



National Environmental
Research Program

Project 9.1

Decision support for a vulnerable GBR under environmental change

Ken Anthony, Nick Wolff, Pete Mumby, Karlo
Hock, Michelle Devlin, Roger Beeden



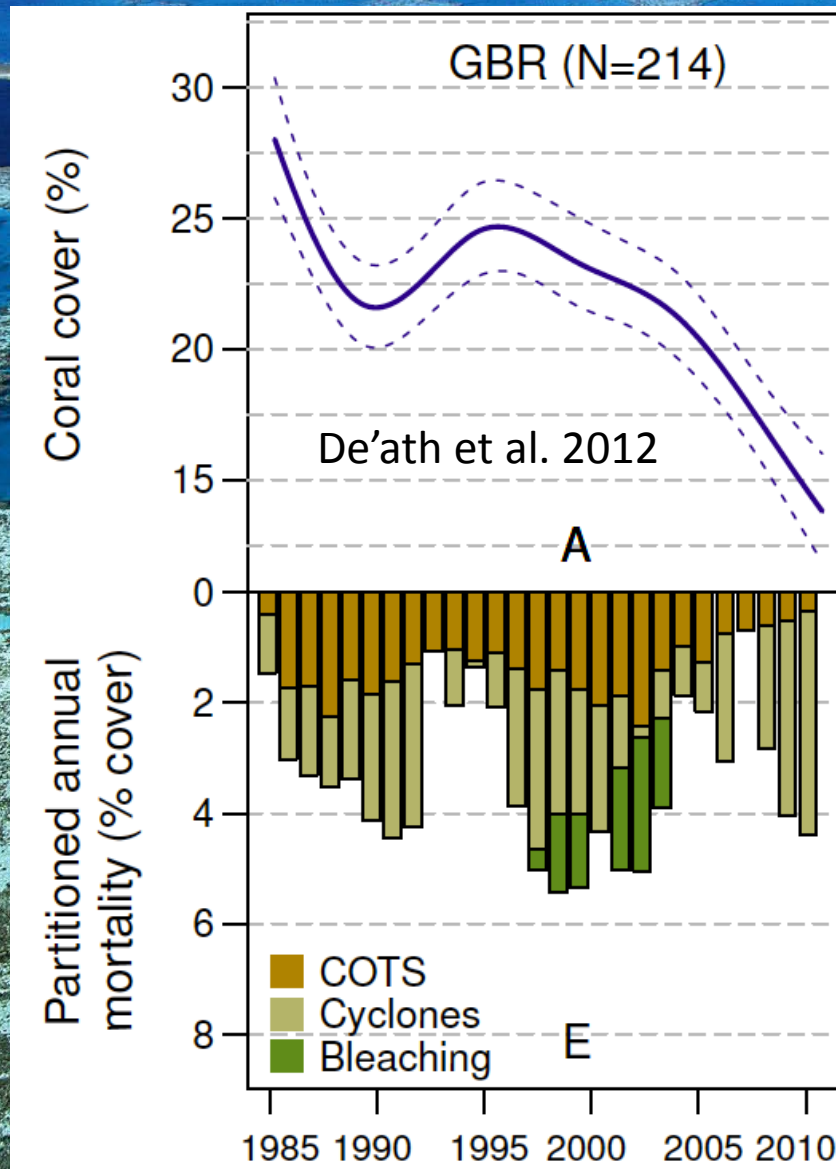
MSEL
Marine Spatial Ecology Lab



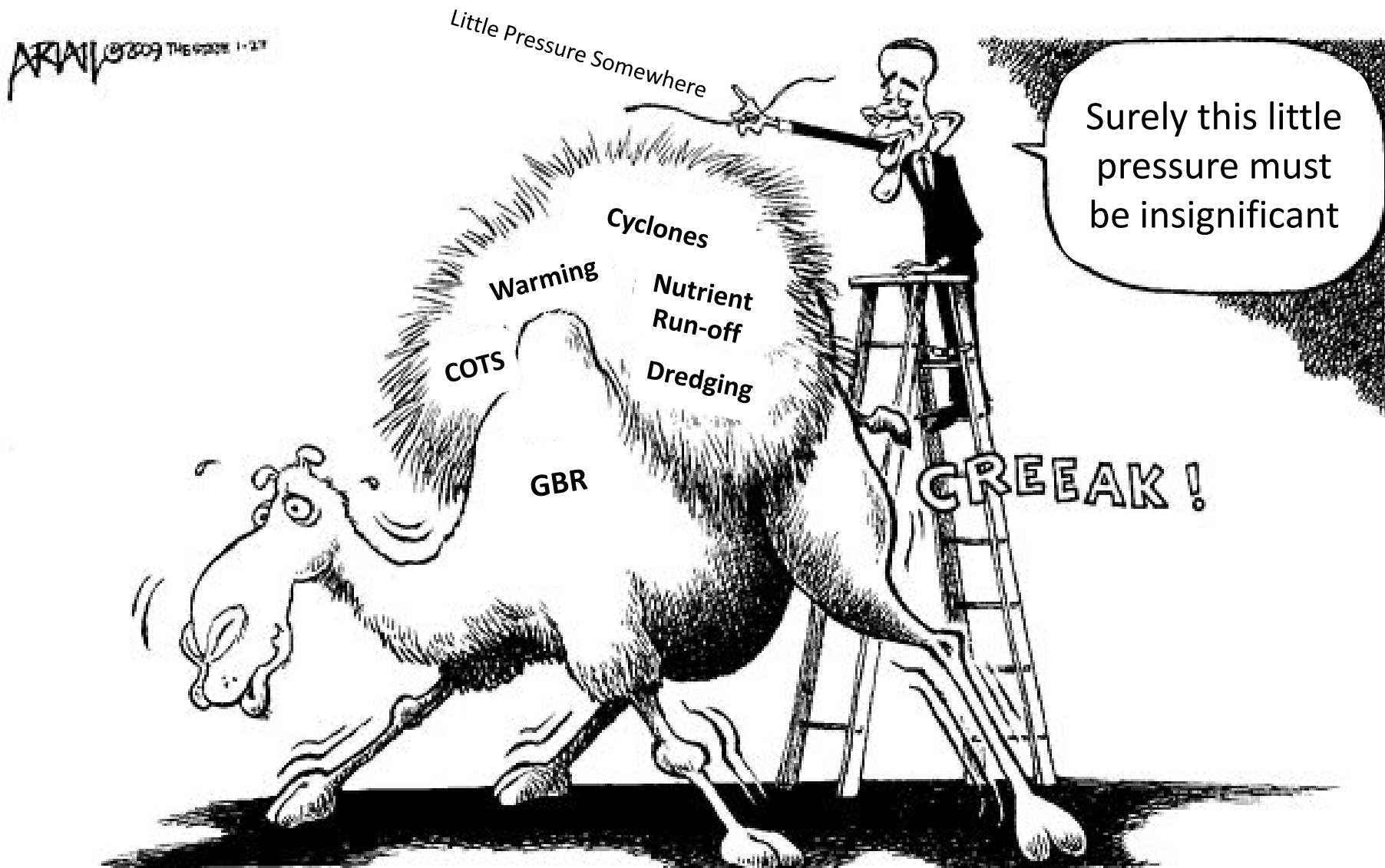
NERP Environmental Decisions Hub



A Vulnerable or Resilient Great Barrier Reef ?

