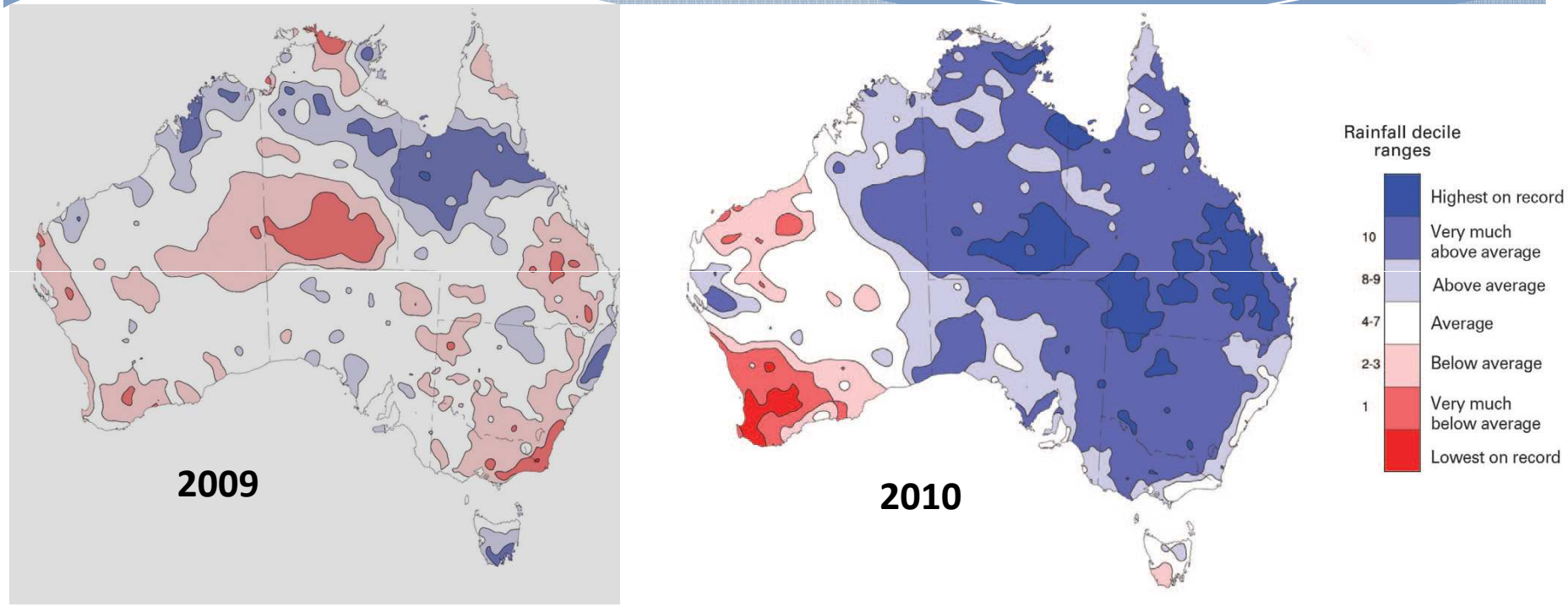
Learning from extreme events



Annual Rainfall Deciles

(based on a 111-year climatology of gridded fields from 1900 to 2010).

Justin Brookes

Learning from history

"When the well is dry, we learn the worth of water"

Benjamin Franklin (1706 – 1790)

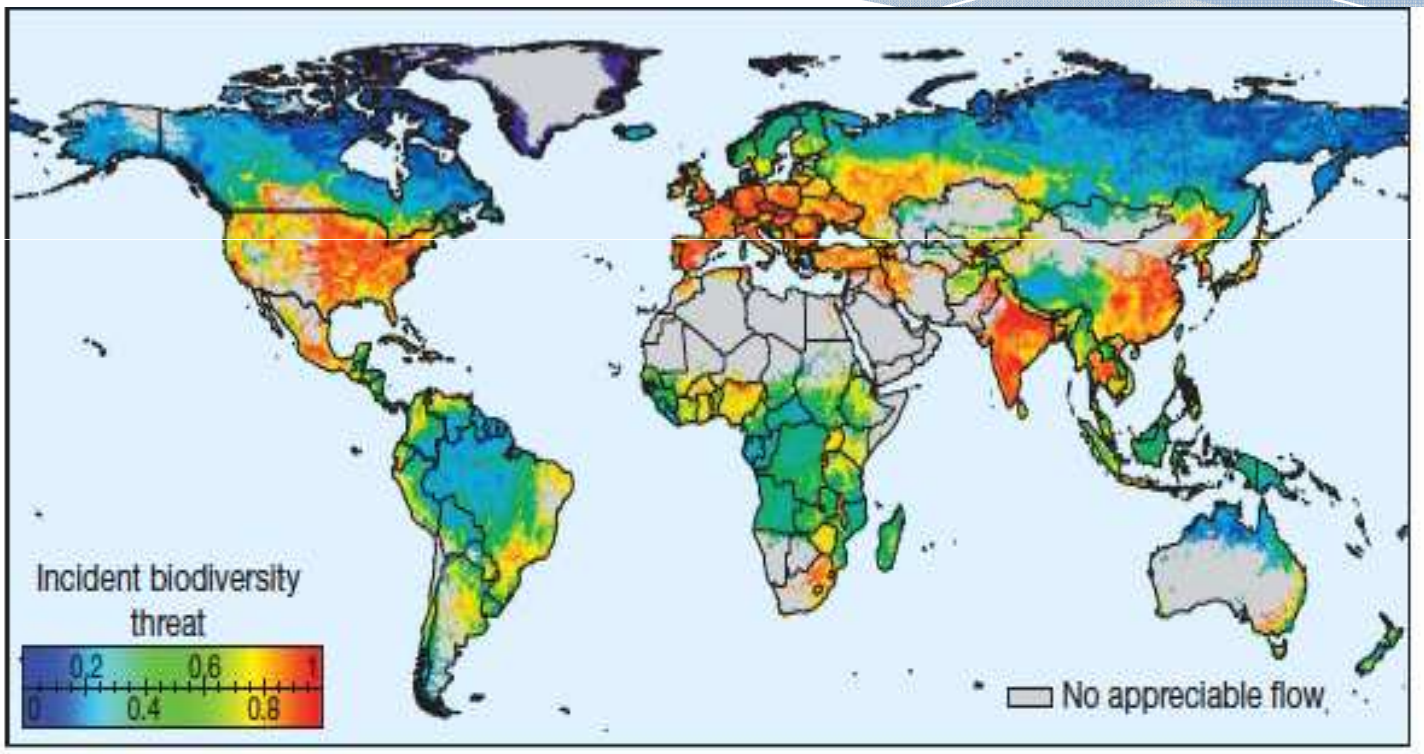
….. 300 years later what have we learnt ?

