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Overview of USGS and Landslide Hazards Program

Advisory Committee on Landslides, January 16, 2025

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

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.

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USGS Regions Aligned to DOI Unified Regions

Olympia
Salem
Boise
Helena
Bismarck
Pierre
St. Paul
Madison
Lansing
Augusta
Montpelier
Concord
Albany
Boston
Providence
Hartford
Harrisburg
Trenton
Dover
Annapolis
Washington D.C.
Carson City
Sacramento
Salt Lake City
Cheyenne
Denver
Des Moines
Lincoln
Topeka
Springfield
Indianapolis
Columbus
Jefferson City
Frankfort
Charleston
Richmond
Raleigh
Nashville-Davidson
Santa Fe
Oklahoma City
Little Rock
Columbia
Atlanta
Phoenix
Jackson
Montgomery
Tallahassee
Baton Rouge
Austin

PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO

USGS Regions

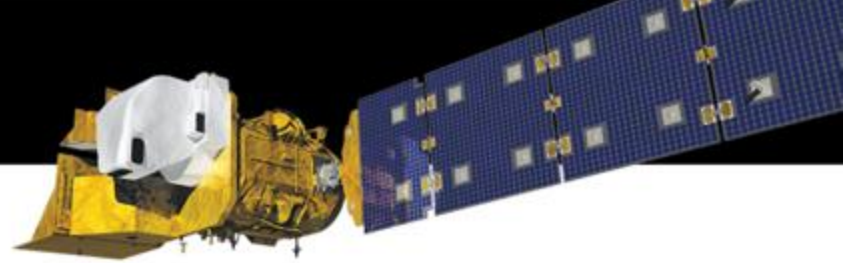
- Northeast
- Southeast
- Midcontinent
- Rocky Mountain
- Southwest
- Northwest - Pacific Islands
- Alaska

DOI Unified Region

1 North Atlantic-Appalachian
2 South Atlantic-Gulf
3 Great Lakes
4 Mississippi-Basin
5 Missouri-Basin
6 Arkansas-Rio Grande-Texas Gulf
7 Upper Colorado-Basin
8 Lower Colorado-Basin
9 Columbia-Pacific Northwest
10 California-Great Basin
11 Alaska
12 Pacific Islands

Hawaii
Guam
Alaska
Puerto Rico and US Virgin Islands

USGS by the Numbers



People

8,410 Employees

1,436 Contractors

591 Emeriti

198 Volunteers

Science and Monitoring

170,000+ Publications (since 1879)

54,000 7.5-minute Quadrangles (Topographic Maps)

1000+ At-Risk Species Studied

25 Active Patents (85 since 1996)

1 Research Reactor

~20,000 USGS-operated Groundwater Wells monitored for water level and water quality

11,800+ USGS-operated Streamgages

~4,000 USGS-operated Earthquake Sensors in U.S.

~70 U.S. Volcanoes Directly Monitored of 161 Considered Active

14 Geomagnetic Observatories

3 Satellites

201M Landsat data downloads

100% Interferometric Synthetic Aperture Radar (IfSAR) Data Collected in Alaska

94.7% National Coverage of 3DEP High-resolution Elevation Data

56% U.S. Coverage of Geologic Maps (Detailed to Intermediate Scale)

171 Geologic Provinces USGS Assesses for Undiscovered Oil and Gas Resources

~100 Mineral Commodities for which USGS Collects National Data for 180 Countries

Locations

491 Laboratories

391 Facilities

In all 50 states and 2 territories (Guam and Puerto Rico)

60 Science Centers *(7 Regions)*

22 Programs *(5 Mission Areas)*

10 Climate Adaptation Science Centers *(1 National - 9 Regional)*

43 Cooperative Research Units

54 Water Resources Research Institutes

Partnerships

4,300 Partners/Cooperators

5,157 Contracts, Cooperative Agreements, and Grants

Funding

$1,455M 2024 Enacted

$646M 2024 Reimbursables

$69M 2024 Bipartisan Infrastructure Law (BIL)

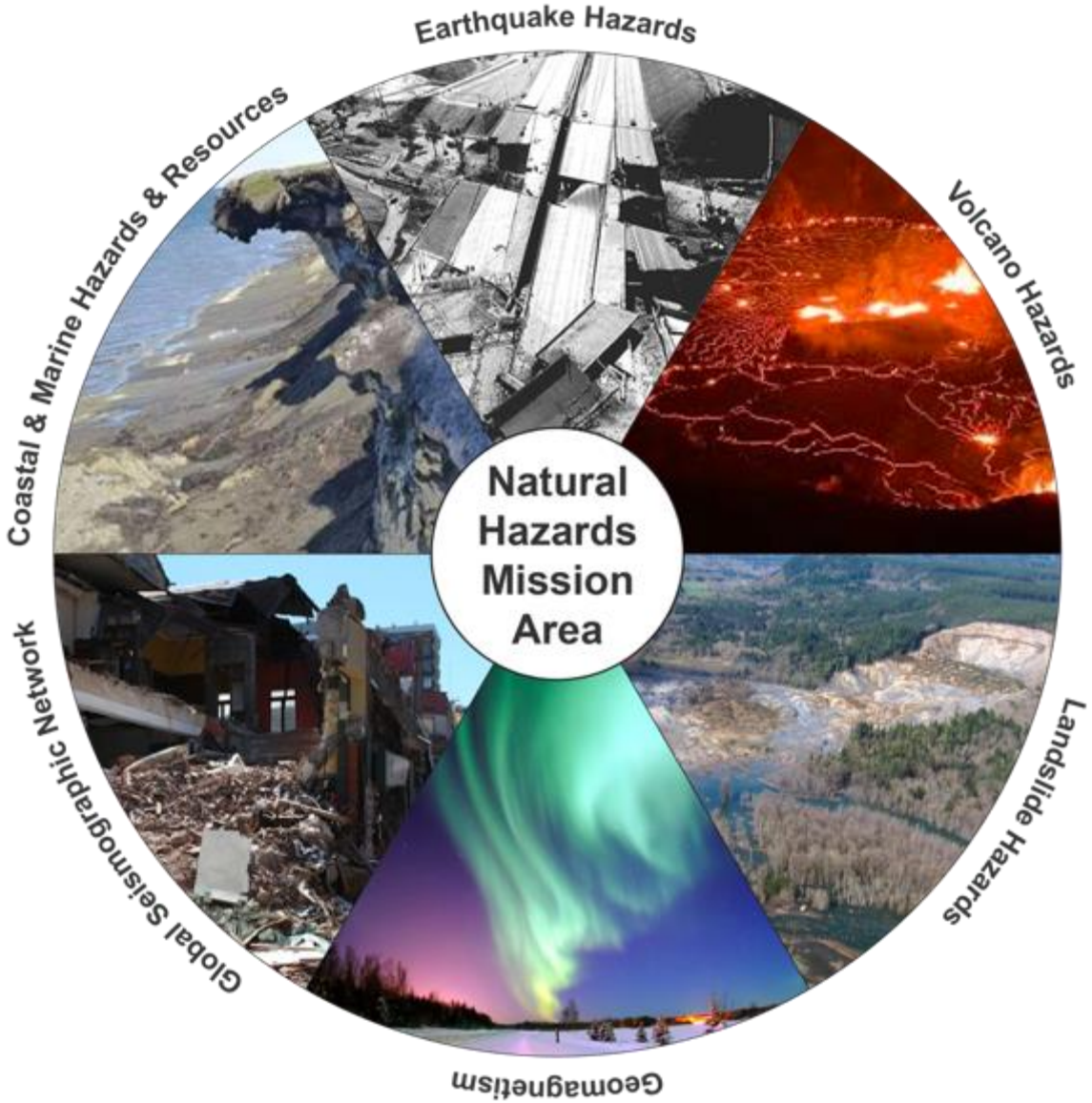
USGS

August 2024


Volcano Hazards Program
National Cooperative Geologic Mapping Program
Coastal & Marine Hazards/ Resources Program
Landslide Hazards Program
Earthquake Hazards Program
National Geospatial Program
Groundwater & Streamflow Information Program
Steelhead Haven, Washington, March 22, 2014

USGS Natural Hazards Mission Area

- **Six Programs:**
  - Coastal/Marine Hazards & Resources
  - Earthquake Hazards
  - Geomagnetism
  - Global Seismographic Network
  - **Landslide Hazards**
  - Volcano Hazards
- Coordinates the broader hazards mission of the USGS – floods, hurricanes, tsunamis, and wildfires
- Implements integrated science strategies for risk reduction through understanding multi-hazard vulnerability and exposure
- Coordinates USGS science response activities following disasters



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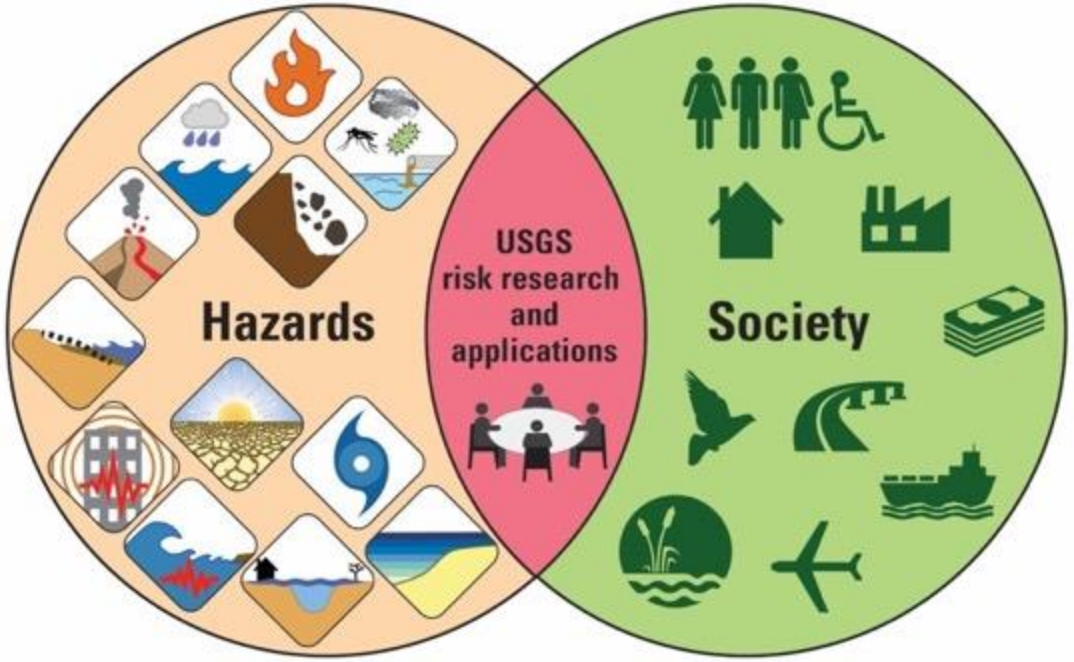
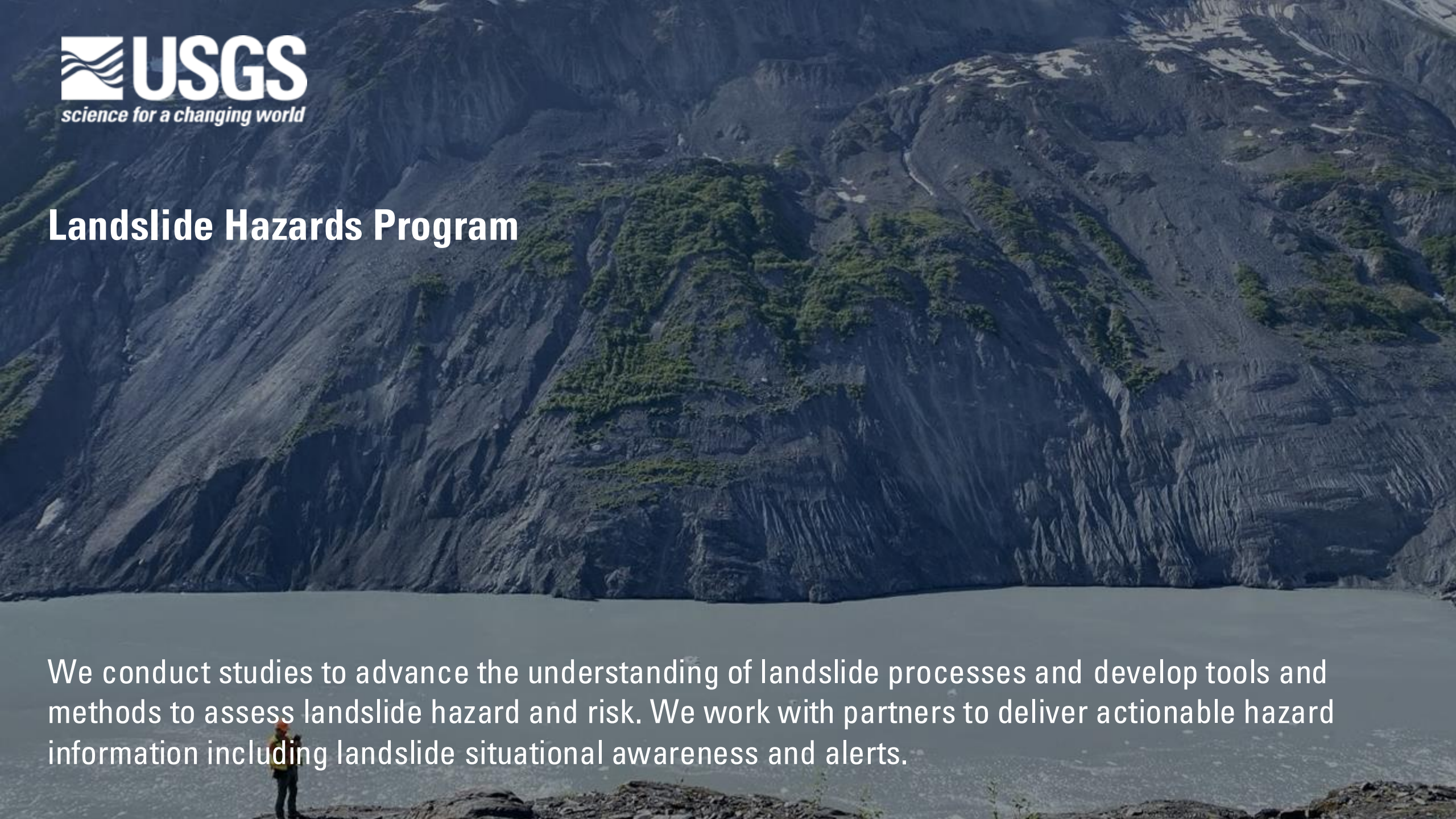
USGS science to support risk reduction



