Inland Fisheries Service

Lake Sorell Electrofishing Survey – April 2024
Technical Report

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Introduction

Lake Sorell was once regarded as one of the top three trout fishing waters in Tasmania. The large expanse of wetlands and rocky shores made for a highly productive lake, which resulted in the trout being in exceptional condition. During the height of the fishery in the 1980s to the early 1990s, trout catch rates peaked at two fish per day with an estimated harvest of 120,000 trout captured over the 1992-93 season. Both brown and rainbow trout are found in Lake Sorell, with rainbow trout at low numbers. Natural recruitment occurs in two main locations, Mountain Creek and Silver Plains Creek. Prior to the discovery of carp in 1995, trout were also able to move into and from Lake Crescent. The trout fishery began to decline after 1995 due to the impacts of extremely low lake levels and associated high turbidity events and European carp *(Cyprinus carpio)* management activities.

Lake Sorell is a large (54 km^2) shallow lake that flows into the smaller Lake Crescent (23 km^2). It is located in the south-eastern corner of the Tasmanian Central Plateau (42°05'56.9"S 147°10'27.8"E), at 800 m AHD at the head of the Clyde River catchment. Lake Sorell is a modified natural lake, made up of a range of habitats (rocky shores, deep reef structures, and marshes). At full supply, both lakes have extensive wetland areas, one of which is a lakeside reserve that is internationally significant and listed under the Ramsar convention. A range of animals inhabit these wetlands which include invertebrates (including the endemic snail *Austropyrgus* sp.), frogs (with populations of the endangered southern bell frog *Litoria raniformis* previously recorded), waterbirds, short finned eels (*Anguilla australis*) and the endangered endemic golden galaxias (*Galaxias auratus*).

Lake Sorell was initially closed to the public on 9 March 1995 when carp were first discovered, however the lake was subsequently re-opened in August 1995 as it was assessed as low risk, due to the low carp population at the time. In 2010, Lake Sorell was again closed due to a significant carp spawning event stimulated by rising lake levels and warm conditions late in 2009. For the next 11 years, intensive gill net effort was undertaken to target carp, which negatively impacted the trout population. Barrier nets were set around the major wetlands to prevent carp from accessing spawning habitat, and these nets also prevented trout accessing these productive areas for feeding. During February 2021, due to the assessed low risk posed by the remaining low carp population, Lake Sorell was re-opened.

After an extensive 28 year physical removal program, the Inland Fisheries Service (IFS) announced the functional eradication of carp from Lake Sorell in June 2023. This electrofishing survey was undertaken to determine a baseline abundance of trout and, assess trout weight and length structure, as the lake continues to recover as a recreational fishery. The last trout survey undertaken in Lake Sorell was in the early 2000's.

Methodology

The IFS Smith-Root electrofishing boat was launched at Dago Point Boat ramp on 15, 16, and 17 April 2024. With three staff on board, the boat was driven over the routes shown in Figure 1 (Day 1: R1 to R4, Day 2: R5 to R12, Day 3: R13 to R15). The electrofishing boat was driven parallel and close to the shore, and at times also driving straight in towards the shoreline amongst areas of structure. The generator was activated intermittently to capture as many brown trout as possible. The shock time and the number of fish captured were recorded for each electrofishing run. Each electrofishing run was recorded by noting the start and end grid squares, with the track of the boat plotted on a map (Figure 1).

Each fish was measured to fork length (mm), weighed (g), and their sex determined by external observation (male or female or indeterminate). Condition factor of the fish was calculated using the formula: $k=(10^5 \times \text{weight})/\text{length}^3$.

The categories of k are poor ≤0.9, fair >0.9 and ≤1.2, good >1.2 and ≤1.6, excellent >1.6.

The aim of the survey was to capture and process approximately 200 brown trout. All fish were released back into the lake after processing.

