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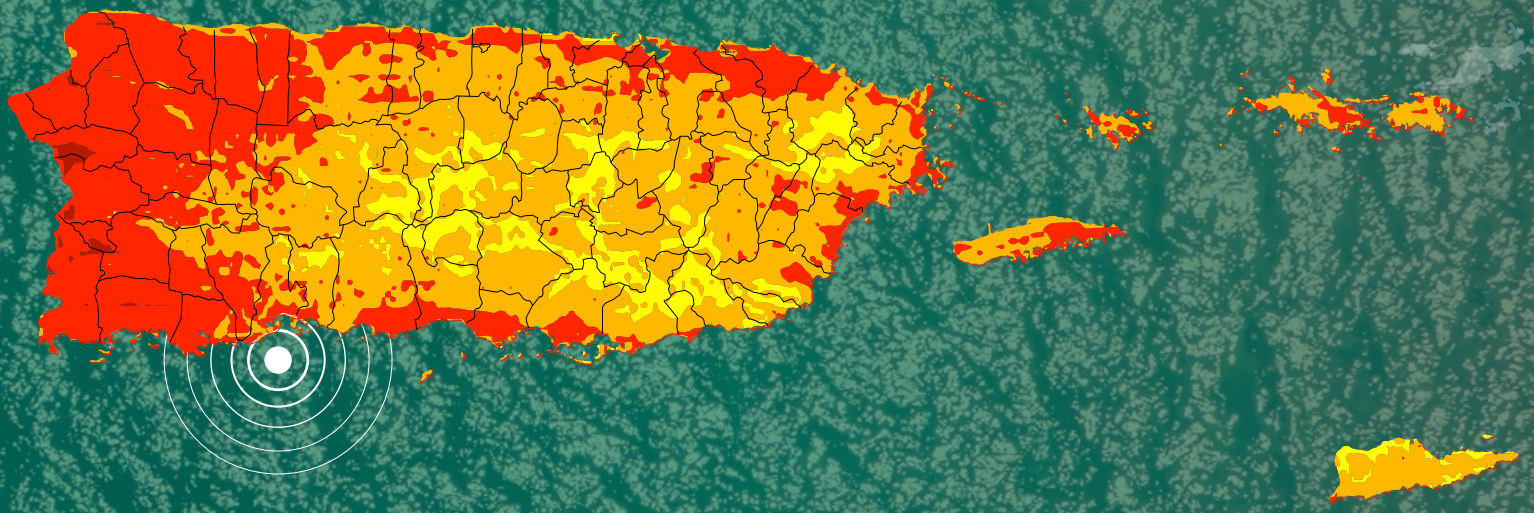

## 2025 USGS NATIONAL SEISMIC HAZARD MODEL

PUERTO RICO & THE U.S. VIRGIN ISLANDS

# MEDIA GUIDE

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# RELEASE NOTES:

- Overview data release published December 2025 - https://doi.org/10.5066/P14ATJLJ
- Documentation for model inputs, additional data releases, software and Review Panel Reports - https://www.usgs.gov/programs/earthquake-hazards/science/2025-puerto-rico-and-us-virgin-islands-long-term-national
- Overview report expected to be published April 2026
- Media materials finalized April 2026

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# OVERVIEW

# TERMS AT A GLANCE

## NSHM

The National Seismic Hazard Model. A scientific tool developed by the U.S. Geological Survey that estimates the likelihood and strength of ground shaking from an earthquake across a region over a long-term period. It informs building codes, emergency planning and a variety of other risk-reduction strategies.

## Damaging shaking

Earthquake shaking that is intense enough to cause damage, such as breaking glass, cracking plaster and falling furniture.

## Model

A computer simulation that projects future scenarios of something – in this case, the likelihood of ground shaking from an earthquake – based on the best available data and understanding of real-world processes.

