

Dec 13th, 3:40 PM - 5:00 PM

Build it and they will come. Or will they? Golden Perch in Koondrook Perricoota Forest

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Build it and they will come. Or will they? Golden Perch in Koondrook Perricoota Forest

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Koondrook-Perricoota Forest (KPF)

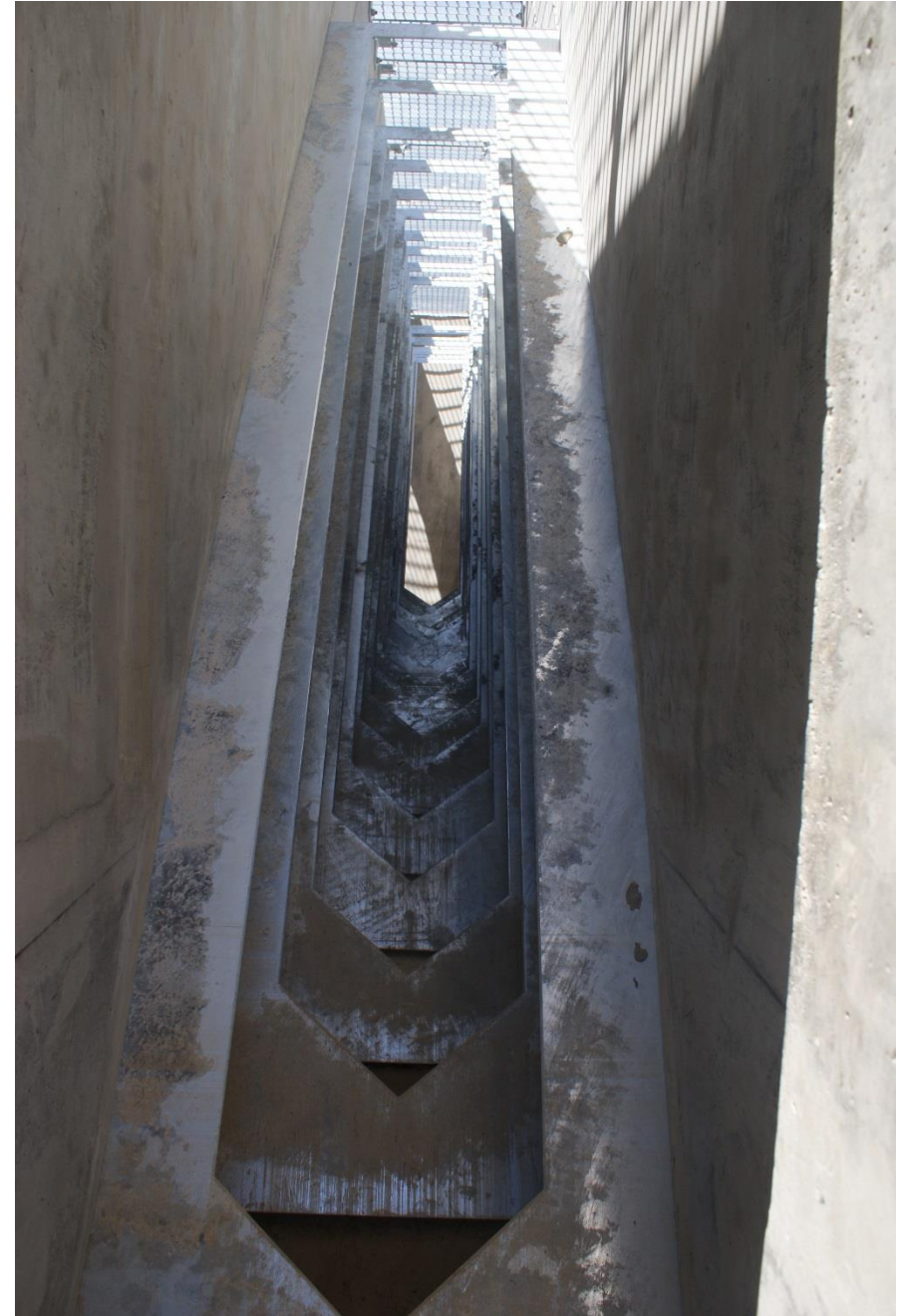
- Extensive floodplain forest area adjacent to the River Murray between the towns of Gunbower and Barham.
- River regulation = reduction of natural flooding of the forest = decline of the health of the forest.
- Water management infrastructure was constructed as part of The Living Murray Initiative to enable the watering of the KPF.







