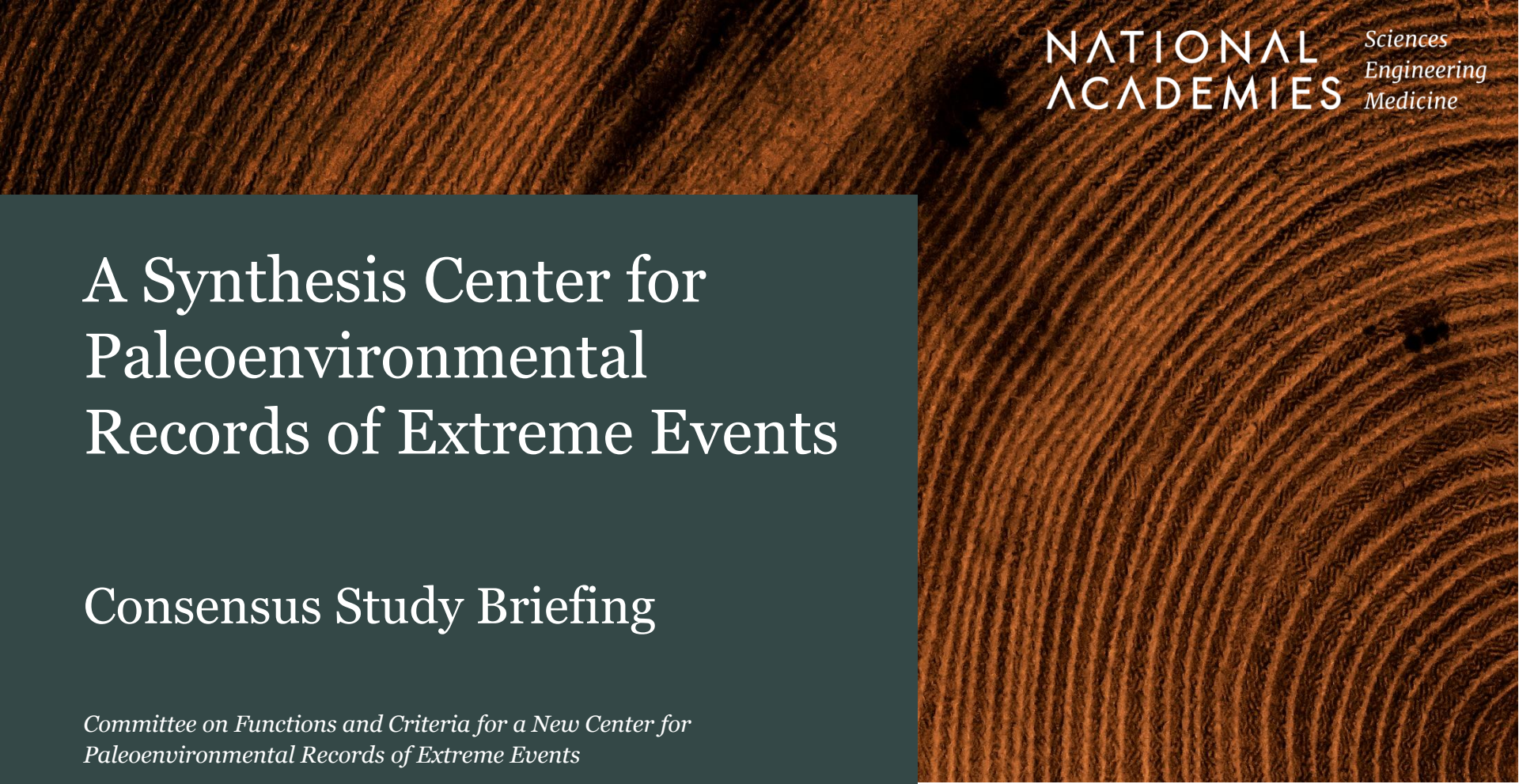


NATIONAL ACADEMIES Sciences Engineering Medicine

A Synthesis Center for Paleoenvironmental Records of Extreme Events

Consensus Study Briefing

Committee on Functions and Criteria for a New Center for Paleoenvironmental Records of Extreme Events