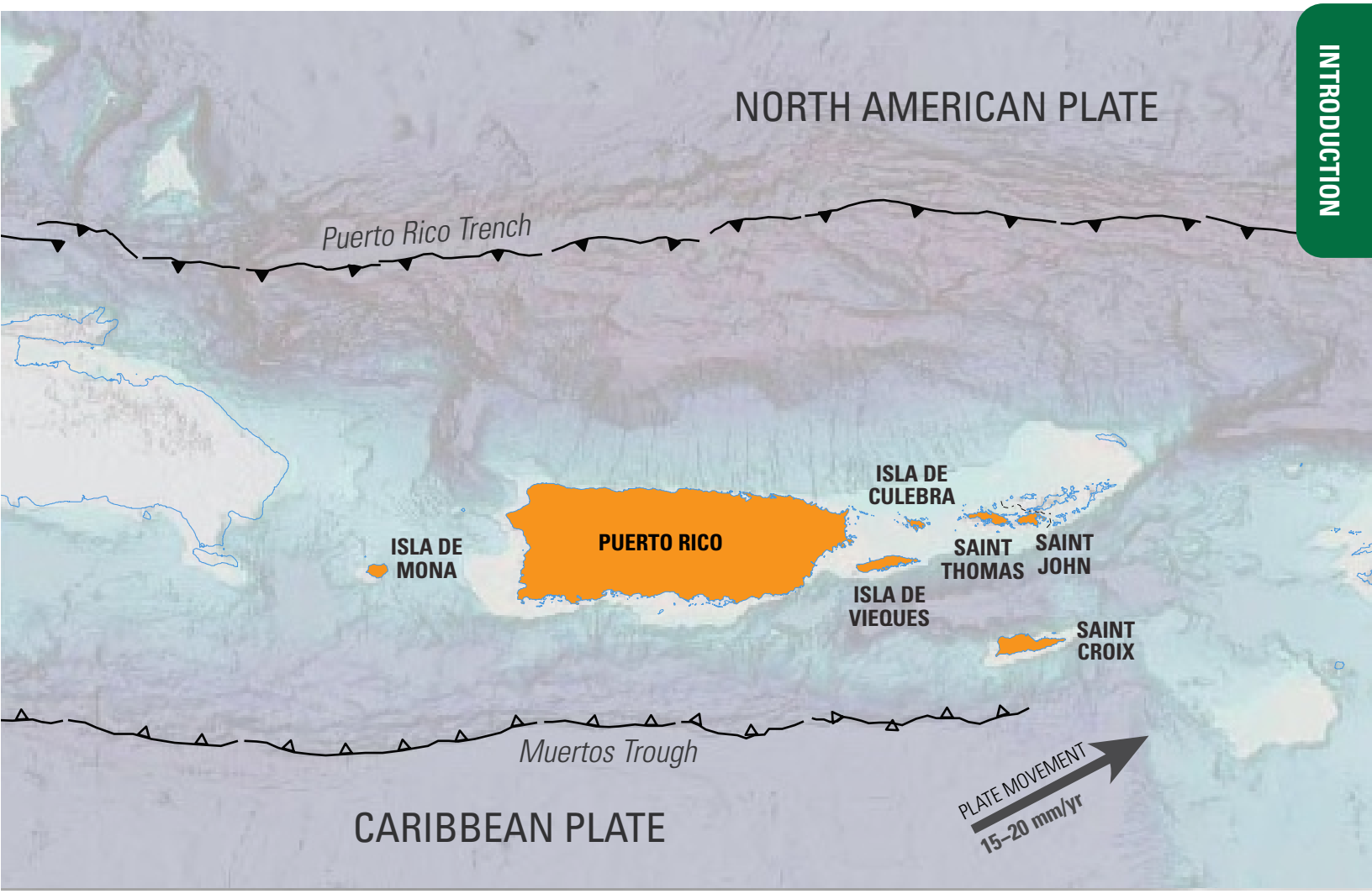
## Hazard

The physical process or condition that can harm things people care about. Ground shaking maps are examples of earthquake hazard maps.

*For more technical terms, view the Glossary at the end of the media guide.*

## Addressing Uncertainty

Following the Gold Standard in Science, the USGS used the best available data and methods. For example, some faults, depths and soil behaviors are uncertain. This uncertainty is accounted for by bracketing the results. Other specific variables and potential contributing factors are beyond the scope of this work.




# EARTHQUAKE HAZARDS

## PUERTO RICO & THE U.S. VIRGIN ISLANDS

Puerto Rico and the U.S. Virgin Islands sit at the dynamic and complex boundary between the North American and Caribbean tectonic plates—a region with a long history of earthquakes. Over the past 400 years, at least a dozen major earthquakes of magnitude 7 or greater have struck this region, among them seven events with reported damaging ground shaking, such as the 1867 M7.3 and 1918 M7.1 earthquakes. Recent events, such as the 2020 M6.4 earthquake in southwest Puerto Rico, which was widely felt throughout the region and caused substantial local damage, underscore the ongoing earthquake hazards for people living on these islands. Additionally, earthquakes in the region can trigger secondary, or cascading hazards, such as damaging landslides or tsunamis.

To help communities, engineers and decision-makers prepare for future earthquakes, the U.S. Geological Survey has released an updated National Seismic Hazard Model for Puerto Rico and the U.S. Virgin Islands, the first new model since the original version was released in 2003. This update incorporates more than two decades of new science, including updated earthquake source and ground-shaking models. The new NSHM provides the most accurate picture yet of where, how much and how often the ground could shake from future earthquakes in this region.

## A FORECAST, NOT A PREDICTION

It is worth noting that the seismic hazard model is not a prediction tool. Instead, it offers a long-term forecast of the likelihood of earthquake hazards as expressed through color-coded maps showing the relative potential for ground shaking across the islands. These maps are essential for supporting modern building codes, aiding in emergency planning and guiding public safety efforts. They also help communities better understand cascading hazards (where one hazard causes another hazard), such as when a major earthquake triggers a landslide or produces a tsunami.

## EMPOWERING COMMUNITIES

By using the best available science, the seismic hazard model empowers local governments, engineers and residents to make informed decisions that can help save lives. This media guide provides maps, key takeaways, and helpful resources for journalists to communicate the significance of the NSHM and its role in building a safer, more resilient future for Puerto Rico and the U.S. Virgin Islands.

# WHAT IS A SEISMIC HAZARD MODEL?

A seismic hazard model acts like a roadmap for earthquake preparedness. It doesn't predict when or where the next earthquake will happen, but it does show where strong ground shaking will most likely occur over the long term. It is also a tool that gives engineers, planners and residents the resources they need to make informed decisions before an earthquake disaster strikes.