Forest access (and exit) for fish



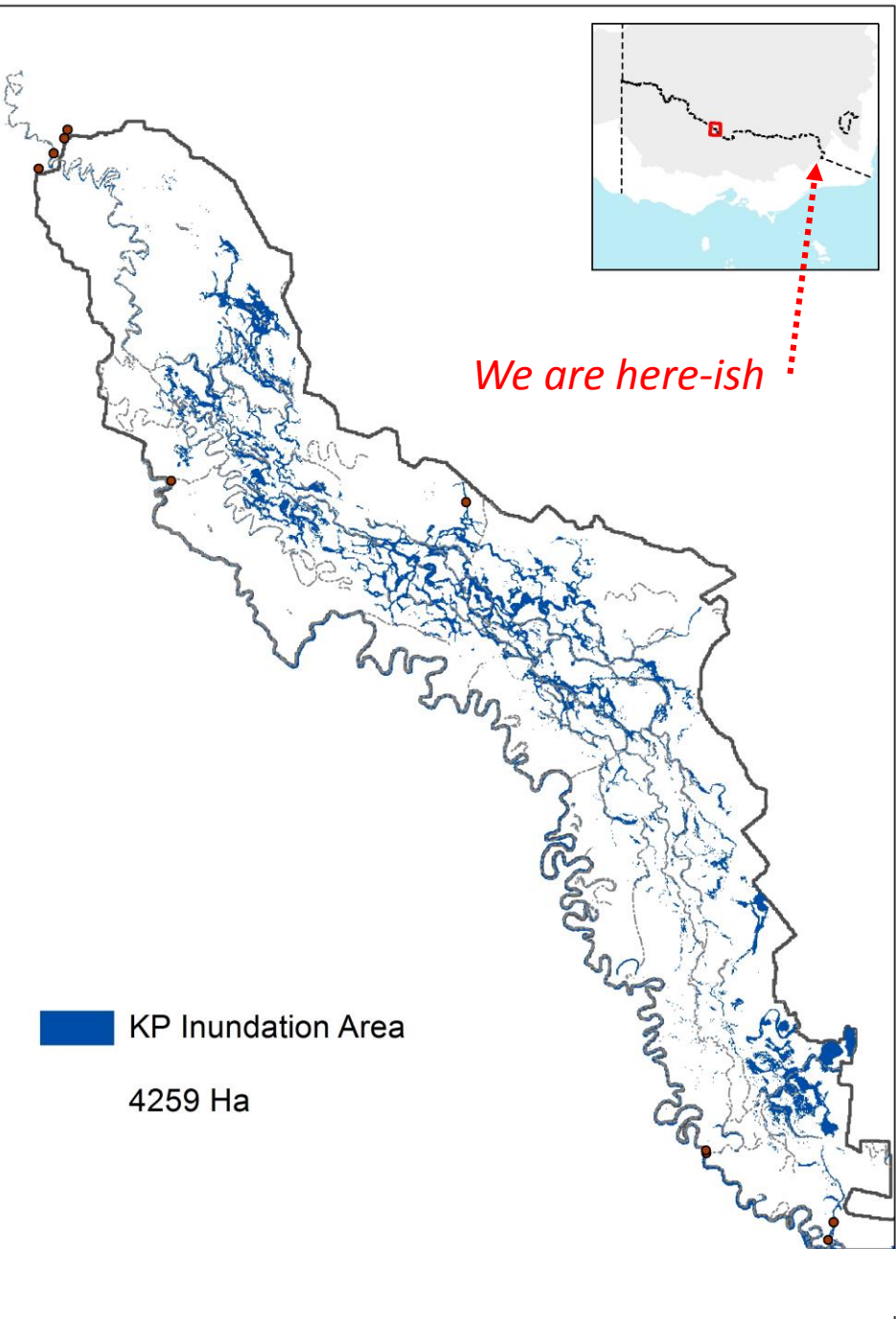


A blue banner with a white silhouette of three trees on the left. The text on the right reads "Koondrook-Perricoota Forest Flood Enhancement Works Project" in white.

