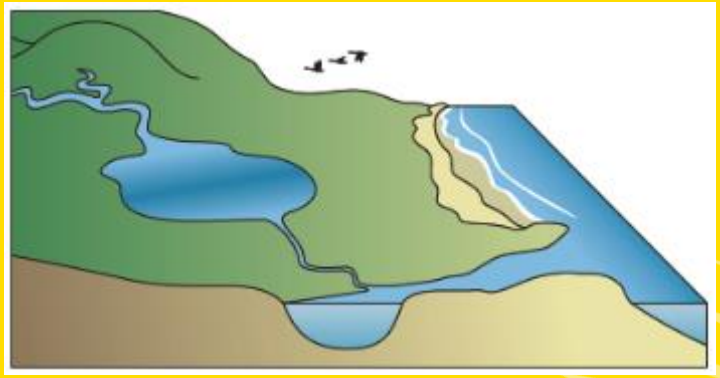

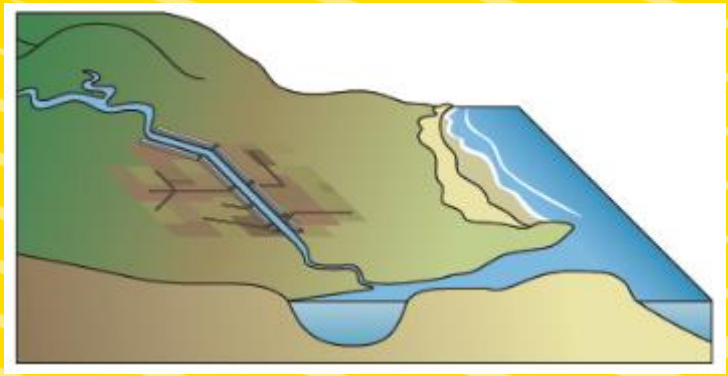

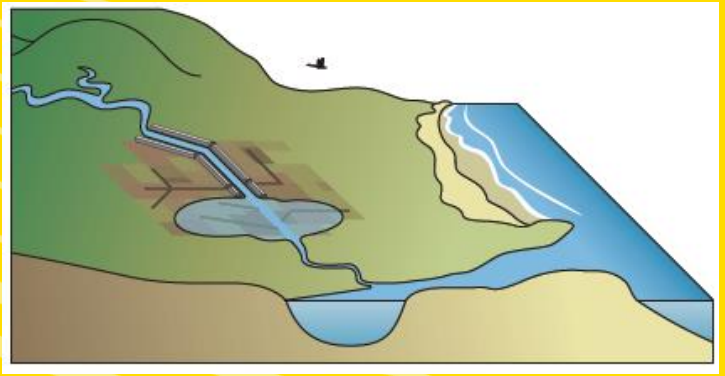

Creating Blue Carbon Ecosystems: "How to…"

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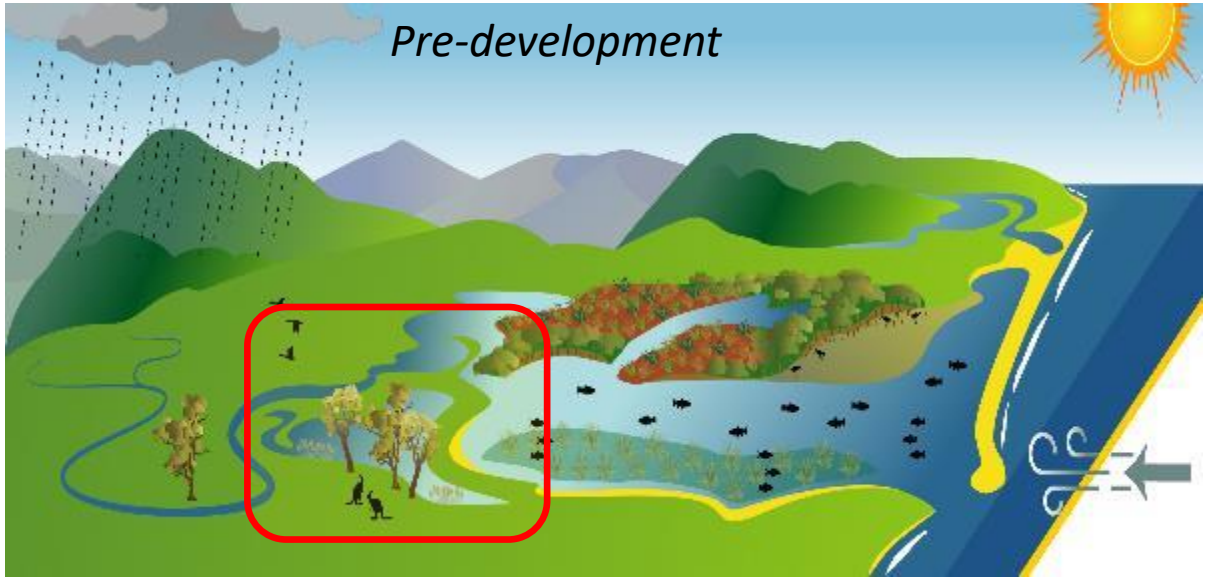
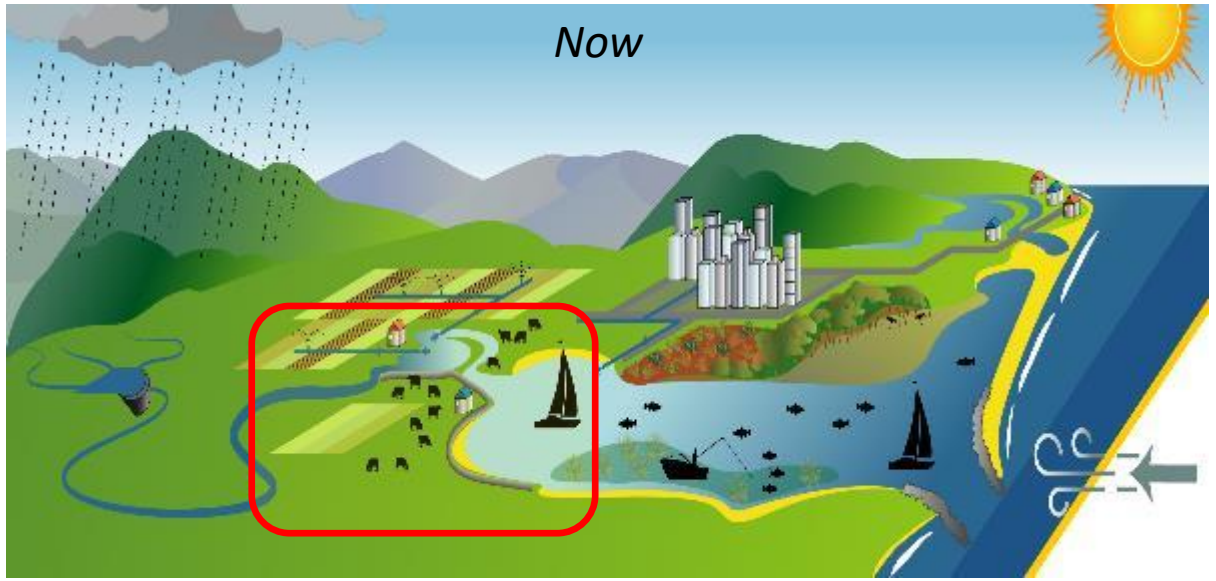
School of Civil and Environmental Engineering

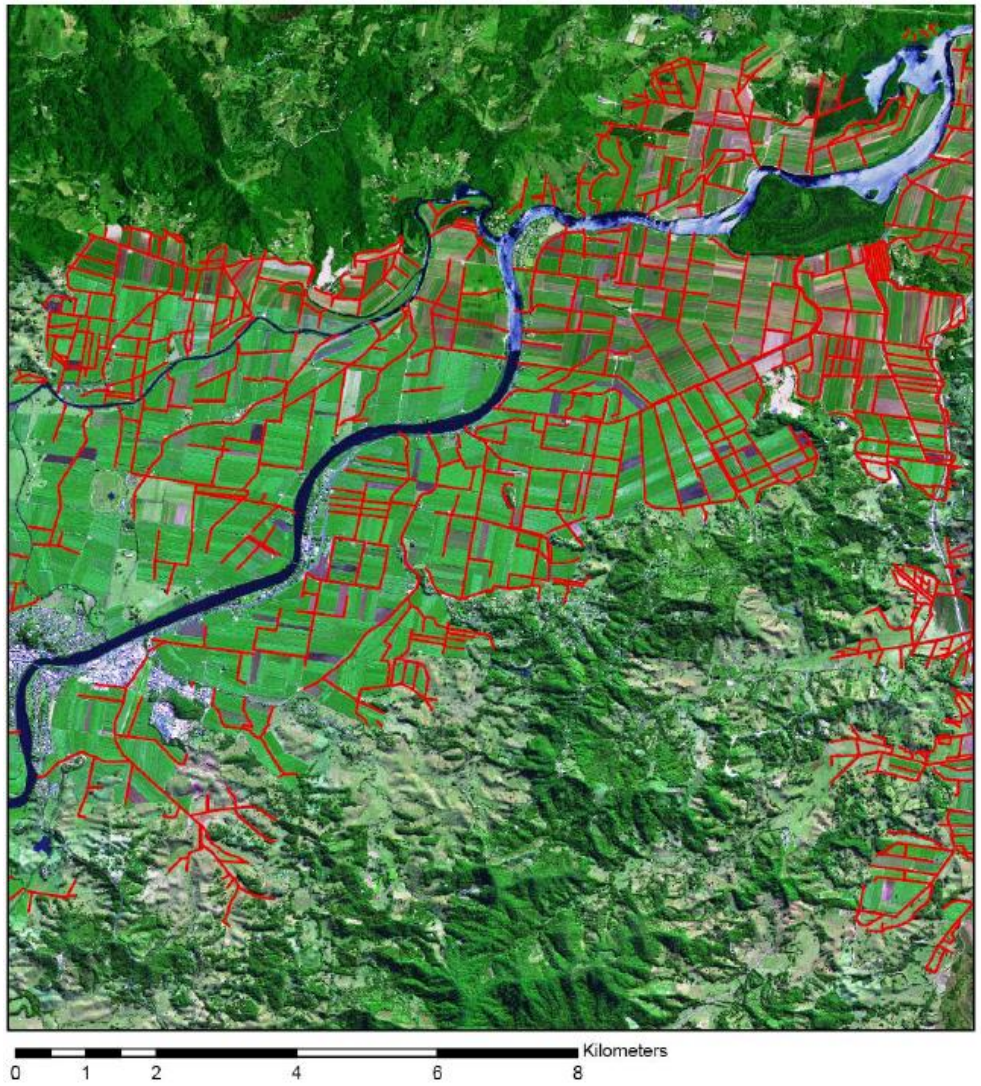
A/Professor Will Glamore
e. w.glamore@unsw.edu.au
m. 0404 822 080