The USGS has provided seismic hazard assessments since 1976. The NSHMs are developed for the conterminous U.S., Alaska, Hawaii, and the inhabited U.S. territories, and are routinely updated based on new science.

The NSHM described in this media guide is an updated version of the hazard assessment that was previously developed for the region in 2003. The USGS revises its earthquake hazard models to ensure that the most up-to-date information is used and that best practices are applied to the assessment process.

# WHY DOES IT MATTER?

The NSHMs provide information that informs public policy decisions to keep people safe from earthquake hazards. For example, building codes for structures like buildings, bridges, highways, railways, pipelines, and other infrastructure, as well as emergency planning and public safety efforts, are based on these earthquake hazard assessments. They help communities understand their environment, better prepare for earthquake hazards and reduce the potential for damage or injury when the ground shakes.

## HOW DOES IT WORK?

### Collect data
Experts gather decades of scientific data on earthquakes, faults and ground conditions.

### Thorough review
The seismic hazard models are reviewed throughout the development process during public workshops, public comment periods, peer reviews and technical evaluation by panels of subject matter experts.

### Analyze patterns
They use advanced computer simulations to estimate how often earthquakes of different sizes might occur, how much shaking they could cause and how much of an area will shake.

### Create maps
Earthquake hazard maps use color-coding to display the likelihood of ground shaking over a specific time period, helping communities identify and prepare in areas where the hazard is greatest.

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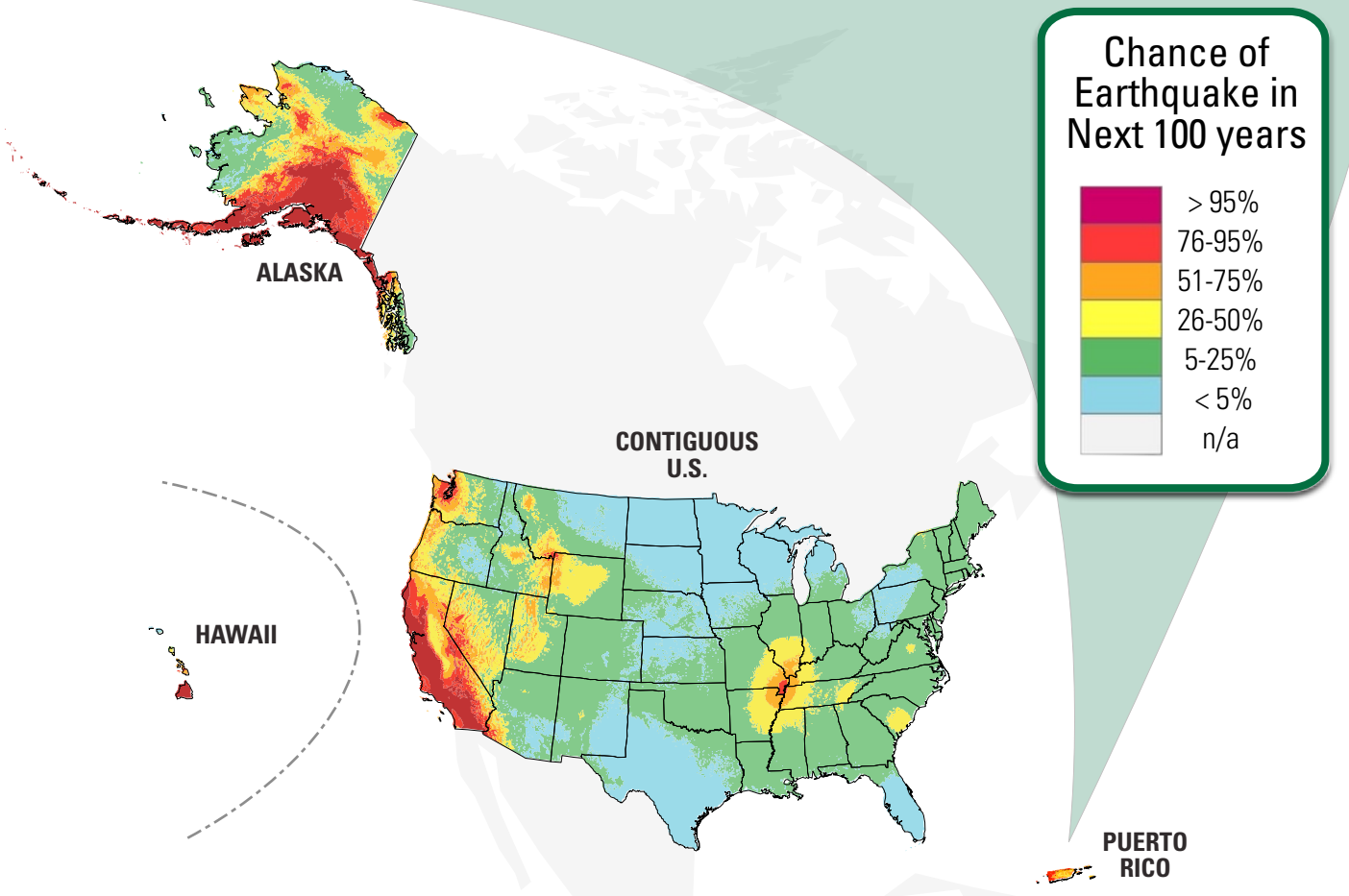
# KEY FINDINGS

# NATIONAL SEISMIC HAZARD MODEL

## WHERE WILL EARTHQUAKE GROUND SHAKING BE FELT?

The National Seismic Hazard Model (NSHM) estimates the potential for earthquake ground shaking across the United States and its territories. It is the primary scientific basis for seismic provisions in building codes, insurance rate structures, and risk assessments. It is an essential tool for many stakeholders by showing where strong earthquake shaking is most likely to occur, allowing for better mitigation and preparedness in those areas.