PUBLIC BRIEFING I 29 APRIL 2026

Key takeaways

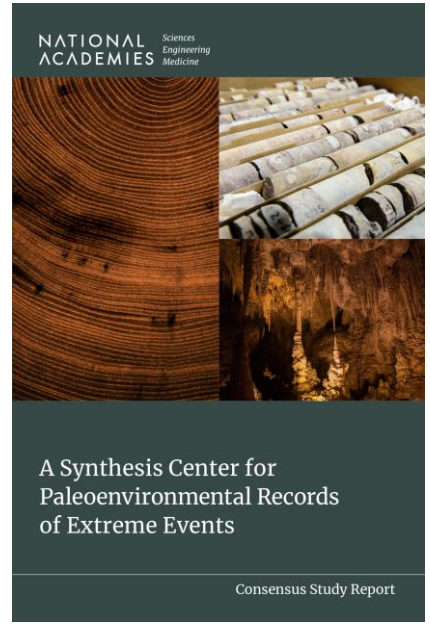
The mission for a new center for paleoenvironmental records of extreme events would be to help **improve societal resilience** to future extreme events.

The center would focus on

- **synthesis** of data and information around central questions, and
- **translation** of scientific information into actionable knowledge.

Its products would provide novel scientific insights, inform resilience planning and emergency preparation strategies, assist with risk evaluation and prediction, protect vital infrastructure, and save lives.

Download the report



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Statement of Task

The National Academies will study the potential functions of a new center for paleoenvironmental records of extreme events, including:

- An overview of where paleoenvironmental records of extreme events are held
- Goals and objectives for a new center
- Criteria to be considered for a center such as organizational structure and funding mechanisms

Committee input

- Repository and database managers
- Database and informatics experts
- Paleodata users (or potential users) in
  - Climate modeling
  - Civil infrastructure
  - Insurance and risk management
- Synthesis center leaders

Organization of the report

Summary	
Chapter 1:	Overview of the Study, Roadmap for the Report
Chapter 2:	The Role of Paleoenvironmental Data in Understanding Extreme Events
Chapter 3:	Overview and Ecosystem of Existing Information
Chapter 4:	Potential Goals and Functions of a Models for a New Center
Chapter 5:	Framework for a Center for the Synthesis and Translation of Paleoenvironmental Data
Appendixes	