Blue Carbon Method



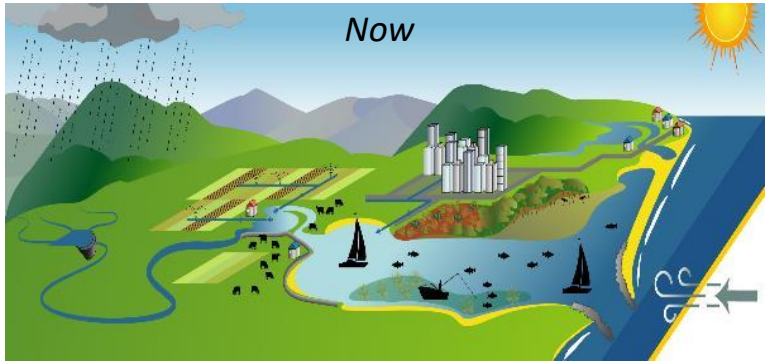


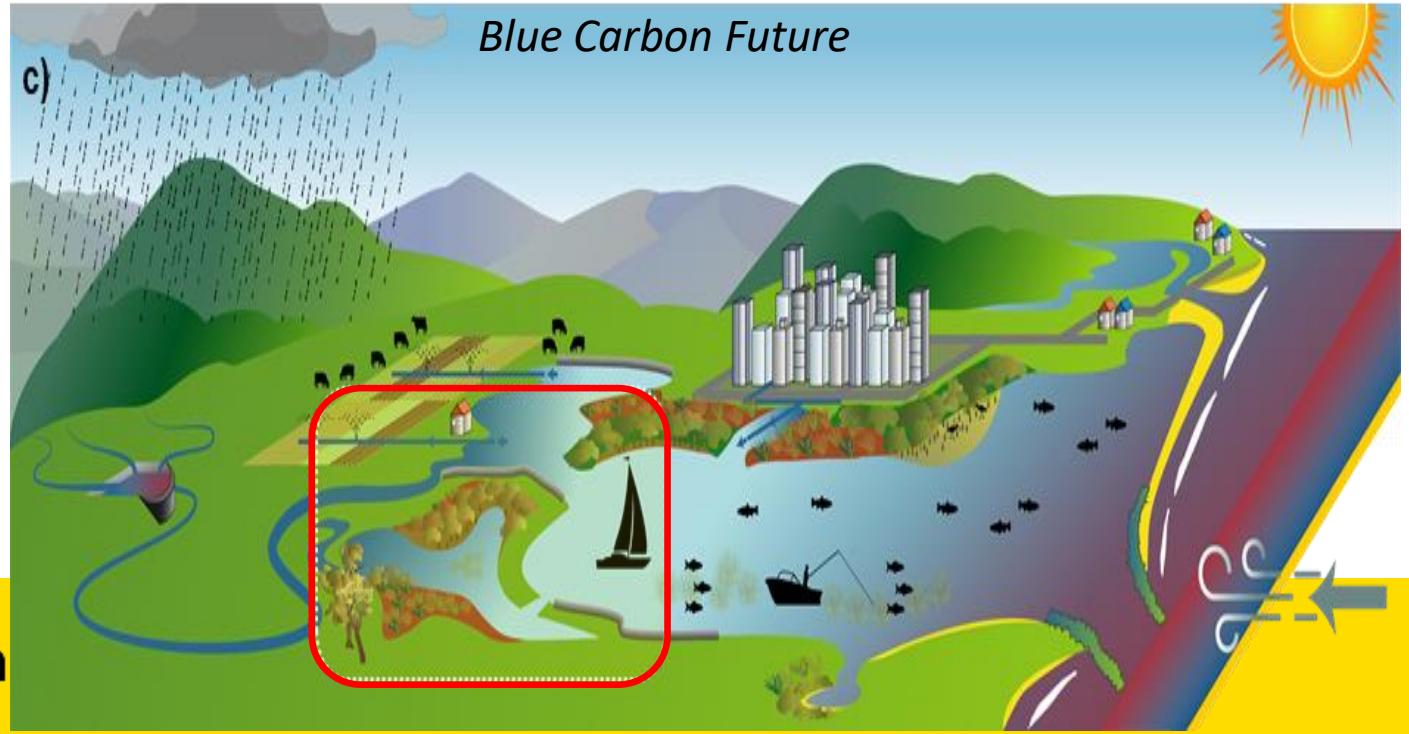

Ballina
Woodburn
Evans Head

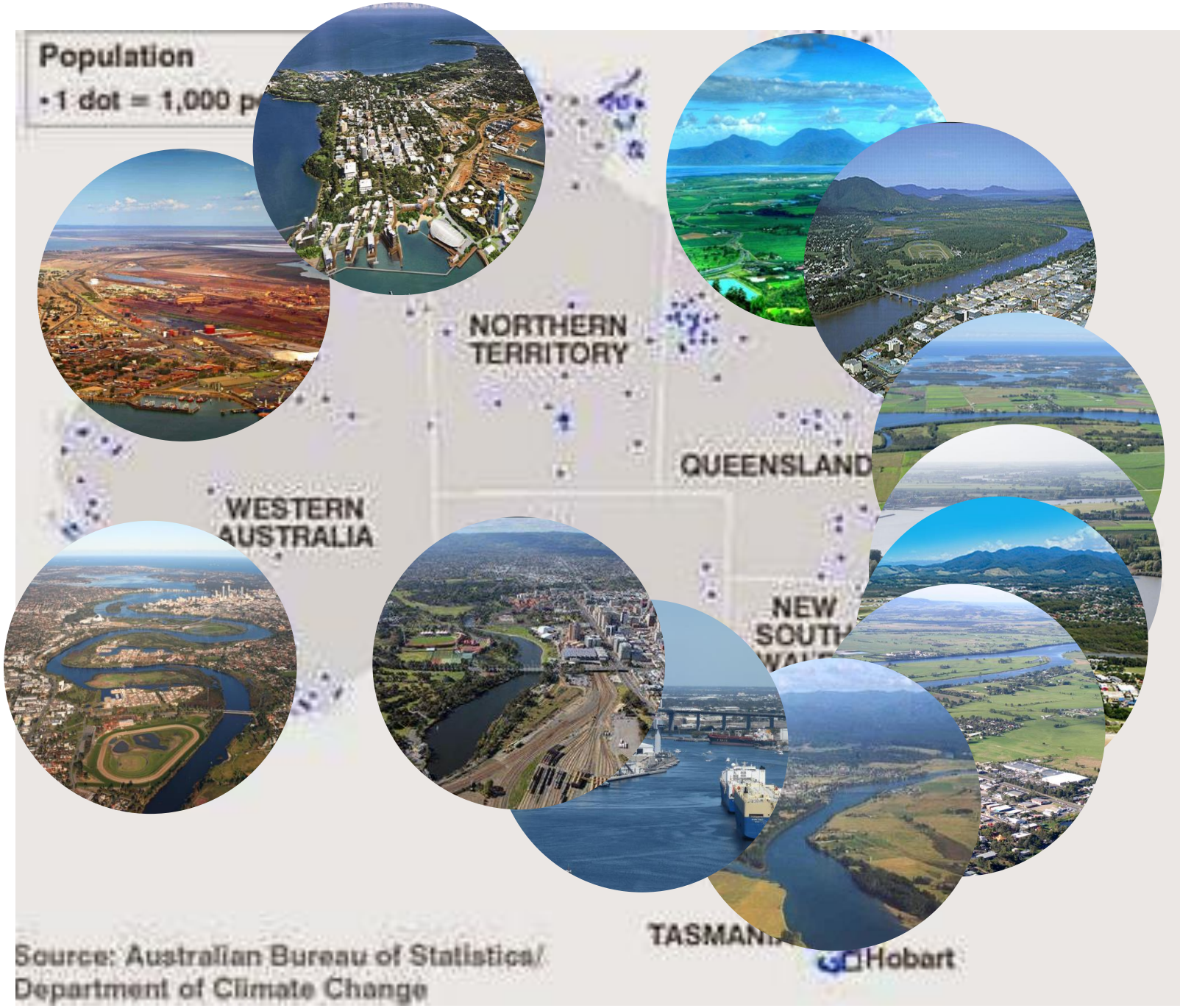

Kilometers
0 1 2 4 6 8


Kilometers
0 1.25 2.5 5 7.5 10

Blue Carbon Ecosystem Creation







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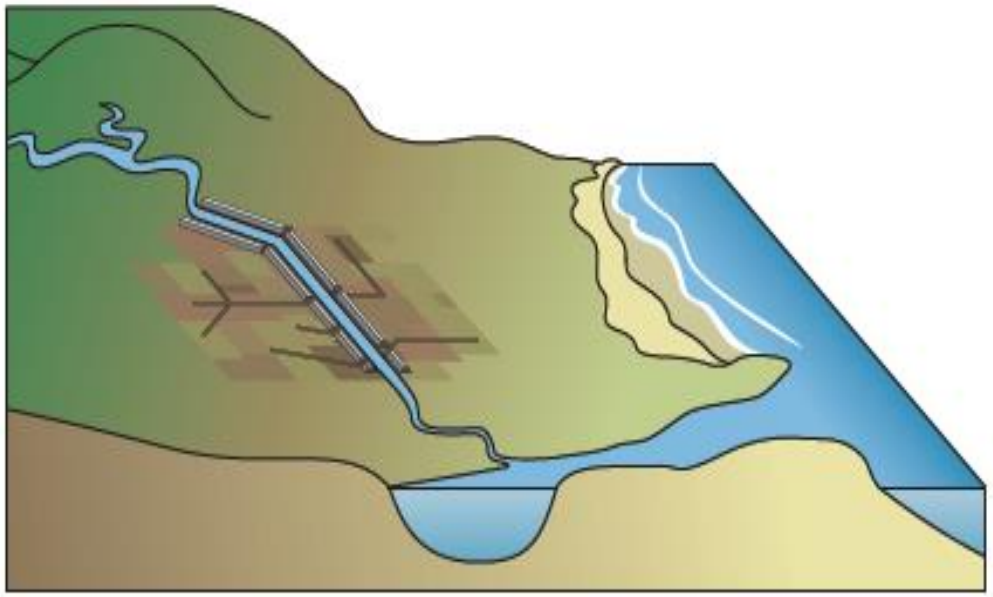
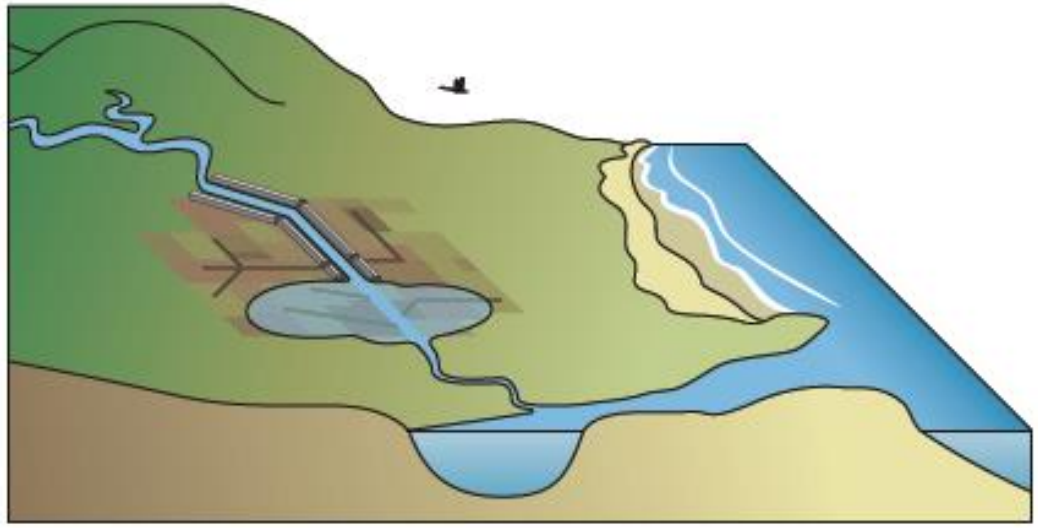


Tidal introduction *projects have been underway for 25+ years.*

Driven by:

- *Improved water quality (ASS),*
- *Bird and fish habitat,*
- *Reduce flood risk,*
- *Community amenity,*
- *Offsets,*
- *Restore Forward Ethos, and*
- *Blue carbon.*



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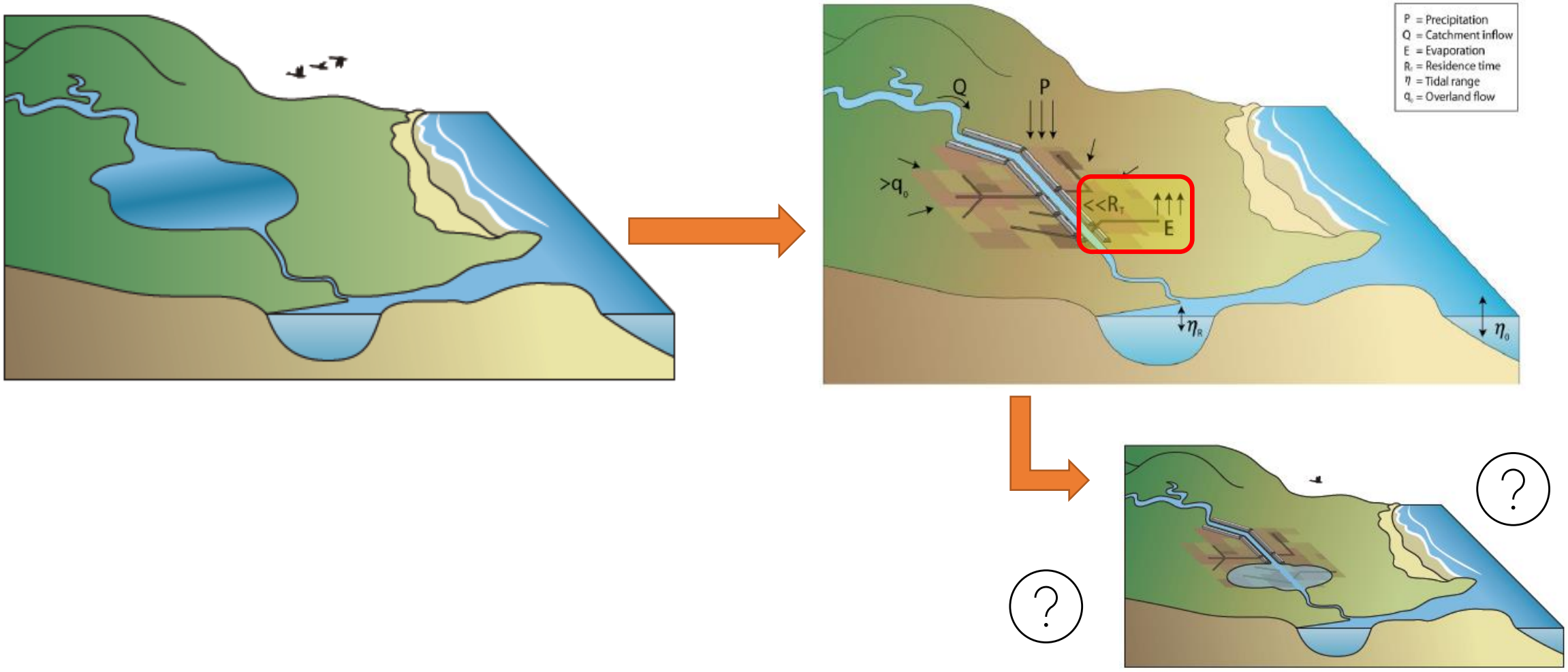
Blue Carbon: How to??



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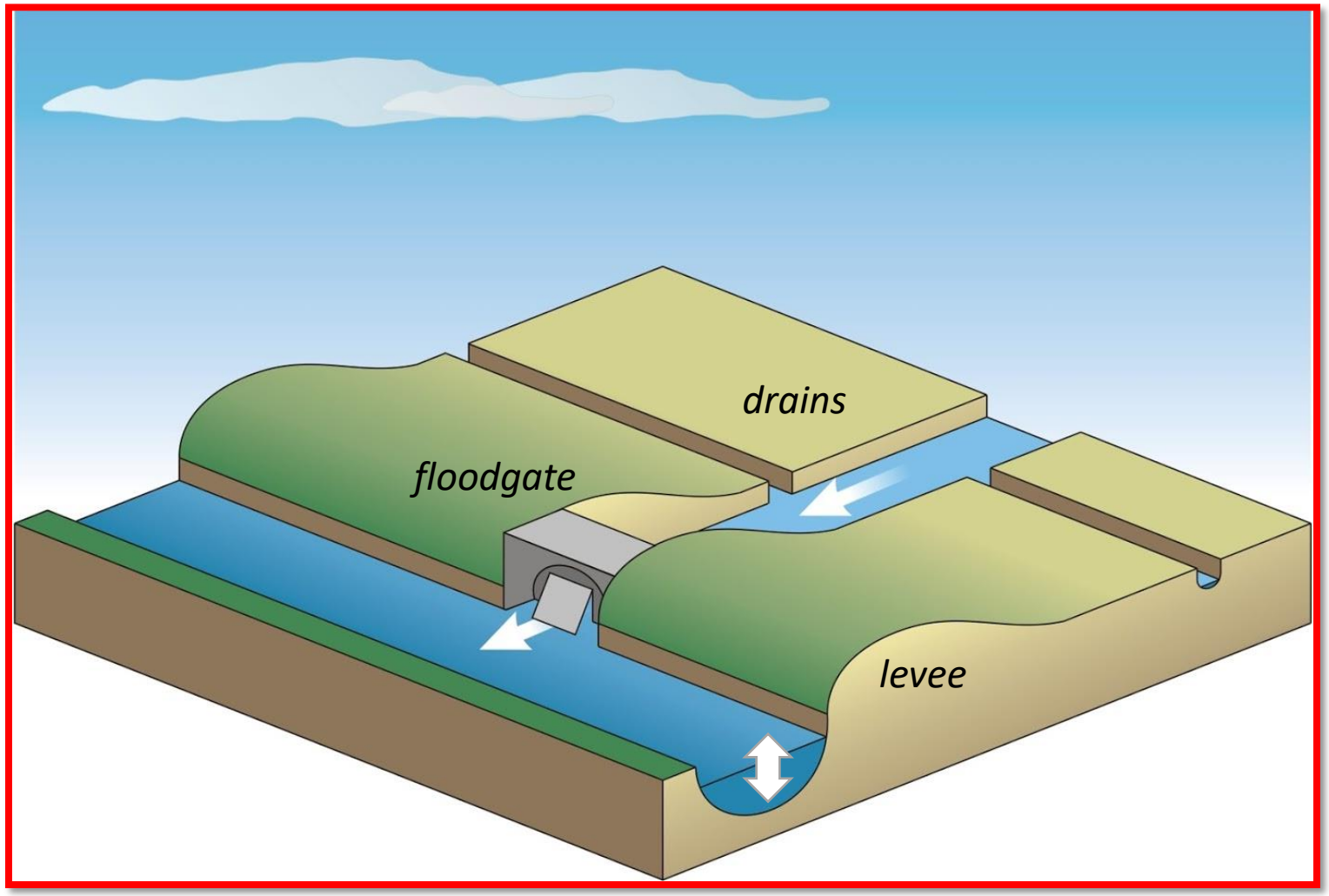
Blue Carbon: How to??



