Salinization of *Melaleuca*-dominated wetlands of the Gippsland Lakes, Australia

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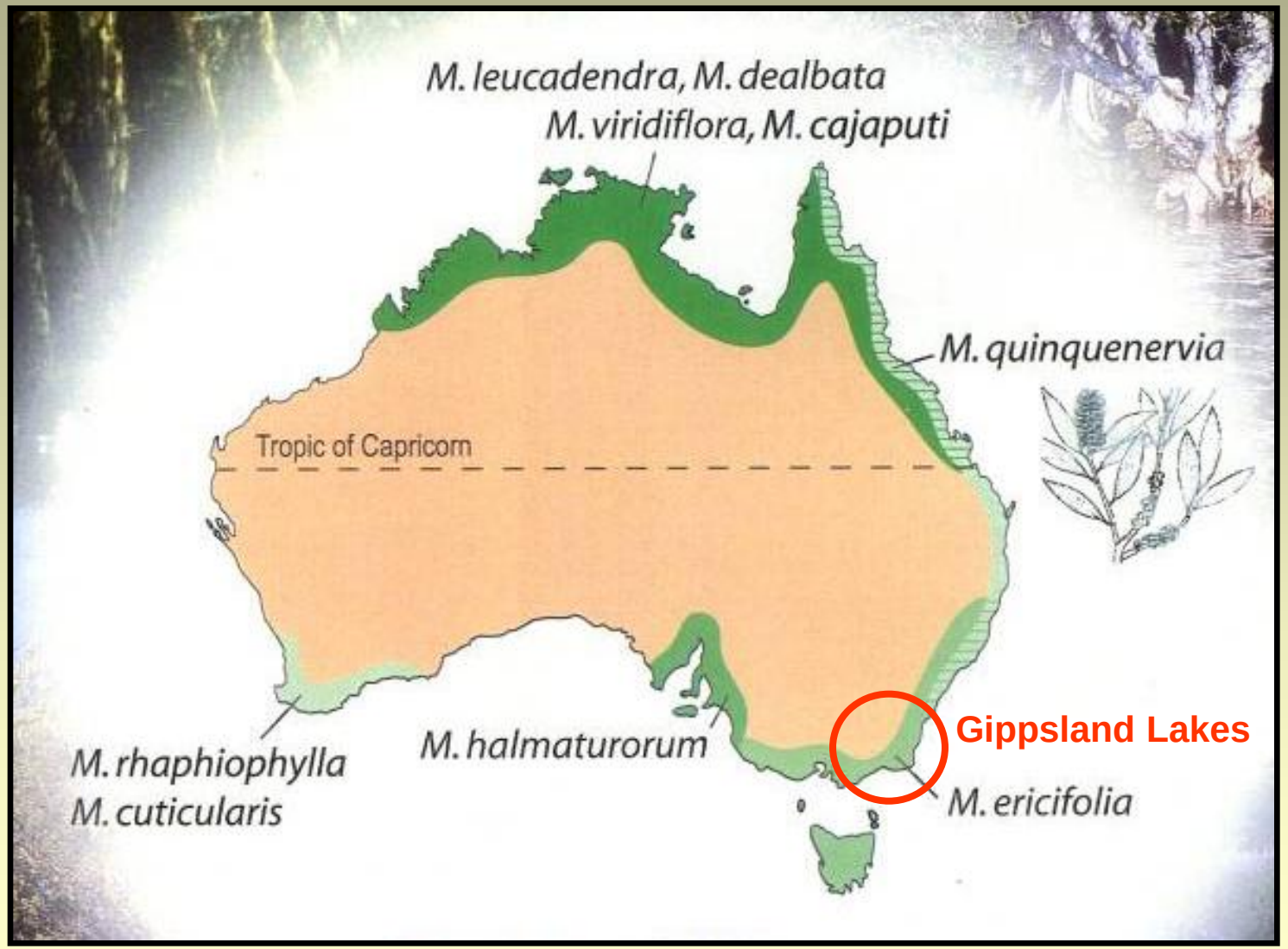
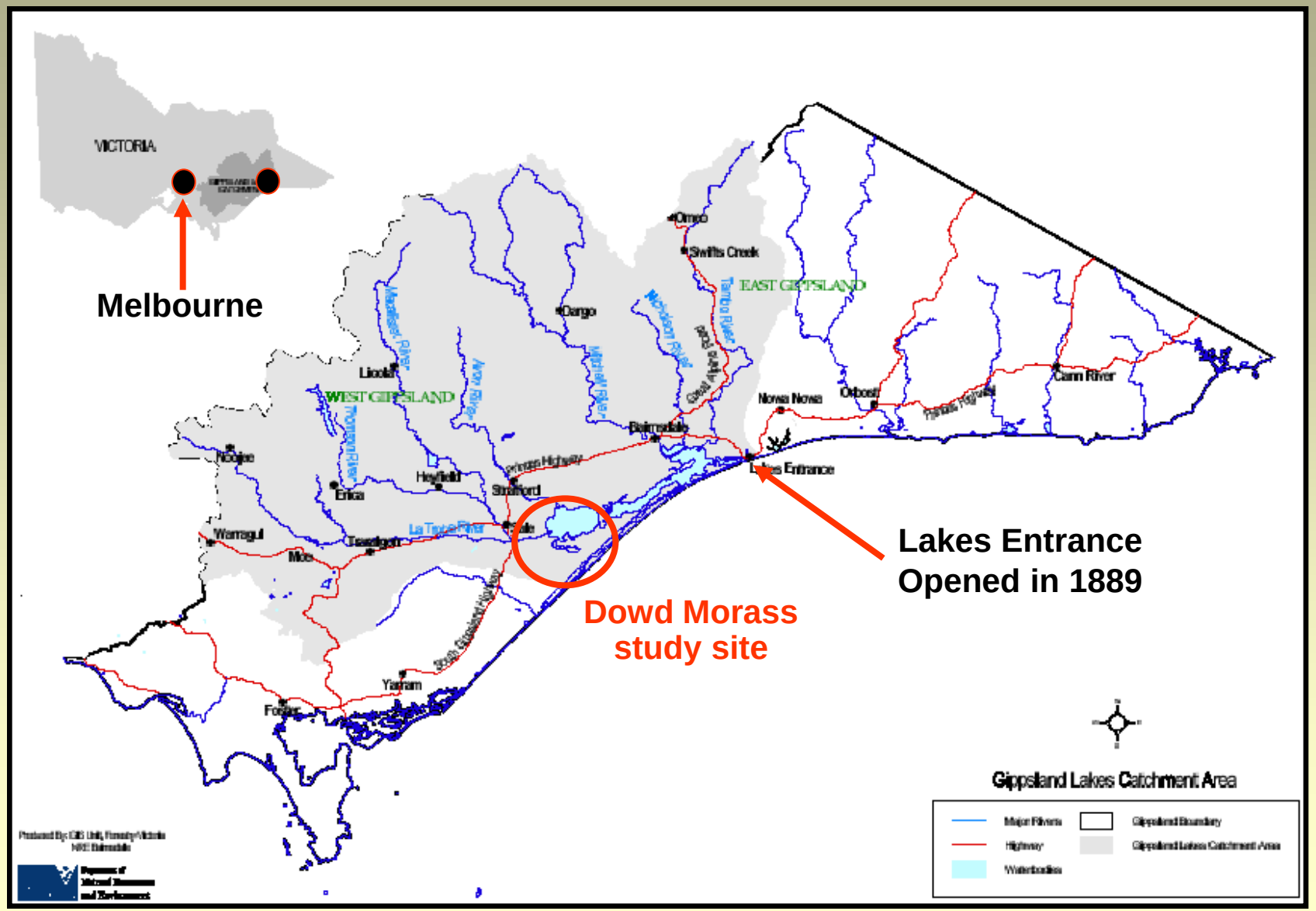
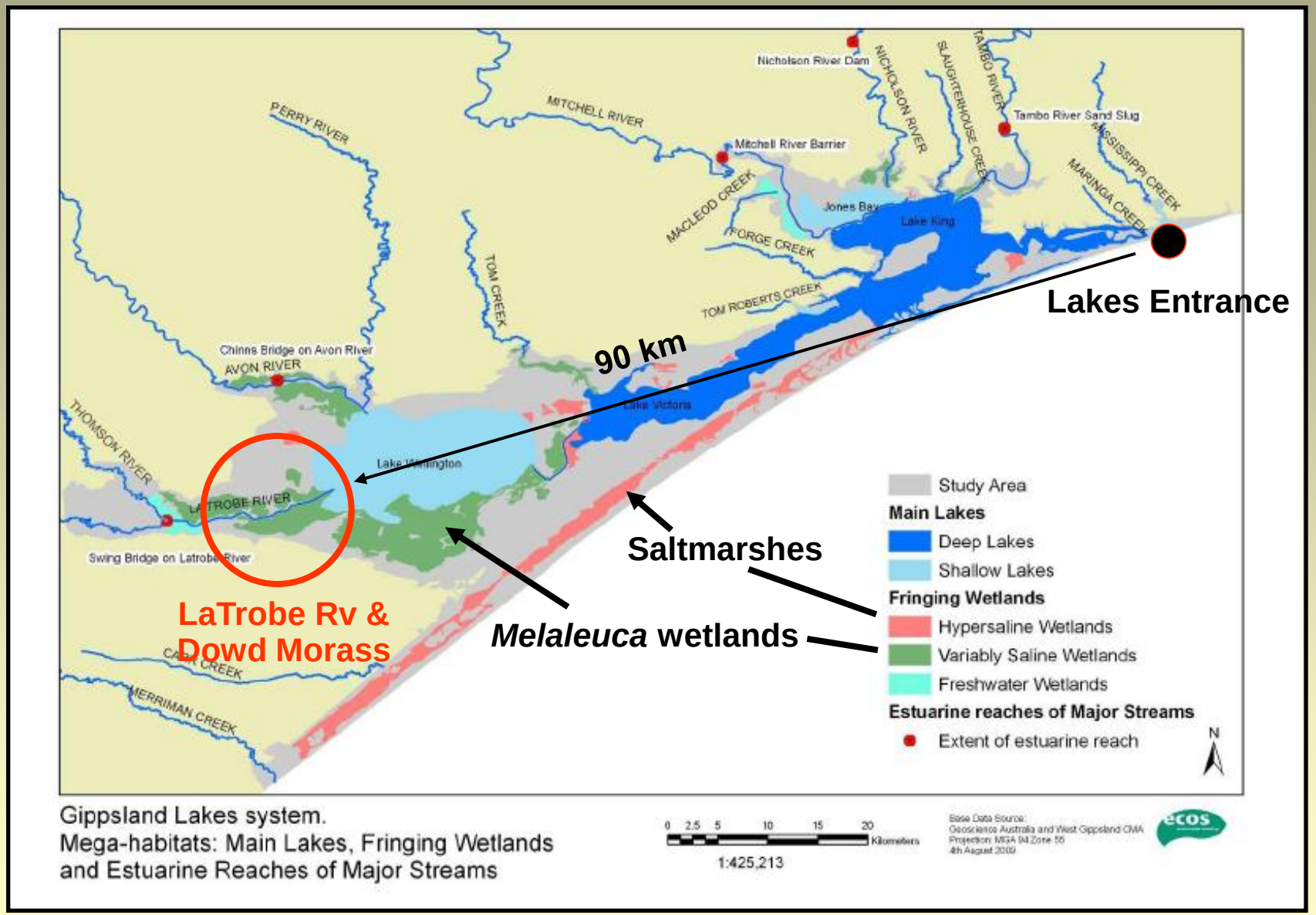
Australian distribution of *Melaleuca*



