

Using loss of resilience as an early warning signal to predict the likelihood of forest mortality

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A team of researchers from Duke University and Princeton University has found that it is possible to use loss of resilience as an early warning signal to predict the likelihood of forest mortality. In their paper published in the journal *Nature Climate Change*, Yanlan Liu, Mukesh

Kumar, Gabriel Katul and Amilcare Porporato describe their study of California forests using data from satellites and what they learned from it.

As the planet continues to warm due to [human activity](#), scientists continue to study the possible impacts of a changing environment. One known impact is [forest loss](#)—as the planet heats up, weather patterns change. Some areas grow hotter and dryer, making it more difficult or impossible for forests to survive. Prior research has shown that in some instances, it is possible to save a forest from dying by thinning trees or shrubbery—doing so means less sharing of water in the soil. But for land managers to save a forest, they need to know it is in danger. Unfortunately, warnings by the trees (browning leaves, for example) tend to come too late. In this new effort, the researchers have found a way to sense a forest is in trouble months in advance, allowing resuscitative measures to be taken.

The work involved looking for loss of resistance by a forest rather than signs of obvious stress. One way to see it is by noting changes in reflected and emitted radiation from a forest in data from the Landsat 7 satellite. The team studied data from the satellite for the period 1999 to 2015, which covered two droughts in California. By noting changes that occurred as the droughts progressed and then comparing what they found to forest areas that died, they were able to see [warning](#) signs. They found that using such technology, they were able to see evidence of loss of resilience as early as six months before loss of greenness, in some cases—in other cases, the time frame was up to 19 months. The researchers believe their early warning system could be used to alert local [land managers](#) to potential [forest](#) losses in time for them to take measures to save them.

More information: Yanlan Liu et al. Reduced resilience as an early warning signal of forest mortality, *Nature Climate Change* (2019). [DOI:](#)

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