Tidal Inundation Risks:

- *Tidal inundation*
- *Uncontrolled salinity*
- *Long-term changes*
- *Unintended impacts*
- *Infrastructure*

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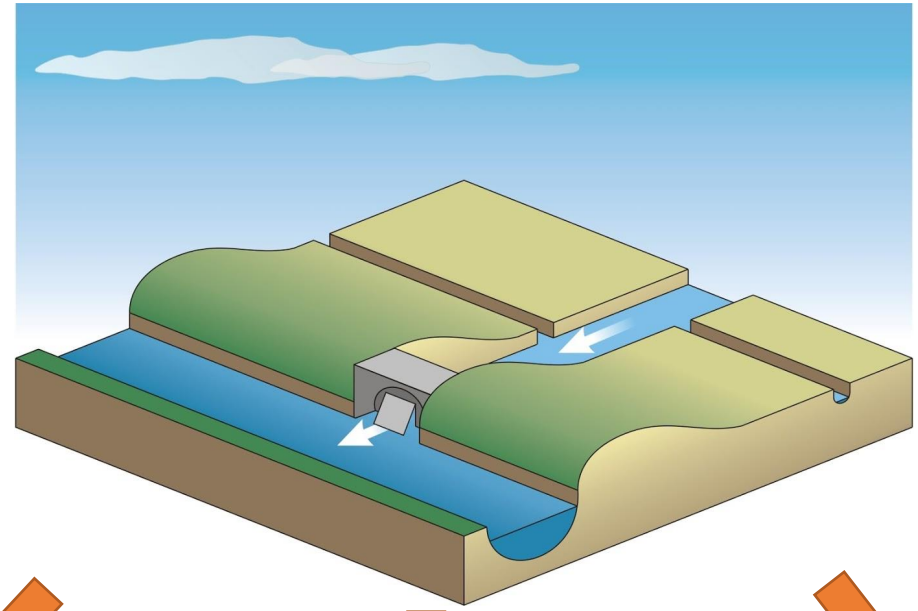
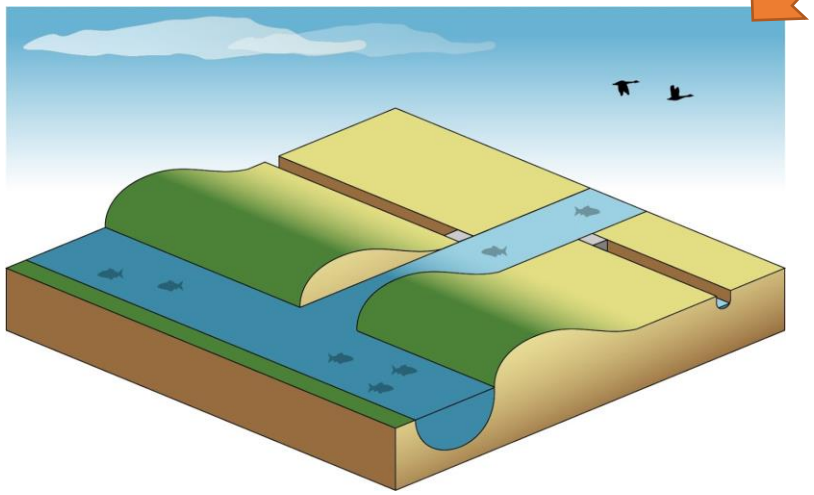
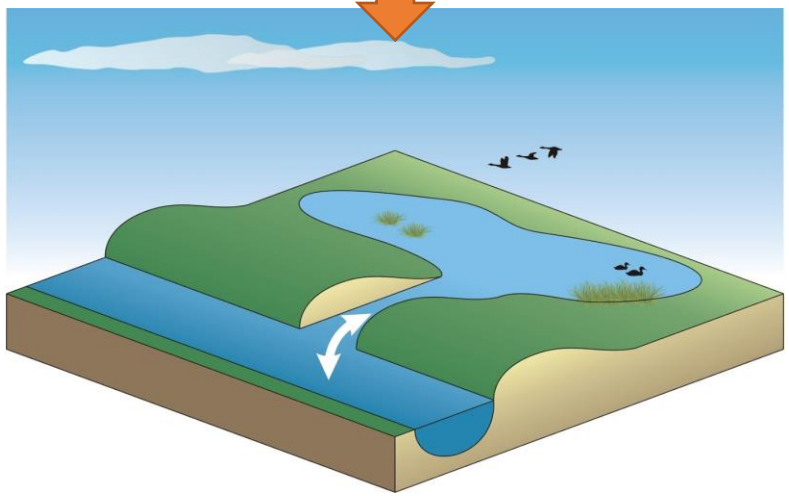
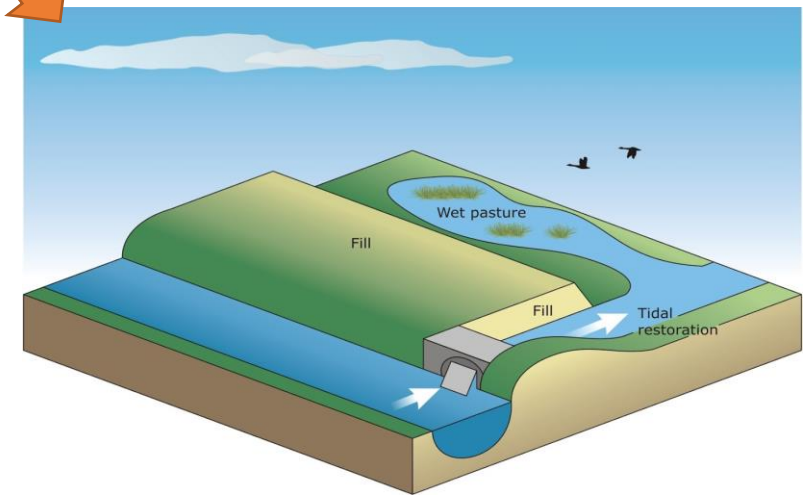
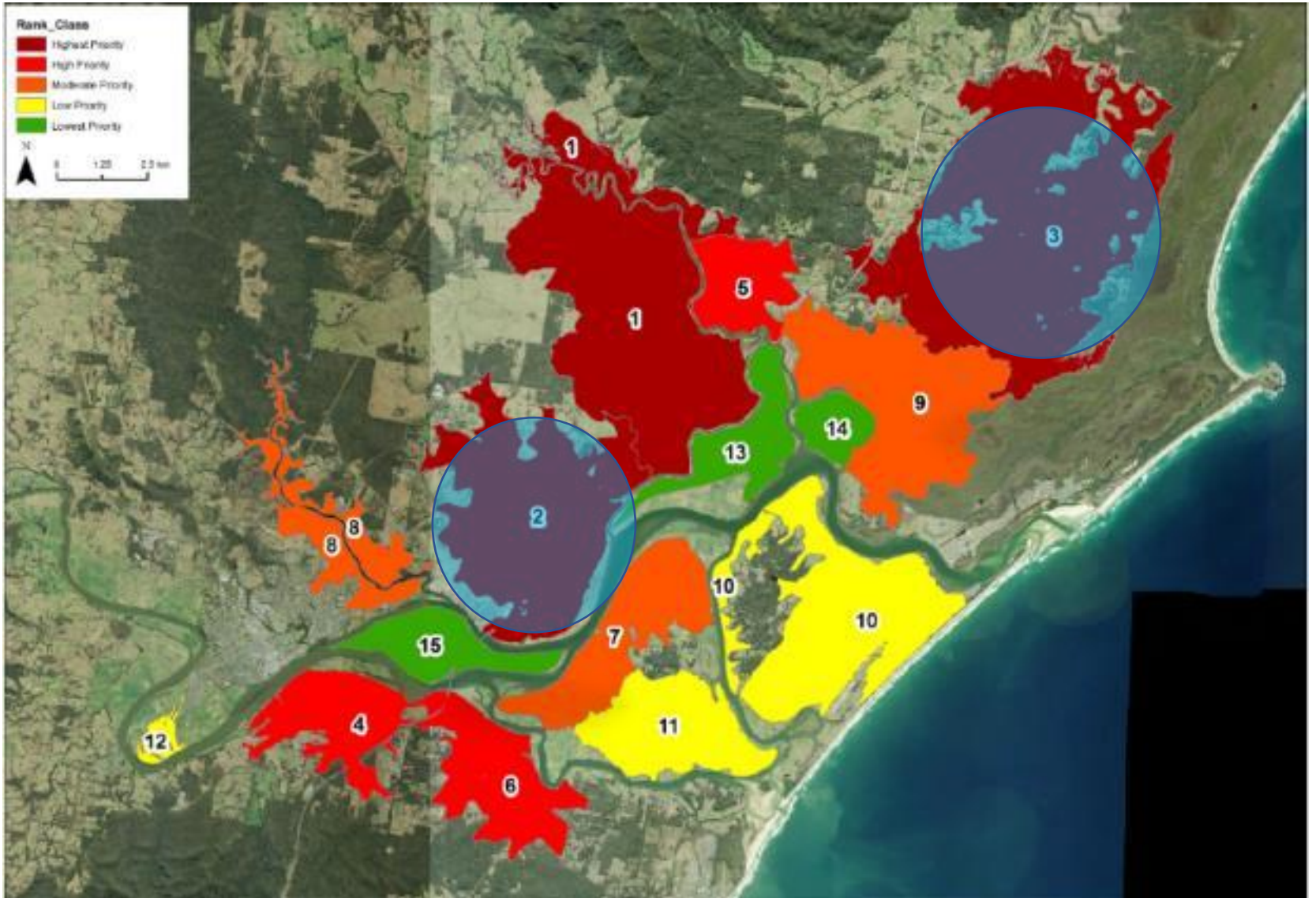







