NAVIGATING CHANGE IN WESTERN PORT

SUSTAINING COASTAL WETLANDS AMID SEA-LEVEL RISE AND UNRAVELING MANGROVE ENCROACHMENT

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All Things Western Port Community Forum 31/08/2023

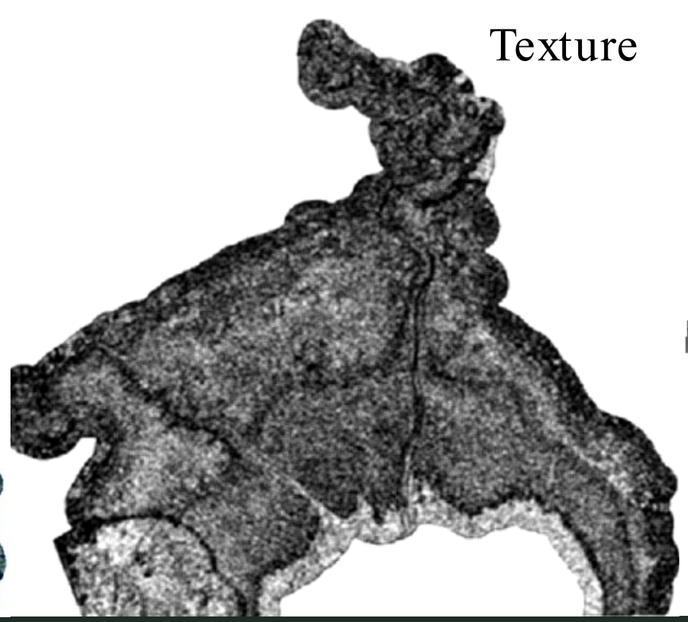
March of the mangroves: drivers of encroachment into southern temperate saltmarsh

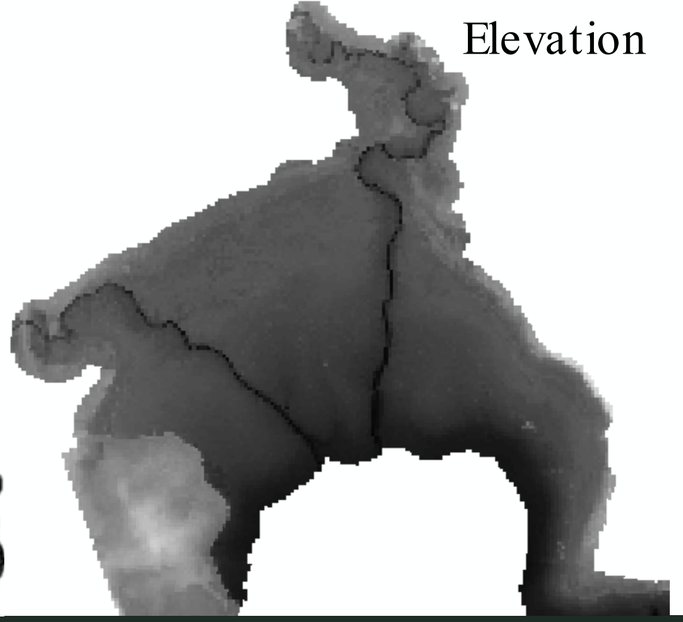
Whitt et al 2020 Estuarine Coastal and Shelf Science

