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Legacy effects and cascading impacts of climate extremes on ecosystems

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Climate extremes impact ecosystems directly by imposing stress conditions and impairing normal functioning. Depending on its severity, recovery from a given event can take several years to decades, which results in compounding effects of recurrent extremes in time. Climate extremes can also have indirect impacts on ecosystems e.g., by increasing the hazard of concurrent disturbances, such as fires or insect outbreaks. The increased frequency or intensity of climate extremes due to anthropogenic climate change has, therefore, the potential to increase the likelihood of impact cascades.

Understanding the processes controlling ecosystem responses to and recovery from extreme events, and how temporally and/or spatially compounding events affect ecosystem dynamics is crucial to anticipate potential threats to ecosystem stability under a changing climate. Here, we will discuss challenges in quantifying direct and lagged impacts of extreme events on ecosystem functioning and present recent studies trying to overcome these challenges based on recent historical events. Finally, we will identify key needs in observations and methods to improve understanding on cascading ecological impacts from more frequent extreme events.