

Inland Fisheries Service Carp Management Program

Quarterly Report



October to December 2016



Australian Government

Inland Fisheries Service



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This quarterly report details the Carp Management Program activities from October to December 2016.

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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Carp captures at a glance

Lake Sorell

October – December 2016 (Total)	Adult/Juvenile	Total 1995 to present
289	289 / 0	41,202

Lake Crescent

October – December 2016 (Total)	Adult/Juvenile	Total 1995 to present
0	0 / 0	7797

Overview

Lake Sorell

Fishing effort this quarter resulted in the removal of 289 carp from Lake Sorell. This is in comparison to the 480 carp removed between October and December in 2015. This reduction in captures was expected given the small size of the remaining population, however the strategy implemented in the removal of these fish altered significantly compared to last season. This is due to a change in environmental conditions as well as a maturing carp population. Rapidly rising water levels causing inundation of marshes, in conjunction with the increasing temperatures over the spring months resulted in the carp population displaying a strong drive to push in shore. The detection of this behavior resulted in the vast majority of fishing effort being shifted from deeper water, into the shallow margins around the lake. In addition to gillnets, a wide range of fishing methods were utilized over this quarter (Figure 1, Table 1). These included small fyke nets, big fyke nets stitched into barrier nets, double fyke nets, box traps, the boat electro-shocker, and backpack electro-shockers. All these techniques combined select for both adult, and any potential juvenile carp (which are not susceptible to gillnet capture). No juvenile carp were detected from these fishing methods, with sampling conducted across a wide area of the lake.

Table 1. Catch data from all methods used in Lake Sorell over the October-December 2016 quarter.

Gear Type	October	November	December	Total
Non-Targeted Gillnets	12	42	28	82
Inshore Set Gillnets*	4	24	18	46
Barrier Fyke Nets	29	26	58	113
In-Lake Fyke Nets [†]	0	1	2	3
Backpack Electro-shocker	0	1	4	5
Boat Electro-shocker	0	2	1	3
Gillnets Behind Marsh	1	3	33	37
Total	46	99	144	289

*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.

[†]In-lake fyke nets include small fyke nets, double fyke nets, and box traps.

A total of 10km of gillnet was strategically set behind the barrier nets as a precautionary measure to prevent carp from entering spawning habitats, as well as partitioning the marshes into manageable sections. This was more than double the amount of gill net set behind the marshes in previous seasons. This allowed staff to pin point the location of any potential breaches, and to allow thorough electrofishing effort to be undertaken in each section in order to remove any detected carp. Gillnets were also set across and within key drainage areas in the marshes. Trammel gillnets recently purchased due to their ability to capture various size classes of carp, played a key role in removing fish from these inshore areas.

Intensive fishing effort in inshore regions in conjunction with high water temperatures resulted in high catch rates, peaking on the 26th of December where 41 carp were caught in a single day. This capture included 24 carp across three fyke nets stitched into barrier net at Silver Plains marsh. Prior to this event, the average catch rate of carp was approximately three fish per day. After this date catch rates within the inshore regions returned to the monthly average despite warm weather and rain events continuing for the remainder of the month. This suggests that carp numbers are at a level where catch rates cannot be sustained despite optimal conditions.



Picture 1. A haul of carp caught from a fyke net stitched into a barrier net. These fish were responding to environmental cues, driving them to push into the fyke net as they attempted to access the marsh behind the barrier net.

A large proportion (39.1%) of carp were captured in fyke nets in strategic locations throughout the marsh areas (Figure 1). This behavior represents the first major push into inshore regions from this cohort and has not been observed to this extent for many years in Lake Sorell. The biggest fish caught from the fyke nets was a 1.9kg female carp, which was also the second biggest fish caught to date this season. For the same period during the 2015/16 season, 82.5% of carp were captured in gillnets in deep water, compared to only 28.4% this season (Figure 1). The remaining carp were caught primarily in inshore set gillnets (nets set to block marsh areas and in close proximity to the shoreline), and gillnets set behind the barrier net (to capture carp which have breached the barrier net).