LAKES
The canaries in the landscape

* Sensitive indicators of catchment modification and climatic conditions
* Integrate across landscape, hydrology and climate

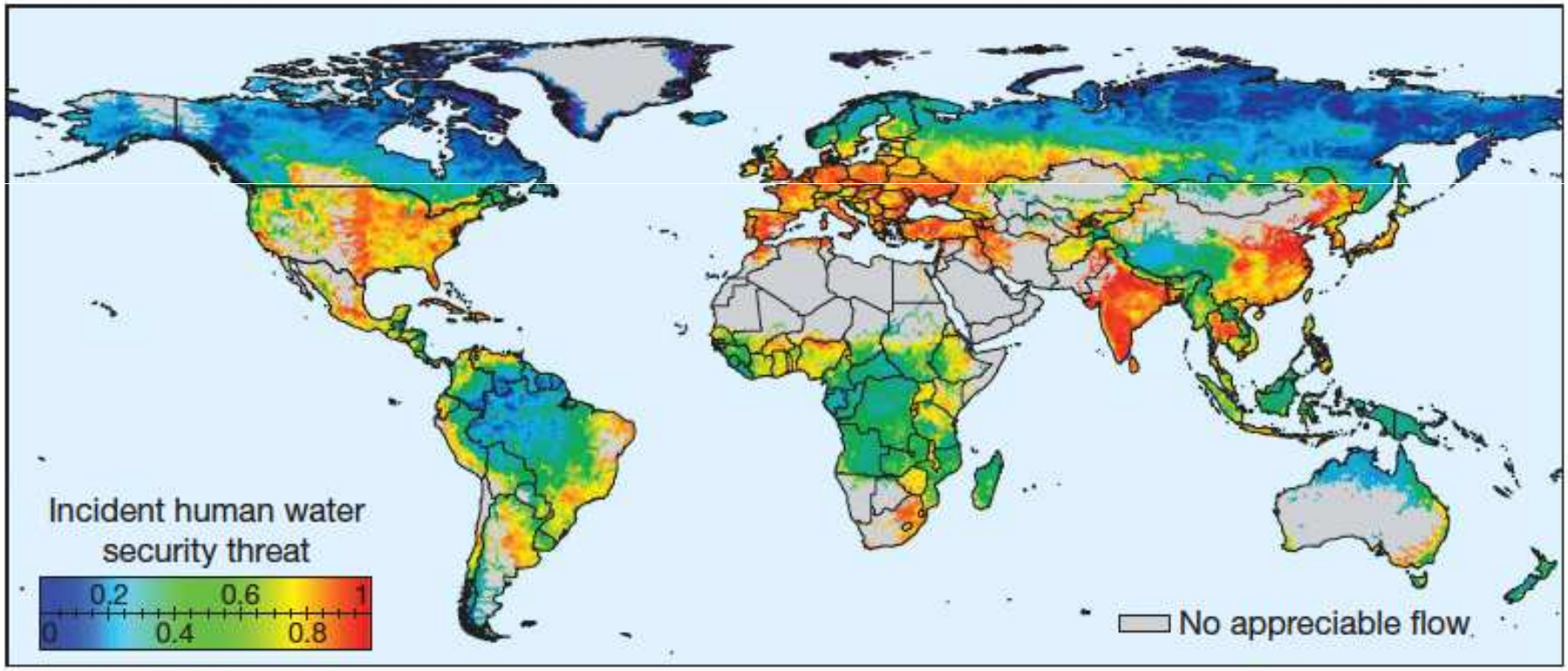
So what are our lakes, rivers and wetlands telling us?

River biodiversity under threat



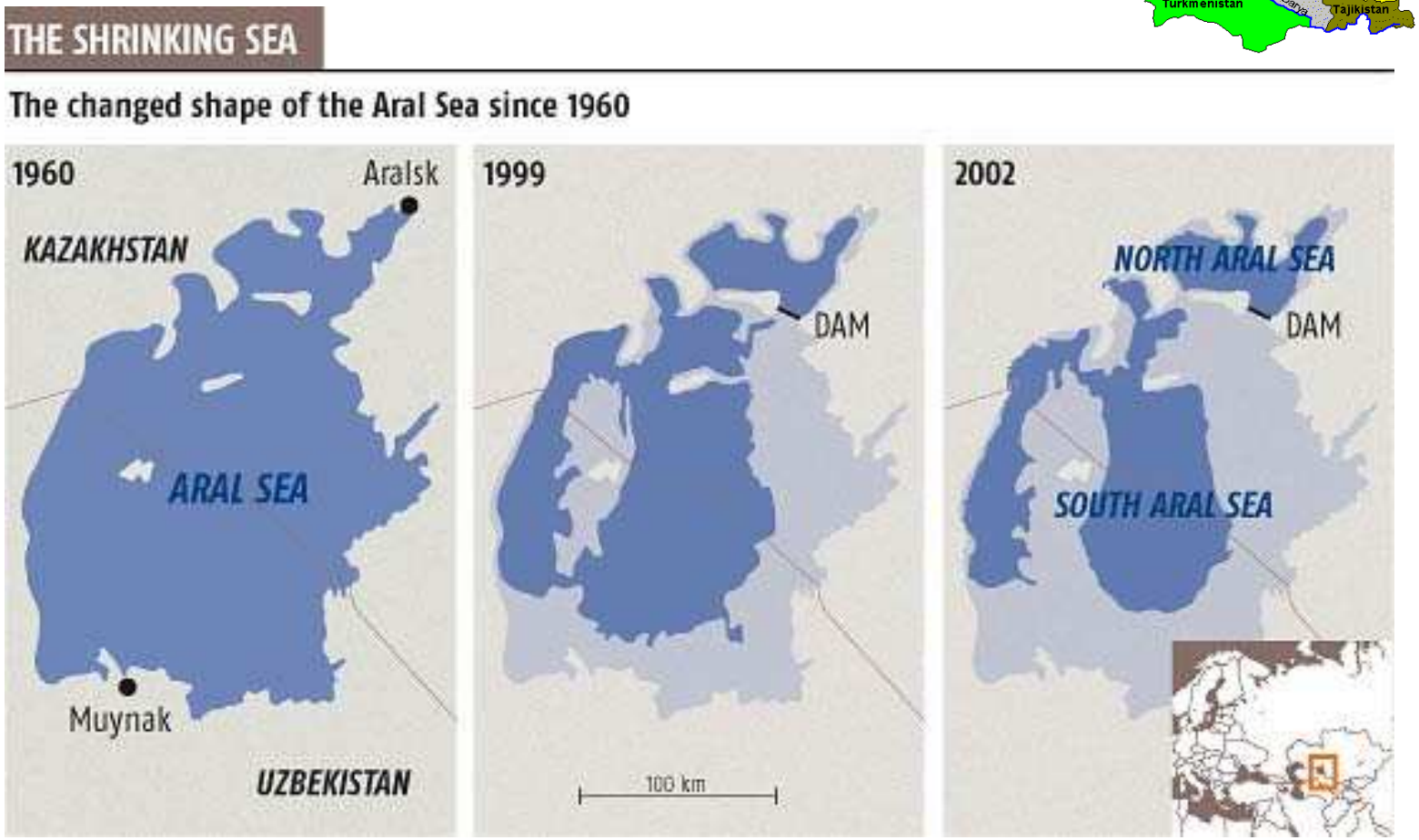
Vorosmarty et al. (2010) Global threat to human water security and river biodiversity Nature 467: 555 - 561

