Inland Fisheries Service

Fisheries Performance Assessment Technical Report

Lake Crescent March 2024

Inland Fisheries Service

Lake Crescent FPA

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Introduction

Lake Crescent is the most significant ‘trophy’ brown trout water within Tasmania, with fish ranging between 2-5 kg. The fishery is managed under the Tasmanian Inland Recreational Fishery Management Plan 2018-2028 (TIRFMP), as an ‘exception to an assisted fishery’ with the fishing season managed for brown trout. Fishing methods are restricted to artificial lures only. A daily bag limit of 2 fish exists, with a minimum size limit of 400 mm and only one fish over 500 mm permitted. Fishery management criteria are defined within the TIRMP and are listed in appendix D. Monitoring of the fishery is done under the TIRFMP to gather information about the fishery, so management can be adjusted to meet the criteria for the fishery.

European carp *(Cyprinus carpio*) were found in Lake Crescent during 1995. An intensive carp management program was initiated to prevent the spread of the species within the State and to eradicate carp from both lakes Crescent and Sorell. The last carp captured from Lake Crescent was in 2007 and the lake was declared carp free in 2009. Carp management actions have also be undertaken at Lake Sorell, with carp declared ‘functionally’ eradicated late 2023. Since this time, the carp containment screens and the Kermodes levee bank connecting both lakes have been removed, with fish now able to disperse between both waters.

Lake Crescent supplies water for irrigation, stock and domestic, and town supply in the River Clyde catchment. The water resource is managed under the lakes Sorell and Crescent Water Management Plan 2005. Lake Crescent has significant wetlands including the Interlaken Lakeside Reserve that is listed under the RAMSAR convention. Lakes Sorell and Crescent support a diverse range of flora and fauna with rare or threatened species, including the endemic native fish the golden galaxias *(Galaxias auratus)* that is listed as threatened under Commonwealth and State legislation. The wetlands are an important refuge for several conservation listed migratory birds that use these areas during droughts.

The Lake Crescent fishery was surveyed during 4 - 6 March 2024. The survey methods and results are discussed below, including a comparison with the 2021 fishery survey. The methods and locations utilised for both surveys were essentially the same, however, the timing was different, with the 2021 survey conducted early winter while the 2024 survey was done during autumn. The difference in timing meant water temperatures were vastly different (2024 16 C & 2021 6 C). Consequently, this differential influenced comparative catches.

The last stocking occurred in 2021, with 503 trout released. All were tagged to allow for a capture-mark-recapture population estimate. No brown trout have been stocked

since this time. However, the removal of the carp containment screens during December 2023 has allowed free movement of fish between lakes Sorell and Crescent.

FPA Survey Methodology

In-Lake Population Surveys

During 4 – 6 March 2024, 40 box traps were set each night over two nights (total of 80 box trap sets) (see appendix F). Soak times were between 20–24 hours. All trout captured were recorded as male, female or immature and were weighed and measured (fork length). Fish were released away from the trap site after processing (without being re-marked). Past survey data at other waters indicated recapture rates are very low and unlikely to significantly influence the results.

Annual Postal Survey

Since 1986, the Inland Fisheries Service (IFS) has conducted a postal survey seeking information about anglers' catches. The survey comprises a form sent to around 4,000 anglers of all licence categories asking set questions about their angling (catch of trout) for the past season. Information on catch per day, harvest and angling effort is collated and analysed. This provides a long-term overview of individual fishery performance in addition to characterising fishing effort. In this report, only records post 2003 are analysed as Lake Crescent was not open to fishing during the period 1995 – 2003 due to carp eradication efforts.

Stocking Database

The IFS keeps electronic records of fish stocking within public waters dating back to 1980. These records set out information on location, date of stocking, species, age, origin, stock type and genotype, in addition to length/weight data and comments e.g. denoting tagged fish. This information provides an historical record of supplementary recruitment into individual waters. In this report, only records post 2013 are analysed.

Angler Creel Data

Each season IFS officers collect fishing effort information from anglers interviewed at a range of waters. This information is entered directly into a dedicated 'Angler Creel' data collection App. Information on location, date, species, number of fish caught and method etc. are entered and stored in an electronic database. This information is

used to examine the catch of trout at individual waters. Once analysed, the summary information is reported as the number of fish caught per day, irrespective if an angler had fished for three or more hours or was continuing to fish. All fish, irrespective of being kept or released were used, including zero catches. In this report, only records from anglers that fished for three or more hours were examined. Additionally, for the purpose of calculating the number of fish captured per day, a days fishing is deemed to be equal to six hours.

Results

In-Lake Population Survey – Brown Trout

During 4 – 6 March 2024, the Service conducted an in-lake survey at Lake Crescent to examine:

- CPUE for brown and rainbow trout
- the length, weight and condition of brown and rainbow trout,
- assess the population structure of brown trout,
- assess the prevalence and growth of tagged brown trout released in 2021, and
- compare the 2021 and 2024 survey results.

CPUE

A total of 31 brown trout were captured from 80 box trap sets, consisting of 40 traps set over two nights, with soak times between 20–24 hours. This resulted in a catch per unit effort (CPUE) of 0.4 brown trout per trap. This is a significant decline (93%) from the 5.6 per trap during the 2021 survey.