Wet pasture
Fill
Fill
Tidal
restoration

Wetland Creation Prioritisation



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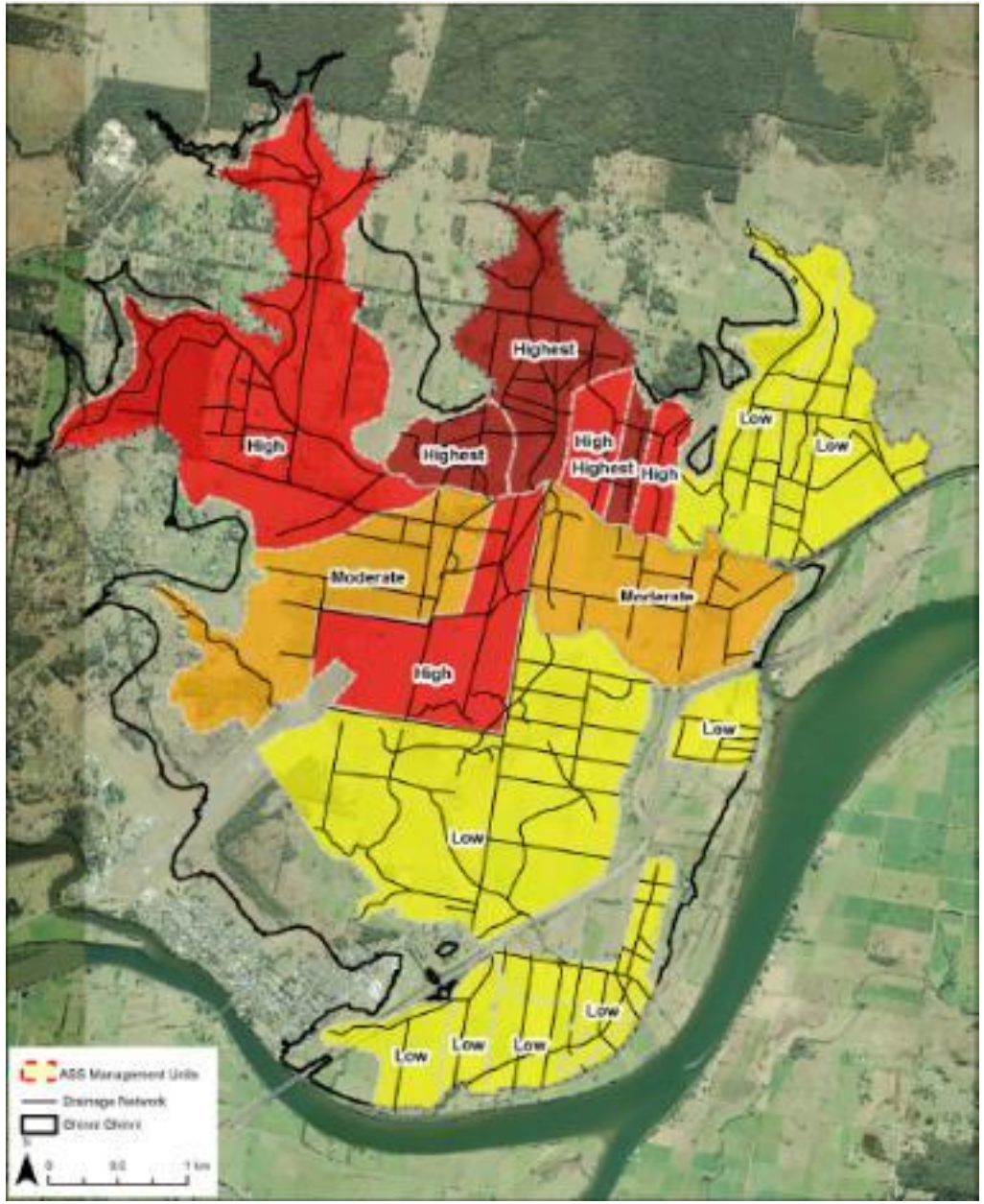
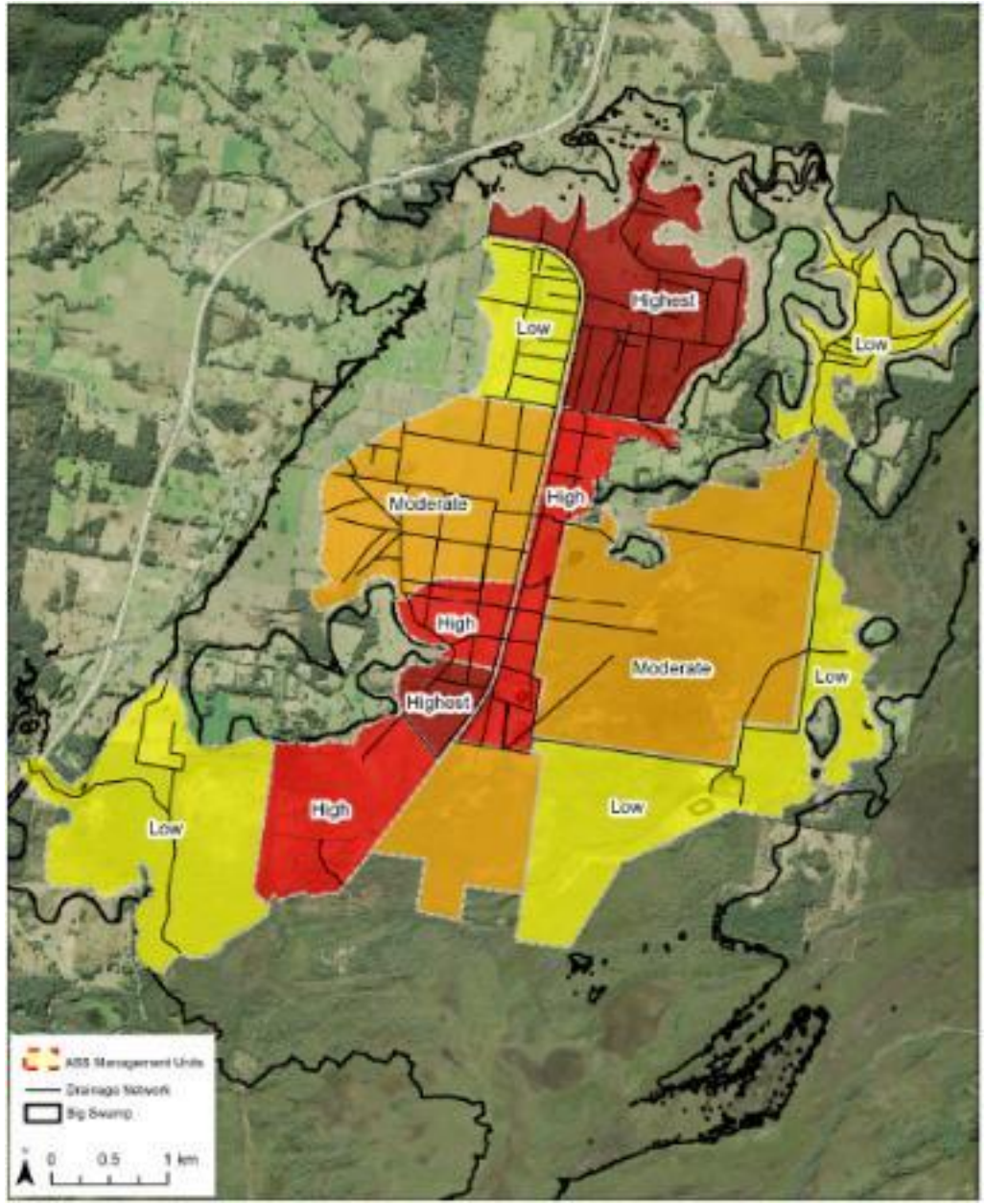
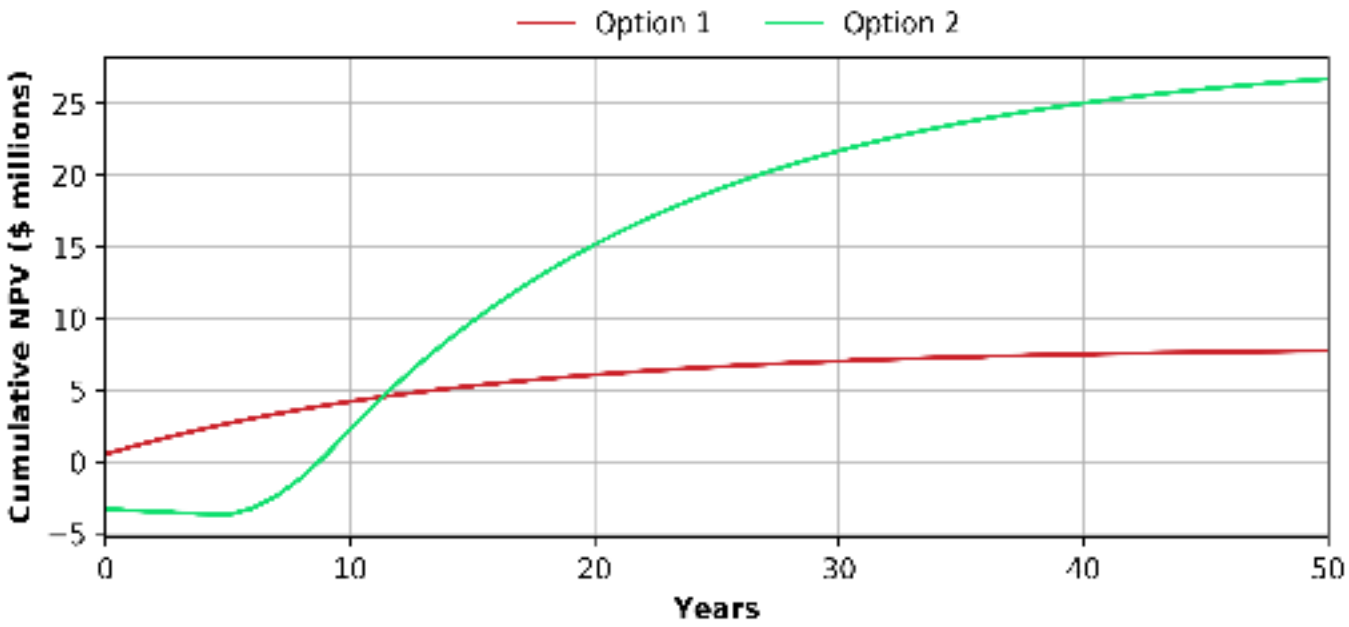

Highest
High
Highest
High
Highest
High
Low
Low
Moderate
Moderate
High
Low
Low
Low
Low
Low
Low
ASS Management Units
Drainage Network
0
1 km


Highest
Low
Low
Moderate
High
High
Highest
Moderate
Low
Low
High
Low
ASS Management Units
Drainage Network
Big Swamp
0
0.5
1 km

Economic Prioritisation

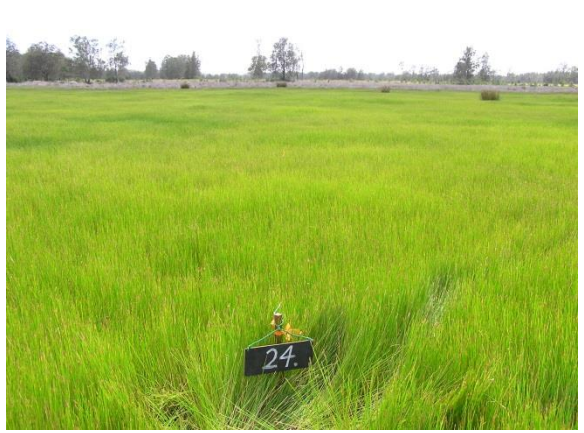
- CBA of coastal wetland restoration (approved by DPIE)
- Using conservative estimates:
  - *Benefits of restoration outweigh cost 7:1*
  - *Net positive benefit after 12 years*
- Stacked values undertaken separately

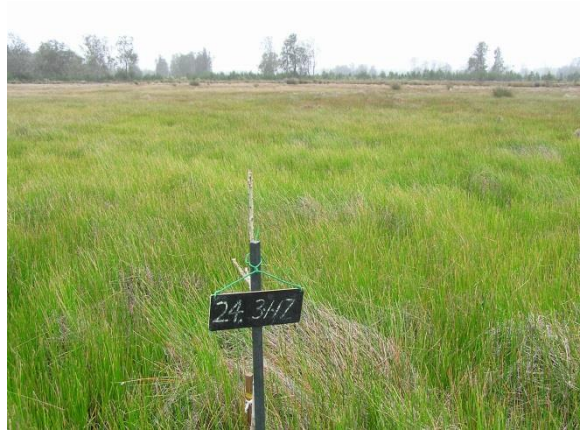


Cost Benefit Analysis – Blue Carbon Creation

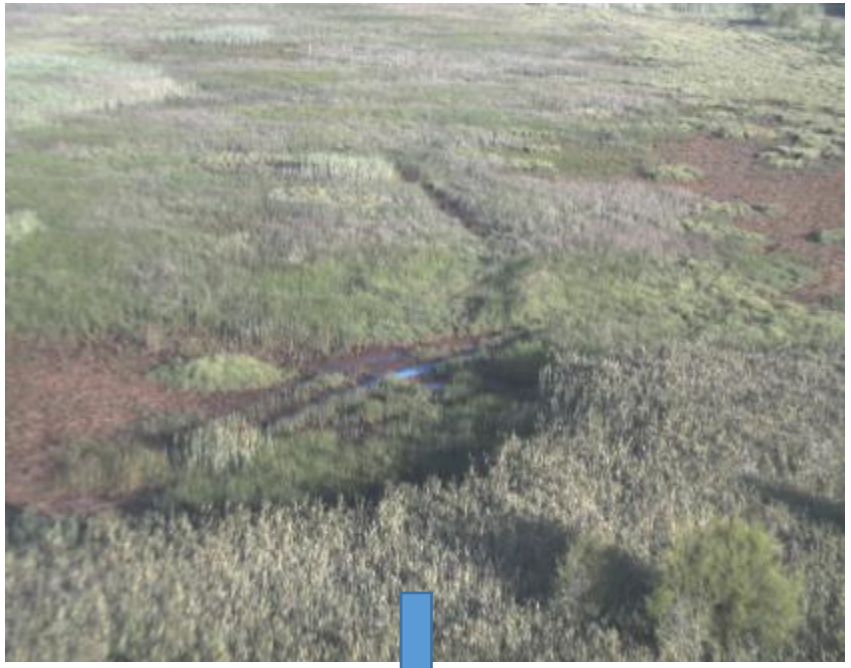
Harrison et al. (2019)

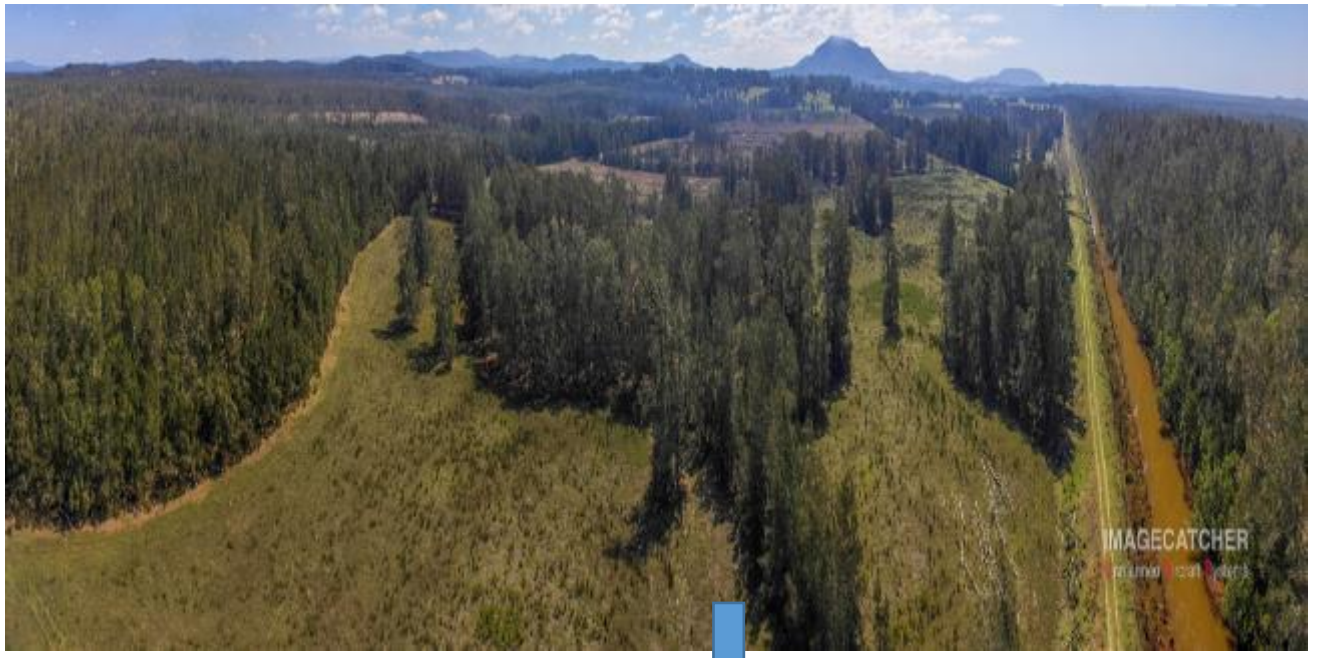
Month 0 → Month 9 → Month 14





Month 24 → Month 36 → Month 48





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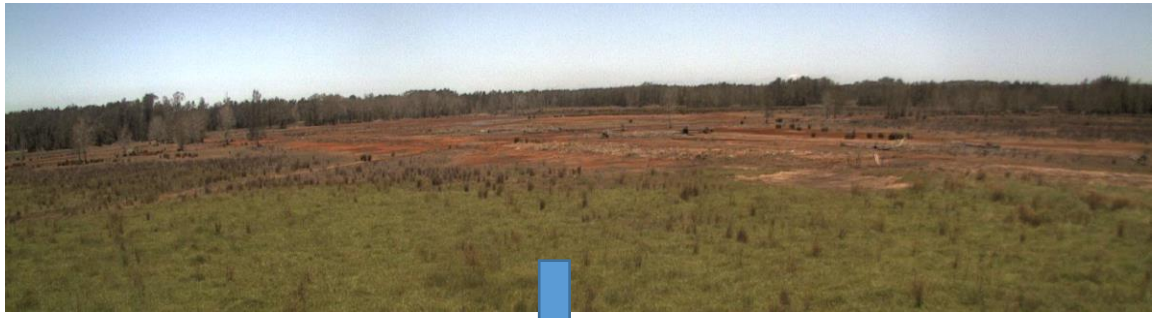