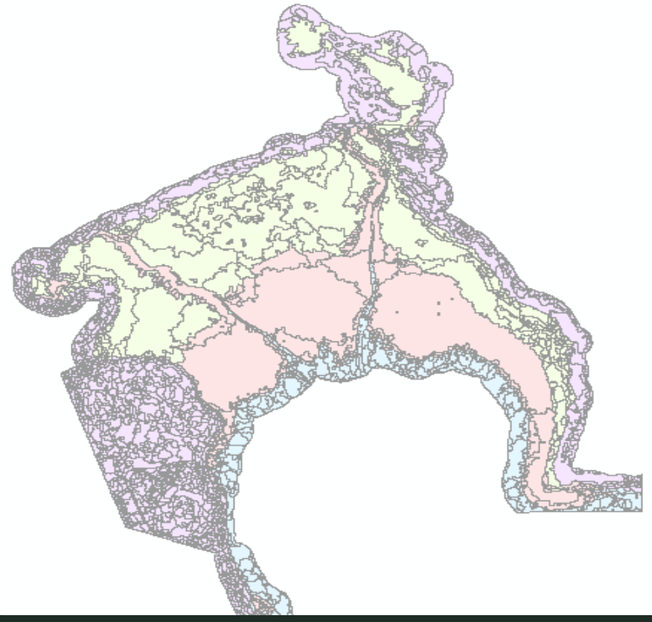
Spectral

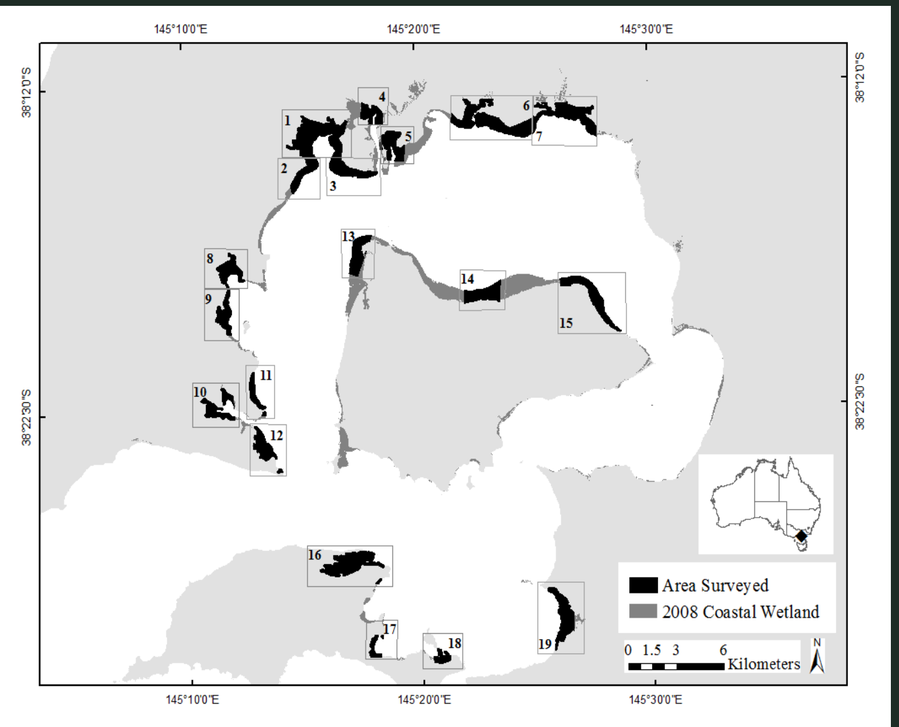
Texture

Elevation





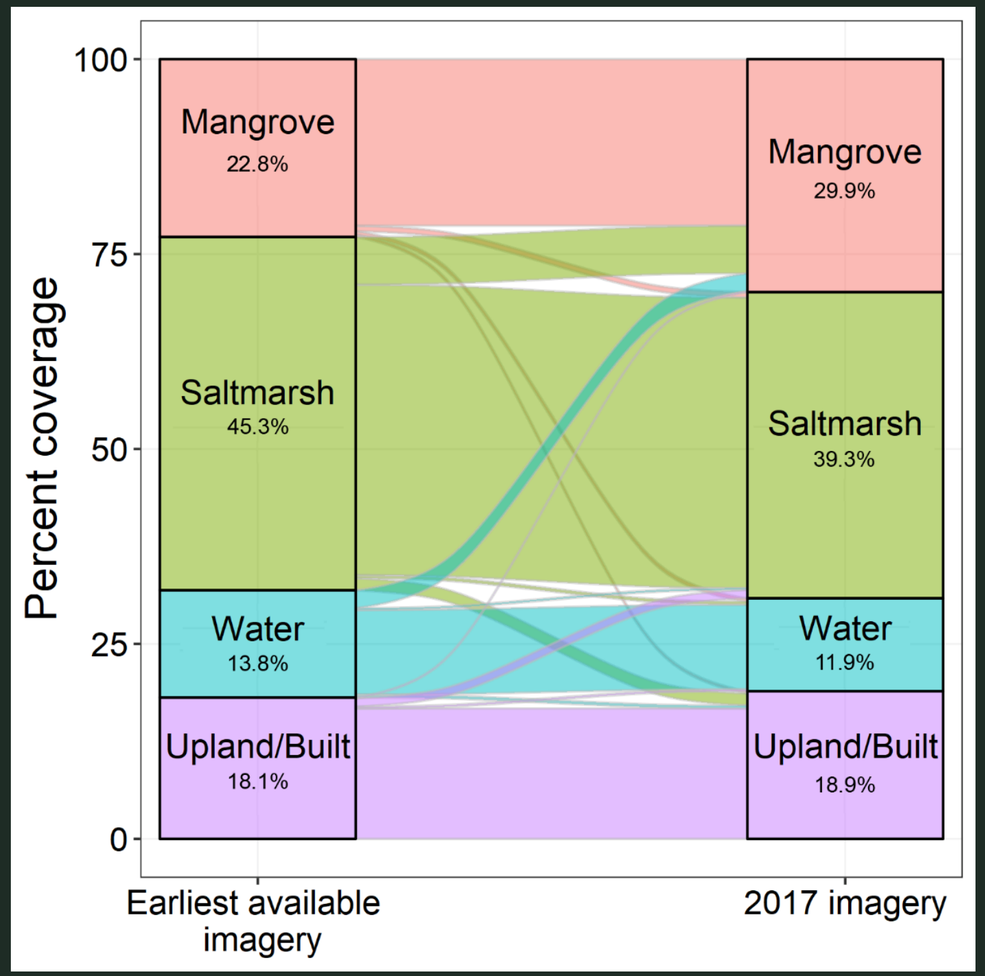




Object Based Imagery Analysis

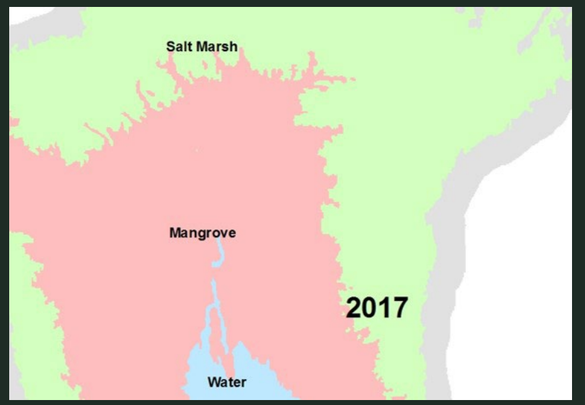