Consequences of natural disasters and extreme events

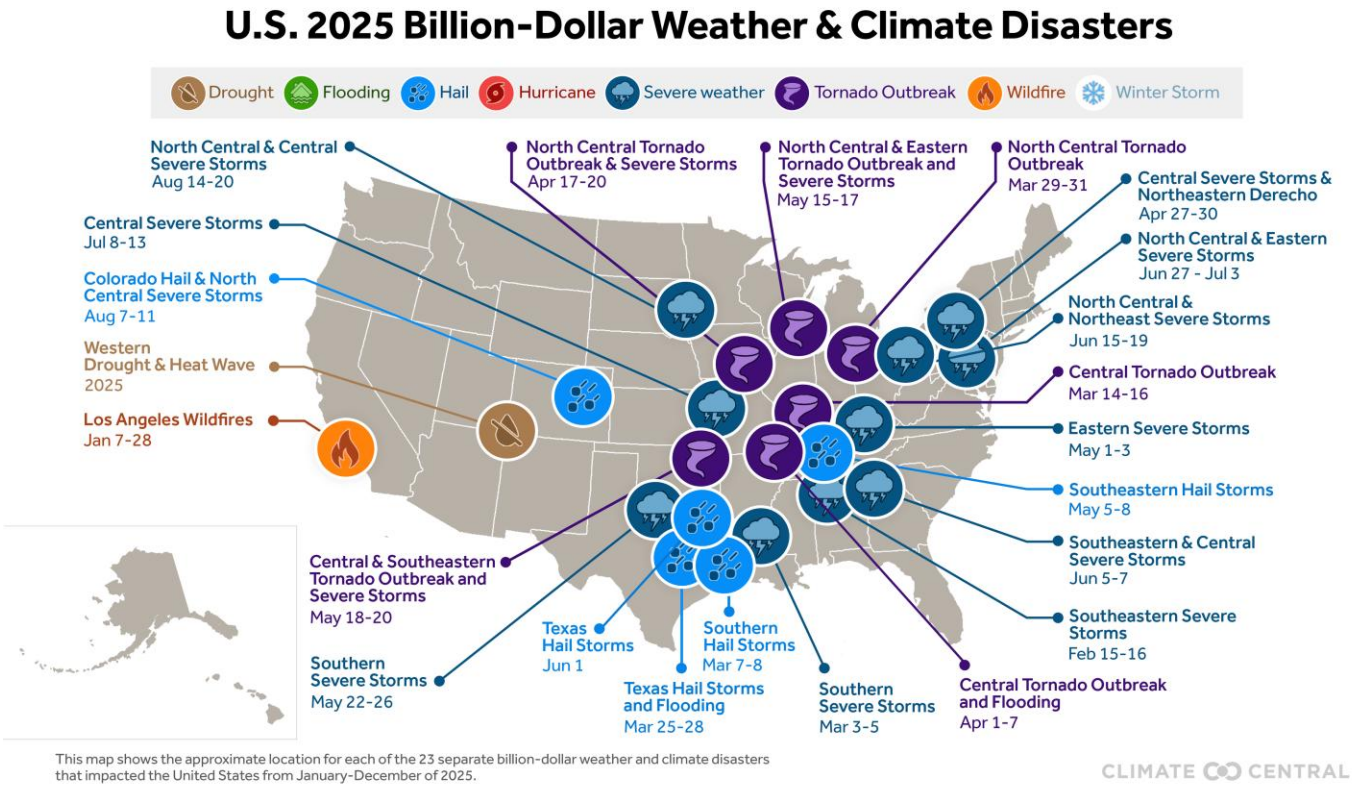
1994 Northridge earthquake

2005 Hurricane Katrina

2025 Los Angeles wildfires

Disrupt and transform landscapes, ecosystems, and societies with significant human and economic costs

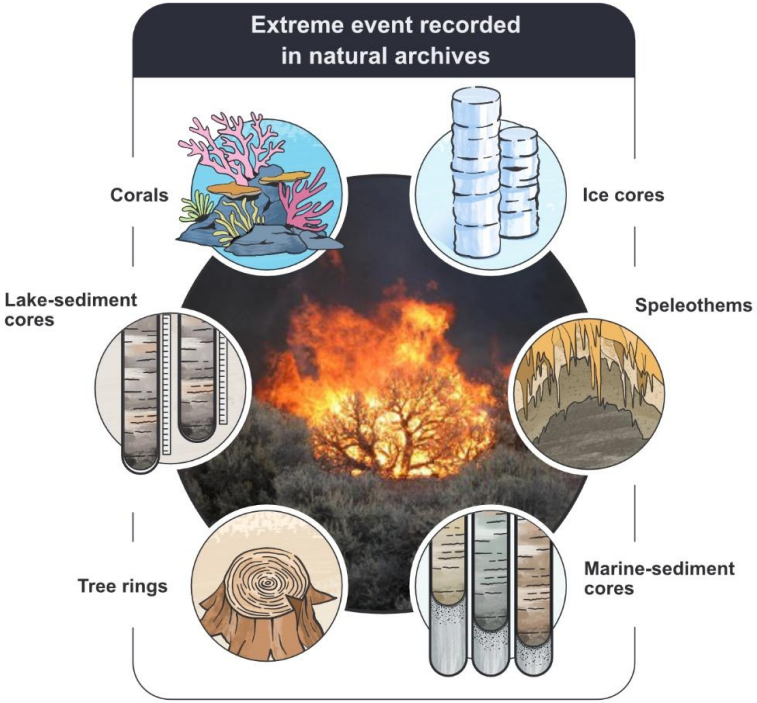
Consequences of natural disasters and extreme events