The Gippsland Lakes



Lakes Entrance

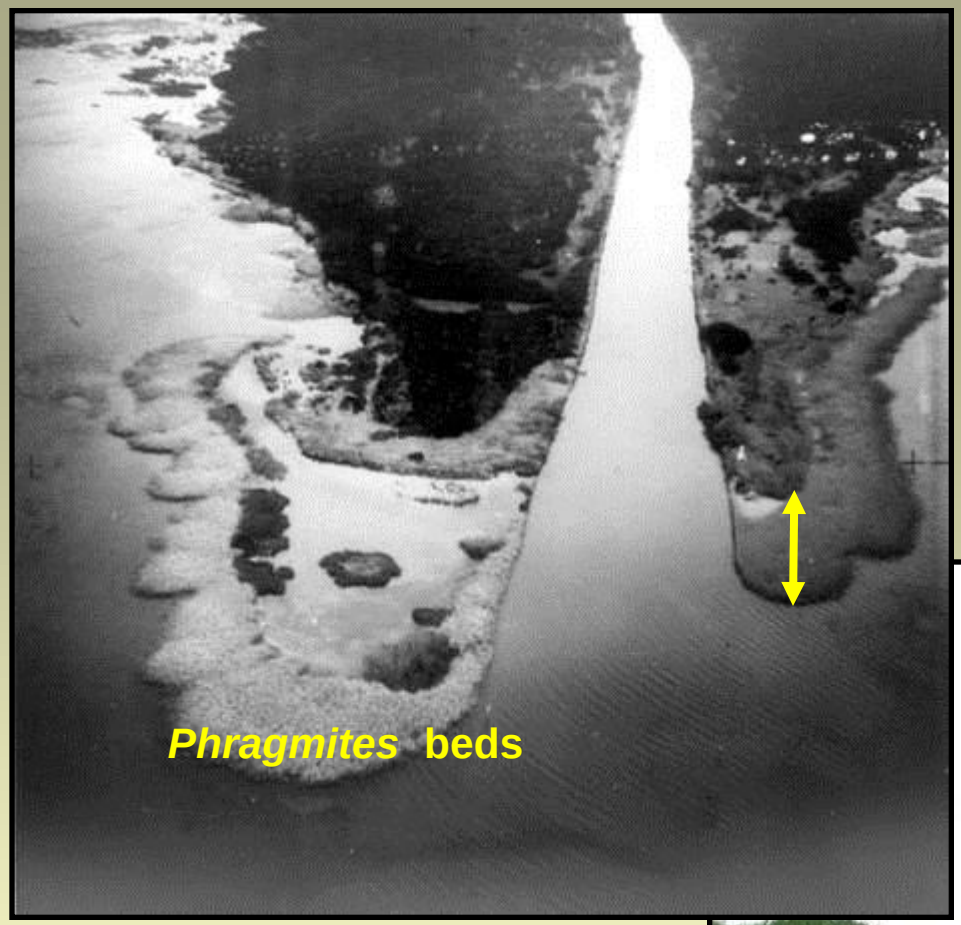


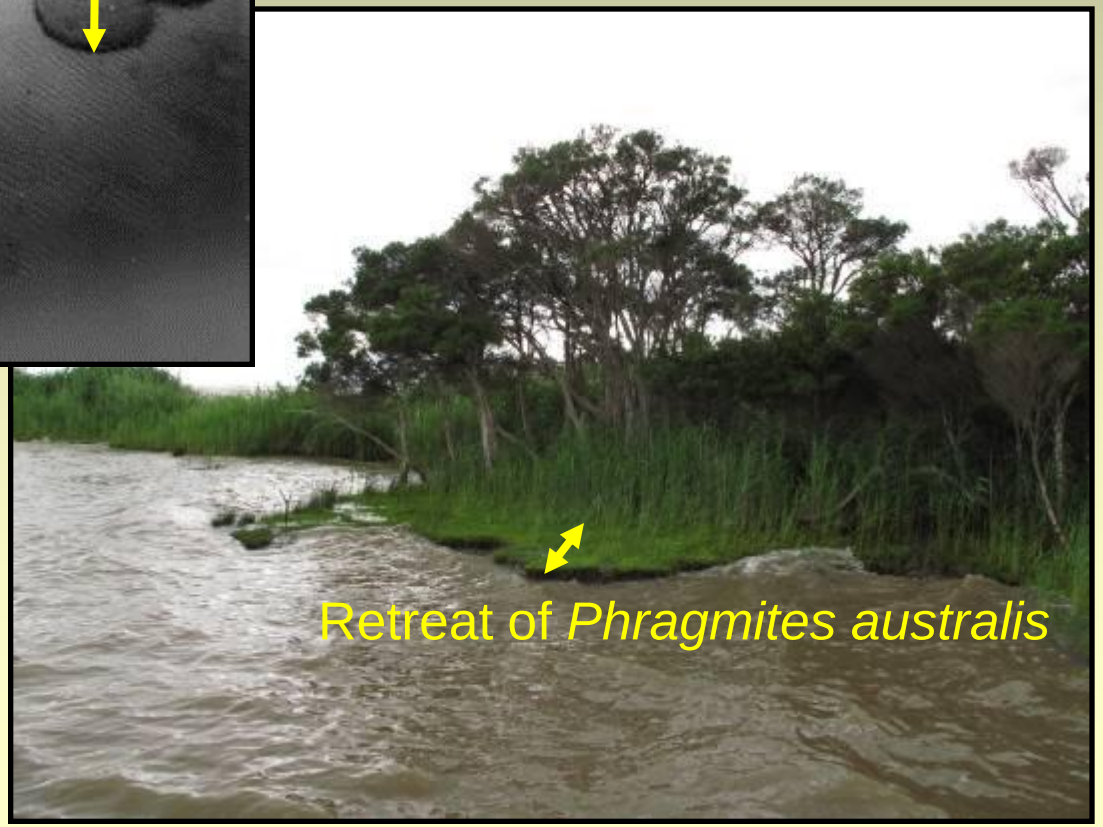
Gippsland Lakes system.
Mega-habitats: Main Lakes, Fringing Wetlands and Estuarine Reaches of Major Streams

Gippsland Sustainable Water Strategy (2010)