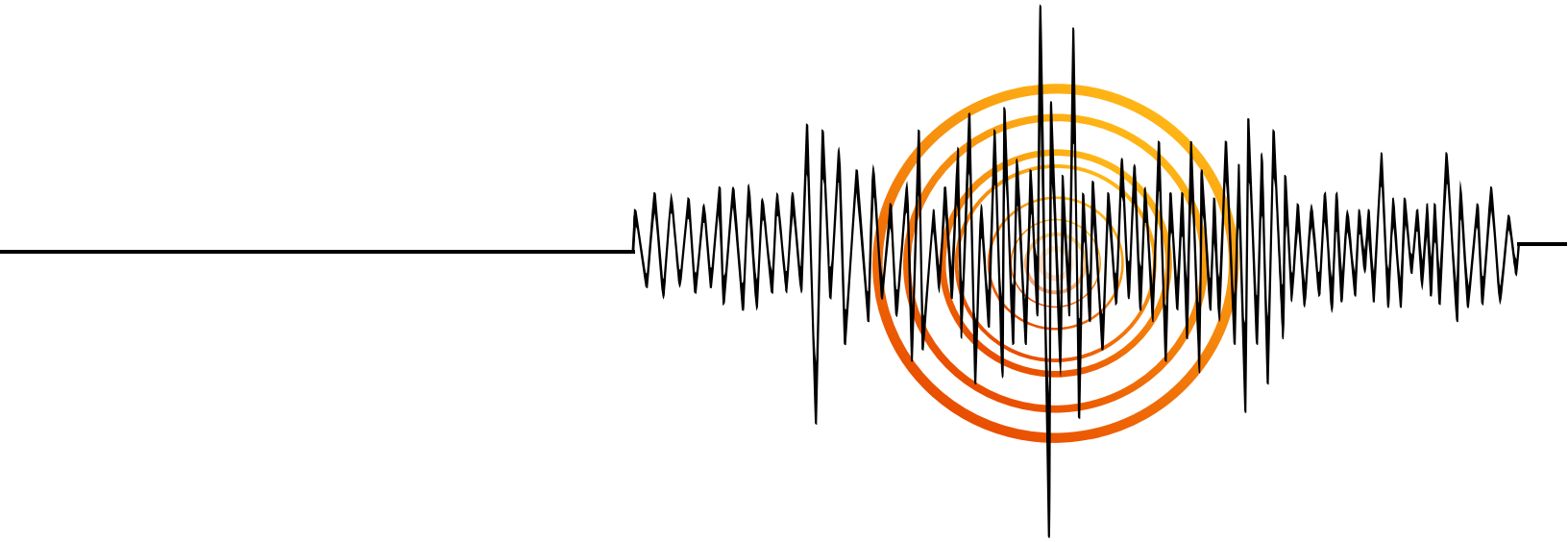
# KEY TAKEAWAYS FROM THE NEW SEISMIC HAZARD MODEL

## History of large, destructive earthquakes in the region

During the past 400 years, Puerto Rico and the U.S. Virgin Islands have had at least a dozen major magnitude 7 or larger earthquakes, many of which have been destructive. Beginning in December 2019, a series of large earthquakes rattled southwest Puerto Rico, including a damaging M6.4 quake on Jan. 7, 2020. Past earthquakes have caused destructive landslides and tsunami-related damage.

## Designed with safety and engineering in mind

The NSHM maps describe various time spans and factors in numerous geologic and engineering considerations. For example, the "chance of damaging shaking" map shows the likelihood during the next 100 years that earthquake shaking, at a minimum, can break glass in structures, rattle dishes off tables, shift heavy furniture in homes and cause damage to walls. More severe shaking could have more dire consequences. USGS earthquake experts have estimated that many shoreline cities and much of western Puerto Rico have a greater than 75% chance of experiencing damaging shaking during the next 100 years.



## New research and analyses used to define seismic hazards

The NSHM was updated with a wide array of new scientific tools and data sources. Researchers integrated new information about seismic activity in subduction zones, specifically focusing on the Puerto Rico Trench and the Muertos Trough. Additionally, the seismic hazard model incorporates recently identified faults, as well as additional historical earthquake records provided by the Puerto Rico Seismic Network and Puerto Rico Strong Motion Program. Lastly, scientists employed cutting-edge fault rupture, surface deformation, and data processing methods to produce the most accurate model possible.

# KEY TAKEAWAYS (CONT.)

## Site-specific ground shaking models

To ensure the most accurate and appropriate results, researchers used updated ground-motion models for both active crustal and subduction sources, with adjustments made based on Puerto Rico and the U.S. Virgin Islands site-specific data.

