20th International RIVER SYMPOSIUM and Environmental Flows Conference
Australian Government
Commonwealth Environmental Water Office
UNSW AUSTRALIA
UNIVERSITY OF CANBERRA
INSTITUTE FOR APPLIED ECOLOGY
The Murray-Darling Freshwater Research Centre
CSIRO

Waterbird recruitment and movement: Responses to flooding, stressors and threats

The Murray-Darling Basin Environmental Water Knowledge and Research project (MDB EWKR)

Waterbird Theme Co-ordinator:
Heather McGinness (CSIRO)

Waterbird Theme Leadership Group:
Richard Kingsford (UNSW)
Ralph Mac Nally (UC)
Veronica Doerr (CSIRO)

Waterbird Theme Research Implementation Team:
Kate Brandis (UNSW), John Martin (RBGSyd), Heather McGinness, Freya Robinson, Melissa Piper, Micah Davies, Art Langston (CSIRO), Maria Bellio (CSU), Tim Reid (UC), students and volunteers

BRISBANE, AUSTRALIA | 18 - 20 SEPTEMBER 2017

Introduction

Environmental flows and other land and water management actions affect the availability and quality of both breeding and foraging habitats for waterbirds at multiple scales

The expected outcomes of the Australian Murray-Darling Basin Environmental Watering Strategy for waterbirds are 'increased abundance and the maintenance of current species diversity' (MDBA 2014).

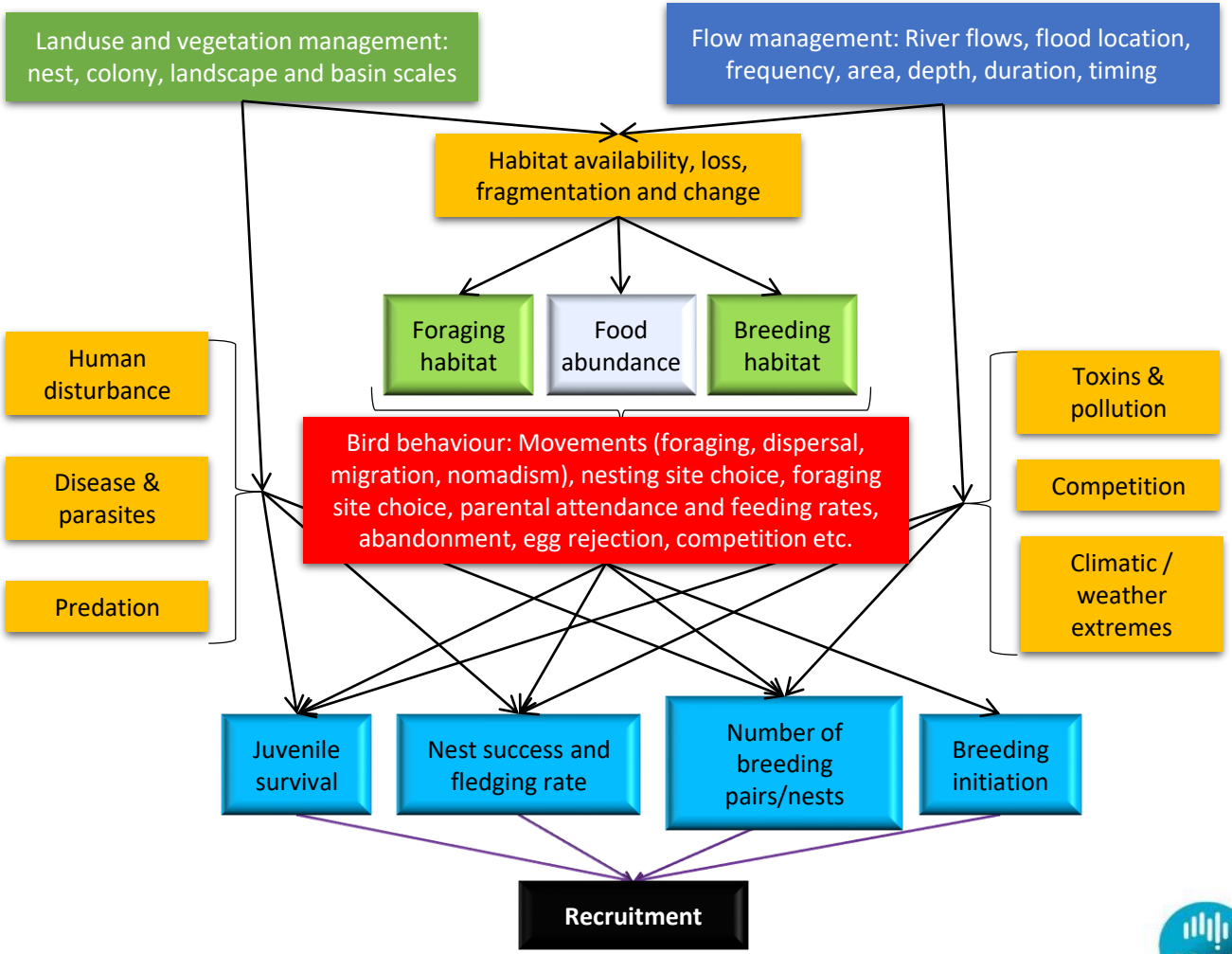
To achieve this, we need to address knowledge gaps including:

a) Drivers of and threats to recruitment – their relative importance

b) Demographic rates (survival, mortality etc.)

c) Movements – local and national

Doing so will improve our capacity to more effectively target land and water management actions and predict their effects


Landuse and vegetation management: nest, colony, landscape and basin scales
Flow management: River flows, flood location, frequency, area, depth, duration, timing
Habitat availability, loss, fragmentation and change
Foraging habitat
Food abundance
Breeding habitat
Human disturbance
Disease & parasites
Predation
Bird behaviour: Movements (foraging, dispersal, migration, nomadism), nesting site choice, foraging site choice, parental attendance and feeding rates, abandonment, egg rejection, competition etc.
Toxins & pollution
Competition
Climatic / weather extremes
Juvenile survival
Nest success and fledging rate
Number of breeding pairs/nests
Breeding initiation
Recruitment

Research components 2015/16 – 2018/19

Component 1: Foraging habitats and movements

- Where and what are the critical foraging habitats that support recruitment?
- How might these be affected by water and land management and threats such as habitat loss?

Component 2: Nesting habitat requirements

- What are critical nesting habitat characteristics we need to maintain and how do these affect recruitment?
- How do water and land management and threats such as predation interact with nesting habitat characteristics to affect recruitment?

Field research activities

Colonial-breeding waterbirds: Ibises and spoonbills (*Threskiornithidae*)

- Detailed satellite-tracking movement studies of >40 straw-necked ibis (*Threskiornis spinicollis*)
- Identification and characterisation of important foraging and roosting habitats and their locations
- Surveys of nesting habitat characteristics and species preferences
- Quantifying egg and chick survival rates
- Quantifying predation (species, impacts, timing, location)
- Estimating impacts of nest/egg/chick exposure





Results: Egg and chick survival and mortality

- Hatching rates are often low (30–60 %).
- Most egg mortality is driven by predation or nest abandonment.
- Hatching rates differ between species.
  - Royal Spoonbill eggs are more likely to survive to hatching than Straw-necked Ibis eggs, while Australian White Ibis eggs are the least likely to survive to hatching.
- Once hatched, chick survival rates until leaving the nest are high and similar among the three species (88–92 %).
- Further analyses are planned – e.g. effects of water level changes, nest exposure, weather, disturbance, toxins

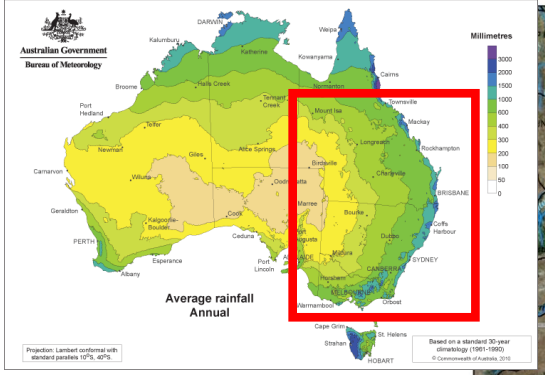
Satellite tracking movements and habitat use