- Assessments and alerting for earthquakes, volcanic eruptions, landslides, coastal storm impacts and SLR
- Seismic networks support NOAA's tsunami warnings
- Stream gage network supports NOAA's flood warnings
- Geomagnetic observatories support NOAA Space Weather Forecasts
- USGS has key role in tracking zoonotic diseases
- Geospatial information supports response operations for wildfire and many other disaster types

USGS



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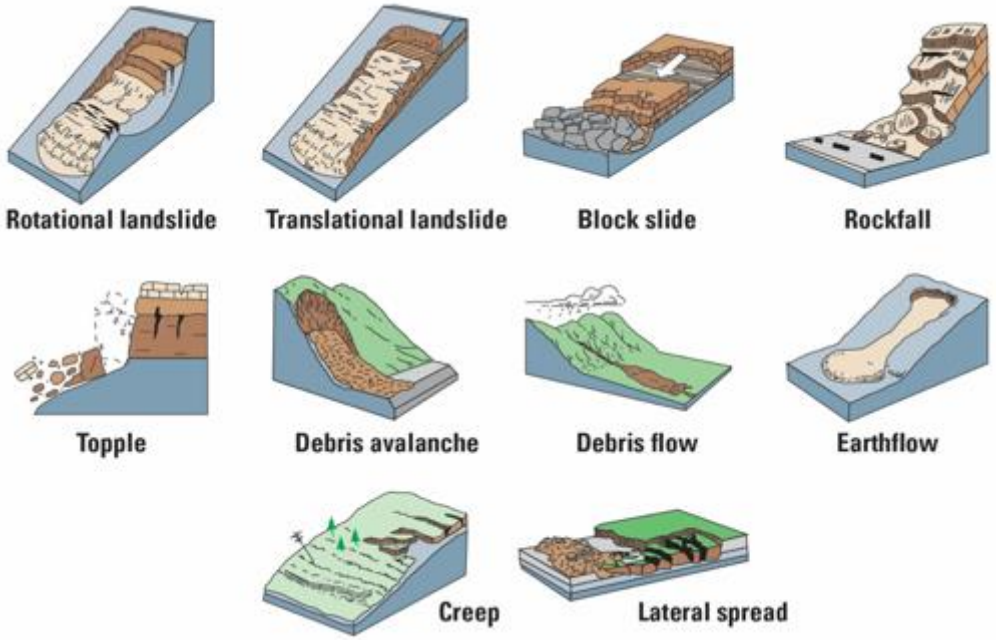
Landslide Hazards Program

We conduct studies to advance the understanding of landslide processes and develop tools and methods to assess landslide hazard and risk. We work with partners to deliver actionable hazard information including landslide situational awareness and alerts.

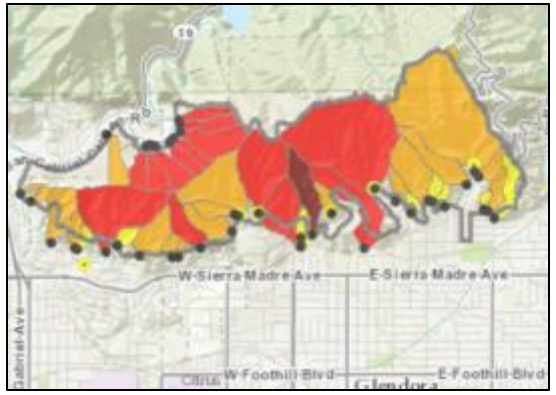
The pull of gravity on Earth materials creates landslides that move in many ways



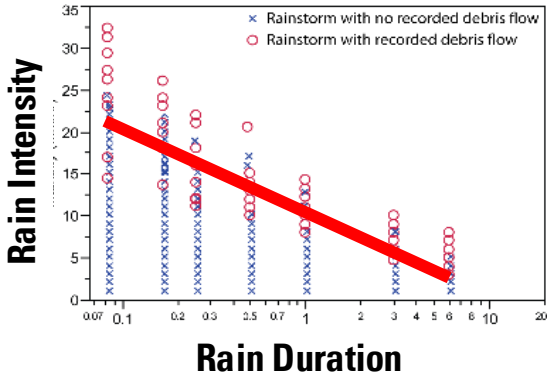
A range of environmental factors influence the timing, size, and speed of landslides

Landslides hazards: Key Questions?

Where?



When?

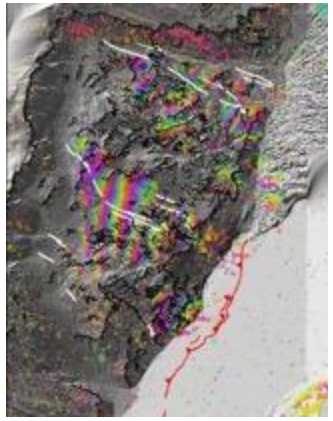


How big?

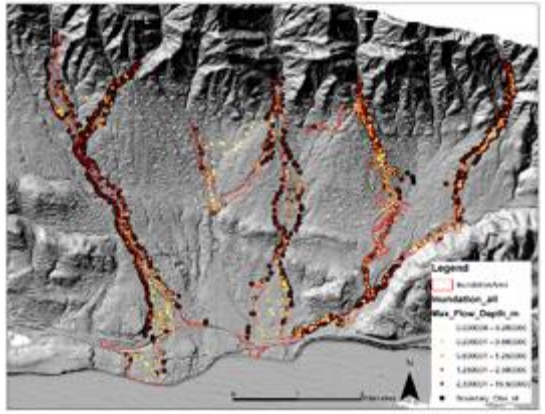
How fast and far?

Data and methods to close science gaps

Remote sensing



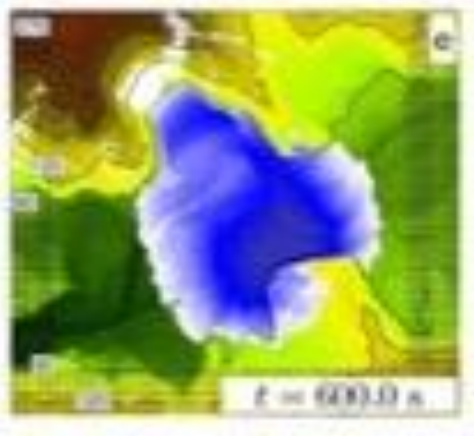
Mapping

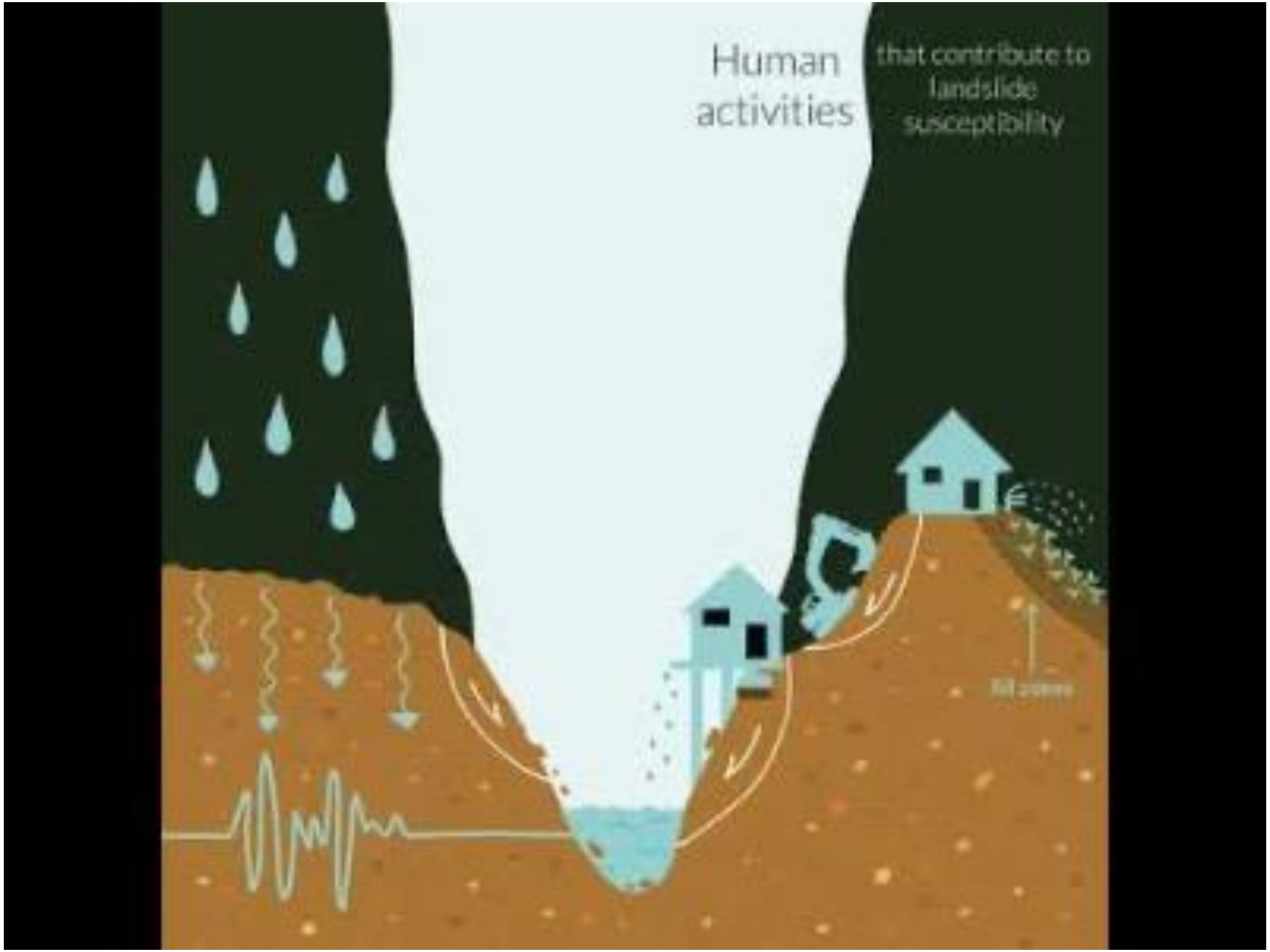


Field monitoring

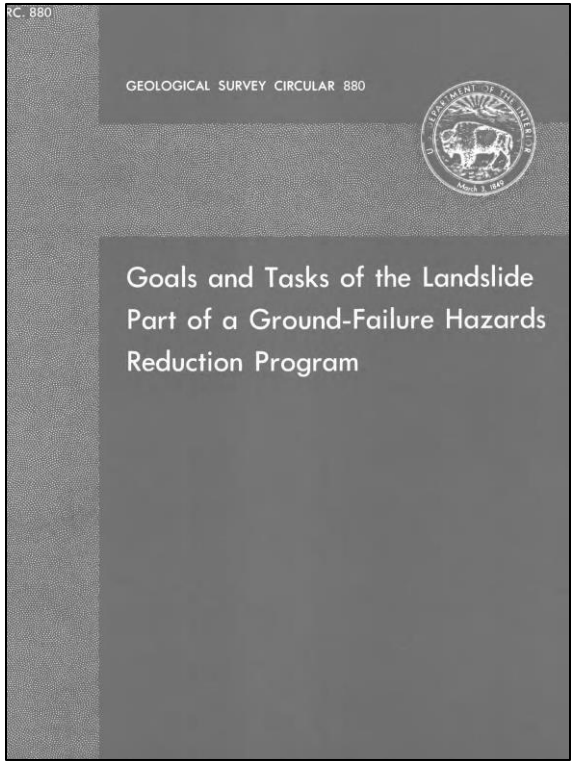
Laboratory studies

Models

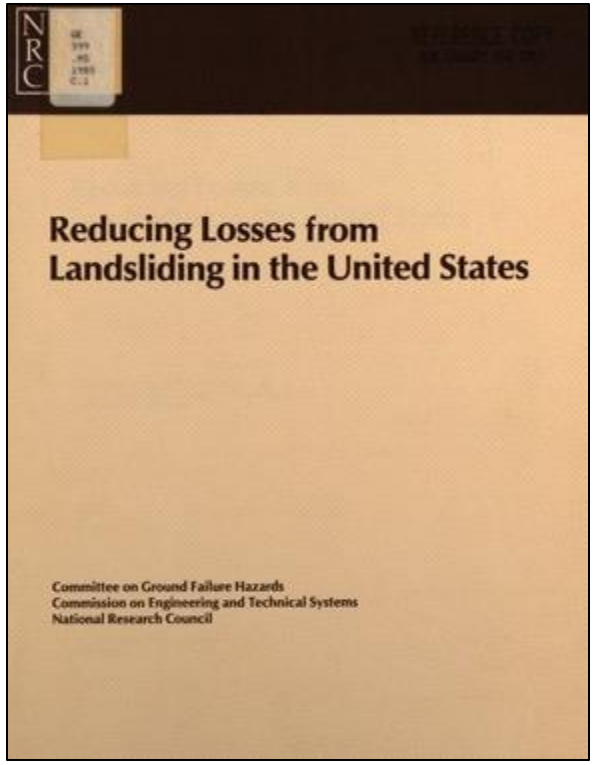



Human activities
that contribute to landslide susceptibility

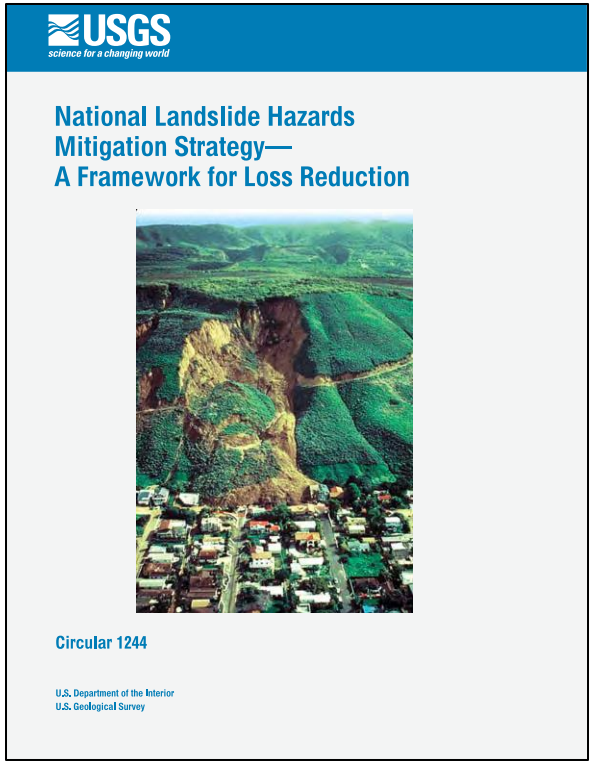
Long history of efforts highlighting the need for landslide science to reduce risk