Human security threat



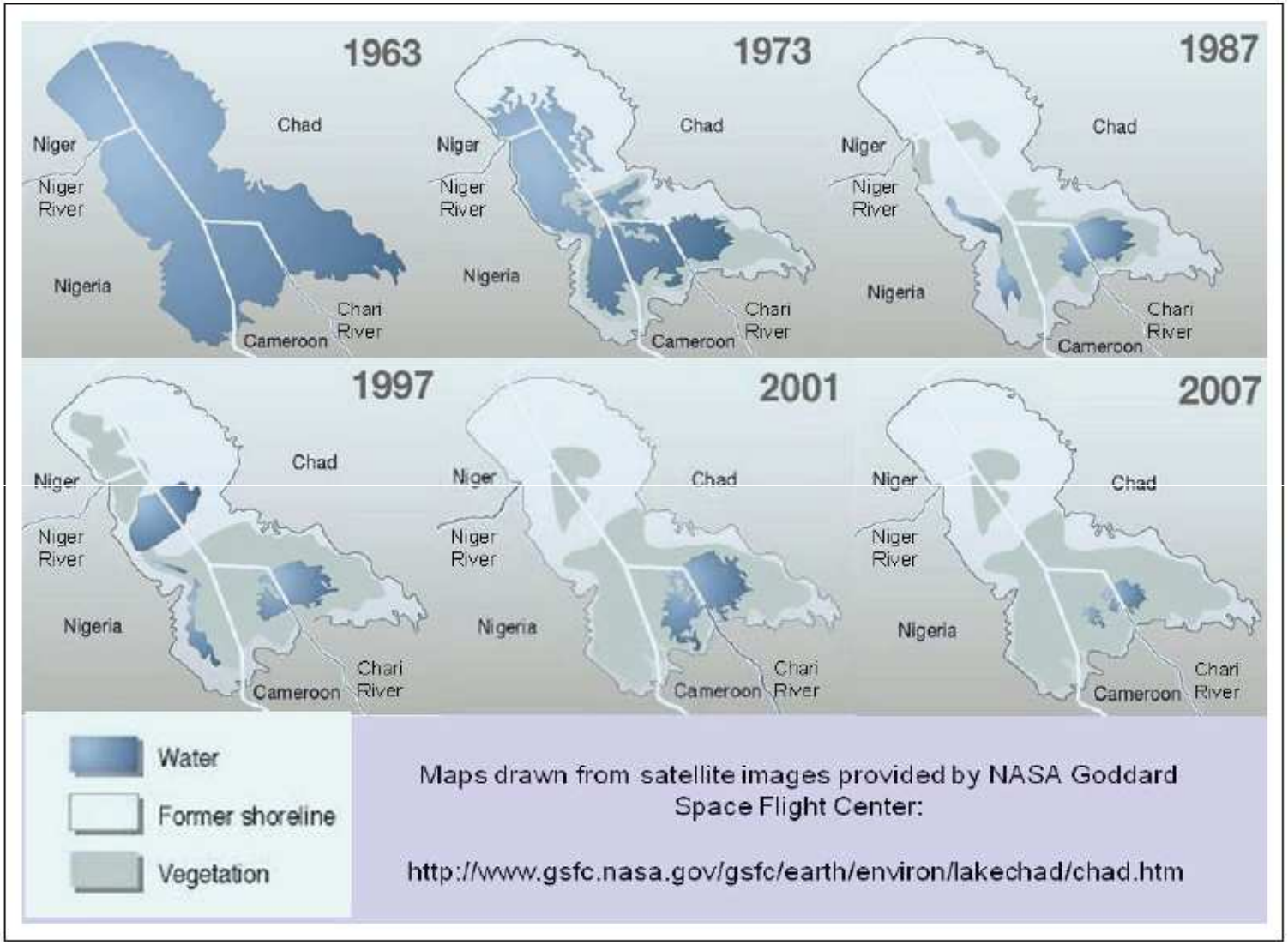
Aral Sea

- 75% reduction in volume
-120km shoreline retreat



The Aral Sea

Image sources: www.alexandre.leroux.net/water/pictures/boat_over_aral_sea.jpg
and maguires.com/patupe/ photos.htm


1963
1973
1987
1997
2001
2007
Chad
Niger
Niger River
Nigeria
Cameroon
Chari River
Water
Former shoreline
Vegetation
Maps drawn from satellite images provided by NASA Goddard Space Flight Center:
http://www.gsfc.nasa.gov/gsfc/earth/environ/lakechad/chad.htm