Weight and Length Information (resident brown trout)

Thirty brown trout (from the 31 captured) were weighed, measured and sex determined. None of the 500 adult brown trout tagged during the 2021 transfer were captured. This is despite anglers reporting captures of tagged brown trout until February 2024.

The processed catch consisted of 10 females, 18 males and two indeterminate fish. The mean weight was 2,392 g and length of 550 mm (Table 1). This was a

substantial increase compared to the mean weight of 1,675 g and length of 535 mm from the 2021 survey. The mean condition factor was 1.30 that was a significant increase compared to the 2021 result of 1.09. On average, male and female fish where similar in weight, length and condition factor.

Table 1: Length, weight and condition factor for resident brown trout separated by sex, 2024.

Grouping	Measurement	Mean 2024	Minimum 2024	Maximum 2024
All brown trout (n= 30)	Length (mm)	550	259	686
	Weight (g)	2,392	200	3,950
	Cond Factor (k)	1.30	1.12	1.48
Male (n= 18)	Length (mm)	570	396	686
	Weight (g)	2,529	830	3,950
	Cond Factor (k)	1.30	1.19	1.47
Female (n= 10)	Length (mm)	573	471	656
	Weight (g)	2,580	1,300	3,900
	Cond Factor (k)	1.31	1.14	1.48
Indeterminate (n=2)	Length (mm)	260	259	261
	Weight (g)	215	200	230
	Cond Factor (k)	1.22	1.12	1.32

The length/weight plot (see Figure 1) shows the range of lengths of brown trout were similar for both 2021 and 2024 surveys. However, the corresponding weight of fish in the 2024 survey was significantly higher, indicating higher grow rates.

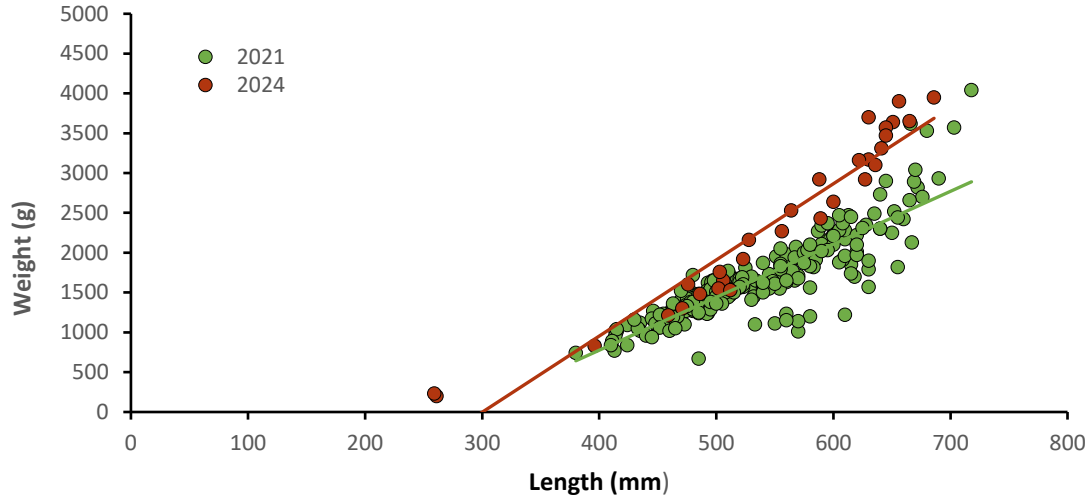
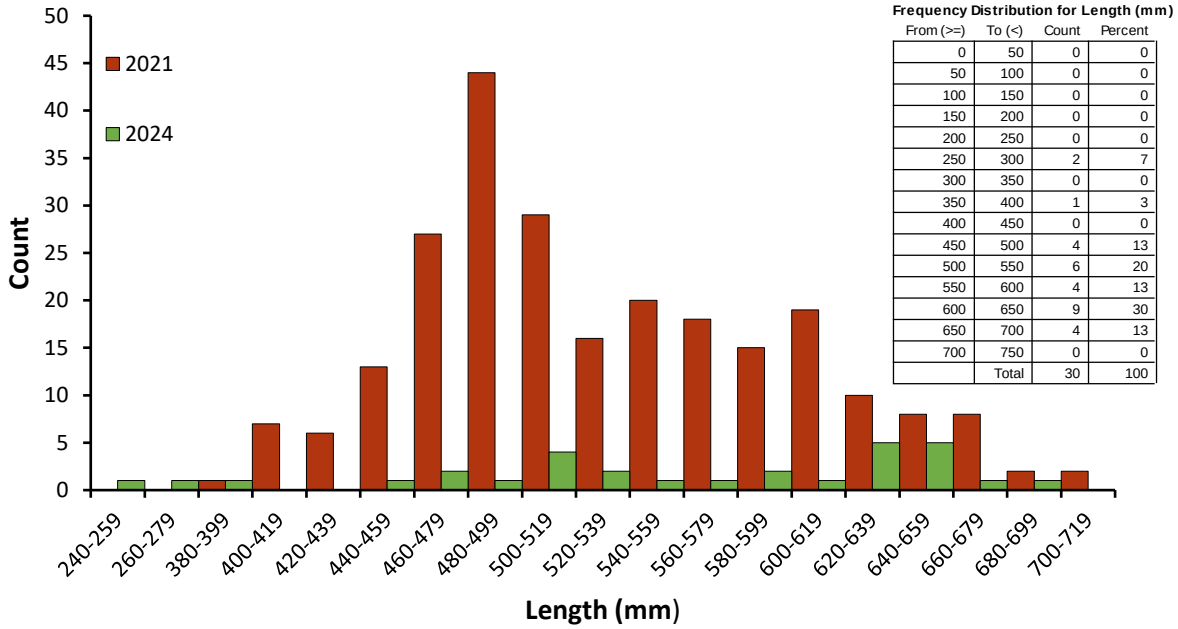