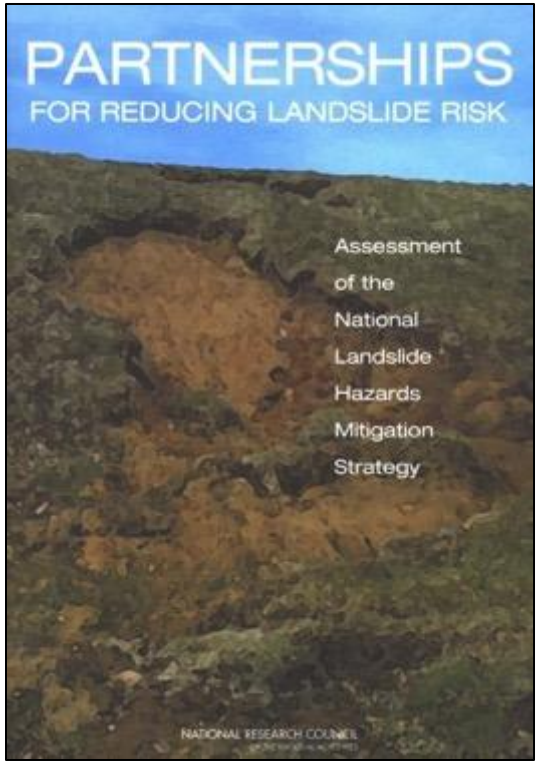
USGS Circular 880 (1982)



National Research Council (1985)



USGS Circular 1244 (2003)



National Research Council (2004)

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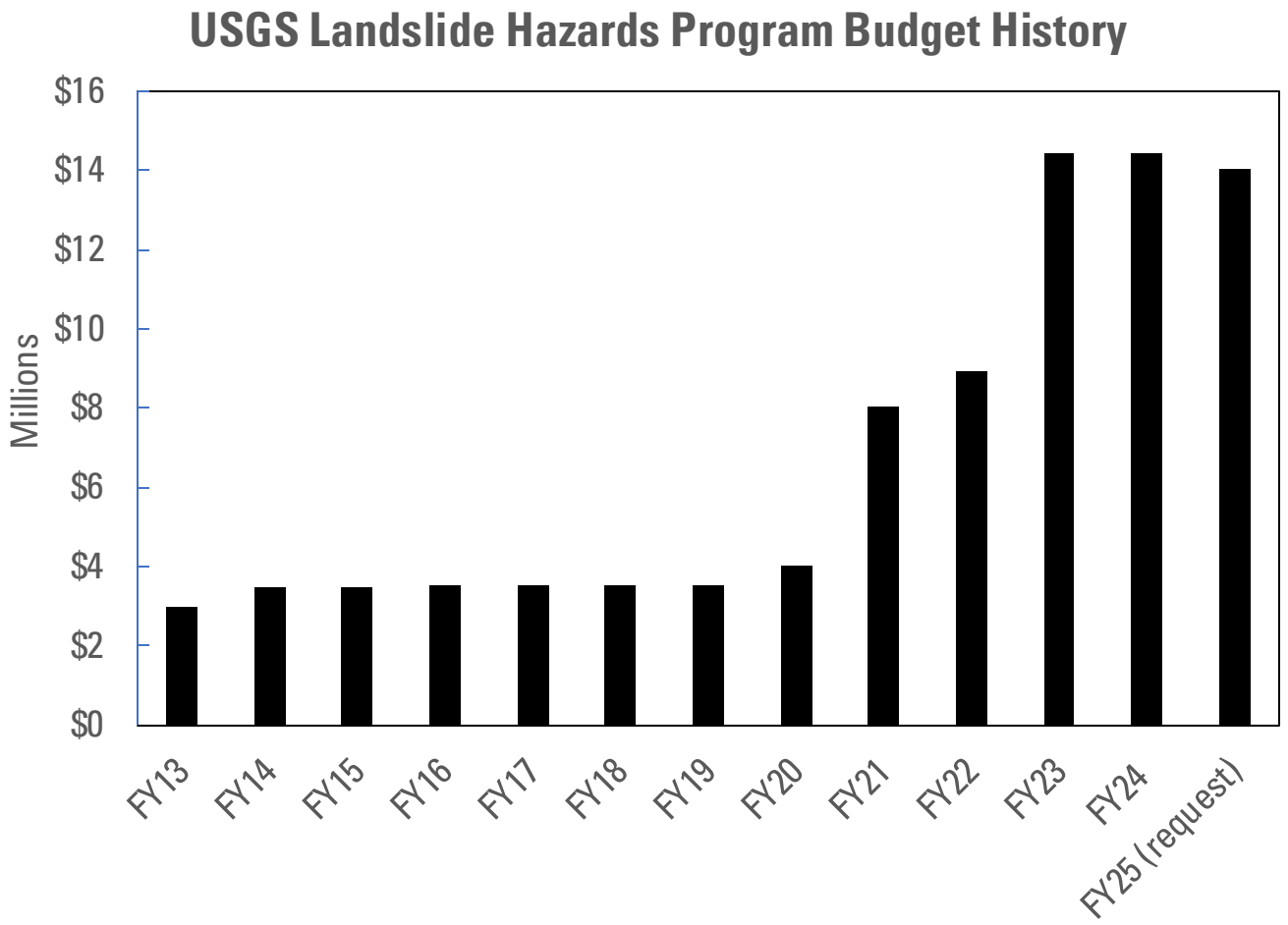
Landslide Hazard Program budget has grown in recent years



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*but eroded by inflation in fixed costs

2021 National Landslide Preparedness Act

- First introduced in 2016 by Representative DelBene (WA-1)
- Signed into law on 5 January 2021 (expired at the end of FY24)
- National Landslide Hazards Reduction Program (USGS, NWS, NSF)
- Federal Interagency coordination on Landslide Hazards
  - Departments of Interior, Agriculture, Army, Commerce, Homeland Security, Transportation, National Science Foundation, Office of Science and Technology Policy, and Office of Management and Budget
- **Advisory Committee on Landslides**
  - States, Territories, Tribes, Higher Ed, Industry Standards Orgs, Emergency Management
- **National Strategy for Landslide Loss Reduction**
- Publicly accessible national database of landslide hazard and risk
- Capacity for rapid deployment of scientists to assist with landslide disasters

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USGS Landslide Hazards Program

National Strategy for Landslide Loss Reduction

Open-File Report 2022–1075

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

Outlines USGS role in leading efforts to reduce landslide risk.

Sets out goals, provides a vision, and describes strategic actions to achieve those goals and vision.

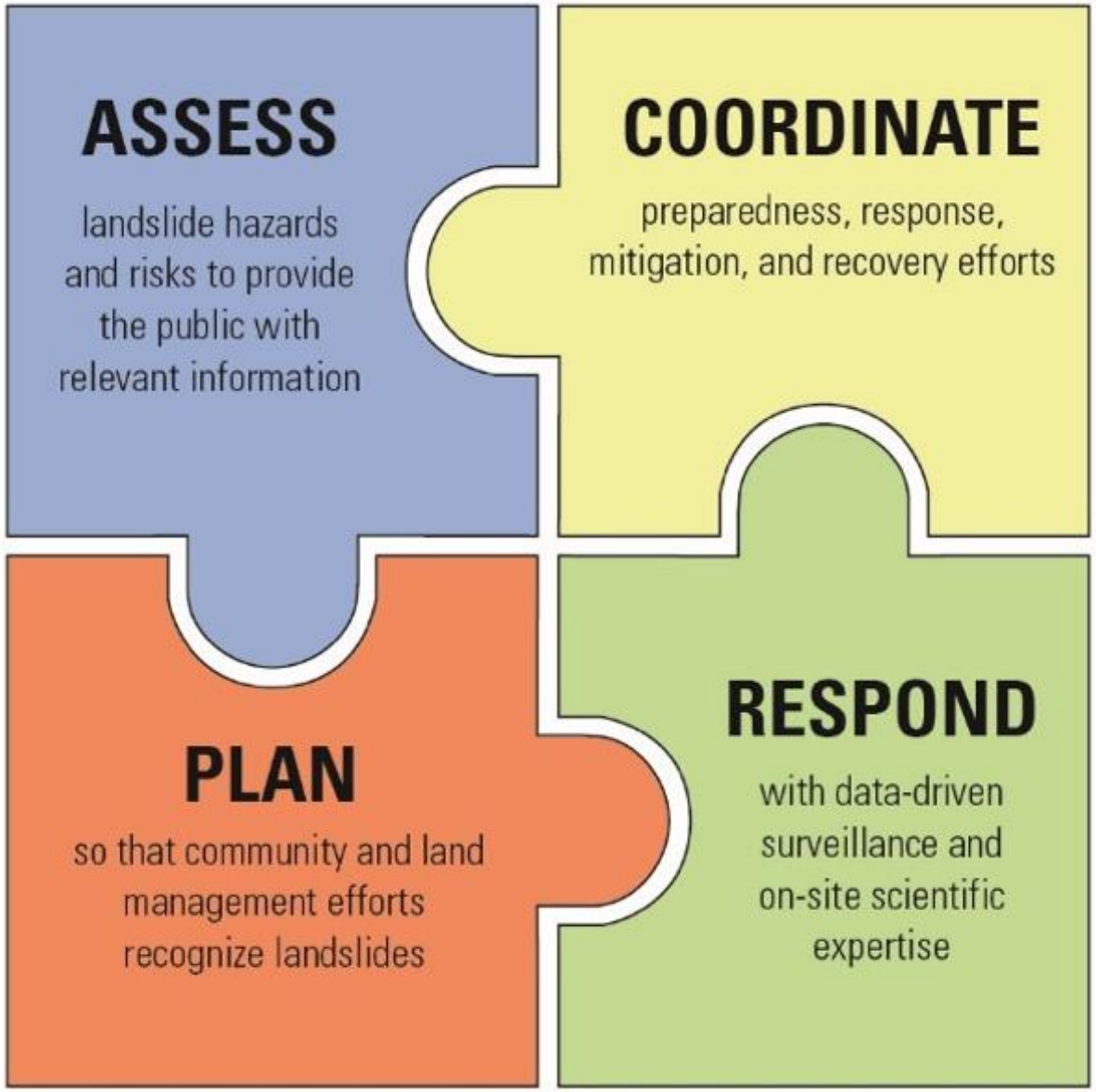
Identifies involved parties and organizations, describes ongoing efforts, and lists specific actions and initiatives.

Goal 1 – ASSESS: Ensure that decision-makers have access to detailed, nationally consistent, and contextually relevant information on landslide hazard and risk

Goal 2 – COORDINATE: Enable efficient and effective coordination of landslide hazard response, mitigation, and recovery efforts across federal, state, tribal, territorial, and local entities

Goal 3 – PLAN: Ensure communities at risk, decision makers, and land managers understand and are prepared for landslide hazards

Goal 4 - RESPOND: Ensure surveillance and responses to landslide events are effective, efficient, equitable, cooperative, and data-driven to protect life, property, and resources



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National Landslide Strategy – Goals and Strategic Actions

Goal 1 – Assess landslide hazard and risk

Strategic Action 1.1	Characterize the societal risks posed by landslide hazards
Strategic Action 1.2	Expand research and development to assess the where, when, and why of landslide hazards
Strategic Action 1.3	Develop a publicly accessible national landslide hazard and risk database
Strategic Action 1.4	Provide publicly available reports of Significant Landslide Events

Goal 2 – Coordinate across Federal, State, Tribal, Territorial, and Local levels

Strategic Action 2.1	Establish an Interagency Coordinating Committee on Landslide Hazards
Strategic Action 2.2	Establish a formal Federal Advisory Committee on Landslide Hazards
Strategic Action 2.3	Develop and maintain Cooperative Landslide Hazards and Risk Grants
Strategic Action 2.4	Establish and support a National Landslide Hazard Risk Reduction (NLHRR) Working Group

Goal 3 – Plan for landslide hazards

Strategic Action 3.1	Provide guidance, tools, and training to include landslide information in hazard planning
Strategic Action 3.2	Develop landslide outreach to improve public knowledge and preparedness planning

Goal 4 – Respond to landslide events to protect life, property, and resources

Strategic Action 4.1	Support existing warning systems to include landslides
Strategic Action 4.2	Improve real-time response actions by having onsite technical experts

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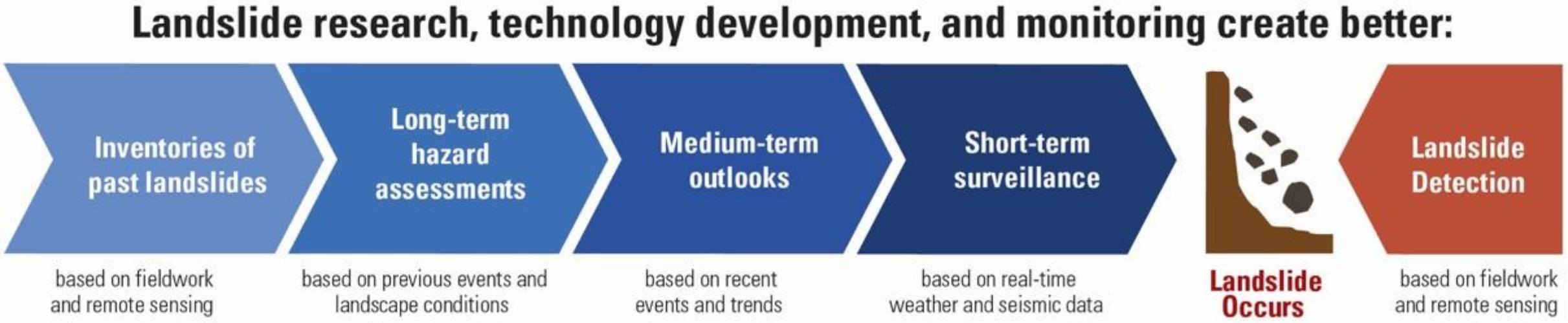
U.S. Geological Survey Landslide Hazards Program



Goal 1 - Characterize the societal risks posed by landslide hazards

Who and what are vulnerable to landslides?

- Improve national-scale landslide hazard map

How do land use, management, and development influence risk?

- Account for demographic exposure, vulnerability, population trends in risk assessments

How have historical and current policies created inequities and vulnerabilities?

- Examine historical and current practices that have exacerbated landslide impacts

What can be done equitably to reduce social vulnerability to landslides?

- Understand the short- and long-term impacts of landslides to local and regional economies, especially for tribal and underserved, isolated, and rural communities

Damage from a post-wildfire debris flow that occurred on 9 January 2018 near Montecito, Santa Barbara County, CA, from heavy rain that fell on steep hillsides that burned in the 2017 Thomas Fire.

