

# Carp Management Program Annual Report 2017-18



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For further information contact:

**Inland Fisheries Service**

PO Box 575

New Norfolk

Tas 7140

Telephone: (03) 6165 3808

Facsimile: (03) 6173 0246

Email: [infish@ifs.tas.gov.au](mailto:infish@ifs.tas.gov.au)

*Find further information about Inland Fisheries Service (IFS) at*  
**[www.ifs.tas.gov.au](http://www.ifs.tas.gov.au)**

**This annual report details the Carp Management Program activities for the financial year 2017 – 18.**

*The objective of the program is:*

*- To eradicate carp from Tasmanian waters and, in the meantime, to minimise the impact of carp on Tasmania from economic, recreational and ecological points of view.*

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## Executive Summary

The anticipation continues to build as carp numbers in Lake Sorell dwindle. The Carp Management Program (CMP) remains on track to complete the eradication of carp from Lake Sorell, after another year of successfully targeting the remnant carp population. In spring, water levels and weather conditions built nicely to provide good conditions to induce carp movement and improve fishing opportunities. The period from October through until mid-December was, as usual, the most productive fishing period. The "Judas" radio transmitter fish allowed focused effort but saw a low return of catch compared to the non-targeted gill nets that were set strategically around the lake.

Falling water levels saw reduced catch rates over the remaining summer. There was a window of very hot weather in late January that saw a small number of carp captured late in the month. Again, this pointed to a very small number of fish remaining. Monthly sampling for recruitment throughout, and post spawning period failed to find any young of the year carp. No spawning was seen which of course is a key to eradication. There was no requirement to draw water from Lake Sorell for downstream use, with enough reserves in Lake Crescent to satisfy this requirement. This allowed good stimulus for carp movement on rainfall events and the lake level is positioned well for the 2018/19 season.

A thorough review of data and further scrutiny was done at the Carp Workshop in May. The fishing effort was similar to the previous year but caught less than a quarter of the number of carp. The carp are now eight years old. There were 107 caught for the year and the average weight was 763 grams. The constant and intense fishing pressure has suppressed the carp size, and gonad analysis indicates that there are serious issues with a population that is struggling to remain viable. The CMP has removed a total of 41452 carp from Lake Sorell, with less than 0.2% remaining.

The coming spring is going to be very interesting. The bets are on for what might remain.

### 1.1 Carp Captures at a Glance

Table 1. Carp Captures from Lakes Sorell and Crescent for the 2017/18 season

Lake	Total 2017/18	Adult / Juvenile	Total 1995 to present
Sorell	107	107 / 0	41452
Crescent	0	0	7797

### 1.2 Lake Sorell

#### Overview

In July-September, maintenance was undertaken at Lake Sorell to prepare for the carp spawning season (October to February). This involved inspecting the 14 kilometres of barrier netting blocking the wetlands. Several kilometres of gillnet was also repaired, which included both gillnets used in active fishing operations, as well as blocking gillnets to prevent carp from accessing the marshes. A small amount of fishing was done during this cold period. Transmitter fish remained spread around the lake, with most of the fish sitting in the same locations for weeks at a time.

Table 2. Total carp captured from all methods used in Lake Sorell over the 2017/18 season

Gear Type	Jul-Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr-Jun	Grand Total
Non- targeted gillnets	1	6	26	11	12	13	0	1	70
Inshore set gillnets*	0	3	5	4	2	1	0	1	16
Barrier fyke nets	1	0	0	5	2	0	0	0	8
Backpack electro-fisher	0	1	2	0	0	0	0	0	3
Boat electro-fisher	0	0	2	5	0	2	0	0	9
Gillnets behind marsh	0	0	0	1	0	0	0	0	1
<b>Grand Total</b>	<b>2</b>	<b>10</b>	<b>35</b>	<b>26</b>	<b>16</b>	<b>16</b>	<b>0</b>	<b>2</b>	<b>107</b>

\*These gillnets include blocking gillnets which prevent access to particular bays, gillnets set adjacent to the shore, and gillnets set around transmitter fish in the shallows.

Gill nets were set in a range of locations, targeting both transmitter fish as well as rocky reef structures in deep water (2m +). In mid-September, the big fyke nets were sewn into the barrier nets. These were placed in strategic locations to catch mature carp pushing into the shallows seeking spawning



habitat. These fyke nets are also an indicator of when the carp will begin to push back inshore, allowing gill nets to be set to target these movements. Two carp were caught in September even while the water was still at a low temperature (2.2°C – 7°C), one in a non-targeted gill net set over a rocky reef, while another was caught in a big fyke net along silver plains.

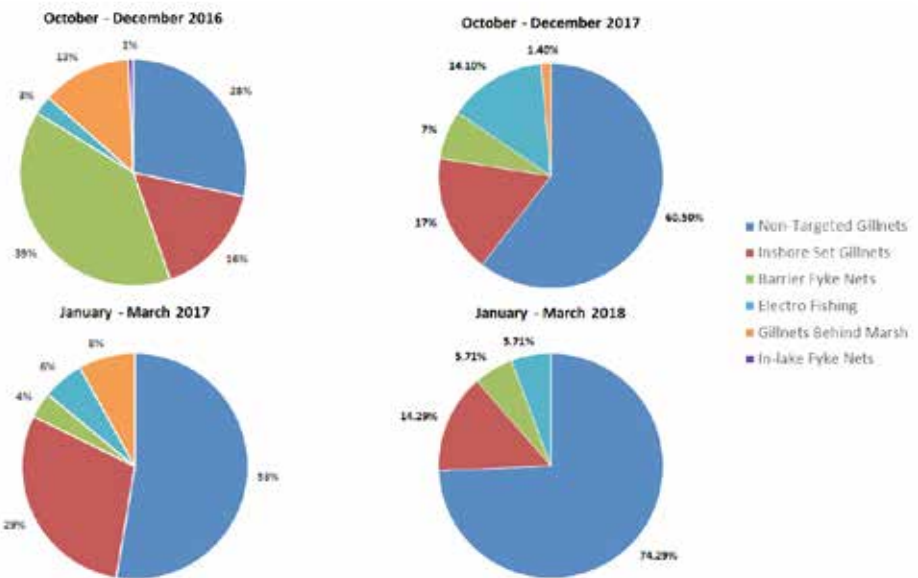


Figure 1. Percentage of total carp captured from each gear type during the carp fishing season (October to March) in Lake Sorell comparing the 2016/17 and 2017/18 seasons

Carp catch rates began to peak in November and December (Table 2), which coincided with an increase in warm weather (Figure 12), as well as a major rainfall event which occurred in early December. Carp respond to these environmental cues, which usually triggers a push into shallow marsh areas in a bid to spawn. Despite the ideal weather conditions only five fish were caught in barrier fyke nets directly after the event (Table 2), the largest carp being a 1.4kg male jelly gonad condition (JGC) carp. This is a stark comparison to 2016/17 for the same period, where the barrier fyke nets accounted for 39% of fish caught for the October to December 2016 quarter (Figure 1). In December 2016, 24 carp were captured across three fyke nets at Silver Plains Marsh in a single day. The low catch rates in fyke nets observed this season are likely to be due to a combination of a low remaining population size as well as inhibited maturity levels amongst the remnant fish. The under developed fish are less likely to push into the marshes or react to the environmental spawning cues.



*Picture 1. A carp entangled in a gill net set in the warm shallows amongst aquatic vegetation.*

The majority of nets this season were focused around the shallow regions of the lake in response to rising water temperatures and lake levels. Most nets were set at right angles to the shoreline to target fish moving around the margins of the lake. Some nets were also set in deeper water over the rocky reefs where carp have historically been known to favor. This season a big proportion of carp were caught in non-targeted gillnets set close to the margins of the lake (Table 2, Figure 1). This method accounted for a higher proportion of fish than last season (Figure 1). Inshore set gill nets, electrofishing, and barrier fyke nets all resulted in much smaller proportions of carp captures (Table 2, Figure 1), however it highlights the need to use a range of integrated techniques.

In line with previous seasons, gill nets were strategically set behind the barrier nets as a secondary precautionary measure to prevent carp from entering spawning habitats. However, due to a lower lake level this season, less net was required to achieve this. Three kilometres of these nets were set, compared to 10km in 2016. Gillnets were also set across and within key drainage areas in the marshes behind the barrier nets, as additional safety. Trammel gillnets, which have been proven to be highly efficient in capturing carp of varying sizes, were used to block off these areas. Only one carp was able to breach the barrier net, but was caught in the gill net set behind (Table 2).



*Picture 2. The biggest carp of the 2017/18 season; a 2.2kg female carp caught in a non-targeted trammel gill net set off the shore at Dogs Head.*

Trammel gillnets were the main type of gill net used for non-targeted effort due to their high catch efficiency. The biggest carp for the season was caught in late January, in a non-targeted trammel gill net set off the shore at Dogs Head Bay (Picture 2). The big female carp weighed 2229gm, and had a gonad weight of 401 gm (GSI: 18%). This was the only large carp caught all season, with no other fish exceeding 1500gm, and the average weight being 763gm.

Table 3. Non-targeted carp captures and gill net fishing effort in Lake Sorell for the 2015/16, 2016/17, and 2017/18 seasons

Month	Non-Targeted Carp Captures *			100m Net Hours		
Season	2015/16	2016/17	2017/18	2015/16	2016/17	2017/18
July-Sept	28	2	1	5698	57.5	4467
October	128	12	6	12701	24010	21132
November	136	42	26	29586	27097	30314
December	100	30	11	46176	28412	26450
January	109	44	12	57707	31137	26715
February	93	22	13	58531	47341	30172
March	6	5	0	10521	6547	10130
Apr-Jun	6	0	1	9794	0	528
<b>Grand Total</b>	<b>606</b>	<b>157</b>	<b>70</b>	<b>272 975</b>	<b>164 602</b>	<b>149 908</b>

\*Note: Non-targeted carp captures refers to carp caught without the aid of transmitter fish, and not part of aggregations.