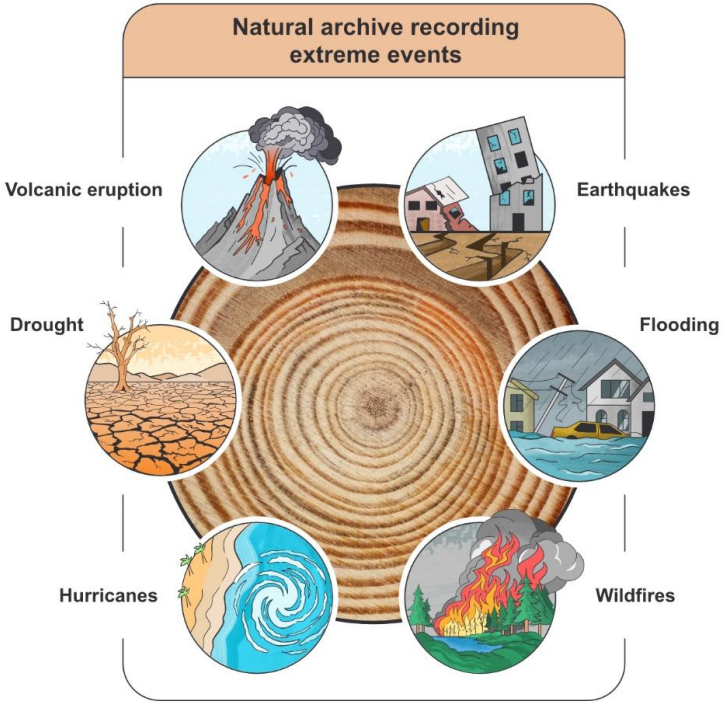


$1 spent on preparedness and planning can save $13 in losses

Image: NOAA

How are extreme events recorded in paleoenvironmental data?





How are extreme events recorded in paleoenvironmental data?

Direct records of individual events

Constrain the magnitude and timing of discrete events

Sedimentary flood deposits, tree-ring fire scars

Time-averaged indicators of frequency and magnitude

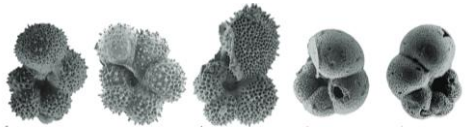
Reveal long-term patterns of event occurrence, even when individual events cannot be resolved or identified

Time averaged sediment records of storm frequency

Large-scale environmental conditions

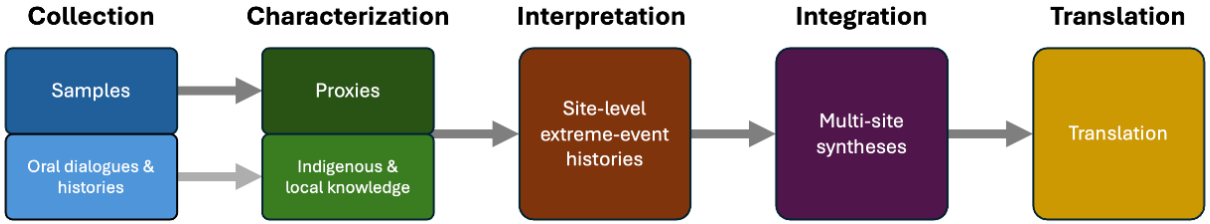
Influence the likelihood or intensity of extreme events