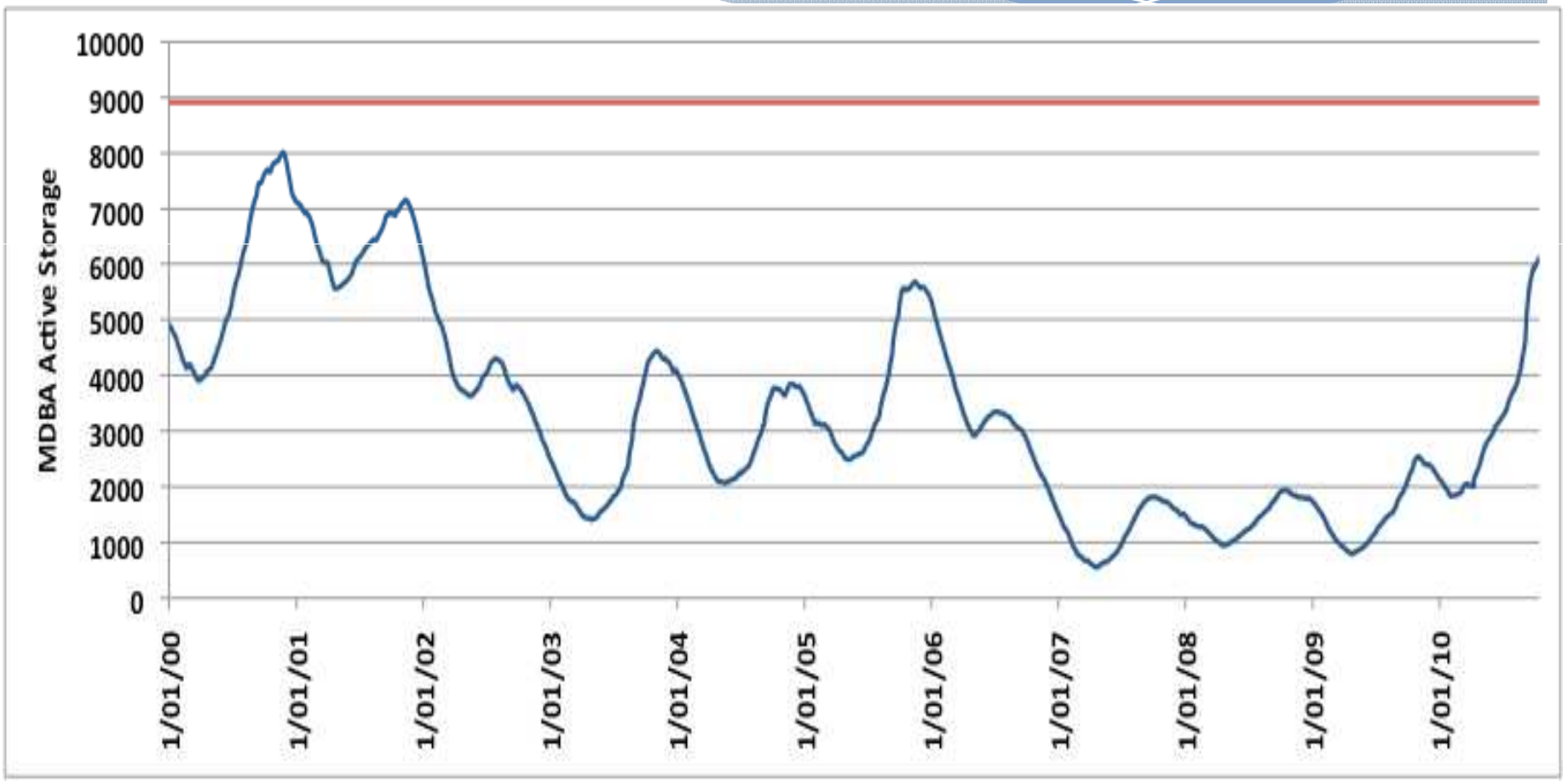
The role of science to inform policy and management

* How do we protect ecosystems given competing demands and uncertainty about future climate?
* Requires robust science to inform the debate on water use
  * also includes economic and social aspects
* Need for predictive capacity
  * Climate, hydrology, hydrodynamics, water quality, ecological response
  * Science to ensure we get maximum return on $$

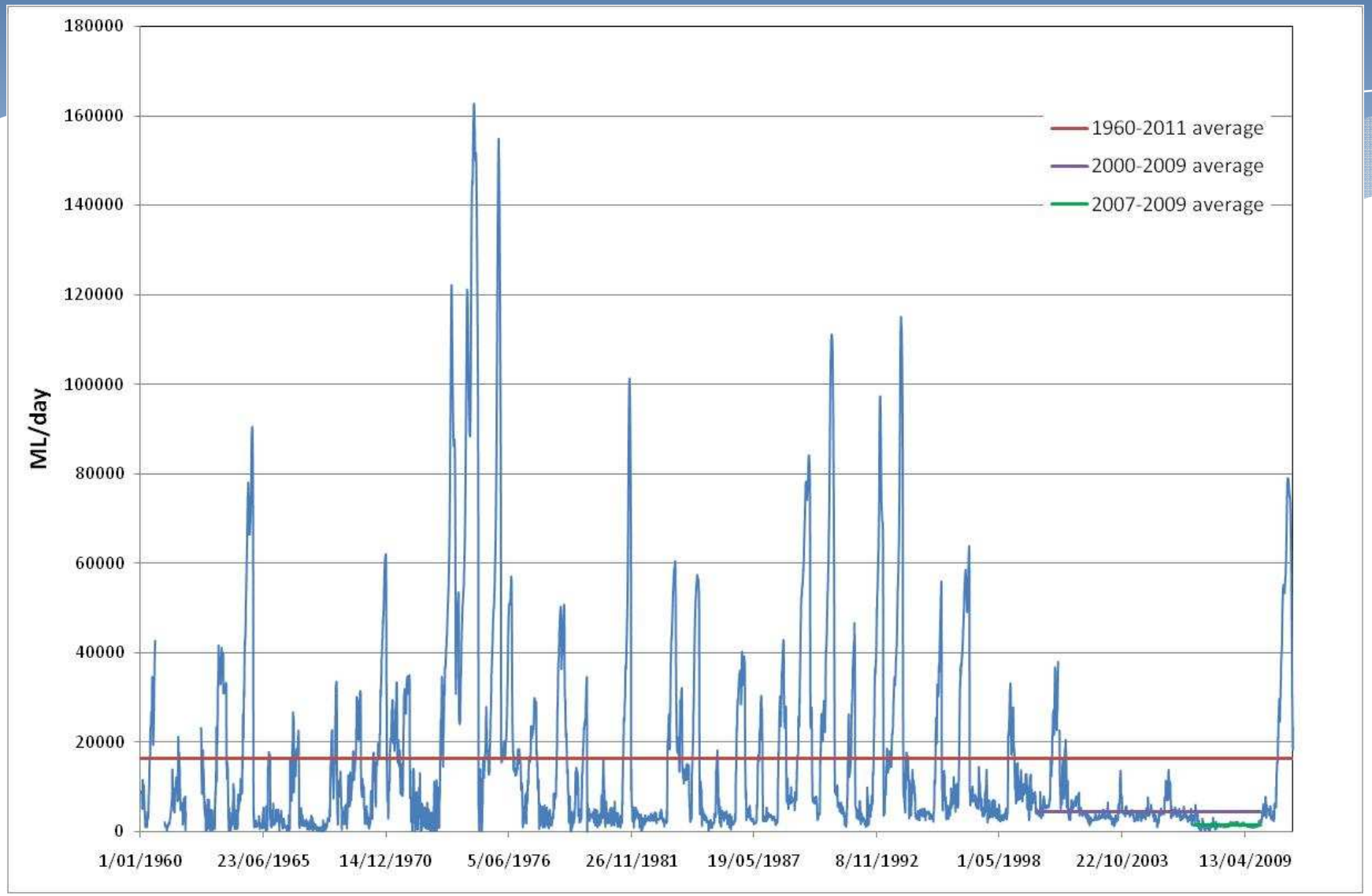
River regulation, over allocation and drought in our lifetime