There was a small reduction in non-targeted gill net effort compared to last season, where the amount of effort this season decreased by 8.9% (Table 3). However, during the peak months of carp season (October to February), a similar amount of effort was undertaken compared to 2016/17, but catch rates were still significantly less (Table 3). Gillnetting peaked in November and February (Table 3), in response to rapidly increasing and decreasing water temperatures (Figure 12), to target carp moving between the deep and shallow margins. In January and February as carp moved away from the shore and back to deeper water, gillnets were removed from the marshes behind the barrier nets. These nets were re-deployed into deep water to increase non-targeted netting effort.

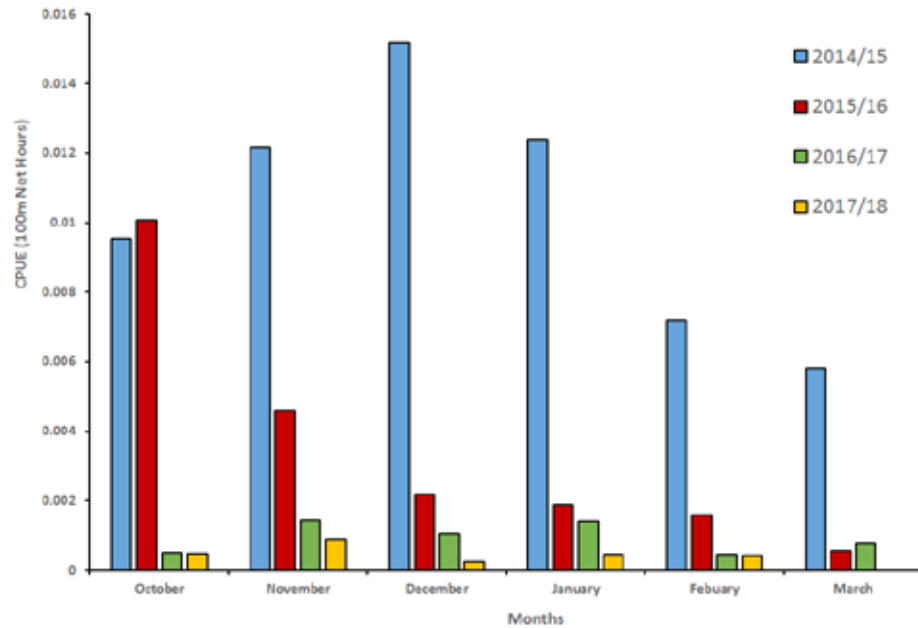


Figure 2. Catch per unit effort (CPUE) of non-targeted gill netting during the carp fishing season (October to March) in Lake Sorell comparing the 2014/15, 2015/16, 2016/17, and 2017/18 seasons.

Non-targeted gill netting catch rates remained relatively low all year; and the catch per unit effort (CPUE) was much less for all months when compared to last season (Figure 2). This follows the historic trend of declining total carp captures as the population is continually depleted (Figure 3). The weather at Lake Sorell this summer was warm and stable (Figure 12), which provided favourable conditions for catching carp. Therefore this factor can be ruled out as a contributor to the low CPUE.

Carp captures remained steady in January and February with fish continuing to be caught in non-targeted gill nets around the shoreline, however by March catch rates dropped off completely (Table 2). This is likely to be due to a combination of factors, including a falling water temperature and lake level, cold unsettled weather, and a small remaining population. These conditions result in the carp moving back to deeper water, where their overall movement slows down. Despite the increased effort offshore, no carp were caught for the month of March (Table 2), which is the first time this has occurred in the last nine years.

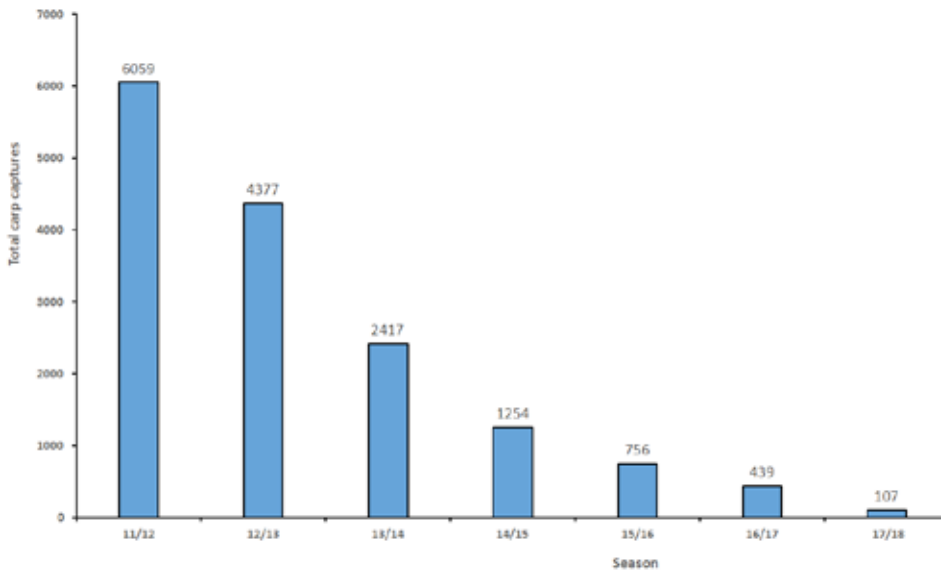


Figure 3. Total carp captures from Lake Sorell using all methods (2011-2018)

The proportion of male carp affected by the jelly gonad condition (JGC) has continued to increase since 2015/16 (Figure 4). The ratio of JGC males to healthy males in the October to December 2015 quarter was 1:3, but by the October to December 2017 quarter, the ratio had shifted to 1.4:1 (Figure 4). Although the January to March 2018 quarter appeared to show an increase in ratio of healthy males (Figure 4), due to the low sample size of wild male fish for this quarter (9 carp), this ratio is unlikely to be an accurate reflection of the current population. The increase in male carp affected by JGC will play an important part in the final stages of the eradication due to their reduced reproductive output. This further supports the hypothesis that intense fishing pressure has removed all but those fish with the slowest development.

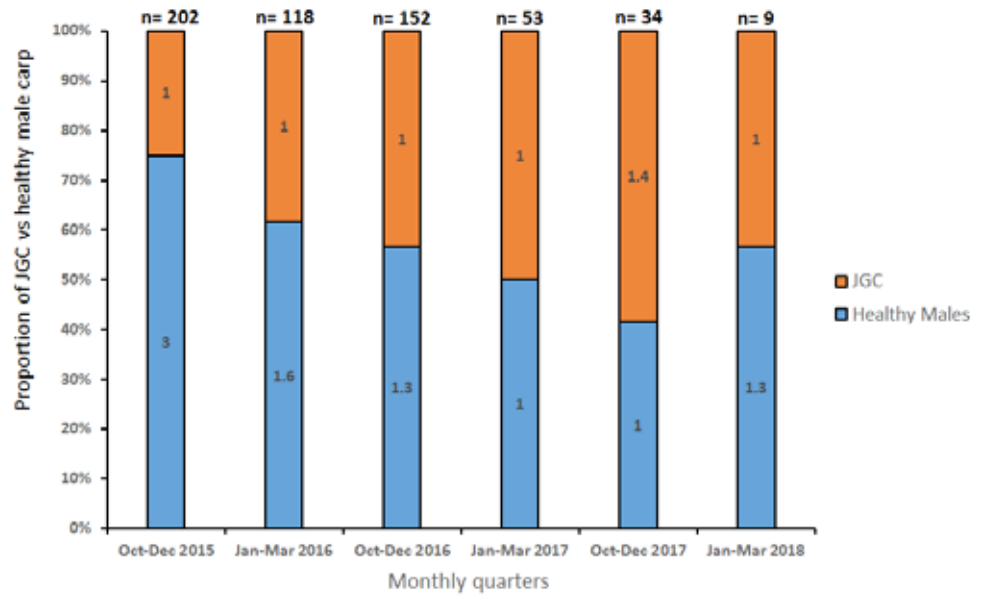


Figure 4. The change in ratio of jelly gonad condition (JGC) males to healthy males from 2015-18, compared by October to December and January to March quarters.

In summary, the slow fishing and reduced catch rates encountered this season gave the CMP an indication of what to expect this coming year. The reducing CPUE associated with the daily netting requires focused and persistent effort. However, these signs are very positive, and the team is motivated to maintain the fishing pressure. By continuing to use a range of fishing techniques, the aim will be to finish off the majority of carp this coming spring. In order to achieve this, optimal environmental conditions are required to draw the remaining fish into the shallows where they become vulnerable to our fishing gear. In addition, there will also be an equally important emphasis on stopping spawning.

Turbidity levels in Lake Sorell have been steadily decreasing since 2008, however from December 2017 to the present, there has been an increase in total turbidity in both Lake Sorell and Crescent. This can be attributed to a lower lake level, combined with windy periods during the time the water samples were taken. Wind fetch on the lakes causes a spike of natural silt re-suspending in the water column. Despite the increasing total turbidity, the colloidal component of the turbidity remains relatively stable, and is declining slowly. Increasing lake levels over the coming winter/spring should see a reversal of this effect, and result in a decrease in the overall total turbidity.