1970s 1999 2009 2017

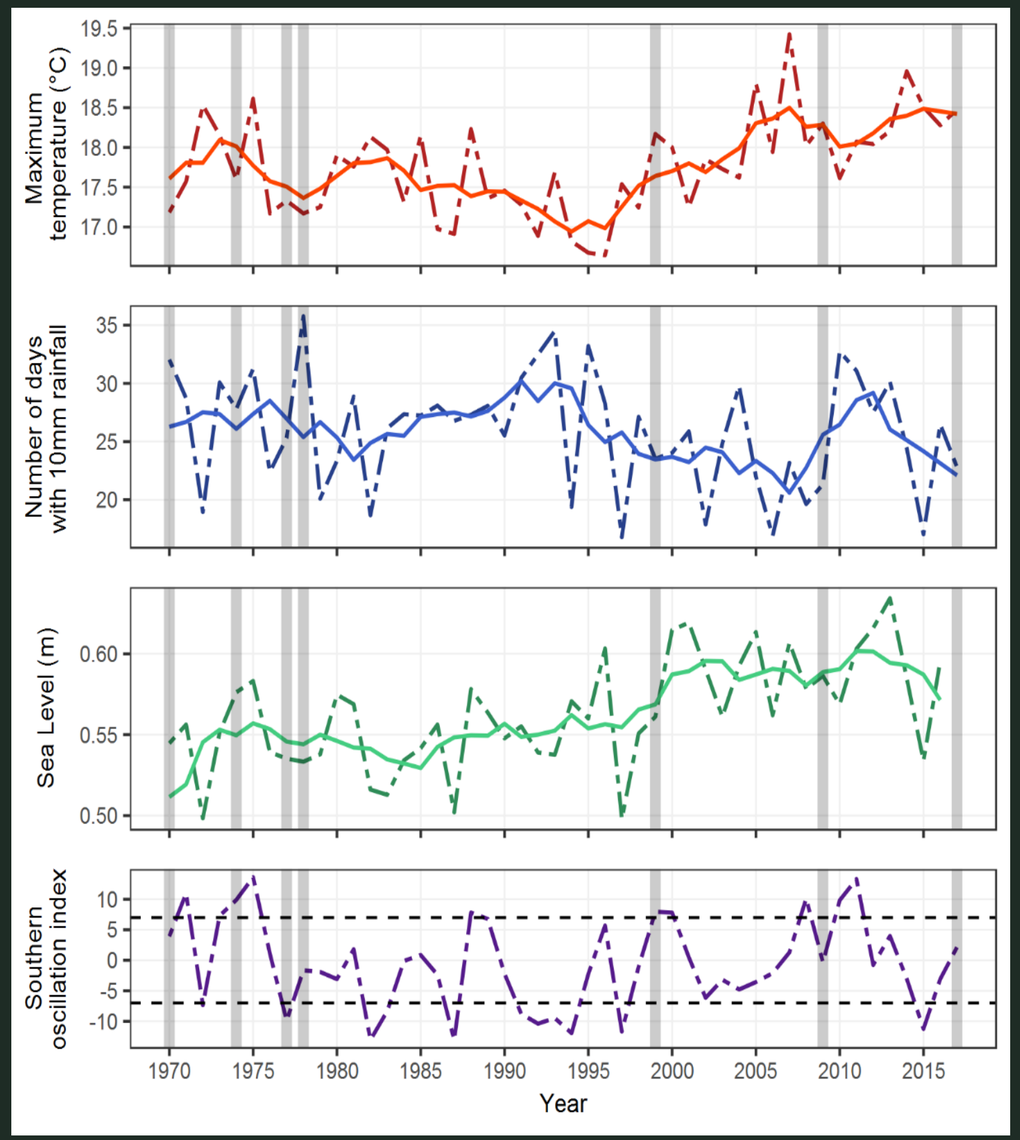
1) ENVI Feature Extraction Tool
   - Low pass filter aerial imagery
   - Grey level occurrence matrices
   - Elevation
2) Segmentation parameters
3) Supervised classification