Sea-surface temperature, greenhouse gas concentrations



Images: USGS, IODP

“Information ecosystem” for past records of extreme events



“Information ecosystem” for past records of extreme events

Collection

Samples

Oral dialogues & histories

Characterization

Proxies

Indigenous & local knowledge

Interpretation

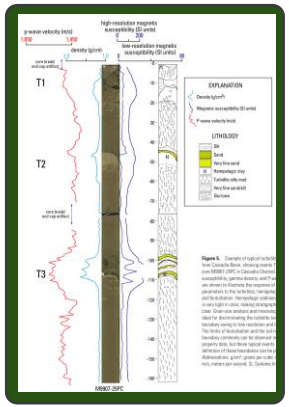
Site-level extreme-event histories

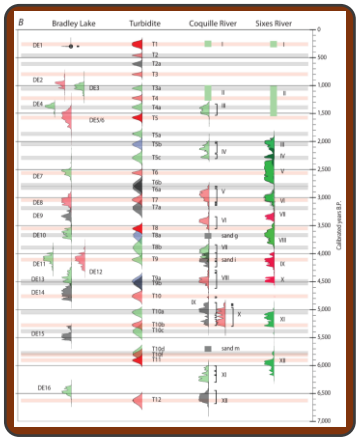
Integration

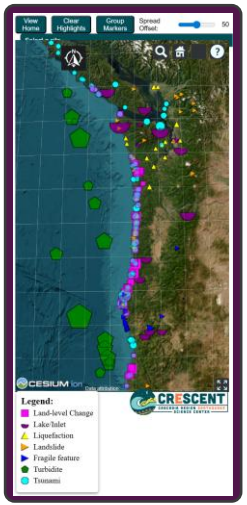
Multi-site syntheses

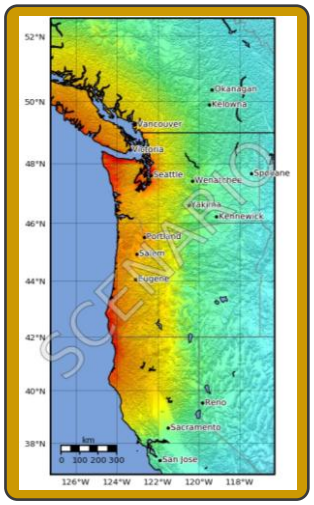
Translation

Translation





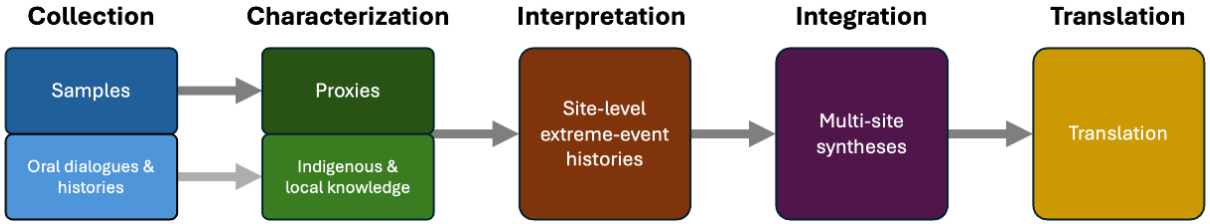




Scientific workflows

Actionable science

“Information ecosystem” for past records of extreme events



Core & Sample Repositories

- Continental Scientific Drilling Facility
- Gulf Coast Repository

Primary Data Archives

- Neotoma
- ITRDB
- EarthChem

- SESAR
- iSamples
- State Geologic Surveys

Derived Data Archives

- WDS-Paleoclimatology
- Pangaea
- Dryad
- FigShare
- Journal Appendices

- USACE Paleofloods

Analytical Pipelines & Synthesis Products

- LiPD & LiPDVERSE
- USGS Paleo Tsunami DB
- North American Drought Atlas
- PaleoHURDAT

Translation and Synthesis Centers

- USGS Powell Center
- NSF Cascadia Region Earthquake Science Center

Scientific workflows

Actionable science

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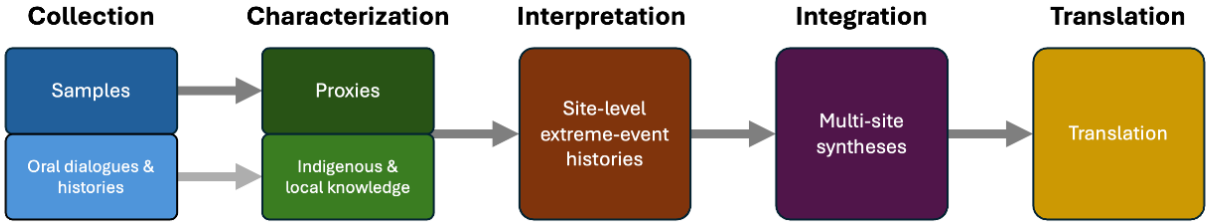
Gaps and Challenges in the Information Ecosystem



- Fragmentation
- Interoperability and metadata
- Data heterogeneity
- Inventory gaps
- Time-limited funding
- Accessibility, findability, discoverability
- Synthesis
- Community analysis and discussion
- Applicability