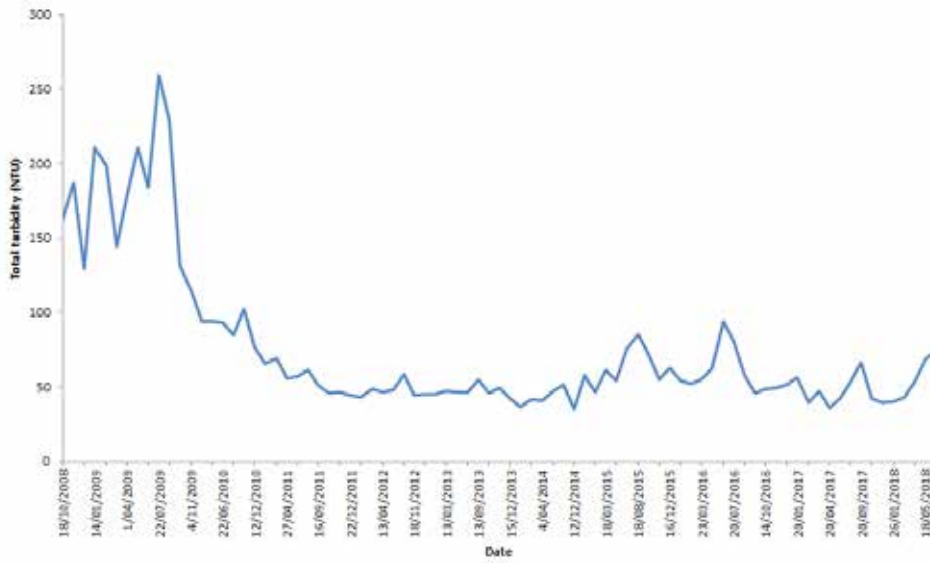


Figure 5. Turbidity levels in Lake Sorell from 2008 to 2018

### 1.3 Lake Crescent

No carp were captured in Lake Crescent this year despite continued annual sampling and monitoring, with the last carp caught in 2007. Since the extremely low water levels in 2008, the average total turbidity of Lake Crescent has improved considerably. This is the direct result of high water levels flushing the lake after large rainfall events. The slight increase in total turbidity from December 2017 to the present is explained in the previous section.

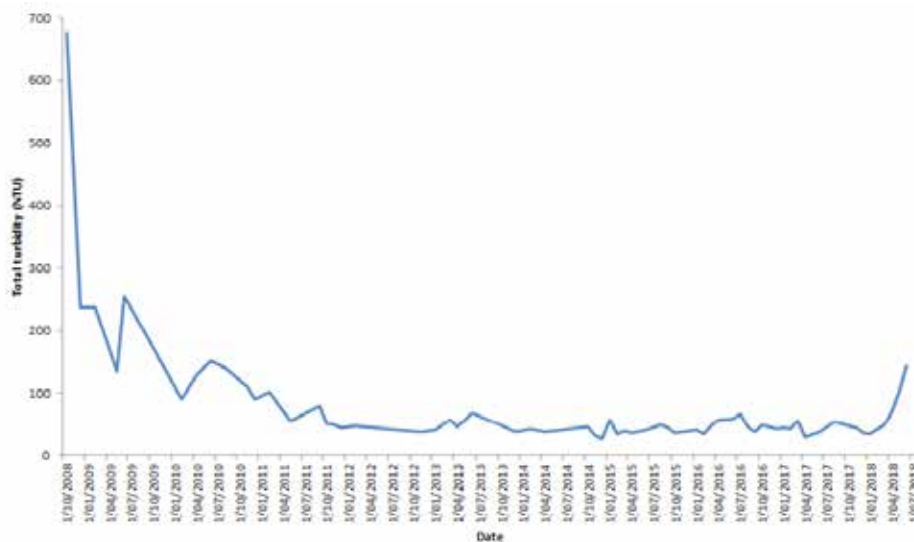


Figure 6. Turbidity levels in Lake Crescent from 2008 to 2018



## 2.

### Juvenile Carp Surveys

The annual Lake Crescent juvenile carp survey took place on the 15th of March 2018. The aim of this survey was to make sure carp had not made their way back into Lake Crescent, and to look for any signs of new recruitment if spawning had occurred recently. Although no carp have been seen in Lake Crescent since 2007, surveys are still carried out every year to confirm the lake remains carp free.

Backpack electrofishing was undertaken in areas where carp were known to favour. This included drains, marshes in front of and behind barrier nets, as well as a range of rocky, muddy, and sandy shorelines and areas with lots of underwater vegetation. Fourteen areas around the lake were surveyed using backpack electro-fishers for a minimum of 10 minutes at each location. This technique selects for both adult, and any potential juvenile carp (which are not susceptible to gillnet capture). A total of 210 electrofishing minutes were undertaken, with short-finned eels and golden galaxias making up the majority of the catch. A couple of rainbow trout were also caught in the shallows. No carp were found in Lake Crescent.



*Picture 3. One of the well-conditioned short finned eels caught during the Lake Crescent juvenile carp survey.*

The Lake Sorell juvenile carp survey was conducted from Monday the 5th to Friday the 9th of March 2018. The aim of this survey was to see if spawning had occurred over the past few months, and whether any new cohorts of carp could be detected.

Sixty six fyke nets were set around the lake in close proximity to macrophytes and near shore areas where young of the year carp have been caught previously. Like electrofishing, fyke nets select for carp of all sizes. Backpack electro-fishers were also used at 24 sites around the lake. Electrofishing was undertaken for a minimum of 15 minutes at each location. In total, 6149 fyke net hours were put in over the duration of the survey, as well as a total of 385 electrofishing minutes. This resulted in numerous eels and golden galaxiids being caught, but no sign of any young of the year carp.

This season additional monthly juvenile surveys from October to February were also done. These were undertaken over one or two days and involved backpack electrofishing, as well as fine mesh dip netting of any available wetland areas, from the barrier net back to the shoreline. No juvenile carp were detected on any of the surveys which suggests that spawning was prevented.



*Picture 4. Checking fyke nets set around the edge of the lake to target juvenile carp.*

# 3.

## The River Clyde Survey

As well as the lakes Sorell and Crescent juvenile carp surveys, a survey of the River Clyde was also done. The survey examines selected sites that feature ideal carp habitat immediately downstream of Lake Crescent to the township of Hamilton, to check that carp have not become established in the River Clyde system. The survey has been done each year since carp were first found in lakes Crescent and Sorell. Backpack electrofishing was done at three sites on the River Clyde which includes the Nant Bridge (300m stretch), the Bothwell sewage works (100m stretch), and the Hamilton Weir (100m stretch). A minimum of 30 minutes of backpack electrofishing was done at each site, with a range of species caught. Fifty five redfin perch, 9 tench, 3 brown trout, and 11 short finned eels were shocked in total. No carp were found, which shows that the containment strategy has been successful.



Picture 5. A large brown trout shocked upstream of the Nant Bridge in one of the shallow pools.

# 4.

## Transmitter fish

Over the 2017/18 season, 18 transmitter fish were successfully released in Lake Sorell. Most of the fish were dispersed around the lake, but occasionally moved close to shore during weather events. These conditions consisted of periods of warm, sunny, settled weather, as well as rain events which were able to raise the lake level. On most occasions they moved individually, however there were a few instances where the transmitter fish grouped up. Nets were mainly set on transmitter fish when they were found close to the shore, however if some were found to sit in an area for a long period, nets were also set around these fish. The ability to accurately set nets around transmitter fish is much higher when the fish are in shallow water, as opposed to deeper water (1m +).

Table 4. The number of active transmitter fish, targeted carp captures, and targeted, non-targeted, and total transmitter fish recaptures for the 2015/16, 2016/17, and 2017/18 seasons

	Season		
	2015/16	2016/17	2017/18
Active transmitter fish	12	14	18
Targeted carp captures	96	44	5
Targeted transmitter fish recaptures	9 (50%)	11 (52%)	16 (38%)
Non-targeted transmitter fish recaptures	9 (50%)	10 (48%)	26 (62%)
Total transmitter fish recaptures	18	21	42

This season saw the highest number of active transmitter fish successfully released, compared to 2015/16, and 2016/17 (Table 4). Of the 19 fish released in 2017/18, only two (10%) were detected on mort mode (Figure 8), with one of these fish being recaptured once before perishing. Despite the increase in active transmitter fish, only five carp were caught as a result of the targeted effort (Table 4 & 6). This was the smallest amount of fish caught from targeting transmitter fish in many years, where in 2015/16 when 12 active transmitter fish were used, 96 carp were caught as a result of transmitter fish (Table 4). This season also saw the highest occurrence of non-targeted transmitter fish recaptures, and the highest number of total transmitter fish recaptures seen over the last few years (Table 4). A high proportion of fish were caught three or more times this season (50%), while last season the majority of fish (57%) were only caught once (Figure 7). The increase in number and proportion of non-targeted transmitter fish recaptures could be

a consequence of the increased number of successfully released transmitter fish. It is also likely that the environmental conditions, combined with the maturity of fish, and the level of fishing effort applied to the lake has been highly effective. Increased incidental recapture of transmitter fish further suggests that the remaining population of carp is low.

