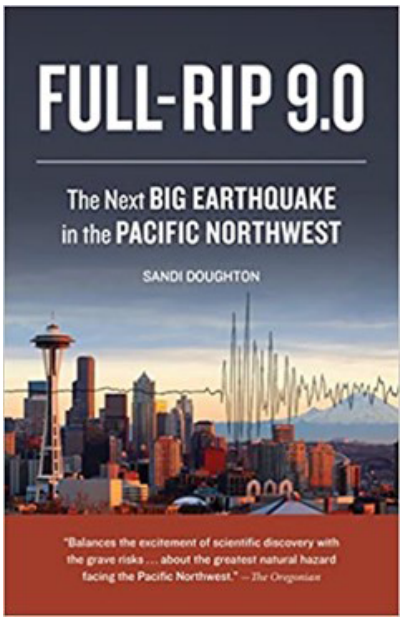
Full Rip 9.0

The Next Big Earthquake in the Pacific Northwest

Reviewed by
Lee Mauney, P.E., CFM
HDR
Dam Levee & Civil Works Project Manager

This article marks the fourth consecutive ASDSO Quarterly Book Club review in the Journal of Dam Safety. Looking forward to a new year of reading together, our committee has several ways to expand and improve the series. One is to connect the book selection to an article in the same issue when it makes sense. So, because this issue's articles focus on seismic analysis and the science of earthquake dam safety, we've chosen a title on earthquakes to coincide and provide a background to those featured articles.



The Cascadia Subduction Zone is 750 miles long, running along the Pacific coast from Northern California to southern British Columbia. In 2015, Kathryn Schulz's Pulitzer-Prize winning account of a future Cascadia earthquake, *The Really Big One*, awakened the public to the inevitable hazards of living in the Pacific Northwest. This quarter's ASDSO book club selection, *Full-Rip 9.0* by Sandi Doughton, takes us deeper into the discovery, history, and science of the Cascadia Subduction Zone and discusses the ramifications for residents and infrastructure located in Seattle and areas along the northwest coast.

> *"The human mind has a tendency to wander after one too many worst-case scenarios, and earthquakes are the toughest natural disaster to wrap the brain around anyway. Hurricanes, forest fires, and floods follow seasonal schedules. There's usually enough warning time to board up the windows, stack sandbags, and evacuate. Earthquakes operate on a time scale that's both inevitable and inscrutable. (p.237)"*

Part scientific-detective story, part seismic-risk and emergency-preparedness education, Doughton weaves a remarkable story. Using an unlikely combination of geologic fieldwork, modern technologies, Native American oral tradition, and historic recordkeeping of an orphan tsunami that made landfall an ocean away in 1700, geologists and other scientists have pieced together evidence of an immense northwest "megaquake". Brian Atwater, one of the main scientists featured in *Full-Rip 9.0*, tells another version of the story that includes a further history of the scientific discovery and is a great follow-on read if *Full-Rip 9.0* inspires you to learn more. Check out *The Orphan Tsunami of 1700: Japanese Clues to a Parent Earthquake in North America* (2005).

Full Rip 9.0 is about more than just one type of earthquake, however. The subduction process is responsible for all three types of earthquakes that occur in the Pacific Northwest: deep quakes, shallow crustal quakes, and megaquakes; the book covers the regional implications and likelihood of all three occurring.

No one in the past three hundred years has witnessed a Cascadia earthquake. Not a single soul in the past millennium has weathered a rupture on the Seattle Fault. But hundreds of thousands of people across the Northwest have stories to tell about the third type of earthquake that stalks the region: deep quakes, like the one that struck between Olympia and Seattle in 2001. Some old-timers have lived through three of them, including the biggest quake in Washington's recorded history. (p.123)

The book concludes with a checklist of what everyone should do to prepare for the earthquake and resulting tsunami, and a call to individual and collective action. "*Another Cascadia megaquake will strike. It could be ten minutes from now, or it could hold off until today's toddlers are great-grandparents* (p.237)." Case studies of dam failures from seismic events are rare compared with other more commonly occurring failure modes. However, thanks to many of the scientific discoveries described in *Full-Rip 9.0,* we understand the seismic loadings we can expect at specific dam site locations. Yet, these scientific advancements have only occurred recently, so most of our dams in Washington and Oregon were designed without any knowledge of the subduction zone earthquake's potential. How can we continue to improve our understanding of seismic risk related to dam/levee safety and be better prepared for future seismic hazards, including the inevitable "Really Big One"?