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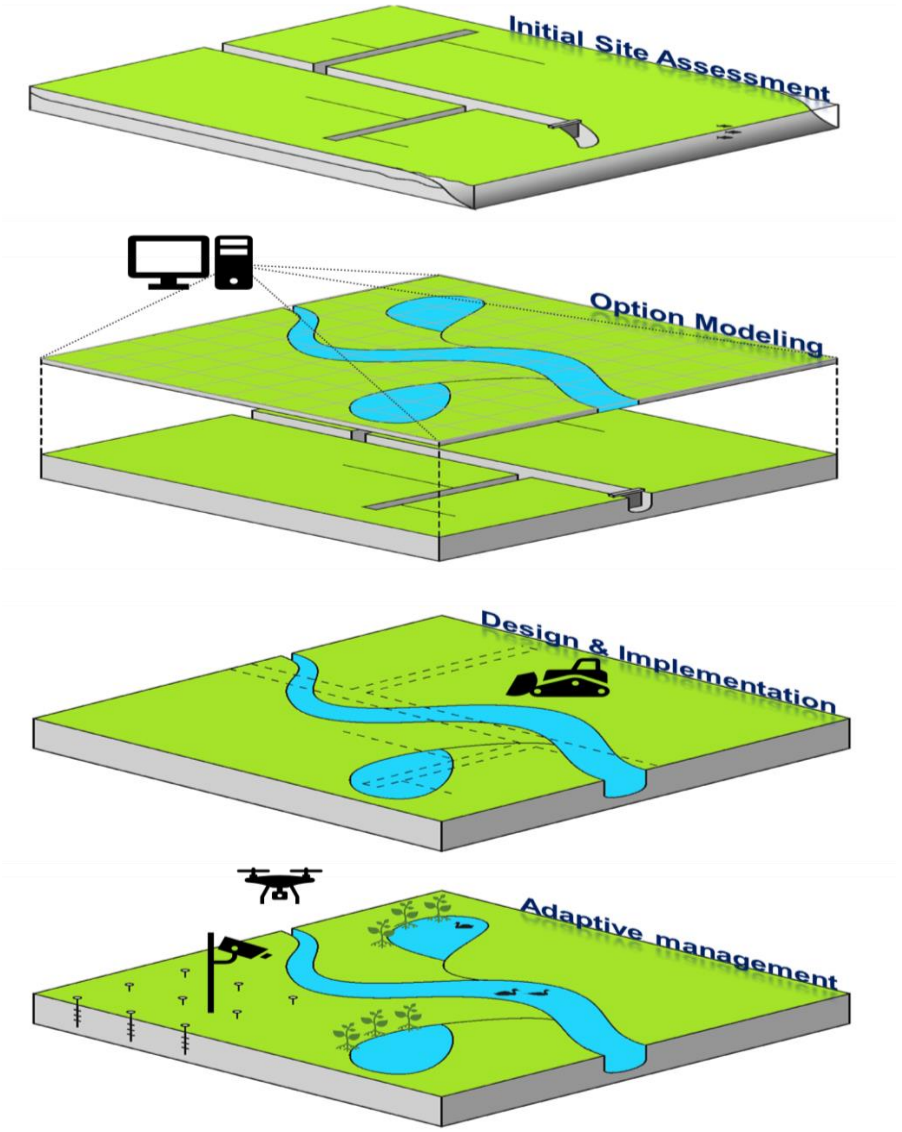
How to?



Step 1

Initial site assessment and conceptual understanding

- Establish the eco-hydrological site context.
- Review and analyse existing data.
- Collect additional data via field surveys and monitoring campaigns as required.
- Undertake initial mapping and develop a detailed conceptual model of the site and proposed activity.

Step 2

Detailed site assessment and scenario modelling

- Select appropriate modeling tool (e.g., GIS/spatial, hydrological, hydrodynamic)
- Develop and calibrate a hydrodynamic model (if applicable)
- Develop and shortlist/select restoration options.
- Model each option to assess blue carbon ecosystem outcomes and impacts to adjoining properties

Step 3

On-ground implementation and management solutions

- Detailed design, planning, implementation and associated costings
- Consideration of a staged-approach to on-ground implementation
- Develop an on-ground action plan

Step 4

Adaptive management

- Set long-term blue carbon and eco-hydrological targets for the site
- Develop a long-term monitoring program to benchmark against targets.
- Iteratively adjust on-ground management actions to ensure that targets are continuously being met and all risks are being managed.

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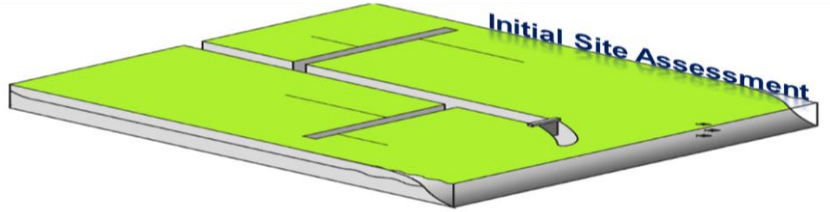
Site Assessment



Decreasing scale and increasing level of detail

Regional scale considerations

What is the regional setting of the site? Where in Australia is the site located?

What are the regional climate and geomorphological conditions and drivers.

System scale considerations

What is the hydrological and geomorphological system boundary and setting?

The 'system' is typically comprised of the catchment, estuary and coast.

Local site scale considerations

What is the local system boundary and setting?

What are the local scale eco-hydrological units and key features of the site?

Process of developing conceptual understanding of the site

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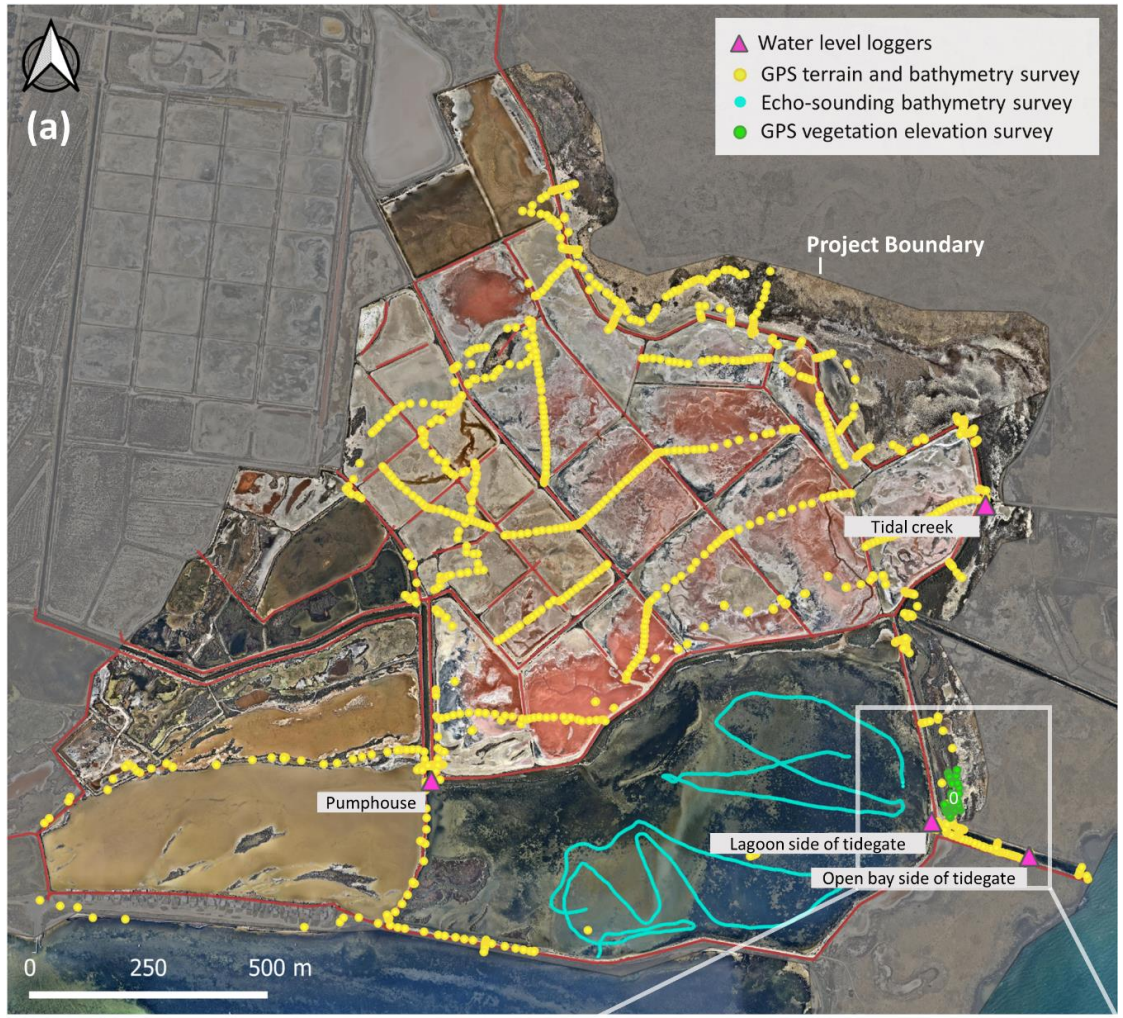
Site Assessment



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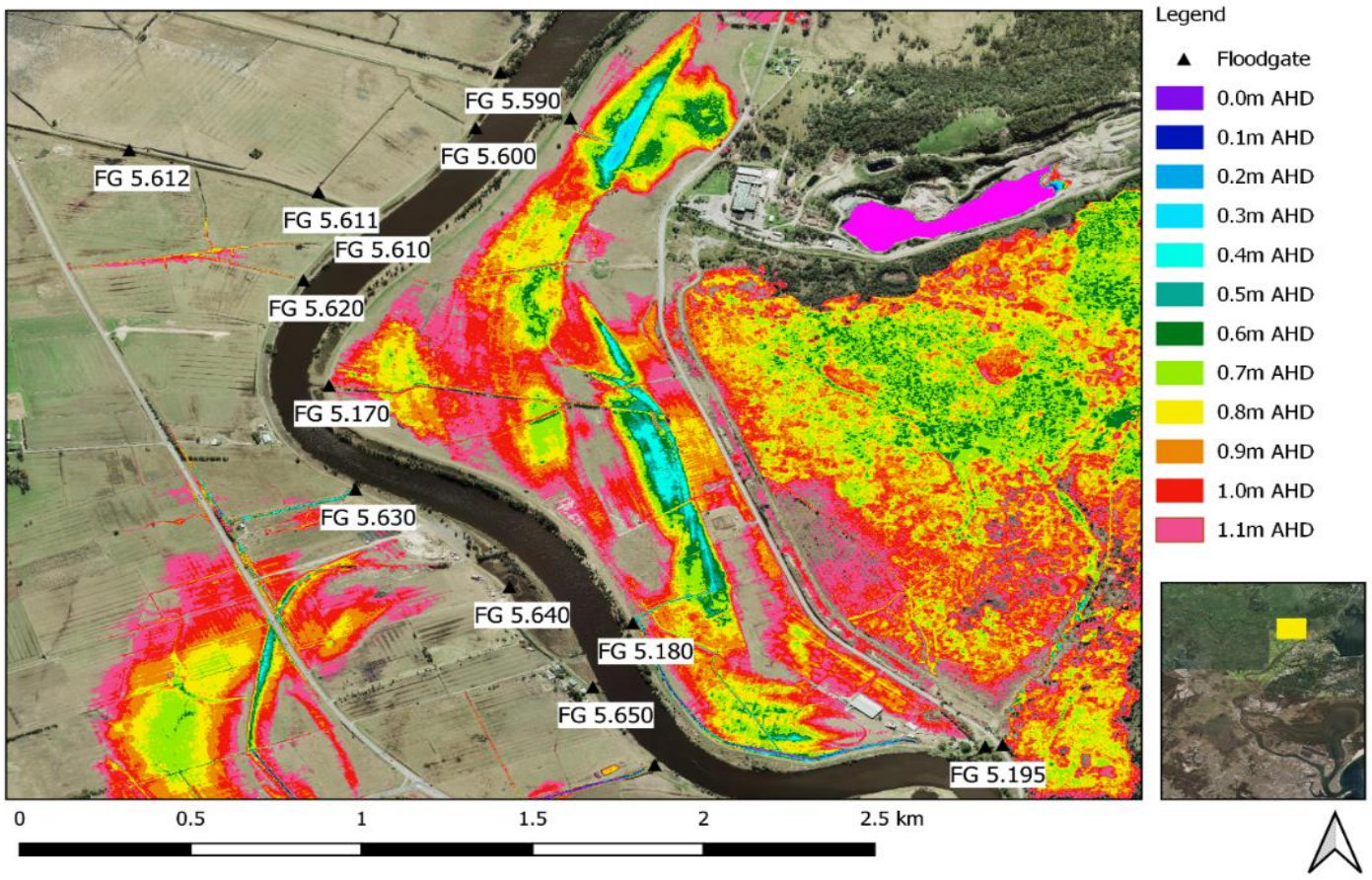
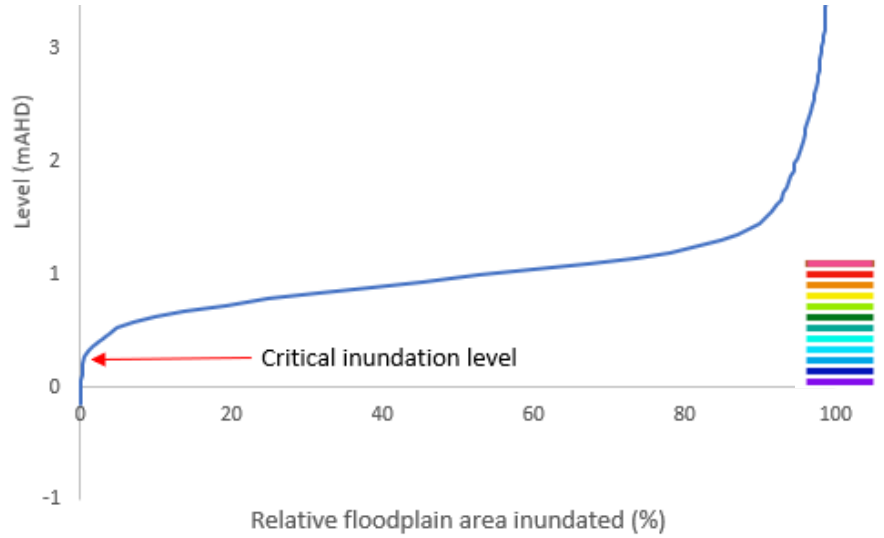
Site Assessment