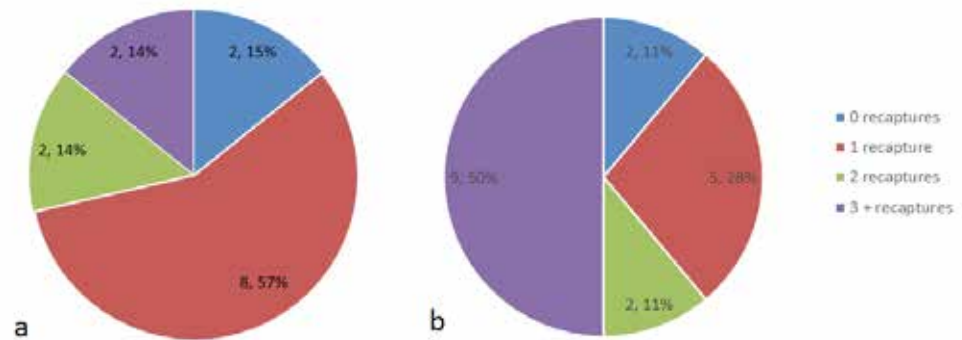


Figure 7. The number of recaptures of transmitter fish over a. the 2016/17 season, and b. the 2017/18 season

Note: Fish detected on mortality mode but not recaptured/recovered are not included in these charts.

Of the 19 transmitter fish released, two fish (10%) were detected on mort mode, three fish (28%) were killed after being recaptured, four fish (21%) are currently still alive, and 10 fish (50%) were retained (Figure 8b). The three fish killed were due to injuries sustained by capture, which was similar to last season (Figure 8). The number of fish on mort mode was also reduced compared to last season, dropping from 28% to 10% (Figure 8). The big difference between the fates of transmitter fish across the two seasons was that a big proportion of transmitter fish in 2017/18 were caught and retained, rather than being released back into the lake (Figure 8).

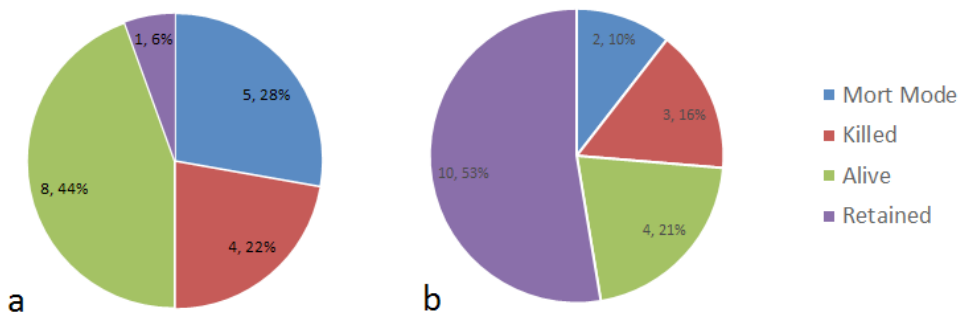


Figure 8. The fate of all transmitter fish used over a. the 2016/17 season, and b. the 2017/18 season

Note: Mort mode refers to a transmitter fish which has been inactive for 12hrs or more, therefore assumed dead or the transmitter was shed from the fish. Killed refers to a fish which was able to be recovered but was either dead on arrival, or it was deliberately killed. Retained refers to fish which were caught but were retained and kept in captivity.

This was due to the fact that now the numbers of remaining carp in Lake Sorell are at a critical level, the CMP were cautious about leaving male transmitter fish swimming in the lake. Although all transmitter fish used are affected by the JGC, research conducted by IMAS PHD student Raihan Mahmud has shown that only carp with advanced stages of JGC are completely sterile. The male carp used as transmitter fish were at varying stages of the JGC, therefore some are still able to produce viable milt, despite being severely inhibited. Taking into account the wild population of carp is also likely to be male limited, and the low associated catch rates of carp with transmitter fish (Table 4 & 6), a decision was made during the season to begin to remove the majority of transmitter fish from the lake, to reduce the potential of an unwanted spawning.

Only one transmitter fish was caught in a barrier fyke net, while all others were either caught in gill nets or by backpack electrofishing during a targeted event. The transmitter fish 393 had the highest number of recaptures in 2017/18, with five recaptures from the 1st of October 2017 to the 19th of January 2018 (Table 5). Transmitter fish 434, 353, 374, and 452 all had the second highest number of recaptures for the season with four recaptures (Table 5). Transmitter fish 353 was the only fish which was recaptured exclusively by targeted effort, while eight other transmitter fish were only caught by non-targeted fishing effort (Table 5). Another eight fish were recaptured via a combination of both targeted and non-targeted fishing effort (Table 5). As mentioned previously, the associated carp captures with the

recapture of transmitter fish was very low this season, with the majority of events resulting in just the transmitter fish caught. However, of the five carp caught from targeted effort, three were ex-transmitter fish (Table 6).

One event of significance occurred on the 9th of January when four transmitter fish were located in close proximity in Diamond Bay. A gathering of transmitter fish in an area has usually resulted in large carp catches. The last big aggregation occurred on the 28th of November 2012, where five transmitter fish were detected in Kermodes Bay over the muddy shallows. Targeting these fish resulted in the capture of 717 carp in a day. With this in mind, it could be expected to catch a reasonable number of fish in this 2017/18 event. However, after sampling the area with gill nets, backpack electro-fishers, and boat electro-fishers, not a single wild carp was detected, with only the transmitter fish being caught. The low associated catch rates and the lack of aggregations are all good indicators of a small remaining population size.

Table 5. Transmitter fish recaptures for the 2017/18 season with recapture dates

TrackerID	Number of recaptures				
	1st	2nd	3rd	4th	5th
151.092	22/1/18				
151.172	1/12/17				
151.112	28/12/17				
151.393	1/10/2017	22/11/2017	20/12/2017	22/12/2017	19/1/18
151.513	24/10/2017	14/11/2017	16/12/17		
151.492	2/10/2017	1/11/2017			
151.434	12/11/2017	5/01/2018	9/01/2018	19/1/18	
151.353	8/10/2017	12/11/2017	9/01/2018	29/01/2018	
151.374	2/10/2017	21/11/2017	22/11/2017	13/12/17	
151.553	10/11/2017	2/12/2017	24/01/2018		
151.270	22/11/2017	30/11/2017	4/01/2018		
151.292	16/11/2017	20/01/2018	7/02/2018		
151.452	24/12/2017	3/01/2018	6/01/2018	10/02/2018	
151.332	15/11/2017				
151.533	4/1/2018				
151.413	17/11/2017	29/12/17			

Table 6. Transmitter fish recaptures for the 2017/18 season with associated fish captures

TrackerID	Number of recaptures				
	1st	2nd	3rd	4th	5th
151.092	0 Carp				
151.172	0 Carp				
151.112	0 Carp				
151.393	0 Carp	0 Carp	0 Carp	0 Carp	0 Carp
151.513	1 Carp (E.T*)	0 Carp	0 Carp		
151.492	0 Carp	0 Carp			
151.434	1 Carp	0 Carp	0 Carp	0 Carp	
151.353	0 Carp	1 Carp (E.T*)	0 Carp	0 Carp	
151.374	0 Carp	0 Carp	0 Carp	0 Carp	
151.553	0 Carp	0 Carp	0 Carp		
151.270	0 Carp	1 Carp	2 Carp (E.T*)		
151.292	0 Carp	0 Carp	0 Carp		
151.452	0 Carp	0 Carp	0 Carp	0 Carp	
151.332	0 Carp				
151.533	0 Carp				
151.413	0 Carp	0 Carp			

Note: Shaded cells represent fish caught by active targeting of the transmitter fish, non-shaded cells represent fish caught in non-targeted fishing gear. The two frequencies highlighted in red are the transmitter fish which are still at liberty. \*Refers to ex-transmitter fish

Based on the catches from transmitter fish this season, the remaining transmitter fish will be removed from the lake before the coming spring. The low associated catch rates combined with the potential of accidental recruitment by the male transmitter fish has deemed the use of these fish to be too risky at this stage in the program. Using only advanced stage sterile JGC male carp would solve this issue, however the techniques required to confidently confirm the status of the gonad before release has been difficult. Therefore for the first time since 1997, transmitter fish will not be used to assist with the fish-down strategies, and there will be more of an emphasis on gill netting known areas of interest, assisted with the use of electrofishing and fyke nets.





*Picture 6. The result of targeted effort using radio telemetry equipment, a gill net, and backpack electrofishing; on the left is an ex-transmitter fish which was caught in a trammel net, as a result of pin pointing a current transmitter fish, on the right.*

# 5.

## Golden Galaxias Survey

The annual golden galaxias (*Galaxias auratus*) survey was conducted during March 2018. This is the 13th consecutive year this action from the Lakes Sorell and Crescent Water Management Plan 2005 has been completed.

At lakes Sorell and Crescent, twelve fine-mesh fyke nets were set overnight at three locations within each lake. Sets consisted of four fyke nets at each location, with the number of golden galaxias captured per fyke net recorded. In addition, the fork lengths of 100 golden galaxias were recorded for each lake.

Table 7. Captures of golden galaxias in fyke nets, set at three locations in lakes Crescent and Sorell 2018.

Lake	Location	No. Fyke Nets	Number Captured
Crescent	Site 1 Agnew Creek Shore	4	504
	Site 2 Boathouse Shore	4	222
	Site 3 Lower Clyde Marsh	4	365
	<b>Total</b>	<b>12</b>	<b>1091</b>
Sorell	Site 1 East side of Island	4	327
	Site 2 Inside Grassy Point	4	706
	Site 3 Dogshead Point	4	143
	<b>Total</b>	<b>12</b>	<b>1176</b>

\* Denotes site impacted by wind.

The total catch of golden galaxias in Lake Crescent was 1091, with all sites producing good numbers of fish. At Lake Sorell, 1176 golden galaxias were captured, with the Grassy Point site capturing over half the total catch (Table 7).