Mangrove encroachment

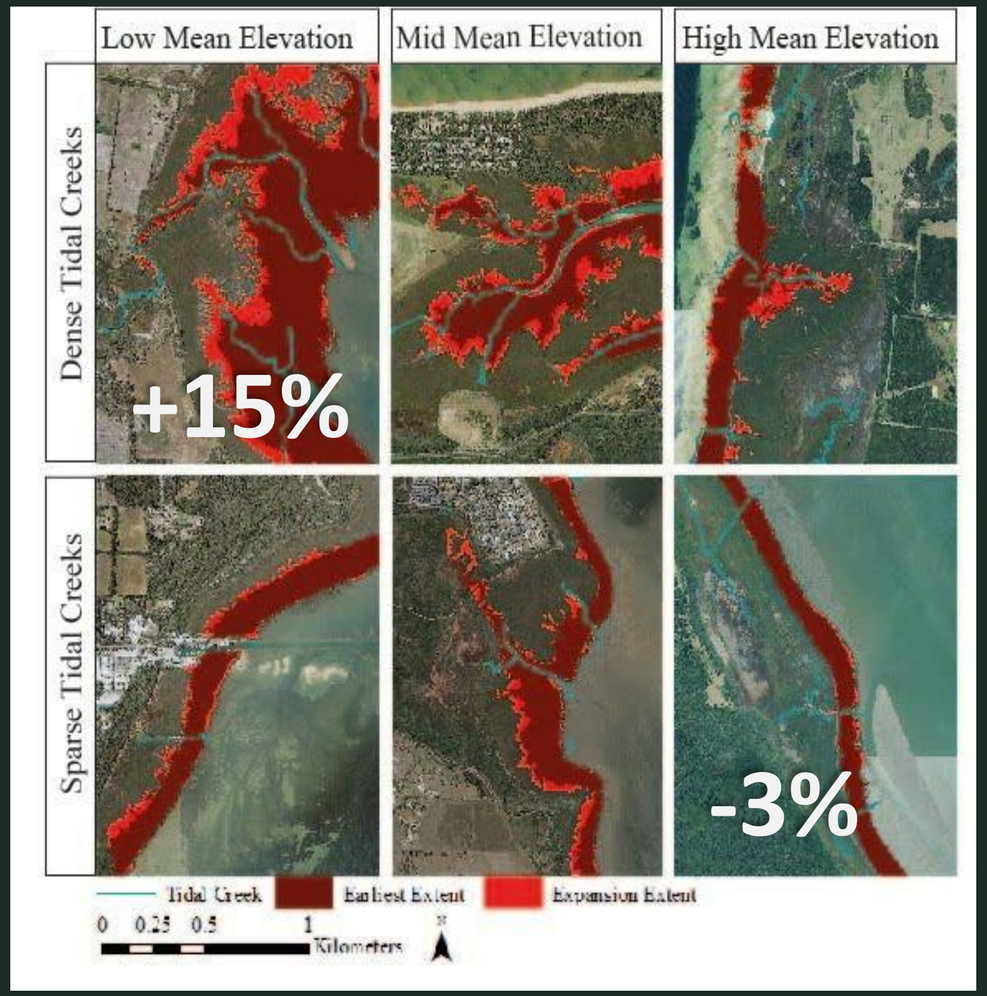
- Mangrove area had the largest net gain at the expense of saltmarsh
- Saltmarsh area continuously decreased at 12 sites
- Saltmarsh landward migration was negligible