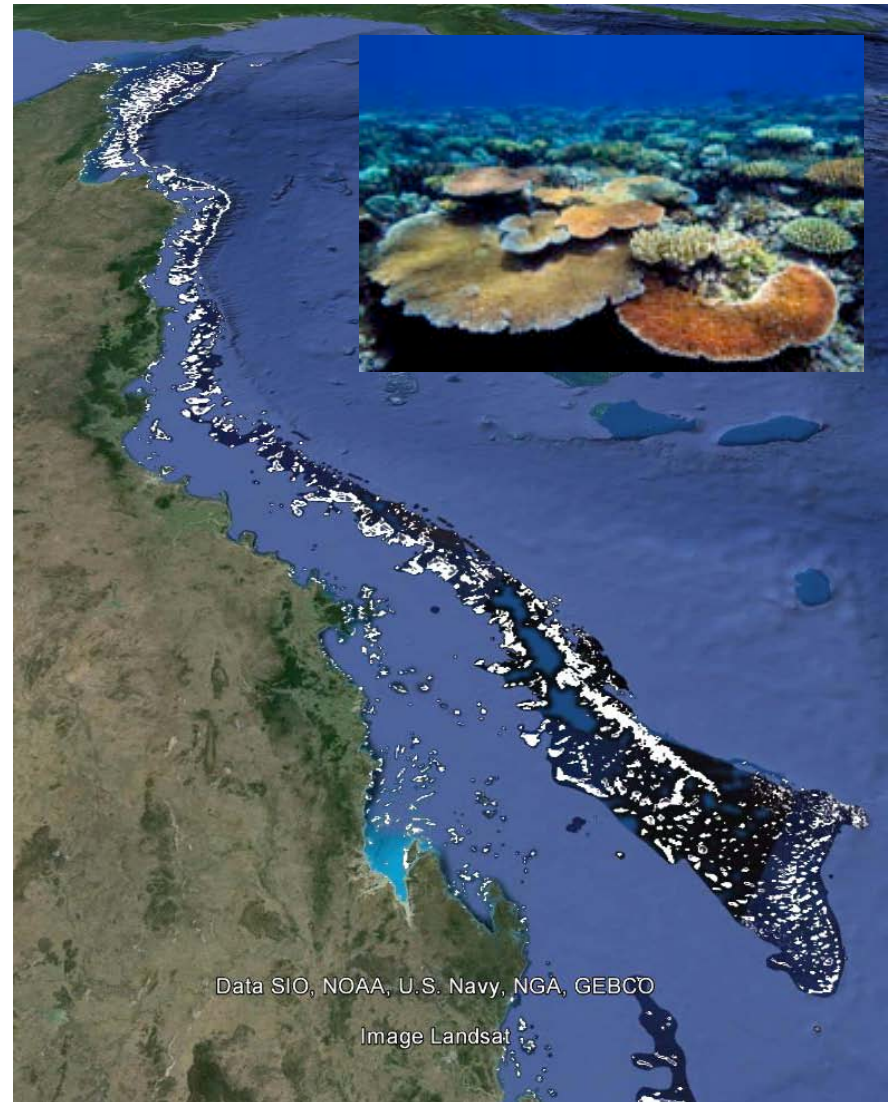


Cumulative impacts – what's the last straw?



Objective 1 of 2

- **Develop spatial understanding of vulnerability and resilience of GBR corals as we move towards year 2050**