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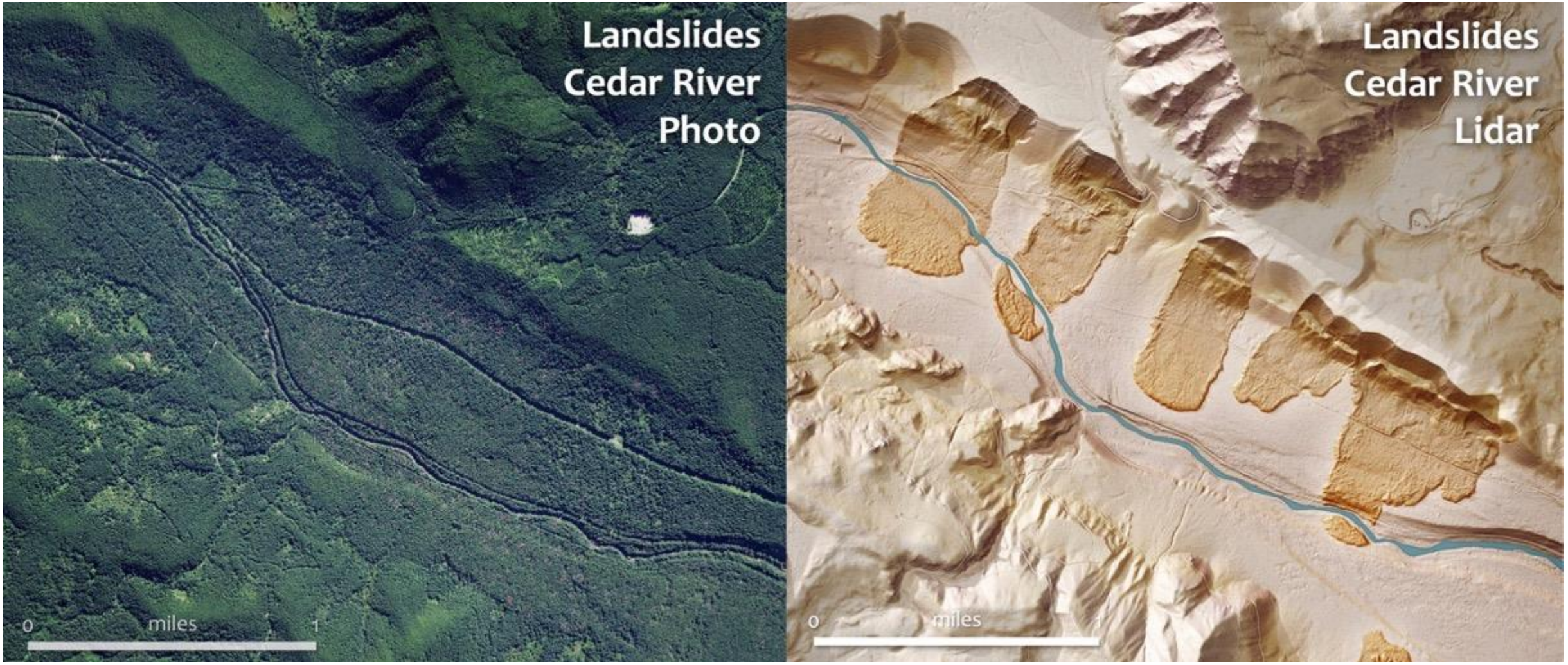
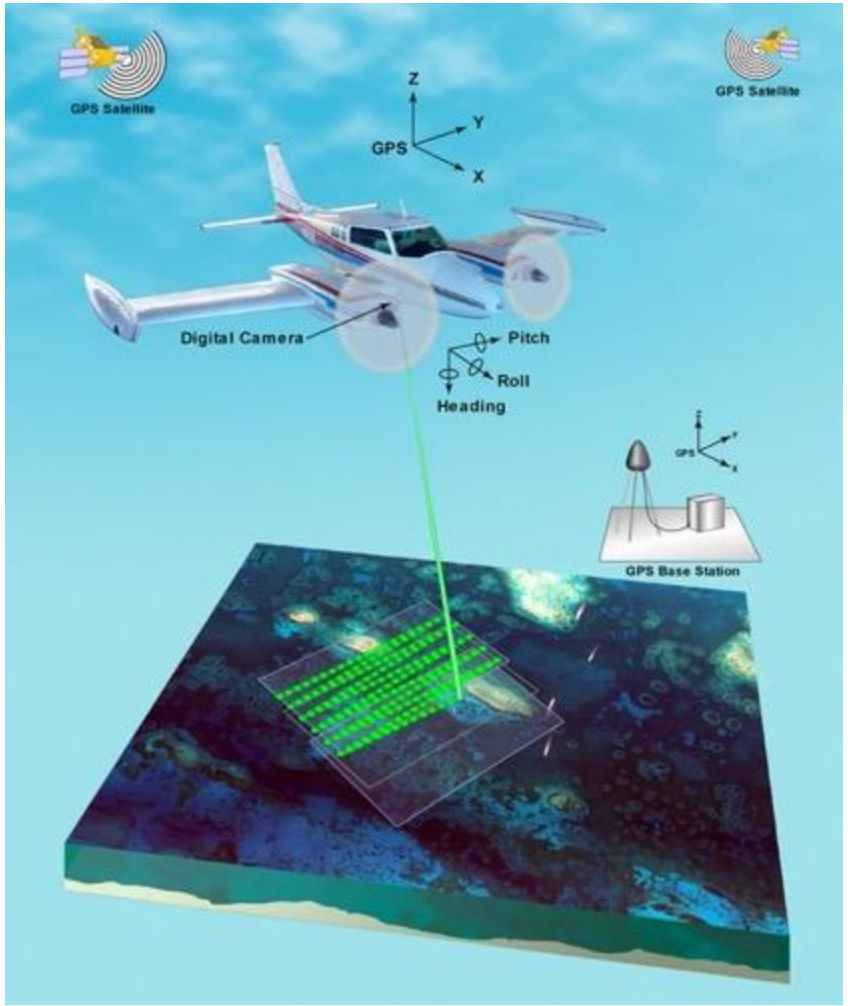
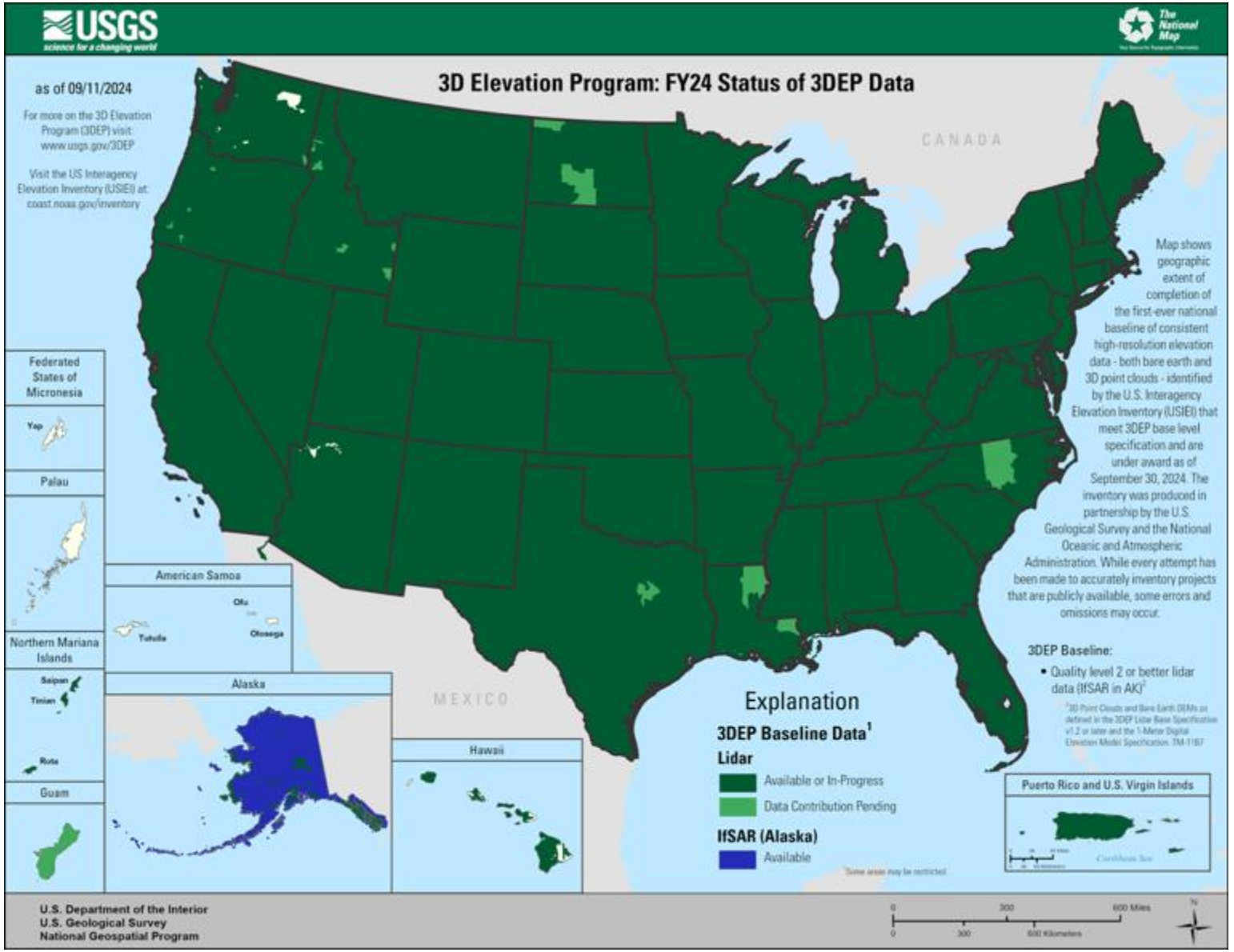
Lidar technology has revolutionized landslide mapping



Images courtesy of Dan Coe – Washington State Geological Survey

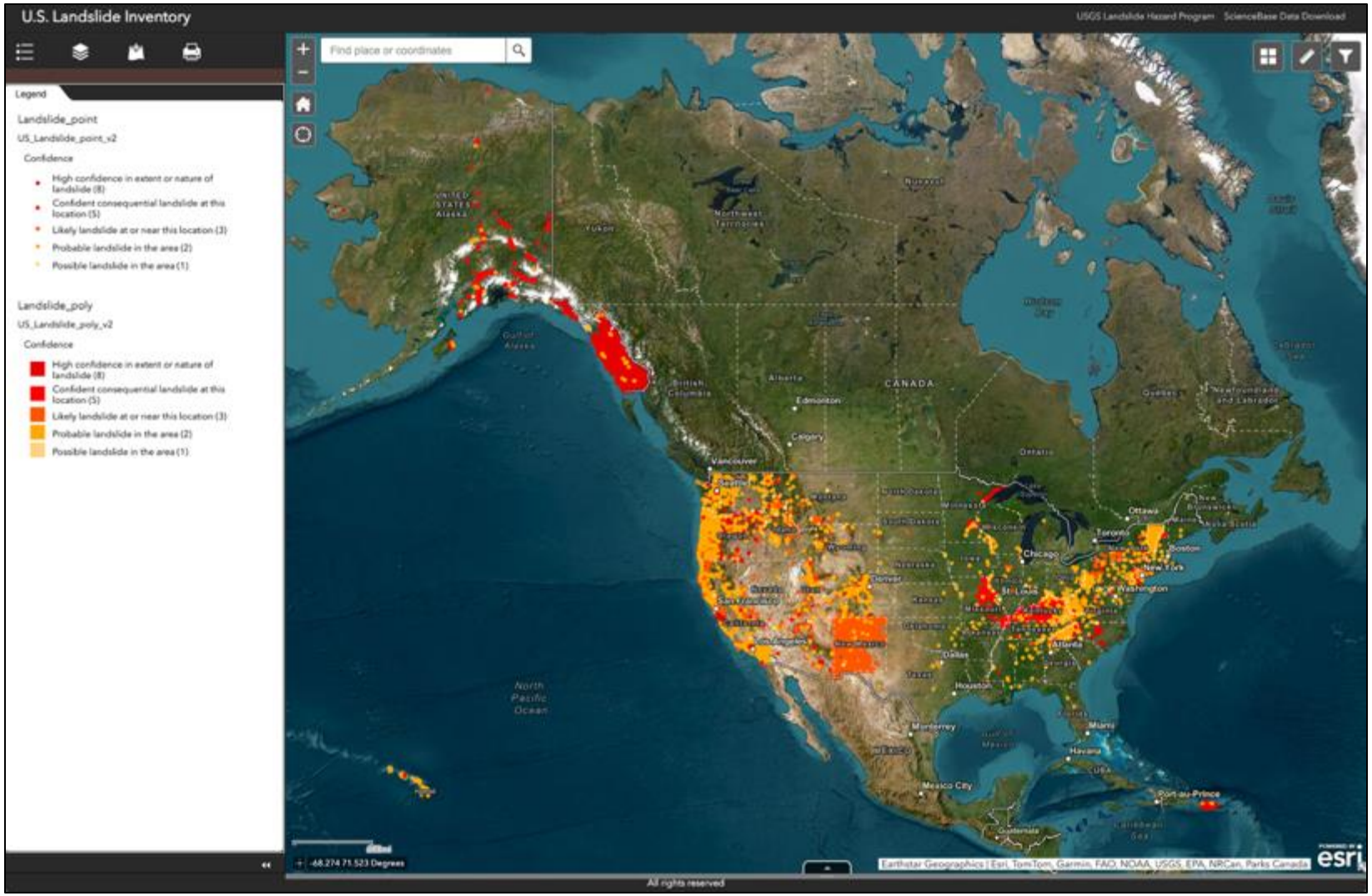
Nationwide, high-resolution topography data is close to being a reality





Goal 1 – Develop a publicly accessible national landslide hazard and risk database