## Higher earthquake hazard than previously thought

When comparing the 2025 NSHM for Puerto Rico and the U.S. Virgin Islands with the 2003 version, the seismic hazards are generally higher, especially for more intense shaking that can be damaging to low-rise buildings and other stiff structures. The increased hazard reflects the addition of newly discovered faults and revised understanding of historical seismicity, as well as updates to ground-shaking models to better capture how ground shaking varies across the region.

ipsum

# KEY MESSAGES

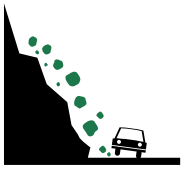
## WHY THE NATIONAL SEISMIC HAZARD MODEL IS VALUABLE

### Seismically active region

Puerto Rico and the U.S. Virgin Islands have a long historical record of seismicity. During the last 400 years, there have been at least a dozen major earthquakes of magnitude 7 or larger. Many of these events have been destructive.

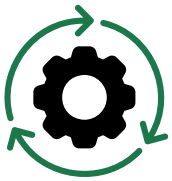
### Legacy building codes

Most of Puerto Rico's buildings were constructed before 1987, when the building code was updated with modern seismic standards. The updated hazard model revises the locations and potential shaking intensity for areas at risk, providing the foundation for safer building design and informing building codes moving forward.



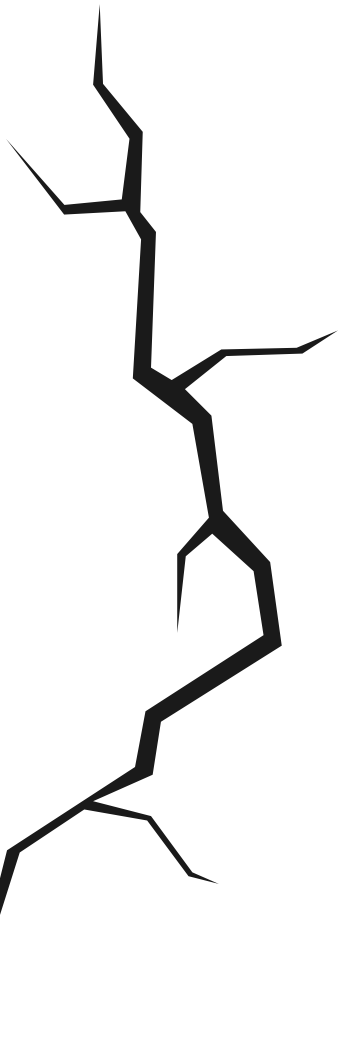
### Cascading hazards considerations

Earthquakes in this region can trigger secondary, or cascading hazards, like landslides and tsunamis. These other hazards can be as dangerous, or more so, than the earthquake ground shaking.



### Updated model inputs

Each update to the NSHM includes the latest data, methods, and models for earthquake sources and ground-shaking simulations.

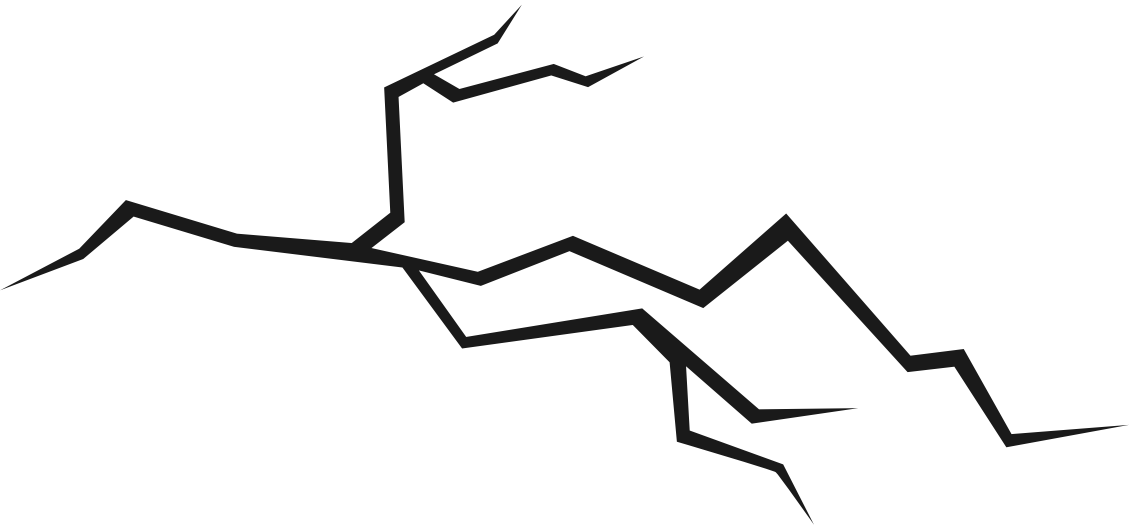


# KEY MESSAGES
(CONT.)

## Not earthquake prediction
Earthquakes cannot be predicted, but hazard models provide the best long-term forecasting to support planning and mitigation efforts.

## Better perspective of what's under your feet
The earth hasn't changed, yet how researchers study it has. Scientists have new data, methods and models to help better interpret earthquake hazards and associated seismic risks.

## Future updates are coming
The NSHM models for other U.S. territories, including Guam, the Commonwealth of the Northern Mariana Islands and American Samoa are currently being updated. In addition, the comprehensive 50-state NSHM, last updated in 2023, will be updated again in 2029.