Climatic drivers

- Mangrove area increased with drought like conditions
- Positive relationship with annual median maximum temperature ($p < 0.001$)
- Sea level rise not a significant driver



Geomorphic

- Sites with lower mean elevations were significantly more susceptible ($p < 0.001$)
- Tidal creek density significantly increased mangrove encroachment ($p < 0.001$)
- Sites with shorter mean distance to ecotone boundary had significant increases in mangrove area ($p < 0.001$)

Management implications

- **Further research on assisting saltmarsh landward migration**
  - Removal of physical barriers
  - Adjusting elevation of adjacent land
  - Active planting
- **Areas with higher mean elevations and fewer tidal creeks could be prioritized**

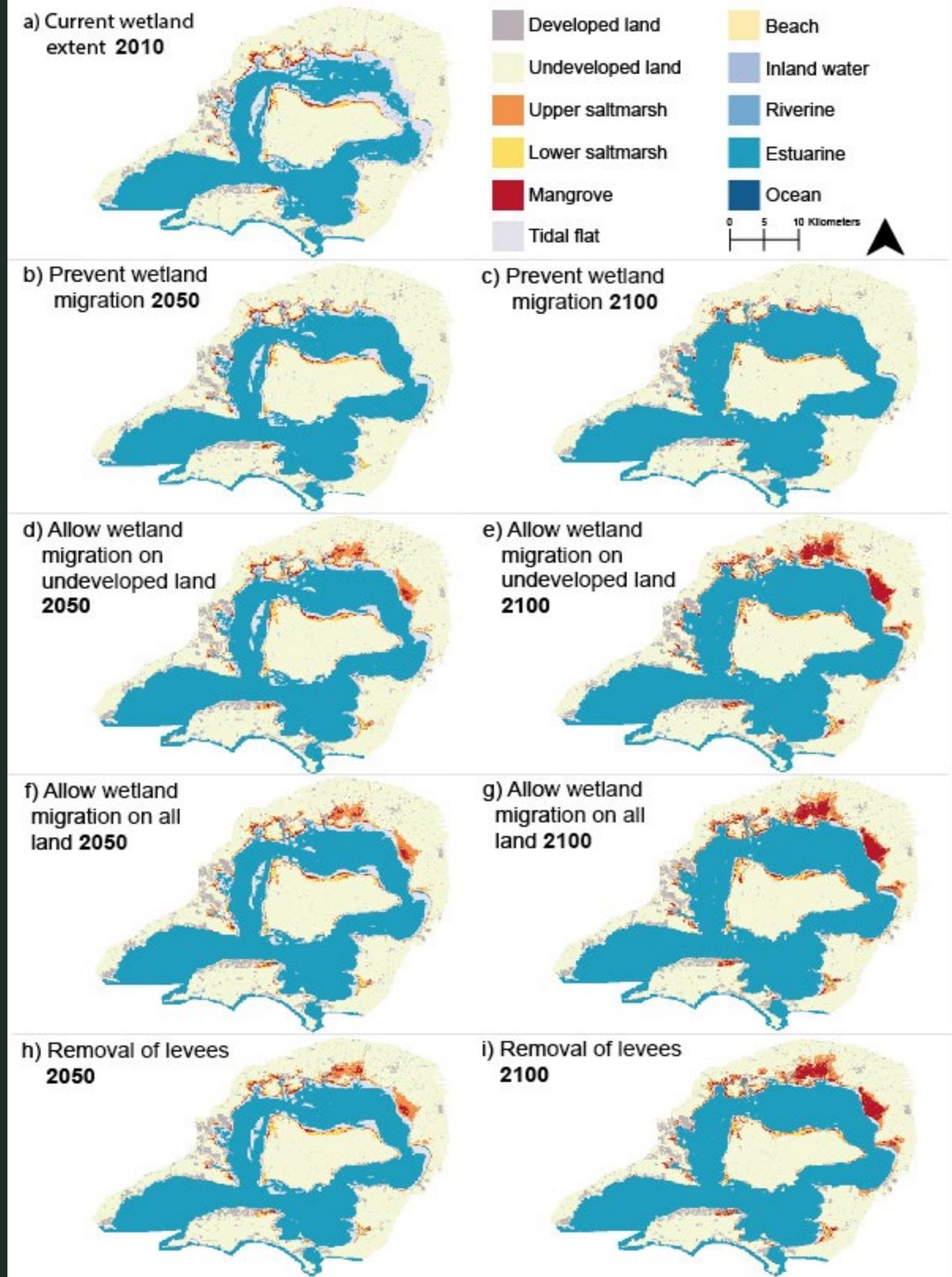
Adaptive management strategies for maintaining coastal wetlands under sea-level rise

