

GB CMA Dry Inflow Contingency Plan 2008-2009 Review



Background

As part of state government drought planning the Goulburn Broken Catchment Management Authority prepared a Dry Inflow Contingency Plan (Plan) in October 2008. The Plan provided the basis and direction for the management of significant river, floodplain and wetland assets in the Goulburn Broken Catchment if lower than average flows occurred in the 2008/09 season.

A total of 74 actions were identified that aimed to maintain or avoid the local extinction of the significant river, floodplain and wetland assets. The actions included:

- Regulating flows to maintain or improve aquatic habitat.
- Enforcing or amending existing rules for water extraction to maintain or improve aquatic habitat.
- Monitoring water quality and native fish populations, this can trigger actions such as the relocation of native fish or flow regulation. Monitoring water quality and native fish populations can also improve our understanding on how they respond to dry inflows, which will inform the development of future low inflow management actions.
- Controlling exotic fish biomass to reduce competition with native fish species.
- Fencing out or removing stock from riparian and wetland habitats to reduce grazing pressure on native vegetation, maintain fauna habitat and reduce nutrient and sediment inputs.
- Controlling pest plants to reduce competition with native flora species and maintain or improve fauna habitat.
- Protecting and increasing drought refuge.

Of the identified actions 30 were of high priority. These actions aimed to avoid the local extinction of priority species including Barred Galaxias, Macquarie perch, Trout Cod, Murray Cod, Freshwater Catfish and Water-shield in the Goulburn River, Broken Creek, a number of unregulated streams, and Barmah Forest.

As the caretaker of river health and the manager of the environmental water reserve, the Goulburn Broken Catchment Management Authority has the key responsibility of delivering, implementing and monitoring the Plan. This report details the progress of the GB CMA in implementing the 74 actions in the Plan and the additional six actions identified for implementation.

Results

Of the 74 actions identified in the Plan, 89% were completed or partially completed, 11% did not commence and 0% were not required to be undertaken due to the scenario conditions not been met (see Table below). Of the high priority actions 89% were completed or partially completed, 11% did not commence and 0% were not required to be undertaken due to the scenario conditions not been met (see Table below).

Status of Dry Inflow Contingency Plan actions




Action Status	High Priority		Medium Priority		Low Priority		Total	
	No.	%	No.	%	No.	%	No.	%
Actions completed	26	86	28	82	10	100	64	86
Actions commenced	1	3	1	3	0	0	2	3
Actions have not commenced	3	11	5	15	0	0	8	11
Actions not required to be undertaken	0	0	0	0	0	0	0	0
Total	30	100	34	100	10	100	74	100

The following tables identify the status of each of the 74 actions. The priority actions are listed first and all the actions are grouped under the four flow scenarios and the following headings:



- actions for regulated streams;
- actions for unregulated streams;
- actions for wetlands; and
- complimentary actions.

Actions for Regulated Streams




Goulburn River (2006/2007 and 99% Inflow Scenarios)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
1	Goulburn Weir - Murray River (reaches 1-8)	Run 250 ML/day during winter 2008 and use the water saved for water quality and environmental flow management.	Maintain aquatic habitat and water quality	Murray Cod, Silver Perch	High		
2	Goulburn Weir - Murray River (reaches 1-8)	Monitor water quality and flow (includes the installation of multilevel water quality probes at two locations downstream of Shepparton).	Inform management decisions	Murray Cod, Silver Perch	Medium		Includes real time monitoring.
3	Goulburn Weir - Murray River (reaches 1-8)	Survey fish and macroinvertebrate communities (abundance and diversity) and riparian and in-channel vegetation condition.	Inform management decisions	Murray Cod, Silver Perch, general ecological values and functions	Medium		


Goulburn River (2006/2007 and 99% Inflow Scenarios continued)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
4	Goulburn Weir - Murray River (reaches 1-8)	Survey the abundance and diversity fish, fish eggs and fish larvae (ARI implementing).	Inform management decisions	Murray Cod, Silver Perch	Medium		
5	Goulburn Weir	Monitor water quality and flow (G-MW implementing). Develop management responses for poor water quality.	Inform management decisions	Murray Cod, Silver Perch	Medium		



