Talk Wild Trout 2017

Conference Proceedings

11 November 2017
Mansfield Performing Arts Centre, Mansfield Victoria

Target One Million
More Victorians fishing, more often

Your fishing licence fees at work

Victorian Fisheries AUTHORITY

Aboriginal acknowledgement

The Victorian Government proudly acknowledges Victoria's Aboriginal community and their rich culture and pays respect to their Elders past, present and emerging.

We acknowledge Aboriginal people as Australia's first peoples, and as the Traditional Owners and custodians of the land on which we work and live.

We recognise the strength of Aboriginal people and communities and value the ongoing contribution of Aboriginal people and communities to Victorian life, through their daily work and at key events, and how this enriches us all.

We recognise all Aboriginal cultures and communities are diverse, and should be celebrated.

We acknowledge that the land and water is of spiritual, cultural and economic importance to Aboriginal people. We embrace the spirit of reconciliation: guaranteeing equality of outcomes and ensuring an equal voice.

We have distinct legislative obligations to Traditional Land Owner groups that are paramount in our responsibilities in managing Victoria's resources.

Partners:

Victorian Fisheries Authority

Your fishing licence fees at work

Target One Million
More Victorians fishing, more often

Representing Victorian Recreational Fishers VRFish

Arthur Rylah Institute

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Foreword

Victoria's wild trout fisheries are the fishing jewel in the crown for our State.

When you are out fishing, be it the Goulburn, Kiewa, Mitta Rivers or Lake Wendouree, you are catching amazing trout, experiencing the best of Victoria's great outdoors and supporting country towns.

That is why we are actively supporting recreational fishing. *Our Target One Million Program* is getting more Victorians fishing, more often. To support trout fisheries we have:

- ✓ Stocked a record one million trout in 2017 and created an on-line searchable fish stocking data for recreational fishers
- ✓ Introduced minimum size limits for trout
- ✓ Delivered the Wild Trout Fishery Management Program and extended the program for a further two years
- ✓ Saved Lake Toolondo
- ✓ Created new boating access at Blue Rock Reservoir
- ✓ Provided kayak access and extended the jetty at Devilbend Reservoir
- ✓ Delivered the Angler Riparian Partnership Program with $1 million over 4 years to restore fish habitat
- ✓ Run incubator trials on the Jamieson River and Traralgon Creek
- ✓ Delivered six exciting Vic Fish Kids events to encourage young fisher participation.

Three years on from the first Talk Trout Conference, it's great to see Victorian trout fishers working so closely with the new Victorian Fisheries Authority and other agencies to keep building trout fisheries.

The Andrews Government is serious about developing our recreational fisheries and has committed a record $46 million toward these and other *Target One Million* projects that will be a legacy for many years to come.

I wish every trout fisher the best of luck this season and I'm confident our trout fisheries will continue to go from strength to strength.

The Hon. Jaala Pulford MP

Minister for Agriculture
Minister for Regional Development

Conference Program — Saturday 11 November 2017

9.30 am	Arrival & morning refreshments	Delegates
10.00 am	Welcome to Country	Taungurung Clans Aboriginal Corporation
10.05 am	Foreword	Travis Dowling, Victorian Fisheries Authority
10.10 am	Recap – Talk Wild Trout 2015 and 2016	Anthony Forster, Victorian Fisheries Authority
10.20 am	Factors impacting on our wild trout fisheries	Dr John Hayes, Cawthron Institute, New Zealand
11.00 am	One minute reflection for Remembrance Day	
	Morning Tea Break	

Theme 1 – Deeper Understanding (Session Chair: Anthony Forster, Victorian Fisheries Authority)

11.15 am	The state of trout in Victoria: 2017 overview	Jason Lieschke, Arthur Rylah Institute
11.30 am	Health cards for 10 of our best wild trout streams 2017	Brett Ingram, Victorian Fisheries Authority
11.45 am	MyCatch – Fishing for angler catch data	Anthony Forster, Victorian Fisheries Authority
12.00 am	Panel questions & answers	Delegates, speakers & chair
12.15 pm	Lunch	

Theme 2 – Fisheries Management (Session Chair: John Douglas, Victorian Fisheries Authority)

1.00 pm	Taking stock: we are not overfishing our trout	Kylie Hall, Victorian Fisheries Authority
1.15 pm	Smarter stocking to improve our wild trout fisheries	Hui King Ho and Brett Ingram, Victorian Fisheries Authority
1.30 pm	Incubator trials in the Jamieson and King rivers and Traralgon Creek	Terry George, Australian Trout Foundation and John Douglas, Victorian Fisheries Authority
1.45 pm	Panel questions & answers	Delegates, speakers & chair
2.00 pm	Afternoon Tea Break	

Theme 3 – Angler Involvement (Session Chair: Michael Burgess, VRFish)

2.15 pm	Goulburn Broken and North East CMA Angler Riparian Partnership Program 2016-17 : Angler partnerships in habitat restoration to restore rivers and improve trout fishing	Jim Castles Goulburn Broken Catchment Management Authority, Andrew Briggs North East Catchment Management Authority, Terry George Australian Trout Foundation, Dermot O'Brien Victorian Fly Fishers Association, Kris Leckie VRFish
2.30 pm	"An expensive trout!"	Jon Clewlow, Millbrook Lakes
3.00 pm	Panel questions and answers	Delegates, speakers & chair

Conference wrap up

3.30 pm	What I got out of the conference	Phillip Weigall, FlyStream.com Kris Leckie, VRFish
3.45 pm	Close of conference	Travis Dowling

Victorian Fisheries Authority — Your fishing licence fees at work — Target One Million: More Victorians fishing, more often — Representing Victorian Recreational Fishers — VRFish — Arthur Rylah Institute

Overview of Wild Trout Fisheries Management Plan

The **Wild Trout Fisheries Management Program** is a collection of nine projects over three years that aims to deliver:

- A clearer understanding of the cause(s) of the decline in wild trout fisheries,
- A better understanding of priority trout populations' health and status,
- Improved engagement with fishers to share our understanding of trout fisheries management, science and factors that drive the fishery,
- More responsive management of wild trout recreational fishing in Victoria, and
- Improved fishing opportunities for wild trout in Victoria.

Development

The summer of 2013-14 was an unhappy one for many of Victoria's trout stream anglers. Widespread reports of poor fishing were received from many normally productive wild trout streams.

In response, Fisheries Victoria commissioned Arthur Rylah Institute researchers to conduct population surveys of four trout rivers in North East Victoria during February 2014. These streams were selected to broadly represent those North East rivers where anglers reported poor angling catch rates. They included the King River (above and below Lake William Hovell), the Howqua River (upstream of Mansfield-Jamieson Road), the Jamieson River (upstream of Jamieson) and the Upper Goulburn River (Jamieson to Woods Point). The results suggested that trout populations in the lower reaches of these rivers were low in abundance. Trout populations at the higher elevations seemed unaffected.

The results of the survey were presented to:

- Representatives of trout fishing organisations at meetings on 3 April and 20 June 2014 held at Fisheries Victoria's Snobs Creek Hatchery. This group of 12 agreed to act as a reference group to consider future research and development proposals.
- A public forum (attended by approximately 70 guests) held at Alzburg Resort, Mansfield on 10 April 2014.

A range of possible factors may have contributed to the trout population results observed. For example, one likely contributor to seasonally low trout abundances in the lower reaches of rivers in North East Victoria are high water temperatures associated with high ambient air temperatures and low summer river flows. Australia's mean temperature has been increasing since the 1980s and there are predictions that higher temperatures will occur more frequently in the future.

Trout are a cold water fish species and are physiologically vulnerable to warm water and impacts can be seen on distribution, feeding, growth, survival, reproduction and catchability by fishers.

A range of additional factors have also been suggested as contributing to low trout abundances in the lower reaches of North East Victorian rivers. These include stream habitat condition, fishing pressure, predation (e.g. cormorants) and competition with other species (e.g. carp).

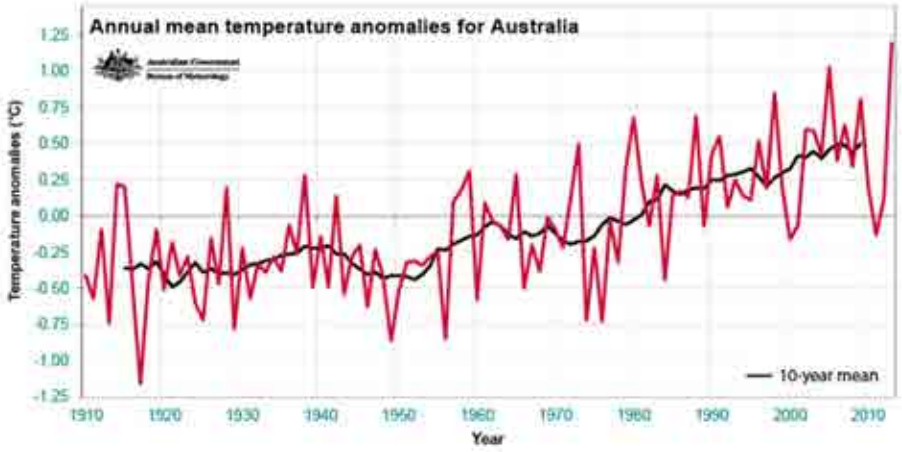

Figure 1: Annual mean temperature anomalies for Australia (compared with 1961–1990 average). Source: BOM 2014.

At both meetings, there was considerable discussion about what, if any, fisheries management interventions could be adopted to better understand how the fishery is performing and what could be done to improve it.

The high levels of angler concern about the status of river trout fishing in North East rivers and the social and economic contribution that trout fishing makes to the regional economy warranted further attention. Fisheries Victoria initiated a research and management program to address the key questions raised at the public meetings to better understand how the trout fishery is performing and what, if any, management interventions may be appropriate. Further details about the Wild Trout Fisheries Management Plan (WTFMP) are listed over page, throughout the proceedings and can be obtained from the website: www.depi.vic.gov.au/fishing-and-hunting/recreational-fishing/wild-trout-population-survey/wild-trout-fisheries-management-plan'

The Wild Trout Fisheries Management Program will address the following key questions:

Are summer temperatures adversely impacting our river trout fisheries?

Trout are a cold water fish and high summer water temperatures can reduce feeding and increase mortality. A trout tracking study will use acoustic tags and listening stations in the Delatite River to determine how river trout respond to changes in water temperatures. If trout move when water temperatures increase, where do they go and at what temperature do they move?

Is there a decline in wild trout populations and breeding?

Wild trout populations in rivers rely on natural breeding to spawn young fish. Monitoring trout populations will help us assess annual breeding performance and predict the strength of the next year class of trout. This project will conduct annual fish population surveys in up to twelve priority rivers annually (3–4 sites in each) to provide a 'report card'. This can be compared to historical trout population information in some of these rivers given substantial prior research in many Victorian waters. This project will also consider whether predation and competition from other species is adversely affecting trout populations in rivers. During the survey work, scientists will record information about carp, their size and abundance, along with other possible predators of trout such as cormorants.

Is fishing pressure adversely impacting trout populations and the quality of the trout fishery?

Excessive angler harvest of fish can impact trout populations by decreasing the number of reproductively mature fish. In turn, this can reduce the number of young fish produced in a system. Angler surveys and a 'tag return' program in the Howqua River will help us understand more about catch and harvest levels. It is prudent to regularly test catch limits, closed seasons and equipment restrictions to confirm they are still appropriate. If the project finds evidence that fishing pressure is impacting the fishery, then there may be a need to reconsider fishing regulations including size and bag limits, the closed season or permitted equipment.

Are research results well understood by fishers?

