



ACT
Government

Environment and Planning



YERRABI POND FISH KILL

SEPTEMBER-OCTOBER 2014

Report to the Assembly on the Yerrabi Pond Fish Kill event under Recommendation 2 from the March 2015 Report on Annual and Financial Reports 2013-14 by request of the Standing Committee on Planning, Environment and Territory and Municipal Services.

May 2015

YERRABI POND FISH KILL

The collection and disposal of a large number of dead Murray Cod occurred at Yerrabi Pond over a 25 day period, 20 September to 14 October 2014.

On 20 September 2014 the Environment and Planning Directorate (EPD) first received the report of dead Murray Cod (*Maccullochella peelii*) at Yerrabi Pond. The responsibility to protect waterways and to investigate possible pollutant spills resides with the Environment and Protection Authority (EPA). Officers from the EPA attended the pond on that day and found three dead Murray Cod but there was no evidence of pollution or other dead fish in the area.



Photo of dead Murray Cod floating in Yerrabi Pond (Oct. 2014).

On 24 September a second report was received by EPD of 15 dead Murray Cod at Yerrabi Pond. EPD officers from the Environment Protection Authority (EPA), Conservation Research (CR) along with staff from Territory and Municipal Services Directorate (TaMSD) attended the pond on that day and found 20 dead fish. Once again, no sign of pollution or cause of death was found. At the time it was noted that the water in Yerrabi Pond was very clear and there was an exceptionally high amount of filamentous algae growth.

Between 18 to 23 September the air temperature rose 8.3° from 13.9° to 22.2° . During the event the September air temperature peaked at 24.1° , which is 6.2° above the September monthly mean, and 28.1° on 6 October, which is 5.6° above the October monthly mean.

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Carcass of a Murray Cod on the lake edge (Sept. 2014)

On 24 September, CR provided the ACT Government Vet with two Murray Cod samples but the analysis was inconclusive as the carcasses were too decomposed.

Water samples were taken from Yerrabi Pond to test for pesticides, herbicides and cyanobacteria (blue-green algae) which can sometimes be associated with fish kills. However, the results from the sampling determined there was nil detection for pesticides or herbicides and only a low level of cyanobacteria.

On 3 October additional pH and dissolved oxygen measurements were undertaken at Yerrabi Pond by the EPA. The results recorded for both pH and dissolved oxygen were consistent with the required environmental standards for urban lakes and ponds as detailed in the Environment Protection Regulation 2005.

Additionally, the Aquatic Ecologists from CR, used boat electrofishing on 3 October to collect fresh samples to test for fish viruses. Murray Cod, Golden Perch, Redfin Perch and Gambusia were caught and samples were obtained for testing. The samples were sent to Professor Whittington at the University of Sydney on 7 October to test for Epizootic Haematopoietic Necrosis Virus and Dwarf Gourami Iridovirus. The test results were found to be negative for these two viruses in the fish sampled.



While further investigating were undertaken, as a precautionary measure, TaMSD erected a sign similar to that shown above on the 3 October notifying the public of the closure of the pond and issuing warnings around water related activities. The sign was subsequently removed around 17 October.

Before dawn on 10 October aquatic ecologists from CR undertook further sampling and collected dissolved oxygen and other water quality measures to try to determine if dissolved oxygen levels were dropping to low levels over night and contributing to the fish deaths. Measurements were taken from six sites at depths up to 4.5 m. Measurements were again within standards for an urban lake.

Throughout the fish kill event TaMSD provided daily inspections and carried out the collection and disposal of over 100 dead fish from the Yerrabi Pond. All the dead fish collected were Murray Cod and ranged in size from 30-100 cm in length with the average size being 50 cm in length.