Figure 1: Length/weight plot for brown trout captured during the 2021 and 2024 surveys.



Frequency Distribution for Length (mm)

From (>=)	To (<)	Count	Percent
0	50	0	0
50	100	0	0
100	150	0	0
150	200	0	0
200	250	0	0
250	300	2	7
300	350	0	0
350	400	1	3
400	450	0	0
450	500	4	13
500	550	6	20
550	600	4	13
600	650	9	30
650	700	4	13
700	750	0	0
	Total	30	100

Figure 2: Length frequency for brown trout, 2021 and 2024 surveys and associated summary data for 2024.

Due to the small sample size, a comparison of the 2021 and 2024 length frequency data was limited. The results from the 2024 survey show there was a general shift toward a lower percentage of fish in the mid length ranges of 450 mm to 550 mm (54% 2021 compared to 33% 2024) conversely, there was an increase in the percentage of fish over 600 mm (21% 2021 compared to 43% 2024). The percentage of fish under 400 mm increased from less than 1% percent during 2021 to ten percent during 2024.

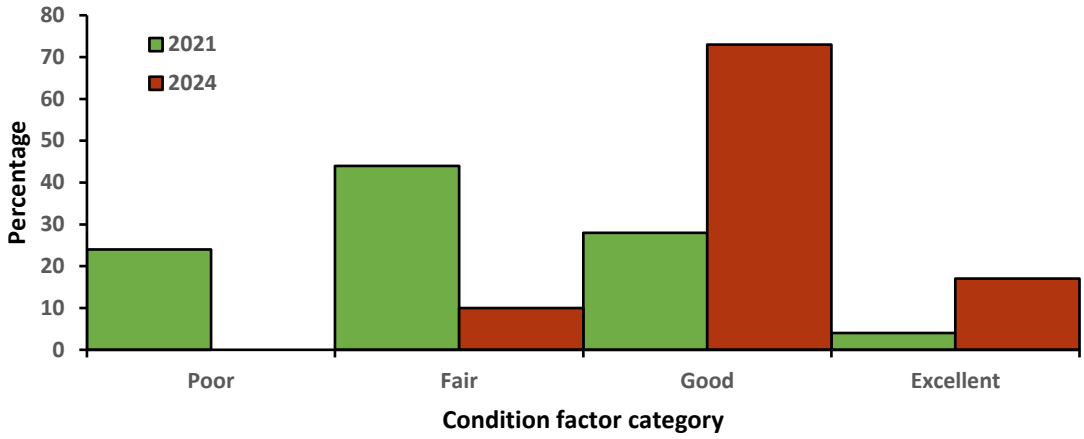


Figure 3: Comparison of condition factor category for brown trout 2021 and 2024.

The average condition for brown trout from the 2024 survey was 1.31 k. This represents a 20 percent increase in average condition factor since 2021, where the average was 1.09. During the 2024 survey, 73 percent of brown trout were categorised in good condition, with 17 percent in excellent condition and ten percent as fair. No fish were in poor condition (Figure 3). This contrasts with the 2021 results, where 24 percent were in poor condition, 44 percent as fair, 28 percent as good and five percent as excellent.

Angler Postal Survey

The results of the Angler Postal Survey (APS) for Lake Crescent since its reopening during the 2004-05 season, are generated from an average reply rate of 14 respondents per season. Initially during 2004-05, the reply rate was at a high of 15 respondents. This decreased to just 1 or 2 respondents during 2006 – 2008 and no respondents during 2008 – 2010, a period of low lake levels and associated high turbidity. The number of respondents over the past 13 years (2011-24) has averaged 14. Consequently, the results need to be interpreted with this information in mind.

After the initial stages of reopening the lake for fishing, fishing effort during 2006 – 2014 declined to very low levels (see Figure 4). After 2014 fishing effort increased to 3,305 days during 2015-16. It then decreased to around 1,000 – 1,600 days for the period 2018 – 2021 and has increased to above 5,000 days during 2022-24. The number of anglers fishing Lake Crescent generally follows angling effort, with an average of 820 anglers fishing the lake each season over the past ten years (see Figure 5). These results indicate a small number of anglers fishing Lake Crescent for around 2 – 6 days per season.