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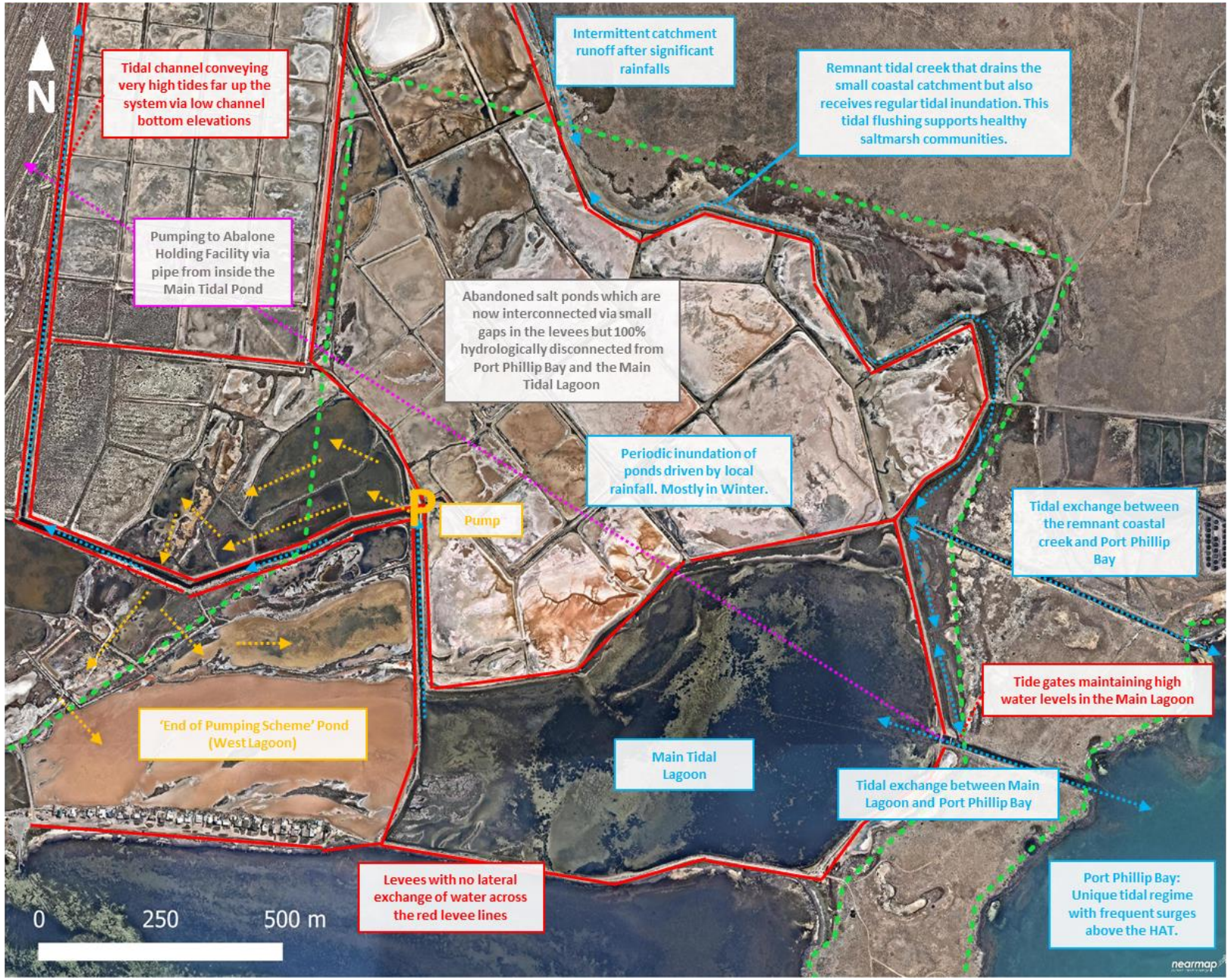
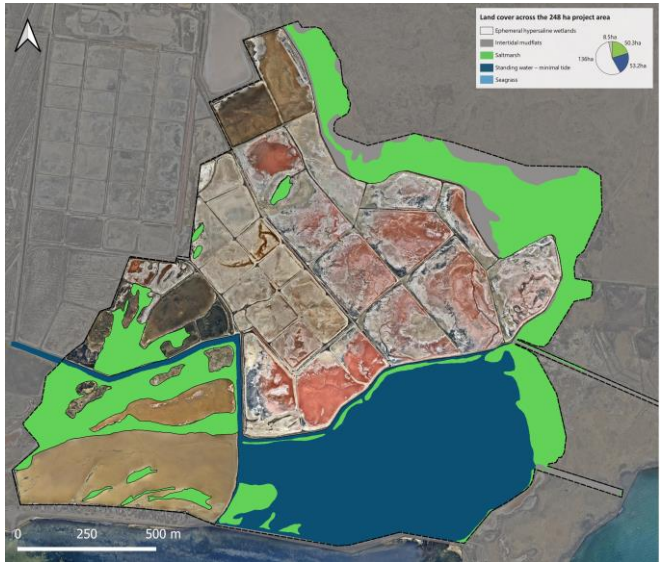
Natural Water Flows | Artificial structures affecting water flows | Western Ponds Artificial Pumping Scheme | Abalone – Pumping Scheme | Parks Victoria Site Boundary





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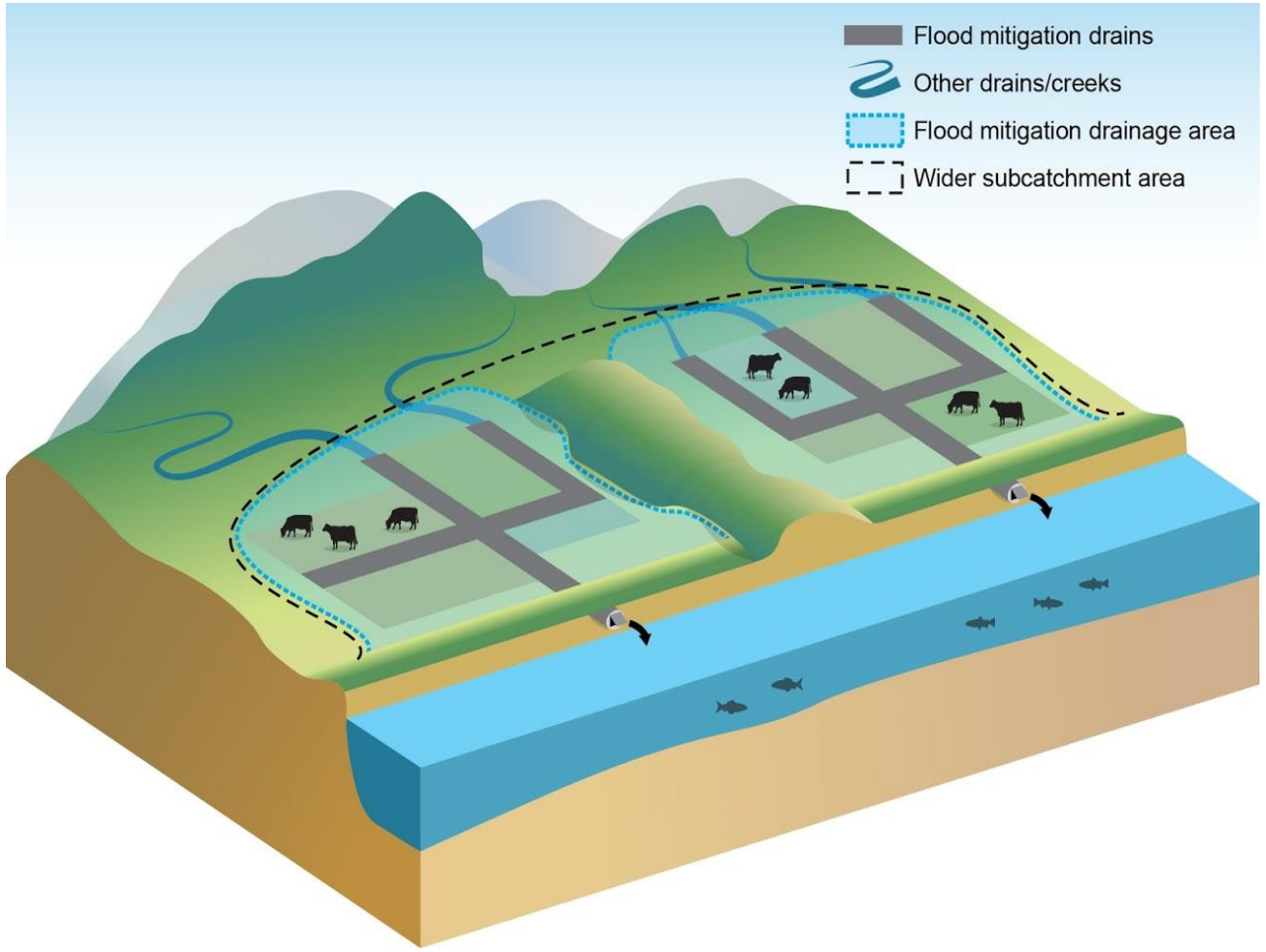
Risk Assessment – Hydrologic Models

- Model selection should reflect site complexity and risk assessment.
- Bathtub models provide conservative risk estimate.
- Additional detail is required in complex sites or to test remedial risk measures.



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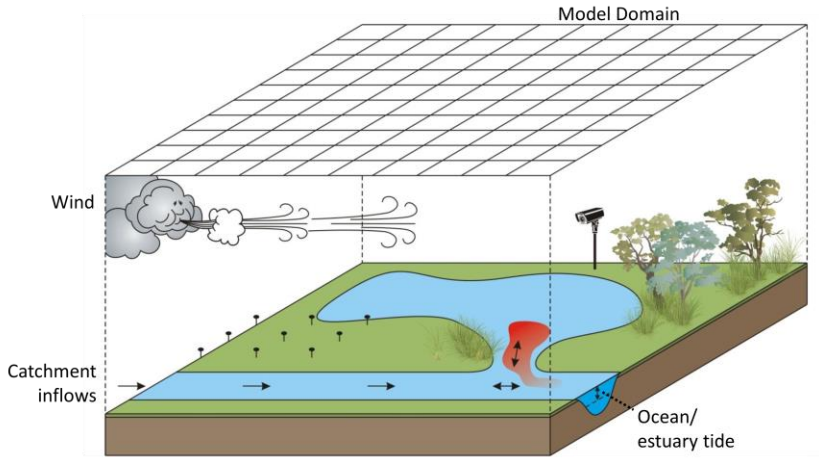

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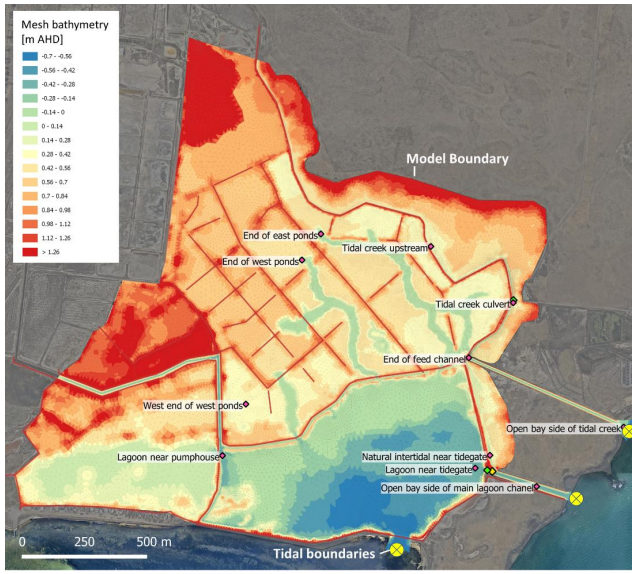