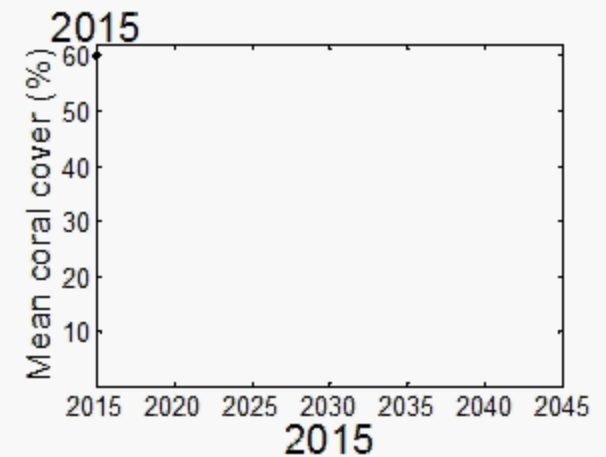
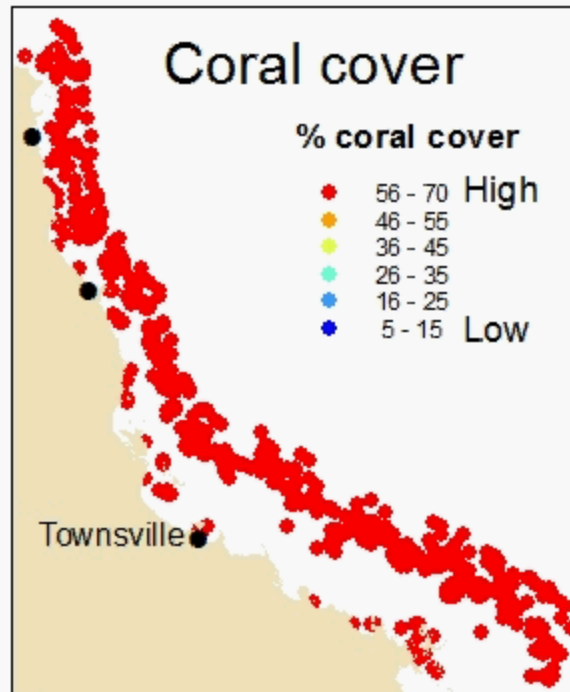
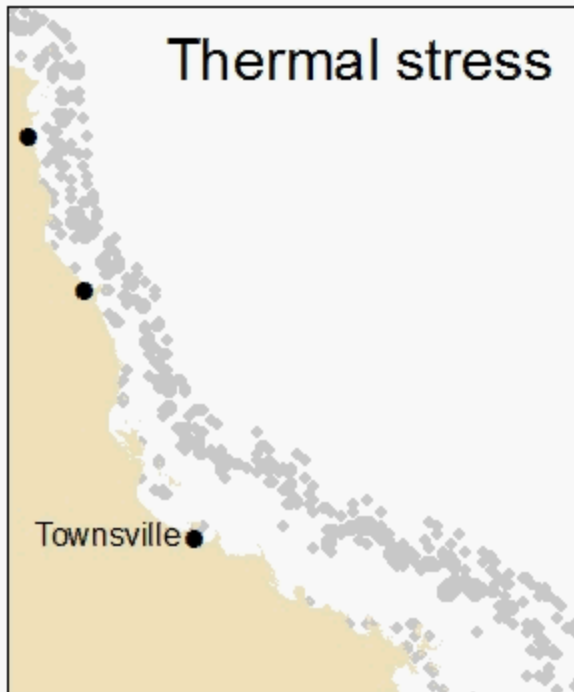
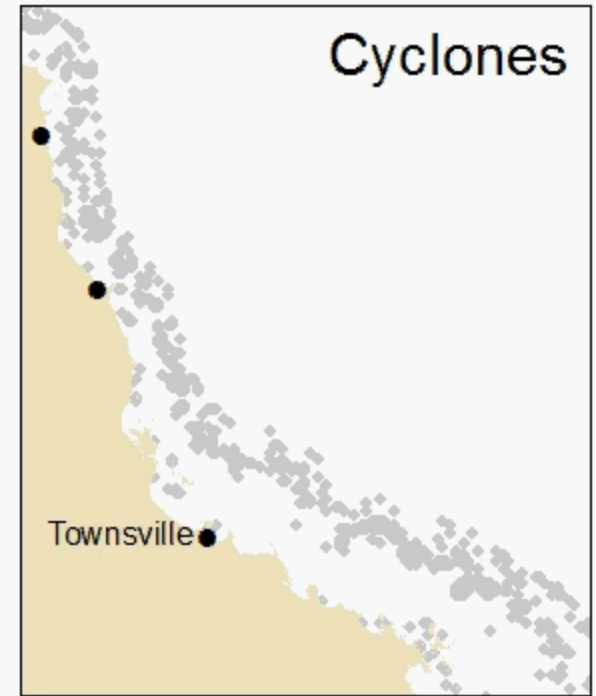
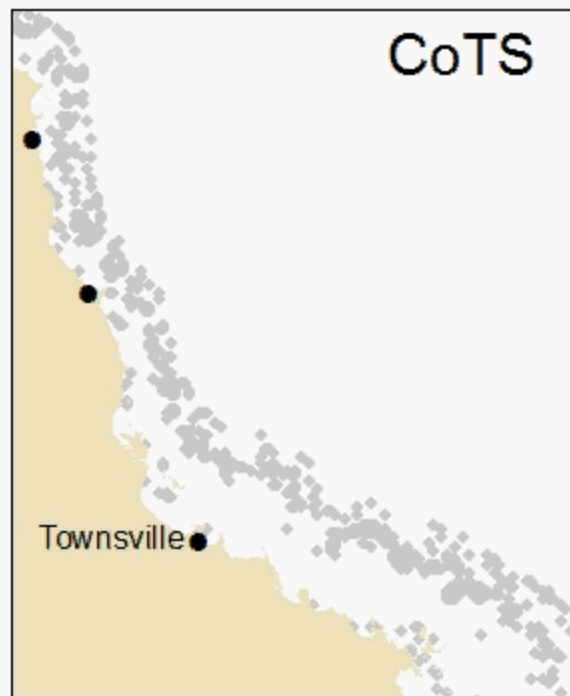
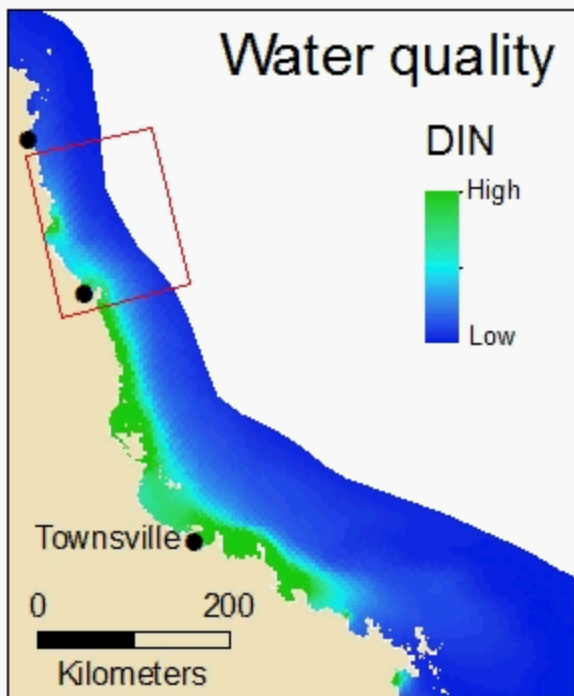


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Objective 2 of 2

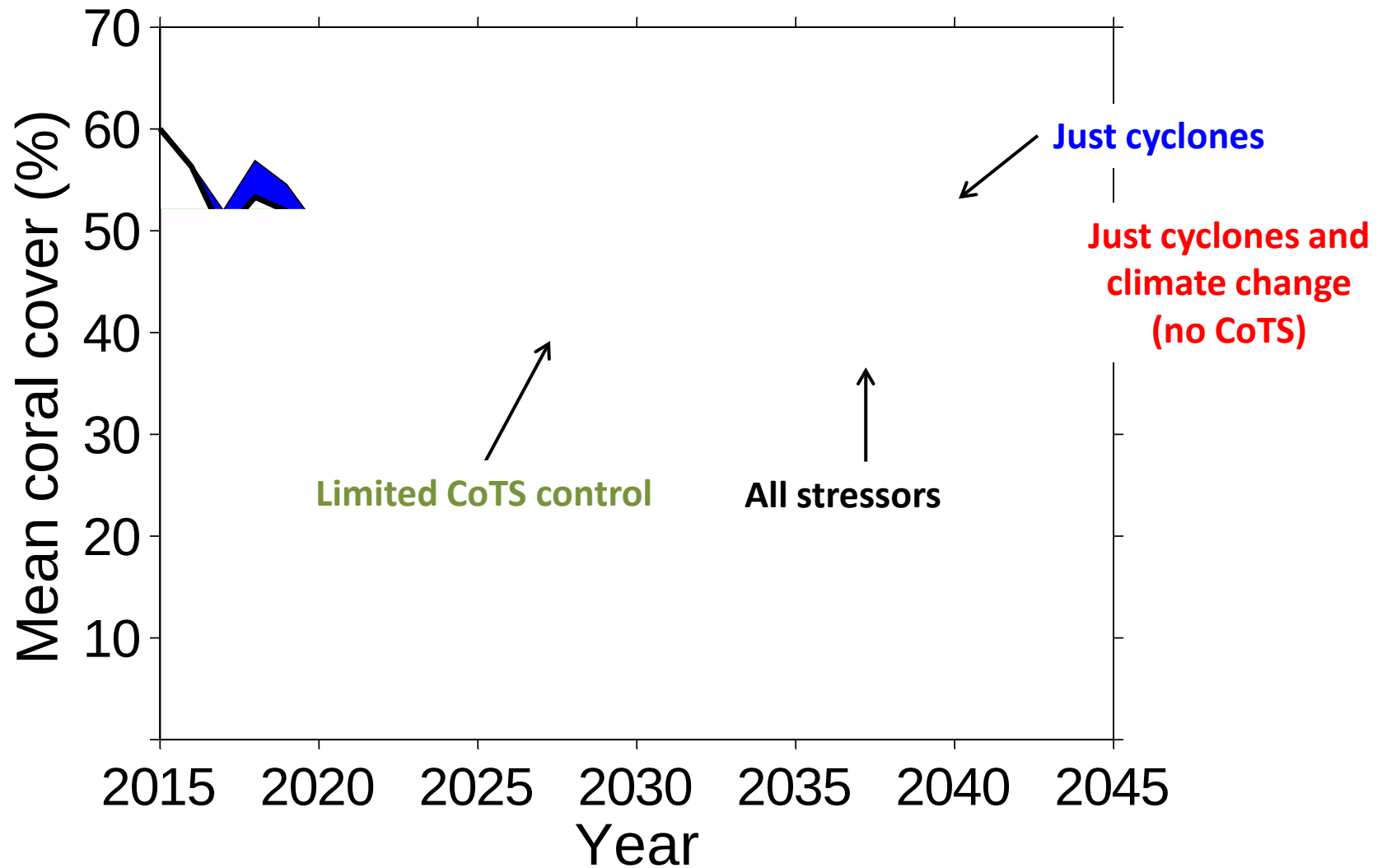
- Guide **effective management decisions to protect GBR corals** – what reefs can we / should we protect and how?





