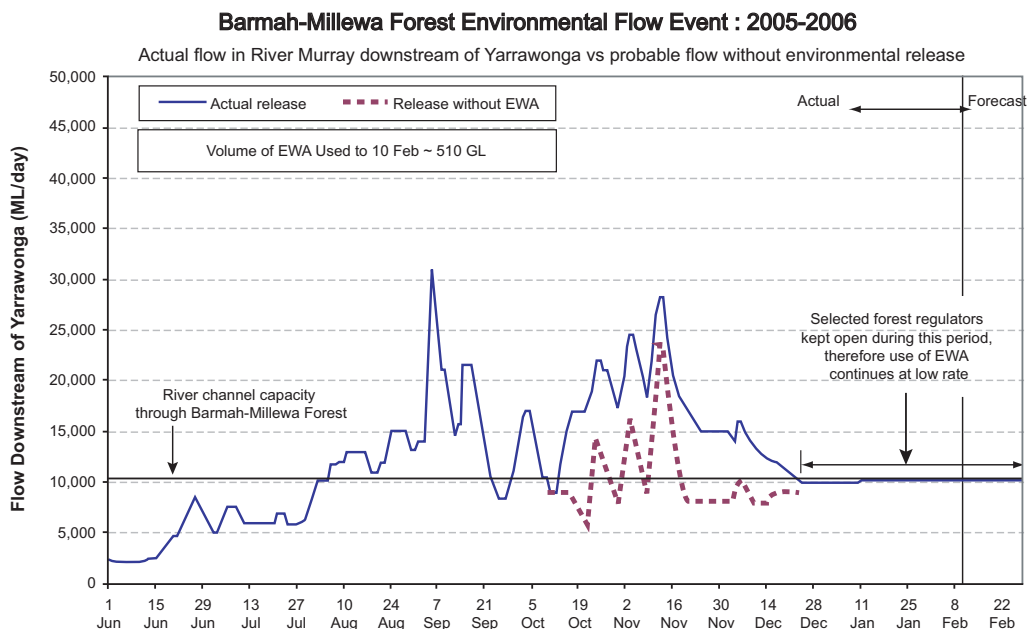


Section D: Environmental watering actions and key outcomes at the Icon Sites (particularly since Spring 2005)

Barmah-Millewa Forest Icon Site

1. Actions:

- (a) Formal support was received from New South Wales and Victorian Governments on 11 October 2005 to release the 500 GL accumulated Barmah-Millewa Forest Environmental Water Allocation (BMF EWA), according to an agreed operating plan. The operating plan included provision for regular review of the release in response to environmental, operational and other considerations.
- (b) Rainfall in the Kiewa and Ovens River catchments during late October 2005 provided the opportunity to use the BMF EWA to build upon natural tributary inflows to increase the unregulated flow peaks by an additional 5 000 ML/d downstream of Yarrawonga (without exceeding channel capacity downstream of Hume Reservoir) to maximise flood spread onto the floodplain. Otherwise the EWA release was used to maintain a continuous base flow through the Forest ranging between 15 000 and 18 000 ML/d for several months (Fig. 3). This particular flow pattern was needed to satisfy a range of ecological objectives within the Asset Environmental Management Plan for this Icon Site.



Prepared by RMW 10/02/06. Only valid on day of issue.

Figure 3: Hydrograph of the Barmah-Millewa Forest Environmental Flow Event 2005/06 and cumulative use of the EWA.