Annual conferences with trout fishers and community groups will help everyone stay informed about the progress and key outcomes of each project from the Wild Trout Fisheries Management Plan. Interested groups can thus better understand the factors at play and consider the best options for maintaining and improving our wild trout fisheries. The conferences will also provide an opportunity for fishers to hear about the very latest trout fishing developments, from local and international trout experts.

How can we reliably track changes in the angling performance of our trout fisheries?

There are many angling clubs that record their catches with great diligence. If this information can be shared for use in fisheries management, it may be a cost-effective way to get an indication of fishery performance over time and a means of assessing the impacts from interventions such as stocking and habitat restoration. A trial program using angling club records in fisheries monitoring will be expanded to include the wild trout fisheries in Victoria.

Is reduced trout stocking into Lake Eildon impacting the trout fisheries in its inflowing rivers?

Fisheries managers are keen to better understand the contribution that trout stocking in Lake Eildon makes to the inflowing river trout populations. Similarly, to better understand the proportion of river fish which return to the lake for some period of their life stage. A study will be undertaken to determine more cost effective and accurate methods of marking stocked trout and allow a better understanding of the relationship between trout populations in Lake Eildon and its feeder rivers.

Have there been changes to bankside vegetation along our rivers? If so, have they affected water temperatures?

River water temperature is strongly influenced by the nature and extent of stream-side (riparian) shading. Major changes to bankside vegetation (e.g. bushfires and flooding, clearing and replanting) may adversely impact wild trout fisheries. This project will look at the changes to riparian shading and if warranted, the scope to rehabilitate streamside vegetation.

Does trout stocking help wild brown trout river fisheries recover?

Past research on wild trout fisheries in Victoria and worldwide suggest stocking on top of existing self-sustaining populations is an ineffective strategy to improve the quality of fishing in the long-term. However anglers have a strong affinity with stocking and it's perceived benefits. This project will trial the stocking of two-rivers (Howqua and Upper Goulburn Rivers) with tagged trout to re-assess the effectiveness of this intervention to assist recovery and enhance wild trout fisheries.

Talk Wild Trout Recap on year 1 & 2

Anthony Forster
Freshwater Fisheries Manager, Victorian Fisheries Authority

It's a daunting task to summarise the expansive work of the first 2 years of the Wild Trout Fisheries Management Program. In a nutshell, the program has bought together world class international and local expertise and given us fresh insight to what drives the performance of our trout fisheries and, what's holding it back.

The summer of 2013/14 was one of the hottest on record and whispers of poor trout fishing, even in our most iconic rivers, grew to a chorus. This concern gave rise to the Wild Trout Fisheries Management Program, an 8 point plan with a mix of science, monitoring, angler engagement and stocking. Funding was secured through Recreational Fishing licence fees and State Government initiative program after unprecedented support from no less than 18 trout friendly organisations.

Here are some of the highlights from the first 2 Talk Wild Trout conferences:

Wild trout health report cards

River	2015	2016
Aire River	Excellent	-
Dargo River	Moderate	Good
Upper Goulburn River	Good	Moderate
Howqua River	Very good	Excellent
Jamieson River	Moderate	Low
Kiewa River	Excellent	Excellent
King River	Good	Good
Mitta Mitta River	Excellent	Very good
Nariel Creek	Low	Good
Ovens River	Recovering	Moderate
Toorongo River	Excellent	-
Yarra River	Good	-
Barkly River	-	Very good
Merri / Hopkins Rivers	-	Excellent
Morass Creek	-	Very good

Over two years (2015 & 2016), the trout population "health status" of 15 of our most popular trout rivers and streams were surveyed. Each fishery was scored against key health indicators including; evidence of recent breeding, presence of multiple year classes and presence of mature fish. By pooling these indicators, overall trout fishery performance ratings were established - recovering, low, moderate, good, very good & excellent. The outcomes of this assessment are shown in table 1. Results to date suggest trout populations are seasonally dynamic and responsive to changing environmental conditions. Based on these surveys and past research, trout populations are vulnerable to catchment scale impacts e.g. climate, bushfires and floods, but tend to bounce back after a few years, when more favourable conditions return. The number of wild trout fisheries surveyed that were good or better (good, very good or excellent) in 2015 was 66% and in 2016 was 75%. Two fisheries in 2015; Ovens River (recovering) and Nariel Creek (low) both showed signs of recovery after 12 months.

Trout and climate variability

In 2015 we found East / West flowing river, such as the Delatite, Howqua and Jamieson Rivers receive more sunlight and tend to me be warmer, particularly where riparian shading is lacking. Water temperatures in the lower reaches of these and other rivers in the height of summer were up to 29 Degrees Celsius - well over the thermal tolerance of trout. It's no wonder trout fishing declined in these reaches as temperature stressed trout stop feeding, lost condition, move upstream or, after prolonged exposure, died. Acoustically tagged trout in the Delatite River showed a tendency for larger trout to move upstream when water temperatures exceeded 22 Degrees Celsius. These observations reinforce the critical role that riparian shading play in keeping water cool enough for trout.

Climate change modelling suggests the range of our Victorian wild trout fisheries may decline by as much as 50% over the next 20 years. This means less trout in the warmer lower reaches of our once iconic trout streams. Strategic replanting to provide shade along rivers may to some extent offset these trends – even a few degrees can make a big difference. We found there is growing global concern about trout fishery response climate variability. In parts of Canada, for example, fishing for trout is banned when temperatures are high to avoid losses from post catch release.

Figure 1 – There is growing international concern about the vulnerability of trout to climate variability.

Figure 2 – Victorian trout fishers (VRFish and Australian Trout Foundation) raising awareness of trout handling and vulnerability to hot weather.

Trout fishing pressure

Based on a 2014 study of summer campers in North East Victoria, harvest rates of trout were low and fishers were not significantly impacting trout populations i.e. exploitation rates were low (< 5%). Angler returns of high reward trout tags were also low (~ 3%) and compliance rates were very high. This study has just been repeated this summer – refer presentation by Kylie Hall.

Trout stocking trials

Over two years (2015 & 2016), a total of 20,000 fin-clipped yearling brown trout were stocked in two rivers; the Upper Goulburn and Howqua Rivers. Follow up electro-fishing surveys, covering 17.5 kilometres, found a total of only 11 stocked (fin-clipped) trout. While this result was disappointing, our review of similar Victorian, interstate and international trout stocking trials suggested these results were not unexpected. Researchers propose stocked trout didn't survive in numbers and contribute to the fishery because hatchery reared trout are outcompeted for

space and food by resident wild trout. Hatchery trout are conditioned to swim in large schools, in fast flowing raceways and feed off the surface as high energy pellets routinely rain down on them. If stocked trout adopt these behaviours when released they are likely to lose condition, and be less effective in finding natural live feed. There are a number of other possible explanations for the poor return form stocking trials. We look forward to seeing the results of the 3 year of the trial – refer Wild Trout 2017 presentation Hui King Ho.

Anglers getting involved

In 2015, we heard about the wonderful work of Trout Unlimited to protect, reconnect, restore and sustaining trout fisheries in the United States. With more than 150,000 members donating 600,000 hours each year, this story was inspirational. In 2016, we heard from April Vokey, renowned angler conservationist and fishing journalist about her overseas experience in advocating for local angler action to restore fish habitat. April was also curious about why fishers weren't more actively targeting Australian great native fish species. Her key message was the need for a more integrated approach to angling and environmental advocacy.

Victorian trout fishers, angling clubs and representative organisations have rallied behind the Wild Trout Fishery Management Program. Over the last few years more than 100 trout fishers from dozens of clubs and associations have rolled up their sleeves and planted trees along trout rivers to provide future shading. Trout fishers are now working directly with Catchment Management Authorities to identify, plan and be a part of fish habitat restoration works. Trout fishers have driven or supported several large Recreational Fishing Licence funding grants to undertake major riparian and in stream works on some of our most iconic trout rivers. Fishers have also spent time at the Snobs Creek hatchery marking trout for stocking trials. As agency staff and trout fishers work side by side to strip brood fish, fin clip trout, help liberate stocked fish and attend meetings, a genuine partnership approach has evolved.

Angler interest and support for the program has been the catalyst for the establishment of **Angler Riparian Partnership Program** (ARPP) which now operates across 9 Catchment Management regions with around $1 million dollars over 4 years. The ARPP is gaining momentum as anglers get more involved.

More than 100 trout fishers have volunteered their time to plant stream side trees in the last year.

Trout fishers at Snobs Creek lending a helping hand.

Wild Trout Fisheries Management Program – Phase 2

Buoyed by the positive feedback of the Wild Trout Fishery Management Program, a bid to extend the program a further two years has been successful. The focus of this phase 2 stage is to:

1) Monitor and assess the performance of priority wild trout recreational fisheries in the face of challenging climate trends,

2) Share key information with anglers about the performance of our highly valued wild trout fisheries to inform fishing choices (where to fish) and improve fishing outcomes, and,

3) Evaluate the effectiveness of the Scotty Jordan incubators as a recovery strategy to enhance depleted wild trout fisheries.

Trout fishers and Government resource managers working side by side to understand and improve trout fisheries.

Your fishing licence fees at work

Factors impacting on our wild trout fisheries

John Hayes
Cawthron Institute, New Zealand

Australia and New Zealand share a common history of trout introductions from the northern hemisphere. These temperate species established wild self-sustaining populations wherever cool water and other factors vital to their wellbeing were provided by rivers and lakes in these foreign, southern lands.

Because these charismatic species are so highly valued, they are among the most studied fish in the world. For that reason, their environmental requirements and behaviours are well known and it has been possible to create sophisticated models that predict how trout may respond to changes in some environmental variables.
I presented an overview of those environmental requirements and of drift foraging behaviour. I summarised bioenergetics (energy requirements) and drift-foraging models that predict how trout growth rate and abundance respond to temperature, food supply, flow, and turbidity. Because temperature in particular is likely to be limiting trout populations in Victoria, I used these model predictions to illustrate how sensitive the trout's energy balance is to this master variable. These insights reveal that it is not just lethal temperature tolerances of trout that should be of concern to anglers and fishery managers but also apparently sub-lethal temperatures which interact with the food supply to limit growth potential and survival.

Theme 1 - Deeper Understanding

How healthy are wild trout populations in Victoria's wild trout fishery? Year 3

Jason Lieschke
Arthur Rylah Institute, DELWP

Aim:

To determine the health of wild trout populations in 12 priority rivers across the state.

Overview:

Annual population surveys increase our understanding of trout population trends and health indicators (e.g. breeding, recruitment, growth and condition of fish). This information helps anglers decide where to fish and enable more responsive and targeted fisheries interventions — should they be needed.