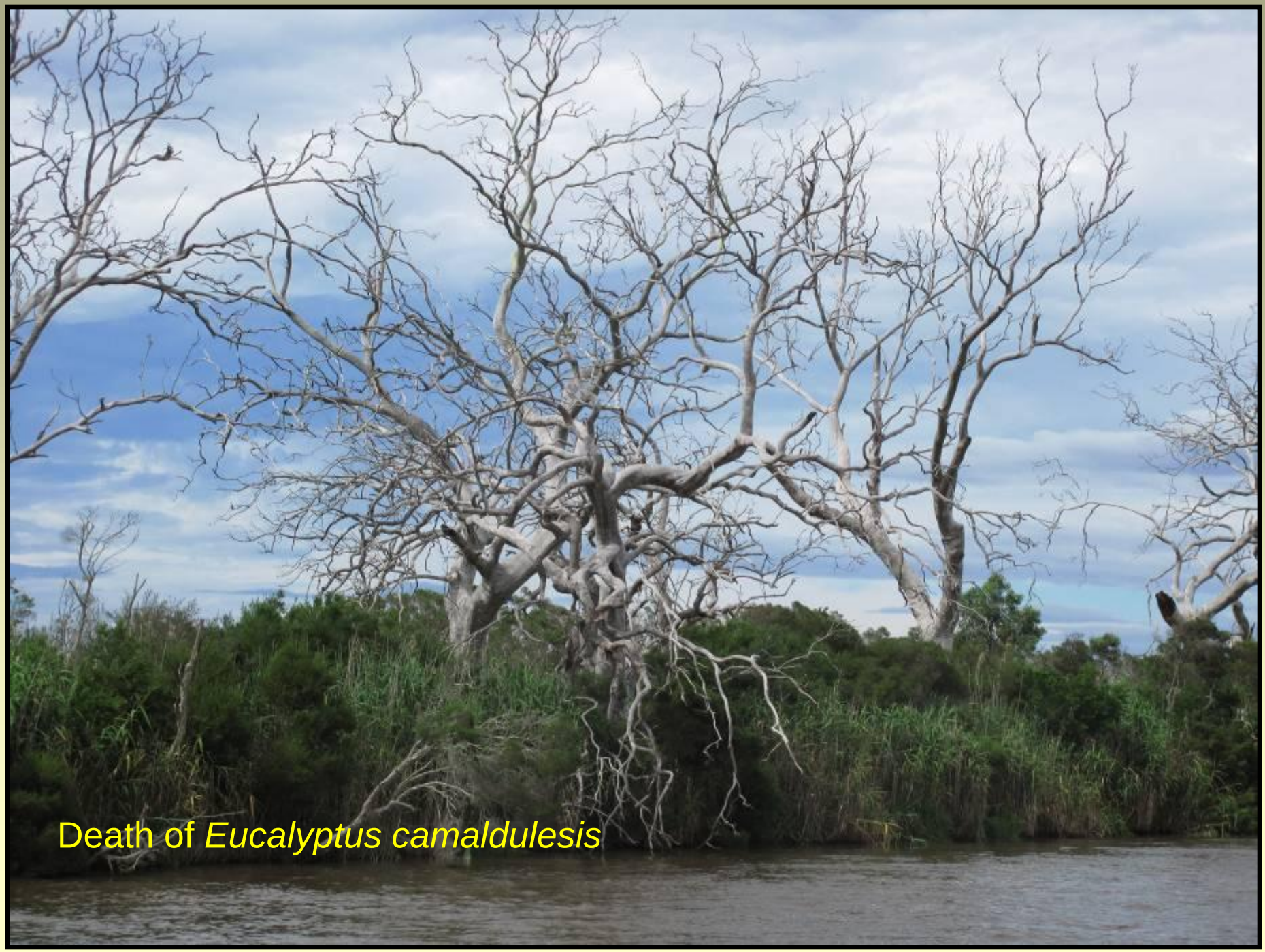
Consequences of artificial opening

LaTrobe Rv – Dowd
Morass estuary
Early 1950s
RAAF photo from Eric Bird





November 2010


Death of *Eucalyptus camaldulesis*

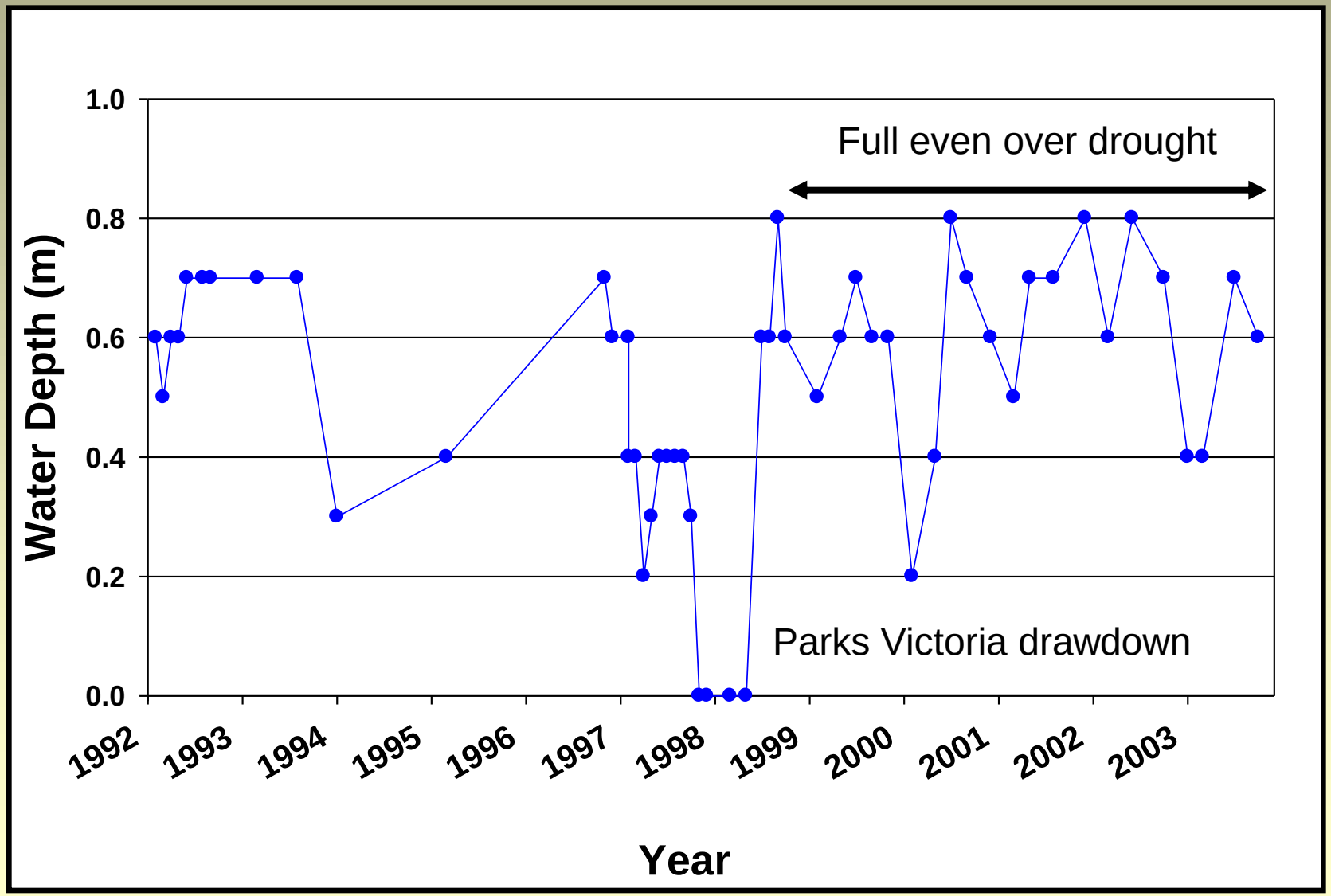

Death of *Melaleuca ericifolia*


Within Dowd Morass:
Death of adult plants
Little floristic diversity