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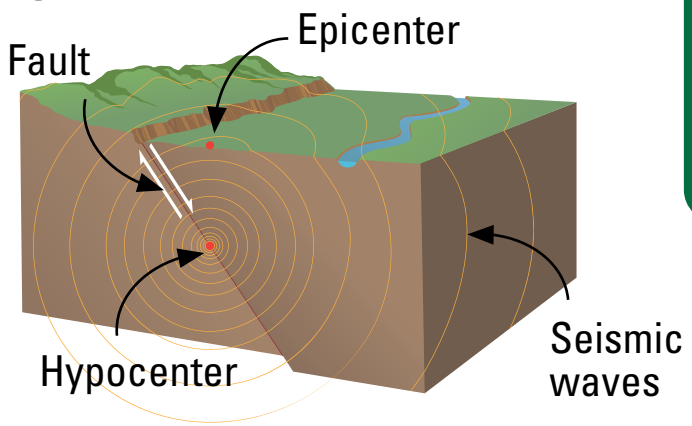
PREPAREDNESS

# UNDERSTANDING EARTHQUAKES

## WHAT IS AN EARTHQUAKE?

An earthquake is what happens when two blocks of the Earth suddenly slip past one another. This releases energy that travels to the ground surface and causes shaking.

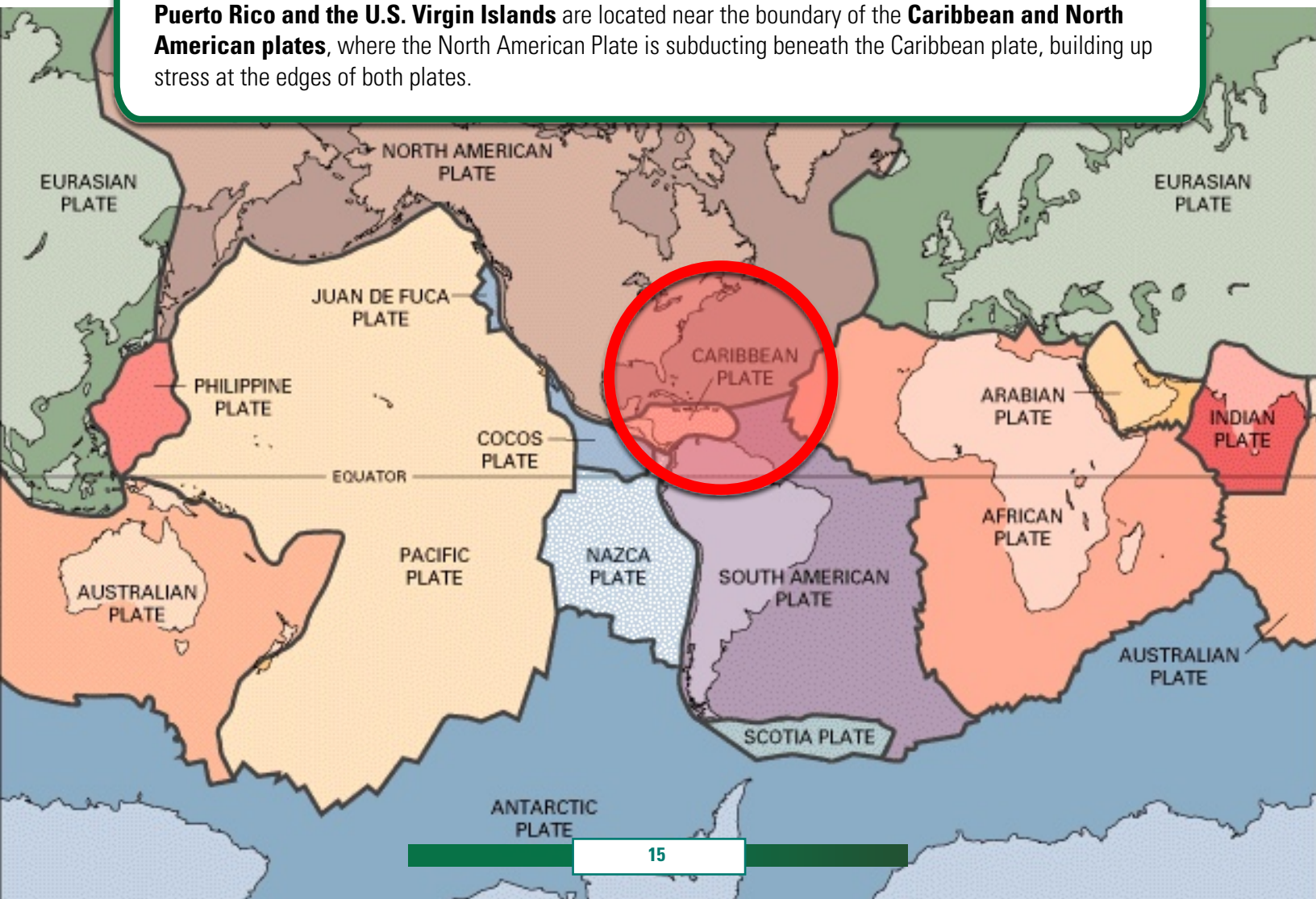
The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter.