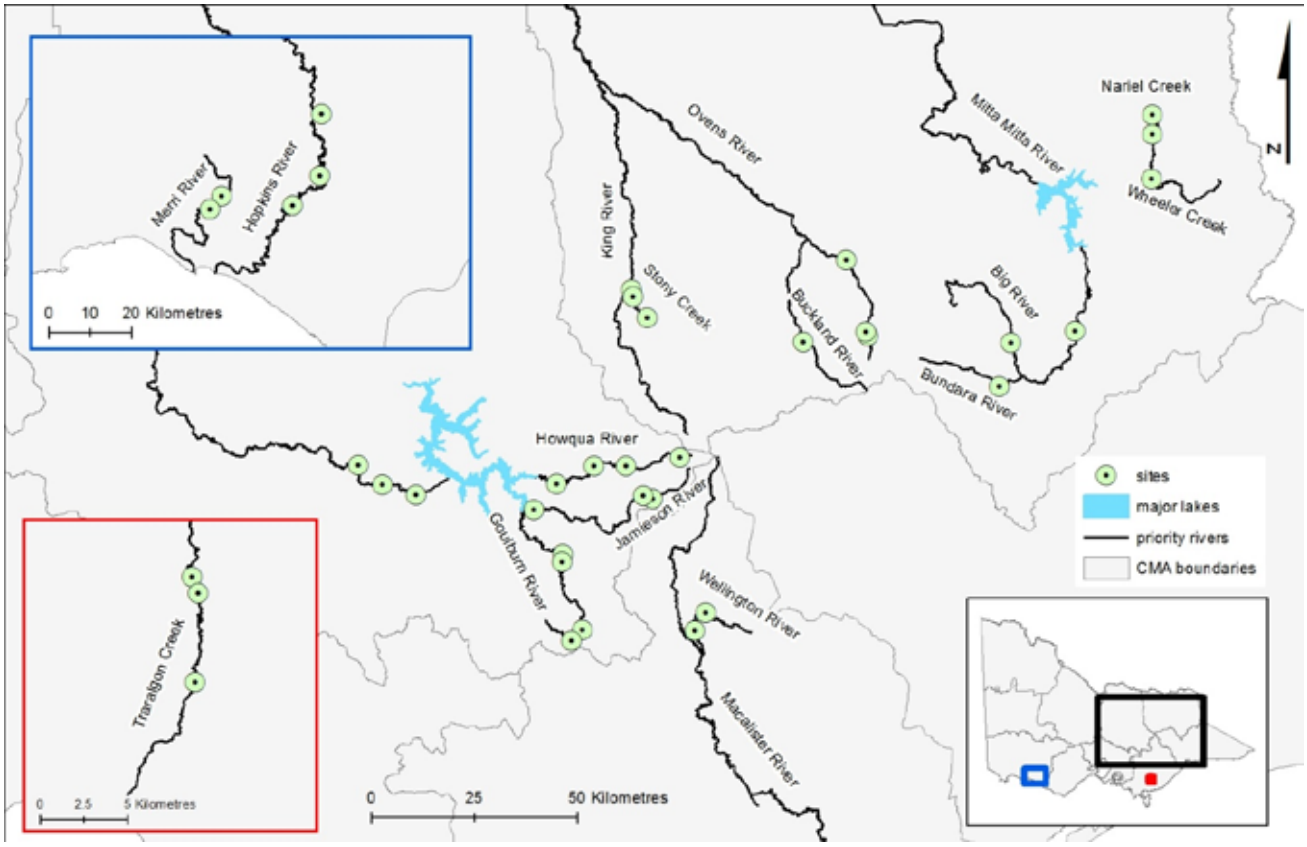

Figure 1. Location of the 12 priority rivers and the 37 sites surveyed across Victoria in 2017.

What did we do?

A total of 37 sites across the 12 priority rivers were identified, and then surveyed between 30 January and 10 May 2017. Sampling methods were consistent with previous surveys; smaller streams were surveyed with a backpack electrofisher for approximately 90 minutes. This generally resulted in 200 m of stream fished, depending on stream conditions (width, depth, etc.). Larger sites were fished using an electrofishing boat for approximately 60 minutes. Some sites were fished with a combination of boat and backpack electrofishing, depending on site conditions. A bank-mounted electrofisher replaced the backpack in the Merri and Hopkins rivers, due to elevated conductivities (salinity levels).

What did we learn?

A total of 986 trout were surveyed with 629 measured for length. Brown trout were the most dominant trout species, contributing 66% (648) of the trout collected. Brown trout were also consistently larger (up to 55 cm) than Rainbow trout (up to 37 cm) (Figure 2). Young-of Year (YOY) Rainbow trout were smaller in size than the YOY Brown trout, as indicated by the abundance of Rainbow trout <8 cm's compared to Brown trout < 12 cm's (Figure 2).

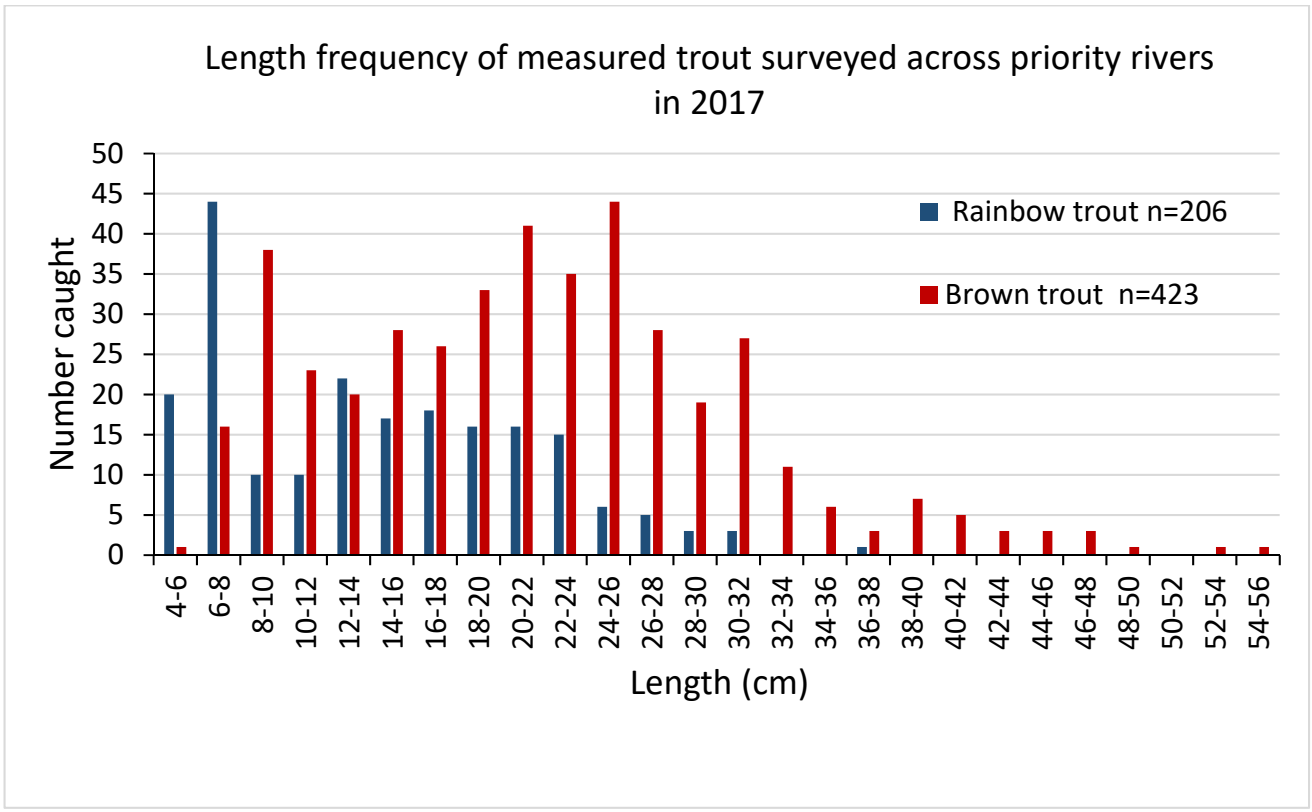

Figure 2. Length frequency of measured trout across Victoria in 2017.

Comparison between 2015-2017 survey results (all rivers combined):

- Less Brown and Rainbow trout were caught during 2017 than during 2015 and 2016, however this was largely driven by low abundances of fish in the Wellington River and Stony creek (Table 1).
- The maximum sizes for Brown trout was similar between all three years, with one individual Rainbow trout larger than previously captured.
- The number of Brown trout over 20 and 40 cm was also similar between years. The number of Rainbow trout greater than 20 cm decreased from 2016, but was similar to 2015.
- No Rainbow trout has been recorded 40 cm or above in all three years.
- When comparing the lengths of Brown trout captured between years, there was a much higher abundance of YOY (4-12 cm's) captured in 2016 compared to 2015 and 2017 (Figure 3). There was also less 4-12 cm Rainbow trout in 2017 compared to 2015 and 2016.

Table 1. Abundance of trout captured in 2015-2017 with maximum size and abundances greater than 20 and 40 cm.

Brown trout	2015	2016	2017
Number of Brown trout surveyed (measured)	804 (766)	1198 (895)	648 (423)
Maximum size Brown trout captured	55	54.5	55
Number of Brown trout over 40 cm's	12	16	17
Number of Brown trout over 20 cm's	302	288	271
Rainbow trout			
Number of Rainbow trout surveyed (measured)	441 (345)	363 (317)	338 (206)
Maximum size Rainbow trout captured	32	31	37
Number of Rainbow trout over 20 cm's	54	77	49

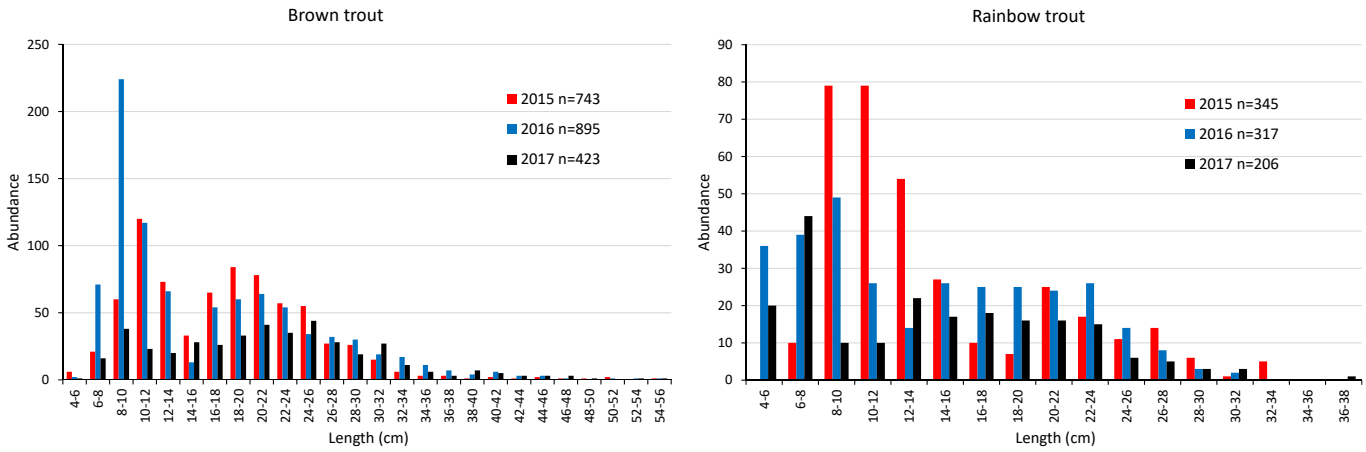

Figure 3. Comparison of abundances of lengths of trout measured across Victoria from 2015-2017.

Comparison between 2015-2017 survey results (repeat rivers only - six rivers with all three years data):
In summary, the following section relates to the six priority rivers (21 sites) surveyed in all three years (i.e. 2015, 2016 and 2017). These are the Goulburn, Howqua, Jamieson, Mitta Mitta (including Big and Bundara rivers), Nariel (including Wheeler Creek) and Ovens (including Buckland River) rivers. Brown trout abundance was highest in 2017 in the Goulburn and Jamieson catchments, and lowest in the Ovens and Mitta Mitta catchments (Figure 4). Brown trout were more abundant in the Mitta Mitta, Nariel and Ovens rivers in 2016 compared to 2015 and 2017. Brown trout abundance in the Howqua River was similar between 2016 and 2017, which were both higher than 2015.

More Rainbow trout were caught in the Goulburn catchment in 2017 compared to 2015 and 2016. Rainbow trout abundance was consistent in the Howqua, Jamieson, Mitta and Ovens rivers, with abundances similar for all three years. The Nariel system had 6-7 times more Rainbow trout present in 2016 compared to 2015 and 2017.

The length frequency distribution of Brown trout indicates that a much higher proportion of YOY fish were captured in 2016, with the lowest numbers of YOY captured in 2017 (Figure 5). The 2016 high winter/spring flows may have impacted on 2017 recruitment success. More fish over 30 cm were captured in 2016 and 2017 compared to 2015. The length of YOY Rainbow trout were larger in 2015 compared to 2016 and 2017.