- Primary species: Straw-necked Ibis (SNI)
- Adults AND juveniles: 40 + birds over two + years
- Captured birds banded with unique coloured and numbered leg-bands (ABBBS)

Transmitter features

- High-frequency location fixes (hourly 7am-7pm + midnight fix)
- GPS Location fix resolution of 10's of metres
- Tracking duration of 2 + years (solar powered)
- Full coverage across Australia regardless of phone networks

Releasing an ibis after fitting a transmitter



2016-2017: 20 transmitters

2017-2018: >40 transmitters

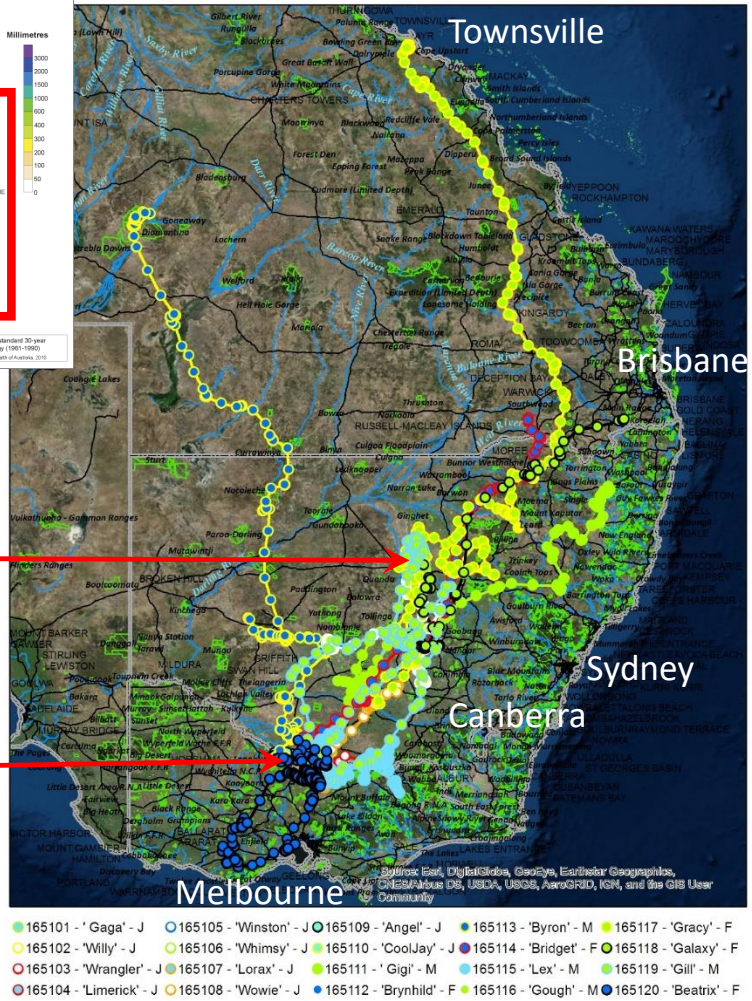
Macquarie Marshes

October 2016: 5 adults

Barmah-Millewa Forest

November 2016: 5 adults

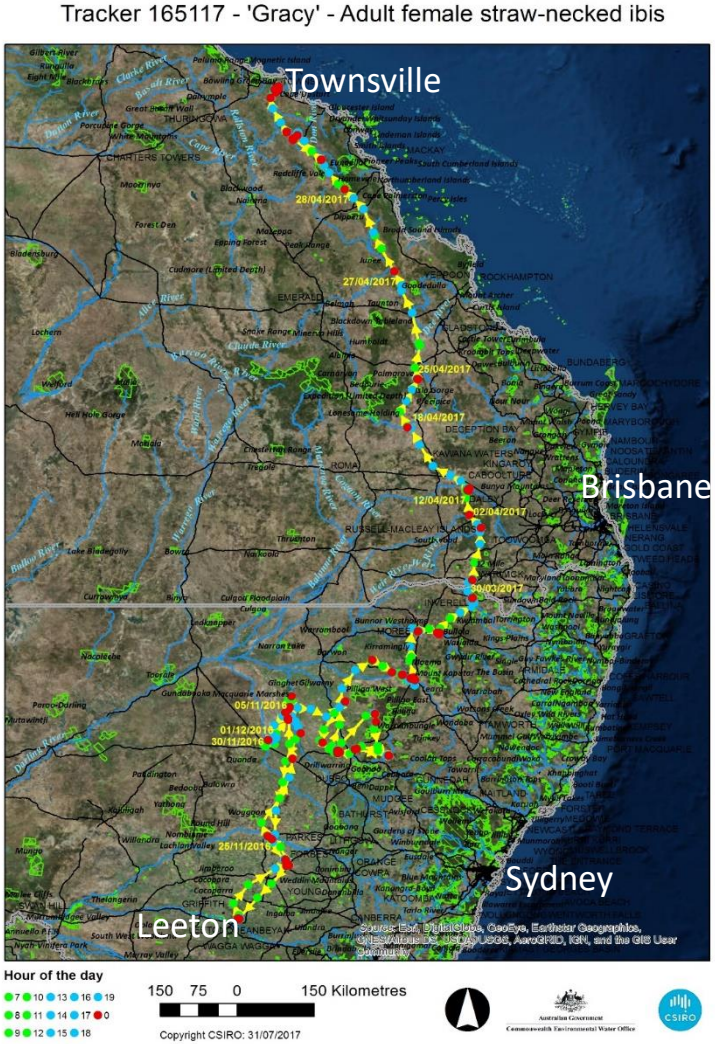
January 2017: 10 juveniles



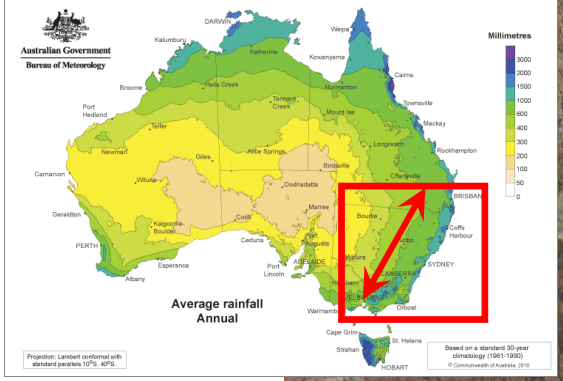
Highlights and trends

Long-distance movements

- Northern and southern birds are mixing and using some of the same sites and routes
- Straw-necked ibis may be one integrated population
  - This year may be unusual with the extent and duration of flooding that occurred
  - This will need to be investigated with tracking in subsequent years and with more birds



Highlights and trends



Common ‘flyways’ or movement corridors for separate birds/groups

- Six of the 10 adults and three of the juveniles have travelled along a common NE-SW route in different directions
- This route corresponds to zones / boundary lines in maps of average climatic conditions, e.g. rainfall, evapotranspiration, etc., see: http://www.bom.gov.au/climate/averages/maps.shtml