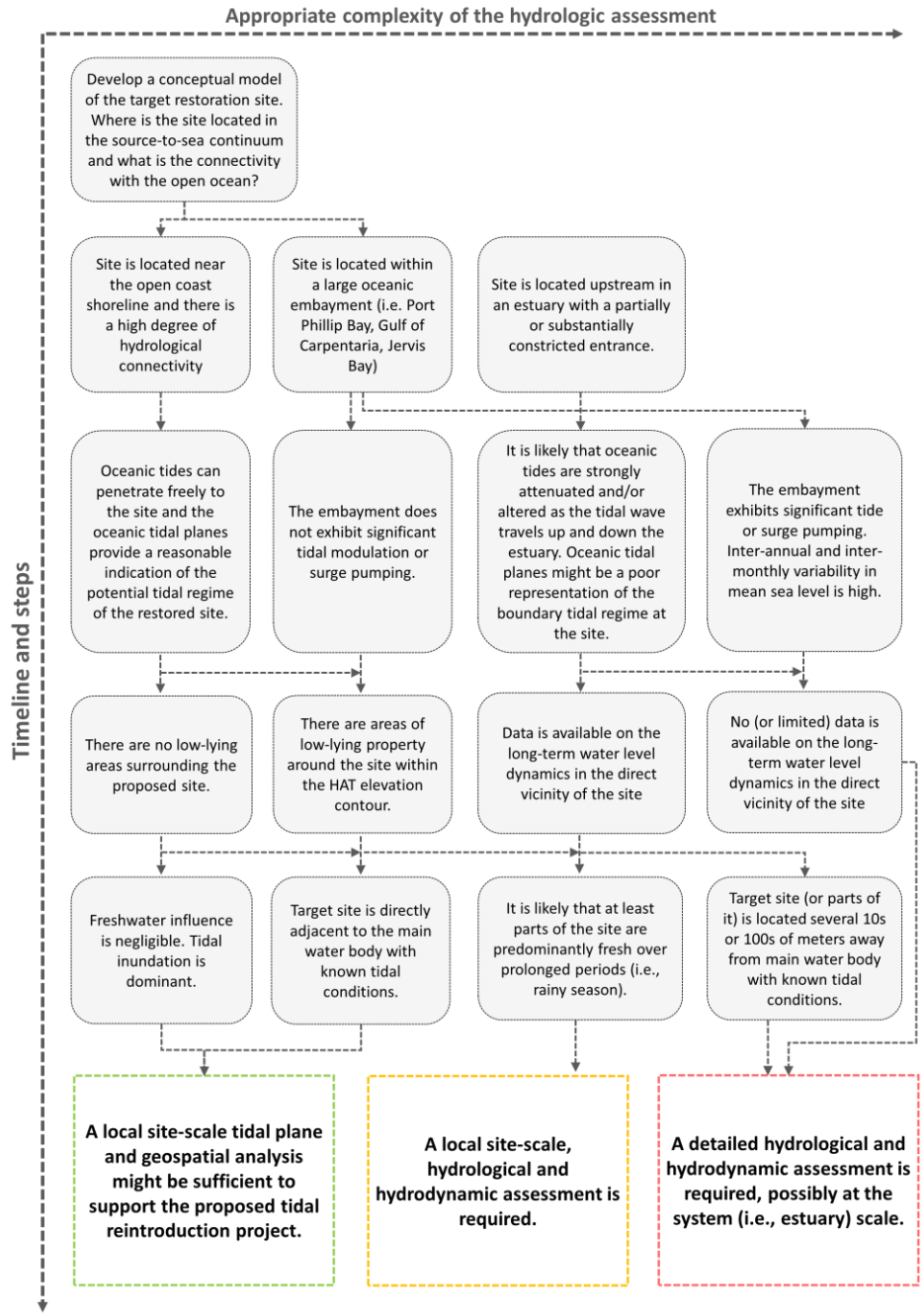

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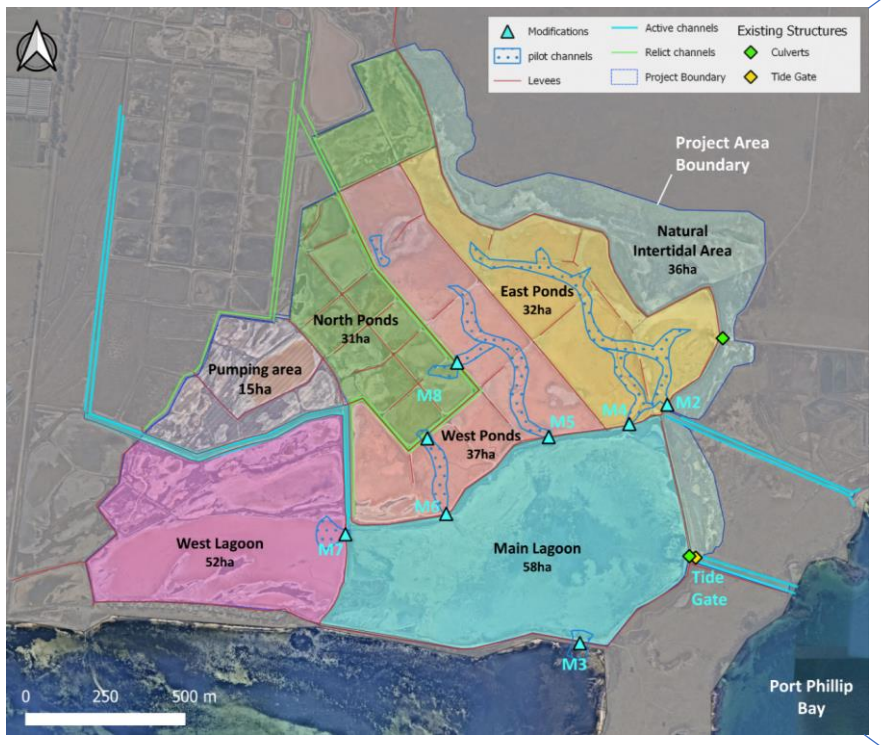

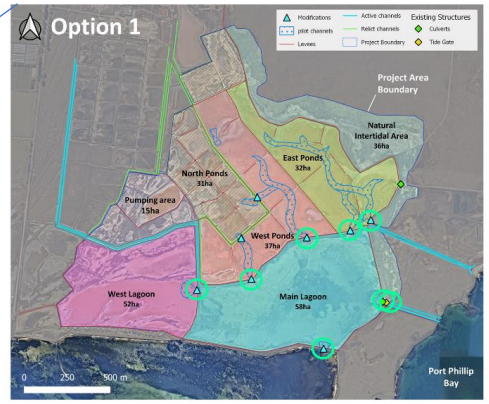

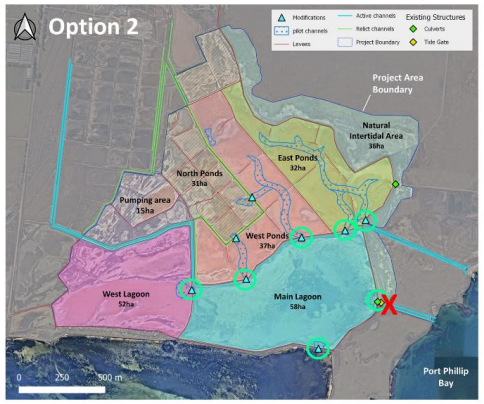

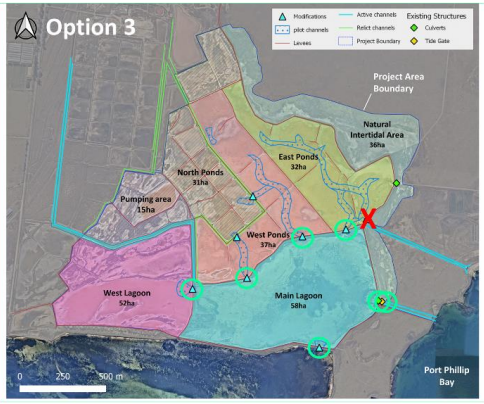

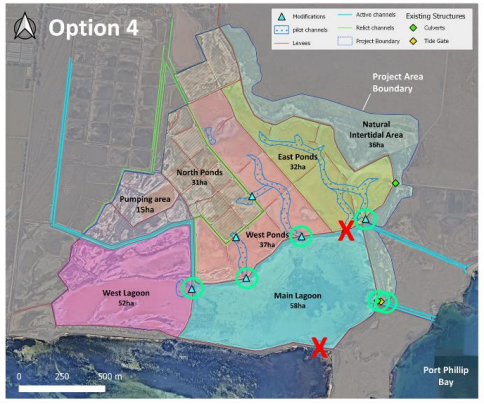

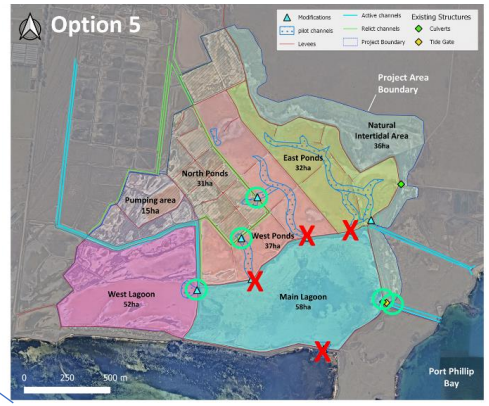

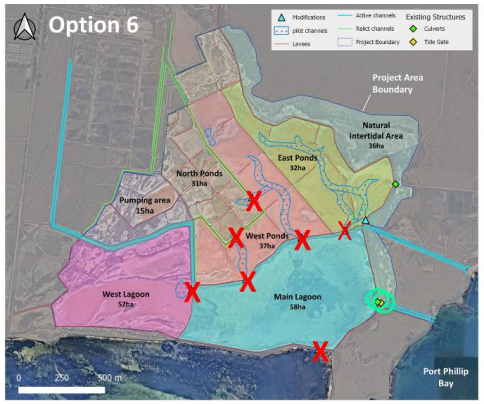

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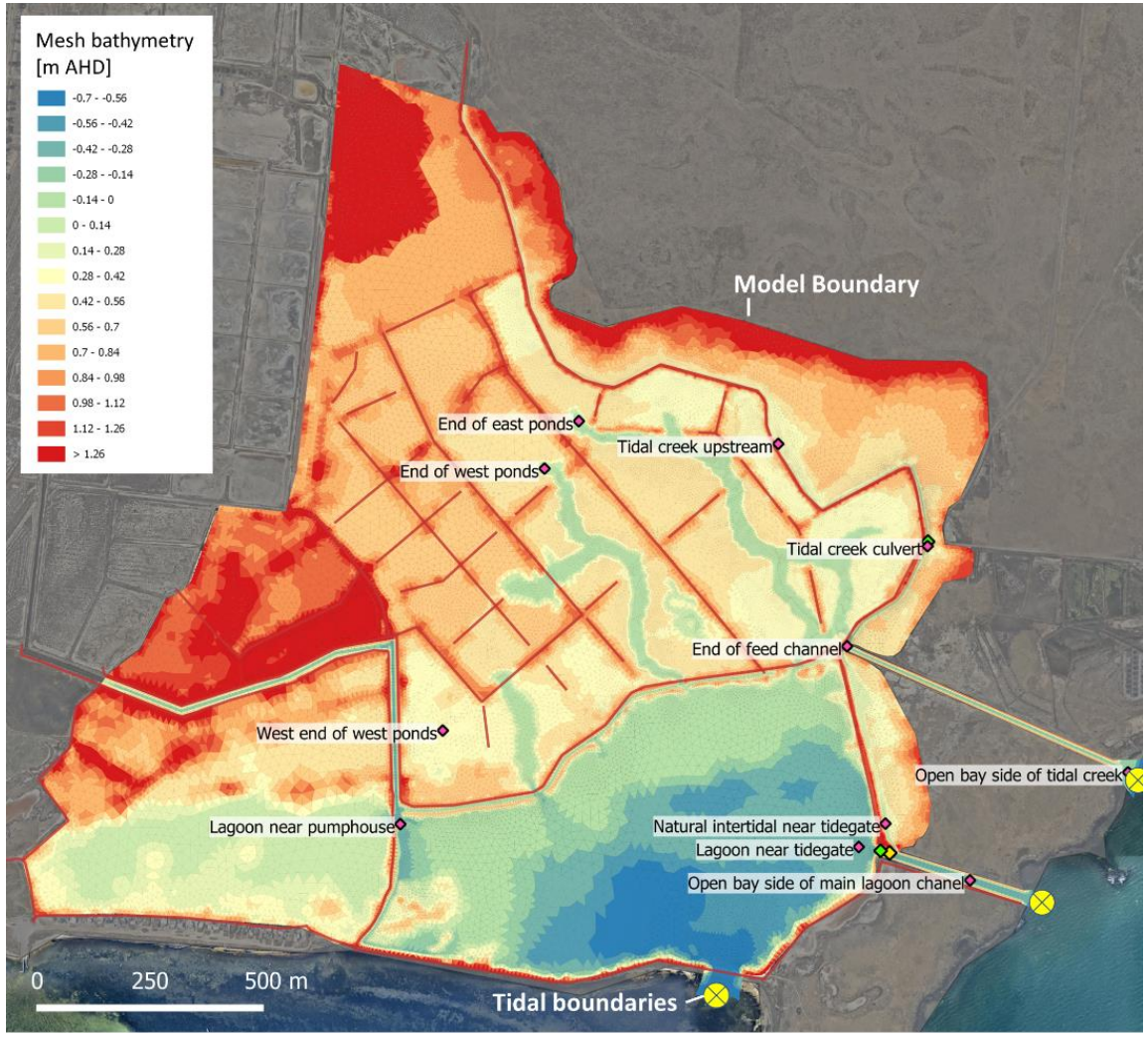
Hydrologic Assessment



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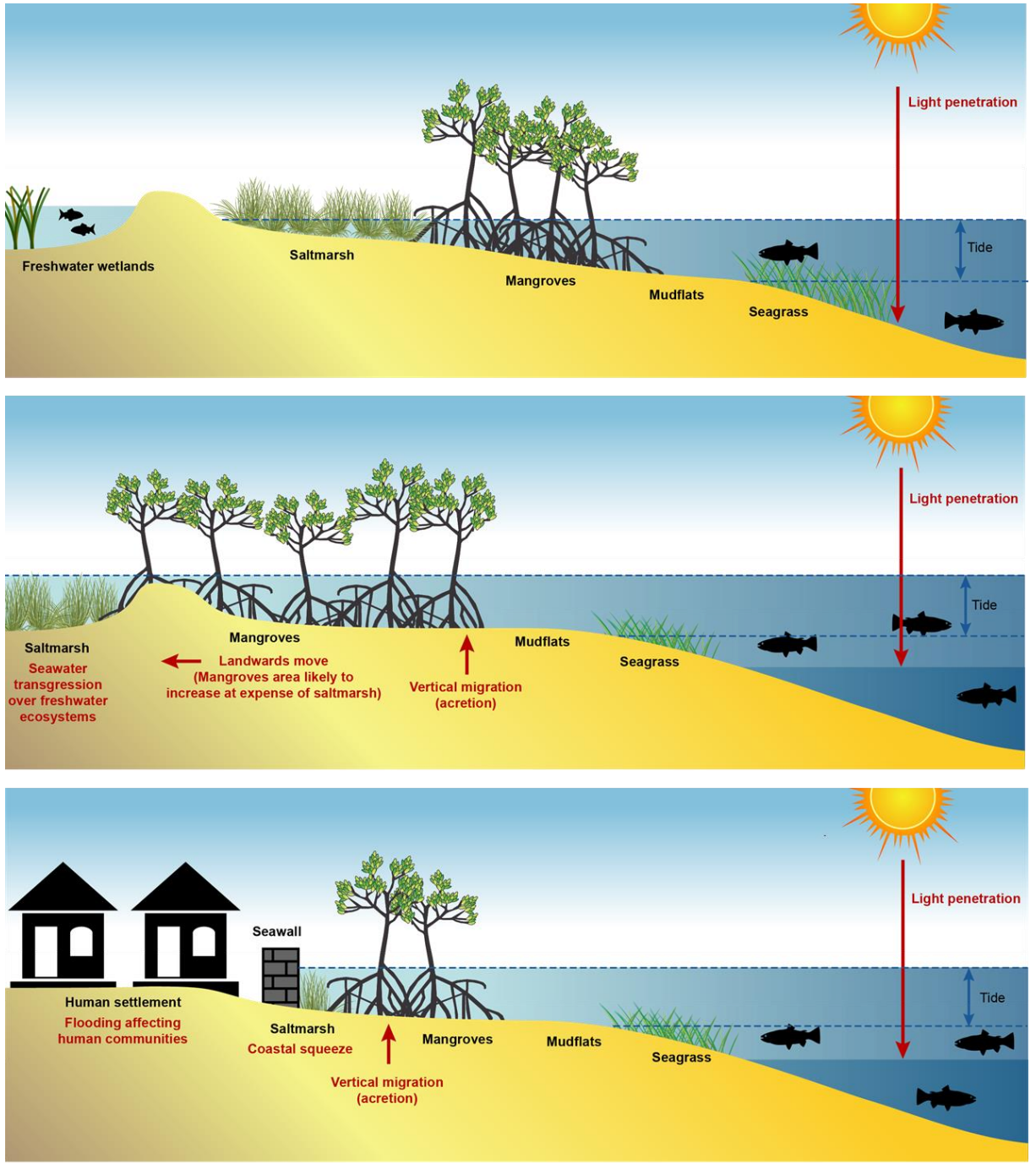
Sea Level Rise Assessment

- SLR forecasts are required to assess risks to adjoining or nearby properties.
- Adopt RCP8.5 Sea Level Rates.
- Consider accretion onsite.
- 25 or 100 year horizon.
- Not a climate change or geomorphic assessment



Source: Dominguez et al. (2019).