Goulburn River (95% and 90% Inflow Scenarios)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
6	Goulburn Weir - Murray River (reaches 1-8)	Monitor water quality and flow (includes the installation of multilevel water quality probes at two locations downstream of Shepparton).	Inform management decisions	Murray Cod, Silver Perch	Low		
7	Goulburn Weir - Murray River (reaches 1-8)	Survey fish and macroinvertebrate communities (abundance and diversity) and riparian and in-channel vegetation condition.	Inform management decisions	Murray Cod, Silver Perch, general ecological values and functions	Low		
8	Goulburn Weir - Murray River (reaches 1-8)	Survey the abundance and diversity fish, fish eggs and fish larvae (ARI implementing).	Inform management decisions	Murray Cod, Silver Perch	Low		


Goulburn River (95% and 90% Inflow Scenarios continued)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
9	Goulburn Weir	Monitor water quality and flow (G-MW implementing). Develop management responses for poor water quality.	Inform management decisions	Murray Cod, Silver Perch	Low		







Broken River (All Scenarios)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
10	Lake Nillahcootie - Goulburn River (reaches 1-5)	Monitor water quality and flow (G-MW implementing).	Inform management decisions	Murray Cod, Silver Perch, Trout Cod, Macquarie Perch, Murray-Darling Rainbowfish	High		
11	Benalla - Lake Nillahcootie (reaches 3-5)	Survey the Macquarie Perch population to determine its status and extent (ARI implementing).	Inform management decisions	Macquarie Perch	High		

Broken River (All Scenarios continued)







No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
12	Caseys Weir - Goulburn River (reaches 1-2)	Survey fish and macroinvertebrate communities (abundance and diversity) and riparian and in-channel vegetation condition.	Inform management decisions	Murray Cod, Silver Perch, Trout Cod, Macquarie Perch, Murray-Darling Rainbowfish, general ecological values and functions	High		

Broken and Boosey Creeks (All Inflow Scenarios)



No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
13	Broken Creek Nathalia to the Murray River (reaches 21-23)	Run 80-100ML/day of Goulburn River Water and flushes down the creek to: <ul style="list-style-type: none"> ● maintain water quality; ● maintain fish habitat; ● and to operate the fish ladders. Requires use of the Goulburn River Water Quality allocation to offset any losses (approximately 10GL).	Maintain aquatic habitat and water quality	Murray Cod	High		
14	Broken Creek Nathalia to the Murray River (reaches 21-23)	Monitor fish movement upstream and downstream of weir pools (via PIT Tag readers) in response to flow regimes (ARI implementing).	Inform management decisions	Murray Cod	High		
15	Broken Creek Rices Weir (reach 21)	Monitor water quality in Rices Weir pool (includes the installation of multilevel water quality probes and a weather station).	Inform management decisions	Murray Cod	High		
16	Broken Creek Katamatite - Waggarandall Weir (reaches 25-26) Boosey Creek Katamatite - Tungamah (reach 33)	Deepen exiting habitat pools (6 pools on the Broken Creek and 3 pools on the Boosey Creek).	Maintain aquatic habitat and water quality	General aquatic dependent species	Medium		3 pools on the Boosey Creek complete. 6 pool on Broken Creek incomplete due to water in Creek.
17	Broken Creek Katamatite - Waggarandall Weir (reaches 25-26)	Monitor water quality in the deepened pools on the Broken Creek (includes the installation of water quality probes).	Inform management decisions	General aquatic dependent species	Medium		
18	Broken Creek Rices Weir (reach 21)	Install a camera to monitor Azolla build up and movement.	Inform management decisions	Murray Cod	High		

5.2 Actions for Unregulated Streams








Unregulated Streams (2006/2007 Inflow Scenario)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
19	Seven Creeks (reach 19)	Continue urban winter extraction directly from the creek into Abbingner Reservoir in reach 17 to minimise impacts on Trout Cod habitat (reach 19).	Maintain aquatic habitat and water quality	Macquarie Perch, Trout Cod	High		
20	Seven Creeks	Survey the Trout Cod population to determine its abundance and distribution. Assess the condition of its habitat (ARI implementing).	Inform management decisions	Trout Cod	High		Results indicate the abundance and distribution of the species is declining.
21	King Parrot Creek	Survey the Macquarie Perch population to determine its abundance and distribution. Assess the condition of its habitat (ARI implementing).	Inform management decisions	Macquarie Perch	High		Fish translocated to Snobs Creek in anticipation of poor water quality from ash and sediment runoff from the fire affected area.
22	Hughes Creek	Survey the Macquarie Perch population to determine its abundance and distribution. Assess the condition of its habitat (ARI implementing). Install signs at key access points to inform the public that the protected species is found in these waters.	Inform management decisions	Macquarie Perch	High		
23	Ryans Creek and King Parrot Creek	Maintain existing urban passing flows.	Maintain aquatic habitat and water quality	Ecologically Healthy River, Growling Grass Frog, Macquarie Perch	High		
24	Broken River (regulated), Goulburn River, Holland Creek, Howqua River, Jamieson River and Ryans Creek	Monitor water quality and macroinvertebrates in waterways recently affected by fire (Waterwatch implementing - Ash Watch Program).	Inform management decisions	Spotted Tree Frog, Macquarie Perch, Barred Galaxias, Ecologically Healthy River, Growling Grass Frog	Medium		