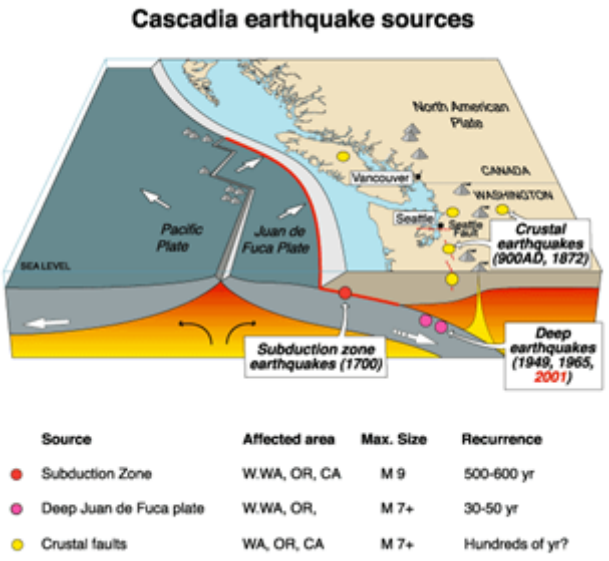


Figure 1. Cascadia earthquake sources

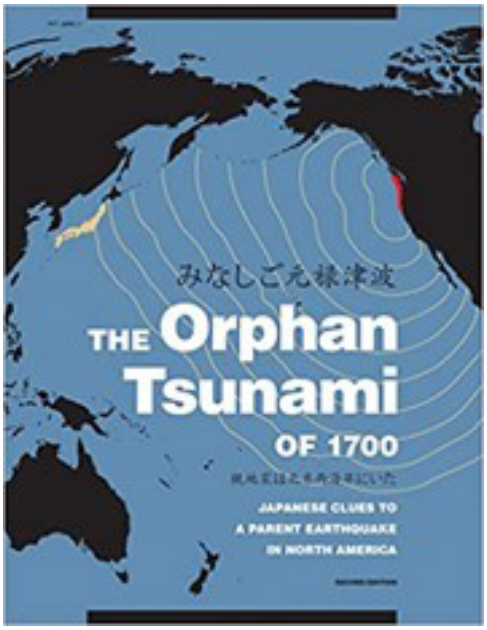


Figure 2. Cover of The Orphan Tsunami of 1700: Clues to a Parent Earthquake in North America

Figure 3. Sandi Doughton during a presentation at TEDxBellingham. The slide shows Brian Atwater, one of the main geologists featured in *Full-Rip 9.0*.

I invite you to read the book and join the conversation on the ASDSO Quarterly Book Club Collaborate site. We plan to host our first virtual event soon, so stay tuned for more details. If you are looking for an overview of earthquakes in the Pacific Northwest before starting the book, I recommend watching this lecture from 2016:

Great Earthquakes of the Pacific Northwest, by Nick Zentner: https://www.youtube.com/watch?v=UJ7Qc3bsxjI

Doughton, S. (2014). *Full-rip 9.0: The next big earthquake in the pacific northwest.* Sasquatch Books. The book is also available as an eBook.

Sandi Doughton is an award-winning science reporter for *The Seattle Times.* She has been covering earthquake research in the Pacific Northwest for more than twenty years. She lives in West Seattle, not far from the Seattle Fault. A video of her 2013 TEDxBellingham Talk, *Shake, Rattle – and Rebound* is available online.

The *ASDSO Quarterly Book Club* is an ongoing review of books that may be pertinent to ASDSO membership.

New or old, the hope is to share a reading list and promote lifelong learning in the dam/levee safety industry.

Please share feedback or future book suggestions to lee.mauney@hdrinc.com or check out our ASDSO Collaborate site.

Full-Rip 9.0: The Next Big Earthquake in the Pacific Northwest was recommended by Ivan Wong, PG.