Wolff et al. ms

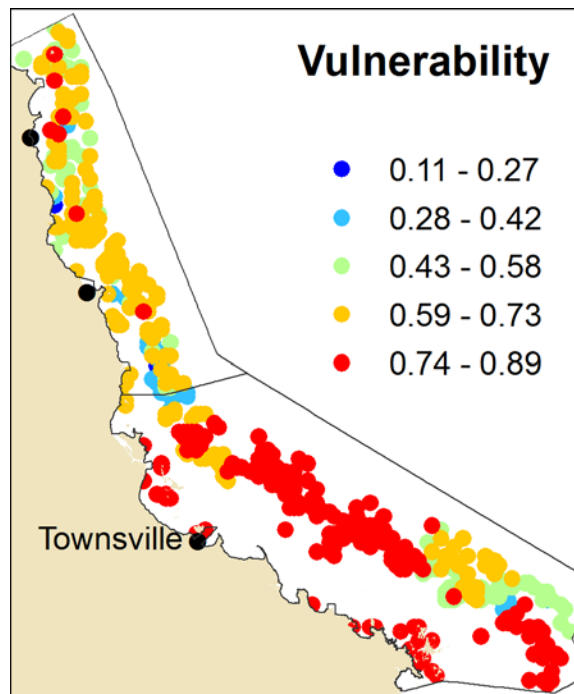
Limiting CoTS contribution to potential outcomes

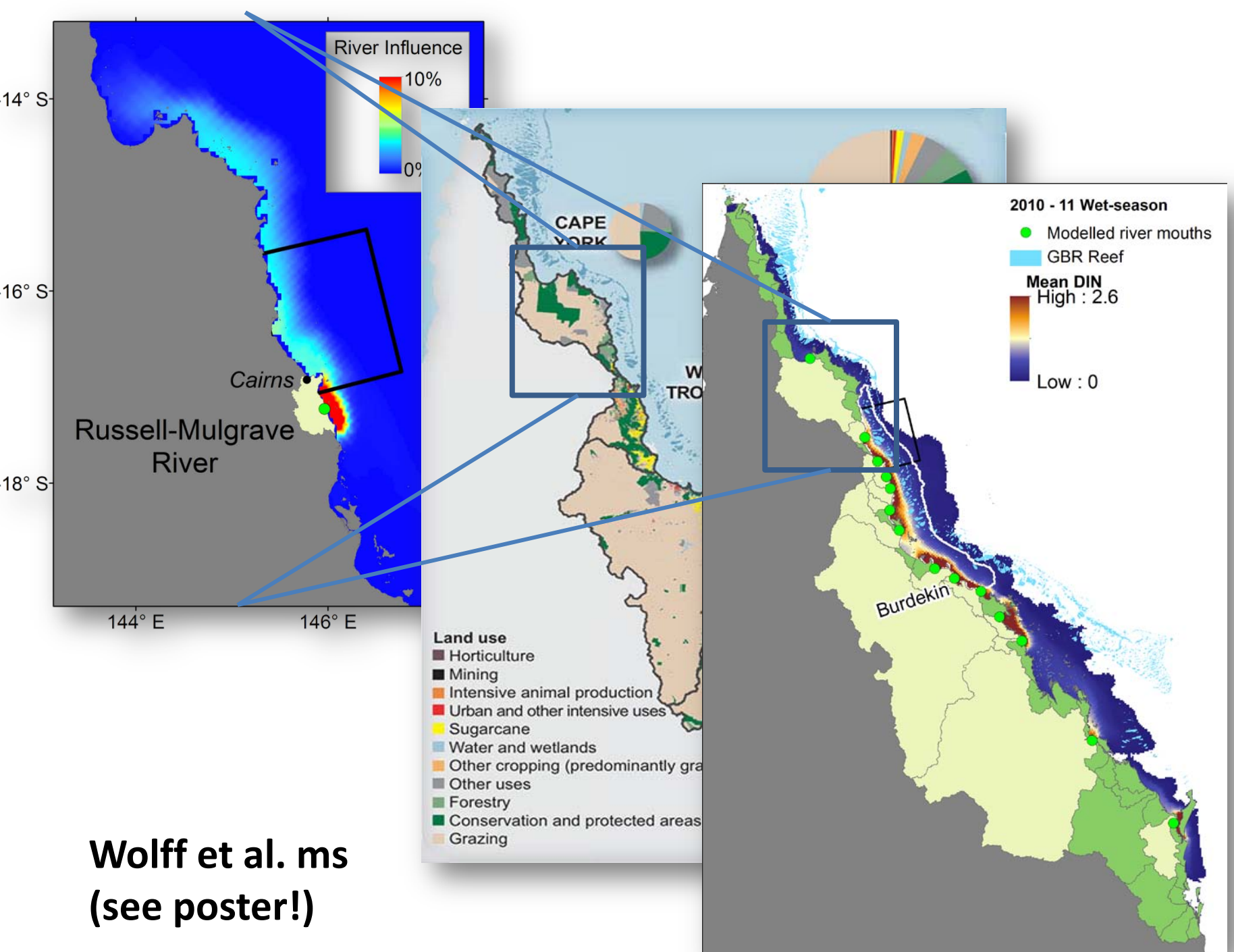


Modified from Mumby and Anthony (in review)

Can help (1) identify reefs that will give best return on management investment
(2) guide the design of targeted monitoring programs

All stressors combined





Wolff et al. ms
(see poster!)