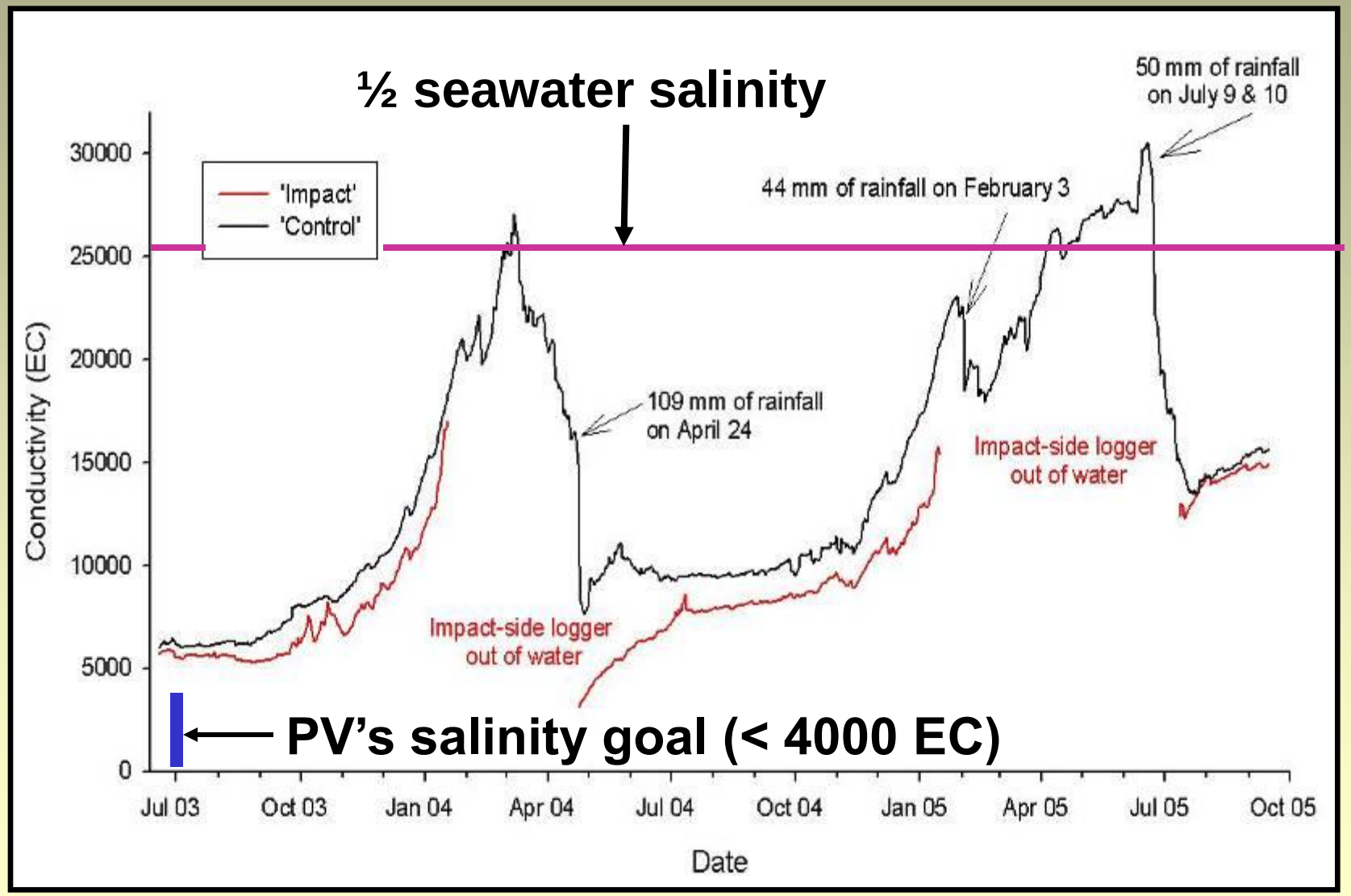

Loss of sexual reproduction


Root suckers

Morass kept full to prevent saline intrusions since 1992



But salinity is still very high



Rehabilitation predictions

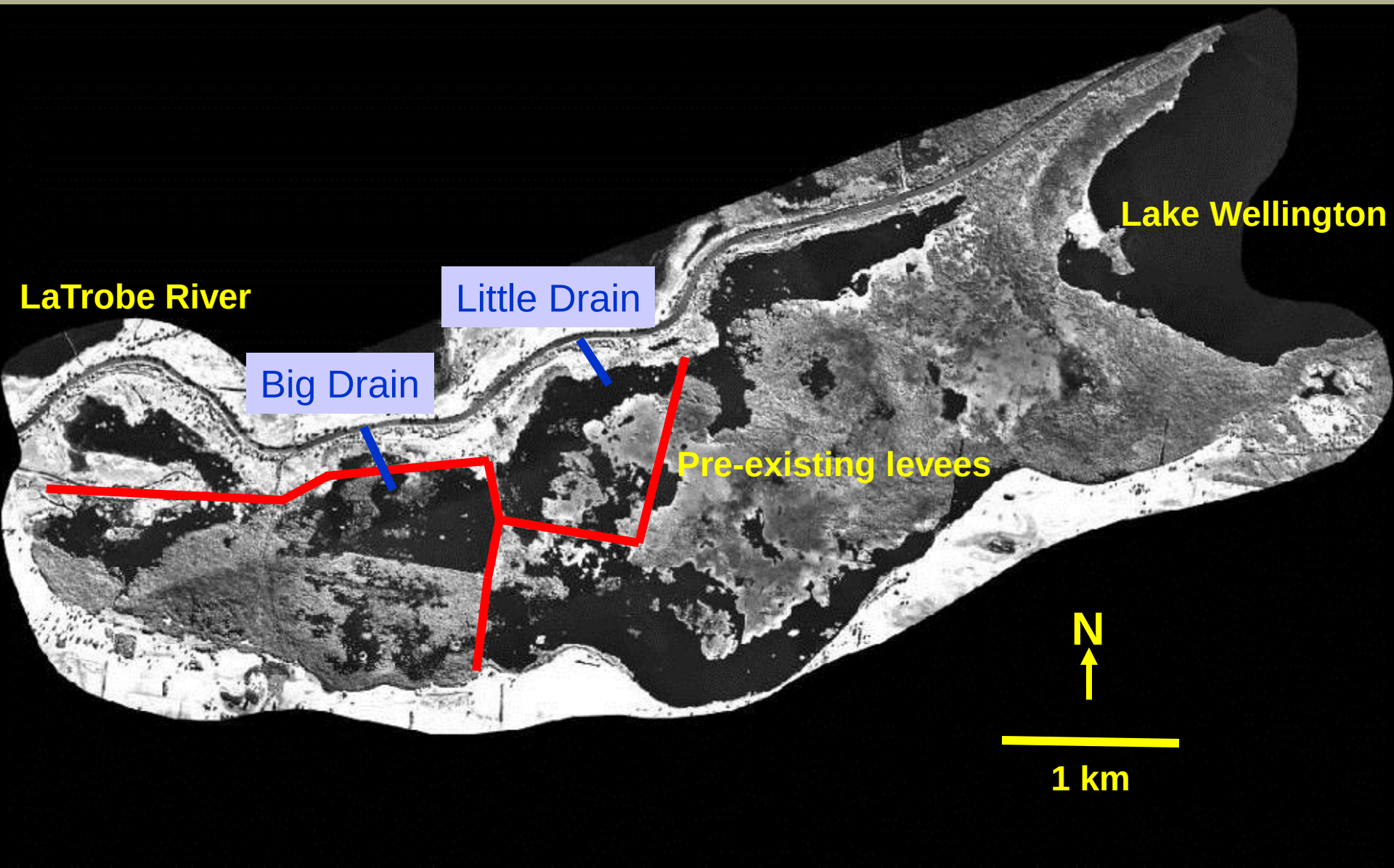
Re-instating a dry phase in Dowd Morass would

- **Improve condition of adult *Melaleuca***