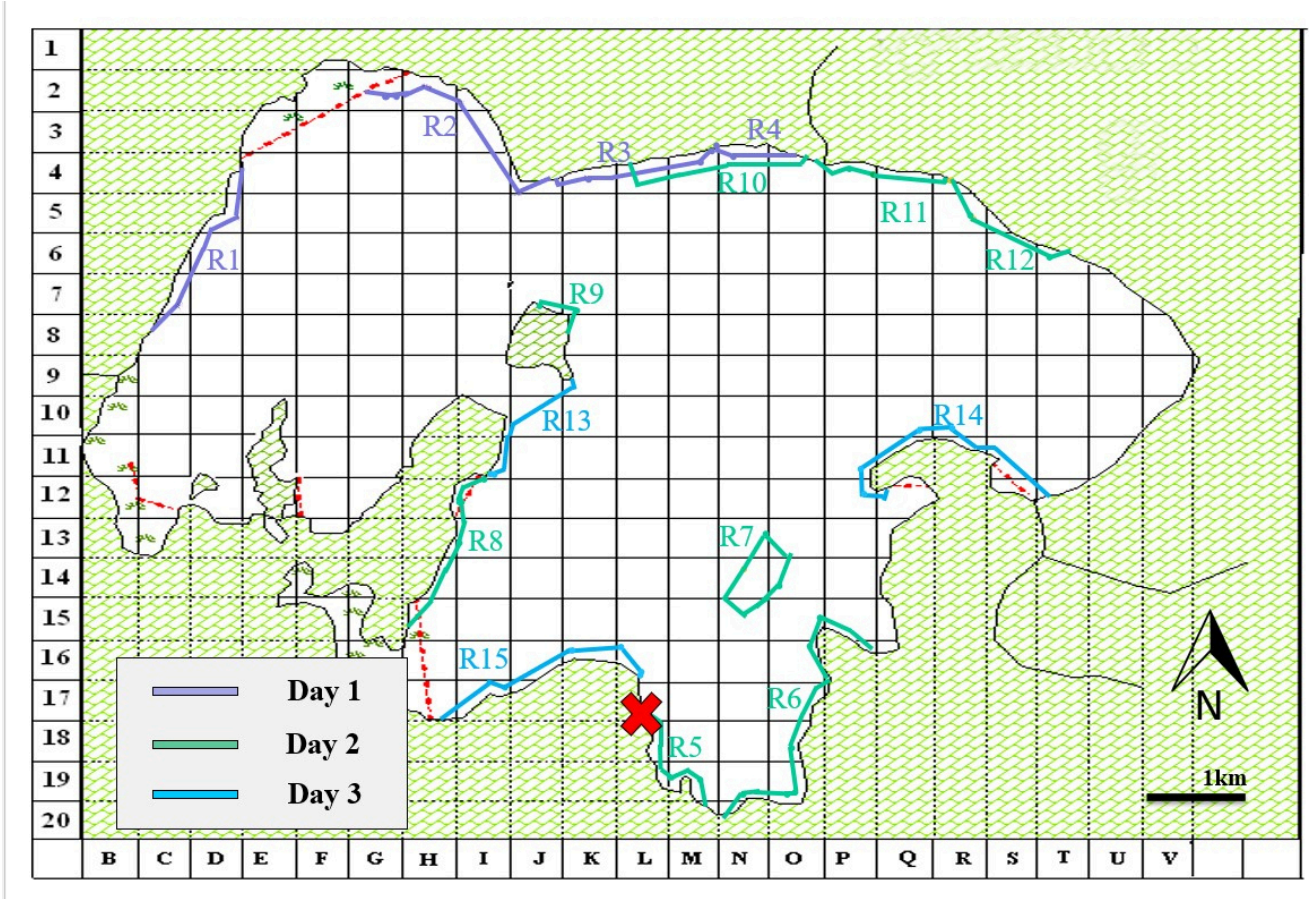


Figure 1. Map of Lake Sorell showing the electrofishing runs undertaken during the survey. R represents Run. Day 1: R1 to R4, Day 2: R5 to R12, Day 3: R13 to R15. X is the location where the boat was launched.

Results

Effort

On 15, 16, and 17 April 2024, the Lake Sorell trout population was surveyed using a boat mounted electrofishing unit, the area covered is shown in Figure 1.

On 15 April, the boat covered approximately 7.3 km with 5,815 seconds (1.6 hours) of shock time (the time the electrofishing unit is active) for 22 brown trout and one rainbow trout. On 16 April the boat covered approximately 15.9 km with 12,782 seconds (3.6 hours) of shock time for 23 brown trout. On 17 April, the boat covered approximately 6.8 km with 7,000 seconds (1.9 hours) of shock time for two brown trout.

The catch per unit effort (CPUE) of this survey was measured in the number of fish caught per hour of shock time. The CPUE for each of the 15 runs varied from two to 47 fish per hour (Table 1), with an average of 10. Six of the runs resulted in no fish caught, despite a distance covered of 13.1 km, as well as a shock time of 9,700 seconds (2.7 hours). Of the nine runs where fish were caught, five runs resulted in CPUE of less than 10 fish per hour. The total shock time of the survey was 25,597 seconds (7.1 hours). The minimum target of 200 brown trout to capture, which is generally the target number of fish allocated for the IFS trout fishery performance assessment surveys was not able to be reached.