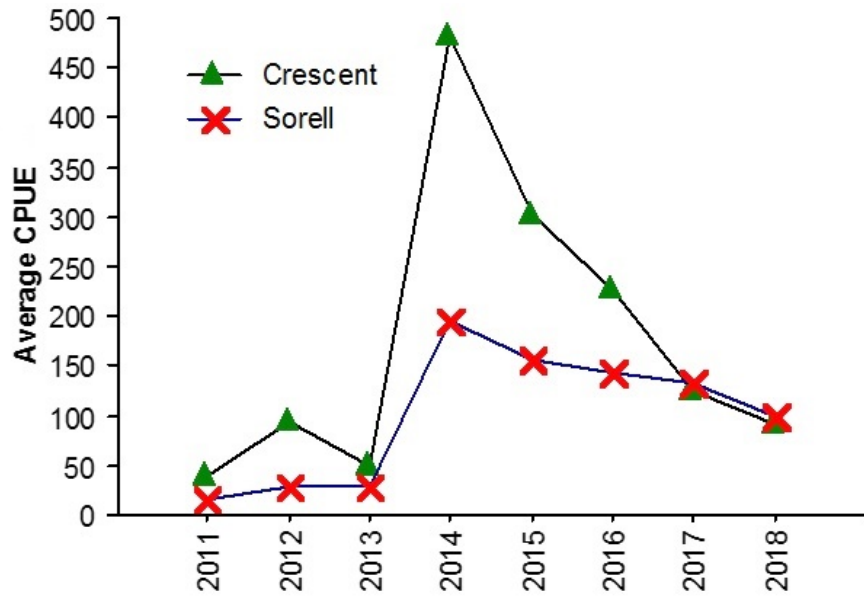


Figure 9. Average (mean) CPUE of golden galaxias for lakes Crescent and Sorell, 2011-2018.

The long term trend in CPUE for Lake Crescent shows a continuing decline in catch following an extreme high CPUE during 2014 (Figure 9). This trend most likely reflects the response of high recruitment during inundation of rocky and marshland areas that provided favorable spawning conditions and preferred juvenile habitat. The decline in CPUE at Lake Sorell was not as apparent and is within the bounds of normal variability (Figure 9). However, the CPUE for both lakes Crescent and Sorell remained above that for the period 2011-13.

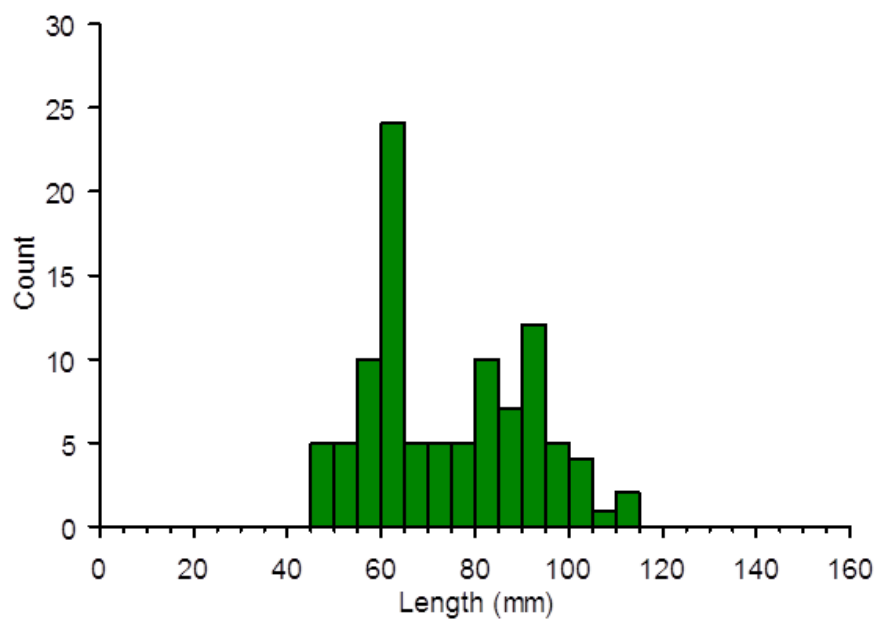


Figure 10. Length frequency of golden galaxias sampled from Lake Crescent 2018 (n=100).

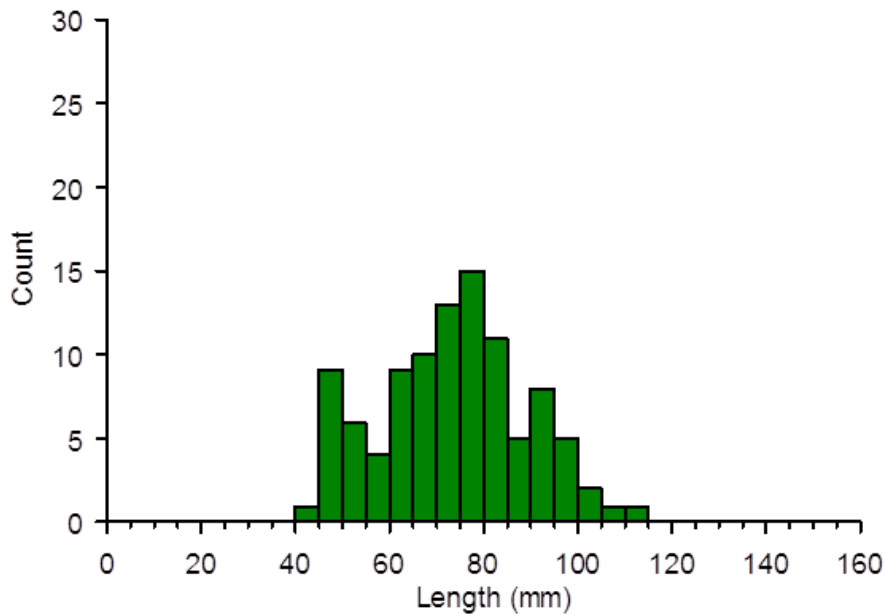


Figure 11. Length frequency of golden galaxias sampled from Lake Sorell 2018 (n=100).

Captures of young of the year (YOY) golden galaxias were significant in both lakes, with a strong cohort of juvenile fish in the 45 – 65 mm length range for Lake Crescent (Figure 10), and 40 – 60 mm for Lake Sorell (Figure 11). In contrast to the 2017 survey results, there appears to be good survival of longer (older) fish into the 3+ year class, particularly for Lake Sorell. Based on these results, the golden galaxias populations within lakes Crescent and Sorell presently remain healthy, with strong recruitment evident in the period 2014 – 2018. However, the continued decline in CPUE for Lake Crescent during 2015-18 needs scrutiny to ensure this population remains robust.



Picture 7. A large golden galaxias caught during the 2018 survey, displaying its striking markings.

# 6.

## Work Experience

The Inland Fisheries Service (IFS) receives regular requests from schools, universities, and interested graduates looking for work experience in freshwater fisheries. The CMP is especially sought after due to the overall diversity of work in the field. In some cases, students come from across the globe to get involved in the eradication of carp from Lake Sorell. Stanley Muloma, a university graduate from Kenya, was one such example. Stanley completed a Bachelor of Science majoring in Zoology and Chemistry at the University of Nairobi, Kenya. He was working as the Principal Fisheries Officer at the Ministry of Agriculture, Livestock, and Fisheries department, from 1997 till 2016, when he decided to come to Tasmania. He arrived in Tasmania in June 2016 to study a Masters degree in fisheries management at the Australian Maritime College, and to learn about the fisheries practices implemented in Tasmania and Australia. Although not a recreational fisherman himself, he was specifically interested in the way recreational fishing in Tasmania was managed. To fulfil the required 20 days of work experience, he chose the Inland Fisheries Service as it had similarities to his fisheries department in Kenya. He was based at the Lake Crescent Field Station for the period, working with the CMP. The activities he was involved in ranged from general boating activities, checking and setting of gillnets/fyke nets, using telemetry receivers to pin point the locations of radio transmitter carp, using the boat and backpack electro-fishers to survey the margins of the lake, to dissecting carp and staging the maturity of the gonads. Overall, he found that the time spent with the CMP allowed him to develop the social skills required to work in a small team for extended periods of time, as well as with people of a different cultural background to his own. He was also able to develop important skills in relation to boat operation and aquatic field work. On completion of his studies, Stanley hopes to either gain employment in a fisheries related department in Australia, or he will apply his new found knowledge and skills back to his old workplace in Kenya.

Table 8. Work Experience (2017/18)

Name	Background	Timeline
Bradley Williams	St Virgil's College	14th – 18th August
Dylan Loh	Hobart College	4th – 6th September
Alex Christian	Hobart College	4th – 6th September
Benjamin Fasnacht	Deakin University	4th – 6th September
Hugh McShane	St Virgil's College	18th – 22nd September
Adam Norris	Sheffield School	25th – 27th September
Brodie Marley	Guilford Young College	5th – 6th October
Alex Robins	Oatlands District High School	16th – 20th October
Jarrad Hunt	University of Tasmania	2nd – 4th October
Pedro De Castro	Institute for Marine and Antarctic Studies student	28th October
Lincoln Wong	Australian Maritime College	2nd – 3rd November
Stanley Muloma	Australian Maritime College	6th Nov – 1st December
Helen O'Neill	Bangor University, Wales	11th – 12th November
Farzana Noorzahan	Dhaka Univeristy, Bangladesh	23rd December
Shahriar Hossain	IUB Univerisy, Bangladesh	23rd December
Alex Gilmour	Elizabeth College	23rd – 25th January

# 7.

## Carp Workshop 2018

The CMP held its yearly workshop on the 10th of May in Hobart. It looked over the past year's work and started planning for the coming year. Alex Schaap, formerly the director of the Environment Protection Authority (EPA), provided an independent review of the workshop and helped develop the plan for the coming year. The new Minister responsible for Inland Fisheries, Sarah Courtney, came to the workshop and was given an update. The Minister offered her support for the work being done, and her words of encouragement were appreciated by the team. The day involved the presentation and discussion of different aspects of the data collected over the last financial year. This gave everyone an understanding of how the program was progressing, the findings for the season, what was done well, and what can be done to complete the eradication of carp from Tasmania.