Koondrook-Perricoota Forest Flood Enhancement Works Project

Restoring the health of the world's second largest River Red Gum Forest

This slide shows the area inundated in the 2014 'commissioning' flood

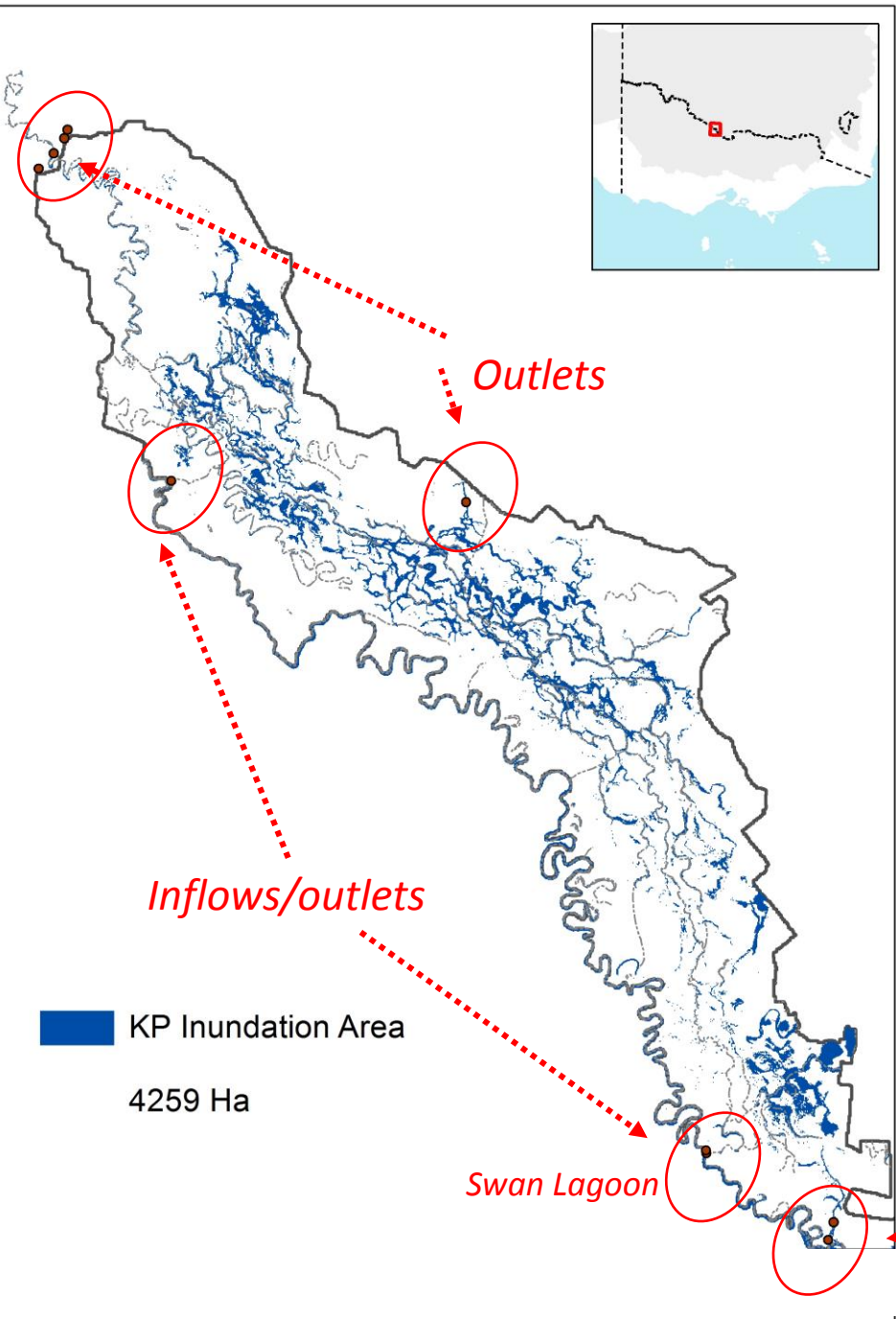




Koondrook-Perricoota Forest Flood Enhancement Works Project

Restoring the health of the world's second largest River Red Gum Forest

This slide shows the area inundated in the 2014 'commissioning' flood



Major inflow infrastructure

Inlet channel inflow – 6000 ML/day



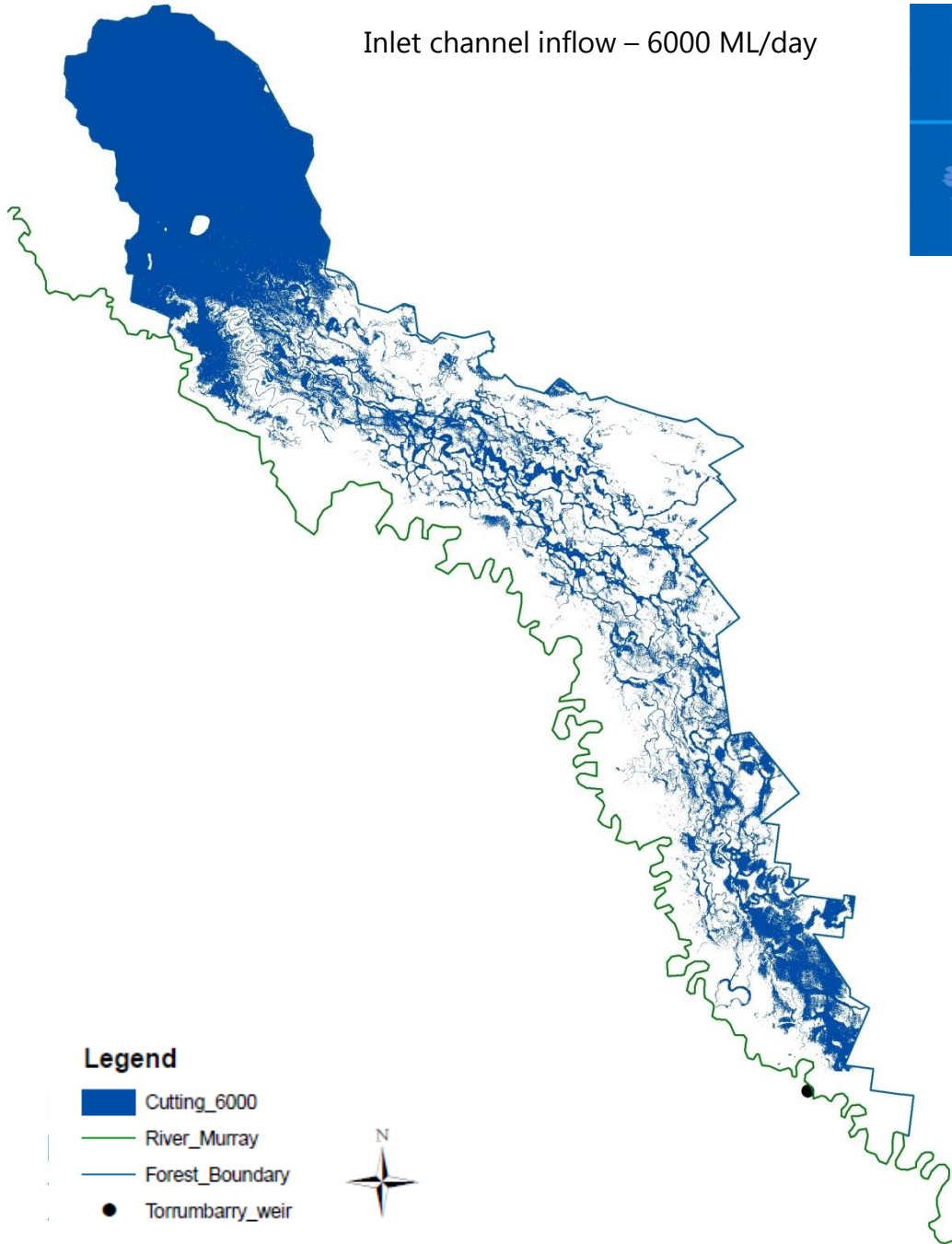
Restoring the health of the world's second largest River Red Gum Forest

Maximum extent of inundation

- 16,000ha of forest inundated.
- 52% of RRG w FDU.