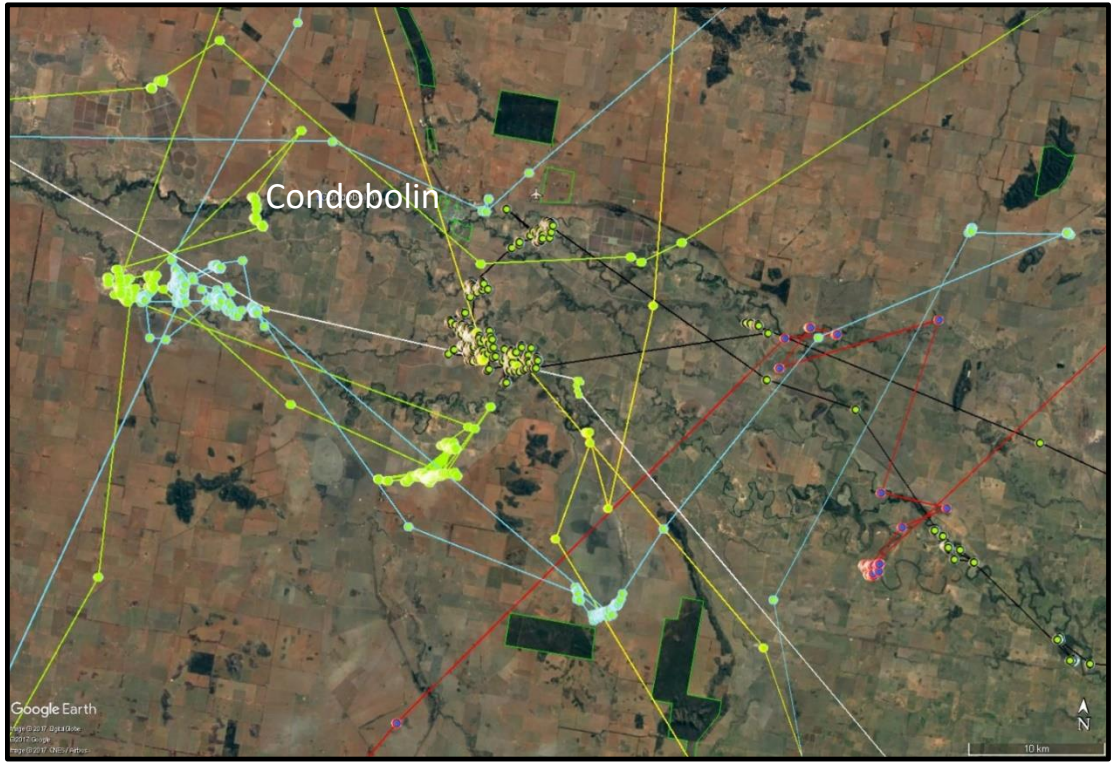
Highlights and trends

Key foraging and stopover points and regions

- Re-use of some sites by different birds at different times

  - For example, the mid-Lachlan River near Condobolin, NSW

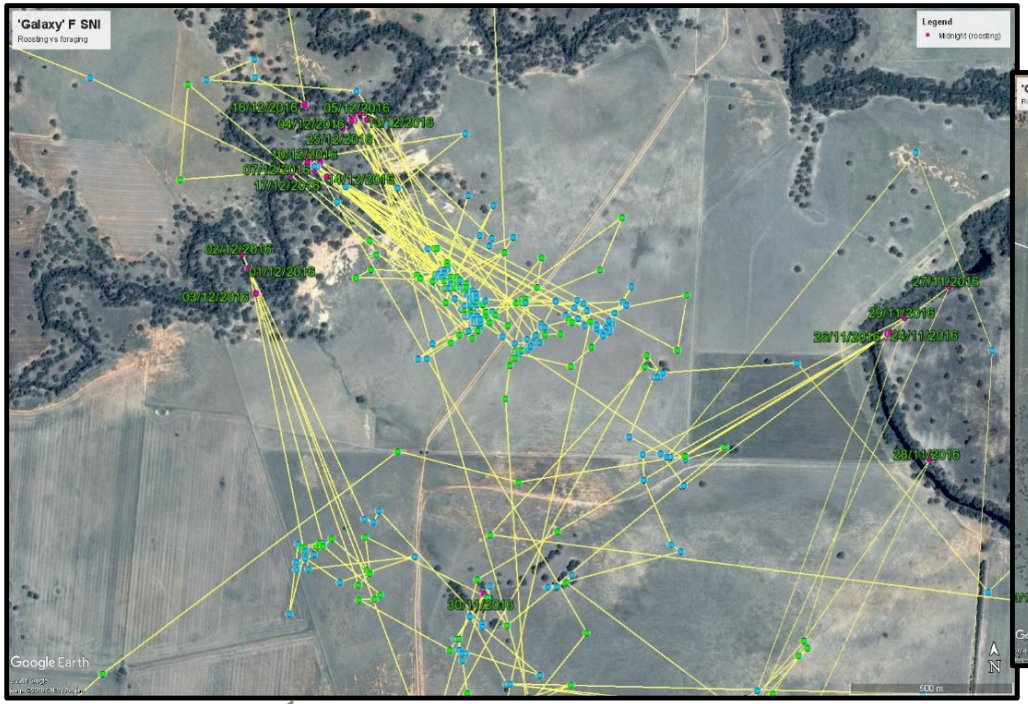
- Mixture of native and agricultural, wetland and dryland habitats