The abundance of Brown trout >20 cm in the six repeated rivers was similar between years, though slightly higher in 2017, whereas the abundance of Brown trout > 30 cm was highest in 2016 and marginally lower in 2017 compared to 2015 (Figure 6). The abundance of Rainbow trout > 20 cm from the six repeat rivers was highest in 2017 and lowest in 2015, but the abundance of Rainbow trout > 30 cm was lowest in 2016, but similar in 2015 and 2017.

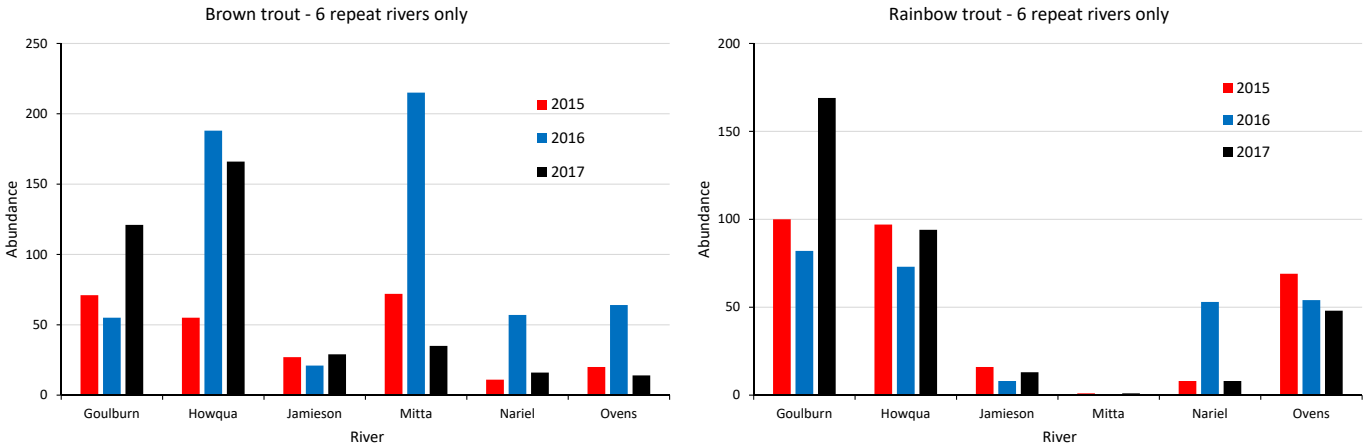

Figure 4. Comparison of abundances of trout measured for the six repeat rivers from 2015-2017.

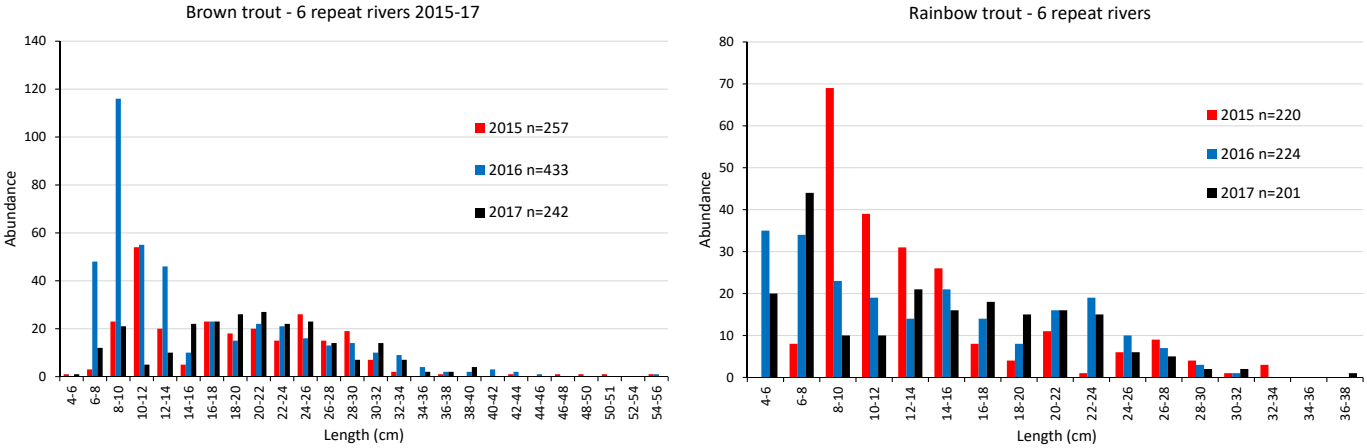

Figure 5. Comparison of length frequency of trout measured from the six repeat rivers from 2015-2017.

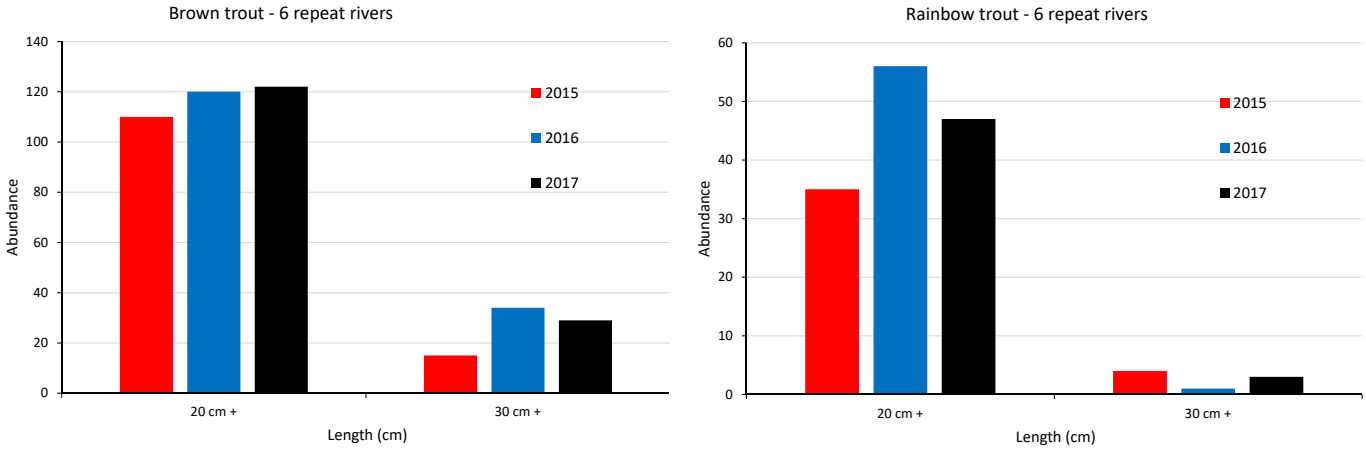

Figure 6. Number of trout above 20 and 30 cm from the six repeat rivers from 2015-2017.

Key findings

2017 findings

- There was evidence of Brown trout recruitment from 2017 spawning in six of the 12 priority rivers. This is much lower than previous years, but different streams were surveyed (including background data for the incubator trials);
- No Brown trout recruitment was recorded at Stony Creek, Hopkins, Merri, Nariel, Ovens or Wellington rivers; The Nariel and Ovens rivers had low levels of recruitment in 2015.
- Low levels of Brown trout recruitment were found in the Jamieson River (first time in 3 years!);
- There was Rainbow trout recruitment from the 2017 spawning in four of the seven priority rivers in which they were recorded;
- No Rainbow trout recruitment was recorded in the Goulburn River tailrace, Mitta or Nariel rivers;
- The Goulburn and Howqua rivers and Traralgon Creek all had at least one site with > 50 Brown trout captured per 100 m surveyed;
- The size of the Rainbow trout recruits was smaller in 2016 and 2017 compared to 2015 (indicating delayed spawning or reduced growth rates;
- The Goulburn River had one site with > 50 Rainbow trout captured per 100 m surveyed (with Howqua similar at 44);

2015-16

- Overall, Brown trout recruitment was stronger in 2016 compared to 2015 and 2017;
- Generally, trout were in higher abundances at the higher altitude sites (similar to 2015 and 2016);
- The 2016 winter/spring was a better year for catching wild trout (angler feedback) but it may have impacted recruitment (compared to 2015 and 2016).

Next steps

- Monitor trout populations in 2018 in 6-7 priority rivers, including the incubator sites (see George and Douglas in these proceedings);
    - Incubator sites are Jamieson River, King River (Stony Creek) and Traralgon Creek;
    - Other priority river sites are Goulburn and Howqua (Stocking sites), Delatite and Buckland rivers.

Health cards for 10 wild trout streams 2017

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Aim:

Produce health cards for each of our monitored streams to assess the past and current health of our wild trout streams.

Overview:

The information in these *Health cards* is aimed to give the reader a better understanding of the health of particular trout streams now and into the future. It is hoped the health cards will also provide some information useful for your future trout fishing adventures.

The information provided on the *Health cards* is based on recent and past survey information collected using electro-fishing methods. Electro-fishing is an effective sampling tool for providing a snapshot of the presence and abundance of fish present in a stream. However, electro-fishing is not perfect and does not catch all the fish present. For example, some studies suggest electro-fishing catches around 28% of trout present at a site, and not all habit is fished (or fishable), particularly in larger streams, such as the Goulburn River tailrace. Often fish are observed but cannot not caught. Therefore, the numbers of fish presented in the *Health cards* should be considered a underestimate. ***There are likely to be many more fish in the system available to fishers, than just those recorded in the surveys!***

It is also important to remember that trout populations vary widely and trout are a resilient species. Some streams support large populations and others support small populations, depending on the carry capacity of the stream. Some streams have lots of small fish and others have few big fish. Streams that fished poorly last year may fish well the next season, or vice versa. Fluctuation is normal in fish populations and trout are particularly good at responding to their environment. These *Health cards* provide a snapshot insight into the current health of a variety of trout populations in Victoria.

What we did:

Between late January and early May 2017, 10 trout streams (Table 1) were surveyed using electro-fishing methods, which are described by Lieschke *et al* (2017), in this document). Two to five sites were surveyed in each stream, and 130 - 1,600 m of stream was surveyed at each site (0.55– 3.4 km per stream). The length of trout caught was measured and their abundance (number of trout caught per 100 m of stream) was estimated. These results were compared with surveys conducted in previous years as part of the *Wild Trout Wild Trout Fisheries Management Program* (Hunt and Lieschke 2015, Hunt and Lieschke 2016) (Appendix I), and historic electro-fishing surveys of the streams conducted by fisheries scientists This information was then summarised into a *Health card* for each stream, and key health indicators assessed.

How to read the *Health cards*:

The green **Key Health Indicators** box provides an easy to read overall evaluation of key health attributes of the trout population in the stream and an overall rating, which are:

Abundance (fish/100 m):	⇧	Up compared to historic records collected over at least three years.
	⇩	Down compared to historic records collected over at least three years.
	⇔	Stable compared to historic records collected over at least three years.
	?	Insufficient information.
Recent recruitment:	✓	Good numbers of small trout < 12 cm (5 inches)[1] present, indicating that trout have spawned recently (last 12 months) (or that a stocking event has recently occurred).
	Some	Some small trout < 12 cm (5 inches) present.
	✘	No small trout present
Multiple size classes:	✓	Wide range of fish sizes present indicating multiple year classes present in the stream.
	Some	Some size classes present.
	✘	Very few size classes present.
Mature fish:	✓	Trout > 30 cm (12 inches)[2] present, indicating mature fish capable of spawning are present in the stream.
	Some	Some trout > 30 cm (12 inches) present.
	✘	No trout > 30 cm (12 inches) present.
Overall rating:	**Low**	**Moderate** **Good** **Very good** **Excellent**

1. Indicative size only as growth of juvenile trout may vary between streams and years.
2. Indicative size only as size at maturity varies between species, streams and years.