Unregulated Streams (2006/2007 Inflow Scenario continued)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
25	Holland Creek, Hughes Creek and King Parrot Creek	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Macquarie Perch, Murray Cod,	High		
26	Holland Creek, Hughes Creek and King Parrot Creek	Continue to enforce irrigation suspensions until flow conditions improve.	Maintain aquatic habitat and water quality	Macquarie Perch, Murray Cod,	High		




Unregulated Streams (2006/2007 Inflow Scenario continued)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
27	Holland Creek, Hughes Creek, King Parrot Creek, Leary's Creek Seven Creeks and Sunday Creek	Establish risk management protocols for fish populations in drought affected streams.	Inform management decisions	Macquarie Perch, Murray Cod, Barred Galaxias, Trout Cod	High		
28	Selected streams and reaches	Continue to monitor the impact of drought on water quality, in-stream health and riparian health at a number of streams (includes purchase of a water quality monitoring kit).	Inform management decisions	Macquarie Perch, Murray Cod, Barred Galaxias, Trout Cod, general ecological values and functions	High		Water quality monitoring kits purchased. Field work not undertaken.
29	Leary's Creek	Monitor the Barred Galaxias population and its habitat (DSE implementing).	Avoid local extinction of population	Barred Galaxias	High		
30	Sunday Creek	Assess whether Sunday Creek has suitable habitat to support the return of the Barred Galaxias population. If there is not suitable habitat continue to house the population in tanks at ARI (ARI implementing).	Avoid local extinction of population	Barred Galaxias	High		Barred Galaxias were translocated from Sunday Creek due to lack of suitable habitat and are still being held by ARI.
31	Streams in the Mt. Buller, Woods Point, Marysville, Mt. Disappointment and Toolangi areas (including Leary's and Sunday Creeks) that support Barred Galaxias populations	Monitor Barred Galaxias populations and the condition of their habitat. Monitor and control predator species (alien trout). Maintain predator barriers (ARI implementing).	Avoid local extinction of population	Barred Galaxias	High		
32	Yea River	Maintain existing urban passing flows.	Maintain aquatic habitat and water quality	Macquarie Perch	Medium		
33	Yea River	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Macquarie Perch	Medium		





Unregulated Streams (2006/2007 Inflow Scenario continued)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
34	Yea River	Continue to enforce irrigation suspensions until flow conditions improve.	Maintain aquatic habitat and water quality	Macquarie Perch	Medium		
35	Acheron River, Delatite River, Ryans Creek and Seven Creeks	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Brown Toadlet, Murray Spiny Cray, Murray Cod, Stonefly, Ecologically Healthy River, Growling Grass Frog	Medium		
36	Delatite River	Maintain existing urban passing flows over summer. If extra water is required it is to be extracted prior to the end of December.	Maintain aquatic habitat and water quality	Murray Cod, Stonefly	Low		
37	Acheron River, Delatite River, Ryans Creek and Seven Creeks	Continue to enforce irrigation suspensions until flow conditions improve.	Maintain aquatic habitat and water quality	Brown Toadlet, Murray Spiny Cray, Murray Cod, Stonefly, Ecologically Healthy River, Growling Grass Frog	Medium		







Unregulated Streams (99%, 95% and 90% Probability of Exceedence Inflow Scenarios)

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
38	Seven Creeks	Survey the Trout Cod population to determine its abundance and distribution. Assess the condition of its habitat (ARI implementing).	Inform management decisions	Trout Cod	Medium		
39	King Parrot Creek	Survey the Macquarie Perch population to determine its abundance and distribution. Assess the condition of its habitat (ARI implementing).	Inform management decisions	Macquarie Perch	Medium		
40	Hughes Creek	Survey the Macquarie Perch population to determine its abundance and distribution. Assess the condition of its habitat (ARI implementing). Install signs at key access points to inform the public that the protected species is found in these waters.	Inform management decisions	Macquarie Perch	Medium		

Unregulated Streams (99%, 95% and 90% Probability of Exceedence Inflow Scenarios continued)









