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Region's tremors typically small, but bear watching

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Compared to more active areas like California, Boston's infrastructure is older and less likely to be constructed with earthquakes in mind.

By **Matt Rocheleau**

GLOBE STAFF JULY 23, 2015

This week's earthquake in Rhode Island was typical for the region. In New England, most seismic events are small and cause no damage.

But that does not mean we are immune from more-severe tremors, researchers say.

In fact, major earthquakes — reaching magnitudes as high as 6.5 — have inflicted widespread damage in the New England before. It's all but certain other big ones will hit again someday. Roughly speaking, they tend to happen here every 1,000 years.

“When larger ones happen, they do have the potential to cause more damage,” said John E. Ebel, a senior research scientist at the Weston Observatory and chairman of Boston College's Department of Earth and Environmental Sciences.

Compared with more-active areas such as California, Boston's infrastructure is older and less likely to be constructed with earthquakes in mind. Meanwhile, large swaths of Boston and other areas are built on manmade fill, which, if shaken enough, could turn into the equivalent of quicksand — a process called liquefaction.

Lessons from a portable earthquake machine

But the biggest reason our region can be more vulnerable is miles below our feet.

Deep-seated rocks below the East Coast are relatively cold, meaning they do not absorb as much seismic energy as the warmer rocks below such places as California, Ebel explained.

A 5.8-magnitude earthquake in Virginia in 2011 caused damage and could be felt over a much greater area than

earthquakes of equal strength out west.

In addition to the potential effects on land, New England's thousands of miles of coastline mean quake-induced tsunamis are not out of the question.

In 1929, a magnitude 7.2 earthquake centered in an area off the southern coast of Newfoundland triggered a tsunami that caused large amounts of damage and killed more than two dozen people, according to the United States Geological Survey.

"We have had some offshore earthquakes east of Boston in a very similar geologic setting to that of the 1929 earthquake," said Ebel.

Seismological models cited in state and city documents have also indicated that a strong earthquake close to Boston could cause billions of dollars in damage and hundreds of deaths.

Thousands of acres of Boston sit atop artificial fill, and tens of thousands of buildings in the city, particularly old brick ones, lack earthquake-protection measures, the city's hazard plan says.

"Although earthquakes are [a] potential city-wide hazard, the areas of the city with the greatest overall vulnerability to earthquake damage are those where unreinforced masonry buildings are located in areas with high liquefaction potential," such as the Back Bay, the plan says.

An alarming article published in The New Yorker magazine this month and widely shared online cited how geologists, seismologists, and other experts believe the Pacific Northwest is due for a massive earthquake, perhaps as strong as 9.2 magnitude.

That event, which the story said may happen in our lifetimes, could trigger a tsunami that would imperil thousands of people and billions of dollars in infrastructure.

However, Ebel said such powerful earthquakes are not considered to be possible here, because historically they have only happened in regions like the West Coast or parts of Japan, which are located above large, active faults.

The strongest known earthquake to hit New England was in 1638. Researchers are uncertain of the earthquake's exact location or how strong it was, but believe it was centered somewhere in New Hampshire or Vermont and measured around 6.5 magnitude.

The Rhode Island earthquake Wednesday, by contrast, measured 2.3.

The strongest known earthquake in Massachusetts had an estimated 6.2 magnitude and was centered off the coast of Cape Ann in 1755, damaging hundreds of buildings.

Ebel said he believes our region could see earthquakes as strong as a magnitude 7.5, based on reports of earthquakes that strong in similar geologic settings.

While scientists have found and mapped numerous faults below New England, they are all considered to be relatively small, inactive, and long-dormant, said Ebel.

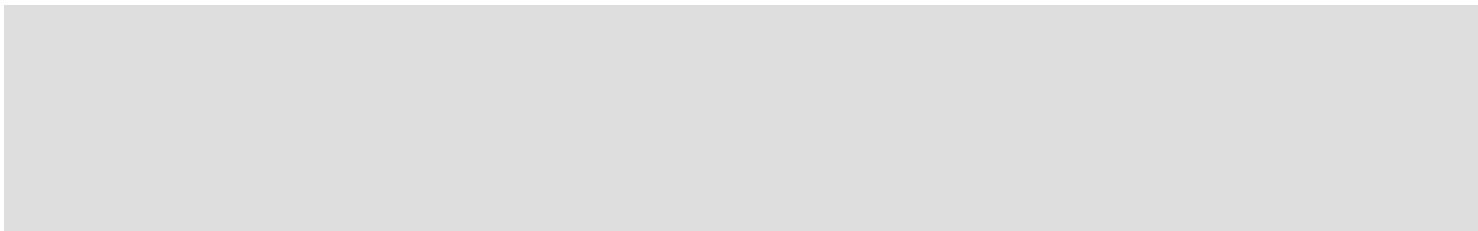
No active faults have been identified in our region, but researchers hope that with more time and that by collecting more data, they will find any that exist. Using rough estimates, Ebel said that New England each year experiences 100 earthquakes in the 1 to 2 magnitude range; 10 in the 2 to 3 range; and one in the 3 to 4 magnitude range.

Meanwhile, the region can expect a 4 to 5 magnitude quake every decade, a 5 to 6 every century, and a magnitude 6 or above every thousand years.

Earthquakes in New England over the past 375 years

Thousands of earthquakes have been recorded in the region since 1638. This map displays 1,200-plus earthquakes for which magnitude and location were recorded.





DATA: Weston Observatory Earthquake Catalog, U.S. Geological Survey

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