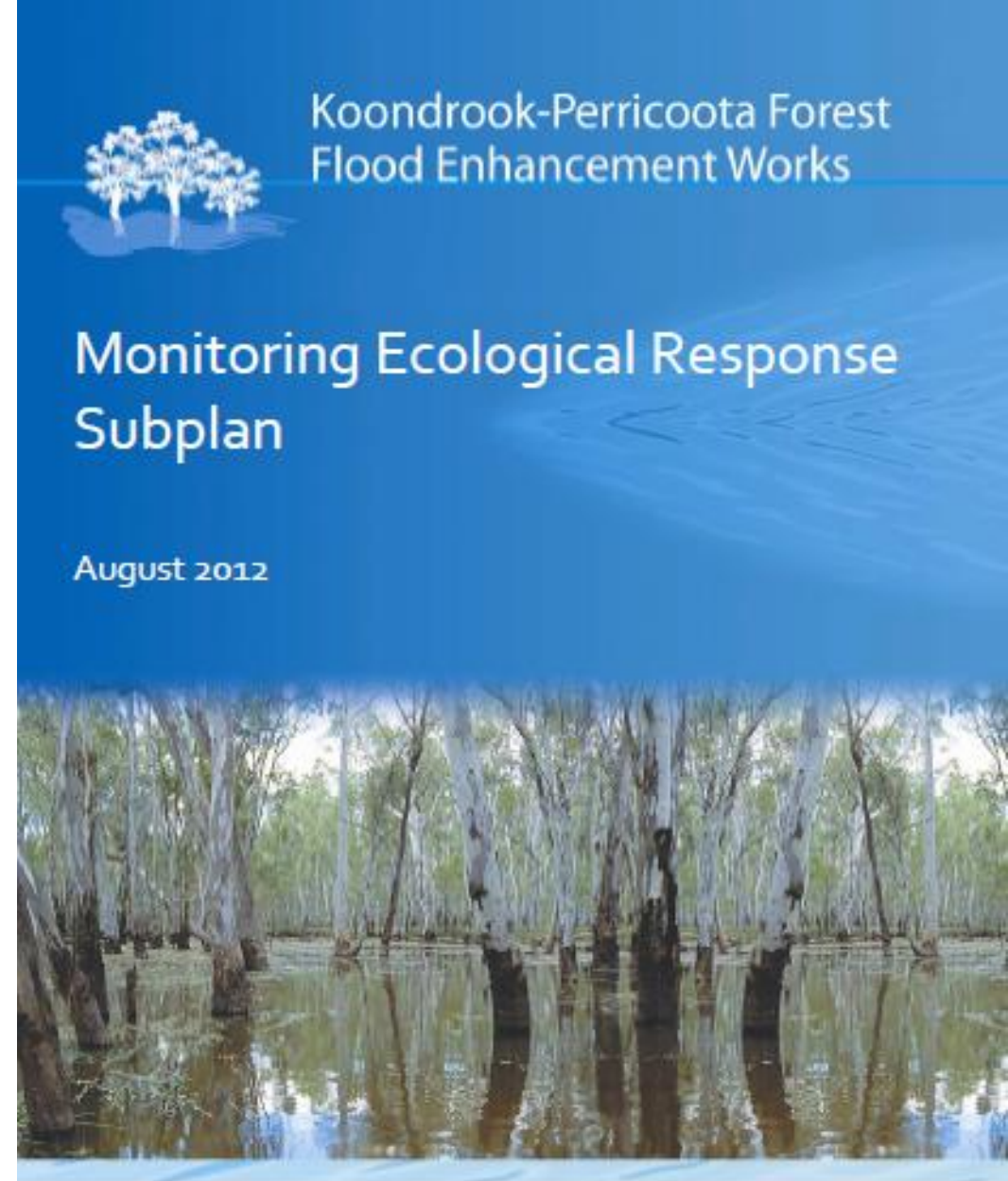
Legend

- Cutting_6000
- River_Murray
- Forest_Boundary
- Torrumbarry_weir



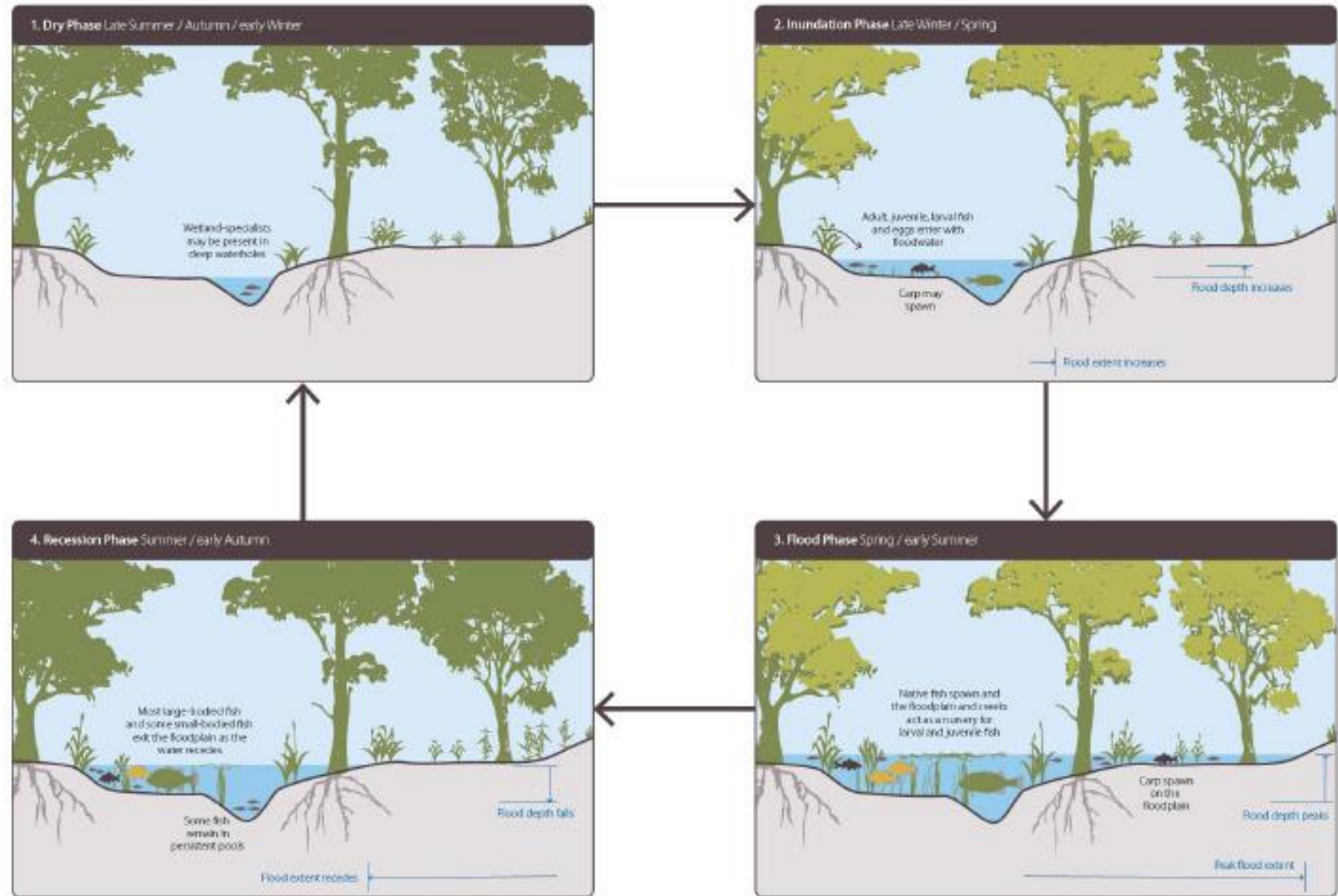
Lots of planning

- Fish, vegetation, waterbirds, frogs
- Conceptual models
- Risks
- Monitoring programs



Fish

- Likely species and responses identified and risks and monitoring objectives identified



Fish: conceptual example predictions

Common carp

- a) Common carp eggs, larvae and adults will be entrained into the KPF
- b) Carp adults will spawn within the forest
- c) Common carp eggs and larvae will develop (recruit) within KPF
- d) Common carp will migrate out of the KPF via downstream regulators and the fishways

Golden Perch

- a) Timing and duration of flow recession will cue native fish migration
- b) Flow provides adequate forest connectivity from the forest habitats to the inlet channel (fish need a pathway back to the inlet channel in order to locate the fishways)
- c) Large fish leave the forest via the fishway in the first half of the recession.

Etc...

