Advancing hurricane ecology to improve ecological resilience in endangered systems

Endangered coastal ecosystems, such as biodiverse longleaf pine savannas, have historically endured the impacts of hurricanes. But intensifying hurricanes, coupled with little remaining habitat and detrimental management actions, threaten their persistence. In 2018, Hurricane Michael, a regionally unprecedented Category 5 storm, affected the Florida panhandle and southwest Georgia, impacting more than 25% of all remaining longleaf pine ecosystems. The storm served as a stark reminder of the vulnerability of remaining habitat to a single intense hurricane.

Hurricane risk varies across ecological scales. Within the individual stand scale, community components face unique risks from hurricane effects. Red-cockaded woodpecker photo credit: Tara Tanaka.

We reviewed the hurricane ecology of pine savanna and woodland ecosystems in the North American Coastal Plain, categorized hurricane risk across the range of extant longleaf pine along a gradient of hurricane regimes, and synthesized ecological effects of recurrent hurricanes. We found that the majority of extant longleaf pine habitat (85%) experiences hurricane force winds every six years, and this is projected to increase. We review risk factors influencing hurricane effects across different scales from populations to ecosystems, then explore how these are affected by linked disturbances, including post-hurricane fires, insect outbreaks, and human actions such as salvage logging operations.

Our synthesis results in suggestions regarding how consideration of hurricane ecology might influence conservation, management, and restoration of coastal ecosystems in a time of rapid environmental change. Across different management goals, anticipating future storm events with proactive planning for resilience and recovery will lead to better outcomes for conserving these critical ecosystems.

MORE INFORMATION

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KEY POINTS

The majority of longleaf pine habitat (85%) experiences hurricane force winds every 6 years.

Our understanding of hurricane ecology and risk would benefit from greater awareness of the effects of low-intensity storms that are chronic and widespread.

Linked disturbances such as post-storm fire, insect outbreaks, and especially salvage logging operations, can exacerbate negative ecosystem effects and delay recovery.

Future management should be based on ecological research that accounts for changing ecosystem dynamics and comprehensive post-storm ecosystem responses to develop climate adaptation strategies and response plans.