As summers get warmer, more rain may not be better than less

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Warmer, wetter weather can increase the intensity of insect and pathogen outbreaks, including needle blight as shown on these pine needles. Credit: Robert L. James/U.S. Forest Service/Bugwood.org

Warm, wet summers are historically unusual and could bring unexpected disruptions to ecosystems and society, according to new research from

the University of British Columbia.

As climate change raises summer temperatures around the world, increases in precipitation could offset drought risk in some regions. However, a paper published in *Nature Communications* this month shows that wetter summers may bring other problems in a warming climate.

"Terrestrial climates around the world tend to alternate between cool, wet summers in some years and warm, dry summers in other years," said UBC forestry PhD candidate Colin Mahony, lead author of the study. "But climate change is driving many climates towards warmer and wetter conditions. We found that where temperature and precipitation are increasing together, climates are changing faster than the temperature trend alone would suggest."

Warmer, wetter summers could produce unexpected impacts, such as disease outbreaks and crop failures, because they break the climatic norms that ecosystems and human communities are adapted to.

For the study, Mahony and co-author Alex Cannon from Environment and Climate Change Canada looked at historical observations going back to 1901 and global climate model projections to the year 2100.

Previous studies of temperature alone have highlighted the tropics as a hotspot of emerging unfamiliar climates. However, this new research points to subtropical and temperate regions—the southeastern U.S., central Canada, northern Australia, southern Africa, central Asia and the African Sahel—as areas where these types of warmer, wetter extremes are most likely to occur.

"We're just getting into the time period where we expect to see this effect," Mahony said.

The next steps will be to look at specific effects of these compound climate extremes in individual regions of the world. Mosquito-borne human diseases such as Zika virus, dengue fever and malaria are promoted by both heat and standing water, and could be exacerbated by warm-wet extremes.

Closer to home, recent outbreaks of fungal diseases in the forests of western North America have been linked to warmer and wetter conditions at specific times of year.

"Some fungal outbreaks over the past couple of decades, such as Dothistroma needle blight, could likely have been anticipated by tracking how temperature and precipitation were changing together," said Mahony, who has worked as a forester in British Columbia for 10 years and has witnessed the impacts of climate change on the ground. "In order to respond to global warming, we need to understand how the climates of the future will be different than the familiar, historical climates that we are adapted to."

More information: Colin R. Mahony et al, Wetter summers can intensify departures from natural variability in a warming climate, *Nature Communications* (2018). DOI: 10.1038/s41467-018-03132-z

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