- **Allow *Melaleuca* to recruit sexually**
- **Increase floristic diversity of understorey**

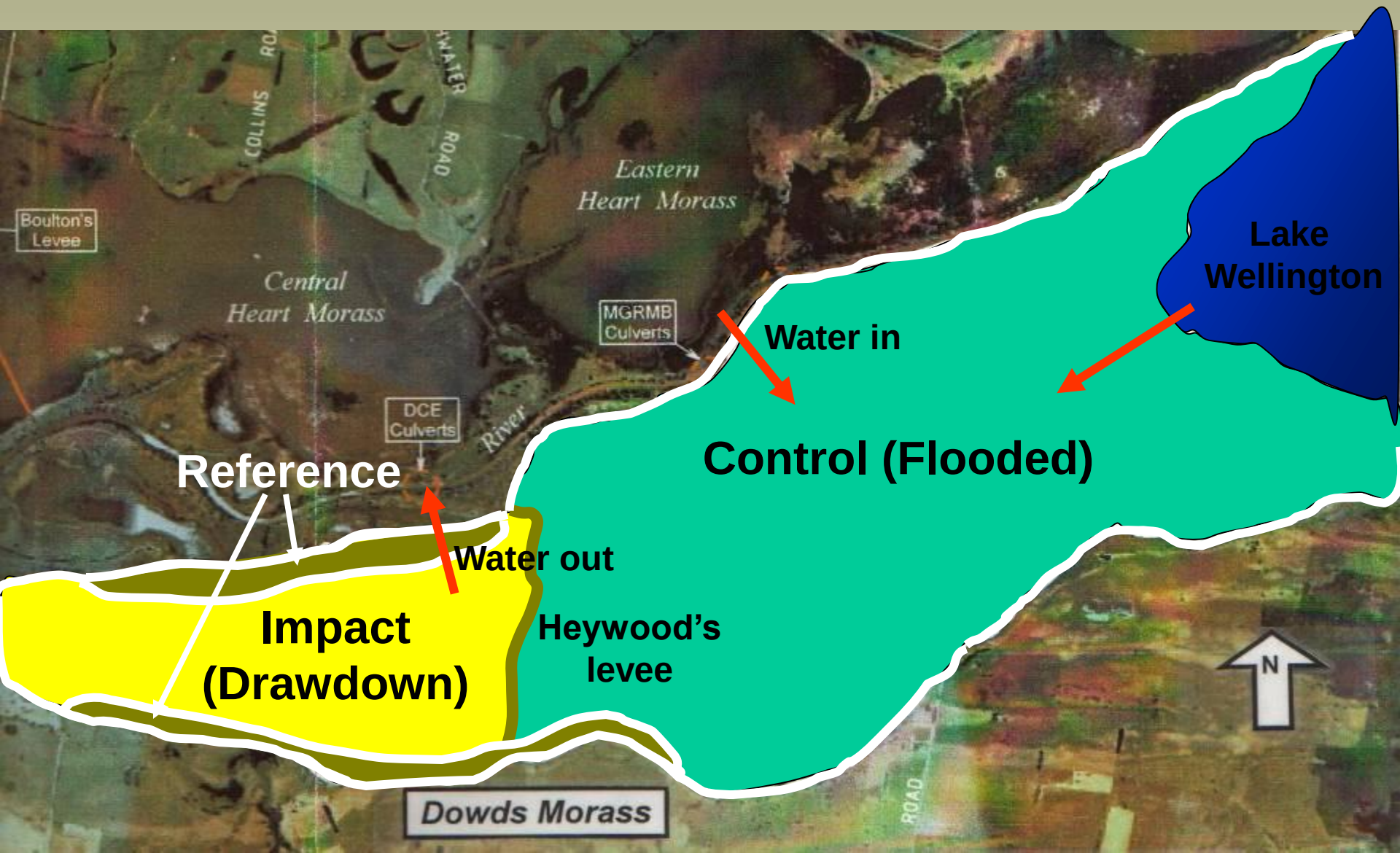
Risks included

- **Activating acid sulfate soils**
- **Increasing water-column and sediment salinity**
- **Being too short to achieve desired outcomes**
- **Too ambitious with too little resources**