Framework

SCENARIO MODELLING

LOCAL / REGIONAL

Land-use
practices

Coastal
development

GLOBAL / REGIONAL

Cyclones

Ocean
warming

OA

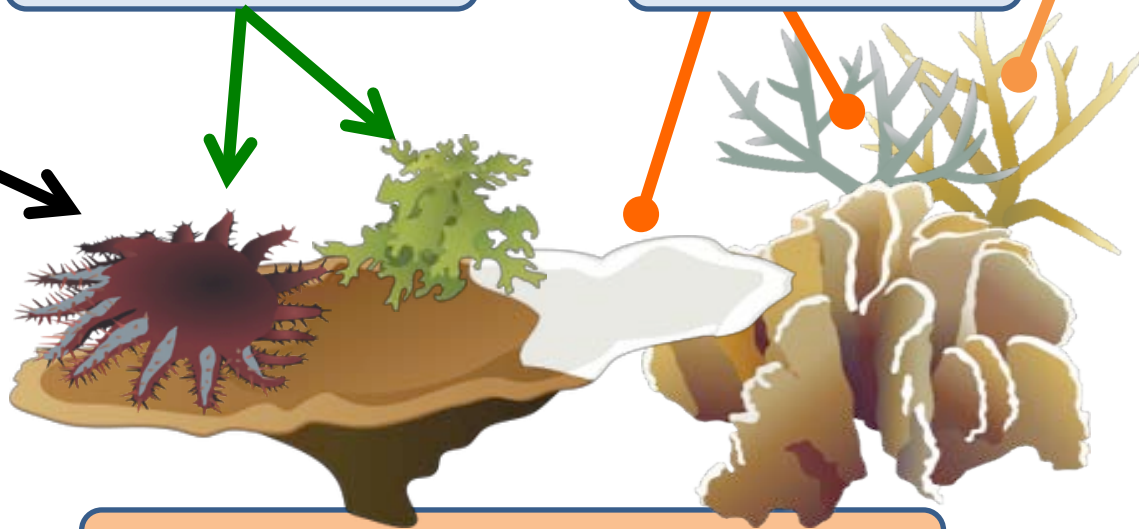
DECISION ANALYSES

Management
options /
alternatives

Review of results
against **objectives**:
min vulnerability &
max resilience

Run-off and nutrient
export

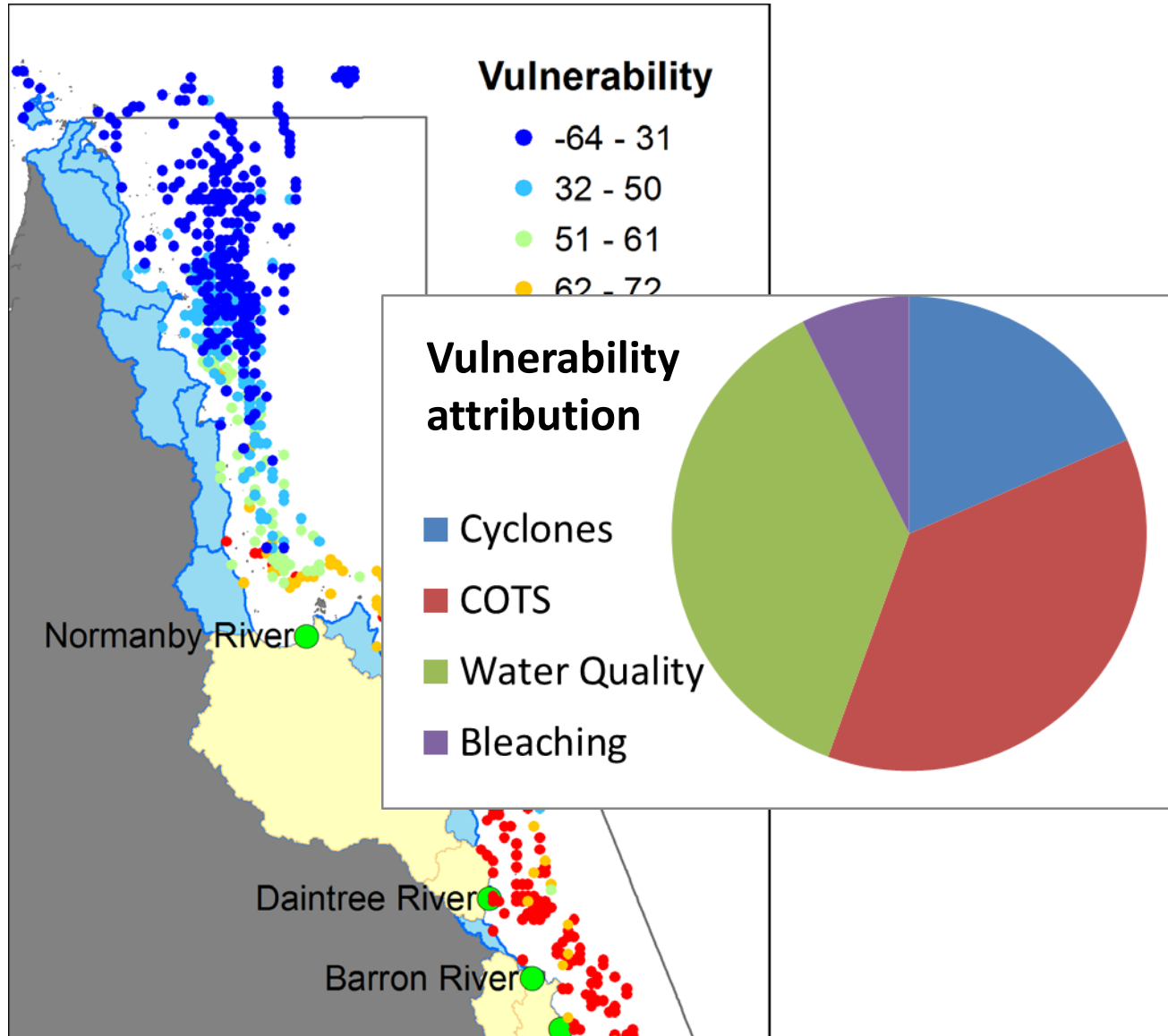
