Has the iconic Western red cedar reached a tipping point?
2 November 2022, by Nicholas Turner

Six years have passed since Bruce Albert witnessed the sudden, inexplicable death of a dozen Western red cedars on his property.

The trees fell victim to a nameless culprit in the span of a single summer, showing no signs of a killer pest or deadly pathogen. Nearby, Douglas firs, maple, alder, black cottonwood and more than a dozen surviving red cedars remain unaffected, if not thriving, to this day.

Albert is puzzled.

"There's no pattern to it," the 70-year-old said.

Similar symptoms have been seen among red cedars throughout the Pacific Northwest.

For millennia, the trees have been pillars of stability and survival for the region's forests and its inhabitants. Scaly, green-blue leaves adorned with small, oval cones hanging from drooping branches provide sustenance for elk when food is scarce during winter. The striped wood, fibrous and forgiving, protected by a soft layer of iconic red bark, wraps around a sturdy trunk that offers shelter for bears or useful material for humans.

Diebacks have felled countless trees throughout the region but, according to emerging research, perhaps never so prominently among Western red cedars or in such noticeable concentrations west of the Cascades.

Albert has been watching dozens of red cedars grow in his backyard since he moved to Snohomish County in 1976, back when heat waves, drought and wildfire were less common amid the region's lush, forested corridors and abundant rain.

Now, just beyond the next hill, the Bolt Creek fire has been burning since early September, an unnerving portent of west side fires to come as summers become increasingly severe and unpredictable.

The ailing red cedars could be the latest victim of an influx of extreme weather events.

Scientists, in their search for a cause, point to a changing climate, but to understand the nature and extent of the invisible threat looming over this beloved species, researchers need more time.

The Western red cedar, or Thuja plicata, is the largest tree in the Pacific Northwest and one of the oldest in Western Washington.

It is one of the most common conifers here, an evergreen, native to the Pacific Coast of North America. The species first laid its roots thousands of years ago in the rich soils of British Columbia. Tools made of red cedar found in Yuquot, a small settlement on Vancouver Island, have been dated as far back as 4,000 years.
Now, it can be found in young groves and ancient forests stretching from California to Alaska.

Sam Barr, a Samish tribal citizen and a supervisor of the Stillaguamish Tribe’s historic preservation office, relies on the tree for his art, spirituality and way of life.

"A lot of people refer to the cedar tree as a grandparent because it provides essential gifts that you need to survive in life," Barr said.

He has been harvesting materials from the tree for 14 years, using bark and wood to create art, tools, canoe paddles and drums inspired by traditional Coast Salish peoples.

Not only does the tree provide him with essential materials to build and carve, but it also provides a connection to his ancestors and their history.

Red cedars have been used by Indigenous communities to build homes, canoes, totem poles, rope, instruments, utensils, bowls, blankets, baskets and more. The tree's natural oils and buoyancy help make it water- and rot-resistant and therefore ideal for use in boats, rooftops and clothing.

White settlers also found the tree useful for shingles, a use that continues today, as well as for deck-building and fencing, among other things, by Northwesterners through the region.

Should the dieback worsen, it's difficult for Barr to fathom the loss of such an essential species, especially one so invaluable to the cultural heritage of First Nations, and foundational to the region's history and growth.

"When you peel the bark off the tree and put your hand on the bare trunk you can feel how alive the tree is, you can feel the fluids that flow up and down the trunk," he said. "It's almost like you can feel the tree's heartbeat."

To examine possible differences between healthy red cedars and those experiencing dieback, researchers from Washington State University, Portland State University and Reed College have collected about 30,000 cores—small, cylindrical cross-sections taken from inside the tree to examine their age and health—from 280 red cedars at 11 sites in Washington and Oregon.

Early findings suggest the dieback could be causing red cedar growth to sputter.

Scientists found the species to be growing largely in unison, regardless of previous health conditions, until about seven years ago during the early stages of a statewide dry spell.

"So they grow less and less right up until they die," said WSU researcher Henry Adams.

Something happened after 2015 that caused them to respond very differently, said his colleague and co-author Robert Andrus.

That year marked the beginning of uncommonly hot, dry weather in Washington that didn't relent until 2018.

In the past 20 years, Washington experienced seven of its 10 hottest years since 1895. Just in the past decade, the state endured a period of unprecedented heat in which soaring temperatures were bookended by an unprecedented drought in 2015 and the infamous "heat dome" of 2021.

Between each bout of extreme weather, cedars were afforded little time to recover.

Red cedars can normally survive a seasonal drought or a single heat wave. But such events in quick succession can gradually weaken a tree's ability to retain water, grow and protect itself from bugs and illness.