*Table 1. Fishing effort, catch., shock time, and distance covered during the electrofishing survey undertaken in Lake Sorell. *Average CPUE*

Date	Run no.	Grid Reference	Shock time (secs)	Distance covered (km)	Fish caught	CPUE fish/hour)
15/04/2024	1	C8-D4	2100	2.3	1	2
15/04/2024	2	G2-J4	2115	2.6	2	3
15/04/2024	3	J4-M4	1000	1.6	13	47
15/04/2024	4	M4-O4	600	0.84	7	42
16/04/2024	5	L17-M20	1982	2	3	5
16/04/2024	6	N20-P16	3300	3.8	0	0
16/04/2024	7	N15-N15	300	2.5	0	0
16/04/2024	8	H15-I12	1700	2.2	0	0
16/04/2024	9	K8-J7	800	0.58	0	0
16/04/2024	10	L4-O4	1700	1.78	6	13
16/04/2024	11	O4-R4	2000	1.42	12	22
16/04/2024	12	R4-T6	1000	1.63	2	7
17/04/2024	13	I11-K9	1900	1.62	0	0
17/04/2024	14	T12-Q12	3400	2.74	2	2
17/04/2024	15	L16-H17	1700	2.44	0	0
Total			**25597**	**30.05**	**48**	**10***

Brown and rainbow trout length weight data

A total of 47 brown trout and one rainbow trout were captured. Of the brown trout caught, 32 were males and 14 females. The rainbow trout was classed as indeterminate.

A summary of the biological parameters is shown in Table 2.

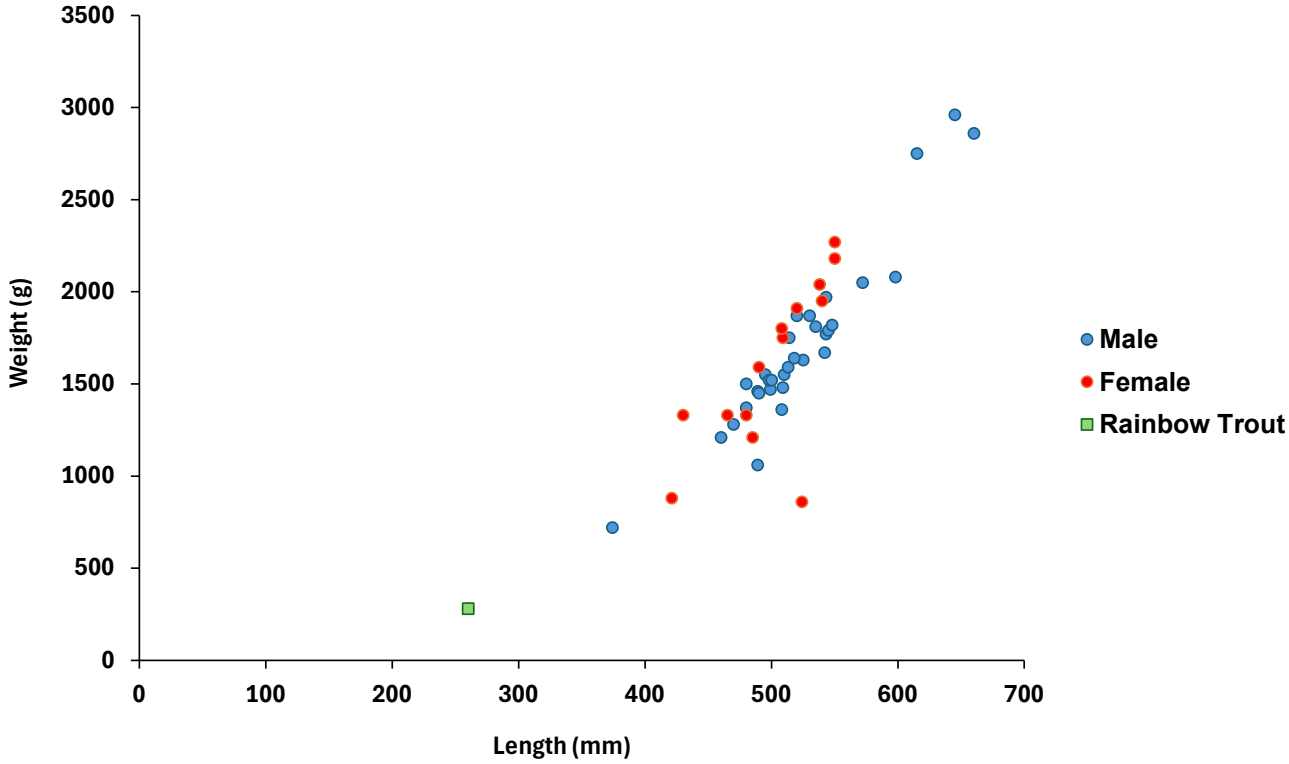


Figure 2: Length weight relationship for brown and rainbow trout caught in Lake Sorell, April 2024 (n= 48).