Loads of specific objectives and targets

e.g. There will be no impact of the operations on the free migration of native fish within the KPF that results in fish becoming stranded

- 1) More than 90% of large-bodied adult fish that enter the KPF will return to the river (Murray cod, golden perch, silver perch, trout cod).
- 2) Large bodied fish within the KPF will attempt to exit the forest on commencement of ramp down

Structure operations and natural floods

- The structures were operated for the first time in August to October 2014 and the fish response was monitored
- There were natural floods in 2010 and 2011 however
 - Some resident pools in 2013 and 2014
- Annual monitoring from 2011 to 2015 (census)

Structure operations and natural floods

- One Golden perch in each of 2011, 2012 and 2015.
 - Only one not in swan lagoon
- But always collected in the River (n=3 sites) at the same time every year



2012 – 370 mm long

Tagging program implemented

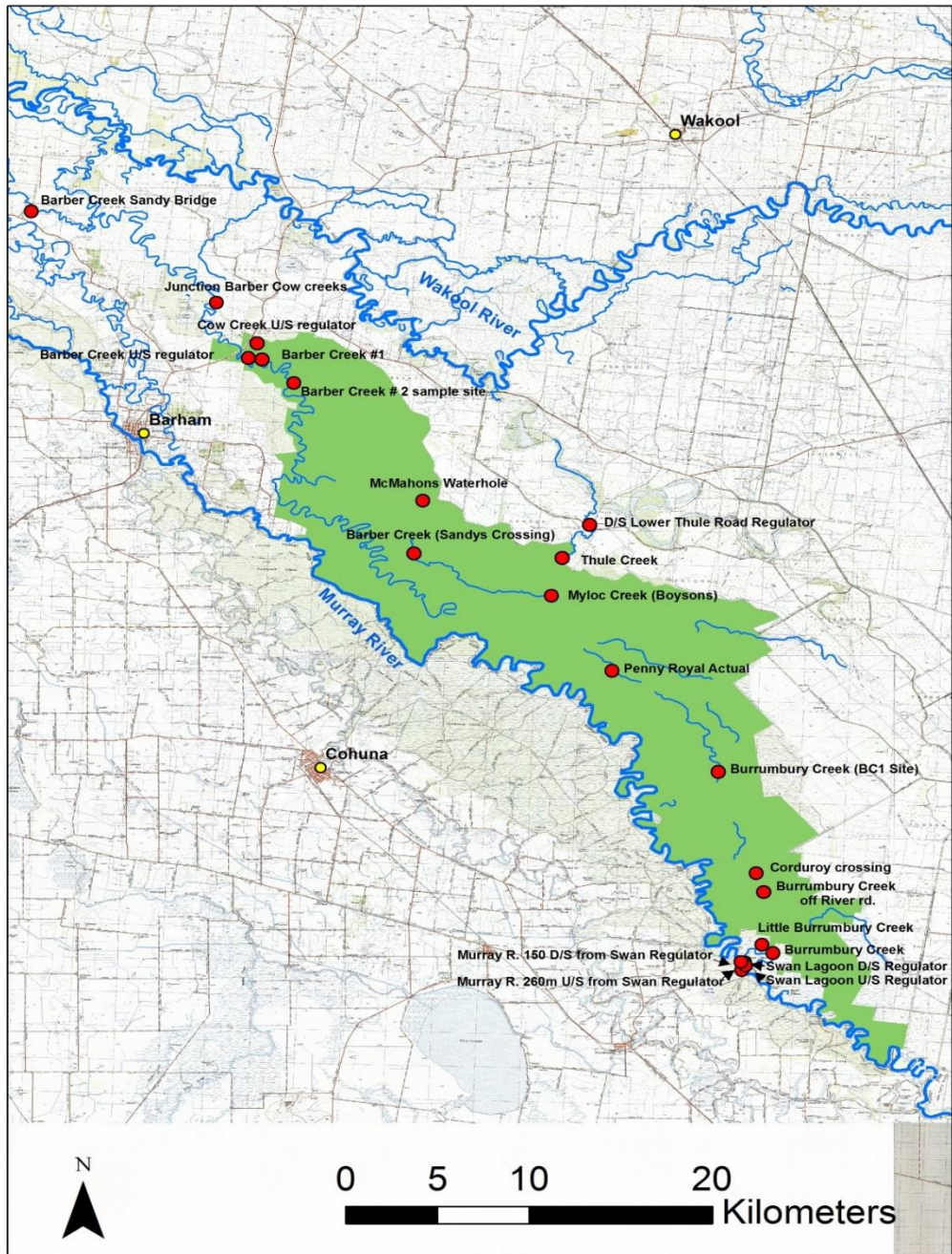
- Intensive electrofishing was carried out in Barber Creek (outside KPF) and in Swan Lagoon in August 2016 to sample large-bodied native fish and common carp suitable for tagging
- Fourteen fish caught downstream of KPF in Barber Creek were tagged in June 2014 and are included
- Array of 21 VEMCO VR2W acoustic receivers was deployed in June 2016 to record the movements of individual tagged fish



