

Western Redcedar Dieback

Western redcedar (WRC; *Thuja plicata*) is an iconic tree species in the Pacific Northwest (PNW), with deep cultural, economic, and ecological ties in the region. However, recent elevated rates of WRC dieback has raised concern about the future of this species under changing climate conditions.

Western redcedar is ubiquitous in the wetter portions of the PNW, where its iconic strippy bark is a common sight in many forests. It can grow up to 70 meters tall and thrive in mature forests for up to 1000 years under favorable conditions. Western redcedar has also long been used by indigenous communities for a variety of purposes, from canoe building to clothing production.

WRC are well adapted to the region's historical climate. Typically, the PNW is wet from fall to spring, with precipitation persisting through May and June. WRC put on most of their yearly growth in those warm, moist early summer months, and slow their growth to conserve water during the drier and hotter months of late summer. Weather conditions during May and June are critical to WRC growth and overall health.

Tree dieback refers to tree canopy thinning — which often indicates increased stress — or outright tree mortality.



Healthy



Canopy dieback



Dead

Western redcedar dieback starts when they lose their needles. If they cannot recover from this, they will eventually continue to lose needles and ultimately die. Figure from Robert Andrus, USDA Forest Service



*The effects of western redcedar dieback in a mixed forest.
Photo by Robert Andrus, USDA Forest Service*

Current Work

WRC dieback events are hard to study, because tree health can change slowly. Tree health may be influenced by a number of different factors, such as climate and competition with neighboring trees. USDA Forest Service researchers, in collaboration with Washington State University and other partners, are working to pinpoint the cause of dieback and what it means for the future of western redcedar in the PNW.

A [recent study](#) investigated how the growth and dieback of WRC trees is affected by climate conditions and drought events. The study focused on the west side of the Cascade Range where most WRC mortality has been observed, but included sites in the eastern Cascades and Northern Rocky Mountains (northeastern Washington and northern Idaho).

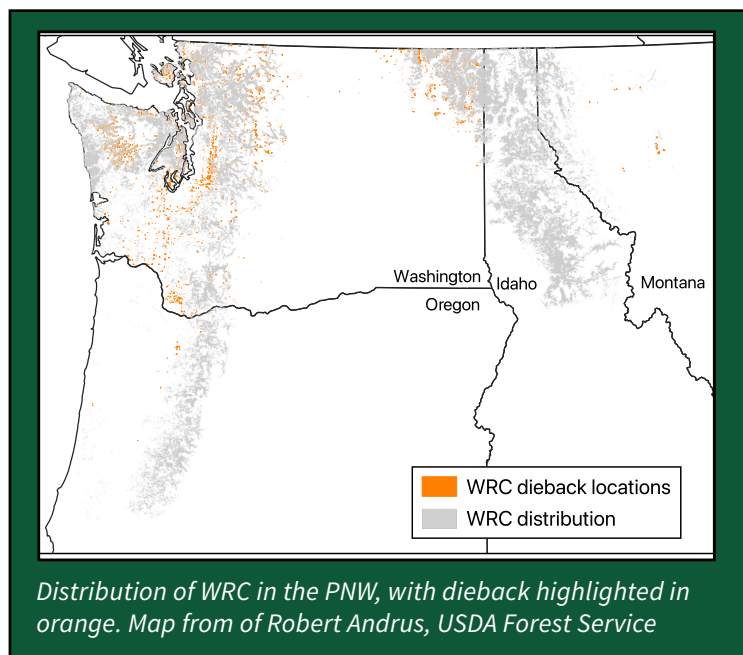
2017-2018 Dieback

Widespread WRC dieback began as early as 2015, with affected trees showing signs of stress for up to a decade prior. Rates of WRC dieback peaked during 2017 and 2018 on the west side of the Cascades from the Willamette Valley, Oregon to Vancouver, Canada. This led scientists to investigate what about the period from 2015 to 2018 led to such dramatic WRC decline.

Hot drought associated with WRC dieback

Climate projections for the PNW suggest summer average temperatures will likely increase, and rainfall will become increasingly unpredictable.

The summers of 2017 and 2018 illustrated what this future might look like, with anomalously hot early summer temperatures and an intense drought. This combination of both higher-than-average temperatures and lower-than-average precipitation is called a “hot drought.”



Key Findings

- Reduced WRC growth, an indicator of tree health, was associated with warmer, drier climate conditions in late spring and early summer (May and June) that lengthen the seasonal, summer drought in the PNW.
- The combination of an early hot drought with warmer and drier summer conditions further reduced the ability of WRC to rebound from stress.
- WRC mortality was strongly associated with multiple, consecutive years of especially warm and dry conditions from May to September, and lower-than-average precipitation.
- Interior (Northern Rockies) populations of WRC were more resistant and resilient to drought—they exhibit dieback less readily and rebound from dieback more quickly—and appear less vulnerable to widespread canopy dieback than coastal populations.

So What?

- Although the study cannot directly attribute WRC dieback to climate change, its findings are an early warning sign. Longer, warmer, and drier summers are anticipated to become more frequent and will likely lead to more WRC dieback.
- Selecting and planting WRC stock sourced from interior populations may help sustain WRC trees in coastal populations in light of continued climate change effects, but more testing is needed to better understand how this stock will do in a new region over the long term.
- Despite recent dieback, most WRC trees survived the unfavorable climate conditions and remain healthy. Still, there are some climate-smart practices managers could use to enhance the future success of WRC. These include strategically planting WRC in cool, moist microclimates, thinning to reduce competition, and monitoring for upcoming hot droughts.

Attribution and Citation

The study discussed in this fact sheet was conducted in collaboration between current WWETAC researchers, WSU personnel, and other partners, with the support of Washington State University.

Research is ongoing on this issue, including an innovative citizen science project being piloted at the WSU Puyallup Extension. Find out more [here](#).

To learn more, contact Robert Andrus (robert.andrus@usda.gov)

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