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After shock

The devastation of last year's Boxing Day earthquake and tsunami in Southeast Asia offers vital lessons for the west coast of North America

BY JODI DI MENNA AND STEVEN FICK

In the year since a massive earthquake and tsunami rocked the Indian Ocean, the question "What if it happens here?" has gained urgency in western North America. The geology of the Cascadia subduction zone off the Pacific coast is so strikingly similar to that of Sumatra that scientists in British Columbia have used data from last year's disaster to refine models of how a megathrust earthquake — on the order of magnitude 9.0 — would affect the province's coast.

"The Sumatran earthquake was the type closest to what we expect in Cascadia," says John Cassidy, a seismologist at Natural Resources Canada in Sidney, B.C. "We set out to learn as much as we could from what occurred in Sumatra so that we could be better prepared when our big one happens."

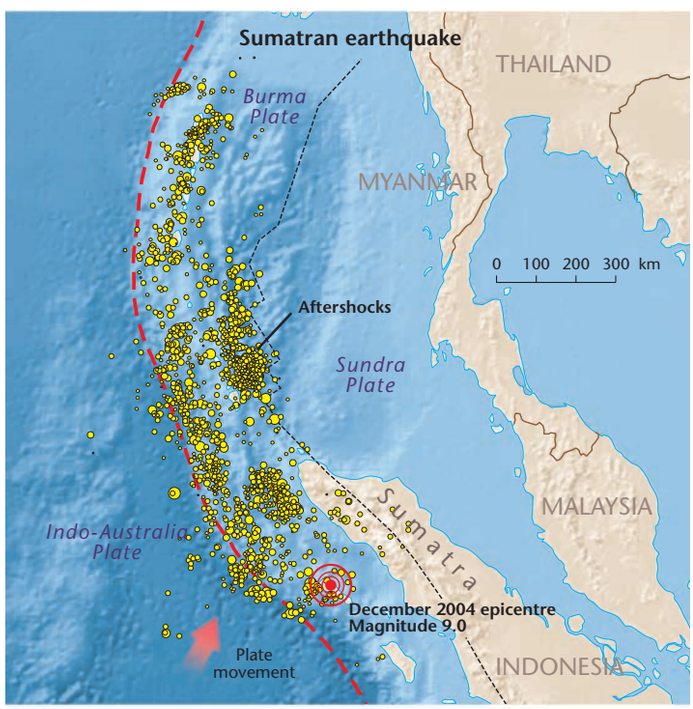
Geological deposits and coastal First Nations lore indicate that large earthquakes have hit the West Coast every 200 to 800 years, and since the last one shook the region 305 years ago, scientists believe Cascadia could be ready to rupture at any time. In fact, in September, Vancouver Island slid to the west about the width of a pencil, an event that occurs every 14 months and increases pressure along the fault line. "This slipping motion means we're one step closer to a big earthquake," says Cassidy.

The Sumatran experience gave scientists an idea of what to expect when it does happen. Using information gathered from that event, Cassidy and his colleagues plotted the same pattern of aftershocks and crustal deformation onto a map of the North American coast (opposite bottom).

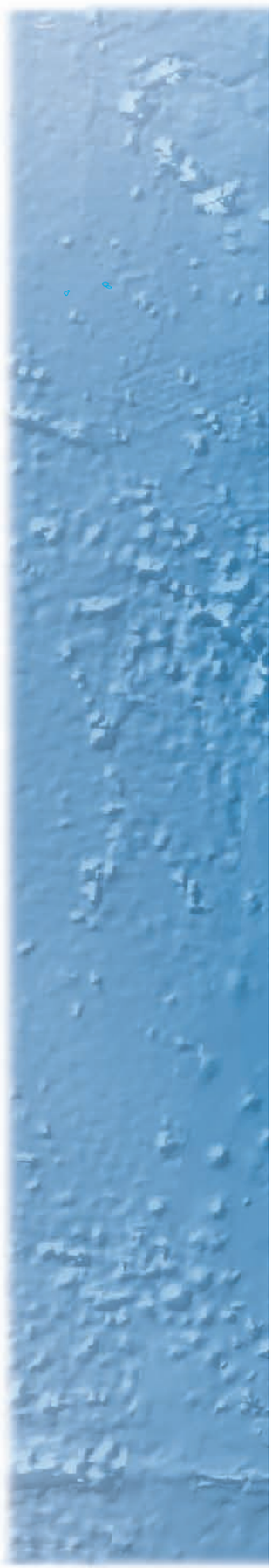
Predictions by computer models were largely confirmed by the Sumatran events, but in some cases, there were unexpected variations. Shaking was stronger than expected and felt farther inland (opposite), and the tsunami flooded higher up on shore and with more variation from place to place than scientists had anticipated.