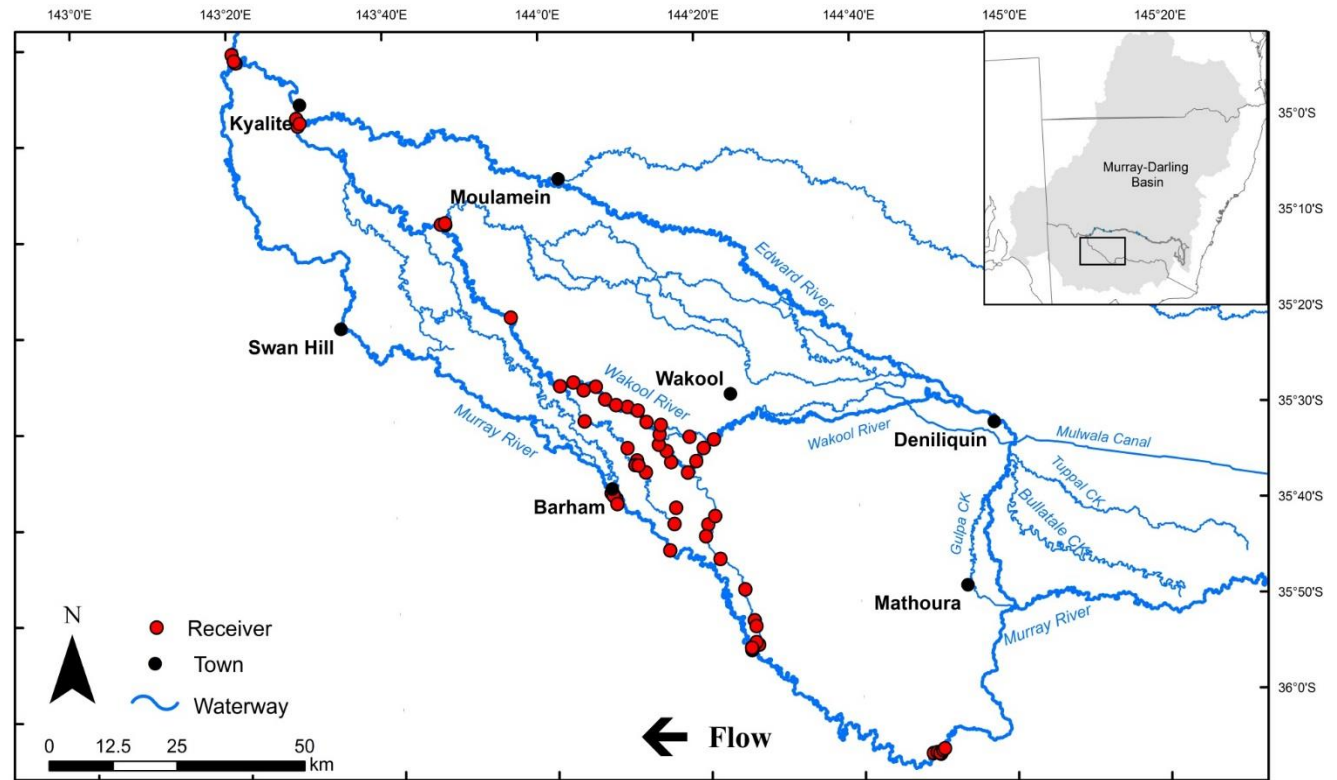
Tagging program implemented

- 12 golden perch
- 1 silver perch
- 44 common carp acoustic tagged across 2014 and 2016





Acoustic array of receivers



2016 natural flood

- In 2016, a very wet winter and spring resulted in large natural flood in KPF that commenced in early August and ceased in late November 2016
- Flow at Torrumbarry exceeded 50,000ML/d
- The inlet channel and return channel were closed and all downstream regulators including Thule Creek were fully open in order to pass all flows.
- Inflows initially were via Swan Lagoon, but as the event increased in magnitude, water flowed into KPF at multiple points downstream of Swan Lagoon.
- The flood event potentially provided approximately four months of connectivity between KPF and the surrounding rivers.

2016 natural flood

- Monitoring movements of large-bodied native fish during a natural flood may provide an indication of how they utilise KPF under 'natural' conditions and therefore will inform managers on how to manipulate the hydrograph during a managed event to promote the exit of large-bodied native fish.
 - In addition, knowing how common carp utilise the forest and surrounding waterways could assist with their future control in the area
 - We know that golden perch and silver perch utilise off-channel habitat in Barmah–Millewa (upstream)

Results

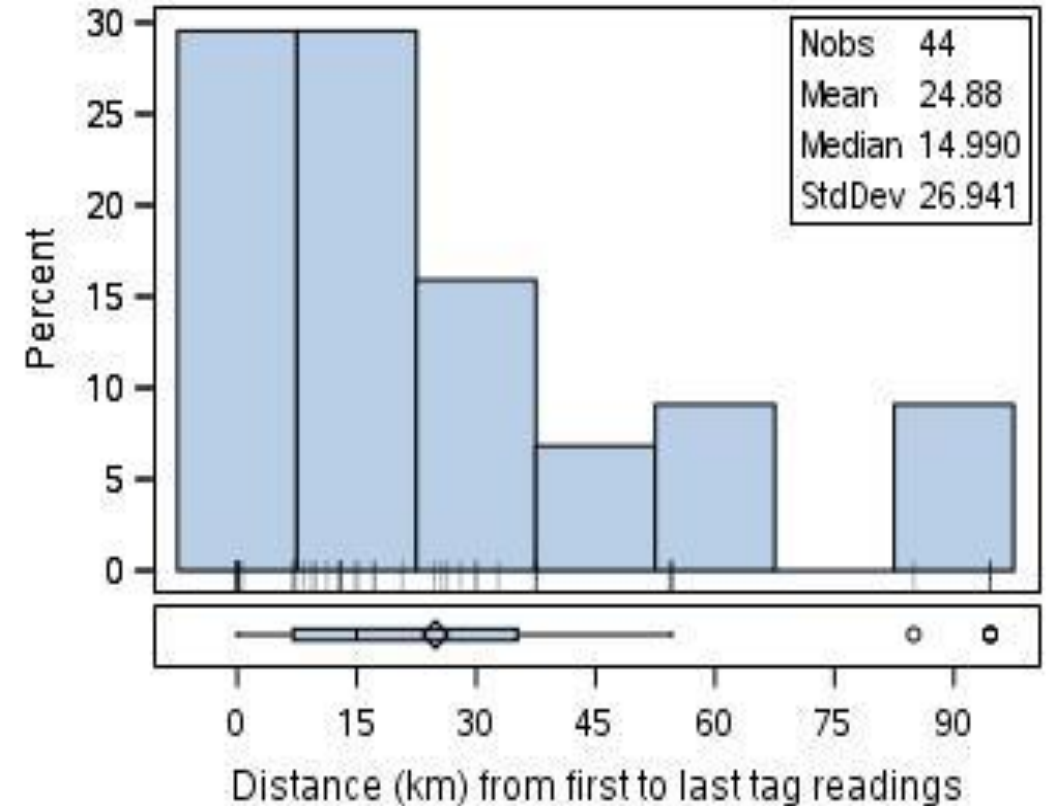
- No golden perch moved into KPF and only six individuals made any movements at all
 - General observations of individual's movement patterns only were explored
- Many more common carp were tagged, enabling a more detailed analysis of their movements.

Common carp

- All of the 44 common carp tagged (including those tagged in 2014) were detected on at least one receiver in 2016.
- Each tagged common carp had on average 1,747 detections and was detected on an average of 7.1 different receivers during the study.