## WHERE DO EARTHQUAKES HAPPEN?

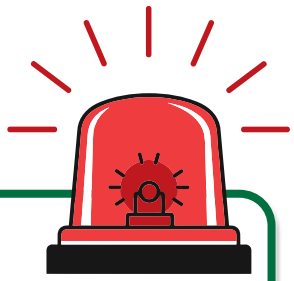
Earthquakes can happen almost anywhere on Earth where there are faults. They can occur at various depths depending on the environment. Most occur near tectonic plate boundaries where plates slowly slide by, beneath or separate from each other. However, some earthquakes occur away from plate boundaries on old faults that remain from past tectonic activity, which can be reactivated by current plate movement and stress.

**Puerto Rico and the U.S. Virgin Islands** are located near the boundary of the **Caribbean and North American plates**, where the North American Plate is subducting beneath the Caribbean plate, building up stress at the edges of both plates.

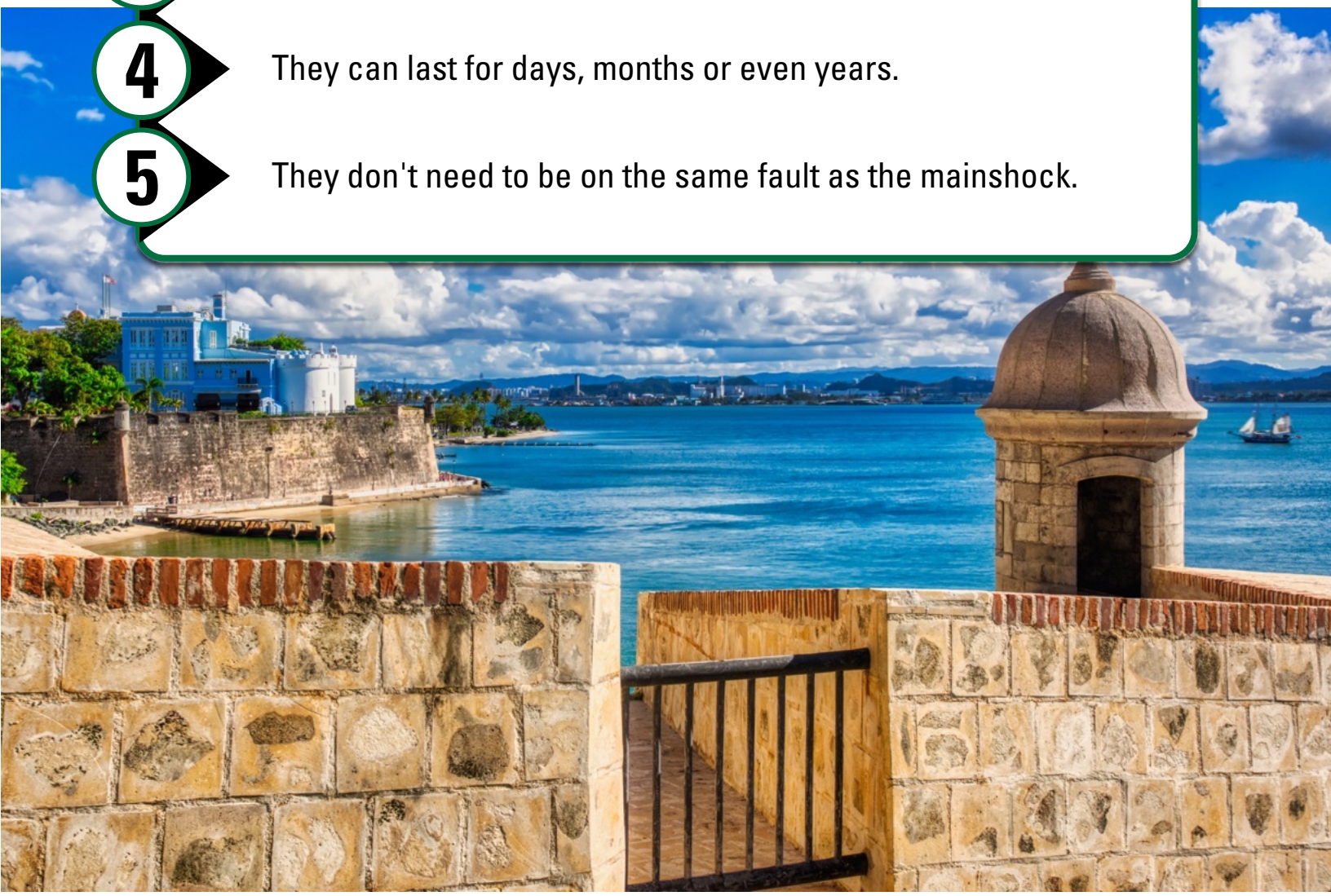


# THINGS YOU SHOULD KNOW ABOUT AFTERSHOCKS

Most large earthquakes are followed by additional earthquakes called aftershocks. While most aftershocks are smaller than the mainshock, they can still be damaging or deadly.



1. They follow a larger mainshock.
2. The larger the mainshock, the bigger the potential aftershocks.
3. They can be damaging and frequent.
4. They can last for days, months or even years.
5. They don't need to be on the same fault as the mainshock.



