volcanic eruptions**, and **landslides**
- Seismic networks support NOAA's **tsunami** warnings
- Streamgages and storm surge monitors support NOAA's **flood** and **severe weather (including hurricane)** warnings
- **Coastal and marine** geologic surveys and research support assessments of earthquake and tsunami hazards, and impacts from coastal storms
- Geomagnetic observatories support NOAA and US Air Force 557th Weather Wing **geomagnetic storm** forecasts
- USGS has key role in tracking **chemical and biological threats**, in particular **zoonotic diseases**
- USGS provides critical science for **wildland fire** management in support of DOI and other federal and state land managers before, during, and after fires
- **Geospatial** information supports response operations for many disaster types



Interagency hazard-specific coordination mechanisms



Asteroids



Drought



Earthquakes



Extreme Heat

Water Resources Council,
Federal Interagency
Floodplain Management
Task Force, among others

Floods



Hurricanes

Interagency
Coordinating
Committee on
Landslide Hazards
(ICCLH)

Landslides



Oil Spills

Office of Pandemic
Preparedness and
Response Policy
(OPPR), among others

Pandemics

Space Weather
Operations, Research, and
Mitigation Subcommittee
(SWORM)

Space Weather



Tsunamis



Volcanoes

National Windstorm
Impact Reduction
Program (NWIRP)

Windstorms

*Slide courtesy
of STPI*



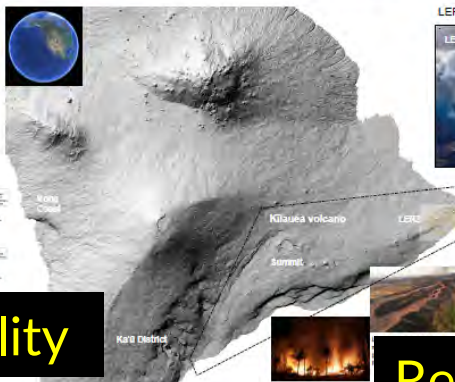
~70 U.S. volcanoes monitored
(of 161 active volcanoes)

Geology and health response to the 2018 eruption of Kilauea

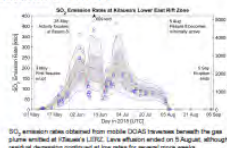
Multiagency geology-health response to the 2018 eruption of Kilauea Volcano, Hawaii

David Damby (USGS) on behalf of Hawai'i Department of Health, Hawaii County Civil Defense Agency, Hawaii Emergency Management Agency, National Park Service, National Oceanic & Atmospheric Administration, U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Geological Survey / Hawaiian Volcano Observatory, University of Hawai'i at Manoa, and many other wonderful colleagues

Overview of 2018 Kilauea Eruption



LERZ SO₂ emission rates and plume concentration measurements



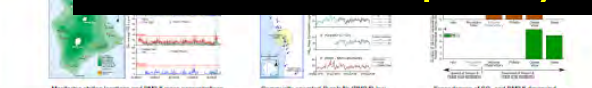
Real-time air quality monitoring

The collaborative effort of EPA, DOI, USGS, NPS resulted in a network of 20 air quality monitoring stations measuring SO₂ and PM. This included established monitoring stations and the rapid deployment of new monitoring stations by EPA using VTEC platform.

NOAA established ambient air quality levels: Blue "unhealthy" (10-3 ppm) and Purple "very unhealthy" (3-5 ppm). ACHRA operational short-term exposure level (STEL) is 10-20 ppm over 15 minutes. US EPA AQCL program designed AQCLs (guidelines for short-term exposure to SO₂) at 0.75 ppm. OSHA's permissible exposure level (PEL) is 5 ppm Time Weighted Average (TWA) over an 8-hour workday (OSHA PEL). Although these guidelines may not be intended for non-occupational environments, they serve the best available standards.



Real-time air quality monitoring



Composition of volcanic plume



Chemical analysis (left) and real-time deviation (right) from the LERZ plume. (Left) Plume dispersion pattern is a proxy for chemical maturity. (Right) Deviation in element mass concentrations at 4 locations (top-down).

