

ID: W2795497891

TITLE: Seagrass on the brink: Decline of threatened seagrass *Posidonia australis* continues following protection

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ABSTRACT:

Seagrasses are in decline globally due to sustained pressure from coastal development, water quality declines and the ongoing threat from climate change. The result of this decline has been a change in coastal productivity, a reduction in critical fisheries habitat and increased erosion. Attempts to slow this decline have included legislative protection of habitat and direct restoration efforts. Monitoring the success of these approaches requires tracking changes in the abundance of seagrasses, but such monitoring is frequently conducted at either too coarse a spatial scale, or too infrequently to adequately detect changes within individual meadows. Here, we used high resolution aerial imagery to quantify the change in meadows dominated by *Posidonia australis* over five years at 14 sites in five estuaries in south-eastern Australia. Australia has some of the world's most diverse and extensive seagrass meadows, but the widely distributed *P. australis* has a slow growth rate, recovers poorly after disturbance, and suffers runaway attrition if the conditions for recovery are not met. In 2010, after declines of 12-57% between the 1940s and 1980s, *P. australis* was listed as a threatened ecological community in New South Wales. We quantified changes in area at fine spatial scales and, where loss was observed, describe the general patterns of temporal decline within each meadow. Our results demonstrate that seagrass meadows dominated by *P. australis* underwent declines of ~ 2-40% total area at 11 out of 14 study sites between 2009 and 2014. In the iconic Sydney Harbour, our analyses suggest that *P. australis* meadows are declining at an average rate greater than 10% yr<sup>-1</sup>, exceeding the global rate of seagrass decline. Highlighting these alarming declines across the study region should serve as means to prioritise management action and review the effectiveness of legislative listing as a method to limit impacts at an ecosystem level.

SOURCE: PloS one

PDF URL: <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0190370&type=printable>

CITED BY COUNT: 43

PUBLICATION YEAR: 2018

TYPE: article

CONCEPTS: ['Seagrass', 'Threatened species', 'Posidonia oceanica', 'Ecology', 'Habitat', 'Climate change', 'Abundance (ecology)', 'Geography', 'Thalassia testudinum', 'Marine protected area', 'Productivity', 'Environmental science', 'Biology', 'Macroeconomics', 'Economics']