Key findings from the workshop were:

- No carp were detected in Lake Crescent or downstream in the River Clyde.
- Carp are contained to Lake Sorell.
- No spawning or small carp were found in Lake Sorell.
- The amount of carp caught this year was less than a quarter of the total number of carp caught last year, despite maintaining a high level of fishing effort. This suggests the population has fallen greatly.
- Studies of the JGC show that it is now affecting over 50% of male carp caught.
- 41 452 carp have been removed from Lake Sorell since 1995.
- Less than 0.2% (<50 carp) of the original population remain.

The plan for the coming year:

- Be prepared for spawning conditions in spring 2018 (i.e. rising water levels combined with warm settled weather in spring). If the conditions are good carp will push inshore to marsh areas, which makes them easier to catch in nets and traps.
- If all goes to plan through the coming spring and summer, a limited opening of Lake Sorell to the public may be considered late in the trout season.



Picture 8. The 2018 Carp Management Program workshop, with Minister Sarah Courtney in attendance.



# 8.

## Water Yields and Deficits

Total rainfall of 736.4 mm was recorded at the Lake Crescent field station from 1st July 2017 to 30th June 2018.

Table 9. Rainfall and release data (2017/18)

Month	Rainfall (mm)	Sorell Release (ML)	Crescent Release (ML)
July	41.4	-	943.75
August	46	-	1520.81
September	49.8	-	5.07
October	57.8	-	231.51
November	48	-	978.90
December	151.4	-	579.76
January	27	-	1542.84
February	50.4	-	1213.34
March	60.2	-	825.59
April	22.2	-	996.36
May	129.4	-	330.93
June	52.8	-	0.96
<b>Total</b>	<b>736.4</b>	<b>-</b>	<b>9169.82</b>

\*Note: There is no continuous flow monitoring on the Lake Sorell release. Only spot checks are done.

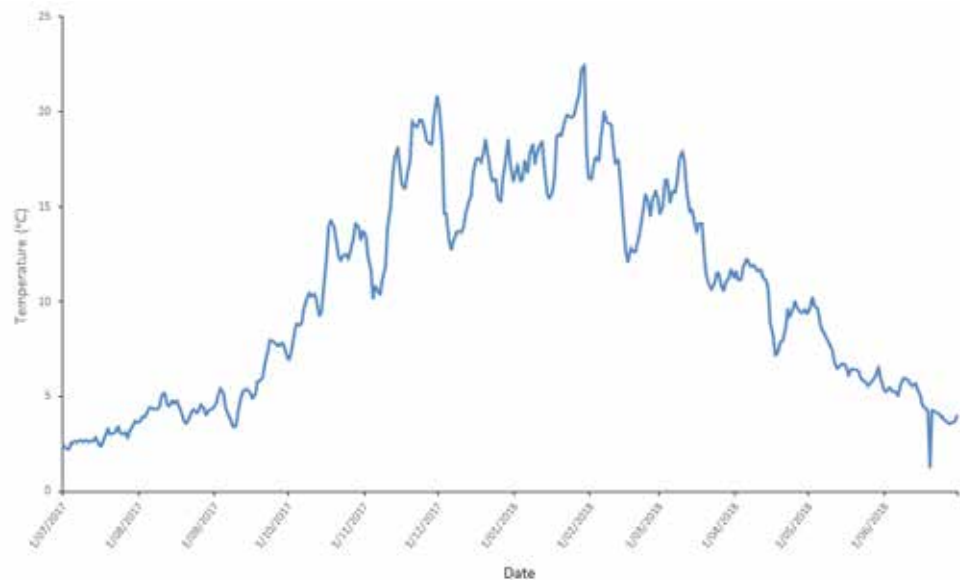


Figure 12. Lake Sorell water temperature from Diamond Shore shallow site (July 2017 – June 2018)

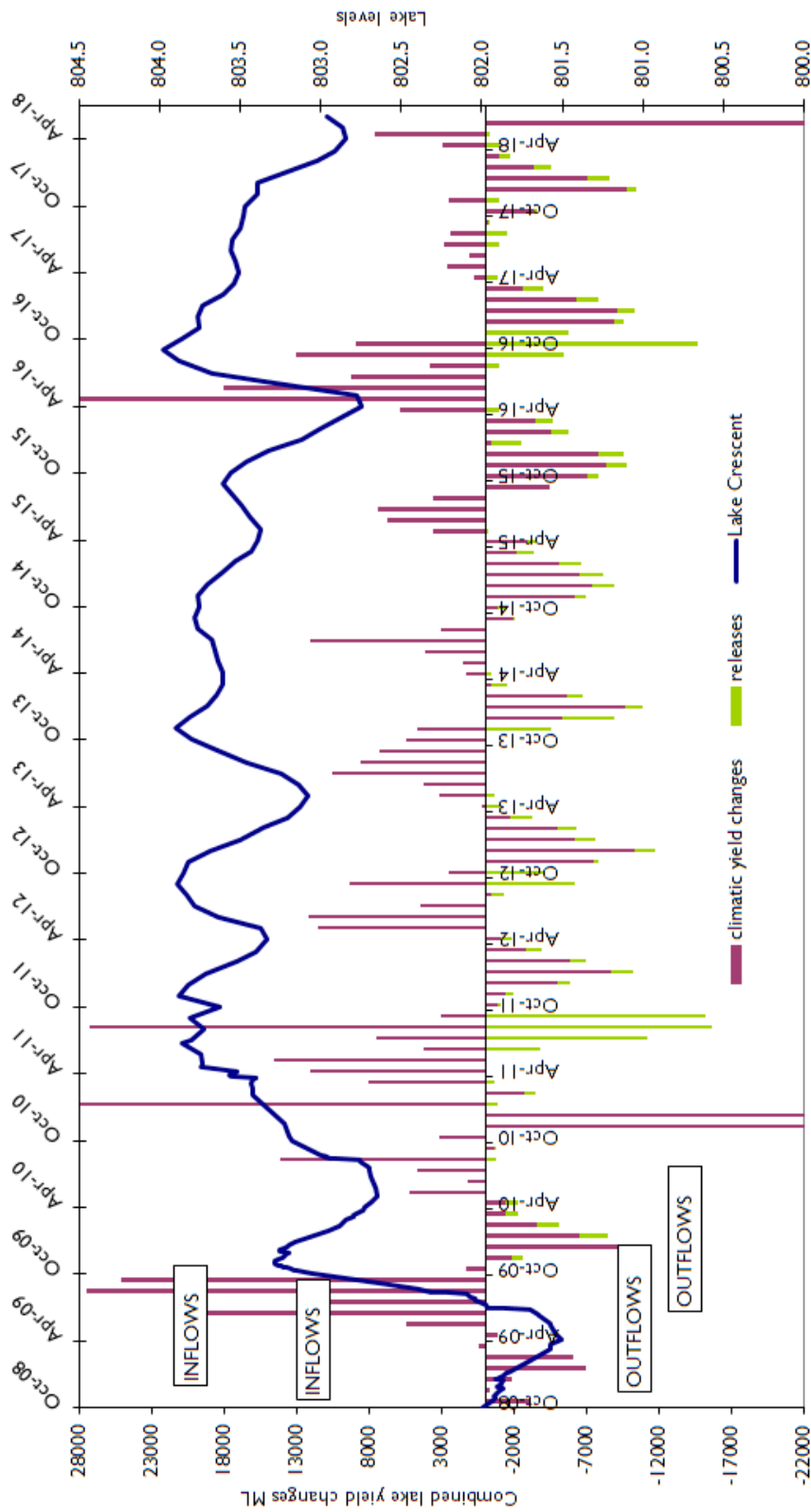


Figure 13. Lake Crescent lake levels, water yields and deficits (2008 – June 2018)

### 9.1 Staff Positions

In August, Storm Eastley and Chris Boon were both successful in their applications for six and twelve month Technical Officer contracts, respectively. In mid-July Chris Bowen resigned from his position of Technical Officer, while in late March Chris Boon resigned from his position of Technical Officer. In May, Storm Eastley was successful in his application for a twelve month Technical Officer contract. Five casual workers were employed to assist with the carp spawning season. The additional funding from the Federal Government finished this financial year.