2. Outcomes:

- (a) The volume of the BMF EWA released from Hume Reservoir from 11 October 2005 to early February 2006 was approximately 510 GL (**Fig. 2, Table 3**) which watered approximately 30, 000 Ha (~55%) of the Barmah-Millewa Floodplain.
- (b) Victoria granted approval in December 2005 for overdraw of the EWA, by up to 50 GL. This was considered necessary for successful completion (through to about March 2006) of significant colonial waterbird breeding and other ecological processes that had been triggered by use of the EWA.
- (c) The release was managed adaptively taking into account responses being observed, particularly for vegetation, waterbirds and native fish.
- (d) Significant outcomes achieved from use of the BMF EWA in 2005/06 include:
 - (i) Improved health and significant new growth and regeneration of River Red Gums;
 - (ii) Unprecedented spawning and recruitment of Silver Perch and Golden Perch and successful spawning and recruitment of Murray Cod and many of the small native forage species;
 - (iii) Breeding and recruitment of thousands of colonial nesting waterbirds of multiple species including Royal Spoonbills listed as vulnerable in Victoria;
 - (iv) Establishment of a colony of mixed Little, Intermediate and Great Egrets along with Nankeen Night Herons in the Barmah Forest (the first time that these listed threatened species have bred in the forest in 40 years);
 - (v) Growth and flowering of significant wetland plants including Wavy Marshwart, Milfoils, Spike-sedges and the regionally significant Moira Grass (**Fig. 4**);
 - (vi) Breeding of large numbers of frogs; and
 - (vii) Production of macro-invertebrates and cycling of carbon.



Figure 4: Wetland vegetation response to watering, Hut Lake, Barmah Forest (Photo: Goulburn-Broken CMA).

Gunbower Koondrook-Perricoota Forests Icon Site

3. Actions:

2004/05 and 2005/06

- (a) During August 2004 and during spring/summer 2005 around 37 GL of water was delivered to several permanent and semi-permanent wetland complexes at Gunbower Forest.
- (b) The objectives in 2004/05 were to:
 - (i) Water three wetland complexes - Little Gunbower Creek, Little Reedy Lagoon and Big Reedy Lagoon;
 - (ii) Deliver water to stressed River Red Gums with Flood Dependent Understorey (FDU); and
 - (iii) Flood areas to provide suitable habitat for colonial nesting waterbird feeding and breeding.
- (c) The objectives in 2005/06 were to:
 - (i) Improve the health of wetland vegetation communities;
 - (ii) Ensure provision of suitable habitat for small wetland fish and frogs;
 - (iii) Support a colonial nesting waterbird breeding event; and
 - (iv) Protect and enhance River Red Gum communities.
- (d) Existing Forest regulators on Gunbower Creek (Yarran, Reedy and Black Swamp Regulator) and on the River Murray facilitated delivery of the environmental water into Gunbower Forest during suitable flow periods. The water re-entered a series of permanent and semi-permanent wetlands and temporarily flooded parts of River Red Gum FDU.
- (e) No environmental water was delivered to the Koondrook-Perricoota Forest during 2004/05 or 2005/06.

4. Outcomes:

- (a) During 2004/05 and 2005/06 between 1 000 – 2 000 Ha (~ 1 100 Ha in 2005/06) was watered at Gunbower Forest (**Fig. 2, Table 3**).
- (b) Sources of water used in 2004/05 included River Murray surplus flows (~5 GL) and Victorian Murray Flora and Fauna Entitlement (~11 GL).
- (c) Sources of water used in 2005/06, River Murray surplus flows (~11 GL) and Victorian Murray Flora and Fauna Entitlement (~10 GL) (**Fig. 2, Table 3**).
- (d) Notable waterbird breeding outcomes were achieved in 2004/05.

- (e) Significant outcomes in 2005-06 include:
- (i) New growth and increased canopy cover of existing River Red Gums, and regeneration of understorey vegetation;
 - (ii) The first significant breeding event of the Great Egret (*Ardea alba*) since 1999/2000 (**Fig. 5**). This species is listed under the JAMBA, CAMBA and Bonn Conventions and is endangered in Victoria;
 - (iii) Breeding of over 200 colonial waterbirds;
 - (iv) Breeding of several frog species;
 - (v) Provision of habitat for large numbers of native fish, including threatened species; and
 - (vi) Growth and reproduction of significant wetland vegetation, including species listed as nationally vulnerable, and State nominated species.



Figure 5: Great Egrets with chicks nesting in River Red Gum trees – Gunbower Forest (Photo: North Central CMA).

Hattah Lakes Icon Site

5. Actions:

- (a) Between April – June 2005, and September – December 2005 approximately 6 GL (~ 4.2 GL in 2005/06) of environmental water was delivered to the Hattah Lakes system by pumping water from the River Murray into Chalka Creek (**Fig. 2, Table 3**).
- (b) Sources of water used included the Victorian Murray Bulk Entitlement, River Murray surplus flows, Snowy Increased Flows, and water donated by Sunraysia irrigators.