The longest brown trout was a male at 660 mm, weighed 2,860 g, while the heaviest was a male at 645 mm and 2,960 g. The smallest brown trout (by length and weight) was a male fish 374 mm and 720 g. The smallest fish was the one rainbow trout t, which measured 260 mm and 280 g.

Table 2: Descriptive statistics for brown trout caught during the Lake Sorell electrofishing survey – length, weight and condition factor separated by sex.

Grouping	Measurement	Mean	Minimum	Maximum
All brown trout (n=47)	Length (mm)	516	374	660
	Weight (g)	1,670	720	2,960
	Condition Factor (k)	1.2	0.60	1.7
Female (n=14)	Length (mm)	501	421	550
	Weight (g)	1,603	860	2,270
	Condition Factor (k)	1.26	0.60	1.67
Male (n=33)	Length (mm)	522	374	660
	Weight (g)	1,699	720	2,960
	Condition Factor (k)	1.17	0.91	1.38

Note: The categories for k-factor are: poor ≤0.9, fair> 0.9 and ≤1.2, good >1.2 and ≤1.6, excellent >1.6. The single rainbow trout caught was not included here.

Comparing the mean condition factor of sexes, female fish were generally in good condition, while male fish were in fair condition (Table 2). The average condition factor for all brown trout was classified as good. A large proportion (52%) of fish were in good condition, 43% in fair condition, while 2% were in poor condition, and 2% in excellent condition (Figure 3).

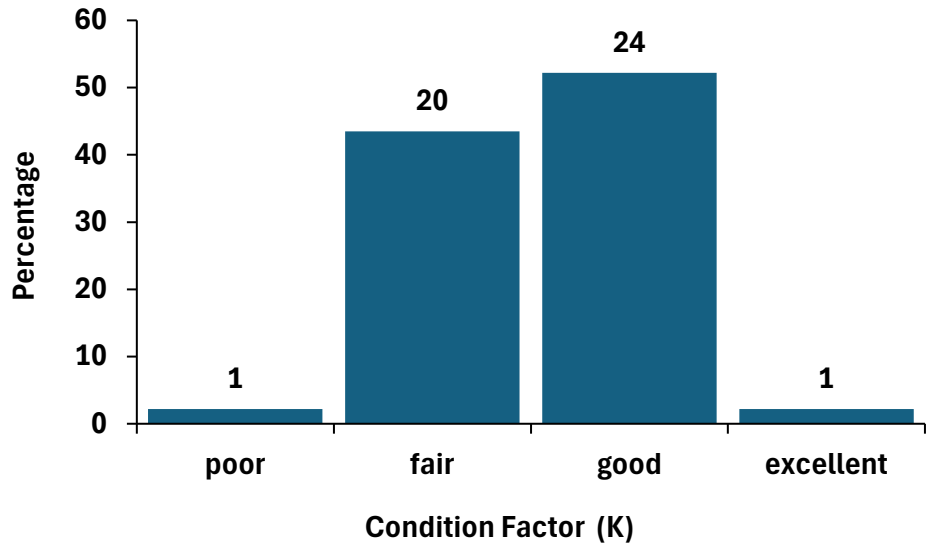


Figure 3: Condition factor category by percentage for brown trout, Lake Sorell. Raw numbers listed above each category.

Due to the small sample size, care must be taken when interpreting the results of the length frequency distribution (Figure 4). The majority of fish ranged in size from 480 to 550 mm, comprising of both male and female fish. There were five fish in excess of 550 mm and six less than 480 mm (including a rainbow trout). Smaller brown trout in the range of 100 to 360 mm were not detected. It was difficult to determine cohorts of fish however, there is likely to be two older age classes.