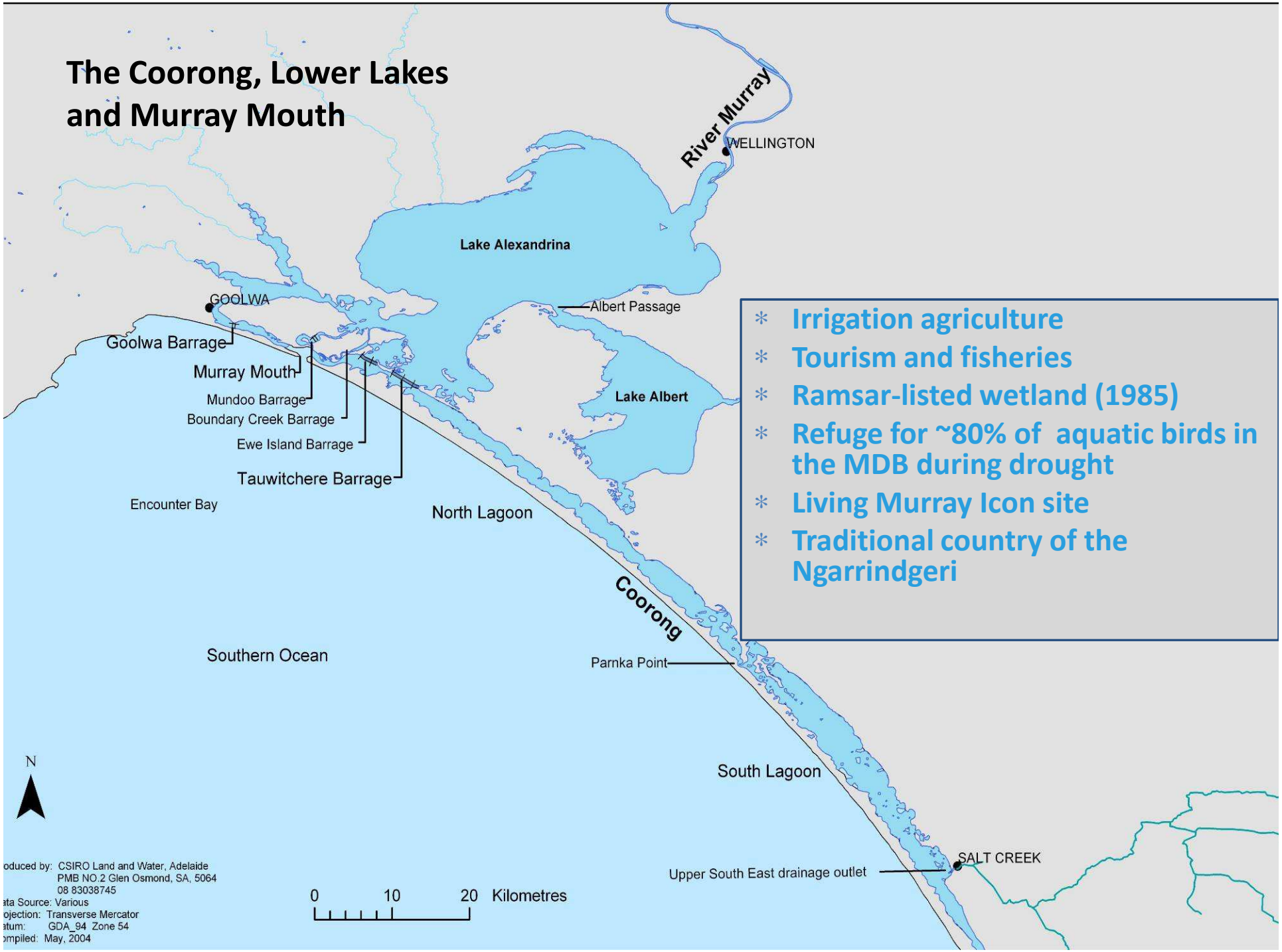
* 1980 – The Song
  * “Take it easy this summer” produced for E&WS
* 1994 – The Cap
  * recognition that the River Murray was over allocated
* 2000s – The Drought
  * Low river flow left the system vulnerable and in some cases at the point of collapse
* Lessons from the Coorong