Experimental manipulations

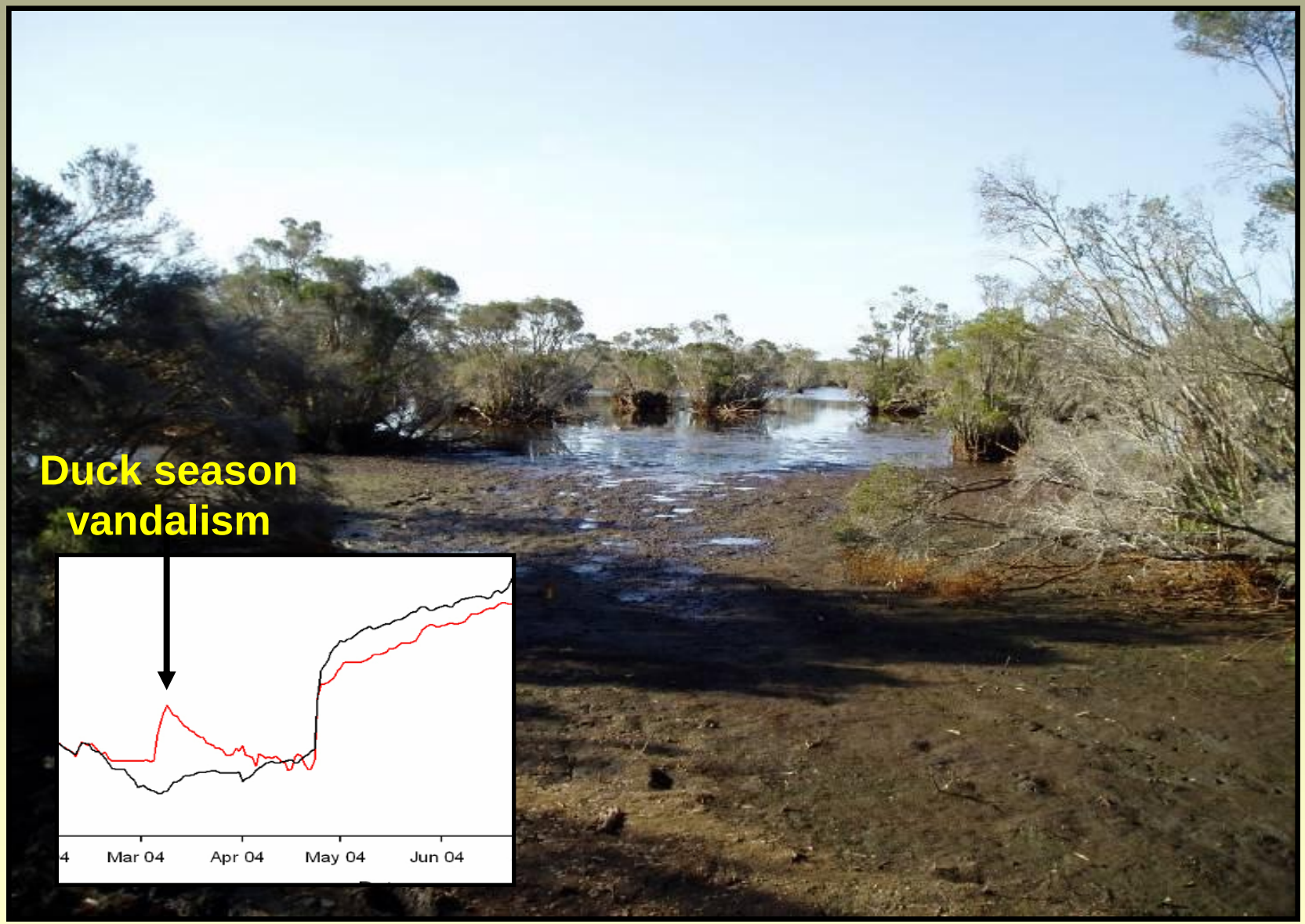


Beyond-BACI experimental design



Passive draw-down 2003-2004

Going well – then vandalism



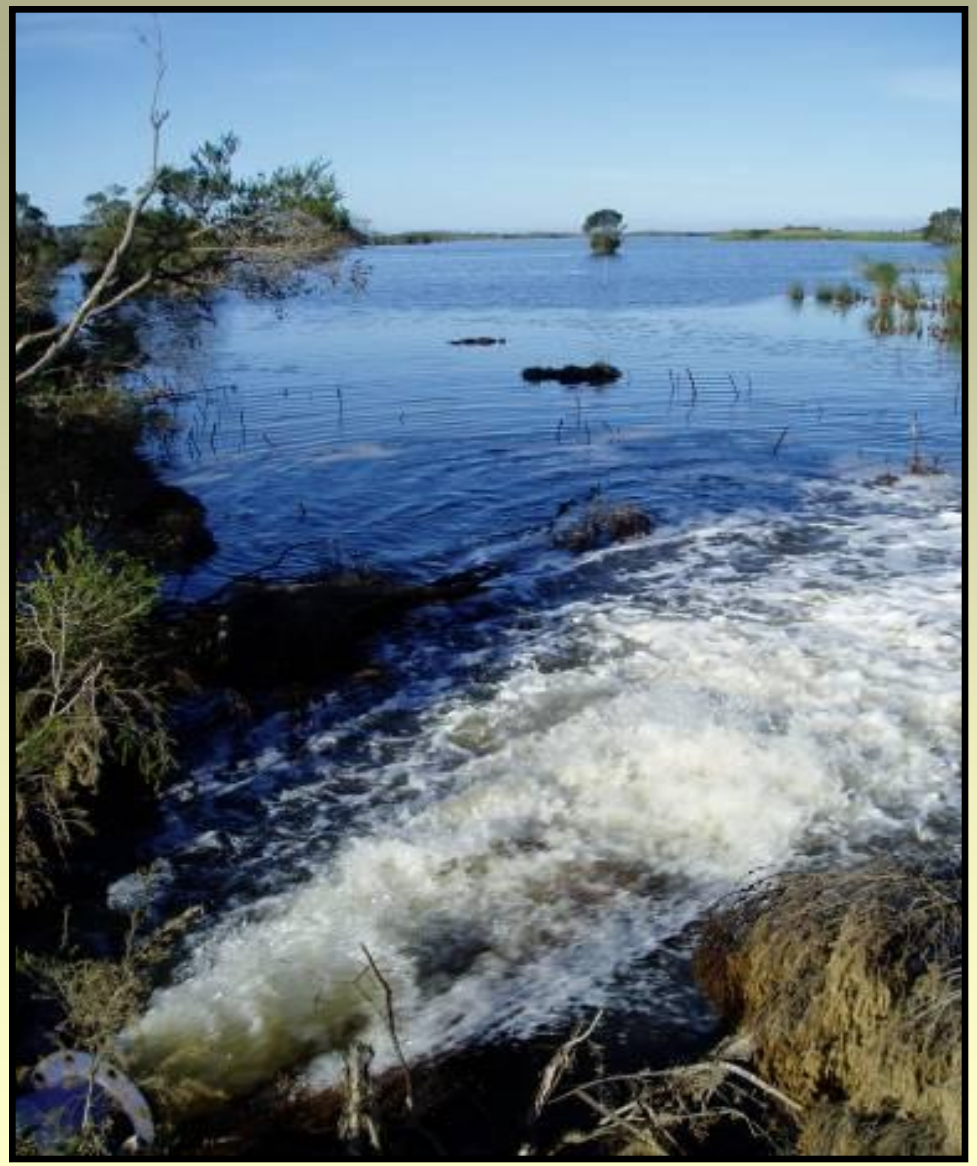
2nd intervention: active draw-down 2005

Response to 2004 vandalism in 2005:

Pumping!