The pink **Monitoring Results** section provides a summary the fish surveys conducted in the stream, including the number of brown trout and rainbow trout caught and their abundance (fish per 100 m), the size of the largest trout caught, the percentage of trout that were over 20 cm in length (defined as catchable), and the abundance and average size of trout over over 20 cm in length. All abundance estimates for current and historic data are derived from fish caught only, and excludes fish that were observed but 0.5not caught.

The map shows the locations of each survey site and abundance of trout sampled at each survey site.

The second page of the card provides important information about the shape of the population (size structure) of the trout population in the stream and the relative abundance compared with previous surveys. Information is also presented on recent stocking events in the streams surveyed in 2017 (see Appendix II for details). Finally, a simple overview summary statement of the *Health card* report is provided.

What we found:

A summary of the key health indicators for the 10 wild trout streams surveyed in 2017 and overall ratings for these streams from 2016 and 2015 surveys are provided in Table 1. In 2017, three streams had an overall rating of Excellent, One Good, three Moderate and three Low.

Trout abundance

A summary of trout abundance records for all sites surveyed in streams as part of the *Wild Trout Wild Trout Fisheries Management Program* (2015-2017), along with historic records back to 1997 for these streams, is presented in Appendix III. Abundances range from <1 trout/100m to 130 trout/100m, with few records (20%) being >20 trout/100m. Abundance estimates for surveys conducted in 2017 are provided in Figure 1.

Trout abundance estimates for the upper Goulburn River and Howqua Rive were up compared to historic records while the abundance estimate for the Howqua River was similar to historic records. However, in four other streams the abundance estimates were generally down on previous years and historic records (Table 1).

Brown trout were caught in all streams surveyed. Rainbow were not caught in the Merri and Hopkins rivers, Traralgon River and Wellington River. Abundance estimates in the streams surveyed in 2017 were generally higher for brown trout than rainbow trout, with the exception of upper Goulburn River and the Ovens River. For brown trout abundance was greatest in Howqua river (average 20.2 fish per 100 m), which was due to an

exceptionally high catch at the Bindaree site (71 fish per 100 m) (Figure 1). For rainbow trout the higher abundance was recorded in the upper Goulburn River (average 20.8 fish per 100 m), with an exception catch from the Johnson Hill Track site (79 fish per 100 m) (Figure 1).

Stony Creek was surveyed, but no trout were caught, and no historic records are available.

Trout size range

The size (length) of brown trout and rainbow trout caught during surveys conducted in 2017 is provided in Figure 2

The highest average length of brown trout was observed in the Hopkins and Merri rivers (31 cm, 12 inches), followed by the Goulburn River tailrace (27 cm, 11 inches) (Figure 2). The largest brown trout measured (55 cm, 22 inches) was also caught in the Hopkins and Merri rivers. The highest average length of rainbow trout was observed in the Nariel Creek system rivers (24 cm, 9.5 inches), followed by the Goulburn River tailrace (22 cm, 8.5 inches) (Figure 2), but the largest measured (37 cm, 14.5 inches) was caught in the Howqua River (Figure 2).

Length weight relationships for brown trout and rainbow trout are provided in Appendix IV.

Table 1. Summary of key health indicators for 10 wild trout streams surveyed in 2017 (excludes Stony Creek where no trout were caught), and overall ratings for these streams from 2016 and 2015 surveys.

	2017 Results					2016	2015
Stream	**Abundance**	**Recent recruitment**	**Multiple year classes**	**Mature fish**	**Overall rating**	**Overall rating**	**Overall rating**
Goulburn River tailrace	⇩	**Some**	✓	✓	**Moderate**		
Upper Goulburn River	⇧	✓	✓	**Some**	**Good**	**Moderate**	**Good**
Howqua River	⇧	✓	✓	✓	**Excellent**	**Excellent**	**Very good**
Jamieson River	⇔	**Some**	✓	✓	**Good**	**Low**	**Moderate**
Merri and Hopkins Rivers	?	**Some***	✓	✓	**Excellent**	**Excellent**	
Mitta Mitta River system	⇩	✓	✓	✓	**Good**	**Very good**	**Excellent**
Nariel Creek system	⇩	✘	✓	✓	**Low**	**Good**	**Low**
Ovens River system	⇩	✓	✓	✓	**Moderate**	**Moderate**	**Recovering**
Traralgon Creek	?	✓	✓	✓	**Excellent**		
Wellington River	?	✘	**Some**	✘	**Low**		

* Recruitment may be due to recent stocking (Appendix II).

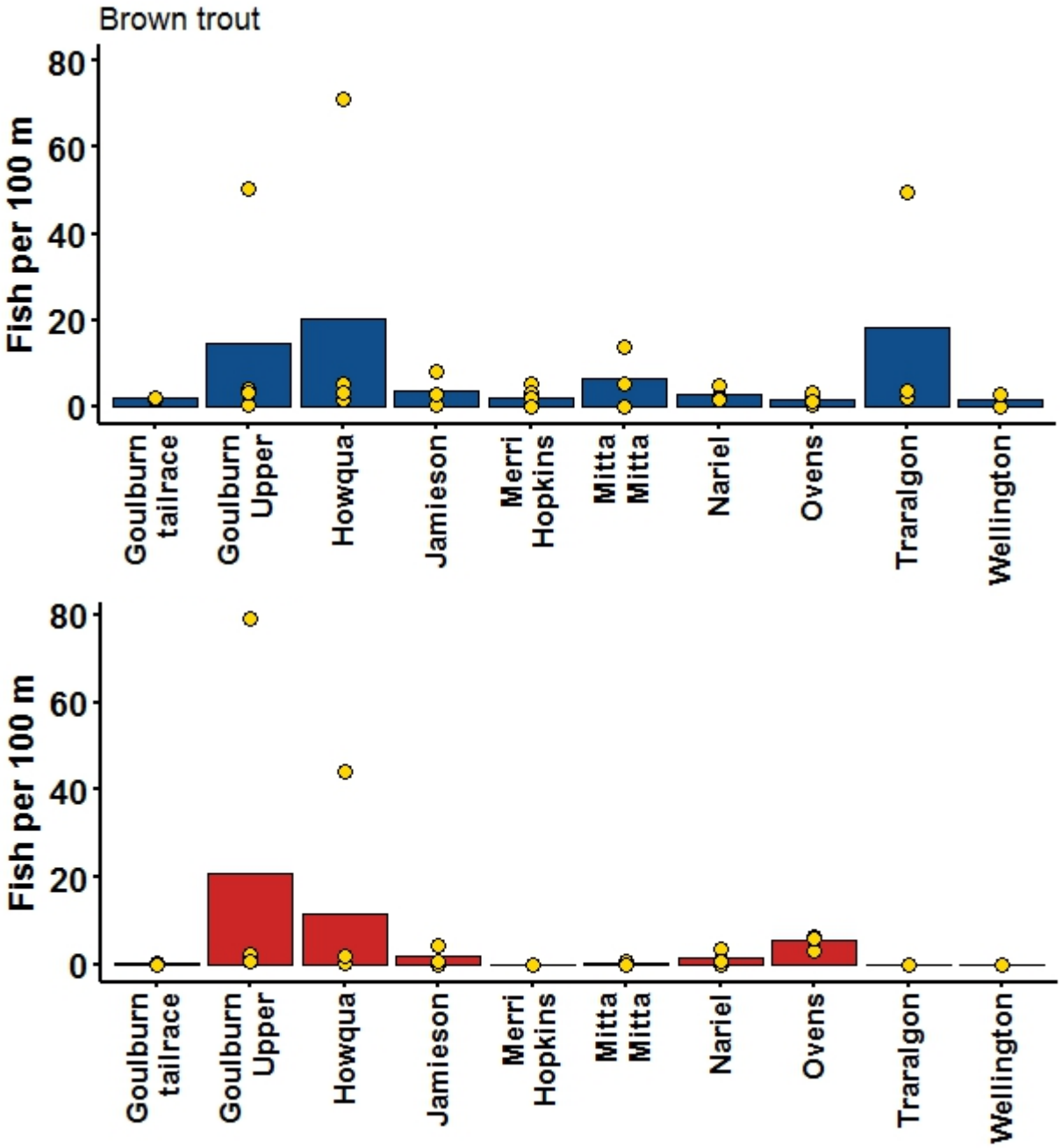


Figure 1. Abundance estimates of brown trout (upper) and rainbow trout (lower) caught during surveys of 10 wild trout streams. (Bars = average values. Dots = estimates for each site surveyed in each stream).

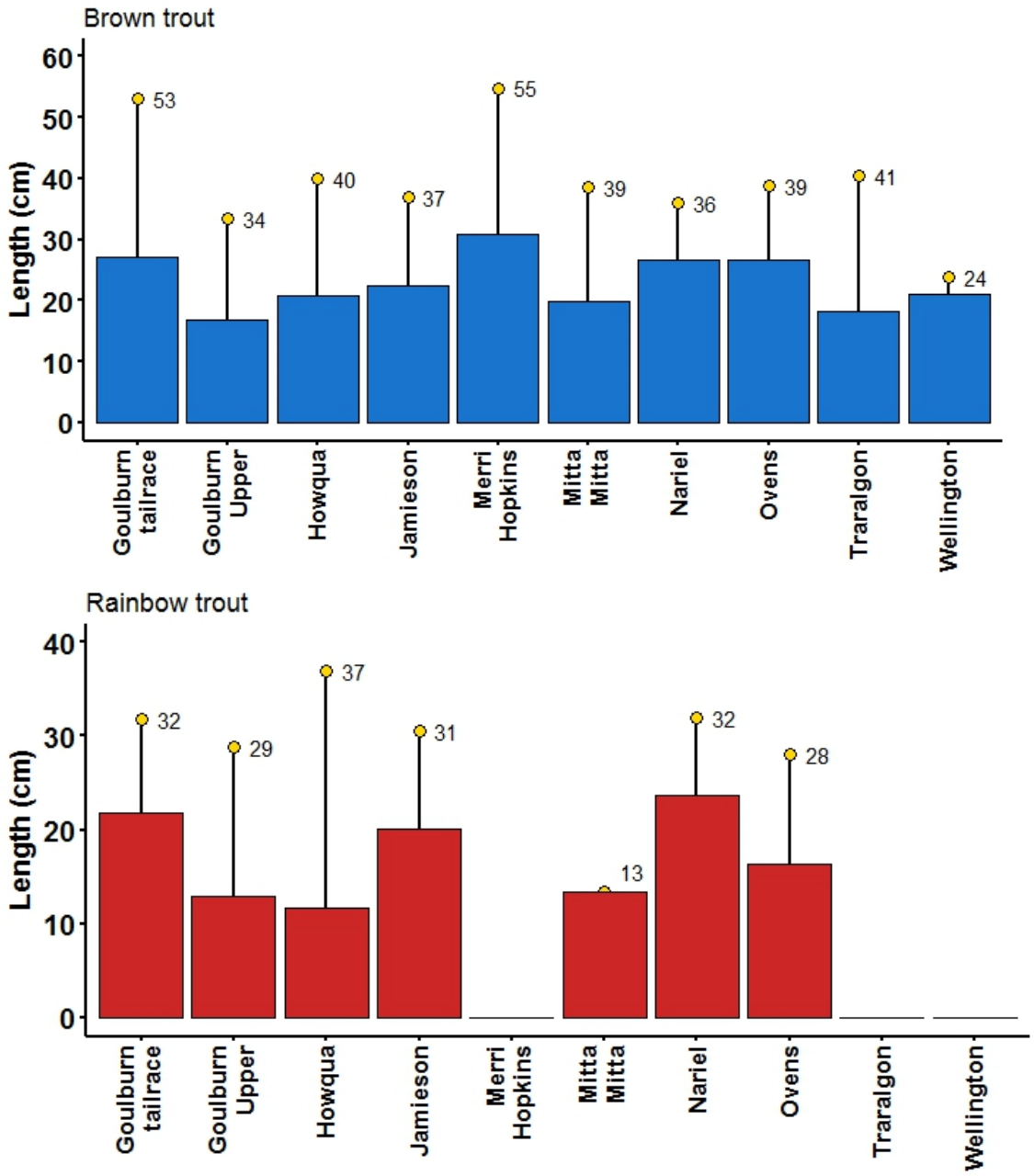


Figure 2. Length of brown trout (upper) and rainbow trout (lower) caught during surveys of 10 wild trout streams. (Bars = average values. Dots = Maximum length measured).