Comparison of volcanic (colored) and anthropogenic (grey) emission rates of elemental metals. Emission rates of metal pollutants during periods of intense degassing can be comparable to local anthropogenic flows from population industrialized countries.

Community health: actions and outcomes

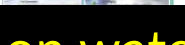
Community health: Actions and outcomes

County	Population	2018/17	2018/16	2018/15
Hawaii County	207,672	21.15%	12.70%	8.57%
Kauai County	71,400	10.50%	10.50%	10.50%
Mauai County	181,152	15.80%	6.18%	6.18%

Information dissemination and use

Information on the eruption and associated hazards was communicated to the public through various channels as possible. These included traditional media (television, radio, newspaper) interviews with officials, scientists and reporters; holding of emergency community meetings; an internet-based social media page including photos and videos; regularly updated websites; and the Emergency (Vigilance) distribution of printed pamphlets.

What can I do to protect myself from ash?



Volcanic ash characterization and implied toxicity

Volcanic ash samples were collected in designated basins and web-sampling campaigns and via a citizen collection program. Selection of Ash Fall Rating website allowed the public to register whether they experienced ashfall in their area.

Ash was analyzed for key physicochemical properties associated with particle toxicity. Analyses were based on a modified rapid response protocol developed by the International Volcanic Health Hazard Network (IVHHN). Key properties include particle size, shape and surface area analysis, ash chemical composition and mineralogy, ashfall wet/dry and oxidative potential, and ashfall toxicity.



Operational dispersion and fallout modelling

Impact of ashfall on water quality

Ashfall and contaminated rain threatened water supplies. Ash: ashfall analyses were performed following an internationally refined protocol for volcanic ash, and data for elements of concern were used to model potential downstream contamination.



Accumulating eruption at the summit. These occurred every ~30 hours leading to ash deposition primarily and dominantly to the southwest. Collapse of Kilauea summit before (left) and after (right) the eruption.

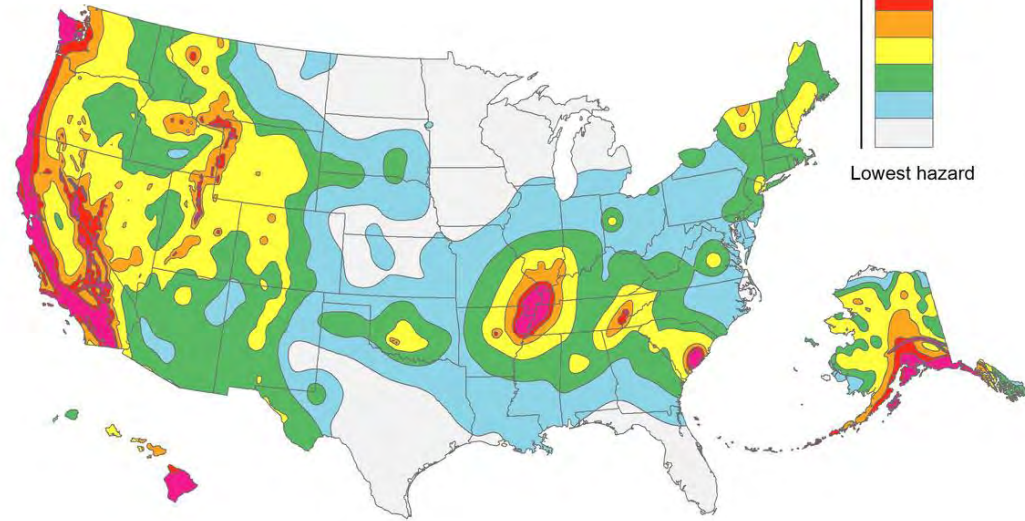


National Earthquake Hazard Reduction Program



- USGS is the applied Earth science component of the four-agency National Earthquake Hazards Reduction Program (NEHRP), first authorized in 1977.
- NEHRP is led by the National Institute of Standards & Technology (NIST); also includes the National Science Foundation (NSF) and the Federal Emergency Management Agency (FEMA).