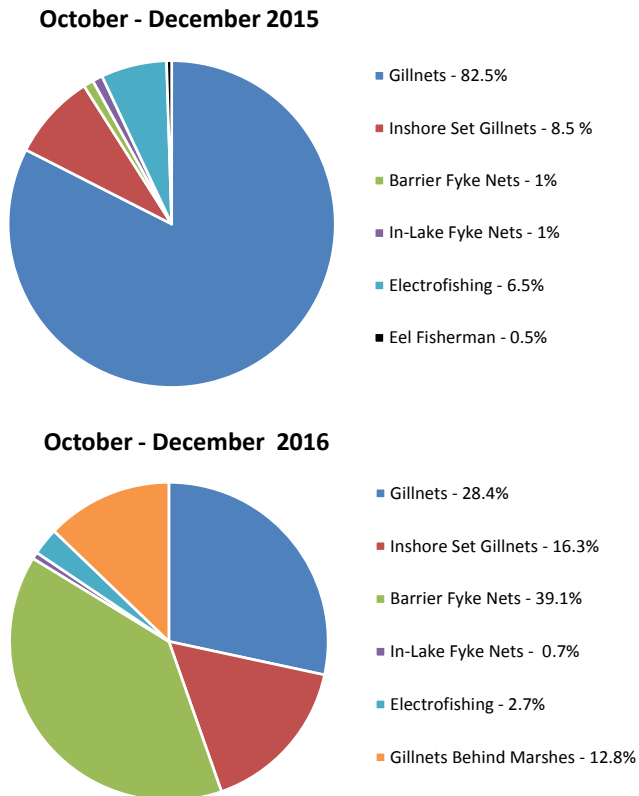


Figure 1. Percentage of total carp captures from all gear types used in Lake Sorell during the October-December quarter in both 2015 and 2016.

In total, 40 fish were removed from high-risk zones behind the barrier nets using a combination of gillnet and electrofishing effort. However no evidence of spawning was observed, with all captured female carp possessing gonads that were neither hydrated nor 'spent'. This suggests that these fish were removed before they had the opportunity to settle in the marsh habitats to aggregate and spawn. In response to the capture of fish behind the barrier nets, juvenile recruitment surveys commenced in December and will continue each month through till March. This is in contrast to previous years where recruitment surveys occurred only once a year in March. These monthly surveys maximize detection of potential spawning events, enabling prompt implementation of control measures, resulting in increased capture efficiency of juvenile fish. The recruitment survey undertaken in December was conducted over three days and returned no evidence of spawning. The surveys involved intensive backpack-electrofishing effort throughout the high risk marsh regions; Kermodes, Silver Plains, and Robertsons. Using multiple backpack electro-shockers and fine-mesh dip nets, the areas were thoroughly surveyed

from the marsh fringe through to the back of the lake shore. Despite 30 hours of electrofishing effort for each survey, no juvenile carp were observed. However, a healthy population of golden galaxias, shortfin eels, tadpoles, and aquatic invertebrates were present.



Picture 2. The 1.9kg female carp caught in a barrier fyke net in late December.

Despite the increase in inshore fishing effort this quarter, non-targeted netting effort within the deeper areas of the lake was maintained at 90% of the level applied during the same period in 2015/16 (Table 2). However, the catch rates of this method only reached 25% of those achieved last spring. This continues the trend of dramatically declining catch rates as the 2009 cohort is further depleted (Table 2, Figure 2). Catch from non-targeted gillnets is standardized to carp per 100 m net hour, in order to make meaningful comparisons between different nets and months and years. With this information, adjustments in gear use are made to ensure and maintain a high level of fishing efficiency. Non-targeted gillnetting effort this season again occurred over a wide area of the lake, with regions of structure and habitat continuing to be a priority. Not only does this allow for the discovery of new carp “hot spots”, but it also served to ensure there were no “cryptic” populations of carp residing in less targeted areas of the lake.

Table 2. Non-targeted carp captures, gillnet fishing effort, and catch per unit effort (carp per 100m net hour) in Lake Sorell during the October-December quarter for the 2015/16 and 2016/17 seasons.