Coral bleaching
and disease



Coral vulnerability or resilience

ECOSYSTEM MODEL

Scenario: Status Quo



Framework

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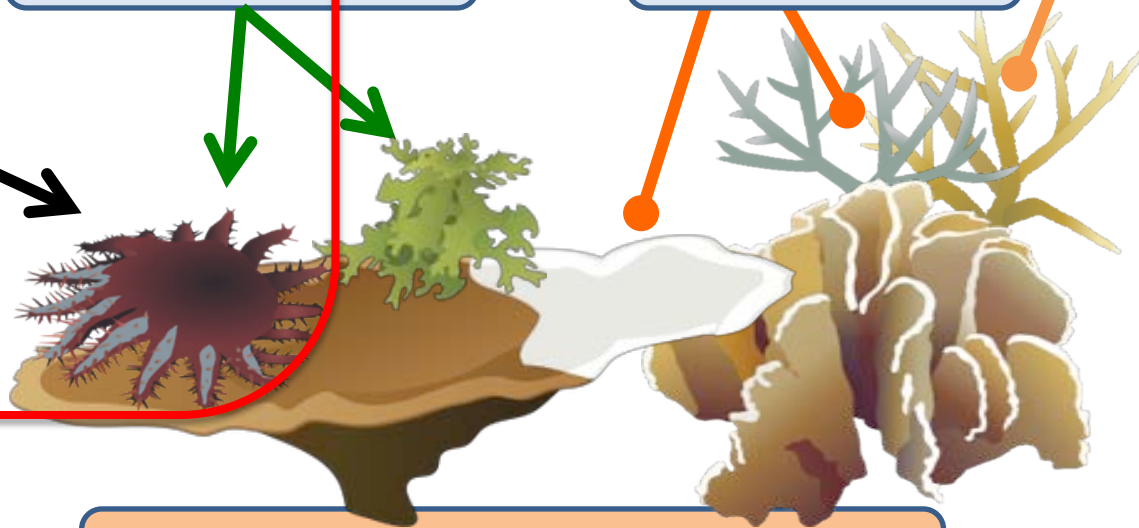
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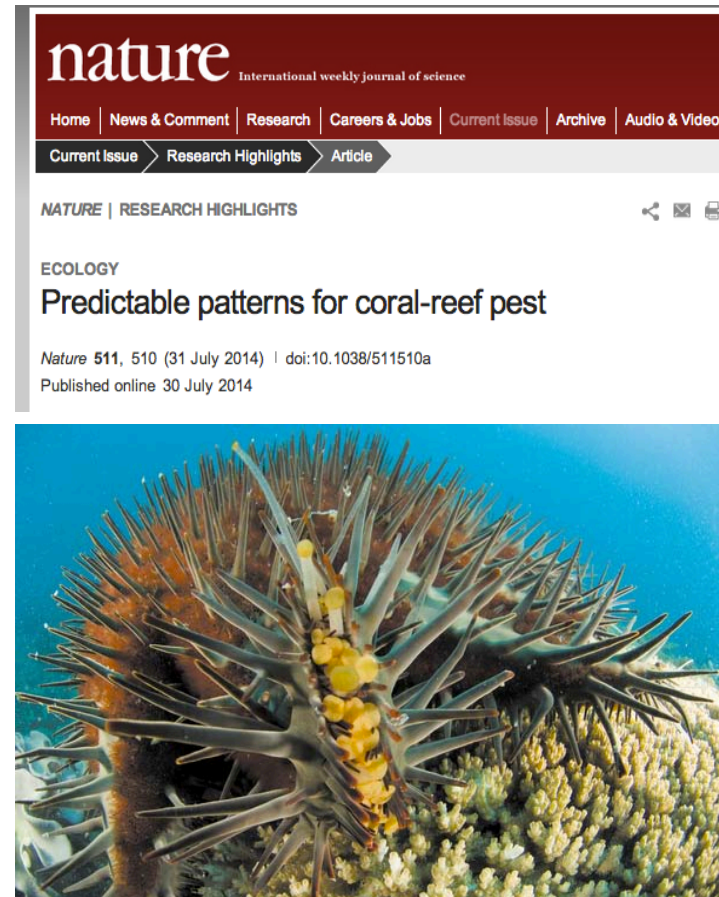
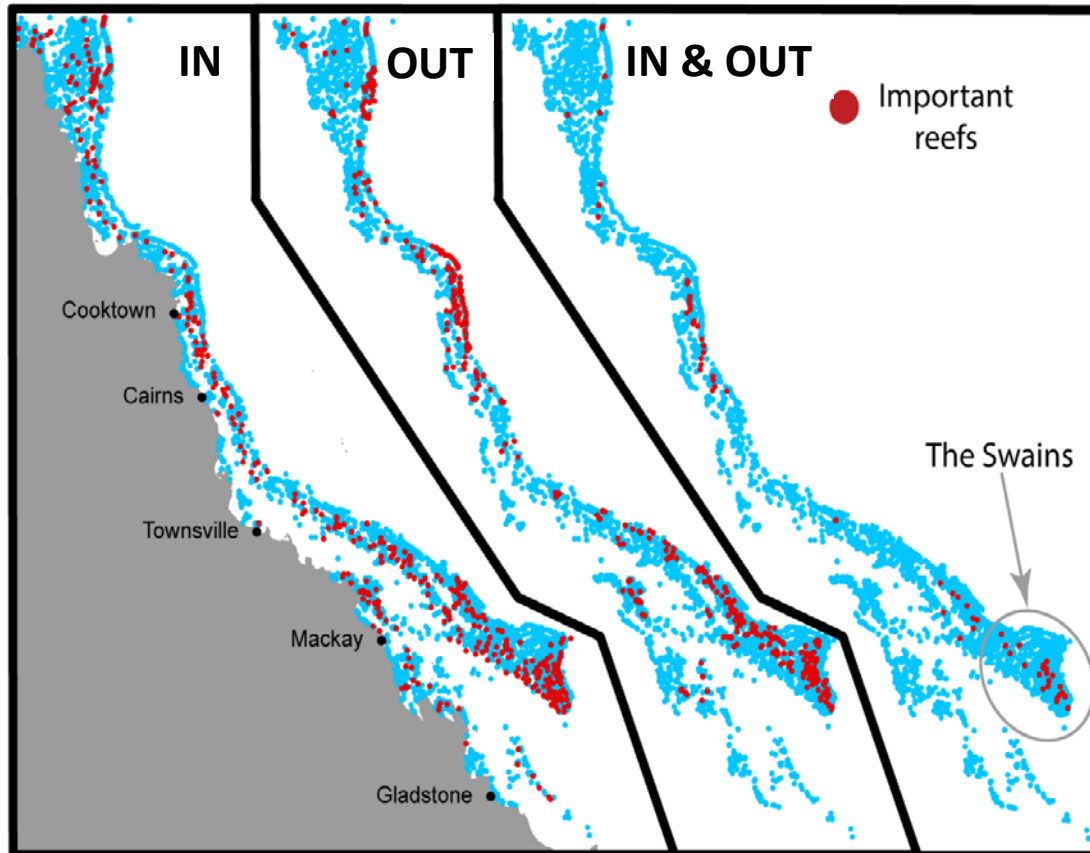
Coral vulnerability or resilience