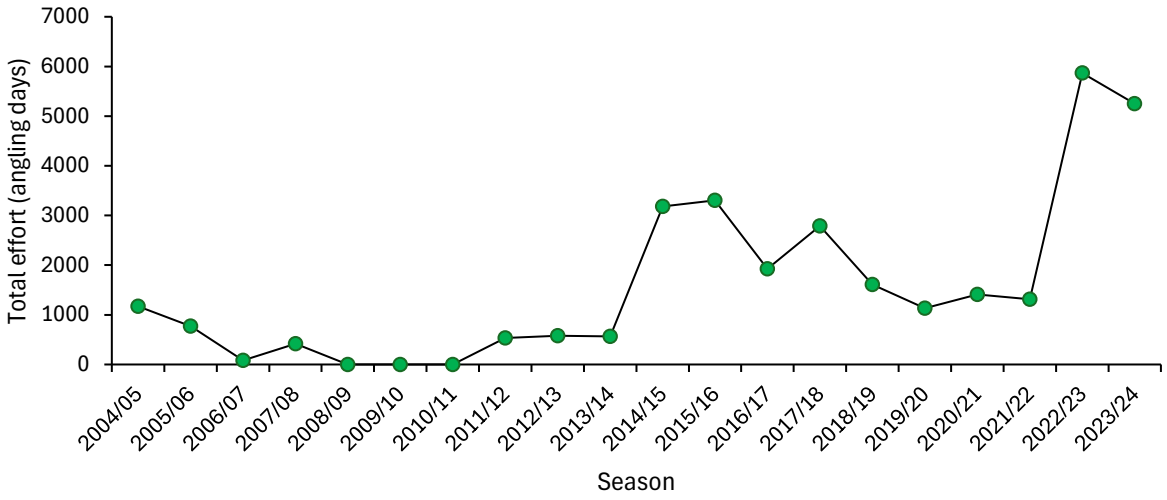


Figure 4: Estimated total angling effort days in Lake Crescent 2004 - 2024

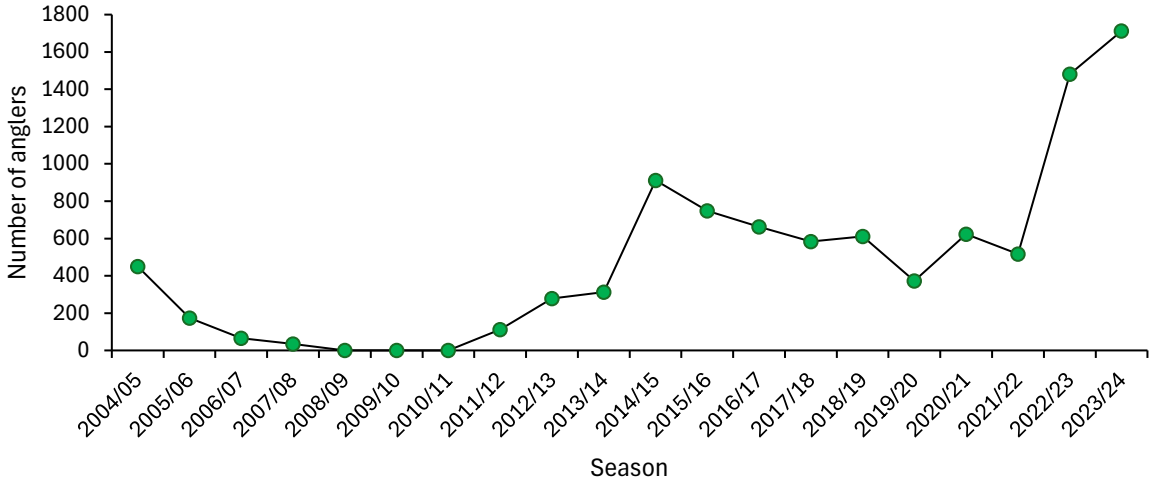


Figure 5: Estimated number of anglers that fished Lake Crescent 2004 - 2024.