Red cedars are particularly sensitive to climate conditions in May and June, Adams said, because that's when they prepare themselves for the subsequent dry season.

A disruption of that cycle—like the unusually cold and wet spring weather Washington saw earlier this year—could mean the difference between life and death.
"If there's not as much moisture available during that period, then they’re going to grow a lot less," Andrus said. "And they're going to shut down their growth a lot earlier."

For years, climatologists have warned that global warming will destabilize the planet's natural systems, pushing them beyond a tipping point into an irreversible feedback loop that eventually leads to mass extinctions and the collapse of entire ecosystems.

In 2008, British scientist Timothy Lenton identified nine planetary tipping points, including the melting or retreat of ice sheets in Greenland, the western Antarctic Ocean and East Antarctica; the collapse or disruption of oceanic currents and monsoons in and around the Atlantic, West Africa, South Asia and India; and large diebacks in the Amazon rainforest and boreal forests.

These tipping points are difficult to foresee, according to the report, as they arrive suddenly and can even trigger or "cross" with other tipping points. For the largest of Earth's natural systems, the process could take millions of years.

But smaller, localized tipping points are expected to emerge as climate change, fueled by humanity's consumption of fossil fuels, continues to worsen.

Researchers fear Western red cedars may have reached a tipping point.

"You don't know where the edge is until you've gone over it," Adams said.

If red cedars have, in fact, reached this climatic point-of-no-return, they face a dreadful prospect: a situation in which broad swaths slowly but inexorably fall victim to this dieback over the coming decades or centuries, and the species becomes extinct—or close to it, by receding into habitats on the fringe of their livable range.

The Pacific Northwest has suffered far bigger diebacks than this but almost exclusively at the hands of an aggressive bark beetle infestation, a fatal disease or deadly fungal infection.

While researchers believe the cause of the Western red cedar dieback is environmental and abiotic, or nonliving, the precise cause and mechanics of it—why the trees are responding this way, which are most vulnerable, what can be done to stop it—remain a mystery.

Perhaps the trigger is unimpeded sunlight. Perhaps it's dry soil. Perhaps it's low snowpack or too much competition. Perhaps the species is migrating north into British Columbia, as has been projected for several tree genera as the climate crisis alters their livable habitat, often pushing them into higher latitudes and higher elevations. Perhaps it's all of the above.

Each condition would require a different treatment.

Aerial surveys of tree health and species distribution have been conducted in Washington and Oregon by both states and the federal government for nearly 80 years. But it was only in 2017 that researchers began using a new label on their map: DC, short for "Dying Cedar."

The surveys show the dieback is sparsely spread across the whole region but largely concentrated in urban corridors and low elevations on the west side.

Joseph Hulbert, from WSU's Forest Health Watch, leads a project gathering data on the red cedar dieback from a network of community scientists. The project has garnered around 1,800 data points from 250 contributors, which has helped Hulbert and other researchers better understand what's happening from the ground.

In South King County's Cedar Creek Park, the wilting remains of a young red cedar stood like a distress beacon as it slowly decayed alongside thriving maples, hemlocks and firs.

Its branches were skeletal and bare, its crown colorless and its striped trunk posthumously studded with tiny holes carved by wood-boring beetles.

"This one is completely dead," said Glenn Kohler, a forest entomologist who studies insects' impact on
forest health, said in August.

He touched the soft bark before removing a small patch to check underneath. The tree lived in a healthy grove surrounded by urban corridors in King County, enjoyed good access to sunlight and showed no signs of common tree killers.

The casualties are still manageable if the dieback doesn't worsen, Kohler said.

If drought is to blame, Kohler said, reducing competition by thinning the understory could help red cedars get more water. But if it's a combination of drought and heat, the solution might require a more tailored approach.

Melissa Fischer, an expert on the red cedar dieback and a forest health specialist with the state Department of Natural Resources, said red cedars undergoing dieback appeared to be more often exposed to sunlight. Trees under the canopy were more often healthier than those receiving direct sunlight.

During a drought, air bubbles drawn from parched soil can break a tree's water column, causing that part of it to wither or die. High temperatures and wind can cause a tree to become dehydrated quicker in the upper canopy.

In Western Washington and Oregon, low spring snowpack may be correlated with severe cases of the dieback.

While these clues are helpful, it's too early to draw conclusions.

"We only have hypotheses as to what's happening," Fischer said.

Timber harvesting should be done cautiously, she said, and perhaps more red cedars should be left for every acre harvested so that they have a canopy to protect them.

"The biggest question is: How do you manage for this species right now?"

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