- **1 x 12” pump**
- **1 x 10” pump**

Pumped continuously for 28 days in early 2005

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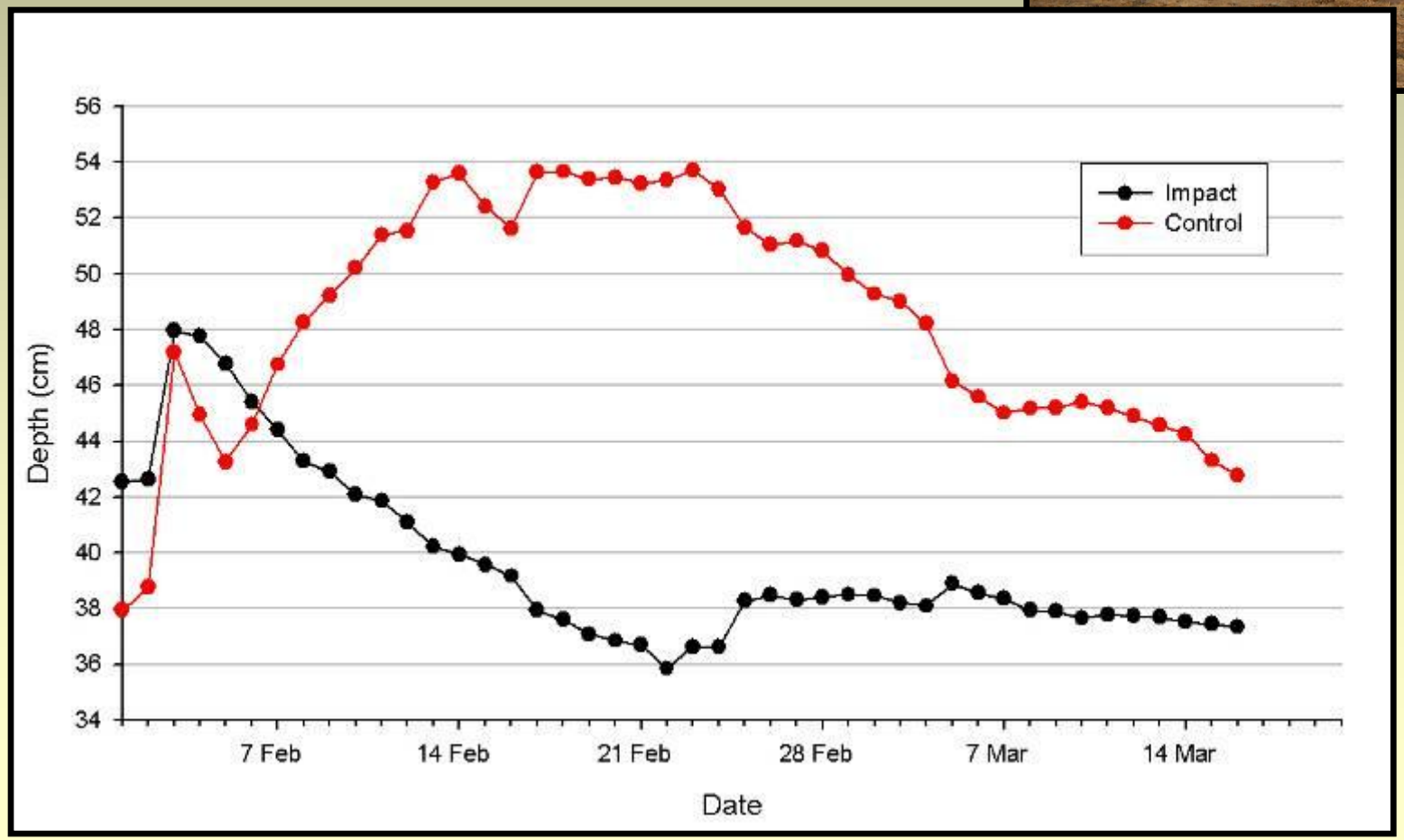
TIP


DYERS
CRANE HIRE
SWL 15T


DYERS
CRANE HIRE


4
KWIK

Active draw-down 2005



Beyond-BACI vegetation assessment

45 x 100-m long transects across wetland

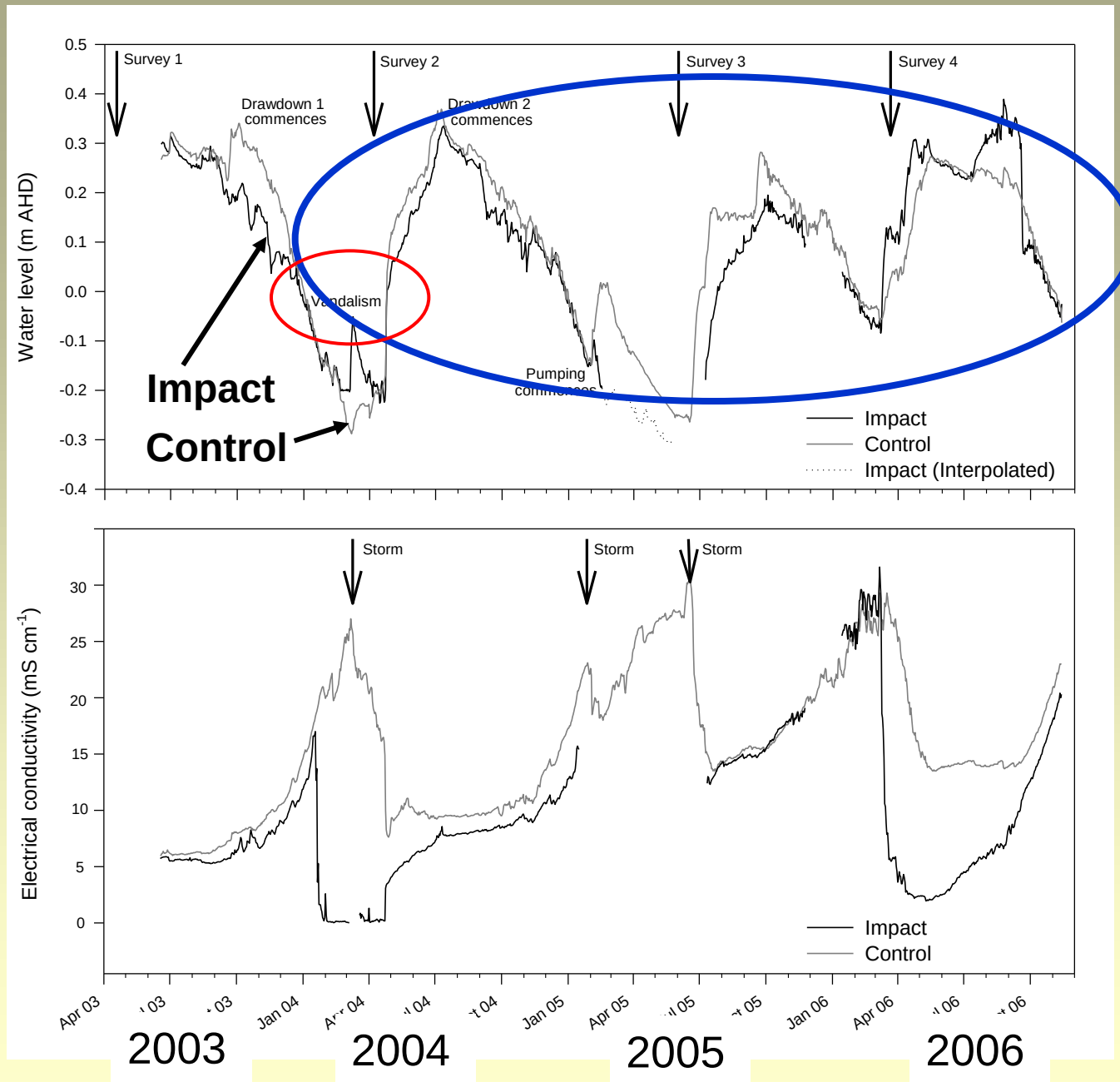
- 20 in Control (flooded) sites
- 20 in Impact (drawdown) sites
- 5 in Reference (shoreline) sites

Dates: April 2003 (B), June 2004 (D), April 2005 (D), April 2006 (A)

Variables:

- Continuous water depth and salinity (data loggers)
- Water depth along transects every 0.5 m (36,000 data pts)
- Vegetation floristics and structure (overstorey & understorey cover and floristics etc) (>120,000 data pts)