The realities of the situation

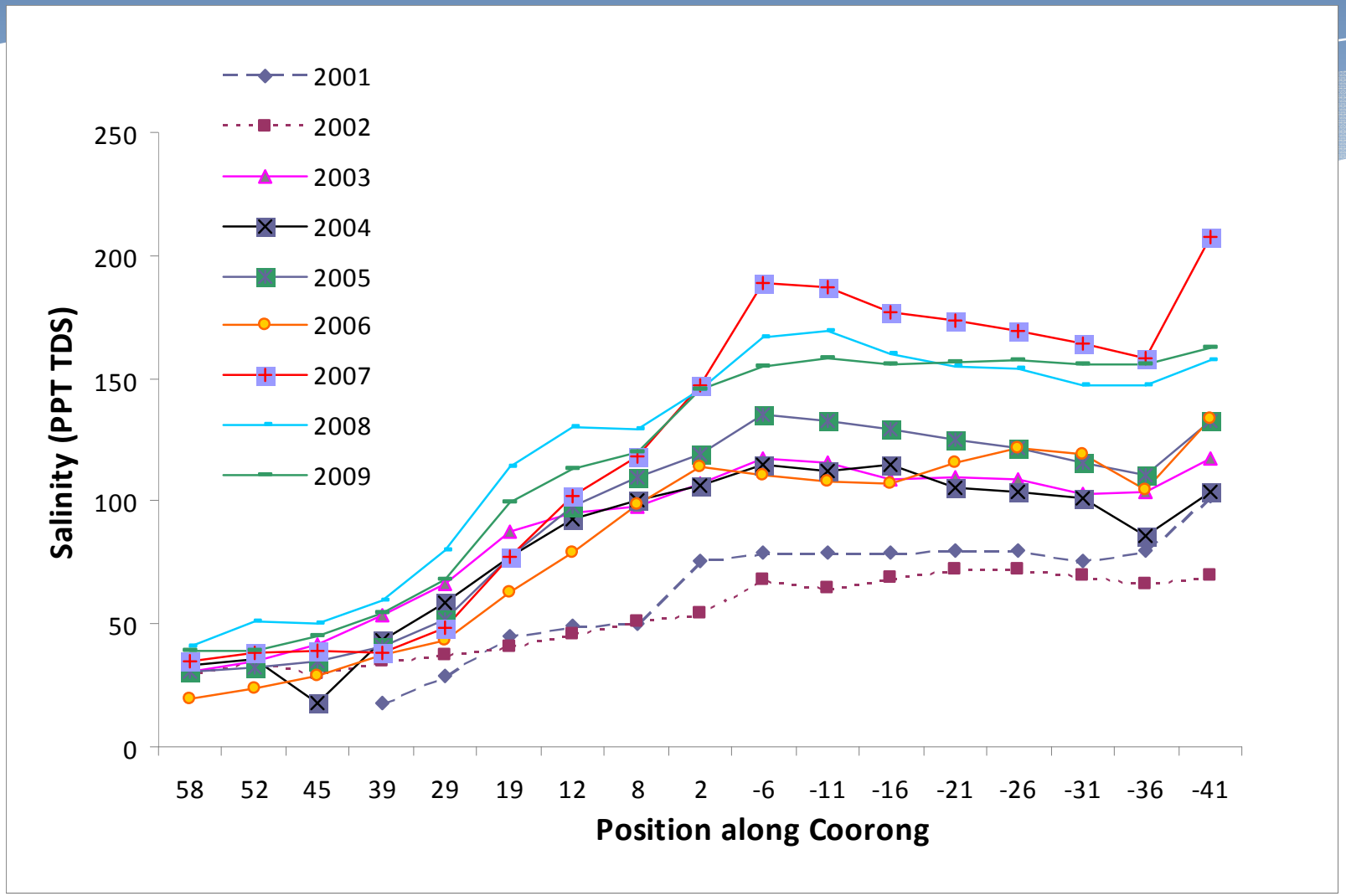


Flows over Lock 1 (Blanchetown) 1960-2011

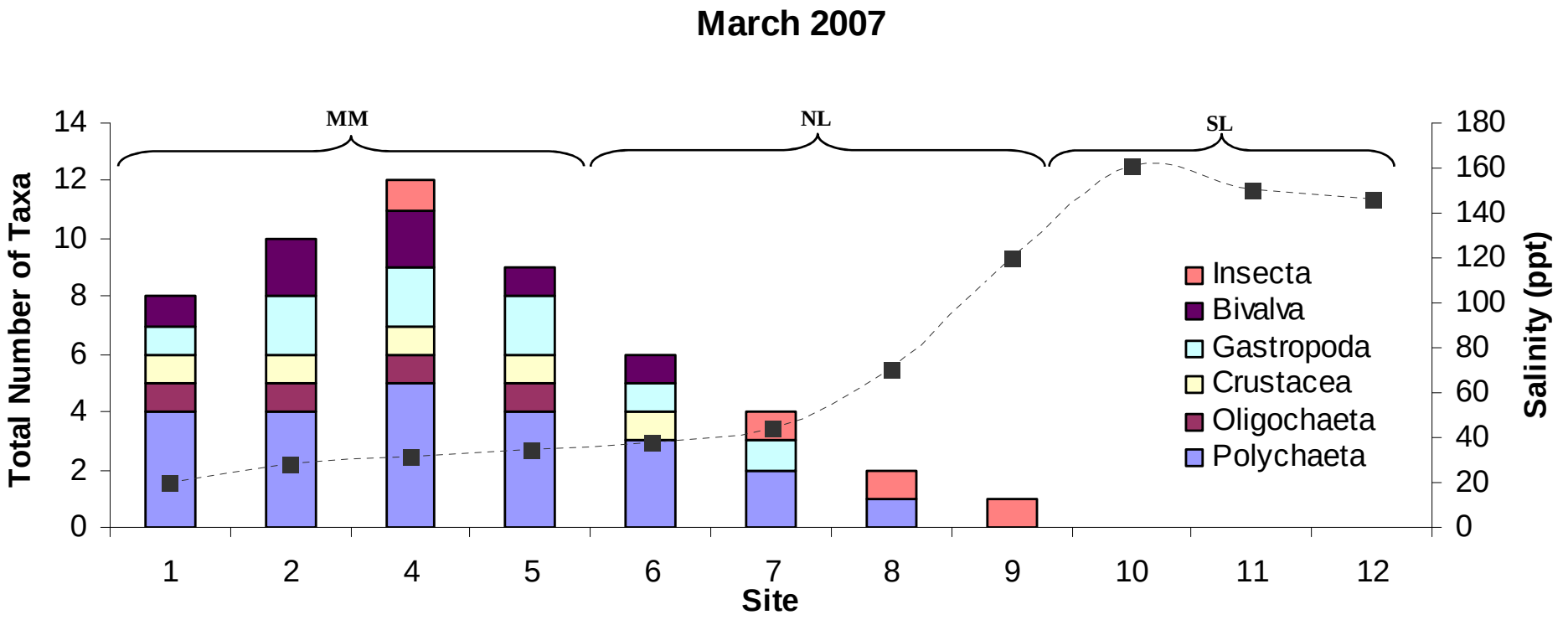


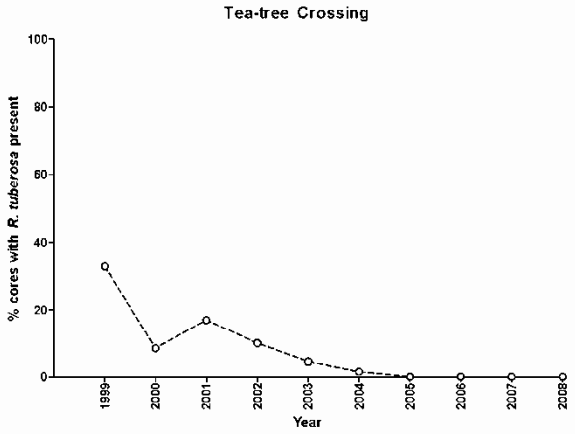

The Coorong, Lower Lakes and Murray Mouth
River Murray
WELLINGTON
Lake Alexandrina
Albert Passage
GOOLWA
Goolwa Barrage
Murray Mouth
Mundoo Barrage
Boundary Creek Barrage
Ewe Island Barrage
Tauwitchere Barrage
Lake Albert
Encounter Bay
North Lagoon
Coorong
Southern Ocean
Parnka Point
South Lagoon
SALT CREEK
Upper South East drainage outlet
N
0 10 20 Kilometres
oduced by: CSIRO Land and Water, Adelaide
PMB NO.2 Glen Osmond, SA, 5064
08 83038745
ta Source: Various
ojection: Transverse Mercator
atum: GDA_94 Zone 54
ompiled: May, 2004
* Irrigation agriculture
* Tourism and fisheries
* Ramsar-listed wetland (1985)
* Refuge for ~80% of aquatic birds in the MDB during drought
* Living Murray Icon site
* Traditional country of the Ngarrindgeri