References:

Hunt, T. and Lieschke, J. (2015). Health cards for 12 of our best wild trout streams. In: *Talk Wild trout 2015: Conference Proceedings* (Hunt, T., Douglas, J. and Forster, A. eds.), pp. 14-38. Fisheries Victoria, Department of Economic Development Jobs Transport and Resources, Queenscliff.

Hunt, T. and Lieschke, J. (2016). Health cards for 12 of our best wild trout streams 2016. In: *Talk Wild trout 2016: Conference Proceedings* (Hunt, T., Douglas, J. and Forster, A. eds.), pp. 17-41. Fisheries Victoria, Department of Economic Development Jobs Transport and Resources, Queenscliff.

Location: Goulburn River tailrace

Surveyed: 8 - 9 May 2017

Site A: Maroondah Highway bridge on the Mid-Goulburn River (1,600 m stretch)

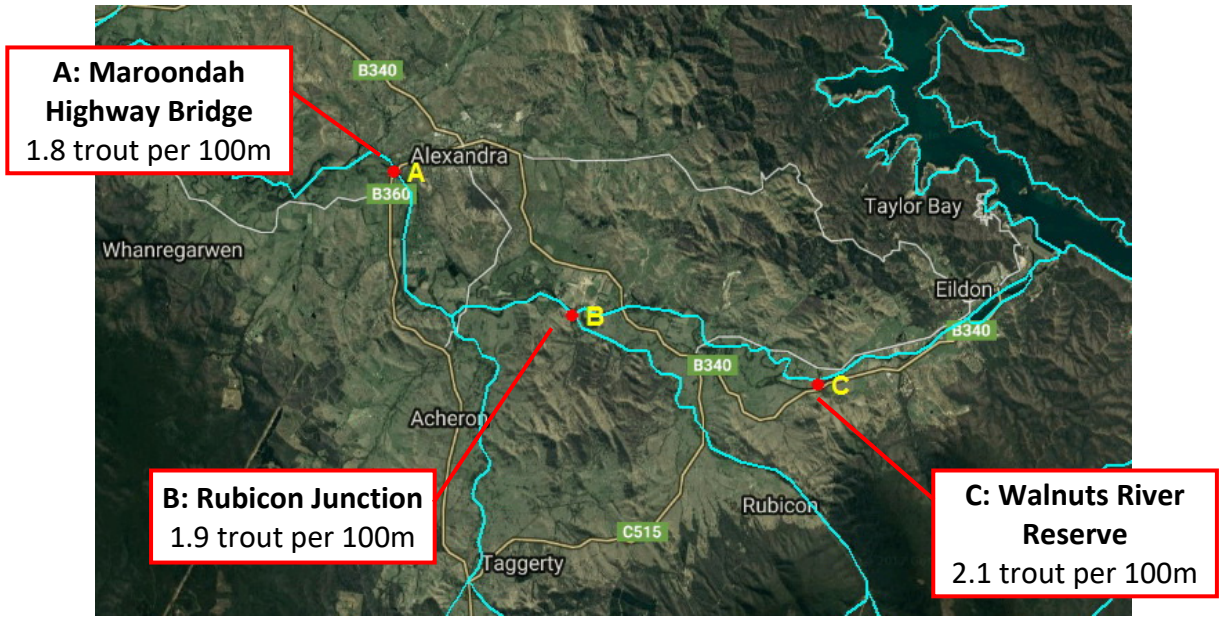
Site B: Rubicon Junction on the Mid-Goulburn River (700 m stretch)

Site C: Walnuts River Reserve on the Mid-Goulburn River (1,100 m stretch)

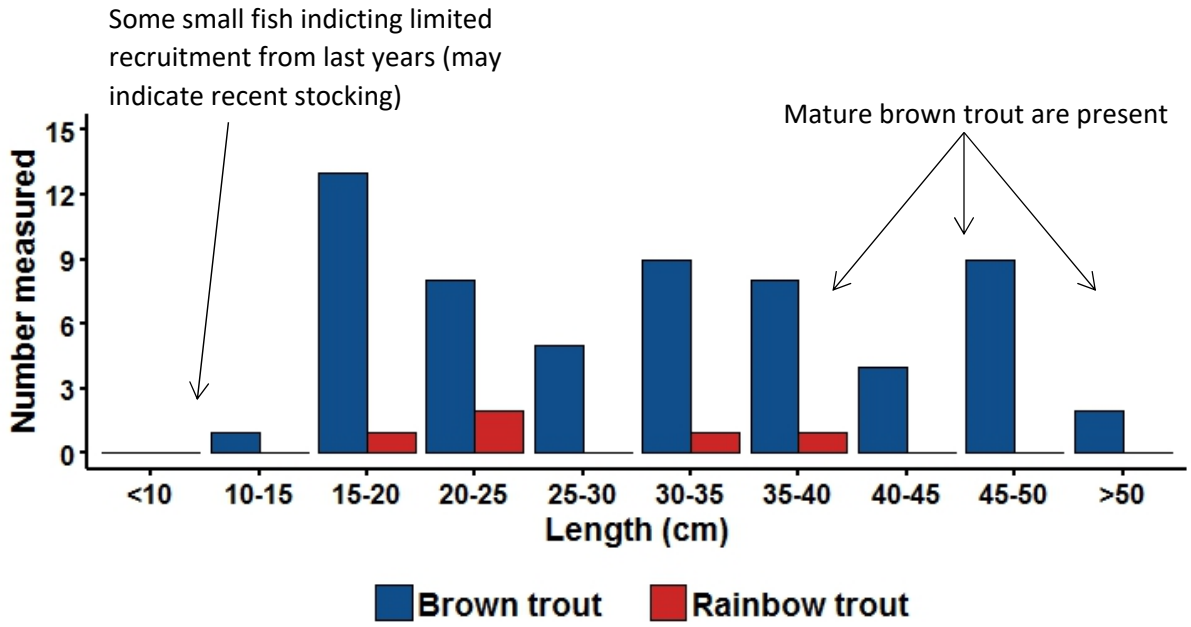
Key health indicators

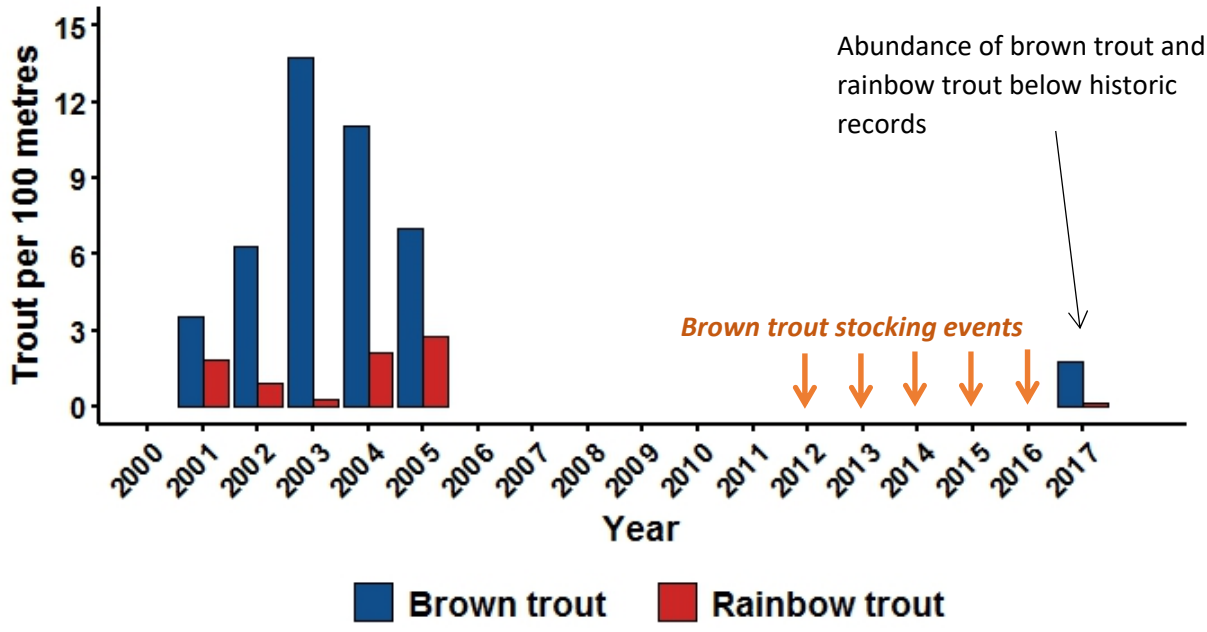
Abundance	⇩
Recent recruitment	Some
Multiple size classes	✓
Mature fish	✓
Overall rating	Moderate

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 3.4 km of river		59	5	64
Mean fish abundance (fish per 100 m)		1.8	0.1	1.9
Largest fish	Weight	1.5 kg (3.3 lb)	0.4 kg (0.9 lb)	1.5 kg (3.3 lb)
	Length	53 cm (21 “)	32 cm (12.5 “)	53 cm (21 “)
% of catchable (20 cm +) fish		59 %	40 %	58 %
Average size of catchable fish (20 cm +)		35 cm (14 “)	30 cm (12 “)	34 cm (13.5 “)
Abundance of catchable fish per 100 m		1.1	0.04	1.1
Other species present:	Australian smelt, common carp, Murray spiny crayfish and redfin perch			



Location: Goulburn River tailrace





The 2017 survey suggests the Goulburn River tailrace supports moderate numbers of brown trout and rainbow trout compared to historic records. There is limited evidence of recent recruitment, despite regular stocking, but mature fish capable of spawning are present.