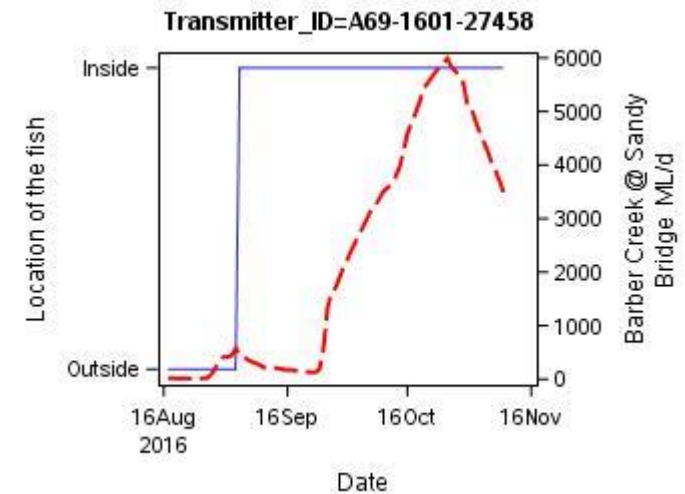
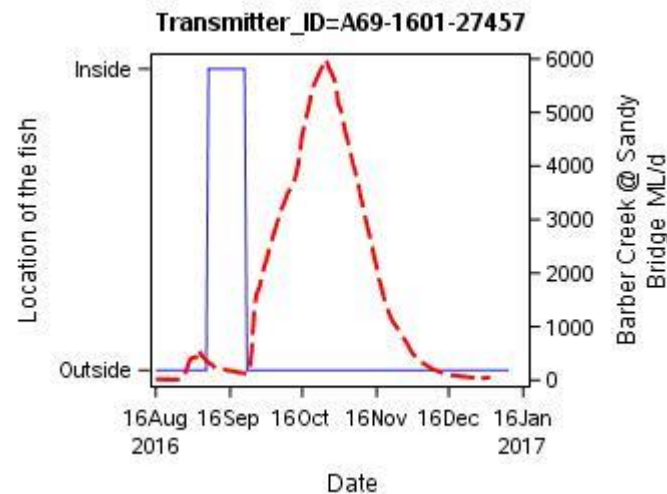
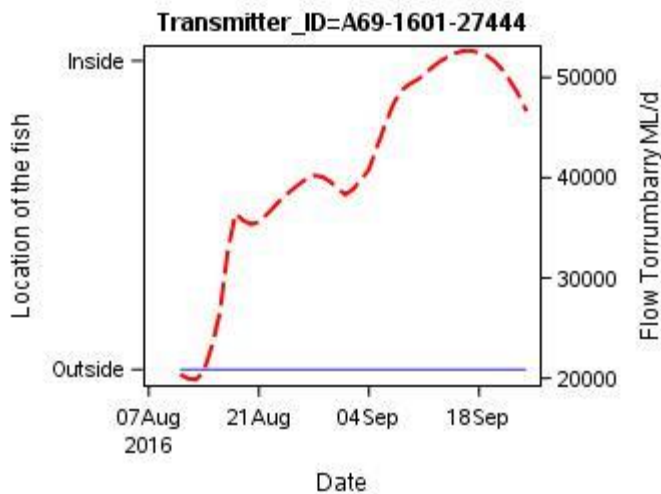
Common carp

- There was an average of 25 km between the first and last readings for tagged common carp (total distance moved, not distance from tagging location),
- Two carp moved a total of 90 km
- 28% of carp were last recorded in the same place they were first recorded and some of these fish had moved into KPF between readings



Carp movement patterns

1. No movement from tagging location – 8 fish; 5 male, 2 female and 1 unknown sex
2. Movement into KPF followed by moving out -22 fish; 13 males, 5 females and 4 unknown sex
3. Movement into KPF without moving out - 12 fish; 5 females, 2 males and 5 unknown sex.



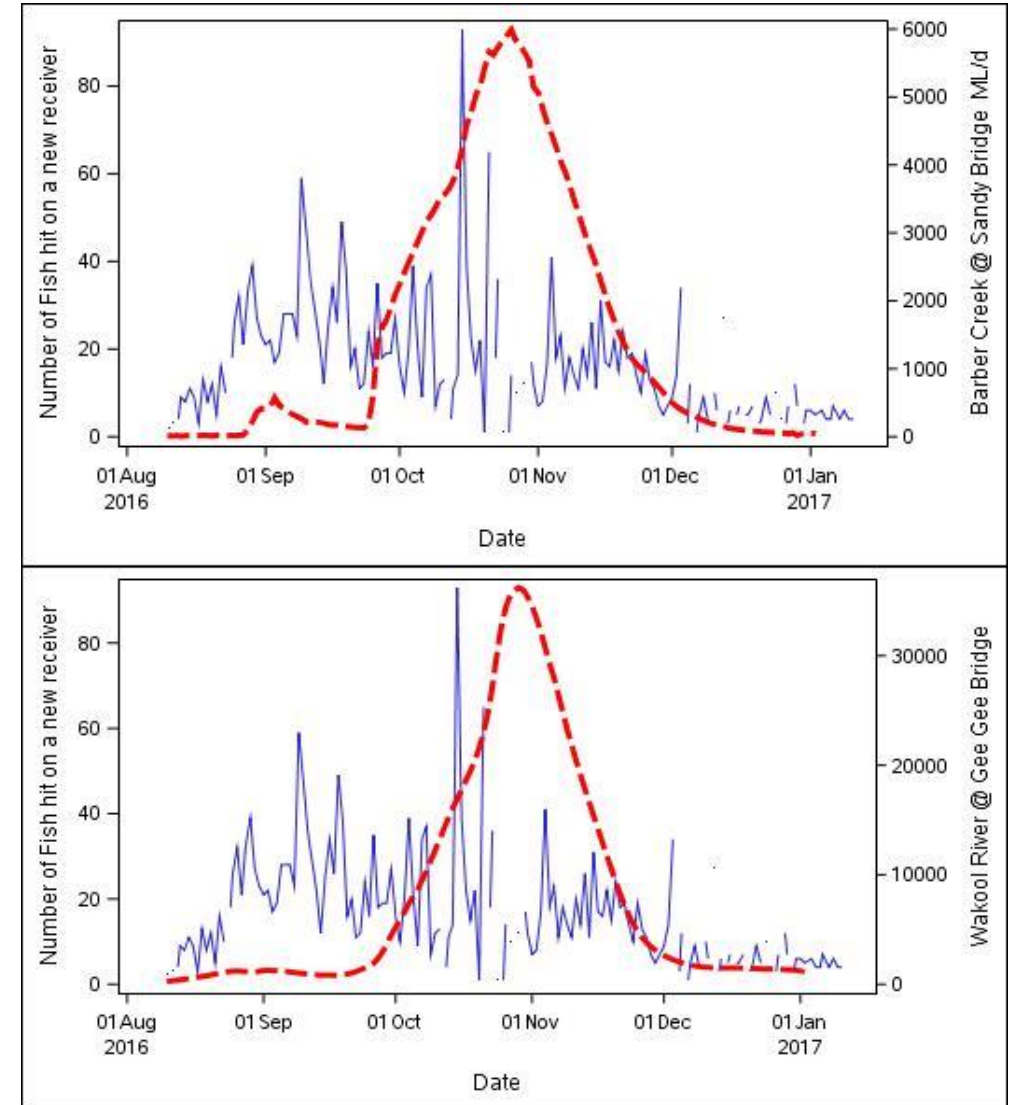
Many fish made multiple movements in and out of the forest