Season	Non-Targeted Carp Captures*		100m Net Hours		Catch Per Unit Effort	
	2015/16	2016/17	2015/16	2016/17	2015/16	2016/17
October	128	12	12 701	24 010	0.010078	0.000499
November	136	39	29 586	27 097	0.004597	0.001439
December	100	30	46 176	28 412	0.002166	0.001056
Total	364	81	88 462	79 519	0.004115	0.001019

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

Catch per unit effort (CPUE) of non-targeted gillnets peaked in November (Figure 2), which is likely to be due to the increase in movement of carp as the water temperature rose steadily. This peak in catch rates coincided with an increase in movement of transmitter fish. Routine tracking revealed that transmitter fish moved great distances throughout the lake, often traveling many kilometers overnight. Despite this activity, no aggregations were observed. This is in contrast to two aggregations occurring in the 2015/16 season. This further suggests that the population is now at a critically low level, with very few fish per square kilometre.

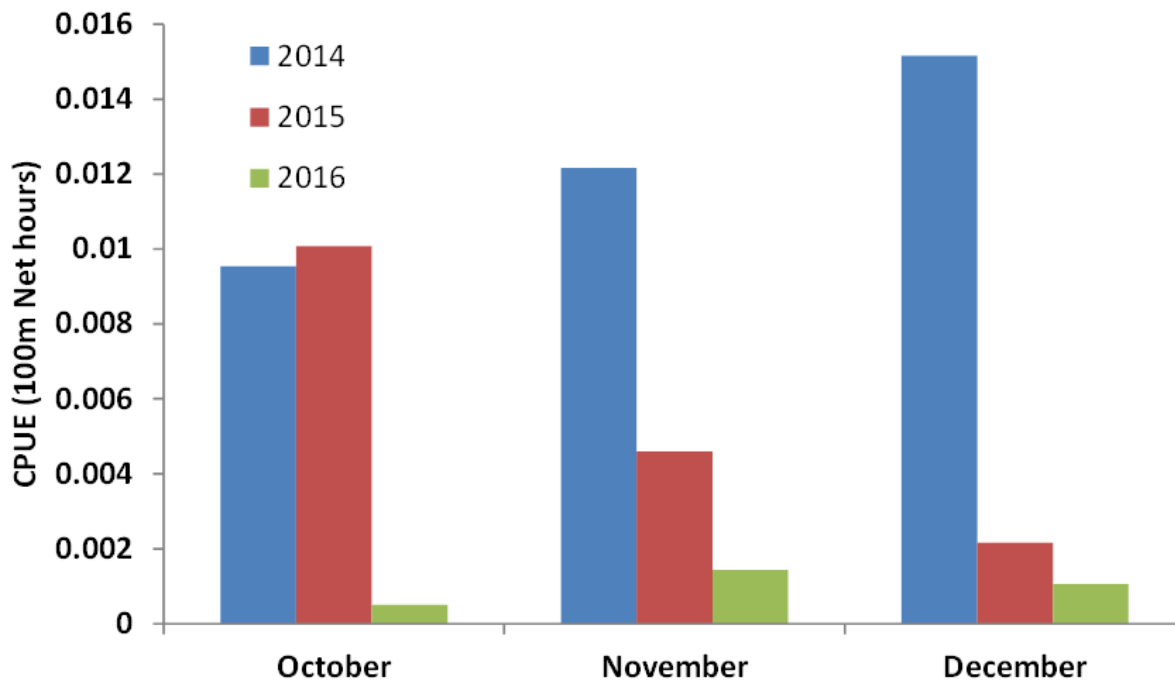


Figure 2. Catch per unit effort of non-targeted gillnet sets in Lake Sorell during the October-December quarter in 2014, 2015, and 2016.

Despite the absence of aggregations the targeting of transmitter fish was still an important strategy, with several significant carp captures occurring as a result. Of note was the capture of a 2.93 kg female carp from a trammel net, which was set around a transmitter fish detected on a shallow, rocky shore on the southern end of St. Georges Island. The transmitter fish, as well as another carp was also caught in this set. This fish contained 460 grams of eggs (with a GSI of 16%), and was the biggest carp removed from Lake Sorell over the past 6 years. The removal of such individuals is of particular importance due to their advanced gonad size and spawning potential.

Catch data revealed that the sex ratio of carp captured this quarter was 1.2 : 1 in favor of males, similar to previous seasons. Of significant note was a further increase in the ratio of carp with jelly gonad syndrome (JGS). This altered from 1 “affected” carp caught for every 4 healthy male fish in the first half of the 2015/16 season, shifting to 1 “affected” carp for each 2.8 healthy male carp during the second half. The ratio this quarter was 1 : 2.4. This increased occurrence of male carp affected by JGS further supports the hypothesis that the remaining numbers of carp are low, and the remnants of the population with the slowest development are currently being fished out.



