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TITLE: The extent of mangrove change and potential for recovery following severe Tropical Cyclone Yasi, Hinchinbrook Island, Queensland, Australia

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ABSTRACT:

Abstract Cyclones are significant drivers of change within mangrove ecosystems with the extent of initial damage determined by storm severity, location and distribution (exposure), and influenced by species composition and structure (e.g., height). The long?term recovery of mangroves is often dependent upon hydrological regimes, as well as the frequency of storm events. On February 3, 2011, Tropical Cyclone Yasi (Category 5) made landfall on the coast of north Queensland Australia with its path crossing the extensive mangroves within and surrounding Hinchinbrook Island National Park. Based on a combination of Landsat?derived foliage projective cover (FPC), Queensland Globe aerial imagery, and RapidEye imagery, 16% of the 13,795 ha of mangroves experienced severe windthrow during the storm. The greatest damage from the cyclone was inflicted on mangrove forests dominated primarily by Rhizophora stylosa , whose large prop roots were unable to support them as wind speeds exceeded 280 km/hr. Classification of 2016 RapidEye data indicated that many areas of damage had experienced no or very limited recovery in the period following the cyclone, with this confirmed by a rapid decline in Landsat?derived FPC (from levels > 90% from 1986 to just prior to the cyclone to < 20% postcyclone) and no noticeable increase in subsequent years. Advanced Land Observing Satellite (ALOS ?1) Phased Arrayed L?band Synthetic Aperture Radar (SAR) L?band HH backscatter also increased initially and rapidly to 5 ± 2 dB (2007?2011) due to the increase in woody debris but then decreased subsequently to ?20 ± 2 dB (postcyclone), as this decomposed or was removed. The lack of recovery in affected areas was attributed to the inability of mangrove species, particularly R. stylosa, to resprout from remaining plant material and persistent inundation due to a decrease in sediment elevation thereby preventing propagule establishment. This study indicates that increases in storm intensity predicted with changes in global climate may lead to a reduction in the area, diversity, and abundance of mangroves surrounding Hinchinbrook Island.

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