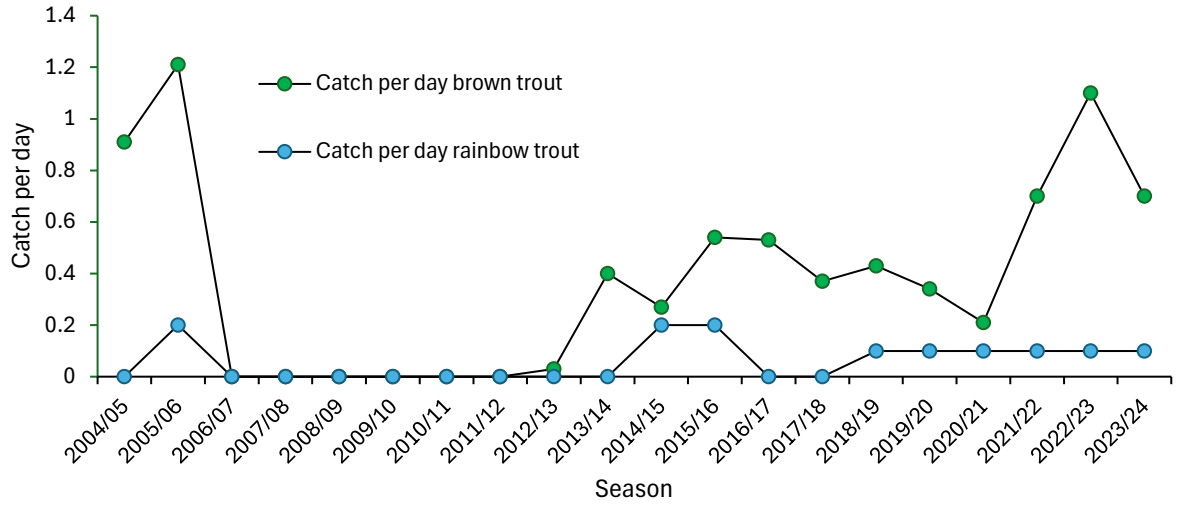


Figure 6: Daily catch rate for brown & rainbow trout 2004 - 2024.

The long term catch rate for brown and rainbow trout has typically been at low levels (see Figure 6). Over the 30 years of the APS reporting, the averaged has been 0.3 brown trout and 0.1 rainbow trout per day. The catch rate during the first two years after the reopening of the lake to fishing, resulted in daily catch rates of 0.9 – 1.2 for brown trout and below 0.2 for rainbow trout. Catch rates for both species fell to negligible levels during 2007 – 2013. From 2014 to 2019, daily catch rates have increased to around 0.3 - 0.5 for brown trout and 0.1 – 0.2 for rainbow trout. Over the past three years the average catch rates of brown trout have increased to 0.7 - 1.1 whilst the rainbow trout catch rate remained at 0.1.

From 2004 until 2021 the estimated average annual harvest was around 500 brown trout per season and 100 rainbow trout (see Figure 7). The past two seasons have seen a large increase in the annual harvest rate. The figure of estimated harvest is unlikely to be accurate due to the small sample size it has been extrapolated from. However, it does highlight a trend that the harvest rate has increased along with participation and higher catch rates over the past two seasons. The maximum harvest for rainbow trout during 2022-23 was estimated at 750 fish, with an estimate of 270 rainbow trout per season for the past ten years.

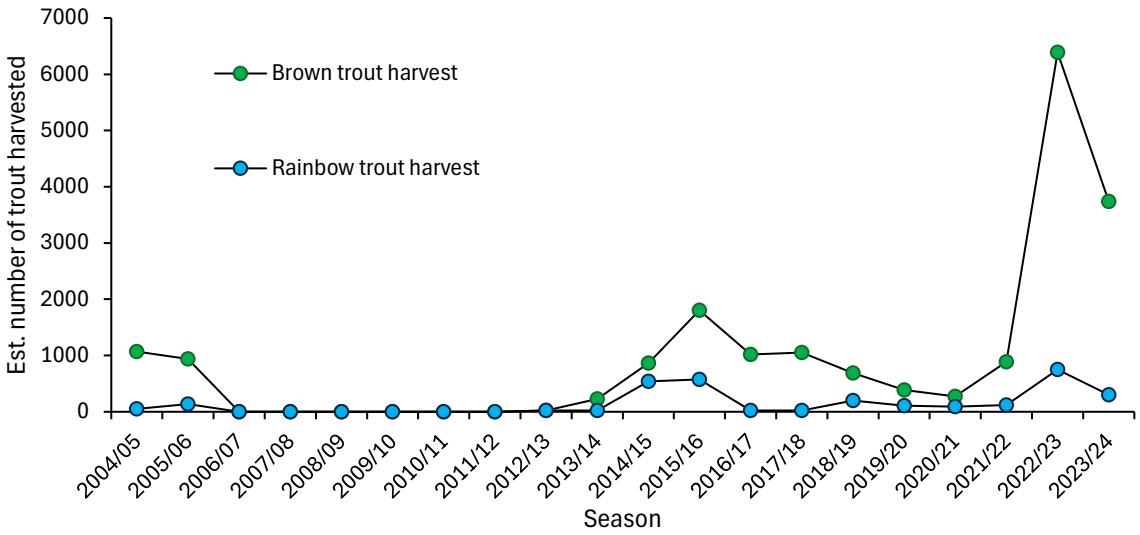


Figure 7: Estimated harvest of brown & rainbow trout 2004 – 2024.

Stocking

Brown Trout

Except for two fry stockings during 2013 and 2014, all stockings post 2013 have consisted of adult brown trout transfers (see appendix A). Since 2015, 10,331 adult brown trout have been transferred from various spawning traps on the Central Plateau to Lake Crescent. The largest transfer of adult brown trout occurred during 2017 with 3,266 fish being released. This was followed by 2,000 adult fish during 2018, 1,000 during 2019. In April 2021, 500 tagged fish were stocked for this assessment, there have been no stockings since.

Rainbow Trout

Since 2013, there have been only two stockings of rainbow trout (see Appendix B). In 2013, 15,000 wild strain fry were released and June 2017, 310 domestic yearlings.