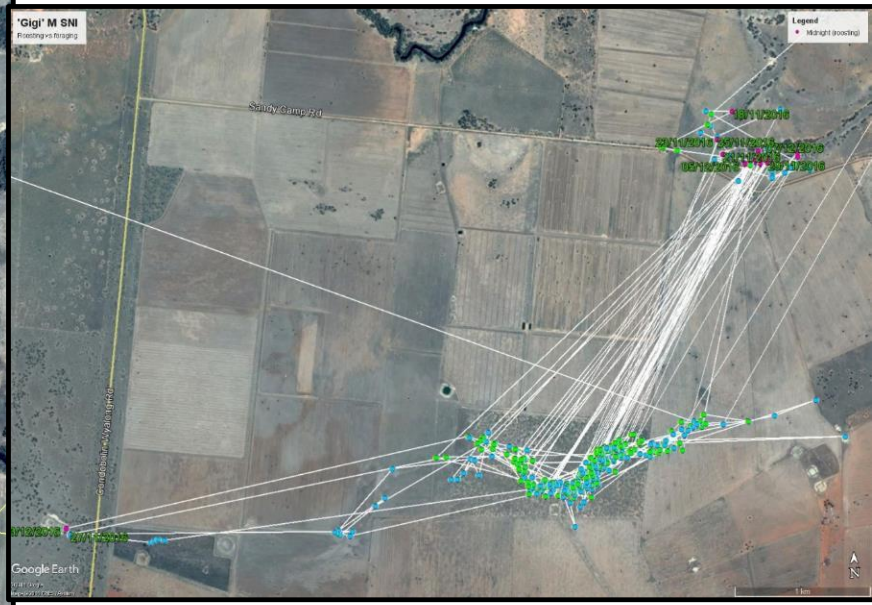


Highlights and trends

‘Paired’ habitats for roosting and foraging

- Ideal foraging habitats have adjacent remnant vegetation with trees for roosting
- Preference for tall roosting trees (eucalypts) next to water