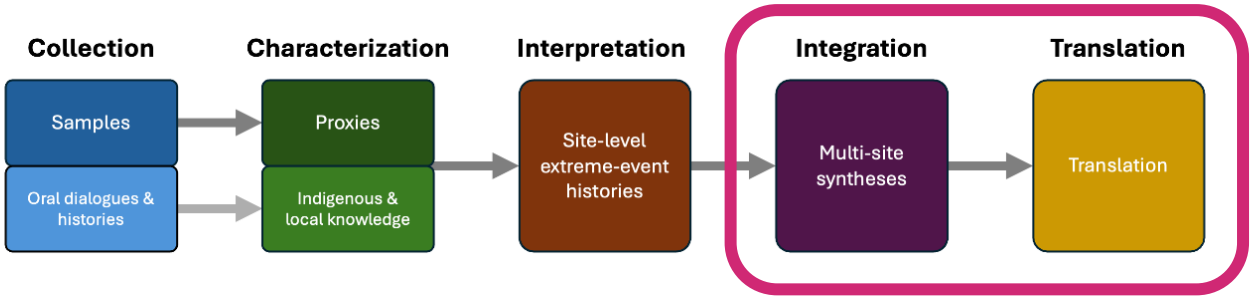
Conclusion 3-1: The current U.S. investments in repositories, digital archives, and analytical frameworks collectively provide infrastructure for the scientific study of extreme events in Earth's past. However, **the infrastructure lacks critical synthesis and translation capabilities to address cross-cutting scientific questions or fulfill societal needs**. Addressing these gaps will require coordinated investment in interoperability, reproducibility, and synthesis capacity.

Potential models for a new center

- New physical repository
- Centralized digital database
- National inventory or metarepository
- Distributed network or virtual center
- Synthesis center model
- Thematic or regional center model
- Collaboration, synthesis, and translation center

Conclusion 4-2: The greatest opportunity for impact lies in a synthesis and translation center with support for both in-person and virtual interactions that **links existing repositories and data systems, supports interdisciplinary analysis informed by stakeholder participants, and promotes engagement, synthesis, and translation of science into action**.

Gaps and Challenges in the Information Ecosystem



Conclusion 3-2: **A new center dedicated to synthesis and translation** would bridge this gap by integrating data across repositories, supporting collaborative analysis, and sustaining engagement among scientists and the policy makers, businesses, and communities that depend on this knowledge. To maximize return on investment and minimize duplication with other efforts, this new center should not support the collection and storage of samples nor their measurement but rather focus on supporting the integration, synthesis, and translation of paleoenvironmental data and samples to study extreme events and their impacts. The center could, however, help identify priorities for new data collection.

Mission and goals

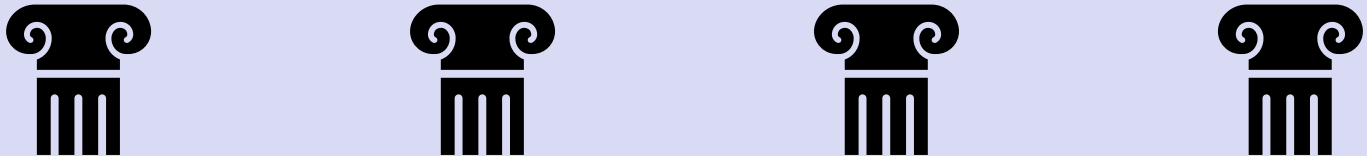
The center's **mission is to help improve societal resilience to future extreme events** by gathering, analyzing, and sharing information about past extreme events among interlinked networks of scientists, community leaders, policy makers, natural resources managers, and businesses.

Support working groups charged with analysis, synthesis, and translation of paleoenvironmental data for specific stakeholder needs

Enhance understanding of past extreme events to generate breakthrough science and impactful societal benefits

Create decision-relevant knowledge that enables agencies, organizations, communities, and other stakeholders to improve preparation and response

Advance communication of extreme event hazards and solutions to all stakeholders



Synthesis products created by the center could provide novel scientific insights, inform resilience planning and emergency preparation strategies, assist with risk evaluation and prediction, protect vital economic infrastructure, and save lives.

Critical functions of a new center

Data science and cyberinfrastructure

Translation and communication

Education and training

- Five permanent staff
- Postdocs and visiting experts
- 5–10 active working groups per year

$3–$6 million per year

- Cost scales with number, size, and meeting frequency of working groups
- Core funding provided by agencies
- Individual projects supported by local governments, private organizations, stakeholder groups, or other entities

Questions?

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NASEM contact: Jonathan Tucker, jtucker@nas.edu