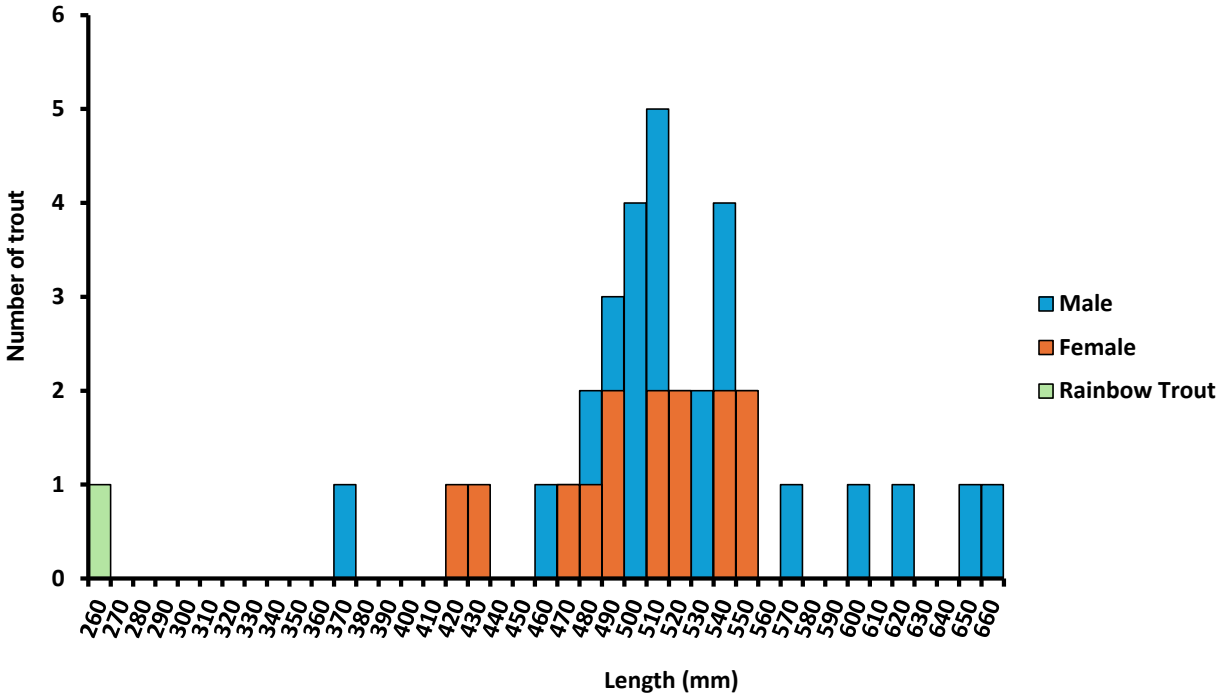


Figure 4: Length frequency for brown and rainbow trout, Lake Sorell, April 2024.

Discussion

This electrofishing survey was undertaken to determine the baseline for the current brown trout population in Lake Sorell, after their numbers were impacted by extensive carp management activities over 28 years. As predicted, the number of trout caught was low, and we were unable to reach the target number of 200 fish for the survey. It is likely some fish may have been in deeper water and were not amenable to electrofishing. However, based on the time of year, the shallow edges should have been most appropriate to target electrofishing efforts.

Most fish were captured along Hatchery shore, in the vicinity of Mountain, with brown trout moving into the area in preparation for spawning. The low number captured was representative of the low population base, due to numerous years of intensive netting during carp eradication program.

The average size of trout caught was 516 mm and 1,670 g, which is comparatively large to other fisheries. Overall, most were in fair to good condition. There was an absence of smaller fish, likely due to recruitment failure, as Silver Plains Creek was blocked with barrier net for many years, and Mountain Creek now has poor trout spawning habitat. The low population base is also contributing to low recruitment. The electrofishing boat has previously been used to capture fish over 100 mm in other waters, so if these smaller fish were present, they would have been vulnerable to capture.

