Sequence matters in droughts and floods

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When extremes of drought and flood come in rapid succession, the extent of damage to vegetation may depend in part on the sequence of those events, according to a new study published in *The American Naturalist*.

The study, which focused on tree species common to the Everglades in Florida, found that seedlings maintained higher growth rates and were less likely to die when subjected to drought first then flood, rather than vice versa. The findings could have significant implications for predicting how vegetation responds to climate extremes—especially amid forecasts of increasingly severe droughts and floods associated with climate change, say authors ShiLi Miao (South Florida Water Management), Chris B. Zou and David D. Breshears (both University of Arizona).

According to Dr. Miao, most previous studies on how vegetation responds to hydrological events have been based largely on responses to a single hydrological condition. Few studies have investigated multiple events in succession.

"Our research suggests that you can't really predict how the plants will respond to combinations of drought and flood by studies that look just at a single drought or a single flood," Dr. Miao said. "We found that plants respond very differently depending on the sequence of flood and drought."

In a greenhouse, Dr. Miao's team subjected seedlings to sequences of

conditions that simulated drought and flood, with each phase lasting four months.

The three species chosen for the experiments have varying tolerances to hydrological events. The pond-apple tree (annona glabra) tends to be flood tolerant. The gumbo-limbo (bursera simaruba, also known as West Indian birch) tends to be drought tolerant. The red maple (acer rabrum, also known as swamp maple) has intermediate tolerances to drought and flood.

Each species tested showed higher mortality and lower growth rate when flood was first in the sequence, compared to when drought came first.

The study has implications for the restoration and management of the Everglades and other aquatic systems, Dr. Miao says. The results suggest that "the challenge ahead includes evaluating different sequences of extreme events."

Dr. Miao and her team plan to conduct additional research on various wetland plants related to their nutrient removal function under extreme hydrological conditions.

Source: University of Chicago