Results

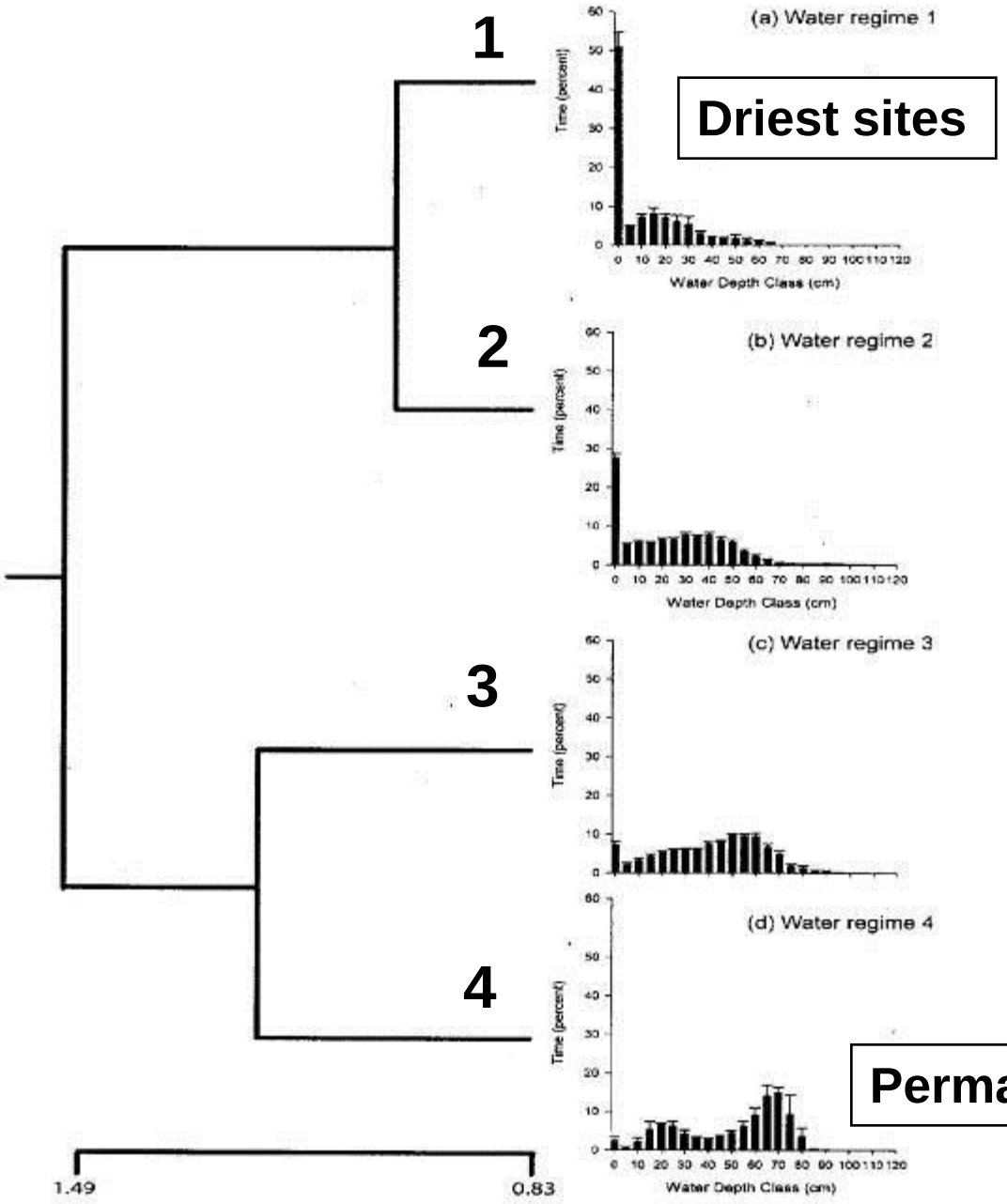


A) Water level

No big difference between Control and Impact water levels

B) Salinity

Confounding variability in salinity between Control and Impact sites



Driest sites

Permanently wet

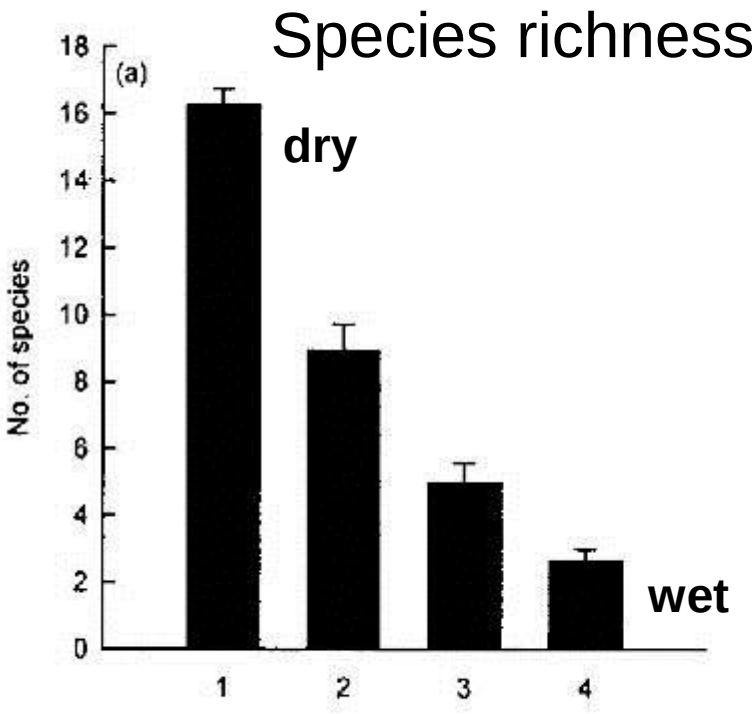
Alternative: non-BACI (gradient) analysis

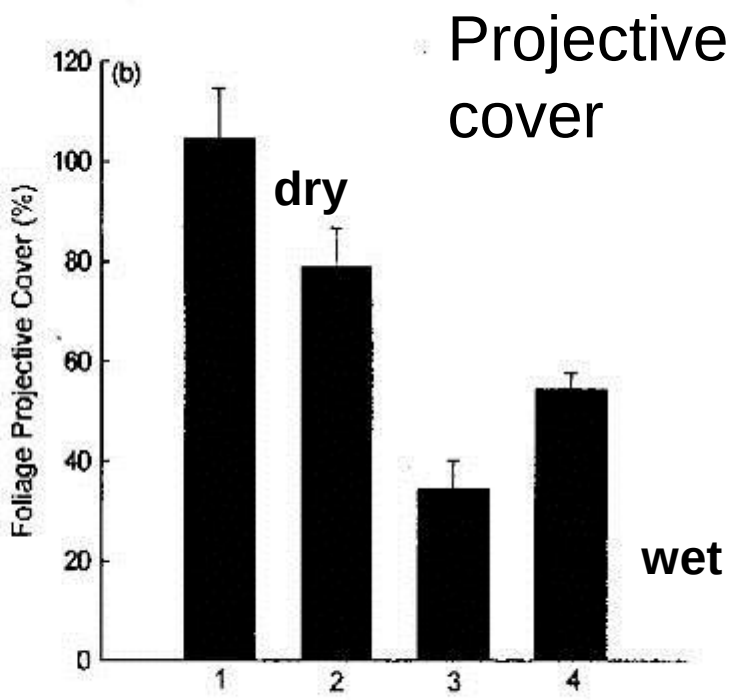
Instead of ANOVA, use gradient analysis

Classification of the hydrology as per Brownlow et al. (1994)

Four water regimes In Dowd Morass

Gradient analysis much better than original BACI-ANOVA approach





Water regimes 1 (dry) – 4 (wet)

Raulings, Morris & Boon (2010) *Freshwater Biology* 55: 701-715

Raulings, Morris & Boon (2011) *Freshwater Biology* 56: 2347-2369

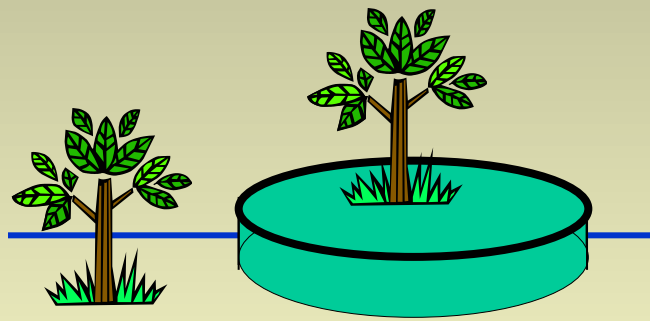
What causes the diversity of hydrologies? Microtopographic relief

Caused by *Melaleuca*, *Phragmites* and *Paspalum* humps

Photo by Matt Hatton

Implications for wetland rehabilitation

2005 revegetation trials



Success after 1 year

<10 % 90%

Large-scale hummock creation, 2006

Results after 4 years

More information?

Copies of two technical handbooks (2005, 2007)

Summary hand-out of papers to date

Over some beers tonight