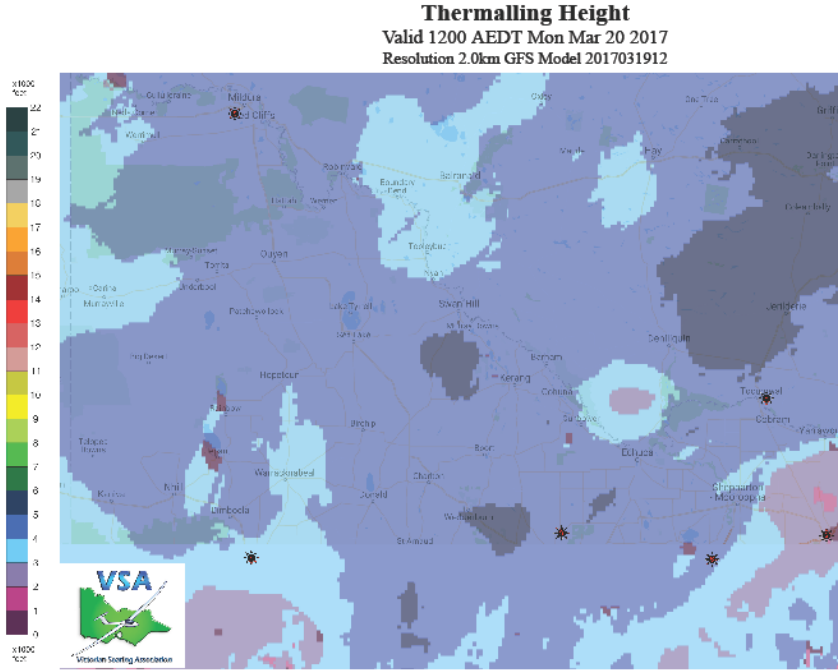




Highlights and trends

Movement associations with weather and season

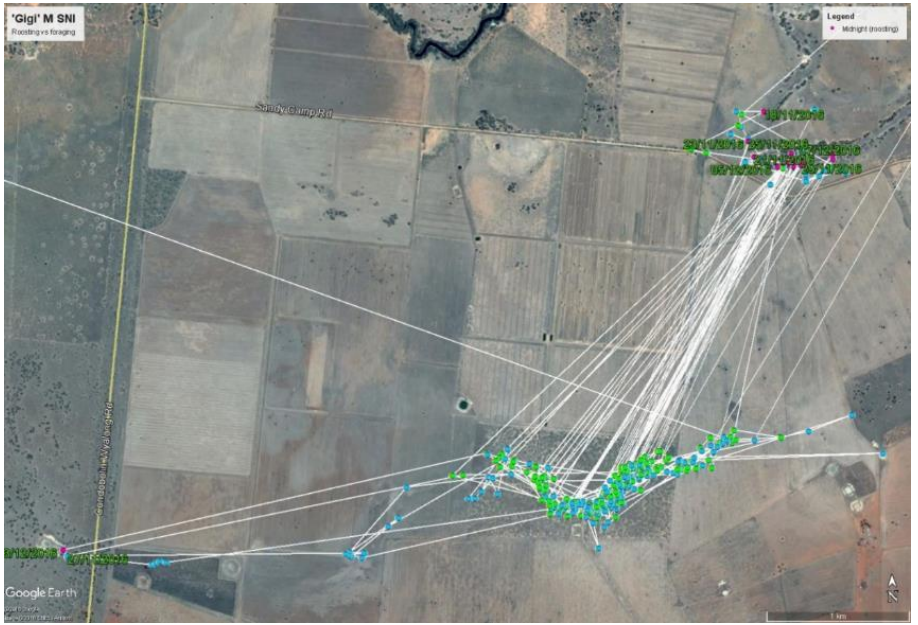
- Similarities in departure times and dates for longer trips
  - ➢ Probably associated with thermals
- Weather changes triggering long-distance movements
  - ➢ E.g. temperature drops, rainfall, shifts in wind direction
- All tracked birds ‘settled down’ in autumn
  - ➢ Highly localised over-wintering areas
  - ➢ Sites chosen vary between birds
  - ➢ More females travelled north than males
  - ➢ Choice of northern vs southern sites for over-wintering not predicted by breeding/capture site



What next?

Component 1: Foraging habitats and movements

- Continued tracking of 2016-17 straw-necked ibis
- Tracking of 40+ new individuals from spring 2017-18
- Analysis of datasets in conjunction with flooding, vegetation, landuse, weather data etc.



What next?

Component 2: Nesting habitat requirements

- Continued monitoring of nests and egg and chick survival and their drivers via remote cameras (2017-18)

- Analysis of data extracted from images for straw-necked ibis, Australian white ibis and royal spoonbills
  - in conjunction with flooding, vegetation, weather and other data

- Analysis of data from on-ground tagged nest monitoring, water depth monitoring, and drone aerial surveys of colonies

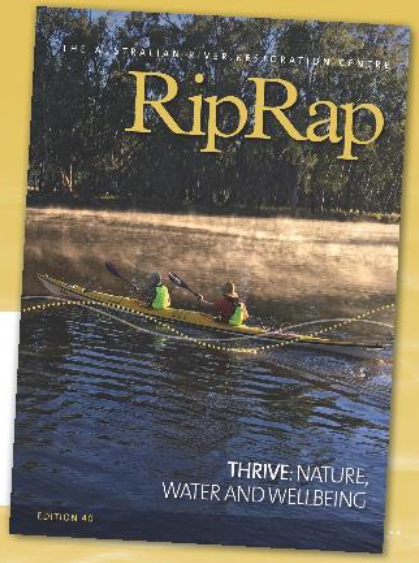
THRIVE:
nature, water and wellbeing

A special and inspirational edition of *RipRap* magazine sharing stories about the people, places, science and management of environmental water in Australia.

There are many people featured in the magazine who are speaking at River*symposium*, and all have some hard copies of *RipRap* to give away, so make sure you attend their presentations!