ECOSYSTEM MODEL

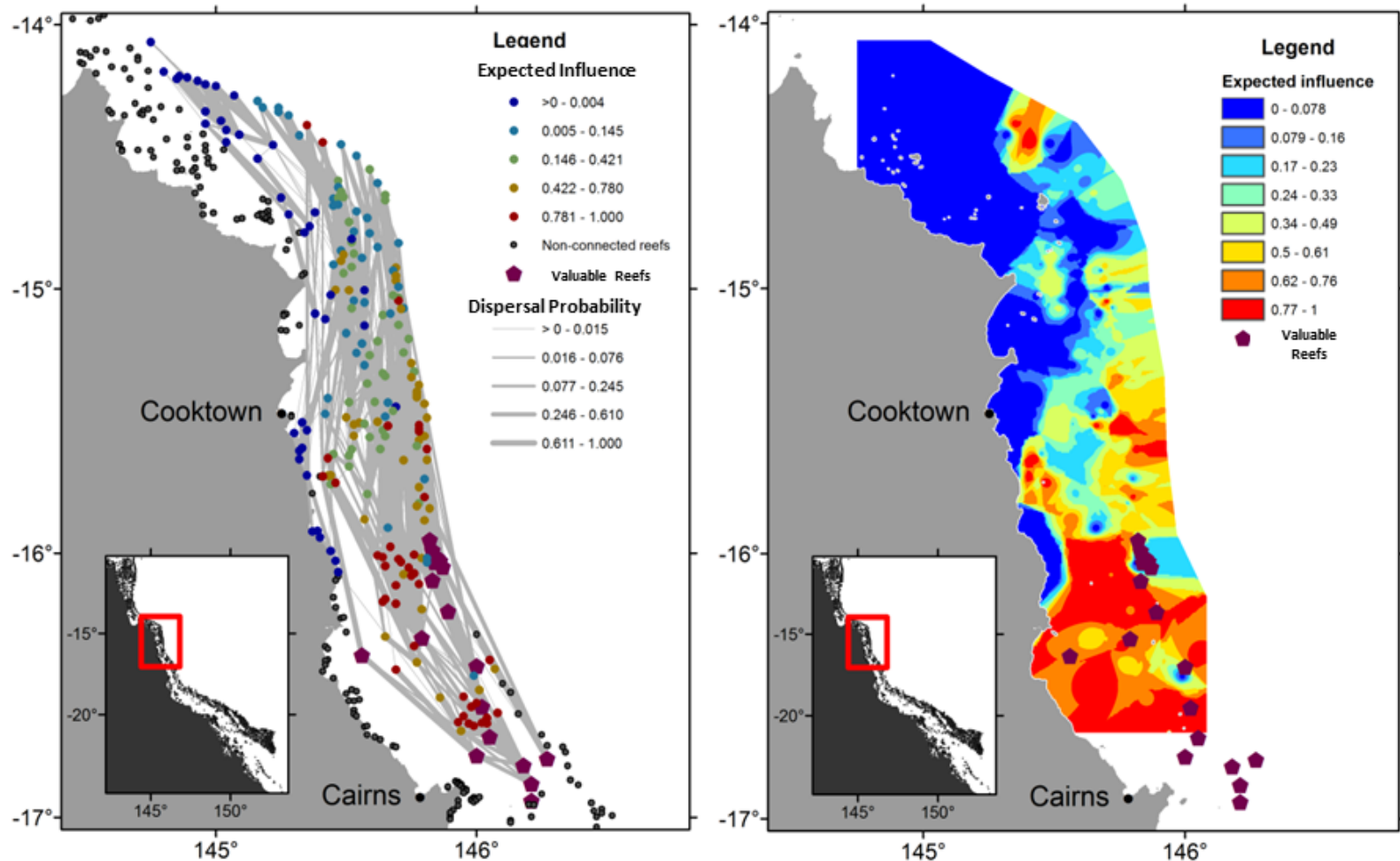


Connectivity networks reveal the risks of crown-of-thorns starfish outbreaks on the Great Barrier Reef

Karlo Hock^{1,2*}, Nicholas H. Wolff¹, Scott A. Condie³, Kenneth R. N. Anthony² and Peter J. Mumby¹



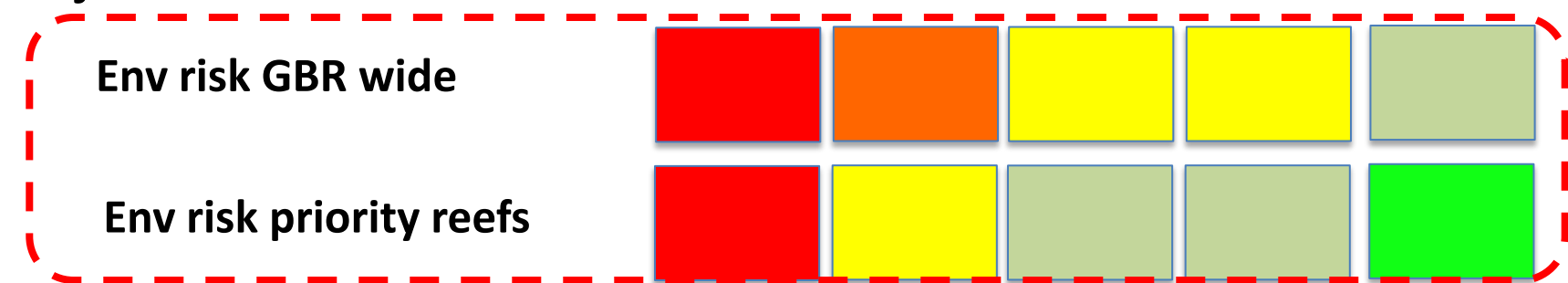
Connectivity pattern and threat assessment for valuable tourism reefs



Hock K, Wolff NH, Hoey J, Beeden R, Condie SA, Anthony KRN, Possingham HP, Mumby PJ.
Adaptive control in connectivity networks: a coral reef pest example. MS

Management alternatives, risks & consequences

Objectives



Cost to tourism industry

Cost to farmers

Mitig costs to Governm

Invitation!
Next steps in partnership with
GBRMPA, AMPTO, DotE and Qld Gov

Risk or cost:



