

# Yellowstone's geology still a mystery

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In this Oct. 15, 2008 file photo, steam rises from vents of Porcelain Basin in Yellowstone National Park's Norris Geyser Basin. (Sean Sperry/Bozeman Daily Chronicle via AP)

By JESSICA MAYRER  
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BOZEMAN, Mont. (AP) -- When Hank Heasler first visited Yellowstone National Park as a little boy, he stared at the bubbles rising up from green- and orange-ringed mud pots, colored by heat-loving bacteria that thrive in water recycled through deep underground aquifers.

"I just remember being fascinated," he said. "I always wanted to know more."

Heasler is now Yellowstone Park's geologist, one of the primary scientists responsible for tracking movement around one of the largest volcanos in North America.

It's a constant challenge, figuring out the park's ever-shifting geological puzzle, he said.

"I'm still excited," he said.

Although he had studied the park for years before becoming park geologist in 2002, when he left the University of Wyoming where he taught for 21 years, he knew he faced a steep learning curve.

"When I first got to Yellowstone, I was totally lost," Heasler said.

Now here he is, seven years later, charged with helping to interpret -- among other things -- just what caused the swarm of more than 800 earthquakes below Yellowstone that started in late December and whether those quakes were linked to volcanic activity.

The super volcano, after all, is capable of catastrophic eruption. "Kind of like a meteor hitting the Earth," Heasler said.

Heasler doesn't think the volcano will blow any time soon.

"We think there's a lot more potential for damage from large earthquakes rather than volcanic eruptions,"

Heasler said.

But he also admitted that, despite all that scientists have learned, Yellowstone is still a marvelous mystery.

One thing scientists know for sure is that the recent seismic activity is not unprecedented. A combination of forces shakes the nation's oldest park thousands of times every year.

Yellowstone sits on the caldera of a super volcano, which molded the white-peaked mountains and still heats 10,000 thermal features, geysers, hot springs and mud pots.

It's an ancient, complex underground system. Water from rain and snow flows through cracks in the porous rock and is heated by underground volcanic rock. Eventually that water returns to the surface through geysers and mud pots.

Because snow recharges deep aquifers in a leisurely cycle that takes about 50 years to complete, Old Faithful is likely spurting liquid that fell as snow during World War II, Heasler said.

"Yellowstone is a fascinating place," said John Eichelberger, U.S. Geological Service volcano hazards program coordinator. "It's one of the places that shows us how dynamic the planet really is. It's alive."

A major earthquake shakes things up in or around Yellowstone Park every 100 years or so, Heasler said, pointing to the Hebgen Quake of 1959, which killed 28 people.

Beginning in December, scientists believe pressure from molten rock triggered about 15 percent of the quake swarm.

Eichelberger compared the pressure buildup to what happens when one leaves a carbonated beverage in the freezer. When liquid freezes, there's nowhere for carbon dioxide to go, so pressure builds, triggering an explosion.

Similarly, as underground magma cools, there's no place for water to go, he said. The steam generated from hot meeting cold builds pressure. And then, boom, the earth shakes, releasing stored energy. Heasler said another form of terrestrial energy release, tectonic shifting, as seen along fault lines in California, likely played a role, too.

But as scientists learn more, aided by ever-advancing technology, about what is going on underground in Yellowstone, more questions arise. In this case, Eichelberger said, scientists are debating what combination of fluids caused the seismic activity.

"The big argument is: Is that swelling caused by movement of hot water or movement of magma?" he said.

But it is clear there's still much, much more to learn.

"One could spend their whole life getting familiar with Yellowstone and still only know a small percentage of it," Heasler said.

After the December earthquake swarm in Yellowstone, an imposter, using a USGS logo, posted a fake evacuation order on the Internet, telling locals they should clear out because the volcano was going to blow.

"They said people should evacuate the Yellowstone area because of the earthquake swarm," said USGS spokeswoman Jessica Robertson. "We're not sure if people actually did."

It's easy to see how words like "swarm," "eruption" and "super volcano" trigger calamitous thoughts, Heasler said. And amid the December rattling, some folks said Yellowstone officials were intentionally keeping a lid on the threat.

"Some people worry about conspiracy and cover-ups," he said.

But folks would know if an explosion were imminent by visible warning signs, like swelling earth and a shift in gasses escaping from the ground, he said.

"That's not something we can quite hush up," Heasler said.

In turn, researchers would be able to give a heads up if the volcano were preparing to blow, he said.

But a volcanic eruption doesn't appear to be imminent, he said.

The Yellowstone volcano hasn't flowed to the surface for more than 70,000 years, and the last super-eruption was 640,000 years ago.

"For humans, that's almost incomprehensible," Heasler said. "But for geologists, that's like yesterday."

When it does erupt, it could be on the scale of the Mount St. Helens eruption, which blasted nearly 230 square miles with volcanic debris.

Or it could generate a smaller, more benign flow, he said.

"There will be another lava flow in Yellowstone's volcanic future," he said. "But we don't know if there will be another big catastrophic explosion again."

Really it's the earthquakes, because they occur more frequently, that pose a greater threat, he said.

But Heasler reiterated that science can't yet explain all of the park's geological quirks.

"The more we understand or know, the more we realize we don't know," he said. "There's a lot more to be learned about Yellowstone."