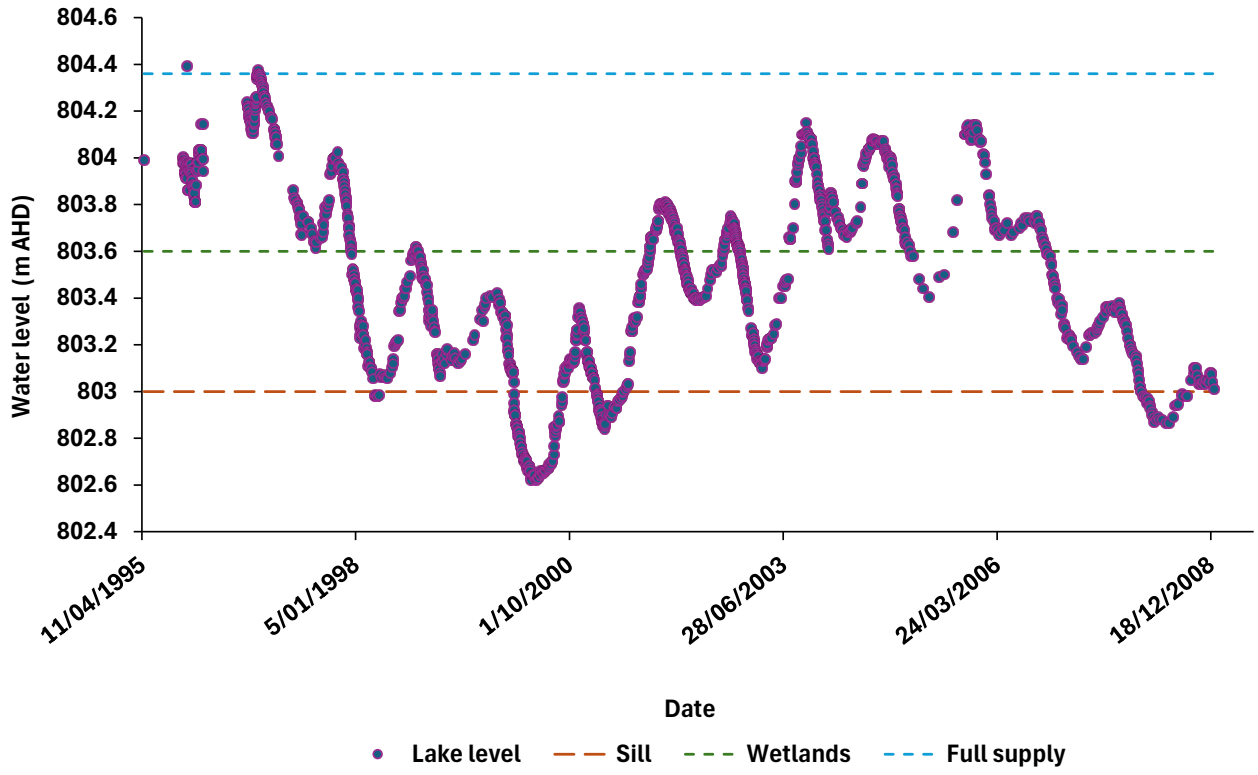
Only one small rainbow trout was caught, which supports the assumption the rainbow trout population is very small. Limited stocking of rainbow trout would be beneficial to ensure their long-term presence.

While the current abundance of trout is low, their condition is likely to become excellent and will provide an exceptional fishery within the Tasmanian context. This is, however, dependent on appropriately managed lake levels that ensure regular inundation the marshes and improved ecological productivity.