# EMERGENCY PREPAREDNESS KIT

## THE ESSENTIALS

After an earthquake, you may be on your own for several days without access to help. Ready.gov recommends being prepared with multiple days' worth of food, water and other supplies. Basic items in a preparedness kit might include:

# WHAT TO DO DURING AN EARTHQUAKE

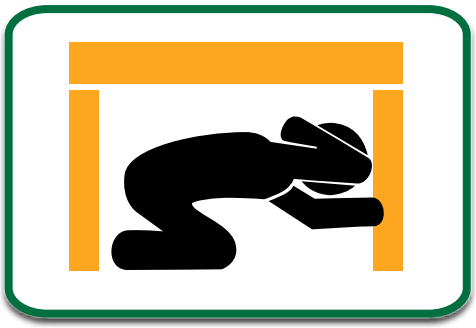
Did you know you live in "earthquake country?" It's true. Places like Puerto Rico and the U.S. Virgin Islands have experienced large earthquakes in the past and will again in the future.

Make sure you know what to do if you feel shaking:
**drop**, **cover**, and **hold on!**

**LARGEST EARTHQUAKE**
Lesser Antilles
*Feb. 8, 1843*
MAGNITUDE
**8.5**

**DROP**

**COVER**



**HOLD ON**

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# MEDIA TOOLS

# ORGANIZATIONS, INSTITUTIONS AND COLLABORATORS

University of Puerto Rico Mayagüez

Puerto Rico Seismic Network

Colegio de Ingenieros y
Agrimensores de Puerto Rico

Virgin Islands Territorial
Emergency Management Agency

# SCIENTISTS' PERSPECTIVE

## WHAT THE RESEARCHERS THINK

"Every earthquake reminds us how fragile life can be. The USGS's goal is to turn awareness into action by giving communities the knowledge they need to stay safe."

- Julie Herrick, USGS Geophysicist

"Hazard maps are more than just an interesting way of showing data. They are an essential tool that can inform decisions to reduce tragedy and keep communities safe when the ground shakes."

- Allison Shumway, USGS Geophysicist

"Living in a beautiful place like Puerto Rico comes with exposure to certain natural hazards. Understanding where they are is the first step toward building resilience and lowering risk. Towards peace of mind."

- Nico Luco, USGS Civil Engineer

"Science cannot stop earthquakes, but it can give us the power to prepare, to build smarter, and to protect what matters most."

- Kevin Milner, USGS Geophysicist

# POINTS OF CONTACT

## PRESS AND MEDIA RELATIONS


For media questions about recent earthquakes:
EARTHQUAKEMEDIA@USGS.GOV

For general science-related questions:
USGSPRESS@USGS.GOV

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GLOSSARY

# GLOSSARY

## HELPFUL EARTHQUAKE TERMS

### Aftershock
A smaller earthquake that follows the mainshock of a large earthquake, occurring in the same general area as the original event.

### Caribbean Plate
The tectonic plate underlying much of the Caribbean region that interacts with the North American Plate at the Puerto Rico Trench near Puerto Rico and the U.S. Virgin Islands.

### Cascading Hazards
Secondary hazards triggered by an earthquake, such as landslides, tsunamis or infrastructure failures.

### Fault
A fracture in the Earth's crust where blocks of rock move past each other. Earthquakes occur when a fault ruptures and releases energy.

### Fault Rupture
The process where accumulated stress along a fault leads to a sudden release of energy, resulting in the splitting and movement of rock along the fault.

### Ground Motion
The shaking of the ground during an earthquake is measured by instruments and modeled to estimate levels of ground shaking based on the size and distance of the earthquake.

### Liquefaction
A process where saturated soil temporarily loses strength during shaking, causing buildings to tilt or sink. It is common in coastal and low-lying areas.

### Magnitude
A measure of the size or energy released by an earthquake. Each whole number increase represents about 32 times more energy.

### Muertos Trough
A deep underwater trench south of Puerto Rico where tectonic forces contribute to seismic activity.

# GLOSSARY
(CONT.)

## National Seismic Hazard Model
A scientific tool developed by USGS that estimates the likelihood and strength of earthquake shaking across a region over a long-term period. It informs building codes and emergency planning.

## Puerto Rico Seismic Network
A local organization that monitors earthquakes in Puerto Rico and provides data for hazard assessments.

## Puerto Rico Trench
An oceanic trench north of Puerto Rico marking the boundary between the Caribbean and North American plates; a source of major earthquakes and tsunami hazards.

## Seismic Hazard
The potential for earthquake-related ground shaking at a location identified by geological and historical data.

## Seismic Risk
The likelihood and severity of damage an earthquake may cause at a location – such as fatalities, injuries, property damage, or economic disruption – based on the ground-shaking hazard and presence of people and structures.

## Seismic Source Model
Simulating where and how often earthquakes are likely to occur, related to mapped faults and zones of seismic activity.

## Subduction Zone
An area where one tectonic plate slides beneath another, often generating large earthquakes. The Caribbean Subduction Zone, specifically the Puerto Rico Trench segment, influences seismicity in Puerto Rico and the U.S. Virgin Islands.

## Surface Deformation
The movement or change in the Earth's surface due to various geological processes, including earthquakes, eruptions or groundwater withdrawal.

## Tsunami
A series of large ocean waves caused by underwater earthquakes, landslides or volcanic eruptions.

## Uncertainty
A term used in hazard modeling to describe limits in scientific knowledge, such as incomplete data or random fault behavior.