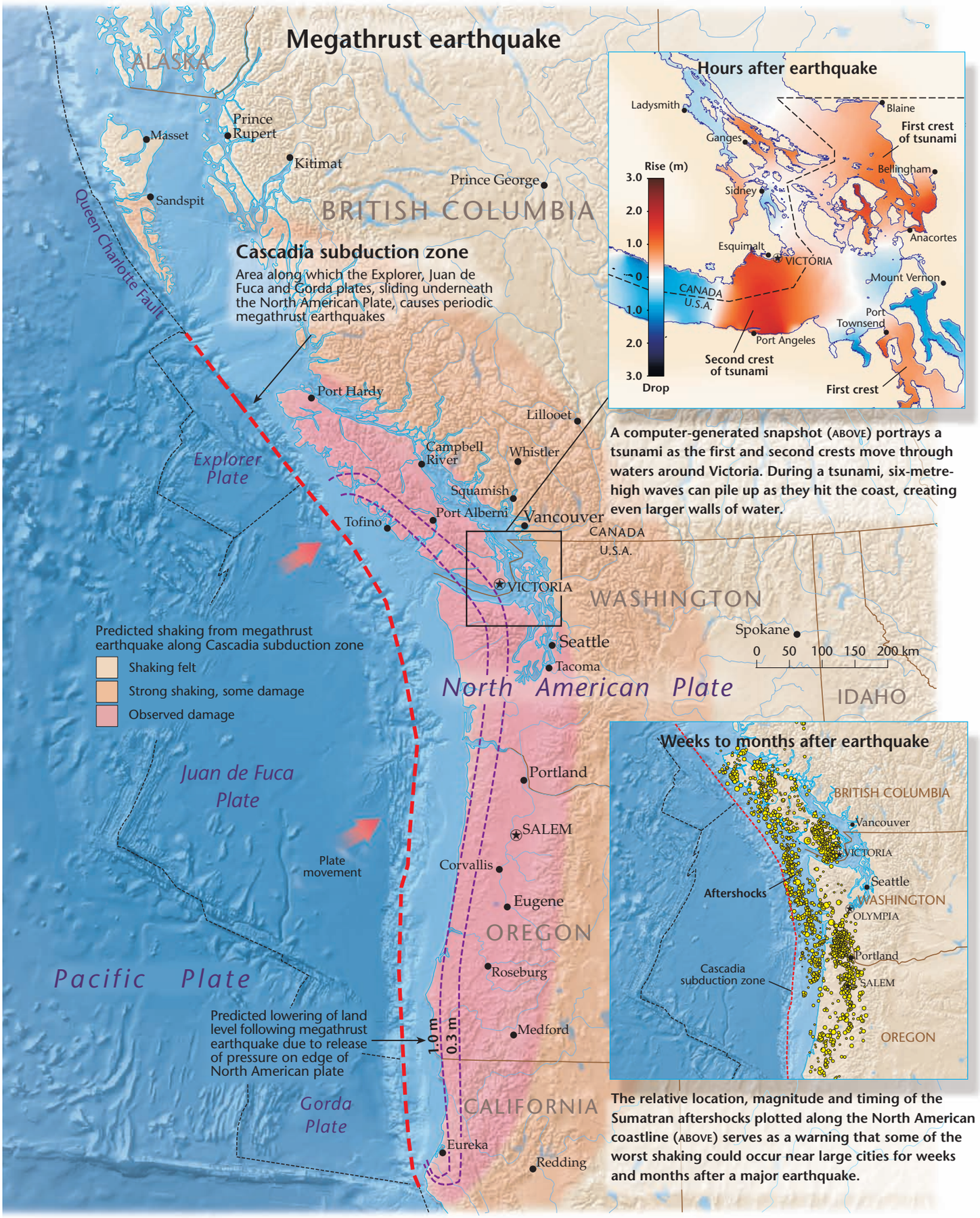
These insights will eventually make their way into building codes and engineering designs in earthquake- and tsunami-prone areas, but more immediately, the Sumatran disaster has led authorities to adjust their reaction strategies by adding warning systems and by increasing public awareness.

"Educating people to be better prepared is the most important aspect," says Cassidy. "The Boxing Day images were a graphic reminder of what can and likely will happen in the future. The key is to use the information and learn from it."



The Sumatran earthquake, triggered when the Indo-Australia Plate slid under the Burma Plate (left), was felt up to 2,500 kilometres from the epicentre. On Canada's Pacific coast, the Juan de Fuca Plate slips under the North American Plate (opposite) at a similar angle and rate, suggesting that a comparable earthquake in Cascadia would be felt as far away as Edmonton and southern California. Both subduction zones are about 1,200 kilometres long, with relatively young underlying plates.





A computer-generated snapshot (ABOVE) portrays a tsunami as the first and second crests move through waters around Victoria. During a tsunami, six-metre-high waves can pile up as they hit the coast, creating even larger walls of water.

The relative location, magnitude and timing of the Sumatran aftershocks plotted along the North American coastline (ABOVE) serves as a warning that some of the worst shaking could occur near large cities for weeks and months after a major earthquake.

SOURCES: GEOLOGICAL SURVEY OF CANADA (SIDNEY, B.C.), NATURAL RESOURCES CANADA; INSTITUTE OF OCEAN SCIENCES (SIDNEY, B.C.), FISHERIES AND OCEANS CANADA