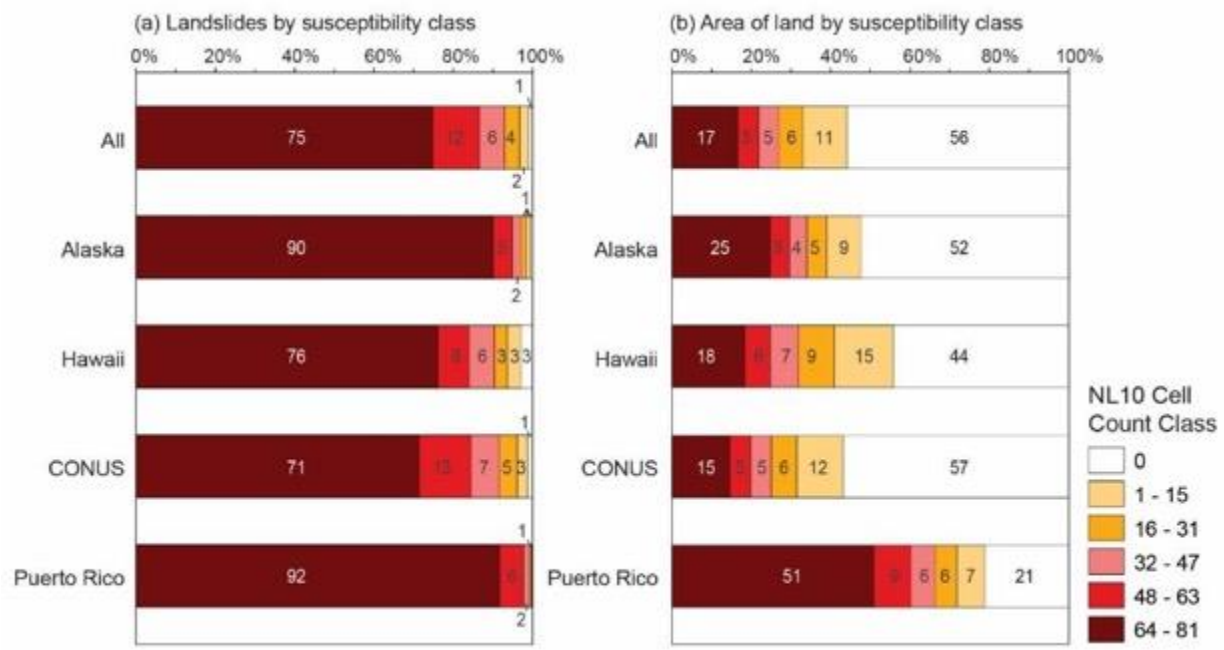
- March 2022 version – almost 1 million landslide locations
- Many mapped by State Geological Surveys
- Vast areas of the US with little or no data
- Enables efforts to begin assessing landslide hazard, exposure, and risk
- Paucity of timing information



Belair and others, 2022, USGS Science Base

USGS

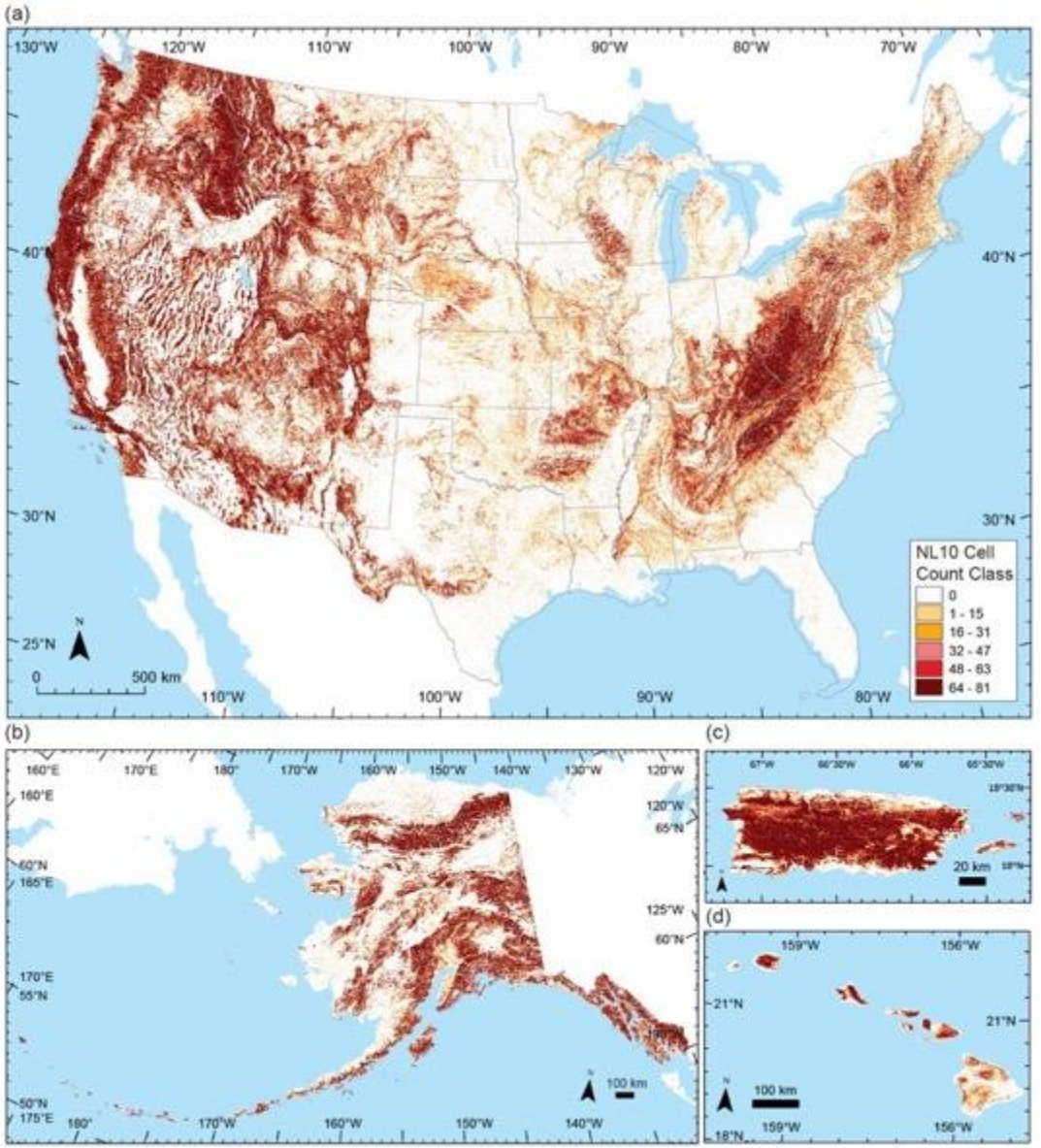
Goal 1 – Characterize the societal risks posed by landslide hazards



For exposure and other applications:

Negligible (0) Some (1-31) Considerable (32-81)

- 10 m 3DEP elevation
- About 900,000 landslide locations
- Slope-relief analysis using USGS HPC resources
- Output at 90 m grid spacing



Mirus and others, AGU Advances, 2024

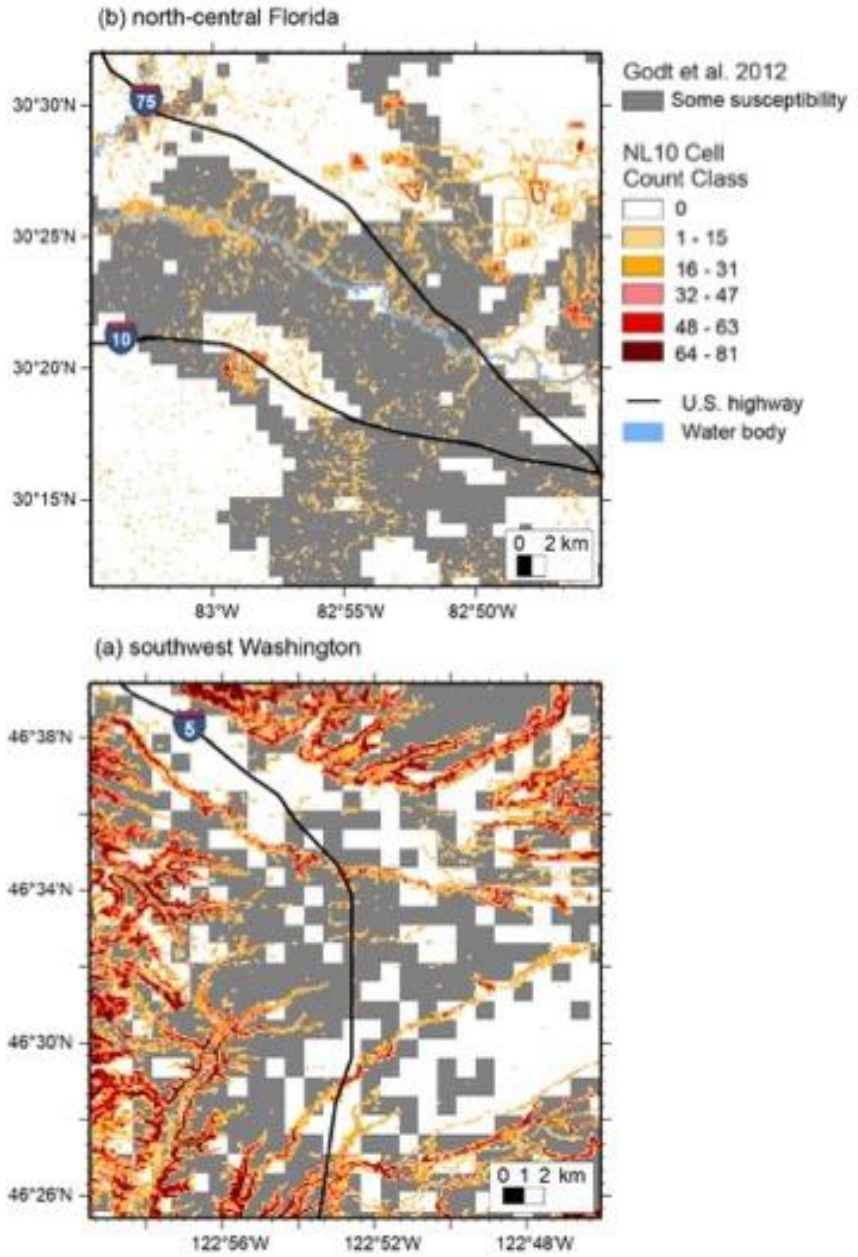
Goal 1 – Characterize the societal risks posed by landslide hazards

What it is:

- Consistent national-scale assessment of landslide potential
- Uniform basis to communicate the nature and scale of exposure
- Useful for prioritizing further investigation and data collection
- Initial step towards hazard and risk
- Improvement over existing CONUS datasets

What it is not:

- Meant to supplant larger-scale more sophisticated assessments
- Detail on landslide type, materials, triggers, timing, or impacts



Mirus and others, AGU Advances, coming soon

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Goal 1 & 4 – Assessing postfire hazard and supporting early warning



Postfire debris flow:

Key questions……

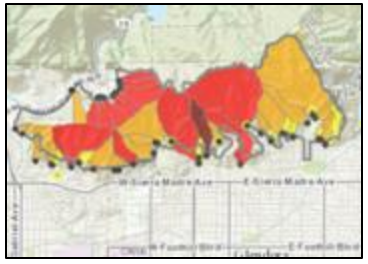
Where?

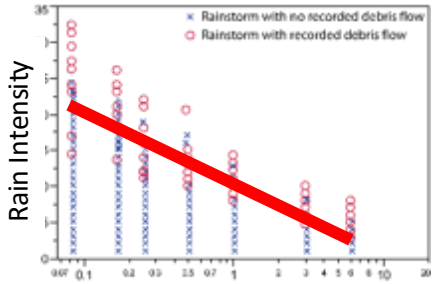
When*?*

How big?

How fast and far?

How long?





Operational products

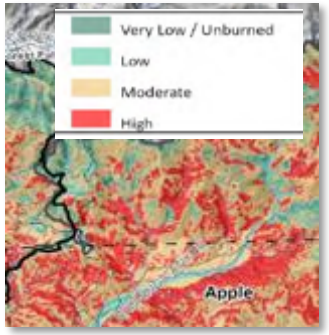
Under development

USGS postfire debris flow hazard assessments are based on empirical models

Models to answer **Where, When, and How Big?** are functions of:

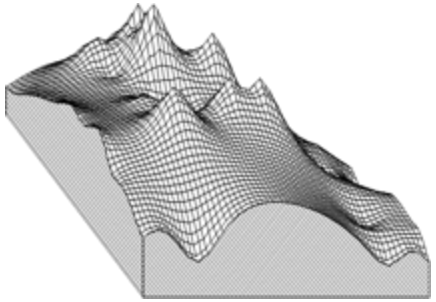
Burn Severity

- Field-verified map of soil burn severity
- dNBR



Topography

- 10-m DEM



Soil Erodibility

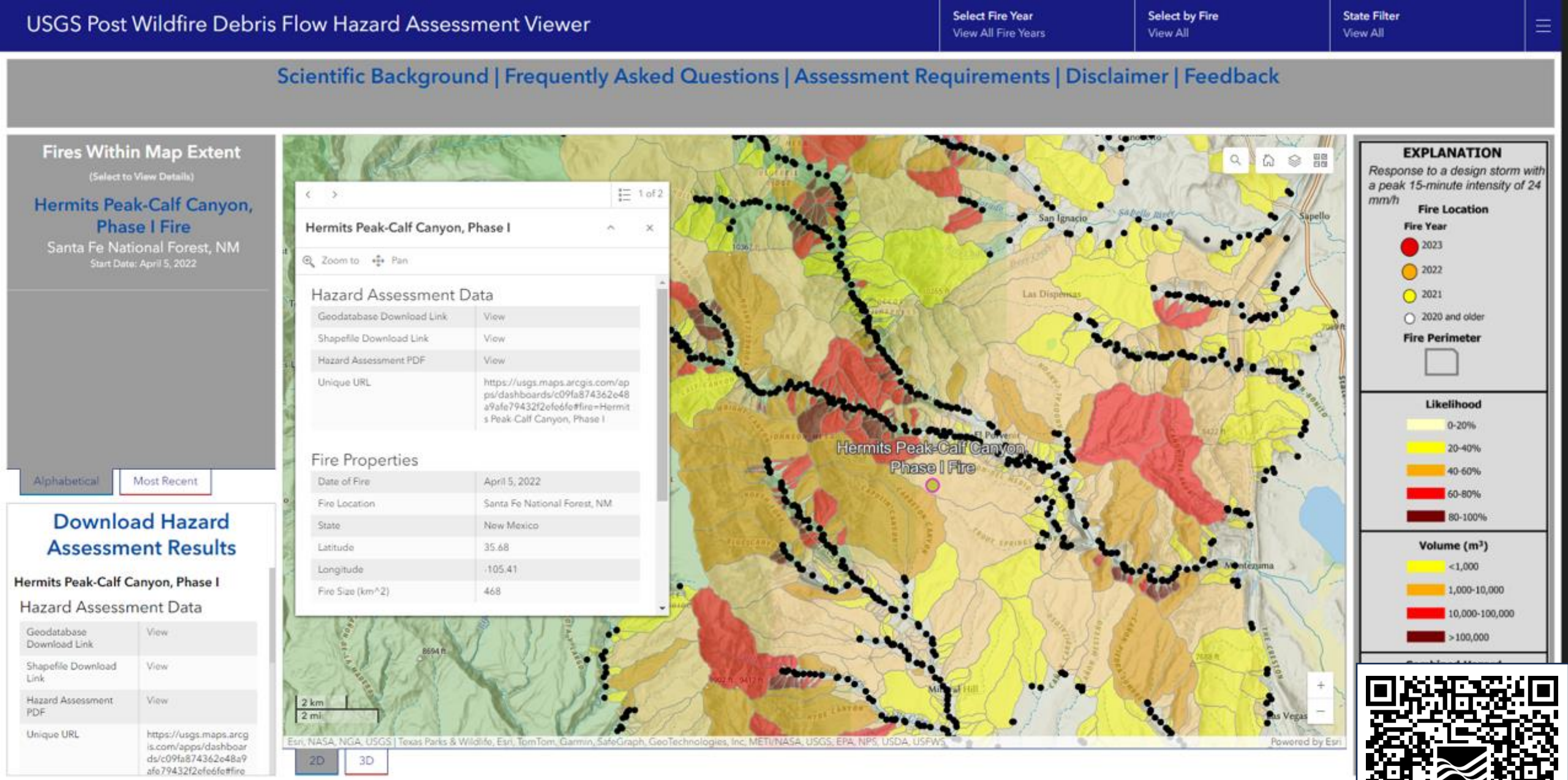
- STATSGO database

Rainfall Intensity

- 15-minute design rainstorms

- Calibrated with data from southern CA
- Tested across intermountain West
- Updated every 5-10 years using new data
- Regional model updates coming soon.