Additional Data or Information

Turbidity Levels

Lake Crescent is a shallow lake with an average depth of 1.5 m. The lake is subject to significant drawdowns relating to high evaporation and irrigation takes, with extremely high turbidity events occurring when inflows are low for an extended period, specifically during drought conditions. Appendix D shows turbidity levels from 2008 to 2023 and associated lake level information. Turbidity levels were very high during 2008 following the 2005 -2009 drought, where low lake levels and high

turbidity prevailed. During late 2009, significant inflows occurred and the lake level increased, with turbidity levels declining to relatively lower readings. These levels continued to decline until 2012, at which time they remained settled around 50 – 70 NTU's. A significant spike of 150 NTU's occurred during June 2018 but quickly declined to previous levels. A relatively small but sustained turbidity event has since occurred post June 2019, with turbidity levels increasing to around 150 NTU's. The La Niña weather pattern from late 2020 until mid-2022 resulted in large amount of flushing and a decrease in turbidity, reaching the lowest levels in over 25 years. The significance of these increases in turbidity and the impacts on the trout population need to be examined further, however there is strong evidence to show that increased levels of turbidly lead to decreasing trout productivity and poor growth.

Discussion

The catch per unit effort (CPUE) of 0.4 brown trout per trap is a significant decline (93%) from the 5.6 per trap during the 2021 survey. There are several factors likely contributing to this low CPUE. Firstly, higher participation in the fishery over the past three fishing seasons has led to higher harvest rates, reducing the population. Additionally, the 2024 survey occurred in early April and the weather was warm, clear and calm, resulting in warm water temperatures, conditions related to low fish movement. These conditions compared to the cooler water temperatures for the June 2021 survey, likely accounts for the large difference in CPUE. Despite a notable decline in CPUE, the daily catch rate from the APS shows anglers' catches increased from 0.21 in 2021 to 0.7 - 1.1 in 2022 – 2024. The increase in catch rate can be attributed to the decrease in turbidity during this period.

In December 2023 following the functional eradication of carp, the screens dividing Lake Crescent and Lake Sorell were removed. With the lakes reconnected, fish can travel between the two lakes. Prior to the screens isolating the two lakes, fish naturally recruiting within Lake Sorell would move into Lake Crescent, therefore eliminating the need of stocking. In this survey, ten percent of fish caught were less than 400 mm. These smaller fish were captured in box traps set in close vicinity to the canal connecting the two lakes. This suggests that Lake Sorell fish have dispersed downstream, despite the Lakes only being connected for four months. In the future it is likely that Lake Sorell will supply enough fish for Lake Crescent to remain within the management criteria outlined in the TIRFMP.

Management Criteria (TIRFMP)

The average weight of brown trout was 2.392 kg, this is close to the criteria set within the TIRFMP, at 2.5 kg +/- 0.1kg. The percentage of brown trout over 600 mm was 43 percent, this is marginally below the prescribed criteria of 50 percent. All but one of the fish over 600 mm were in good to excellent condition. The average condition

factor for brown trout was 1.30 k and is within the long term average of 1.2 – 1.3 k, and above the 2021 average of 1.09. The significant increase in condition since 2021 is linked to the reduction in turbidity over the same period. The turbidity has trended downwards from 150 NTU's during 2019 to a 25 year low of 17.6 NTU's recorded in 2023. At lower turbidity levels trout can more readily access food resources resulting in an increase in growth and condition.

Angling Effort, Catch Rate and Harvest

After the initial interest surrounding the reopening of Lake Crescent during 2004/05 season, angling effort declined to very low levels during 2006 to 2012. This was a period of low lake levels and high turbidity, leading to low catch rates and a negligible harvest of trout. This situation was compounded with a period of no stocking between 2006 – 2012, due to poor water quality. After the lake level improved post 2010, turbidity declined and stocking recommenced. Initially hatchery reared fry and fingerlings were used, with generally poor results. Consequently, stocking progressed to the use of adult brown trout transfers. Stocking adult brown trout caused an increase in participation, catch rate and harvest to acceptable levels. This situation persisted between 2013 to 2019, until turbidity levels once again increased, and the daily catch rate and angling effort declined. During 2019 and 2020, there were anecdotal reports from anglers of poor condition fish. The La Niña weather pattern from late 2020 until mid-2022 brought above average rainfall to the catchment, resulting in high lake levels and flushing and subsequent lower turbidity. These conditions favoured strong growth rates in the trout population with interest in the fishery increasing. From 2022 until 2024 participation, effort and harvest were at the highest levels since the lake reopened in 2004/05.

Creel records for 2021 – 2024 (Appendix G) indicate a consistent level of participation and acceptable catch rate, in-line with the goals for the fishery (Appendix C).

Rainbow Trout

In terms of the rainbow trout population, the relative abundance of fish was low. This relates to low stocking rates, with only two stocking events occurring over the last eight years, one during 2013 (fry) and one in 2017 (yearlings). A small number of rainbow trout will likely be recruited from Lake Sorell in the future, sustaining the relatively low population within Lake Crescent.