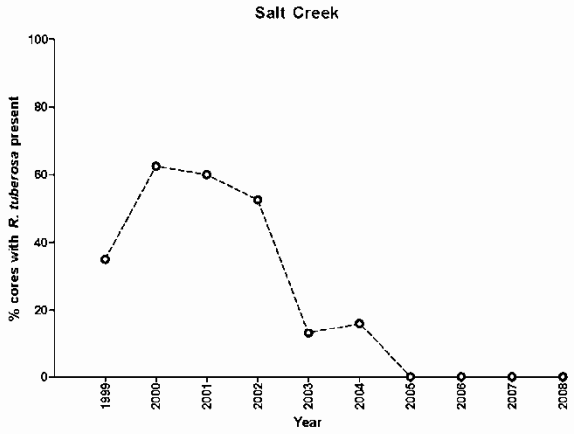
Salinity gradient in the Coorong

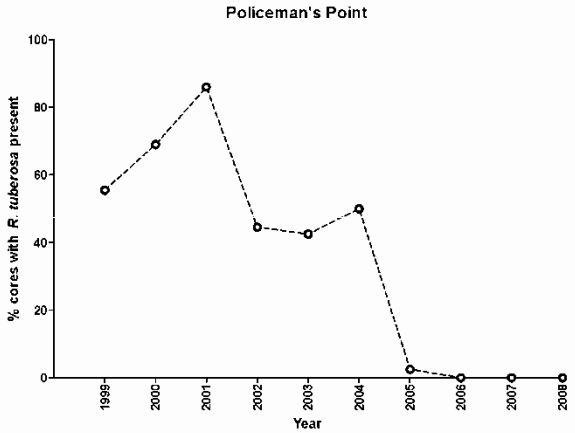


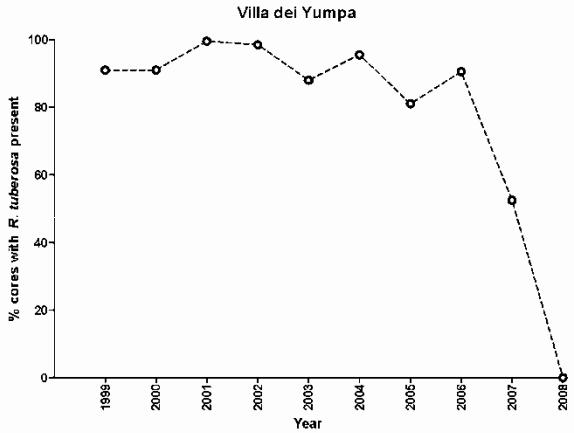
Invertebrate Distributions

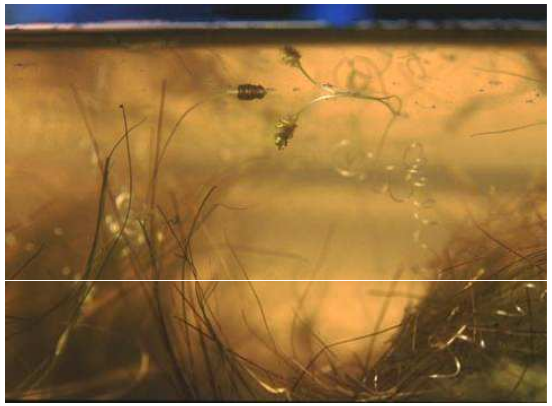


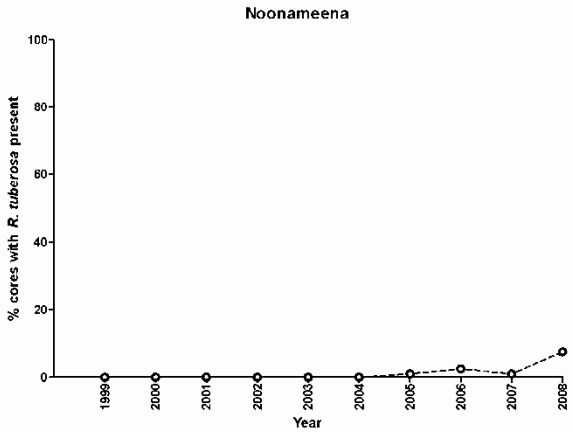






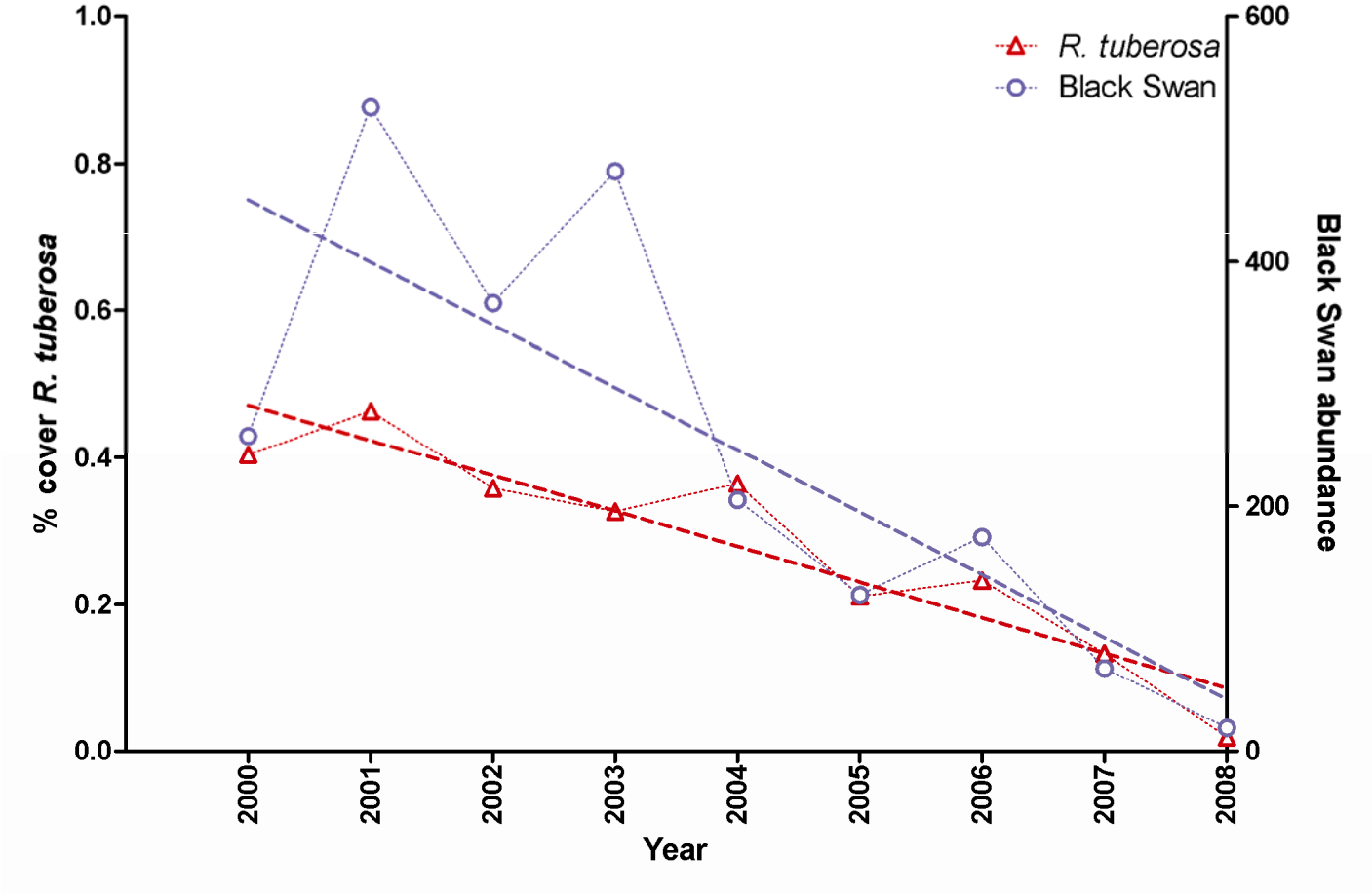




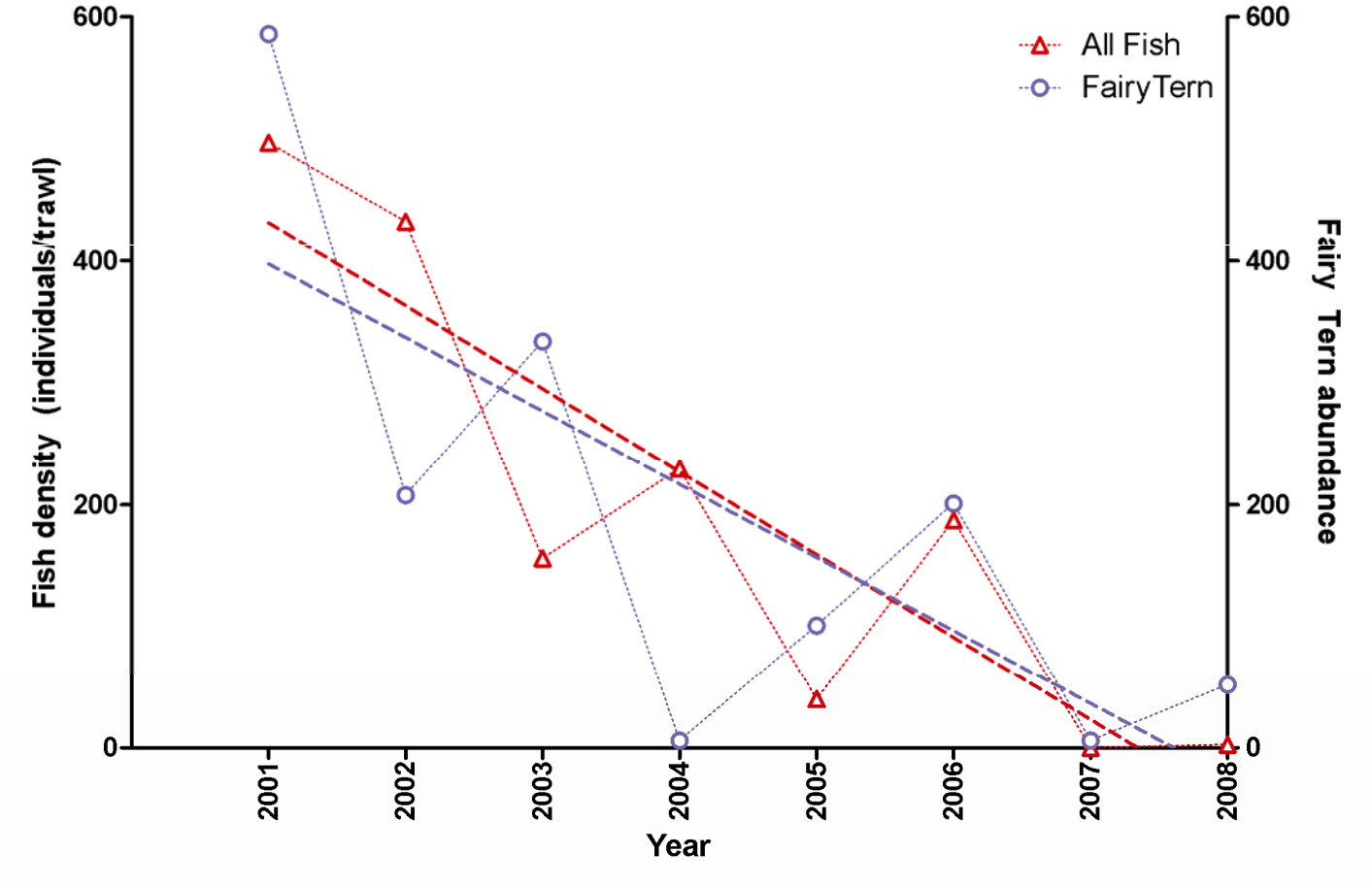


Changes in abundance of *Ruppia tuberosa* at five sites sampled in winter from 1999- 2008

Links to Food: Black Swan



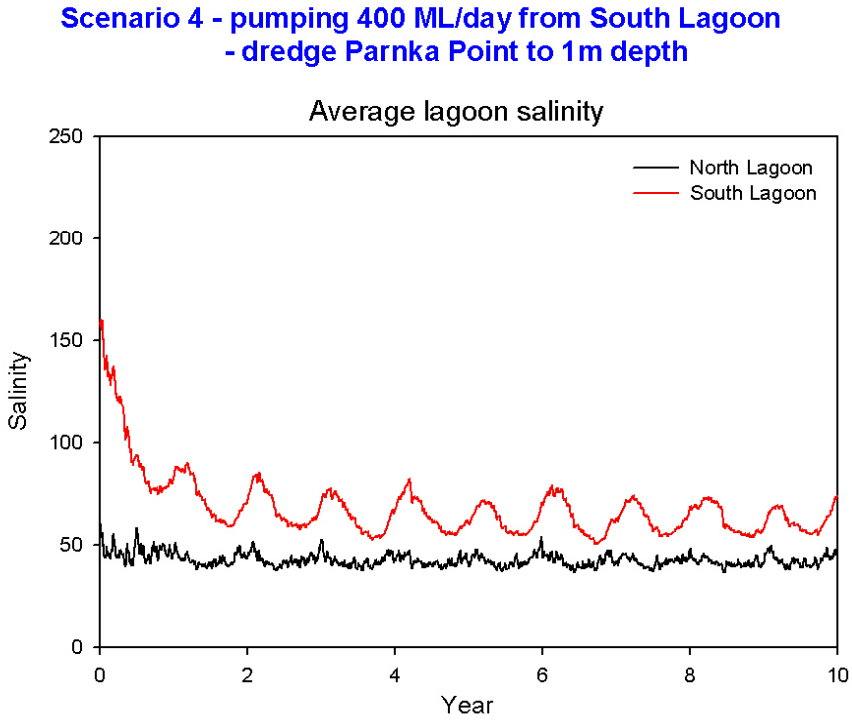
Links to Food: Fairy Tern



Target salinity threshold in South Lagoon is 100 g/L

High flow alone has not flushed out the salt

We need new policy to ensure adequate flow to maintain the Coorong



So what are our lakes telling us?

* Mismanaging the past means we are now over-managing the future
* Running our ecosystems down leaves them vulnerable to further change
* There is an imperative to conserve now so systems are resilient and able to cope with extremes in climate and whatever the future may bring
* We need an investment in new science for tomorrow's challenges because we can't just assume that mining historical data will give us the answers we need