Table 10. Staff positions (2017/18)

<b>Field Officers</b>	Robert Cordwell (0.9fte) Terry Byard (0.5fte)
<b>Technical Officers</b>	Brock Cuthbertson (1fte) Chris Bowen (1fte) Chris Boon (1fte) Storm Eastley (1fte)
<b>Program Leader</b>	Jonah Yick (1fte)
<b>Consulting Scientist</b>	Dr. Jawahar Patil
<b>Section Manager</b>	Chris Wisniewski (1fte)

Table 11. Casual positions (2017/18)

<b>Name</b>	<b>Background</b>	<b>Timeline</b>
Storm Eastley	Rosny College	14th – 16th August
Raihan Mahmud	Institute for Marine and Antarctic Studies PHD student	7th October – 24th February
Kim Clark	Interlaken Shack Owner	3rd November – 13th April
Josef Wisniewski	University of Melbourne student	11th December – 8th February
Jarrad Hunt	University of Tasmania	11th – 14th December

## 9.2 Staff Requirements as per Industrial Agreement

IFS staff are required to undertake weekend work and hours beyond general conditions of service as part of the industrial agreement. The following table outlines the work undertaken by CMP staff for the year:

*Table 12. Weekend work, public holidays and extra hours*

Staff Member	Saturdays	Sundays	Public Holidays	Extra Hours
Jonah Yick	8	8	0	128.55
Brock Cuthbertson	6	6	2	164.77
Chris Boon	4	4	1	94.66
Terry Byard	8	3	0	-
Robert Cordwell	5	6	1	113.6
Storm Eastley	8	7	5	170.25

### 10.1 Carp Sightings

- 3 November 2017 – Macquarie River – Tench
- 13 November 2017 – Farm dam, Longford – Goldfish
- 27 November 2017 – Meadowbank Dam – Tench
- 28 November 2017 – Meadowbank Dam – Tench
- 3 January 2018 – South Esk River – Goldfish
- 3 January 2018 – Tungatinah Lagoon – Tench
- 11 February 2018 – Meadowbank Dam – Tench
- 28 February 2018 – Government House – Goldfish
- 25 May 2018 – Brumbys Creek - Goldfish

### 10.2 Public Presentations

During the course of the year staff from the IFS gave presentations to the following organisations on the CMP:

Table 13. Public presentations

Date	Organisation
7th July 2017	New Norfolk Licensed Anglers Association
20th September 2017	Oatlands District High School Careers Workshop
19th – 20th May 2018	Liawenee Trout Weekend

### 10.3 Timeline of Major Events

Table 14. Timeline of major events 2017/18

Date	Event
<b>July</b>	
18th	Lake Crescent screens opened, and water release commenced.
31st	Begin to start checking barrier nets for holes and tears
<b>August</b>	
14th	Opened up Lake Sorell screens
17th	Closed Lake Sorell and Crescent screens.
<b>September</b>	
4th	Lake Crescent shack inventory and clean up
4th	Six new transmitter carp released into Lake Sorell
4th- 5th	Big fyke nets installed into barrier nets and opened up
12th	Permanent gill nets installed behind barrier nets around Lake Sorell
15th	New shipment of trammel nets arrive
26th	Wing nets set in Lake Sorell

Date	Event
<b>October</b>	
3rd	Install trash traps at the back of Silver Plains main drain
4th	Blocking gill nets installed in front of potential spawning areas
21st	Lake Crescent screens opened, and water release commenced.
21st – 22nd	Monthly Lake Sorell juvenile carp survey
<b>November</b>	
6th	Seven new transmitter carp released into Lake Sorell
12th	Lake Crescent field station site inspection
27th – 28th	Monthly Lake Sorell juvenile carp survey
<b>December</b>	
3rd	Big rain event (over 100ml in 24 hours)
3rd	Closed Lake Crescent screens due to rain event.
6th	Four carp caught in big fyke nets at Silver Plains. First sign of carp reacting to environmental cues for the season.
12th	Six wild carp caught, most carp caught in a day for the season. Most likely reacting to the recent rain event as well as the warm water temperatures (21.5°C).
17th	Lake Crescent screens opened, and water release commenced.
27th – 28th	Monthly Lake Sorell juvenile carp survey
<b>January</b>	
8th	Aggregation of four transmitter fish in Diamond Bay with no wild carp caught
26th	Largest carp caught for the season: 490mm, 2229gm, female
20th – 30th	Very warm weather event which maintained water temperatures from 19°C to 23°C.
29th – 30th	Monthly Lake Sorell juvenile carp survey
<b>February</b>	
2nd	All carp at Salmon Ponds assessed for gonad development
10th	Blocking gill nets removed from Lake Sorell
18th	Permanent gill nets behind barrier nets removed from Lake Sorell
12th- 24th	Big fyke nets removed from barrier nets
26th – 27th	Monthly Lake Sorell juvenile carp survey
<b>March</b>	
6th	Wing nets removed from Lake Sorell
5th – 9th	Annual Lake Sorell juvenile carp survey
15th	Annual Lake Crescent juvenile carp survey
19th – 21th	Lake Crescent and Sorell annual golden galaxias fyke net survey
21st	Clyde River downstream survey
26th	Closed Lake Crescent screens
<b>April</b>	
3rd	Lake Crescent screens opened, and water release commenced.
<b>May</b>	
10th	Carp workshop
12th	Closed Lake Crescent screens
19th – 20th	All carp at Salmon Ponds assessed

## 10.4 Media Articles

- 30th August 2017 - The Mercury- "Public notices: Lake Sorell Closure".
- 30th August 2017 - The Advocate- "Public notices: Lake Sorell Closure".
- 30th August 2017 - The Examiner- "Public notices: Lake Sorell Closure".
- August/September 2017 – Tasmanian Fishing and Boating News – "Carp Report 2017".
- 28th September 2017 – Inland Fisheries Service website, Latest News – "Carp in the gun".
- 28th September 2017 - DPIPWE Pod Latest News – "Carp numbers dwindling in Lake Sorell".
- 6th October 2017 – Inland Fisheries Service website, Latest News – "July to September Carp report".
- 6th October 2017 - The Examiner – "Lake Sorell carp numbers slashed".
- 7th October 2017 – The Advocate – "Lake Sorell carp progress".
- 7th October 2017 – The Examiner – "Carp removal nearly finished".
- 11th October 2017 – Inland Fisheries Service website, Latest News – "Carp Management Program Annual Report 2016-17".
- 11th October 2017 - The Derwent Valley Gazette – "Fishing".
- 12th October 2017 – Pestsmart Feral Flyer, invasive species in the news – "Lake Sorell carp numbers slashed".
- 21st October 2017 – The Mercury – "Trout draft plan goes public".
- October/November 2017 – Tasmanian Fishing and Boating News – "Carp in the gun".
- November 2017 – Victoria and Tasmania Fishing and Boating Monthly – "Anglers reducing carp".
- 3rd November 2017 – Inland Fisheries Service website, Latest News – "When is a carp not a carp?".
- 8th November 2017 - DPIPWE Pod Latest News – "Pay attention: your carp may be a tench".
- 10th November 2017 – Inland Fisheries Service website, Latest News – "Keeping the heat on carp".
- 16th November 2017 – The Examiner – "Brown Dun".
- December 2017 - Australian Society for Fish Biology Newsletter; Lateral lines – "State Reports: Tasmania, Inland Fisheries Service: Carp Management Program".
- December 2017- Australian Society for Fish Biology Newsletter; Lateral lines – "Committee Reports: Carp removal".
- 22nd December 2017 – Inland Fisheries Service website, Latest News – "Not so carpy Christmas".
- 4th January 2018 - DPIPWE Pod Latest News – "Carp control continues while anglers enjoy festive trout season".
- 4th January 2018 - The Mercury – "Fishing".
- 10th January 2018- The Examiner - "Carp cohort plummets".
- 9th February 2018 – Inland Fisheries Service website, Latest News – "October to December 2017 Carp Management Program Quarterly Report".
- 10th February 2018 - The Advocate – "Carp win close, IFS says".
- 22nd March 2018 – Inland Fisheries Service website, Latest News – "Lake Sorell juvenile carp survey is a success!".
- 23rd March 2018 – Inland Fisheries Service website, Latest News – "Lake Crescent remains carp free!".

27th March 2018 – Inland Fisheries Service website, Latest News – “River Clyde Carp Survey”.

27th March 2018 - The Advocate - “IFS closer to carp victory”.

28th March 2018 - The Derwent Valley Gazette – “Fishing”.

4th April 2018 – Inland Fisheries Service website, Latest News – “Government House carp sighting”.

4th April 2018 - The Derwent Valley Gazette – “Lake Crescent still carp free”.

5th April 2018 - The Examiner - “Brown dun”.

9th April 2018 – Inland Fisheries Service website, Latest News – “2018 Golden galaxias survey in Lakes Sorell and Crescent”.

19th April 2018 - The Examiner – “Carping On”.

May 2018 – Victoria and Tasmania Fishing and Boating Monthly – “Lake Crescent remains carp free!”.

9th May 2018 – Inland Fisheries Service website, Latest News – “January to March 2018 Carp Management Program Quarterly Report”.

12th May 2018 - The Examiner – “Carp numbers dwindling: IFS”.

28th May 2018 – Inland Fisheries Service website, Latest News – “Carp Management Program Workshop 2018”.

31st May 2018 - The Examiner- “Plans afoot for top trout spot reopening”.

June 2018 – Victoria and Tasmania Fishing and Boating Monthly – “Government house carp sighting”.

June 2018 - Australian Society for Fish Biology Newsletter; Lateral lines – “Member news: Tasmania Inland Fisheries Service: Carp Management Program Progress”.