USGS National Seismic Hazard Model



Studying earthquake exposure of residents with potential access and functional needs in the US



Accessing Information

- Hearing difficulty
- Vision difficulty
- No telephone service
- No computer access



Processing Information

- Cognitive difficulty
- Speaks English "less than very well"



Acting on Information

- Ambulatory difficulty
- Durable medical equipment reliance
- Women with recent births (past 12 months)
- Self-care difficulty
- Aged 17 and younger
- Aged 65 and older
- Institutionalized populations

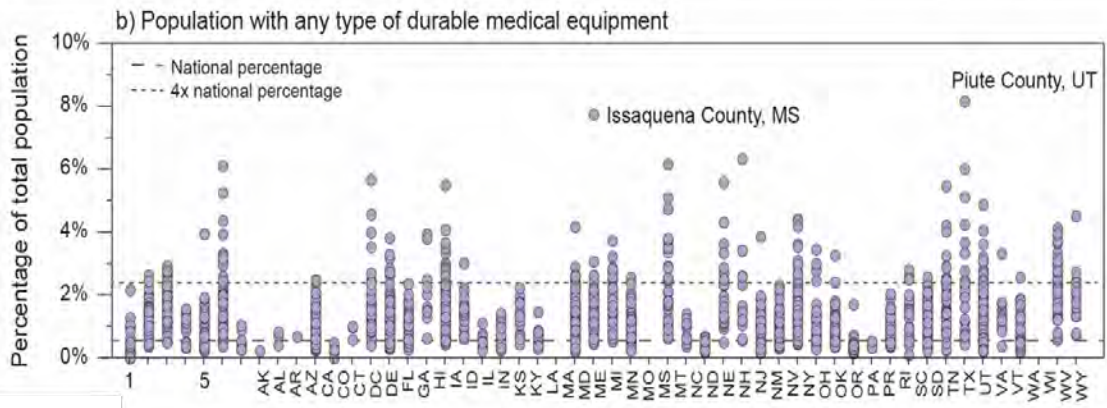
Kailes and Enders (2007)

People with durable medical equipment

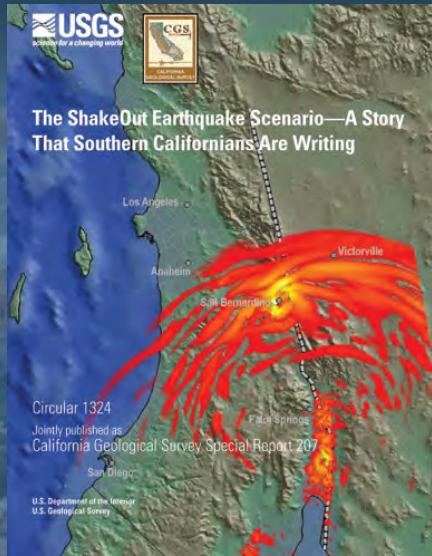
National: 0.6%

8%

Piute County, UT



ShakeOut Public Preparedness Drill has Grown Nationwide and Globally



**Shake
Out.
Don't
Freak
Out.**

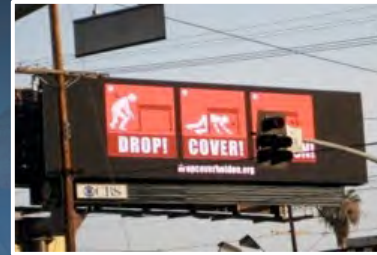
DROP! COVER! HOLD ON!

**Shake
Out**

October 20, 10:20am

Register at www.ShakeOut.org

QR code



The Power of
Partnerships

U.S. DEPARTMENT OF HOMELAND SECURITY
FEMA

California

Earthquake Country **Alliance**
We're all in this together.

SC/EC
an NSF + USGS center

USGS
science for a changing world

CGS
CALIFORNIA GEOLOGICAL SURVEY

CEA CALIFORNIA EARTHQUAKE AUTHORITY

Over 60 million participants in 2025 drills worldwide

**Critical for
decision
making**

**Lack of
standardization**

**Challenges in
data collection**

**Future
collaboration**

DISASTER LOSS DATA

Thank you!



Get more information at
www.usgs.gov