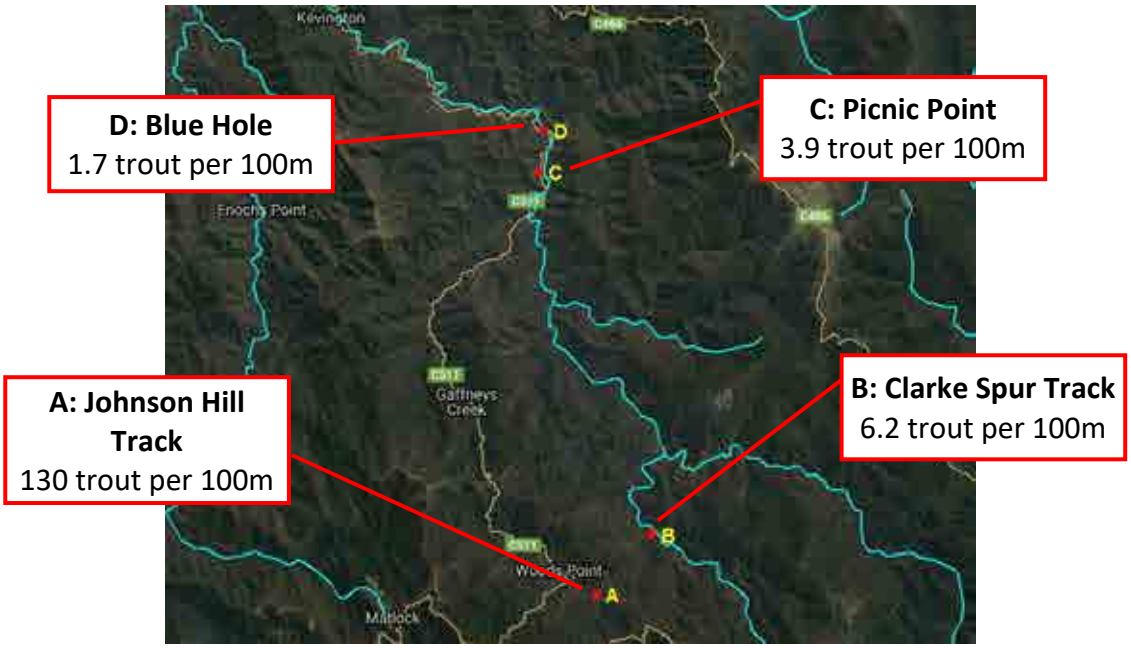
Location: Upper Goulburn River

Surveyed: 31 Jan. - 2 Feb. 2017

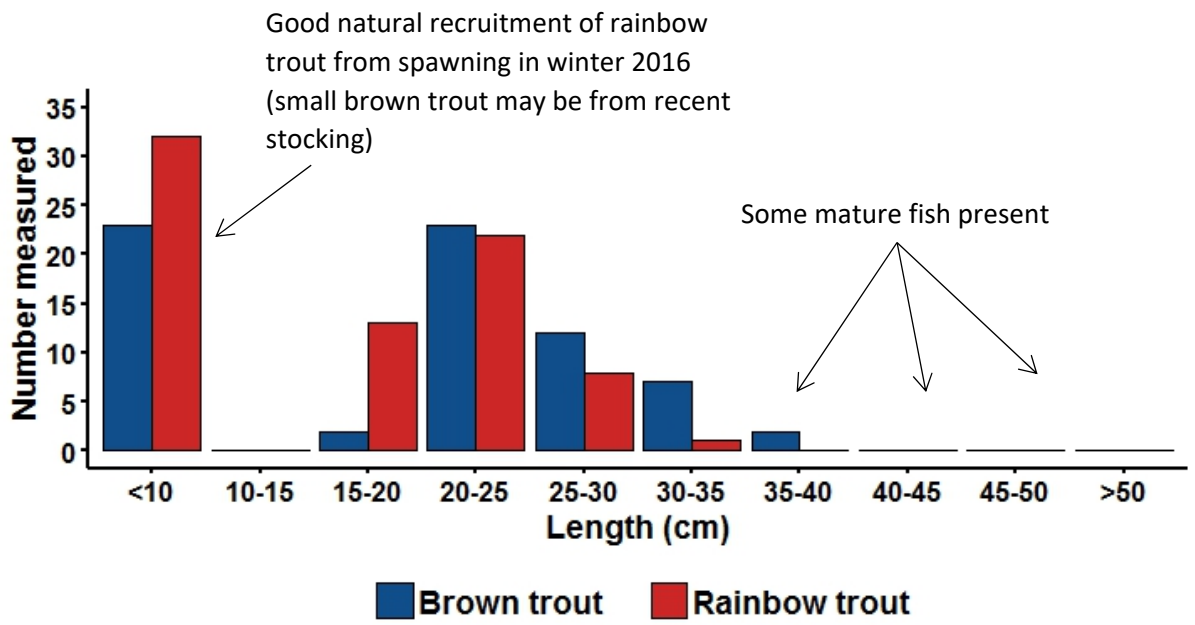
Site A: Johnson Hill Track on the Upper Goulburn River (200 m stretch)
Site B: Clarke Spur Track on the Upper Goulburn River (260 m stretch)
Site C: Picnic Point on the Upper Goulburn River (180 m stretch)
Site D: Blue Hole on the Upper Goulburn River (300 m stretch)

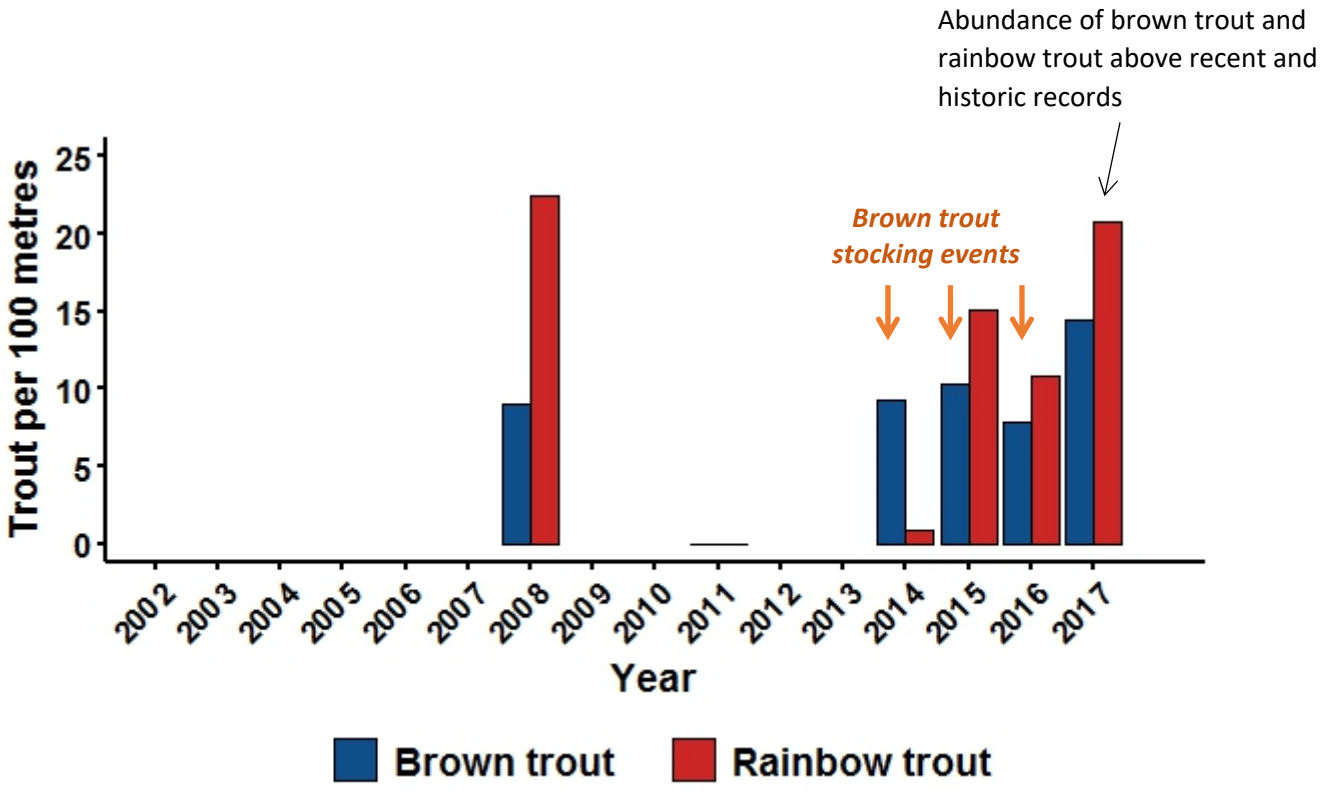
Key health indicators	
Abundance	⇧
Recent recruitment	✓
Multiple size classes	✓
Mature fish	**Some**
Overall rating	**Good**

Monitoring results		**Brown trout**	**Rainbow trout**	**ALL TROUT**
Total number of fish caught in 940 m of river		118	169	287
Mean fish abundance (fish per 100 m)		15	21	35
Largest fish	Weight	0.5 kg (1.0 lb)	0.3 kg (0.6 lb)	0.5 kg (1.0 lb)
	Length	33.5 cm (13 “)	29 cm (11 “)	33.5 cm (13 “)
% of catchable (20 cm +) fish		26 %	11 %	18 %
Average size of catchable fish (20 cm +)		25 cm (10 “)	22 cm (8.5 “)	24 cm (9.5 “)
Abundance of catchable fish per 100 m		3.9	2.3	6.3
Other species present:	2 spined blackfish, common carp, galaxiid minnows, Murray spiny crayfish, redfin perch and yabbies			



Location: Upper Goulburn River





The 2017 survey suggests the upper Goulburn River supports very good numbers of medium sized brown trout and rainbow trout, and there is evidence of recent recruitment.

Location: Howqua River

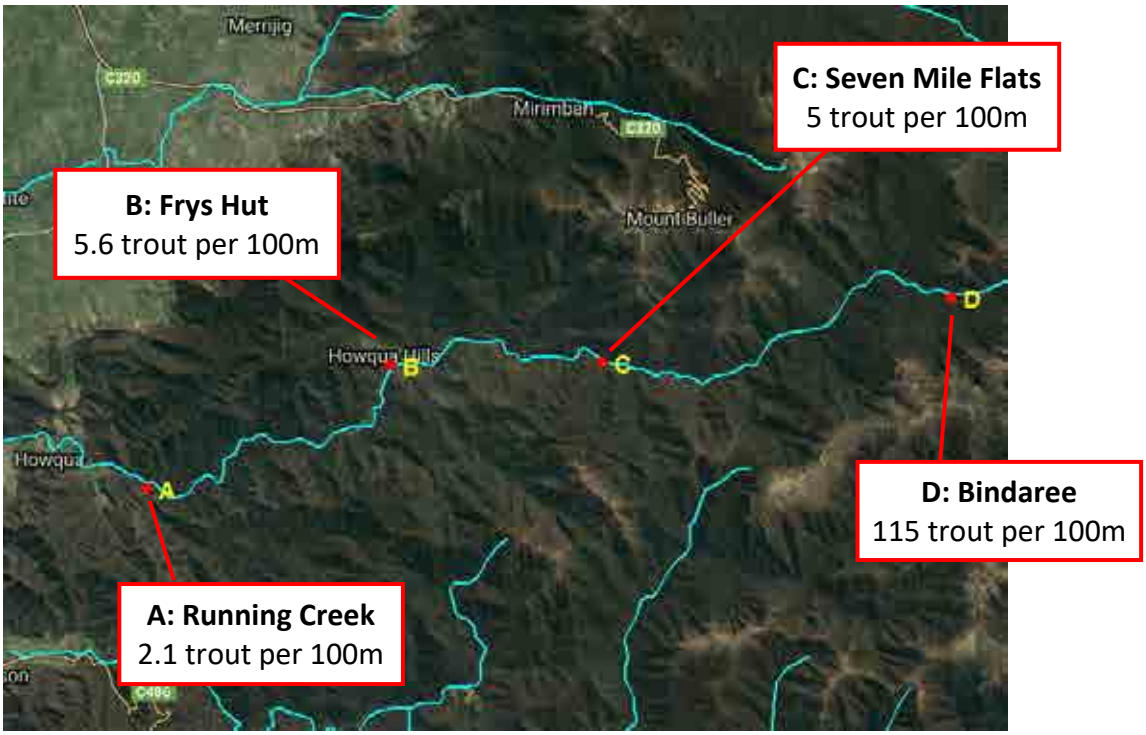
Surveyed: 30 Jan. – 3 Feb. 2017

Site A: Running Creek (290 m stretch)
Site B: Frys Hut on the Howqua River (250 m stretch)
Site C: Seven Mile Flats on the Howqua River (200 m stretch)
Site D: Bindaree on the Howqua River (200 m stretch)