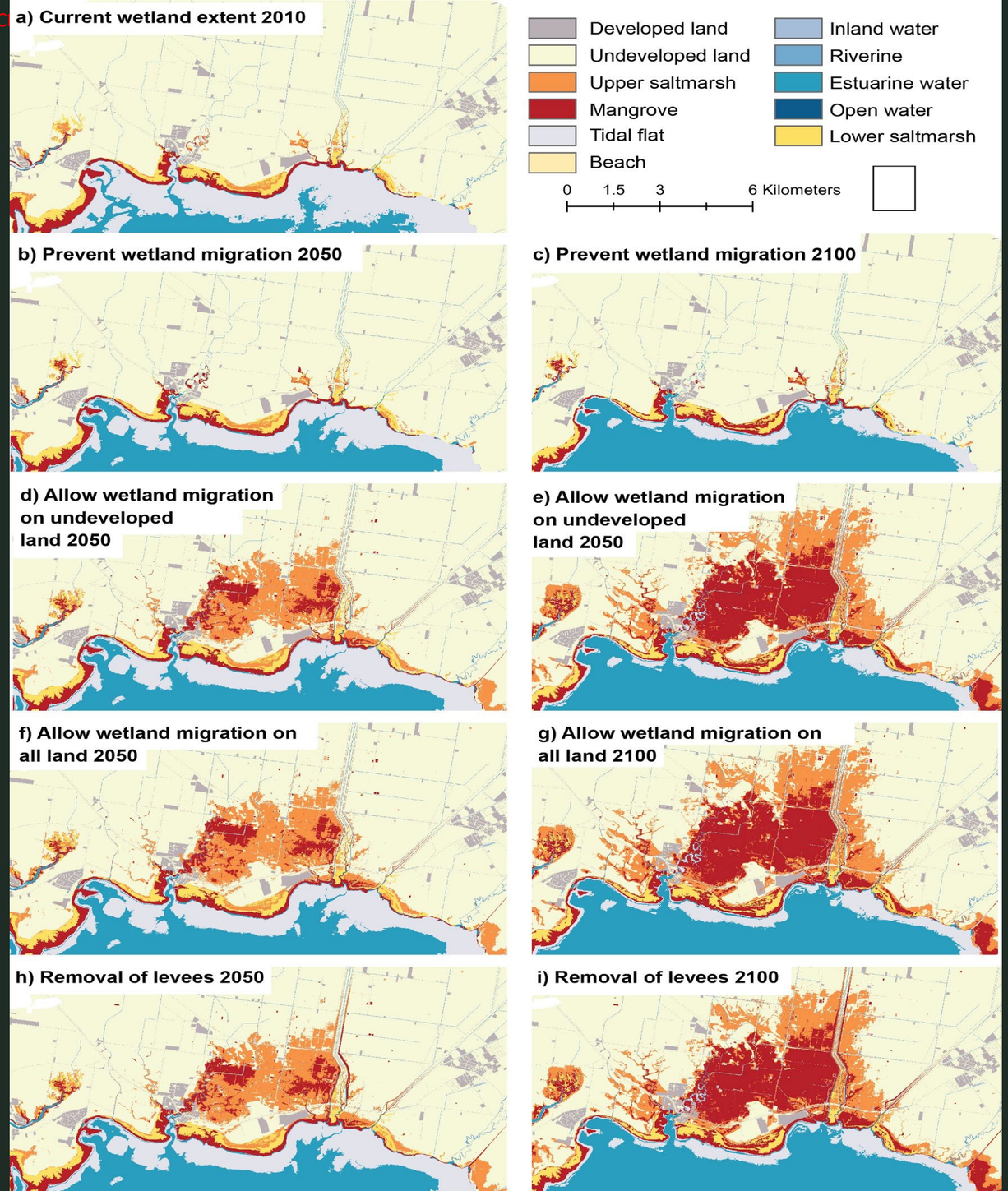
01. Prevent wetland migration

02. Allow wetland migration on undeveloped land

03. Allow wetland migration on all land

04. Allow wetland migration on undeveloped land &remove levees


a) Current wetland extent 2010
Developed land
Undeveloped land
Upper saltmarsh
Lower saltmarsh
Mangrove
Tidal flat
Beach
Inland water
Riverine
Estuarine
Ocean
0 5 10 Kilometers
b) Prevent wetland migration 2050
c) Prevent wetland migration 2100
d) Allow wetland migration on undeveloped land 2050
e) Allow wetland migration on undeveloped land 2100
f) Allow wetland migration on all land 2050
g) Allow wetland migration on all land 2100