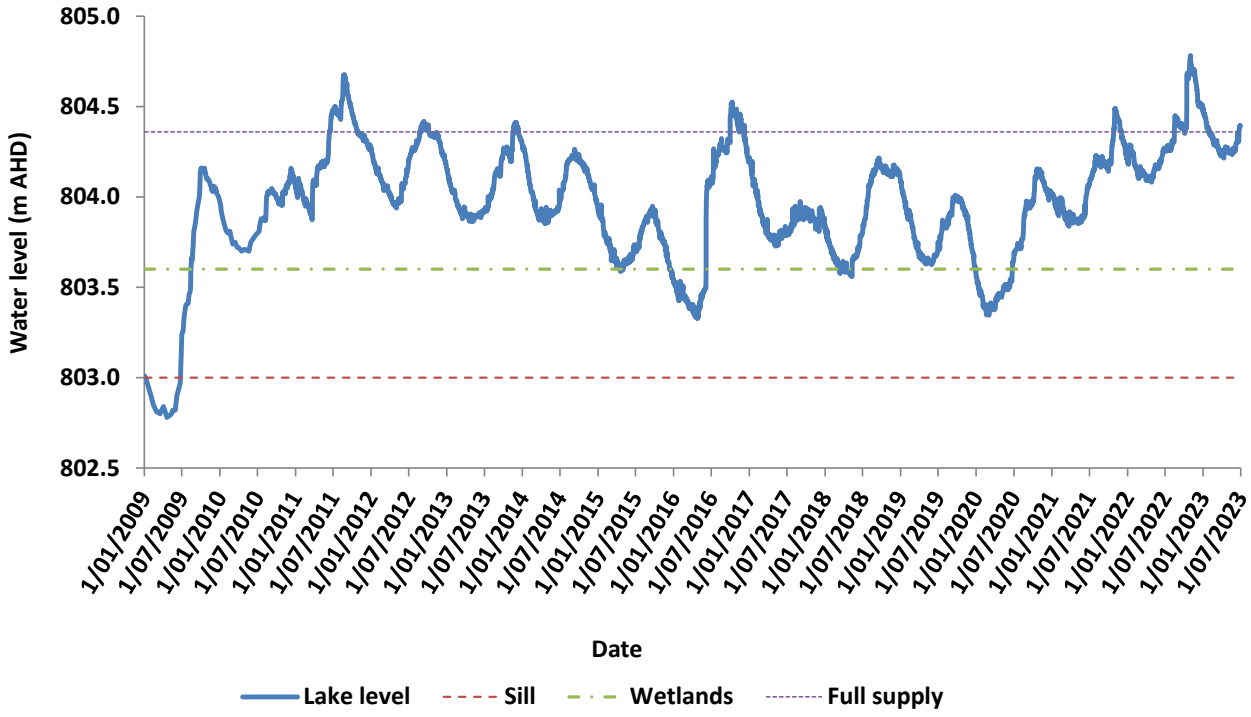
Recommendations

- Allow the brown trout population in Lake Sorell to rebuild naturally via the multiple spawning creeks around the lake.
- Transfer two hundred adult rainbow trout from yingina / Great Lake fish traps to assist with rebuilding the rainbow trout population in Lake Sorell.
- Repeat the electrofishing survey during April 2027, using the same locations and methodology to monitor the trout population.
- To determine young of the year recruitment strength, backpack electrofish brown trout fry habitat during December – March.