Likelihood model: Staley and others., 2017, Geomorphology Volume model: Gartner and others, 2014, Engineering Geology



USGS assesses 20-100 fires each year covering up to 6 million acres/year

Rapid hazard assessments aid decision making – 2017 Thomas Fire

Start of fire

Progression to Montecito

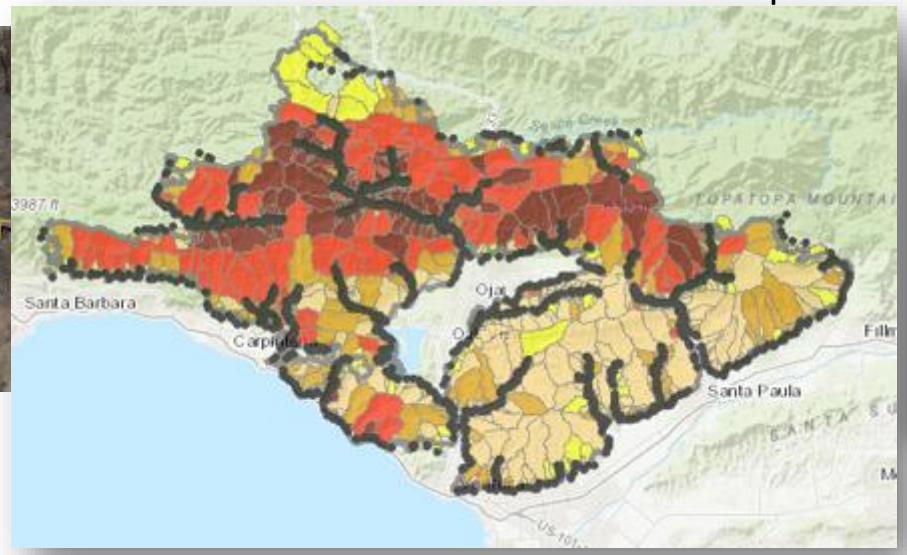
NWS issues **outlook** for debris flow

NWS issues **warning**

Dec 4, 2017 | **Dec 17** | **Late Dec** | **Jan 2** | **Jan 5** | **Jan 8** | **Jan 9 2:30am 3:45am**

Map soil burn severity

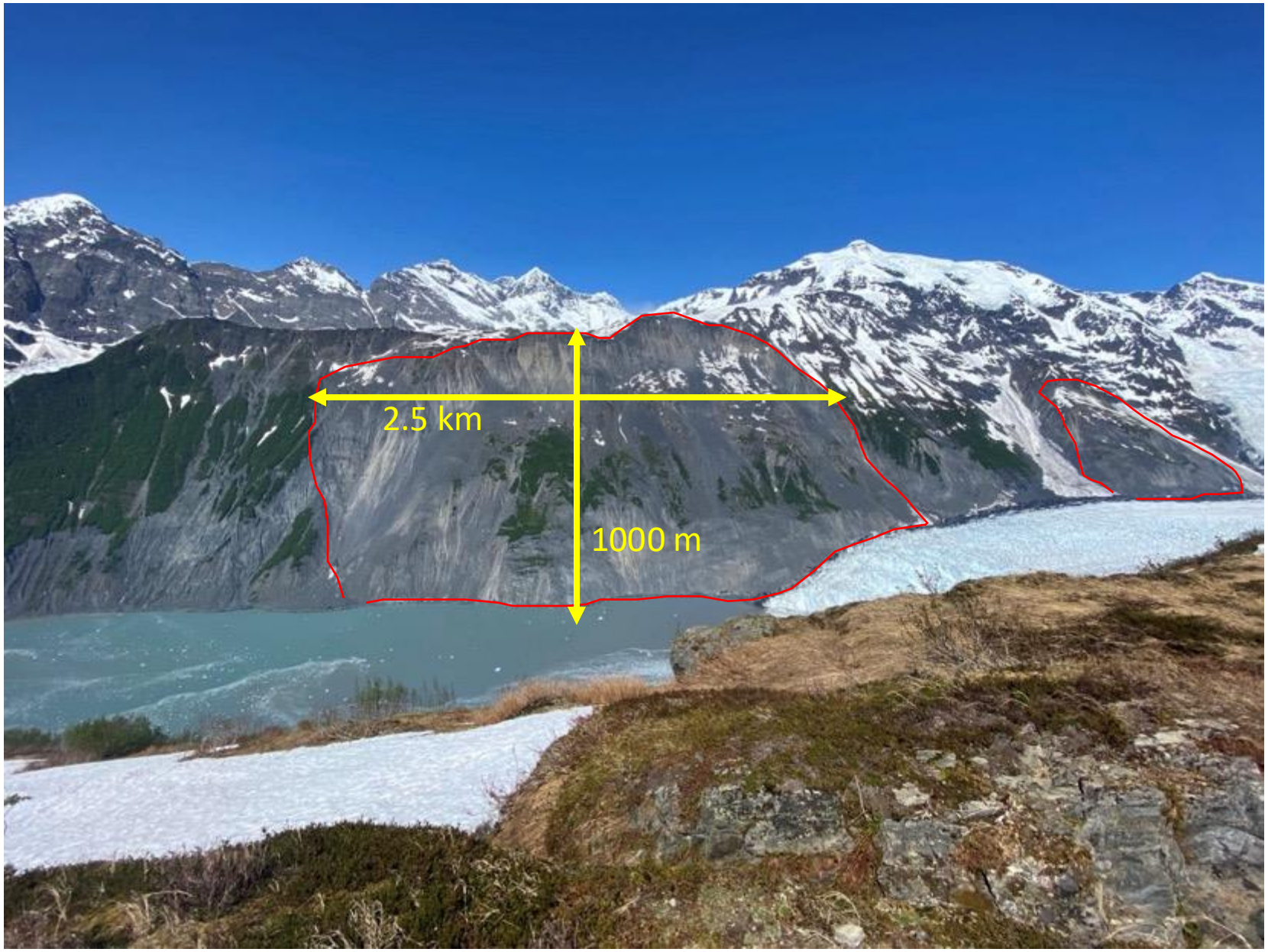
USGS hazard assessment completed

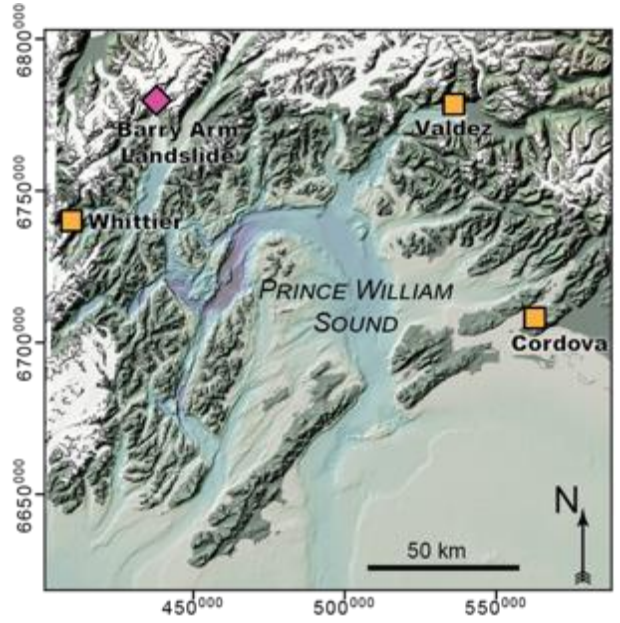


Largest evacuation orders in Santa Barbara County history

50-year rain burst over Montecito

The Barry Arm Landslide





The New York Times

It Could Happen Anytime': Scientists Warn of Alaska Tsunami Threat

A retreating glacier is increasing the risk of a catastrophic landslide and tsunami within a few decades, researchers say.

By Henry Fountain

Mr. Fountain is a science writer and the author of "The Great Quake," about Alaska's deadly 1964 earthquake.

Published May 14, 2020 Updated May 15, 2020

The Atlantic Sign In

SCIENCE

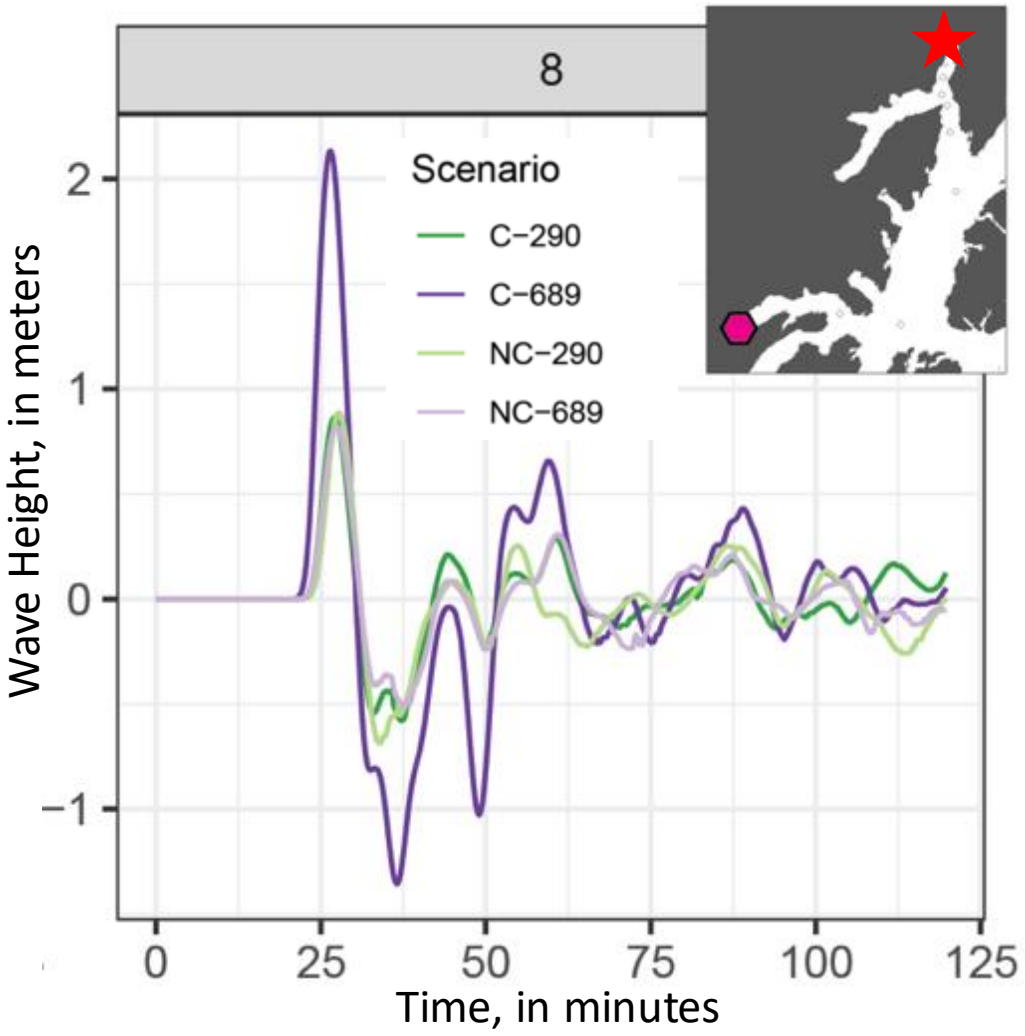
The Alaska Tsunami That Can't Be Stopped

Melting ice has left one small town on the brink of disaster.

VICTORIA PETERSEN AND HIGH COUNTRY NEWS NOVEMBER 15, 2020

USGS science for a changing world · NOAA · State of Alaska · UAF Alaska Earthquake Center · NRCS

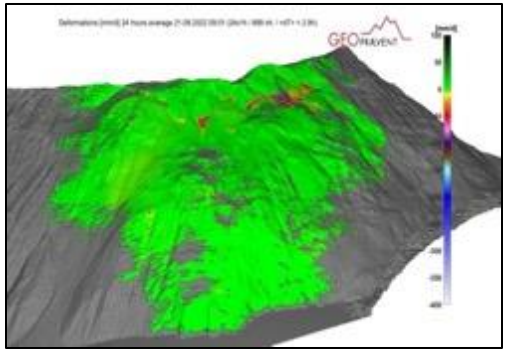
Catastrophic Failure = 2.1-meter wave in Whittier in ~25 minutes

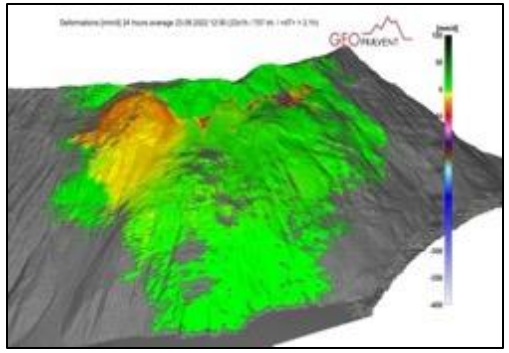


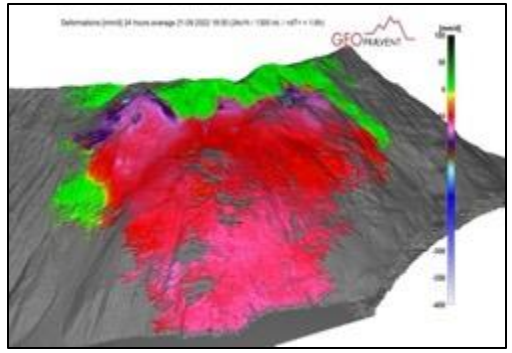
From Barnhart and others, 2021, U.S. Geological Survey Open-File Report 2021–1071, https://doi.org/10.3133/ofr20211071

Photo: D. Staley

Barry Arm Landslide and Tsunami Warning







Goal 4 and Strategic Action 4.1 Advance landslide early warning:

1. Develop USGS landslide surveillance systems, including cyberinfrastructure.
2. Improve landslide surveillance products for consistent and accessible messaging.
3. Expand USGS–NWS cooperation on debris flow early warning.