No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
41	Broken River (regulated), Goulburn River, Holland Creek, Howqua River, Jamieson River and Ryans Creek	Monitor water quality and macroinvertebrates in waterways recently affected by fire (Waterwatch implementing - Ash Watch Program).	Inform management decisions	Spotted Tree Frog, Macquarie Perch, Barred Galaxias, Ecologically Healthy River, Growling Grass Frog	Medium		
42	Leary's Creek	Monitor the Barred Galaxias population and its habitat (DSE implementing).	Avoid local extinction of population	Barred Galaxias	Medium		
43	Sunday Creek	Assess whether Sunday Creek has suitable habitat to support the return of the Barred Galaxias population. If there is not suitable habitat continue to house the population in tanks at ARI (ARI implementing).	Avoid local extinction of population	Barred Galaxias	Medium		
44	Streams in the Mt. Buller, Woods Point, Marysville, Mt. Disappointment and Toolangi areas (including Leary's and Sunday Creeks) that support Barred Galaxias populations	Monitor Barred Galaxias populations and the condition of their habitat. Monitor and control predator species (alien trout). Maintain predator barriers (ARI implementing).	Avoid local extinction of population	Barred Galaxias	Medium		
45	Yea River and King Parrot Creek	Maintain existing urban passing flows.	Maintain aquatic habitat and water quality	Macquarie Perch	Medium		
46	Holland Creek, Hughes Creek and King Parrot Creek	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Macquarie Perch, Murray Cod	Medium		
47	Holland Creek, Hughes Creek and King Parrot Creek	Continue to enforce irrigation suspensions until flow conditions improve.	Maintain aquatic habitat and water quality	Macquarie Perch, Murray Cod	Medium		
48	Yea River	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Macquarie Perch	Medium		

Unregulated Streams (99%, 95% and 90% Probability of Exceedence Inflow Scenarios continued)




No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
49	Yea River	Continue to enforce irrigation suspensions until flow conditions improve.	Maintain aquatic habitat and water quality	Macquarie Perch	Medium		
50	Holland Creek, Hughes Creek and King Parrot Creek	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Macquarie Perch, Murray Cod	Medium		
51	Ryans Creek	Maintain existing urban passing flows.	Maintain aquatic habitat and water quality	Ecologically Healthy River, Growling Grass Frog	Medium		
52	Delatite River	Maintain existing urban passing flows.	Maintain aquatic habitat and water quality	Murray Cod, Stonefly	Low		
53	Acheron River, Delatite River and Ryans Creek	Enforce existing irrigation restriction and suspension rules.	Maintain aquatic habitat and water quality	Brown Toadlet, Murray Spiny Cray, Murray Cod, Stonefly, Ecologically Healthy River, Growling Grass Frog	Low		
54	Acheron River, Delatite River and Ryans Creek	Continue to enforce irrigation suspensions until flow conditions improve.	Maintain aquatic habitat and water quality	Brown Toadlet, Murray Spiny Cray, Murray Cod, Stonefly, Ecologically Healthy River, Growling Grass Frog	Low		

5.3 Actions for Wetlands

Wetlands (All Inflow Scenarios)





No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
55	Barmah Forest (All of the forest)	Continue to prohibit stock grazing while biomass is low (DSE and PV implementing).	Reduce grazing pressure and maintain aquatic habitat	Moirra Grass, Growling Grass Frog	High		
56	Barmah Forest (Gulf Creek)	Deliver periodic pulses of water (50-100 ML/d) down Gulf Creek from the Murray River. Up to 500 ML will be required. No water will be returned to the Murray River.	Maintain aquatic habitat and water quality	Southern Pygmy Perch, Dwarf Flat-headed Gudgeon, turtles	High		840 ML delivered
57	Barmah Forest (Smiths Creek)	Deliver up to 500 ML of water to Smiths Creek via the Murray River. No water will be returned to the Murray River.	Maintain aquatic habitat and water quality	Turtles	Medium		
58	Barmah Forest (Boals Creek)	Deliver up to 50 ML of water to Boals Creek from the Murray River. No water will be returned to the Murray River.	Maintain aquatic habitat and water quality	Turtles	Medium		
59	Barmah Forest (Boals Deadwood)	Flood Boals Deadwoods to maintain Giant Rush habitat (used by colonial-nesting waterbirds during major flood events). Up to 500-800 ML will be required. Little water will be returned to the Murray River.	Maintain aquatic habitat	Colonial-nesting waterbird habitat	Medium		Received water in February 2009 as a result of regulator vandalism
60	Barmah Forest (Top Island Wetland)	Flood Top Island wetland to maintain Giant Rush habitat used by colonial-nesting waterbirds during major flood events. Up to 500-800 ML will be required. No water will be returned to the Murray River.	Maintain aquatic habitat	Colonial-nesting waterbird habitat	Medium		
61	Moodies Swamp	Carry out minor channel works to improve flow efficiency. Capture opportunistic flows (surplus irrigation flows or catchment runoff).	Maintain aquatic habitat	Waterbird habitat (including Brolga habitat), Ridged Water-milfoil, drought refuge	High		
62	Black Swamp	Deliver up to an additional 75 ML to Black Swamp to maintain aquatic habitat and support bird breeding events.	Maintain aquatic habitat	Waterbird habitat, River Swamp Wallaby-grass, drought refuge	High		40 ML gravity fed to wetland