Recommendations

- The fishery management criteria as listed in the Midterm review of TRIFMP (2018-2028) remain unchanged.
- The daily bag limit is reduced to one trout over 500 mm with the existing minimum size limit removed.
- With the screens and the Kermodes levee bank dividing Lake Sorell and Lake Crescent removed, no stocking/transfer events are required, as trout will disperse from Lake Sorell into Lake Crescent and maintain the population.
- Monitoring of future angling effort and harvest is achieved by angler feedback, creel checking and assessment via the annual postal survey (or similar mechanism).
- Continued annual monitoring of the golden galaxias population is undertaken during March – April and the results are incorporated into the management of the fishery.
- Monitoring of lake levels and turbidity is conducted at a minimum of quarterly intervals. An automatic logger is recommended to be installed in Lake Crescent and Sorell.

Appendix

Appendix A: Stocking records for Lake Crescent – Brown Trout (2013– 2024) (excludes local fish salvages that were minimal).

Date	Age	Number	Origin	Weight (g)
8/08/2013	Adult	70	Hydro Creek	400
30/10/2013	Fry	10,000	IFS New Norfolk	2.5
7/01/2014	Fry	5,000	IFS New Norfolk	6.2
20/05/2015	Adult	400	Liawenee Canal	900
27/05/2015	Adult	200	Liawenee Canal	900
4/06/2015	Adult	100	Tumbledown Creek	500
12/06/2015	Adult	200	Liawenee Canal	900
19/06/2015	Adult	430	Mountain Creek	700
25/06/2015	Adult	100	Mountain Creek	700
16/07/2015	Adult	70	Liawenee Canal	900
16/07/2015	Adult	430	Tumbledown Creek	500
23/07/2015	Adult	110	Sandbanks	800
23/07/2015	Adult	100	Scotch Bobs Creek	500
30/07/2015	Adult	250	Tumbledown Creek	500
30/07/2015	Adult	175	Scotch Bobs Creek	500
30/07/2015	Adult	50	Sandbanks	800
14/06/2016	Adult	500	Liawenee Canal	1,000
16/06/2016	Adult	200	Sandbanks	1,000

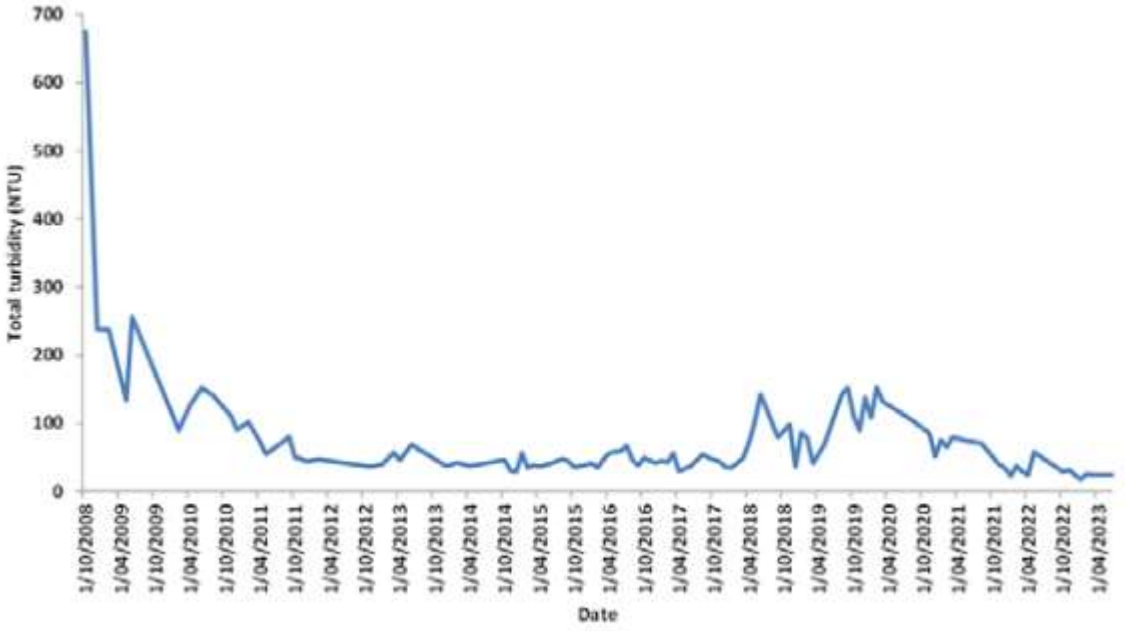
15/07/2016	Adult	250	Tumbledown Creek	600
27/04/2017	Adult	1,400	Liawenee Canal	1,000
28/04/2017	Adult	570	Sandbanks	900
21/05/2017	Adult	255	Liawenee Canal	1,000
24/05/2017	Adult	150	Liawenee Canal	1,000
26/05/2017	Adult	180	Tumbledown Creek	700
31/05/2017	Adult	152	Scotch Bobs Creek	600
7/06/2017	Adult	150	Liawenee Canal	1,000
20/06/2017	Adult	125	Tumbledown Creek	745
20/06/2017	Adult	24	Scotch Bobs Creek	790
29/06/2017	Adult	110	Tumbledown Creek	745
18/07/2017	Adult	40	Scotch Bobs Creek	790
18/07/2017	Adult	110	Tumbledown Creek	745
10/04/2018	Adult	1,220	Liawenee Canal	1,000
11/04/2018	Adult	550	Liawenee Canal	1,000
15/04/2018	Adult	230	Liawenee Canal	1,000
10/04/2019	Adult	250	Liawenee Canal	850
12/04/2019	Adult	500	Liawenee Canal	850
17/04/2019	Adult	250	Liawenee Canal	850
2/04/2021	Adult	500	Liawenee Canal	800

Appendix B: Stocking records for Lake Crescent – Rainbow Trout (2013 – 2024) (excludes local fish salvages that were minimal).