Key partners are the USGS (to monitor and share surveillance information with the NWS), the NWS (to disseminate landslide alerts), and state, tribal, territorial, and local government entities (to reinforce and refine messaging).

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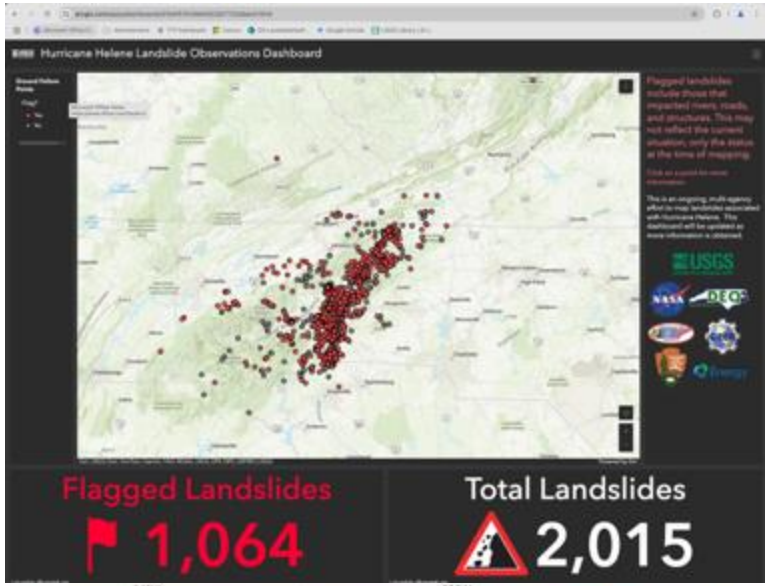
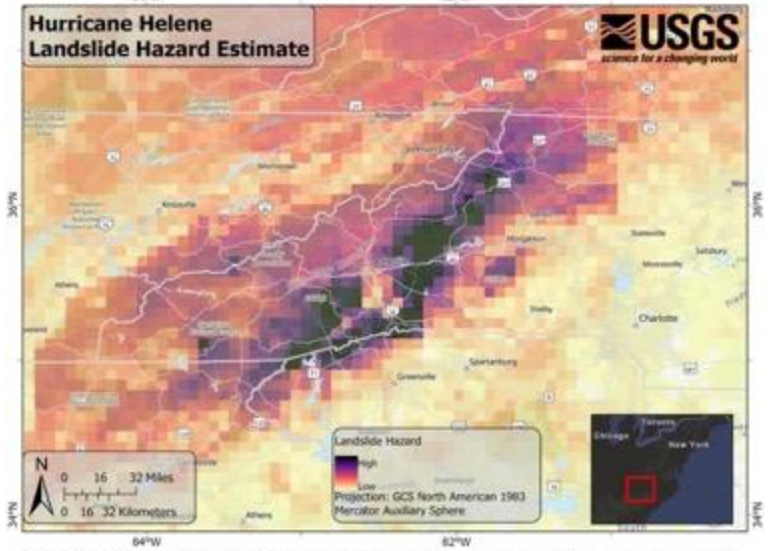
Landslide early warning to reduce risk

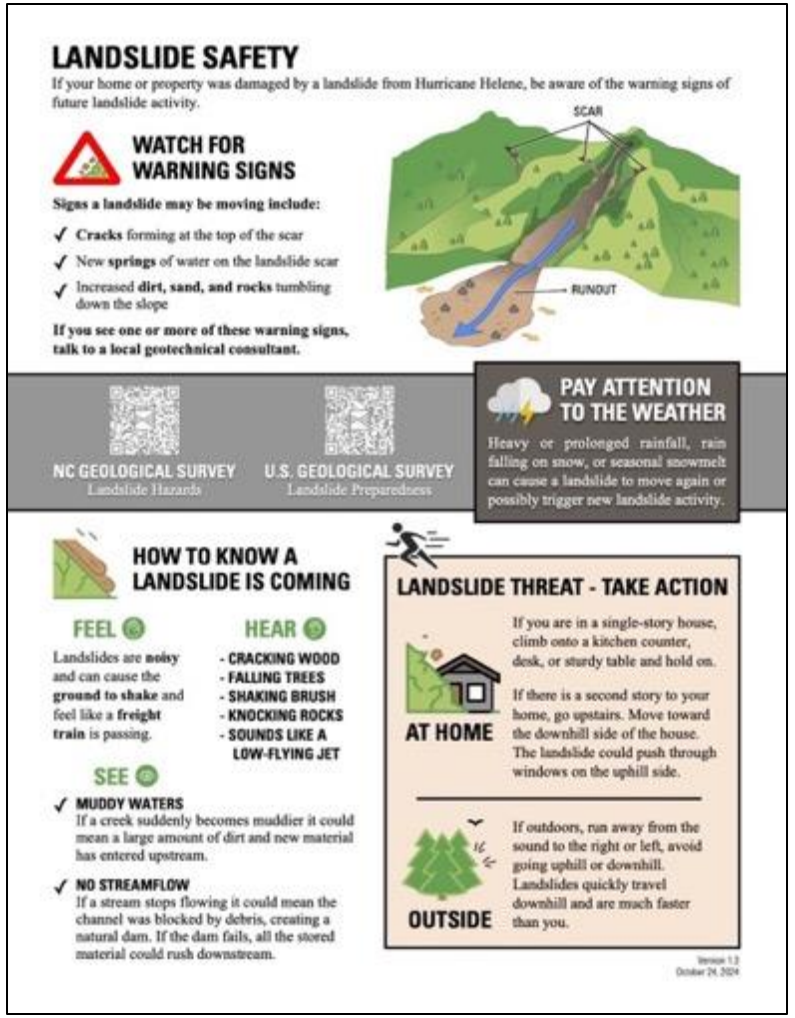
Technical challenges

- Landslide triggers vary in type, space, and time
- Once landslides are initiated, there may be just seconds to take action
- Signs may not be present before a landslide becomes hazardous
  - → Landslide forecasts rely on proxies for slope stability
  - → Warnings assess the likelihood of landslides before they occur
  - → Greater warning lead time = more time to take action and greater uncertainty
- Landslides can occur almost anywhere—forecasts and warnings must be site-specific

Goal 4 – Support response to landslide disasters







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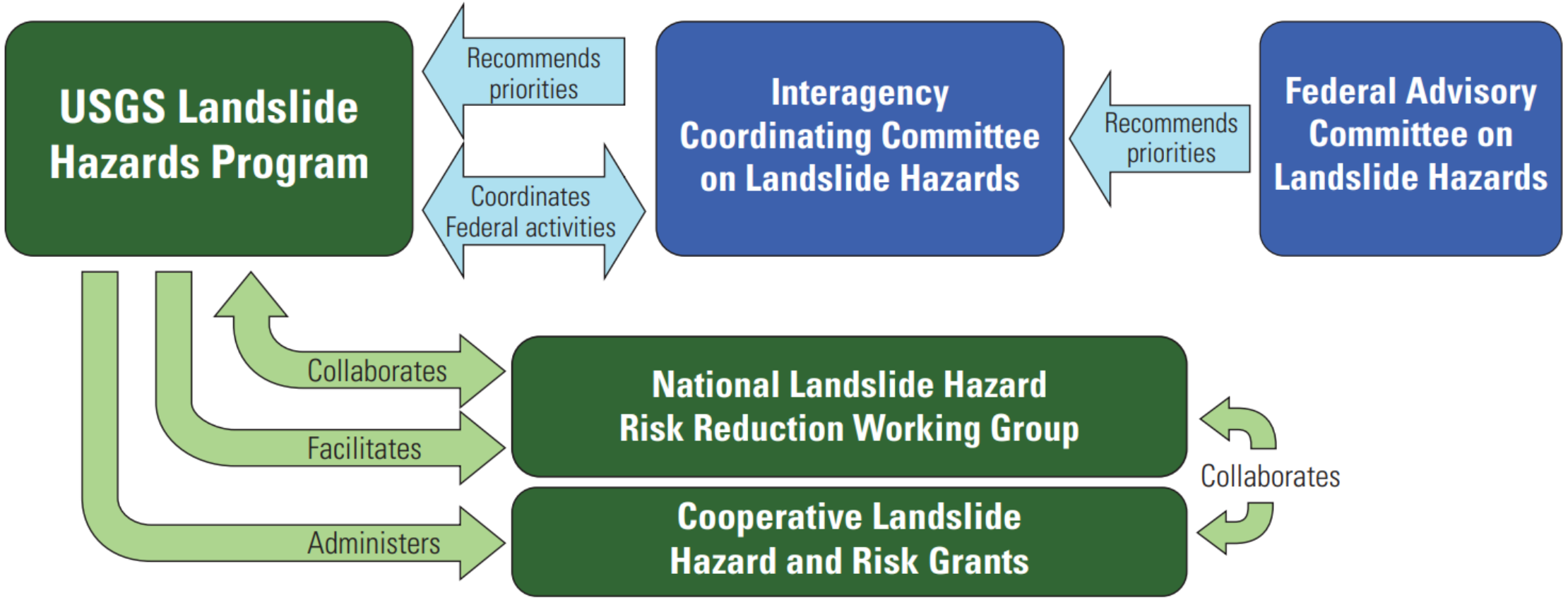
National Landslide Preparedness Act Governance

Goal 2 – Coordinate landslide hazard mitigation, preparedness, response, and recovery efforts



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Please introduce yourself!

1. Name
2. Title
3. Your organization
4. Where you live
5. One sentence: Why you chose to serve on the ACL

Casey Hanell

Leslie Jones

Kelly Hubbard

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Advisory Committee on Landslides Responsibilities

Advisory Committee on Landslides, January 16, 2025

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

Why are we here?

Establishment.

(d) ADVISORY COMMITTEE.—

(1) IN GENERAL.—The Secretary shall establish an advisory committee, to be known as the "Advisory Committee on Landslides" (referred to in this subsection as the "Advisory Committee").

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Why are you here?

(2) MEMBERSHIP.—The Advisory Committee shall be composed of not fewer than 11 members—

(A) of whom none may be an individual described in any of subparagraphs (A) through (F) of section 7342(a)(1) of title 5, United States Code; and

(B) who shall be representatives of—

(i) States, including State geological organizations;

(ii) territories, including territorial geological organizations;

(iii) Indian tribes, including Tribal geological organizations;

(iv) research institutions and institutions of higher education that are qualified—

(I) to provide advice regarding landslide hazard and risk reduction; and

(II) to represent related scientific, architectural, engineering, and planning disciplines;

(v) industry standards development organizations; and

(vi) State, territorial, local, and Tribal emergency management agencies.

Not a Federal employee

Represent one or more of these interests or areas of expertise

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What will we do?

(3) RECOMMENDATIONS.—

(A) IN GENERAL.—The Advisory Committee shall submit to the Committee recommendations for the implementation of the program, including recommendations regarding—

(i) landslide hazard and risk reduction and planning;

(ii) tools for communities;

(iii) research; and

(iv) such other topics as the Advisory Committee determines appropriate.

The ACL will meet, listen, consult, share, deliberate, and **make recommendations**.

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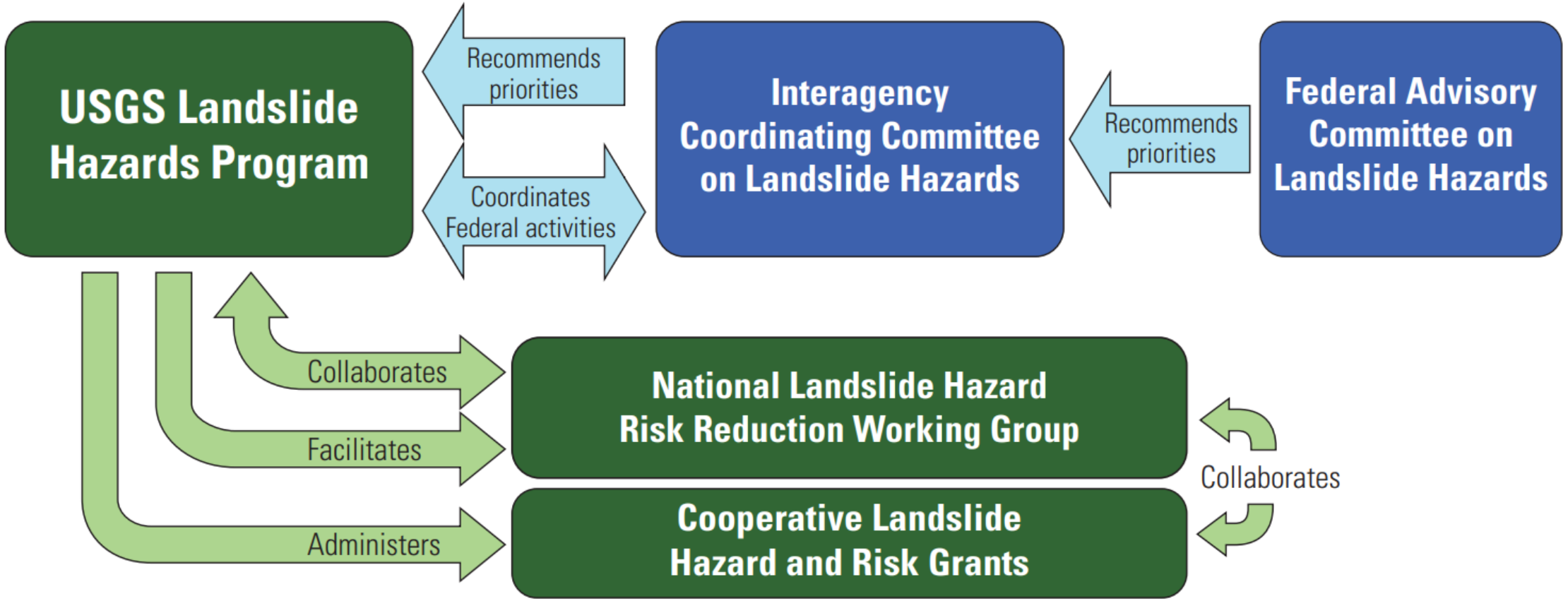
Interagency Coordinating Committee on Landslide Hazards

Goal 2 – Coordinate landslide hazard mitigation, preparedness, response, and recovery efforts



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Interagency Coordinating Committee on Landslide Hazards

Ensures coordination of landslide-related efforts at the federal level

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What will we NOT do?

(3) RECOMMENDATIONS.—

(A) IN GENERAL.—The Advisory Committee shall submit to the Committee recommendations for the implementation of the program, including recommendations regarding—

(i) landslide hazard and risk reduction and planning;

(ii) tools for communities;

(iii) research; and

(iv) such other topics as the Advisory Committee determines appropriate.

We won't make decisions for the U.S. government.

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How will we do it?