Picture 3. A carp entangled in a gillnet set in the warm shallows amongst the strap weed.

In summary, this quarter required a dramatically different fishing strategy when compared to the strategy used during the 2015/16 season. A rising lake level and inundated marshes resulted in a strong drive from the carp population to push into the high-risk marsh areas. Intensive effort within these zones resulted in the removal of a large proportion of the estimated remaining population. Spawning prevention was additionally made a high priority, focusing on preventing and removing any fish that breached the barrier nets and entered the marshes. The January fishing strategy will continue to alter in response to changing environmental conditions. The water level in Lake Sorell is expected to continue to drop, and the marsh areas will begin to de-water. It is expected that the focus of fishing effort will shift to deeper water as the carp push back out to the middle sections of the lake, and their movement slows down during winter. The spawning risk will decrease dramatically due to the loss of spawning habitat and the reduction of important environmental cues such as rain events, rising water levels, and rising temperatures.

Lake Crescent

Lake Crescent's water quality is continuing to show signs of improvement (Figure 3). Since the extremely low water levels in 2008, the average total turbidity of Lake Crescent has decreased considerably. This is the direct result of high water levels flushing the lake after large rainfall events. The capture of a lone female carp in an aggregation with a number of transmitter fish in December 2007 proved to be significant, with no other carp caught since this event. Despite extensive fishing effort and monitoring over the past nine years there has been no evidence of recruitment or the presence of any carp. Timely rains over the winter period have returned the lake to full supply level, allowing the extensive marshlands to fully recover.



Picture 4. The striking markings of the golden galaxias are hard to appreciate in the turbid waters of Lake Crescent.

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. Travis Harris, a first year student from the Australian Maritime College spent a week with the CMP in November, gaining field experience at Lake Sorell. This work experience was required to complete a unit in an Associate degree in Aquaculture. Travis is an avid trout fisherman which is naturally what led him to contact the IFS. While working with the CMP at Lake Sorell, Travis was involved in a range of activities including general boating activities, operation of a hydraulic net reel, checking and setting of gillnets, checking fyke nets, using telemetry receivers to pinpoint the locations of the radio transmitter carp, and using the boat electro-shocker to survey the margins of the lake. Overall, he found the week spent with the CMP gave him a good insight into the practical side of fisheries operations, which he had not yet experienced since enrolling in his degree. On completion of his studies, Travis hopes to gain employment either in the aquaculture industry (Salmon Farms), or at a fisheries department. His experience at the IFS assisted in confirming that this was definitely the career he wanted to pursue, and he was excited for what the future had in store after graduating!



Picture 5. Travis Harris checking small fyke nets set around the margins of the lake.

Employment and funding

In early November Chris Boon was successful in his application for a 6 month Technical Officer position. Seven casual workers were employed to assist with the onset of the carp spawning season and the repair of gillnets.

Table 3. Volunteer positions (October – December 2016)

Name	Background	Timeline
Jared Flakemore	St James Catholic College	31 st Oct – 4 th Nov
Alex Schaap	Former Director of the Environment Protection Authority	2 nd Nov – 7 th Dec
Aaron McAndrew	Australian Maritime College student	7 th – 9 th Nov
Travis Harris	Australian Maritime College student	14 th – 18 th Nov

Table 4. Casual positions (October – December 2016)

Name	Background	Timeline
Storm Eastley	Rosny College	22 nd August – 21 st September
Chris Boon	Australian Maritime College	19 th – 21 st September
Raihan Mahmud	Institute for Marine and Antarctic Studies PHD student	7 th October – 20 th December
Ben Grossmith	Australian Maritime College	7 th – 11 th October
Helen O'Neill	Bangor University, Wales	24 th October – 31 st December
Kim Clark	Interlaken Shack Owner	25 th November – 23 rd December
Will Ertler	Don College	5 th – 23 rd December

Water Management

Table 5. Water Release data (October – December 2016)

Month	Lake Sorell release (ML)	Lake Crescent release (ML)
October	-	14683.41
November	-	5684.21
December	-	727.90
TOTAL	-	21095.52

* Note: There is no continuous flow monitoring on the Lake Sorell release, only spot checks are done. However release from Lake Sorell into Lake Crescent commenced in late June, but the total release volume was not determined.