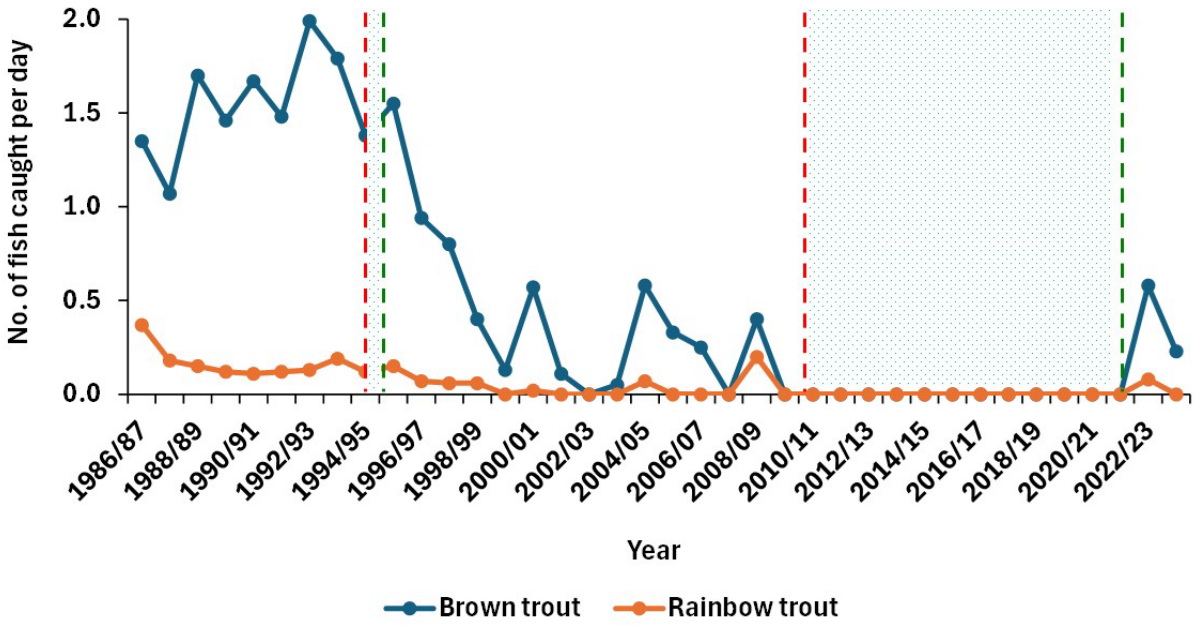
Appendix



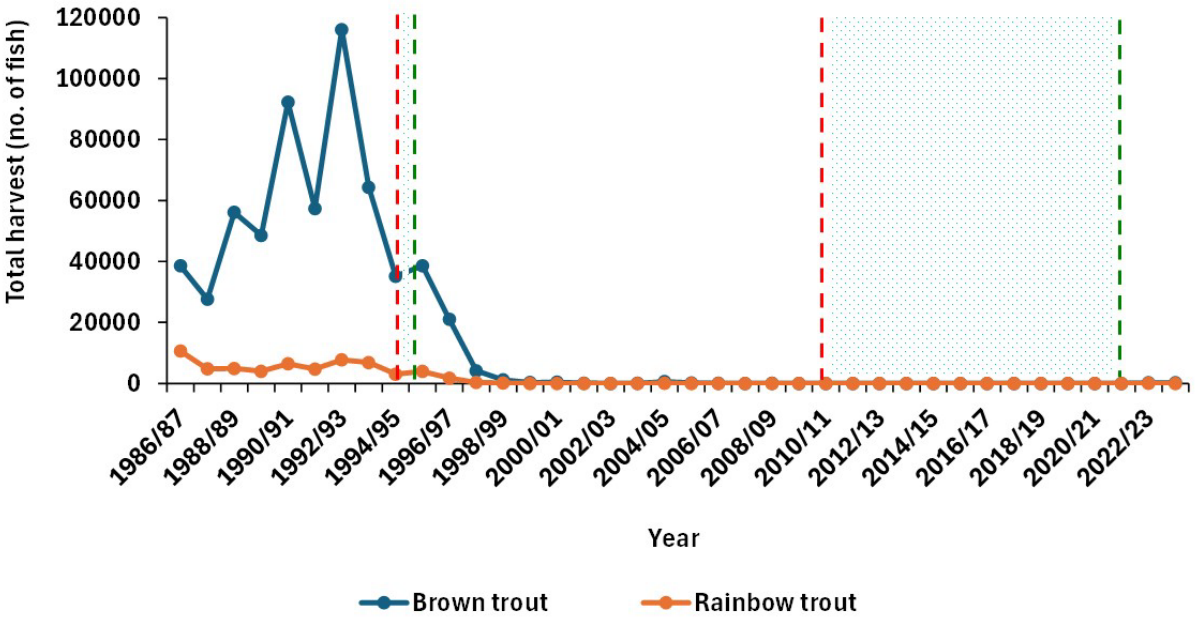
Appendix 1: Lake Sorell levels (m AHD) plotted alongside Sill, Wetlands, and full supply levels (1995-2009). Note: Blanks in between points represent dates with no water level data.



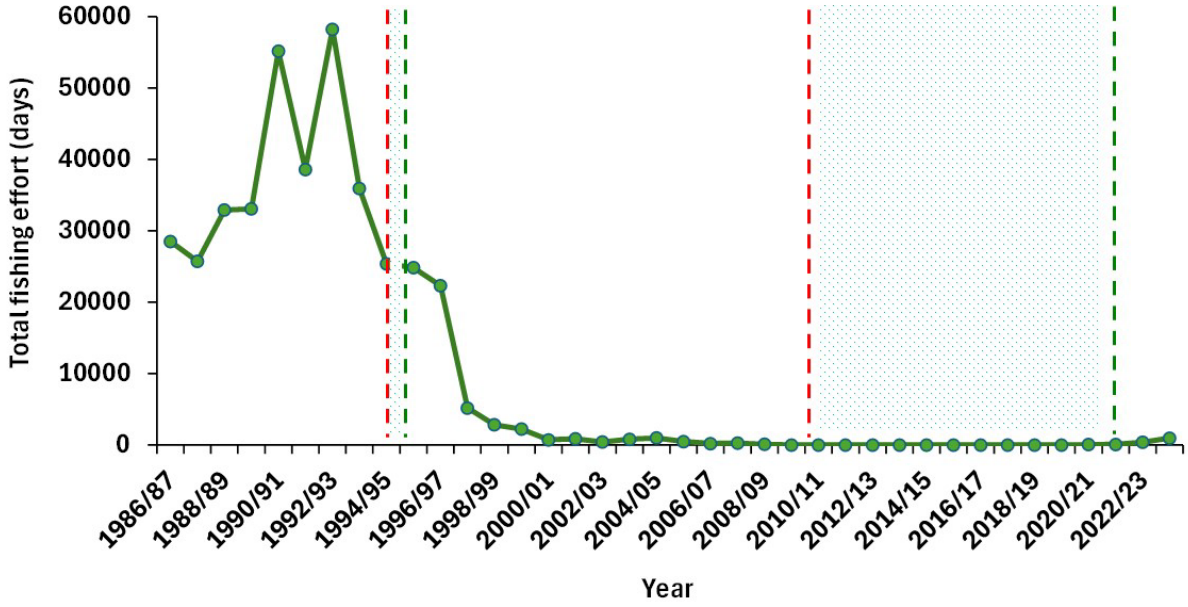
Appendix 2: Lake Sorell levels (m AHD) plotted alongside Sill, Wetlands, and full supply levels (2009-2023).



Appendix 3: Average daily catch rates of trout in Lake Sorell (1986-2024). Note: red dotted lines- lake closed to the public, green dotted lines- lake opened to the public, shaded area- lake closure period.



Appendix 4: Total annual harvest of trout caught from Lake Sorell (1986-2024). Note: red dotted lines- lake closed to the public, green dotted lines- lake opened to the public, shaded area- lake closure period.



Appendix 5: Total annual fishing effort (days) undertaken in Lake Sorell (1986-2024). Note: red dotted lines- lake closed to the public, green dotted lines- lake opened to the public, shaded area- lake closure period.

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