6. Outcomes:

- (a) Approximately 20 km of Chalka Creek was re-wet for the first time since 2002, and several floodplain lakes and connecting creeks were filled or partially filled totalling approximately 200 - 300 Ha (**Fig. 6**).
- (b) Significant outcomes achieved from use of the environmental and surplus water include:
 - (i) Growth and regeneration of River Red Gums (along Chalka Creek), Lignum and other significant plant species inhabiting the Lake edges;
 - (ii) Presence of several native fish species in the Lakes, presumably pumped into the system as larvae, including Murray Cod, Silver Perch (EPBC listed), Golden Perch and smaller natives;
 - (iii) Provision of habitat for over 30 waterbird species on Chalka Creek and the Lakes including threatened species;
 - (iv) Breeding of Australasian Grebes and several waterfowl species on the Lakes for the first time since 2001;
 - (v) Growth of submerged waterplants such as *Vallisneria americana* (Ribbon weed) along Chalka Creek for the first time in years; and
 - (vi) Breeding of tortoises and frogs.



Figure 6: Lake Lockie dry in August 2005 (*left*) (Photo: Mallee CMA); Lake Lockie full in December 2005 (*right*) (Photo: Department of Sustainability and Environment).

Chowilla Lindsay-Wallpolla Icon Site

Chowilla Floodplain component

7. Actions:

- (a) During 2004/05 approximately 3.6 GL of environmental water was pumped or gravity fed (including Lock 6 weir pool raising), to parts of the Chowilla Floodplain. So far in 2005/06 a further 2.4 GL has been delivered (**Fig. 2, Table 3**).
- (b) Sources of water include allocations announced by the South Australian Minister for The River Murray and the NSW Murray Wetlands Working Group, Above Entitlement Flows to SA (River Murray surplus flows) and Snowy Increased Flows.

8. Outcomes:

- (a) Nineteen sites have been watered on the Chowilla Floodplain (July 2004 to February 2006).
- (b) The area watered (including fringing vegetation) is estimated at over 800 Ha (~ 130 Ha in 2005/06) and contains an estimated 7 000 River Red Gums.
- (c) A long-term monitoring strategy is in place at all watered sites, recording changes to tree health and groundwater.
- (d) Significant outcomes achieved from use of the environmental and surplus water include:
 - (i) Across all sites 50-90% of the stressed trees have responded positively to the increase in available fresh water (**Fig. 7**);
 - (ii) Presence of up to a thousand waterbirds on wetlands, including State listed species; and
 - (iii) Breeding of large numbers of frogs and presence of the nationally vulnerable Southern Bell Frog.



Figure 7: Twin Creeks, Chowilla Floodplain pre-watering November 2004 (*left*) and post-watering February 2006 (*right*). (Photo: Department of Water, Land and Biodiversity Conservation).

Lindsay-Wallpolla component

9. Actions:

- (a) During 2005/06, approximately 10.3 GL of environmental water has been delivered to 22 sites on Lindsay, Mulcra (**Fig. 8**) and Wallpolla Islands from pumping, and by temporarily raising the upstream pool level of Lock/Weir 8 to ~60cm above its normal operating level.
- (b) Sources of water used included the Victorian Murray Environmental Bulk Entitlement, Snowy Increased Flows, River Murray surplus flows and donated water.

10. Outcomes

- (a) Approximately 1800 Ha has been watered by these actions (**Fig. 2, Table 3**).
- (b) Significant outcomes achieved from use of the environmental and surplus water include:
 - (i) Increased vigour of River Red Gum, and growth and flowering of Black Box, River Coobah and Lignum adjacent to watered sites;
 - (ii) Growth and reproduction of submerged, emergent and floating macrophytes (water plants);
 - (iii) Presence of several frog species including EPBC listed vulnerable species (the Growling Grass Frog);
 - (iv) Presence of over 30 species of waterbirds on Mulcra and Wallpolla Islands; and
 - (v) First sighting of DeVries snakes ('Mud adder') in Victoria at Wallpolla Island.