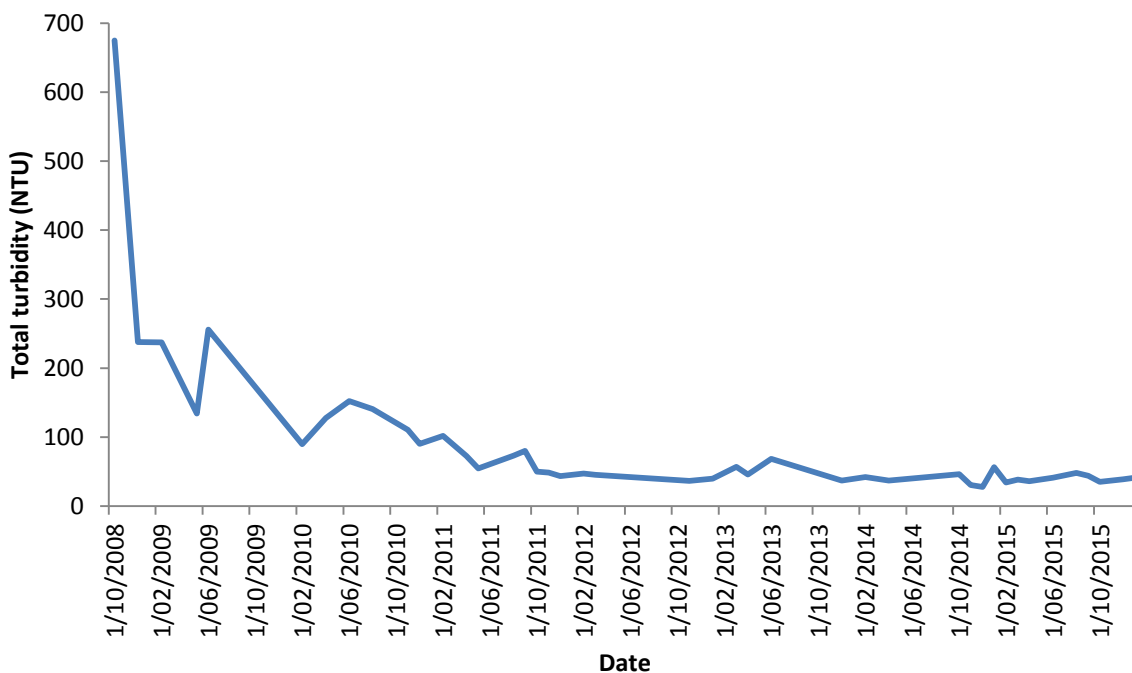


Figure 3. Turbidity levels in Lake Crescent from October 2008 