Framework

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LOCAL / REGIONAL

Land-use practices

Coastal development

GLOBAL / REGIONAL

Cyclones

Ocean warming

OA

DECISION ANALYSES

Management options / alternatives

Review of results against **objectives**: min vulnerability & max resilience

Run-off and nutrient export

Coral bleaching and disease

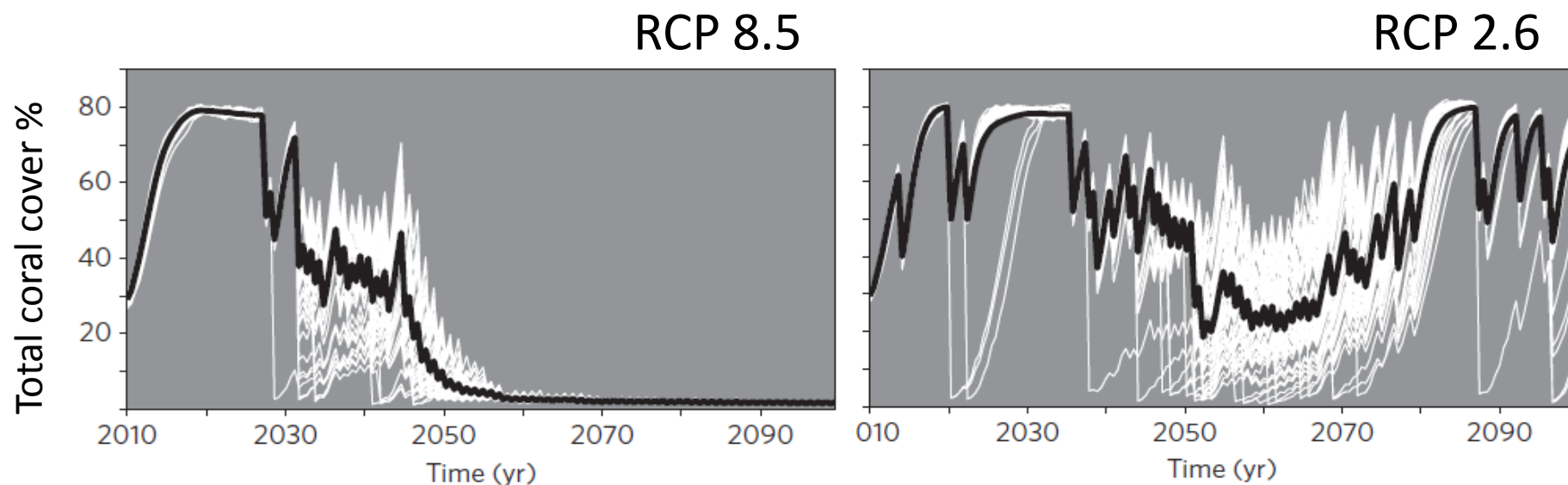


Coral vulnerability or resilience

ECOSYSTEM MODEL

Global disparity in the ecological benefits of reducing carbon emissions for coral reefs

Juan Carlos Ortiz^{1,2*}, Yves-Marie Bozec^{1,2}, Nicholas H. Wolff^{1,2}, Christopher Doropoulos^{1,2} and Peter J. Mumby^{1,2}



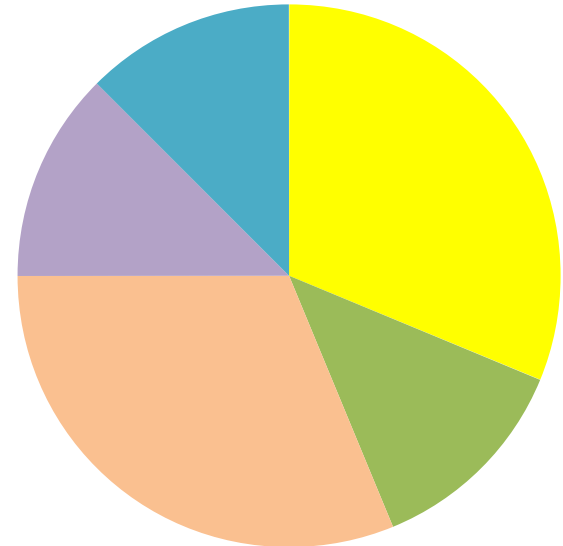
Coral vulnerability attributions under environmental change

Now

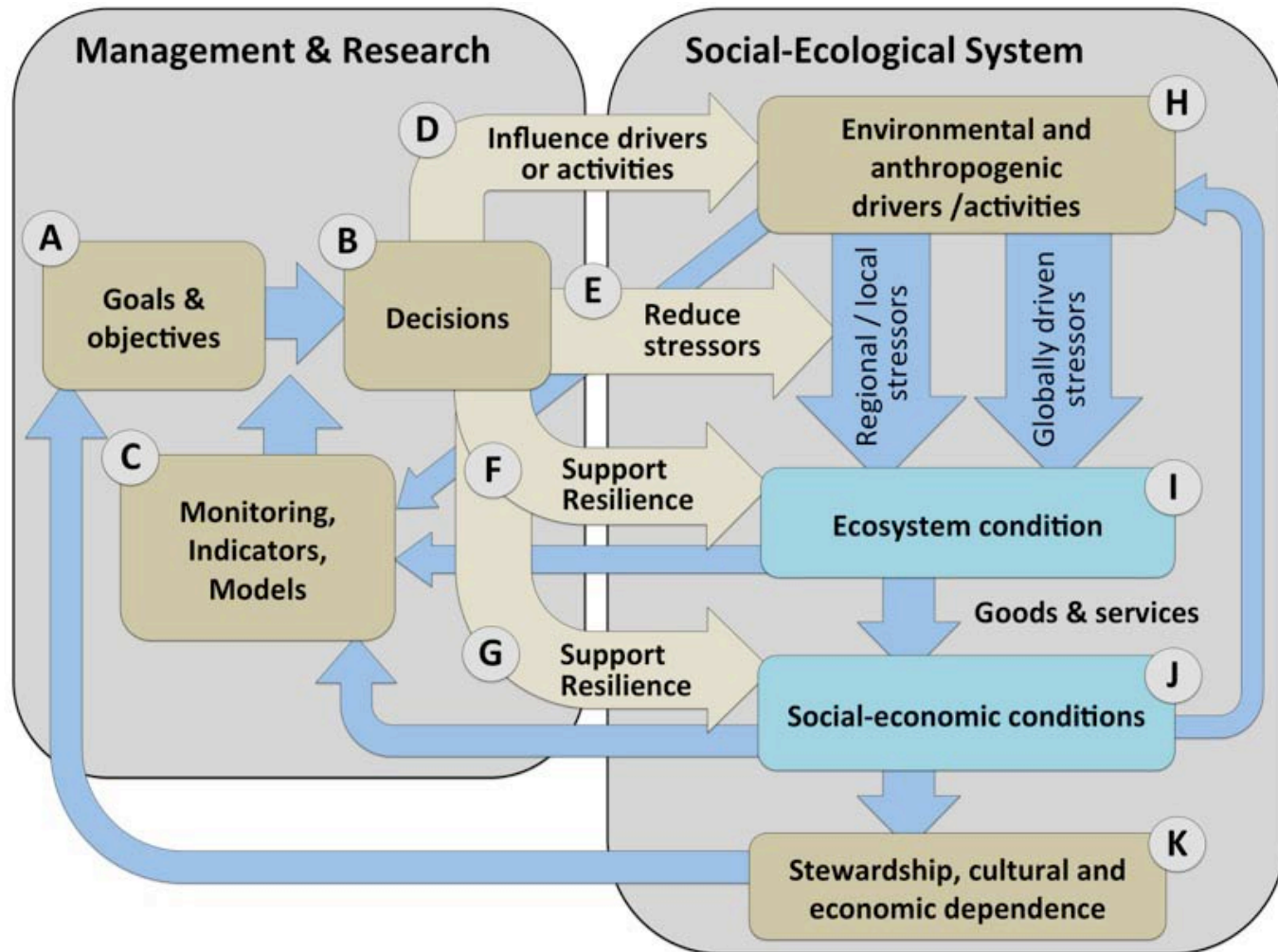


- Acidification
- Water Quality
- Bleaching
- COTS
- Cyclones

Later



RESEARCH REVIEW



Operationalizing resilience for adaptive reef management
(Anthony, Marshall, Beeden, Mumby and 24 co-authors, 2014)



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Thank you!

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