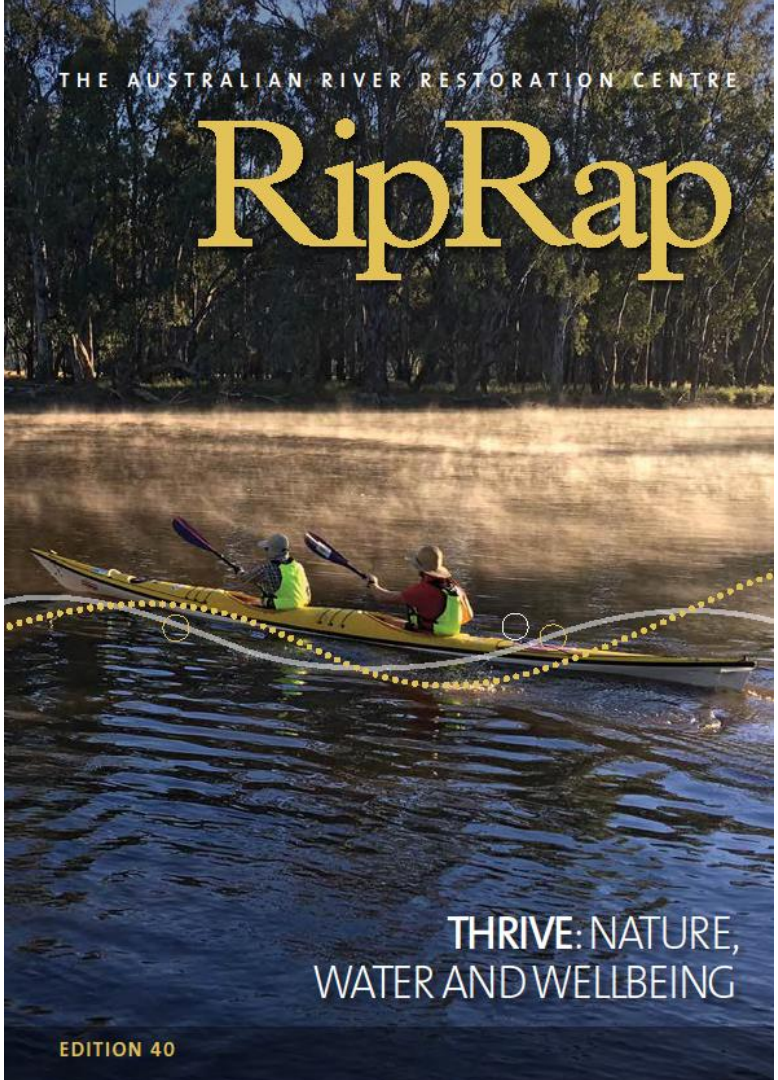
Jessica Davison and Helen Watts—how environmental water research is supporting planning
Paula D'Santos—environmental flows for native fish
Siwan Lovett—why mess is best for community engagement
Nicole McCasker—flow and fish recruitment
Heather McGinness—results from waterbird satellite tracking
Darren Ryder—flow and floodplain production
Phil Slessor— fish recover in irrigation systems

Download your free copy of *RipRap* or purchase a copy at www.arrc.com.au/riprap



ARRC Australian River Restoration Centre

RipRap magazine is produced by the Australian River Restoration Centre and celebrates our wonderful riverine environments by featuring science and stories about different river management topics. The magazine is beautifully produced with fabulous images, robust content and practical insights from people who live, work and care about rivers, creeks, wetlands and billabongs.



Thankyou

Questions?

Contact Heather McGinness

E Heather.McGinness@csiro.au

T +61 2 62464136

Websites:

https://research.csiro.au/ewkrwaterbirds/

http://ewkr.com.au/

http://www.mdfrc.org.au/projects/ewkr/about/

http://www.environment.gov.au/water/cewo/monitoring/ewkr

@AusWaterbirds

https://www.facebook.com/ColonialWaterbirdScience/

Continuing analyses

What do managers want to know?

- Critical foraging, roosting and stopover sites
- Critical habitat characteristics (nesting, foraging, roosting, stopover)
- Foraging trip distances
- Critical routes/movement corridors
- Land and water management actions/policies required to support the above

Other basic biological / ecological knowledge gaps

- Sub-population boundaries/connectivity/existence, ranges
- Philopatry and natal philopatry
- Movement cues and modifiers – e.g. thermals, weather
- Movement paths, directions and distances (foraging, dispersal etc.)
- Variation among individuals, sexes, and age categories
- Timing of departures and arrivals and relationships with other factors
- Physical and behavioural changes as birds age (how can we 'age' them more accurately?)