Figure 8: Mulcra Island Billabong during environmental watering November 2005 (Photo: Department of Sustainability and Environment).

Murray Mouth, Coorong and Lower Lakes Icon Site

11. Actions:

- (a) During August 2004 approximately 40 GL of water was released through the Barrages.
- (b) During July 2005 to February 2006 approximately 640 GL of water was released through the Barrages (**Fig. 2, Table 3**). This included 7 months of continuous fishway operation (to February), coinciding with the required timing for several native fish species to move between the Lower Lakes and Coorong to breed and complete their life cycles.
- (c) Sources of water used included Above Entitlement Flows to South Australia which included a portion of the BMF EWA that was not able to be re-regulated in Lake Victoria, as well as local rainfall and Eastern Mount Lofty Ranges tributary inflows.
- (d) A donation of 5 GL from SA Water announced by the South Australian Minister for the River Murray will be used to keep the fishways on the Barrages open from early February until about April 2006.

12. Outcomes:

- (a) At peak release, 37 gates were open across Boundary Creek (**Fig. 9**), Tauwitchere and Goolwa Barrages, releasing approximately 12 000 ML/d (for 4 days). As the volume available for release reduced, the Barrage gates were progressively closed and the objective was to maintain flow through the fishways for as long as possible.
- (b) The ecological health of the Murray estuary in a localised area around the Barrages was improved as a result of the Barrage releases during 2004/05 and 2005/06.
- (c) Vegetation within Boundary Creek, in particular Lignum showed a positive response to the estuarine conditions created during the release.
- (d) Indicators of Murray Mouth condition (e.g. Tidal ratios) were reportedly the best since dredging commenced in October 2002.
- (e) Up to 100, 000 native fish (comprising 16 different species of mostly small-bodied natives) were captured and released during a study of the performance of the vertical slot and rock ramp fishways at Goolwa and Tauwitchere Barrages in January/February 2006.



Figure 9: Two gates open at Boundary Creek Barrage (Photo: Department for Environment and Heritage).

River Murray Channel Icon Site

13. Actions:

- (a) During 2005/06 New South Wales, Victoria and South Australia contributed to environmental watering at sites along the River Murray Channel. Actions include:
 - (i) Weir pool raisings at Locks 5 (**Fig. 10**), 4 and 1. (Note: Locks 6 and 8 have been described under Chowilla, and Lindsay-Wallpolla sections, respectively); and
 - (ii) pumping or gravity feeding water onto the floodplain.
- (b) Approximately 11.7 GL has been used to February 2006.
- (c) The source of water used includes River Murray surplus flows, Snowy Increased Flows and existing state-based environmental allocations.
- (d) Each State is planning further watering during autumn 2006 using water available from the Snowy Increased Flows and existing state-based environmental allocations.
- (e) During August 2005, a temporary and partial drawdown of Torrumbarry Weir was implemented to enable an inspection of the river banks.
- (f) In other sections of the River Murray System, the Werai Forest received surplus (Barmah-Millewa) flow and the NSW Murray Wetlands Working Group (MWWG) used 6.8 GL of NSW Adaptive Environmental Water at wetlands on public and private land within the Edward-Wakool and Billabong Creek systems. Victorian Murray wetlands including Kerang Lakes and Cardross Lakes received 5.7 GL from the Victorian Murray Flora and Fauna Entitlement (**Fig. 2, Table 3**). These actions combined watered over 1 400 Ha.

14. Outcomes:

- (a) Up to 1 500 Ha was watered along the River Murray Channel, plus an additional 800 Ha of wetlands on public and private land within the Edward-Wakool and Billabong Creek systems. Several of these are sites of significant waterbird breeding.
- (b) A draft report on the erosion of the river banks along the Torrumbarry Weir Pool has been provided to MDBC and is currently being reviewed. The draft report supports the concept of increasing weir pool variability on an ongoing basis to reduce riverbank erosion.



Figure 10: Lock 5 at maximum surcharge (*left*) and adjacent floodplain/wetland inundated by the weir pool raising (*right*) (Photo: Department of Water, Land and Biodiversity Conservation).