Carp movement patterns

- 34 of 42 common carp tagged in Barber Creek or Thule Creek moved upstream into KPF during the flooding
 - Mostly as soon as connectivity with KPF was achieved
- 3 common carp tagged in Barber Creek moved through KPF, into the Murray River and were then detected in Gunbower Creek in Victoria.
- 11 common carp moved through KPF, into the Murray River, then upstream to the Goulburn-Murray River junction
 - 1 moved further upstream to Picnic Point (Barmah-Millewa Forest).
- By December 2016, no common carp were detected within KPF.
 - 12 common carp that had their final detection within KPF were not detected outside the forest, suggesting they either remained in isolated pools within KPF, had exited via a unmonitored connection with the Murray River, or had died.

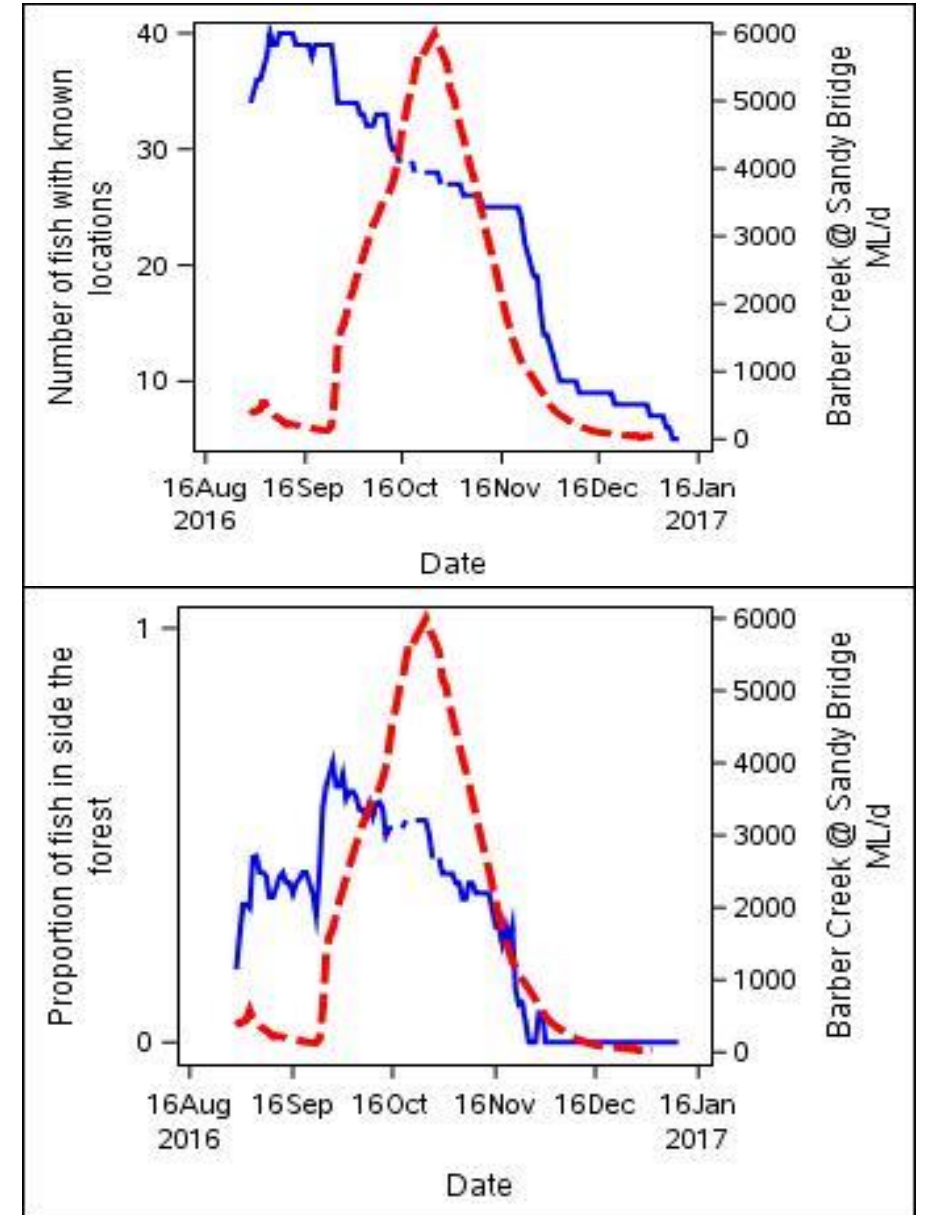
Peak movement and association with water quality and flow

- Peaks in common carp movement coincided with peaks in flow in Barbers Creek, Thule Creek and the Wakool River, and were not related to flow or dissolved oxygen



Movement association with flow

- During the rising floodwaters, 40 to 70% of common carp were inside the forest
- No common carp remained in the forest by December 2016



Discussion

- Golden Perch
 - Are rarely collected in the KPF inlet channel
 - Have tended to move downstream from the area (Wakool Junction) in previous studies
 - Do move into floodplains elsewhere
- YOY were collected in 2018
- Common Carp
- Pack of bastards

Discussion

- Golden Perch
 - Are rarely collected in the KPF inlet channel
 - Have tended to move downstream from the area (Wakool Junction) in previous studies
 - Do move into floodplains elsewhere
 - YOY were collected in 2018
- Common Carp
 - Movement patterns were highly variable
 - Probably moved into KPF for spawning (yesterdays plenary)
 - Trigger for movement was clearly flow,
 - most fish move upstream on the initial flood pulse
 - Falling DO levels did not deter common carp from moving into KPF

Acknowledgements

- Funding by The Living Murray via Forestry Corporation NSW and DPI Fisheries.
 - The Living Murray is a joint initiative funded by the New South Wales, Victorian, South Australian, Australian Capital Territory and Commonwealth governments.
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