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Biodiversity, climate change, and ecosystem services

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ABSTRACT

The capacity of ecosystems to deliver essential services to society is already under stress. The additional stresses imposed by climate change in the coming years will require extraordinary adaptation. We need to track the changing status of ecosystems, deepen our understanding of the biological underpinnings for ecosystem service delivery and develop new tools and techniques for maintaining and restoring resilient biological and social systems. We will be building on an ecosystem foundation that has been radically compromised during the past half century. Most rivers have been totally restructured, oceans have been severely altered and depleted, coral reefs are near the tipping point of disappearing as functional ecosystems, over half of the land surface is devoted to livestock and crop agriculture, with little consideration for the ecosystem services that are being lost as a consequence, some irrevocably so. We have already seen many regime shifts, or tipping points, due to human activity, even before the onset of measurable climate change impacts on ecosystems. Climate change, caused mainly by anthropogenic greenhouse gas emissions, will disrupt our ecosystem base in new ways. Already we are seeing widespread signs of change. Species behaviors are altering and disrupting mutualisms of long standing. We are seeing extinctions within vulnerable habitats and conditions where migrations are necessary for survival but where often there are no pathways available for successful movement in the fragmented world of today. These challenges represent an extraordinary threat to society and a call for urgent attention by the scientific community