If you want to learn more about how other FACs make recommendations:

Advisory Committee on Earthquake Hazard Reduction (ACHER)

Scientific Earthquake Studies Advisory Committee (SESAC)

National Volcano Early Warning System Advisory Committee (NVEWSAC)

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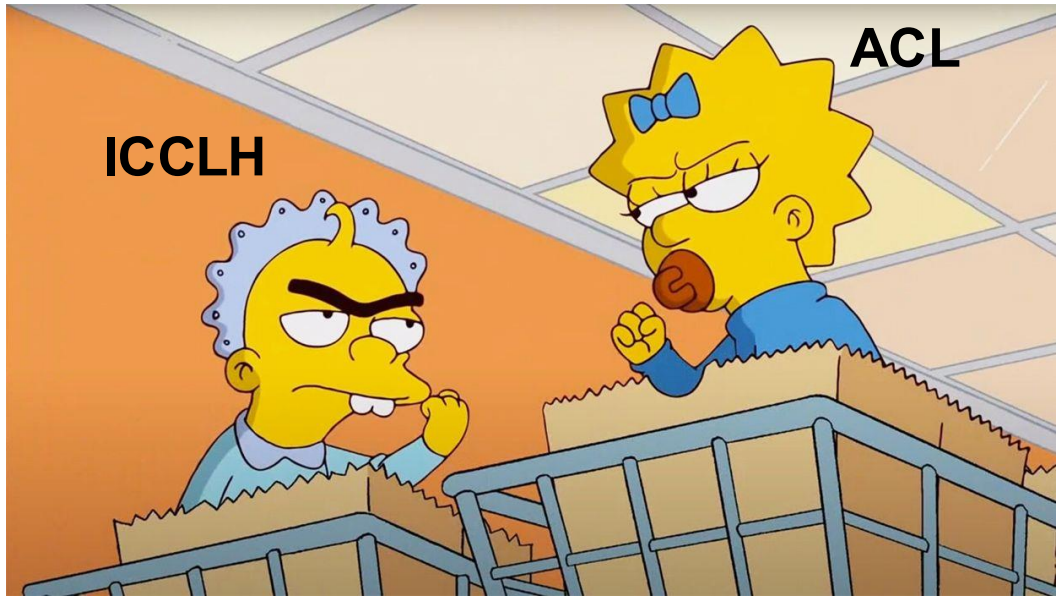
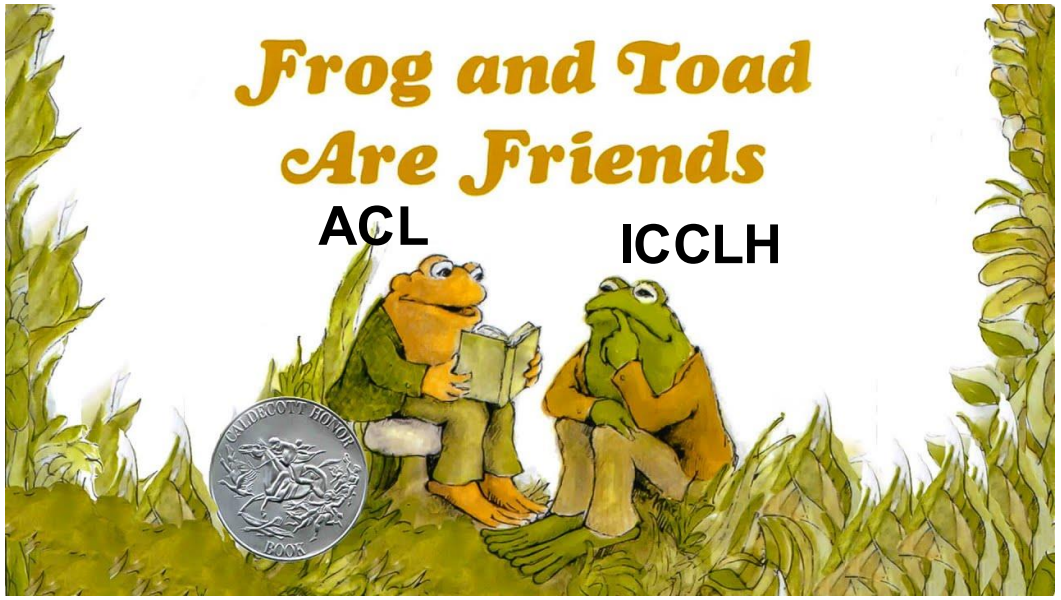
How will we do it?

(B) CONSIDERATION.—The Secretary and the agency heads described in subparagraphs (B) through (I) of subsection (c)(2) shall take into consideration any recommendation of the Advisory Committee submitted under subparagraph (A).

Hopefully not this….



…but more like this.



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Expectations of Advisory Committee members

1. Show up!
2. Prepare and participate
3. Communicate constructively
4. Contribute to ACL outputs
5. Abide by FACA and ethics rules
6. Respond to travel-related queries
    - Be prompt
    - Be patient
    - Be kind

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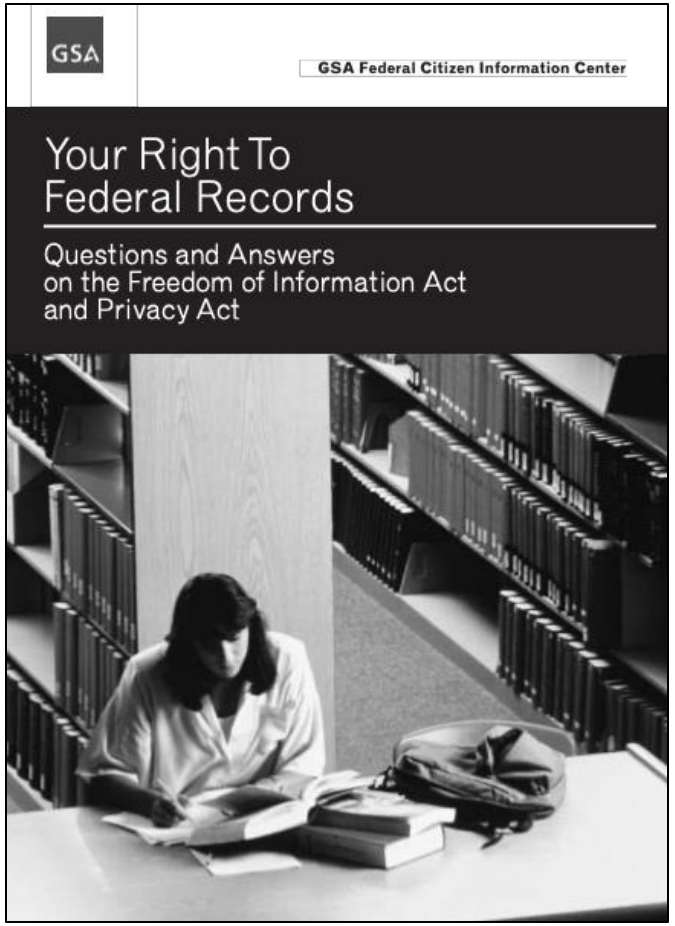
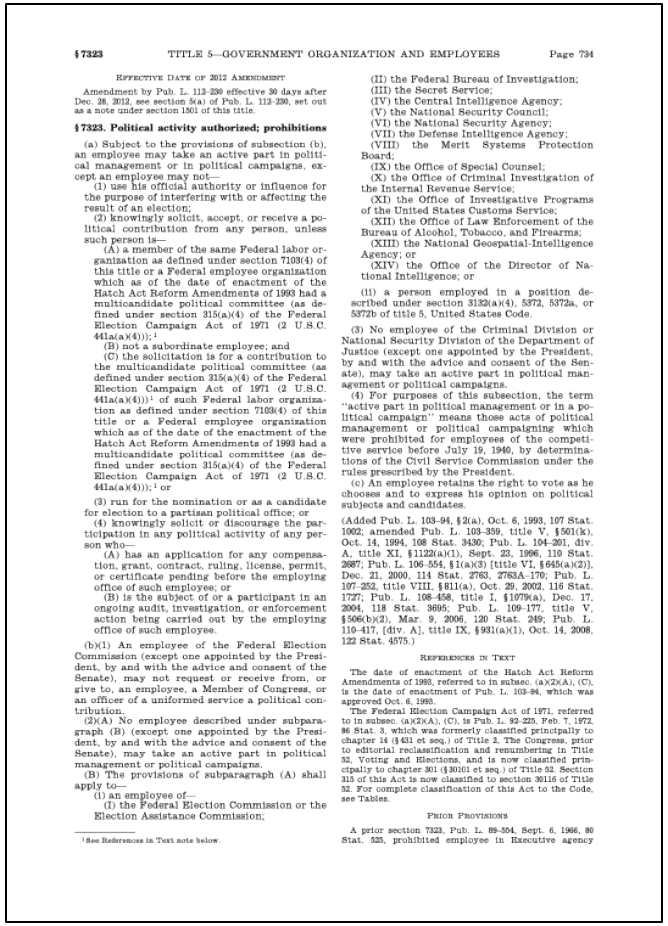
Executive Branch 101



Freedom of Information Act

Congressional Engagement



§ 7323 TITLE 5—GOVERNMENT ORGANIZATION AND EMPLOYEES Page 734

EFFECTIVE DATE OF 2012 AMENDMENT

Amendment by Pub. L. 112–230 effective 30 days after Dec. 28, 2012, see section 5(a) of Pub. L. 112–230, set out as a note under section 1501 of this title.

§ 7323. Political activity authorized; prohibitions

(a) Subject to the provisions of subsection (b), an employee may take an active part in political management or in political campaigns, except an employee may not—

(1) use his official authority or influence for the purpose of interfering with or affecting the result of an election;

(2) knowingly solicit, accept, or receive a political contribution from any person, unless such person is—

(A) a member of the same Federal labor organization as defined under section 7103(4) of this title or a Federal employee organization which as of the date of enactment of the Hatch Act Reform Amendments of 1993 had a multicandidate political committee (as defined under section 315(a)(4) of the Federal Election Campaign Act of 1971 (2 U.S.C. 441a(a)(4)));[1]

(B) not a subordinate employee; and

(C) the solicitation is for a contribution to the multicandidate political committee (as defined under section 315(a)(4) of the Federal Election Campaign Act of 1971 (2 U.S.C. 441a(a)(4)))[1] of such Federal labor organization as defined under section 7103(4) of this title or a Federal employee organization which as of the date of the enactment of the Hatch Act Reform Amendments of 1993 had a multicandidate political committee (as defined under section 315(a)(4) of the Federal Election Campaign Act of 1971 (2 U.S.C. 441a(a)(4)));[1] or

(3) run for the nomination or as a candidate for election to a partisan political office; or

(4) knowingly solicit or discourage the participation in any political activity of any person who—

(A) has an application for any compensation, grant, contract, ruling, license, permit, or certificate pending before the employing office of such employee; or

(B) is the subject of or a participant in an ongoing audit, investigation, or enforcement action being carried out by the employing office of such employee.

(b)(1) An employee of the Federal Election Commission (except one appointed by the President, by and with the advice and consent of the Senate), may not request or receive from, or give to, an employee, a Member of Congress, or an officer of a uniformed service a political contribution.

(2)(A) No employee described under subparagraph (B) (except one appointed by the President, by and with the advice and consent of the Senate), may take an active part in political management or political campaigns.

(B) The provisions of subparagraph (A) shall apply to—

(i) an employee of—

(I) the Federal Election Commission or the Election Assistance Commission;

(II) the Federal Bureau of Investigation;

(III) the Secret Service;

(IV) the Central Intelligence Agency;

(V) the National Security Council;

(VI) the National Security Agency;

(VII) the Defense Intelligence Agency;

(VIII) the Merit Systems Protection Board;

(IX) the Office of Special Counsel;

(X) the Office of Criminal Investigation of the Internal Revenue Service;

(XI) the Office of Investigative Programs of the United States Customs Service;

(XII) the Office of Law Enforcement of the Bureau of Alcohol, Tobacco, and Firearms;

(XIII) the National Geospatial-Intelligence Agency; or

(XIV) the Office of the Director of National Intelligence; or

(ii) a person employed in a position described under section 3132(a)(4), 5372, 5372a, or 5372b of title 5, United States Code.

(3) No employee of the Criminal Division or National Security Division of the Department of Justice (except one appointed by the President, by and with the advice and consent of the Senate), may take an active part in political management or political campaigns.

(4) For purposes of this subsection, the term ''active part in political management or in a political campaign'' means those acts of political management or political campaigning which were prohibited for employees of the competitive service before July 19, 1940, by determinations of the Civil Service Commission under the rules prescribed by the President.

(c) An employee retains the right to vote as he chooses and to express his opinion on political subjects and candidates.

(Added Pub. L. 103–94, § 2(a), Oct. 6, 1993, 107 Stat. 1002; amended Pub. L. 103–359, title V, § 501(k), Oct. 14, 1994, 108 Stat. 3430; Pub. L. 104–201, div. A, title XI, § 1122(a)(1), Sept. 23, 1996, 110 Stat. 2687; Pub. L. 106–554, § 1(a)(3) [title VI, § 645(a)(2)], Dec. 21, 2000, 114 Stat. 2763, 2763A–170; Pub. L. 107–252, title VIII, § 811(a), Oct. 29, 2002, 116 Stat. 1727; Pub. L. 108–458, title I, § 1079(a), Dec. 17, 2004, 118 Stat. 3695; Pub. L. 109–177, title V, § 506(b)(2), Mar. 9, 2006, 120 Stat. 249; Pub. L. 110–417, [div. A], title IX, § 931(a)(1), Oct. 14, 2008, 122 Stat. 4575.)

REFERENCES IN TEXT

The date of enactment of the Hatch Act Reform Amendments of 1993, referred to in subsec. (a)(2)(A), (C), is the date of enactment of Pub. L. 103–94, which was approved Oct. 6, 1993.

The Federal Election Campaign Act of 1971, referred to in subsec. (a)(2)(A), (C), is Pub. L. 92–225, Feb. 7, 1972, 86 Stat. 3, which was formerly classified principally to chapter 14 (§ 431 et seq.) of Title 2, The Congress, prior to editorial reclassification and renumbering in Title 52, Voting and Elections, and is now classified principally to chapter 301 (§ 30101 et seq.) of Title 52. Section 315 of this Act is now classified to section 30116 of Title 52. For complete classification of this Act to the Code, see Tables.

PRIOR PROVISIONS

A prior section 7323, Pub. L. 89–554, Sept. 6, 1966, 80 Stat. 525, prohibited employee in Executive agency

[1] See References in Text note below.

Hatch Act

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Next Steps—Logistics

1. Complete USGS vendor and Concur forms
2. Decide on a meeting tempo
3. Choose a chair (and co-chair?)
4. Draft bylaws

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Next Steps—Substantive

1. Familiarize yourselves with the FY25 budget request
2. Familiarize yourselves with the National Strategy
3. Consider the value of a consensus study
4. What would ”regional landslide observatories” look like?

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