to December 2016

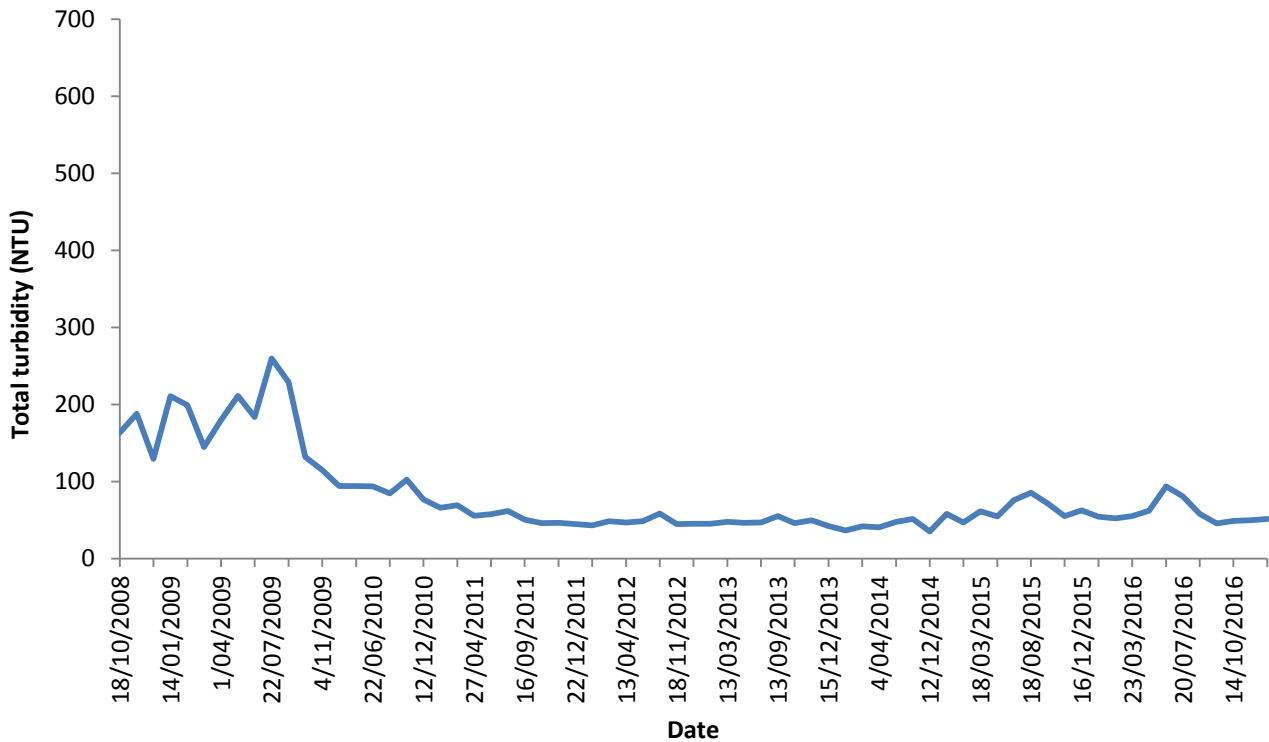
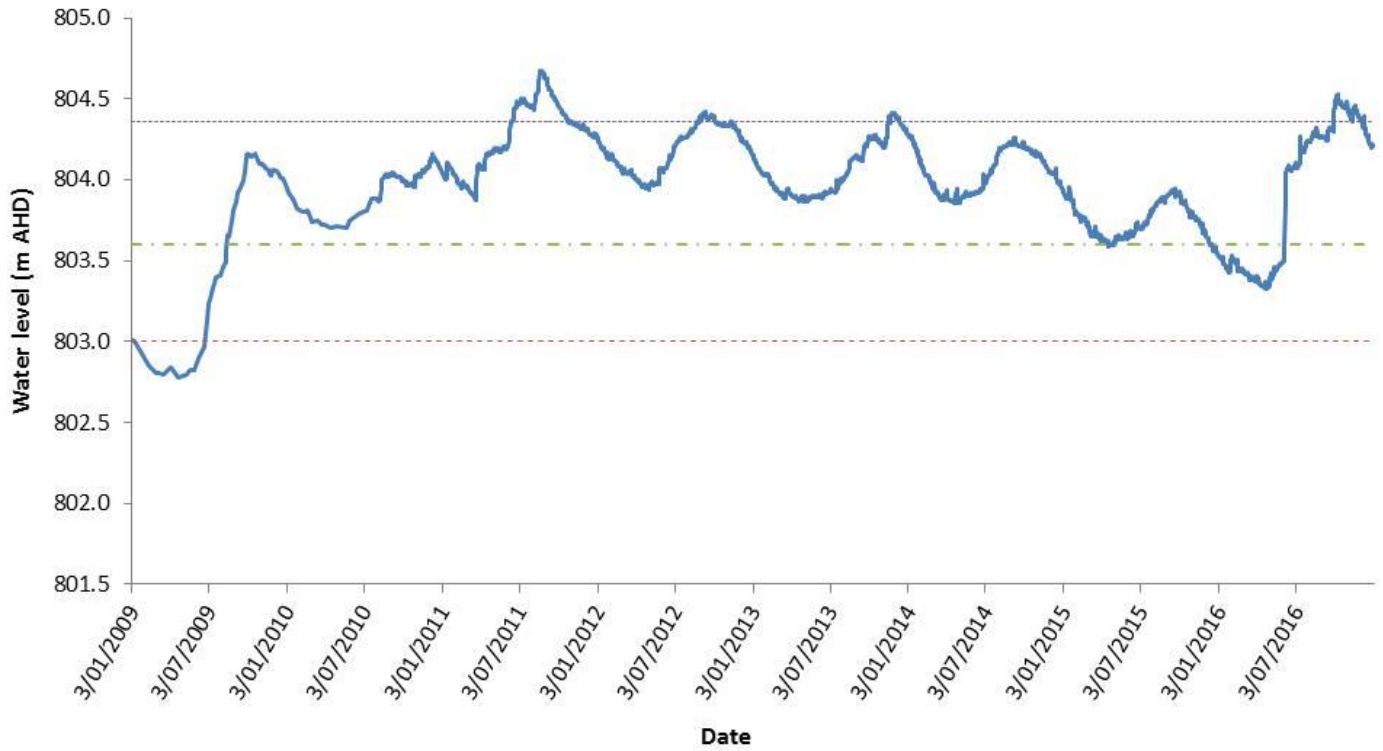