Natural Account	Total Prds	Period 0	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12	Period 13
5101 - Salaries	333,967.61	0.00	20,946.05	18,933.93	22,833.15	26,219.64	41,963.38	27,973.24	28,437.88	26,140.72	29,925.74	25,010.88	37,819.58	27,763.42	0.00
5102 - Lump Sum Leave	38,058.68	0.00	9,833.85	2,561.17	5,448.24	1,419.67	2,608.85	2,051.67	4,038.73	4,194.28	1,127.85	42,133.63	5,607.74	0.00	0.00
5106 - Superannuation	50,030.15	0.00	3,988.79	301,365	3,693.80	3,657.25	5,839.82	3,803.46	4,225.74	3,796.30	4,381.44	3,964.91	5,265.24	4,399.75	0.00
5107 - Otime-Penalties	2,079.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,750.88	328.29	0.00	0.00	0.00
5109 - Allowances	36,279.43	0.00	2,310.66	2,047.72	2,421.00	1,746.78	3,973.39	2,590.89	2,617.42	2,825.47	5,532.42	2,694.53	4,219.43	3,299.72	0.00
5113 - Staff Recruit	275.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	275.00
5202 - Audit Fees	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5203 - Training	1,309.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	318.35	540.91	0.00	0.00	0.00	450.00	0.00
5207 - Equip Hire/Lease	17,027.06	0.00	1,675.81	978.69	978.69	1,894.38	1,443.74	1,436.53	1,436.53	1,436.53	1,436.54	1,436.54	1,436.54	1,436.54	0.00
5208 - Equipment Maint	1,739.70	0.00	54.55	0.00	287.75	0.00	484.45	0.00	504.17	408.78	0.00	0.00	0.00	0.00	0.00
5209 - General Ins	6,621.96	0.00	0.00	0.00	0.00	6,340.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	281.82	0.00
5212 - Printing/Pubs	985.45	0.00	0.00	0.00	0.00	300.00	585.45	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5213 - Library	56.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.60	0.00	0.00	0.00	0.00	0.00	0.00
5214 - Vehicle Fuel	10,058.36	(467.73)	57,108	503.09	559.73	464.09	660.79	927.68	712.68	2,097.07	1,136.30	524.08	449.06	1,152.76	767.68
5217 - Vehicle Maint	3,597.93	0.00	0.00	1,018.86	420.66	0.00	222.84	986.10	0.00	193.00	370.77	342.00	16.50	27.20	0.00
5218 - Phones & Fax	22.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.73	0.00
5219 - Postage/Freight	2,212.22	0.00	0.00	0.00	0.00	734.31	1,467.59	0.00	0.00	0.00	0.00	0.00	10.32	0.00	0.00
5220 - Comp Hardware	790.00	0.00	0.00	0.00	0.00	790.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5222 - Comp Software	0.00	(2,500.00)	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5223 - Network Costs	659.45	0.00	54.50	0.00	54.50	54.50	54.50	54.50	109.00	59.95	54.50	0.00	109.00	54.50	0.00
5224 - Office Req	28.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5228 - Mob Phones Rads	3,630.06	0.00	104.37	2,444.6	221.73	618.24	505.41	154.54	509.77	331.54	248.82	89.42	363.44	238.32	0.00
5229 - Equip Purchases	21,050.34	0.00	0.00	0.00	4,758.86	7,886.06	8,405.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5230 - Equipment Depn	6,833.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5231 - MV Depn	15,995.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5232 - Vessel Depn	9,323.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5234 - Op Supplies	5,460.86	0.00	58.18	1,624.0	555.19	2,093.49	92.95	249.29	735.83	1,212.68	564.74	0.00	437.38	298.73	0.00
5236 - Cont Services	10,931.51	(183.86)	455.22	923.35	0.00	106.99	958.34	1,828.62	3,231.53	753.55	1,506.97	693.22	657.58	0.00	0.00
5238 - OH & S	2,808.95	0.00	135.00	154.00	598.64	135.00	148.59	135.00	156.32	(328.64)	135.00	135.00	263.67	1,141.37	0.00
5240 - Meetings & Conf	1,740.32	0.00	0.00	44.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	242.18	1,454.14	0.00
5243 - Misc Expenditur	45.52	0.00	0.00	0.00	0.00	0.00	0.00	15.00	3.64	0.00	26.88	0.00	0.00	0.00	0.00
5246 - Prop Maint	425.86	0.00	0.00	0.00	0.00	320.00	105.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5253 - Vessel Maint	12,422.64	0.00	572.43	242.65	462.83	760.98	1,406.75	2,103.74	1,303.67	1,898.89	2,346.99	286.46	196.28	719.58	121.39
5255 - Intrastate Trav	19,457.44	0.00	542.05	874.70	1,971.55	2,594.35	2,493.20	3,041.05	3,674.25	1,757.55	2,106.30	318.30	0.00	(329.86)	414.00
5258 - Prot Clothing	2,048.24	0.00	0.00	829.10	23.64	267.20	307.25	0.00	133.96	208.04	85.00	194.05	0.00	0.00	0.00
5267 - Vessel Outboard	9,044.47	0.00	94.05	503.26	0.00	309.00	4,192.07	0.00	1,531.21	1,004.79	0.00	509.00	90.09	0.00	0.00
5269 - Office Printing	94.26	0.00	0.00	2.99	0.00	0.00	36.75	54.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5270 - WDV Disp Assets	2,246.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,246.44	0.00	0.00	0.00	0.00	0.00
5280 - Signage	55.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00	0.00	0.00
State contribution	(400,000.00)														
4204 - Other Int Grnts	(158,369.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(158,369.00)	0.00	0.00	0.00
4303 - Other Ext Grnts	(5,000.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(5,000.00)	0.00	0.00
I/S Contribution	67,044.8														
<b>Total expenditure</b>	<b>630,413.80</b>	<b>(3,151.59)</b>	<b>43,896.59</b>	<b>33,038.02</b>	<b>45,289.96</b>	<b>58,712.07</b>	<b>77,957.39</b>	<b>48,505.83</b>	<b>53,737.28</b>	<b>50,032.80</b>	<b>52,737.14</b>	<b>40,740.31</b>	<b>53,031.96</b>	<b>74,307.97</b>	<b>1,578.07</b>

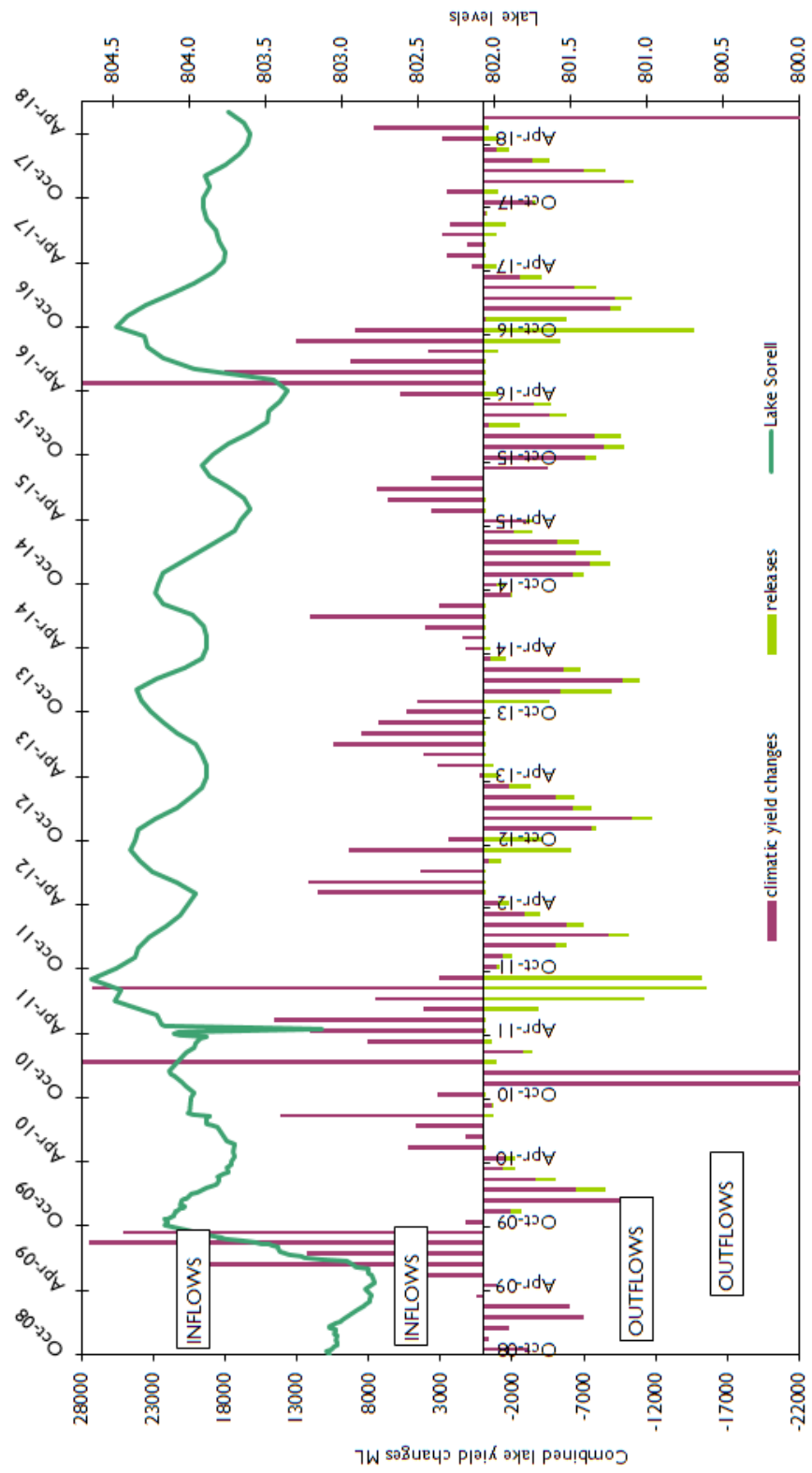


Figure 14. Lake Sorell lake levels, water yields and deficits (2008 – June 2018)





Tasmanian  
Government

CONTACT DETAILS

17 Back River Road

New Norfolk, 7140

Ph: 1300 INFISH

[www.ifs.tas.gov.au](http://www.ifs.tas.gov.au)