h) Removal of levees 2050
i) Removal of levees 2100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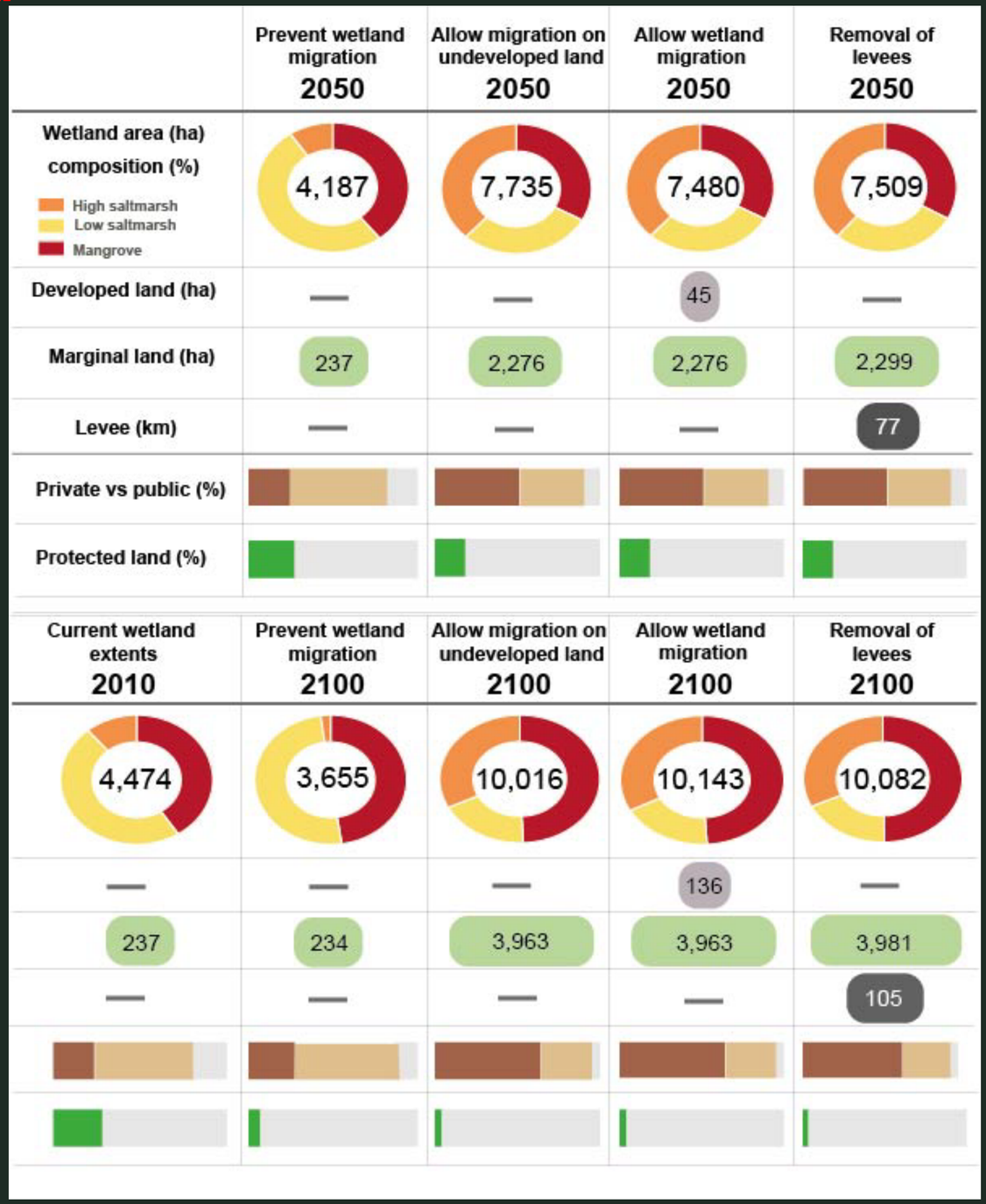
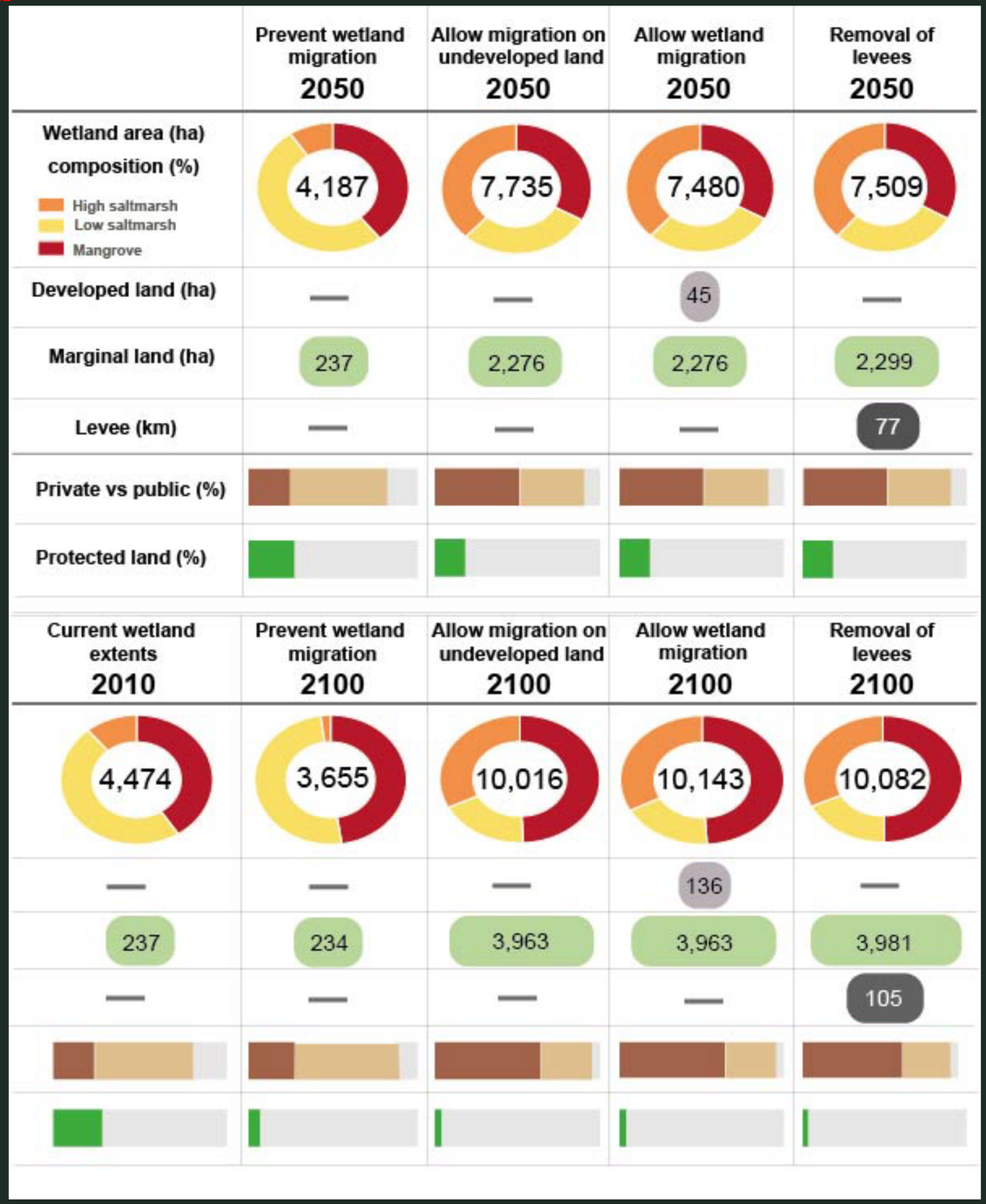
SLAMM Summary

- Opportunity to increase wetland area by 67–73% by 2050 and 124–127% by 2100
- Allowing wetland migration on undeveloped land most effective
- Shift in wetland community composition by 2100, mangroves will expand



SLAMM Summary

- Majority of space available for wetland migration occurs on private agricultural land
- Protected areas will need to be expanded to accommodate landward migration



01. Facilitate landward migration

If landward migration is prevented, there could be an estimated 6% loss of wetlands by 2050 and 18% by 2100.

Adaptive management strategies could increase wetland extents 67-73% by 2050 and over double the current wetland area by 2100.

02. Mangrove area will expand

Mangroves have encroached into saltmarshes since 1970s.

By 2050, if landward migration is facilitated, saltmarsh area could increase. However, areas could transition into mangroves by 2100 under accelerated rates of sea-level rise.

03. Importance of land tenure

By 2050, 51% of the total area for potential wetlands is on privately owned land. This increases to 64% by 2100.

THANK YOU

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