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Photo of large amounts of algae in Yerrabi Pond (Oct. 2014)

As a safety precaution the Directorate alerted the NSW Fisheries of the matter but they had no immediate concern while the deaths only occurred within Yerrabi Pond. NSW Fisheries did offer their assistance and asked to be notified in the event that further fish were found dead downstream in Gungahlin Pond or Lake Ginninderra. This request was not actioned as no fish were found downstream of Yerrabi Pond following the fish kill. There were unconfirmed reports of dead Murray Cod in the Gungahlin Pond (downstream of Yerrabi Pond), however, no evidence was found to support these claims.

Since 14 October 2014 no further reports have been received by EPA of dead Murray Cod in the Yerrabi Pond, nor have any been removed by TaMSD.

This is the first time that a Murray Cod fish kill of this type and scale has been observed in Yerrabi Pond in the 14 years that the pond has been stocked with these fish.

FINDINGS

EPD investigated known possible causes that could have resulted in a fish kill of this type and scale for a large number of fish. The following tests were undertaken but all found to be negative or were at safe levels:

- Epizootic Haematopoietic Necrosis Virus
- Dwarf Gourami Iridovirus
- Cyanobacteria
- Pesticides
- Herbicides
- Number of water quality parameters

After multiple investigations by EPD there is unfortunately no conclusive evidence pointing directly to the cause of the fish kill of Murray Cod at Yerrabi Pond during September and October 2014. However, a possible explanation for the fish kill is that dissolved oxygen within Yerrabi Pond may have reached low levels during pre-dawn periods.

Leading up to the fish kill event there was a 3-day rain event delivering 35.4 mls that was coupled with unseasonal warm temperatures that may have added to the reduction in dissolved oxygen within the pond. The rainfall would have provided an instant supply of new nutrients into the pond, potentially generating a growth of new plant and algae production and bacterial decomposition. This coincided with some unseasonal warmer temperatures resulting in the water's ability to hold oxygen decreasing with temperature increases. The increase of nutrients and the decreased ability for water to hold oxygen could have reduced the dissolved oxygen levels in the pond, especially pre-dawn (see page 6 'Dissolved Oxygen Processes' for an explanation of oxygen in water).

Yerrabi Pond also has very clear water, which (in addition to nutrient input) has led to very high levels of filamentous algae growth across the lake. These algae produce oxygen during the day but consume it through the night.

Further, given the fish kill occurred during Cod breeding season, larger fish would have been expected to be guarding potential nesting sites at the bottom of the lake, where oxygen levels would have been lowest. This may have been compounded by the fact that during the breeding season the fish are more stressed, tend to be sedentary and less likely to move away from poor water quality, which suggests why they may have been affected.

When considering all these factors, it is quite plausible to suggest that the levels of dissolved oxygen might have reached critically low levels for some fish in the Yerrabi Pond during this time.

DISSOLVED OXYGEN PROCESSES

Organisms that live in water require dissolved oxygen (DO) to survive, just like organisms that live on the land. Understanding what causes low DO in water is complex and is affected by many processes which are interlinked. There are both sources and sinks for DO in a water body.

Oxygen sources: the atmosphere, turbulence (e.g. from wind, waves), water inflows, aquatic plant and algae photosynthesis during daylight.

Oxygen sinks: respiration of all aquatic organisms (plants, fish, etc), bacterial breakdown of organic material, some chemical processes.

Interactions that affect DO levels:

- *plants and algae* living in the water both produce oxygen through photosynthesis during day time and use oxygen through respiration which occurs 24 hours a day. Too many plants in a water body can have the effect of causing an oxygen slump just before daylight after they have respired and used oxygen all night.
- *temperature.* Colder water temperatures allow the water to hold more oxygen. Warmer water holds less oxygen. Warmer water temperatures also speed up organic decomposition, which uses DO.
- *depth.* Water closer to the surface generally contains higher DO levels as it is closer to the atmosphere and also where water plants photosynthesise. Water in the lower levels of a water body usually contains less DO because low light limits plant photosynthesis and this is usually where most organic decomposition takes place (a process which uses oxygen).
- *stratification.* In some lakes where the water is deep enough and turbulence relatively low, distinct layers of water temperature can occur. Water near the bottom of a lake is usually cold with low DO, while water in the top layer is warmer with higher DO.
- *short term runoff of flotsam or turbid runoff:* Intense periods of runoff can result in mats of floating debris (generally vegetation, wood chips animal droppings or leaves) covering the water surface, preventing oxygen transfer and inhibiting photosynthesis of water plants.
- *nutrient inputs.* Nutrients getting into a water body also affect DO, usually causing a decrease. Nutrient inputs to a water body include lawn clippings, animal droppings, fertilizers, and the die off of aquatic plants. Increased nutrients affect DO by increasing plant, algae and bacterial growth. Larger numbers of plants and algae not only produce oxygen through photosynthesis, but also use oxygen through respiration and decomposition. If this is coupled with high bacterial decomposition processes (of dead organic matter), which use DO, a significant slump in DO can occur.

FISH STOCKING

Conservation Research within the Environment and Planning Directorate manages fish stocks in the ACT for the ACT Government and conducts regular monitoring of the recreational fish stocks in Canberra's urban lakes (Lake Ginninderra, Lake Tuggeranong, Yerrabi Pond and Gungahlin Pond). The Government fish stocking program is outlined in the 'Fish Stocking Plan for the Australian Capital Territory 2015-2020' available on the Directorates web site.

In January 2015 the Yerrabi Pond was monitored for fish as part of the Urban Lakes Fish Monitoring Program using boat electrofishing. This monitoring resulted in the capture and measurement of five Murray Cod that ranged in size from 403 to 490 mm. This finding suggests that there was a proportion of the Murray Cod population in the lake that survived the September-October 2014 fish kill.

Other species captured during the monitoring were 9 Golden Perch (323-489 mm), 7 Carp (237-705 mm), 6 Goldfish (216-342 mm) and 30 Redfin (53-282 mm). Unfortunately these fish, except the Golden Perch, are non-native species.

Angling is an important recreational activity for citizens of the ACT and fish stocking is an important management tool that supports angling in the urban lakes. One of the key conservation benefits of fish stocking is that it helps to reduce the impacts of recreational fishing on wild populations of Murray Cod and Golden Perch in local rivers by encouraging anglers to fish in urban lakes instead.

Over the last five years the ACT Government has provided \$15,000 p.a. in funding towards native fish stocking in the Canberra urban lakes and ponds. The ACT Government stocks approximately 50,000 fish each year throughout the Canberra lakes and ponds with over 750,000 fish having been stocked since 2000. The stocking of fish in Yerrabi Pond is outlined at Table 1.

The four urban lakes that are stocked by the ACT Government are only stocked in two out of every three years in order to achieve the minimum stocking density that is considered adequate for a viable adult population of native fish from the available funds.

Conservation Research, within the Environment Division of the Environment and Planning Directorate, monitors the fish populations in each lake on a biennial basis to determine the status of fish populations and the success of the stocking program.

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The Canberra Fisherman's Club, one of the five main fishing clubs in the ACT, contributes funds to the ACT Government stocking program. Between 2012 and 2015 the Canberra Fisherman's Club has provided a generous contribution towards the program that totals \$12,500. The Canberra Fisherman's Club also contributed an additional \$2,000 towards stocking of smaller ponds but these ponds fall outside of the government's fish stock program.

TABLE 1 – YERRABI POND FISH STOCKING

YEAR	MURRAY COD	GOLDEN PERCH	TOTAL
2013-14	11,000		11,000
2012-13		6,500	6,500
2011-12			0
2010-11	10,000		10,000
2009-10		9,000	9,000
2008-09			0
2007-08	15,000		15,000
2006-07		10,000	10,000
2006			0
2004-05	4,282		4,282
2003-04		2,000	2,000
2002-03			0
2001-02	5,000		5,000
2000-01		10,000	10,000
Total	45,282	37,500	82,782