Wetlands (All Inflow Scenarios continued)






No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
63	Reedy Swamp	Deliver up to an additional 300 ML to Reedy Swamp to maintain aquatic habitat and support bird breeding events.	Maintain aquatic habitat	Waterbird habitat (including habitat for colonial nesting species), drought refuge	High		
64	Moodies Swamp, Reedy Swamp, Kinnairds Swamp and Black Swamp	Monitor the ecological response of the wetlands to the application of environmental water.	Inform management decisions	Frogs, aquatic vegetation, waterbirds, water quality	High		
65	Lake Mokoan	Translocate fish from Lake Mokoan to more secure aquatic habitat such as the Goulburn River and Hume Dam (DSE, G-MW and DPI Fisheries implementing)	Avoid fish deaths	Murray Cod, Golden Perch	High		

5.4 Complimentary Actions





All Inflow Scenarios

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
66	Selected unregulated and regulated streams	Fence riparian vegetation along stream reaches which support or provide refuge for priority ecological values to reduce stock grazing pressure.	Protect riparian and instream habitat and maintain water quality	A number of priority ecological values	High		Ongoing program.
67	Unregulated streams affected by the recent fires	Continue to support fire recovery planning and the development of a fire recovery plan.	Protect riparian and instream habitat and maintain water quality	Macquarie Perch, Murray Cod, Trout Cod, Barred Galaxias	High		Ongoing program.
68	Selected unregulated and regulated streams	Control aquatic and riparian weed infestations.	Protect riparian and instream habitat and maintain water quality	A number of priority ecological values	High		Ongoing program.
69	Broken Creek (reach 23), Big River (reach 67), Goulburn River (reaches 11, 14, 16), King Parrot Creek (reach 51), Seven Creeks (reach 18)	Assess the condition of streams using the index of Stream Condition (ISC). Indices measured included water quality, riparian vegetation, macroinvertebrates, physical form and hydrology (ISC sentinel site monitoring program).	Inform management decisions	General stream ecological values and functions	Medium		

All Inflow Scenarios continued

No.	Location	Action	Purpose	Ecological Values Targeted	Priority	Status	Comments
70	Broken River (reach 6), Delatite River (reaches 71 and 72), Goulburn River (reach 16), Holland Creek (reach 15), Howqua River (reach 60), Jamieson River, King Parrot Creek (reaches 51 and 52), Ryans Creek (reach 17)	Assess the condition of streams using the index of Stream Condition (ISC). Indices measured included water quality, riparian vegetation, macroinvertebrates, physical form and hydrology. In addition assess the condition of riparian habitat using a variety of methods. Assessment sites include streams recently affected by bushfires in the summer of 2006/2007 (Riparian Trend Project).	Inform management decisions	General stream ecological values and functions	Medium		
71	Boosey Creek (reaches 32, 33 and 34), Broken Creek (reaches 25, 26, 27)	Assess and quantify the environmental condition of instream biota (fish, macro-crustaceans, macrophytes) and physical attributes (channel form, sediment loads, water quality) (Melbourne University implementing).	Inform management decisions	General stream ecological values and functions	Medium		
72	Goulburn Weir	Reduce Yellow Water-Lily infestations	Reduce competition with native flora and maintain aquatic habitat	Water-shield	Low		Ongoing program.
73	Boosey Creek (reach 32)	Monitor the condition and abundance of the Amulla population.	Inform management decisions	Amulla	Low		Undertaken informally by GB CMA staff as part of a program artificially augmenting the population with propagated plants.
74	Broken River, Goulburn Weir, Lake Banella	Investigate Cabomba management techniques.	Inform management decisions	General stream ecological values and functions	Medium		

Key to Tables

-  Action completed
-  Action commenced
-  Action has not commenced
-  Action not required to be undertaken