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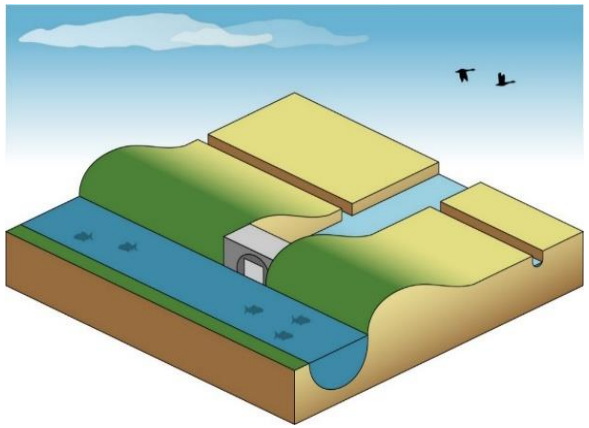
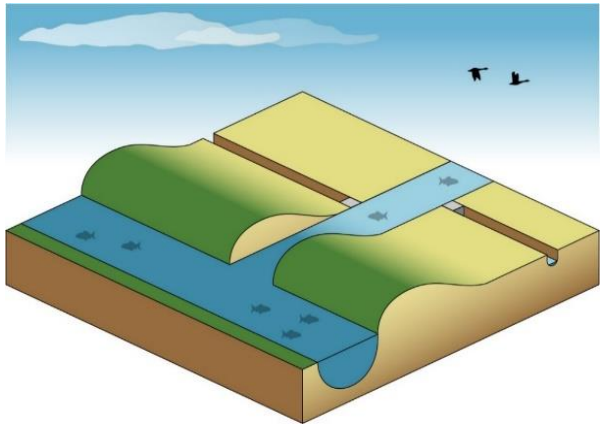
On-ground Works





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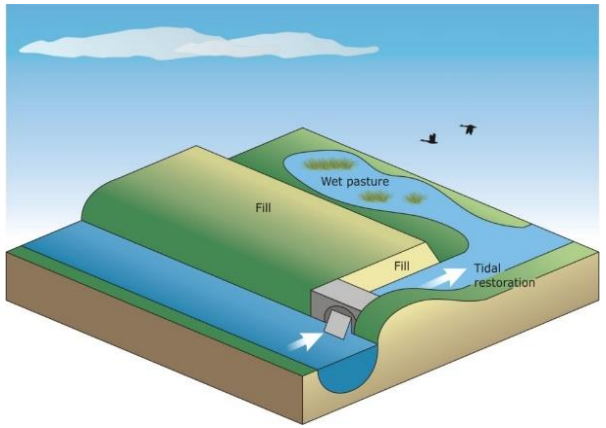

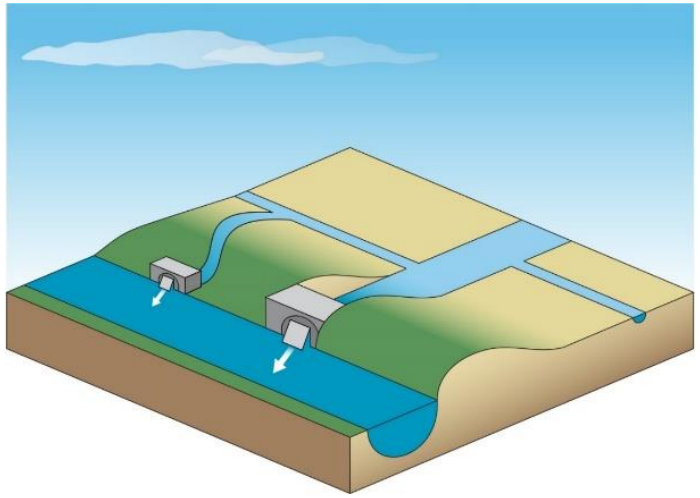

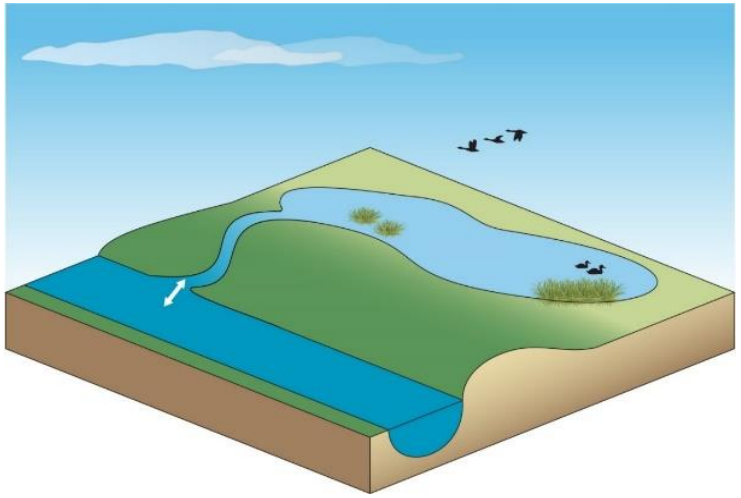

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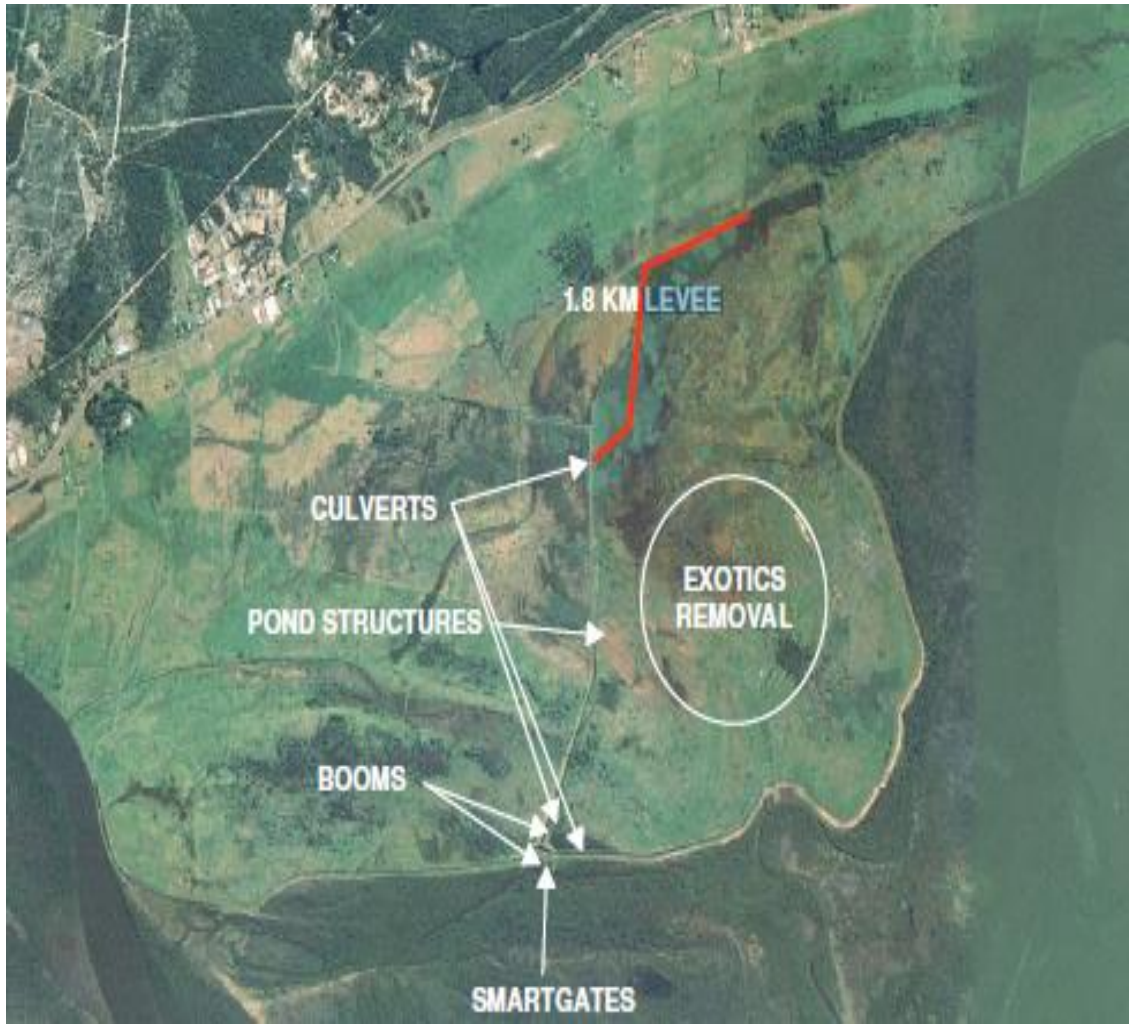
Critical Infrastructure

- Digital mapped geospatial locations of any proposed earth works, engineering installations, or modifications onsite.
- A description of the proposed infrastructure noting the potential hydrologic influence onsite and to nearby landholdings,
- A maintenance program detailing measures to ensure continuity of operation of the proposed infrastructure and mitigation measures associated with the potential failure of the infrastructure.



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Reporting

- Proponent must:
  - Provide a digital geospatial map of the site location(s) within the waterway.
  - Provide a map of the proposed site, including where tidal waters will enter the site, relevant geographic features, site elevation, lot boundaries and proposed extent of tidal inundation.
  - Document risks from the proposed activity and appropriate mitigation measures, including potential risks outside the immediate project area, where relevant.
  - Detail proposed on-ground works, including earthworks, and engineering structures to be installed or modifications to be implemented.
  - Identify maintenance plan for critical infrastructure.

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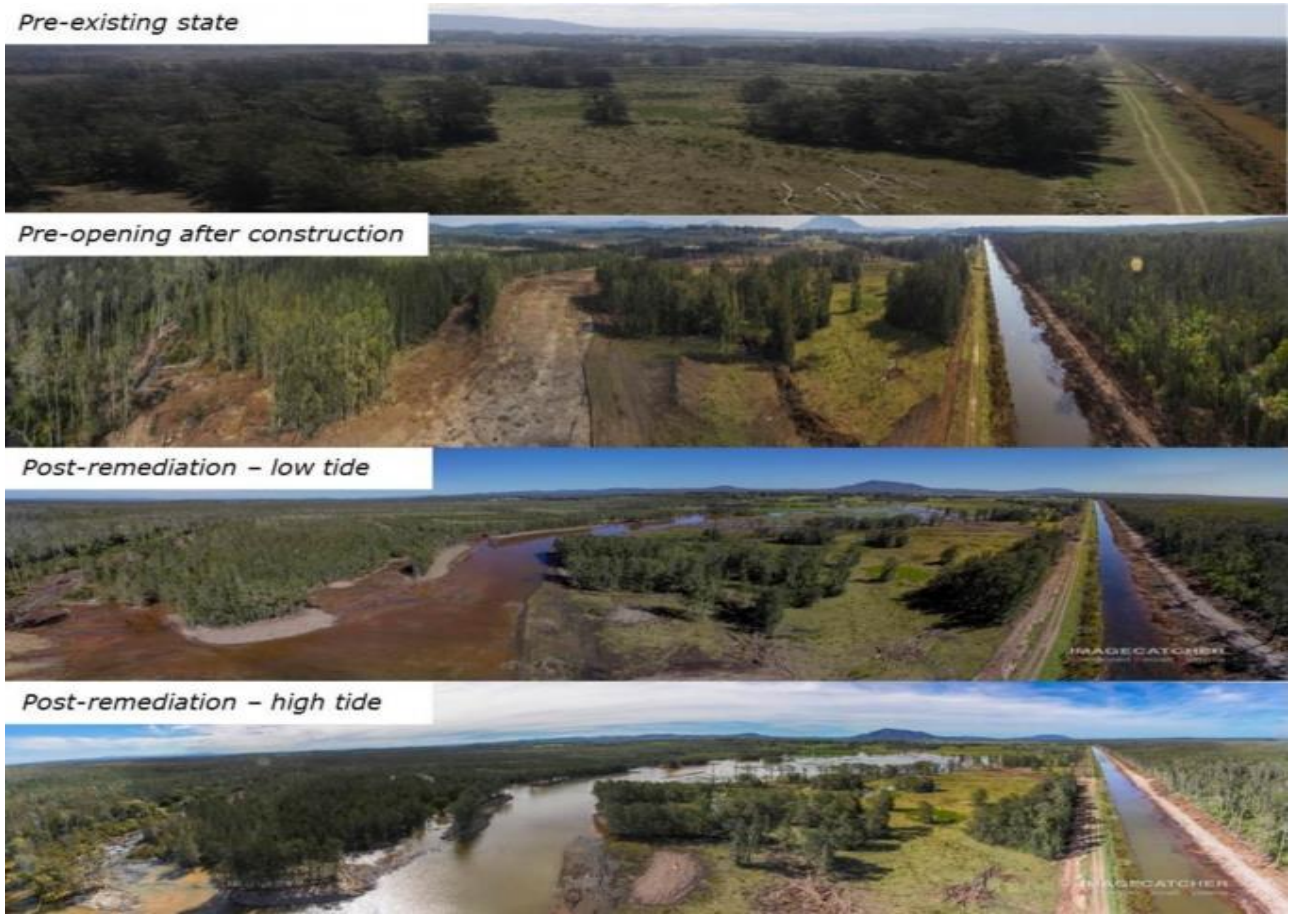
Thank you



Broader thoughts:

- Carbon service providers (CSPs) are asking for **better data** that is easily accessible (not maps)
- No formal **capacity building** for method.
- Need broader knowledge of **dynamics** (not statics).
- Biggest roadblock is social and economic.
- Will likely require **assistance from States** to assist with approval process
- Single market creates a single outcome; **diverse markets** create diverse outcomes.

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