Figure 4. Turbidity levels in Lake Sorell from October 2008 to December 2016

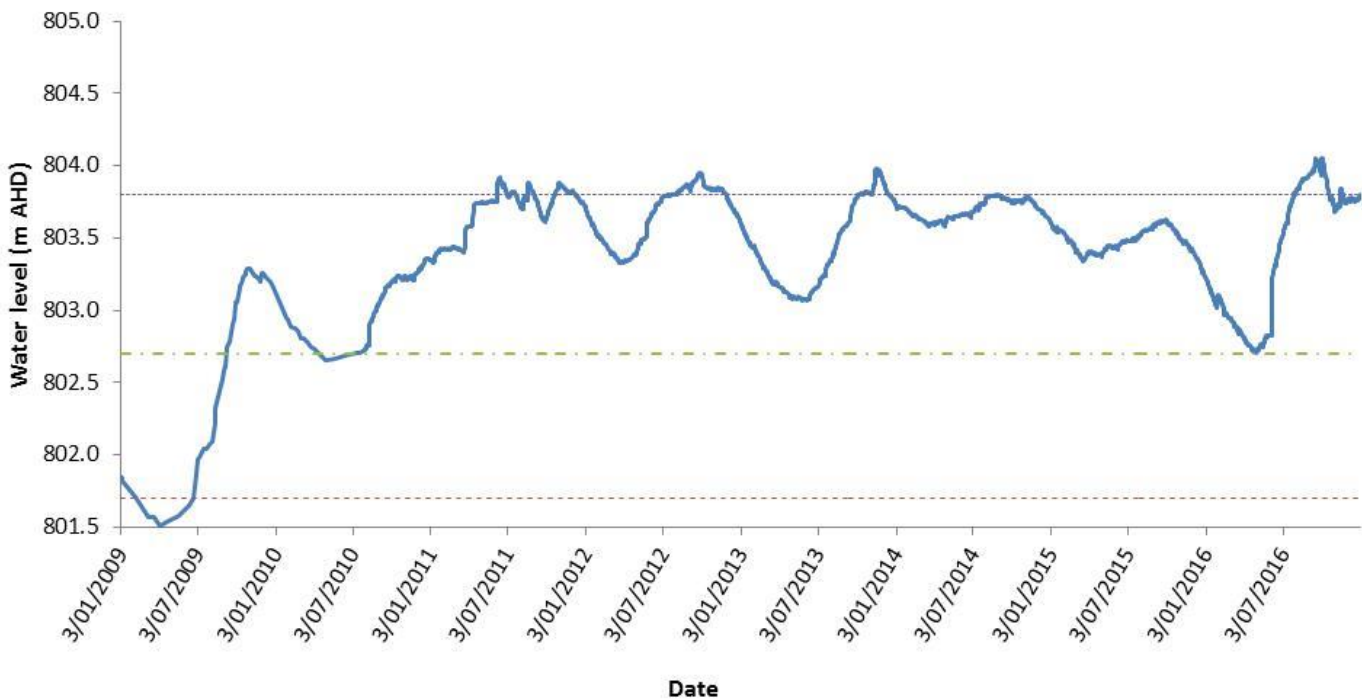


Picture 6. Electrofishing the Silver Plains marshes in Lake Sorell. High lake levels have resulted in extensive marshlands which has heightened the risk of spawning.

Lake Sorell



Lake Crescent



— Water level (m AHD) - - - - Sill - - - - Wetlands - - - - Full supply