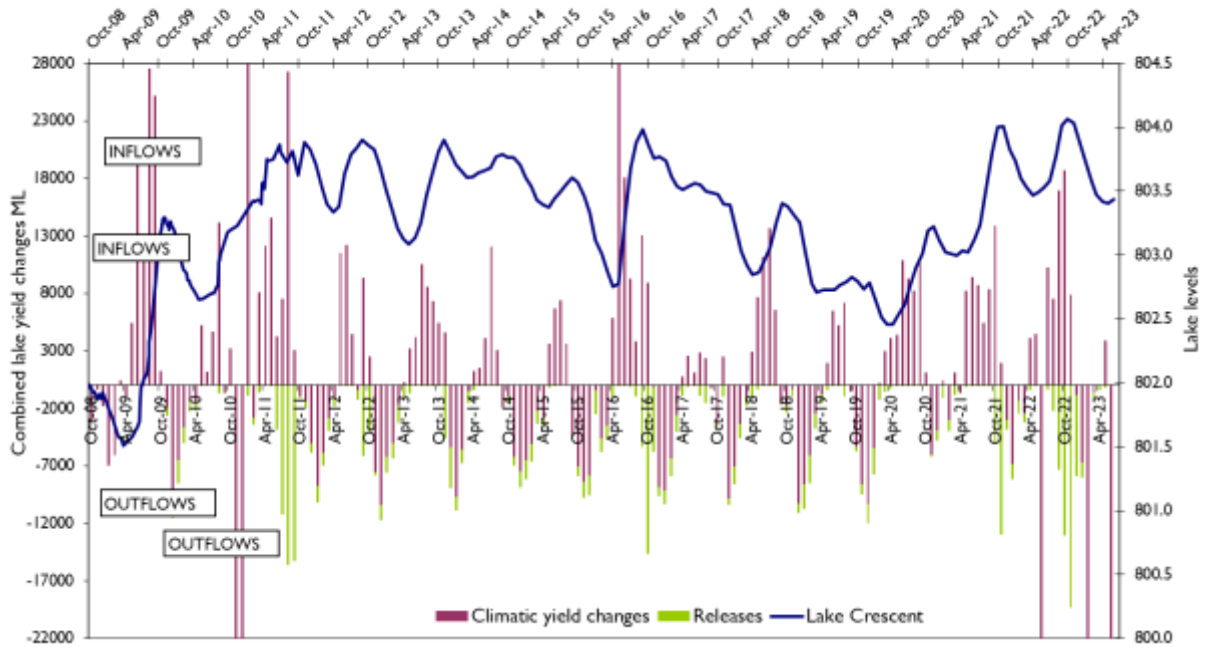
Date	Age	Number	Origin	Weight (g)
14/01/2013	Fry	6,500	IFS New Norfolk	1.7
14/01/2013	Fry	85,00	IFS New Norfolk	0.35
6/06/2017	Yearling	3,000	HAC - Millybrook	310

Appendix C: Performance criteria for Lake Crescent, as listed in the Midterm review of the Tasmania Inland Recreational Fishery Management Plan 2018 – 2028 (TIRFMP)

Species	Average weight (g)	Catch rate	Percent of large fish (%)	Population size
Brown trout	**> 400mm 2.5 kg +/- 0.1**	**0.7 +/- 0.2**	**> 600mm 50%**	**3,000 – 5,000**
Rainbow trout	**> 400mm 2.5 kg +/-0.2**	**0.2 +/- 0.1**	**> 500mm 5%**	



Appendix D: (Top) Turbidity readings for Lake Crescent 2008 – 2023; (Bottom) associated lake levels, water yields and deficits 2008 – 2020. (Source: Inland Fisheries Service, Carp Management Program Annual Report 2022 - 23).



Appendix F: Box trap set locations, Lake Crescent, June2021 (12 sets of 3 traps and 2 sets of 2 traps, over two nights, 80 sets in total).

Appendix G: Lake Crescent angler creel data from the 2021/22, 2022/23 and 2023/24 seasons. Highlighting the high fishing effort and harvest in the past two seasons.

Season	2021/22	2022/23	2023/24
Total Records	32	293	129
Total Records >= 3 hours	2	167	69
Total fishing effort >= 3 hours (hours)	15	984	417
Total fishing effort as days (6 hrs)	6	175	75.2
Total number of brown trout captured	11	129	46
Catch per day brown trout	1.8	0.7	0.6
Total number of brown trout released	4	70	17
Total number of rainbow trout captured	2	12	1
Catch per day rainbow trout	0.3	0.1	0
Total number of rainbow trout released	1	8	0

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