Meeroll and her colleagues have now discovered that it has caused at least two major earthquakes since the last glaciation over 17,000 years ago. Unlike the better-known Cascadia megathrust fault predicted to cause the earthquake referred to as the “Big One”—which is active every 300 to 500 years—crustal faults can display no detectable seismic activity for thousands of years.

Instead, Meeroll and her colleagues must read the trail of clues that earthquakes leave behind long after they’ve ended.

“Landscapes hold the accumulation of effects of earthquakes over thousands of years,” says Meeroll. “By looking at topographic features, we can see how past earthquakes have shaped rivers or mountains. We can use this information to uncover how big past earthquakes were and how long ago they happened.”

But the lush plant life that makes Vancouver Island uniquely beautiful also obscures much of the topography. Meeroll selects the sites for extensive field data collection using a mapping system—known as Light Detection and Ranging (LiDAR)—that emits laser pulses from helicopters. It can be used to visually strip away vegetation and reveal precise topographical features.

“Now that we’ve identified that the Leech River fault is active, the next step is for us to nail down exactly when and how big the most recent earthquakes were,” says Meeroll, whose initial study was supported by the Natural Sciences and Engineering Research Council. She now hopes to collect more extensive LiDAR information to determine the history of similar faults throughout Vancouver Island, and the hazards they may present.

In another similar project, Meeroll is identifying faults in the northwest Himalayas, an area that is home to over 10 million people. She’s looking for faults that could cause big earthquakes, similar to or larger than the one in Nepal in April 2015 that killed nearly 9,000 people. With some of the tallest mountains in the world and large swaths of land inaccessible for field data collection, Meeroll must rely heavily on remote sensing satellite data to analyze the landscape.

Whether in the Himalayas or in Victoria, communities must decide how to respond to the hazards Meeroll uncovers. In New Zealand, nearly all of the fatalities happened when three office buildings that didn’t meet modern seismic standards collapsed during an aftershock.

“My hope is that this information will allow us to be informed, rather than alarmed,” says Meeroll. “When we better understand the risk posed, there’s a lot we can do to keep our communities safe.”