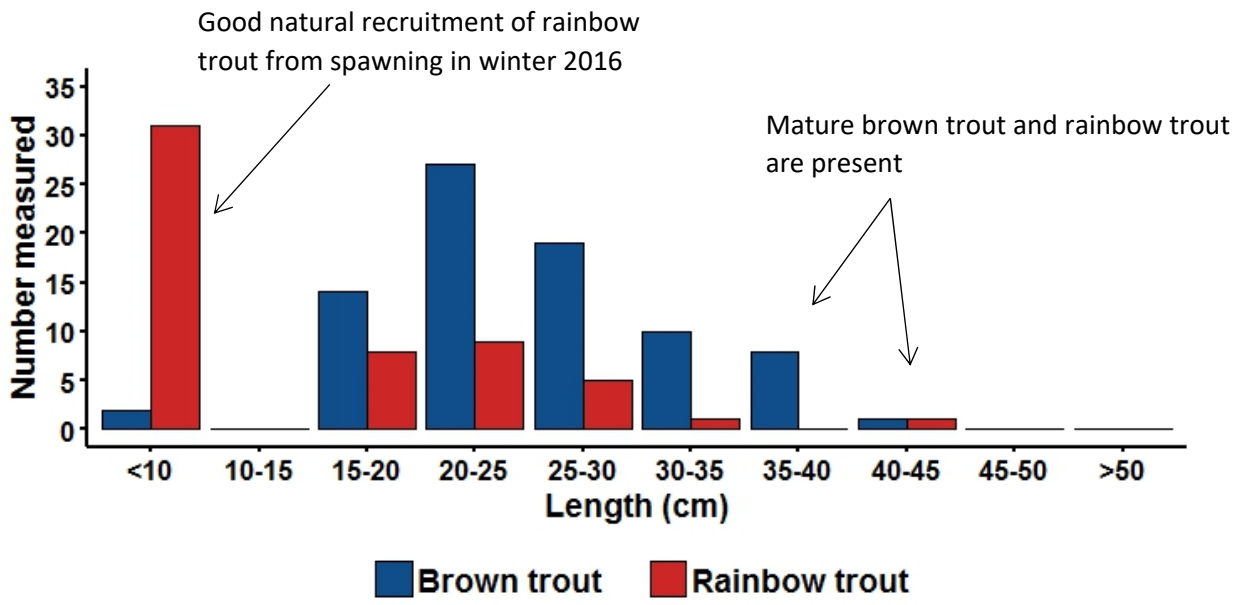
Key health indicators

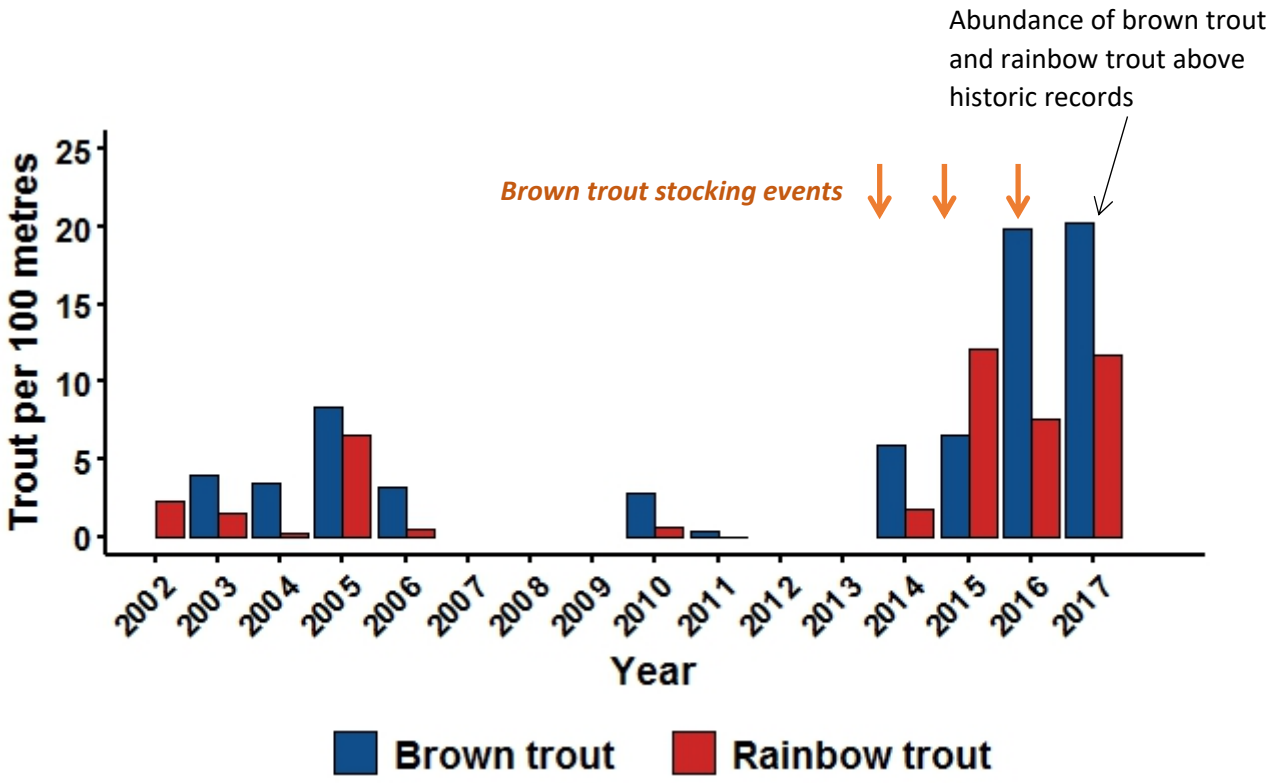
Abundance	⇧
Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall rating	**Excellent**

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 940 m of river		166	94	260
Mean fish abundance (fish per 100 m)		20	12	32
Largest fish	Weight	0.6 kg (1.3 lb)	0.5 kg (1.2 lb)	0.6 kg (1.3 lb)
	Length	40 cm (16 “)	37 cm (15.5 “)	40 cm (16 “)
% of catchable (20 cm +) fish		40 %	11 %	28 %
Average size of catchable fish (20 cm +)		26 cm (10 “)	25 cm (10 “)	26 cm (10 “)
Abundance of catchable fish per 100 m		8	1.3	9
Other species present:	2 spined blackfish, Australian smelt, common carp, galaxiid minnows, Murray spiny crayfish, redfin perch and yabbies			



Location: Howqua River





The 2017 survey suggests the Howqua River continues to support excellent numbers of medium sized brown trout and rainbow trout. Abundance is similar to 2016, but above historic records. Mature fish capable of spawning are present, and there is evidence of recent recruitment of rainbow trout.

Location: Jamieson River

Surveyed: 31 Jan. - 2 Feb. 2017

Site A: Jamieson Caravan Park on the Jamieson River (280 m stretch)

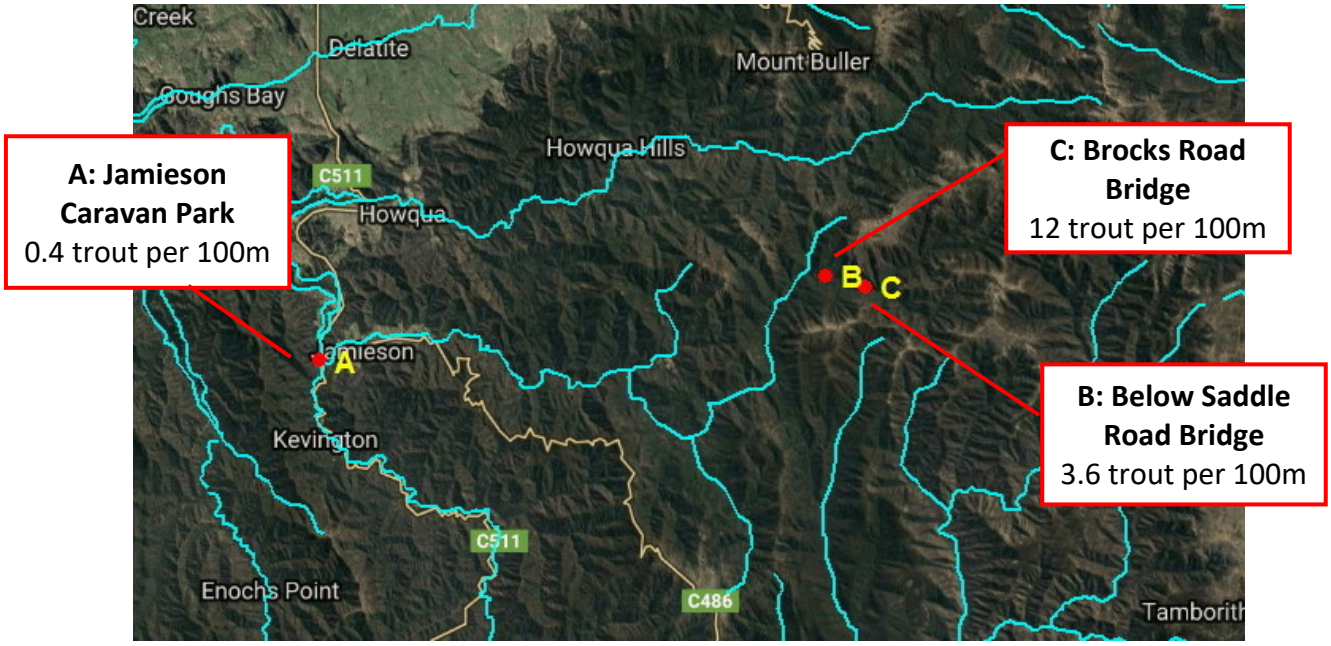
Site B: Below Saddle Road Bridge on the Jamieson River (220 m stretch)

Site C: Brocks Road Bridge on the Jamieson River (250 m stretch)

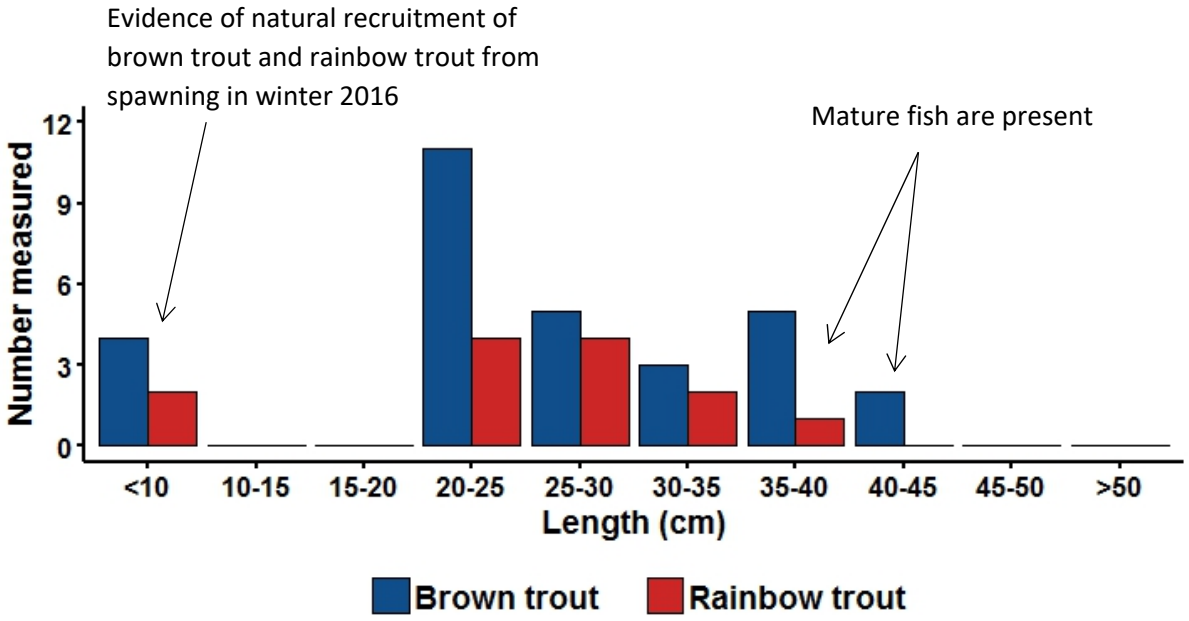
Key health indicators

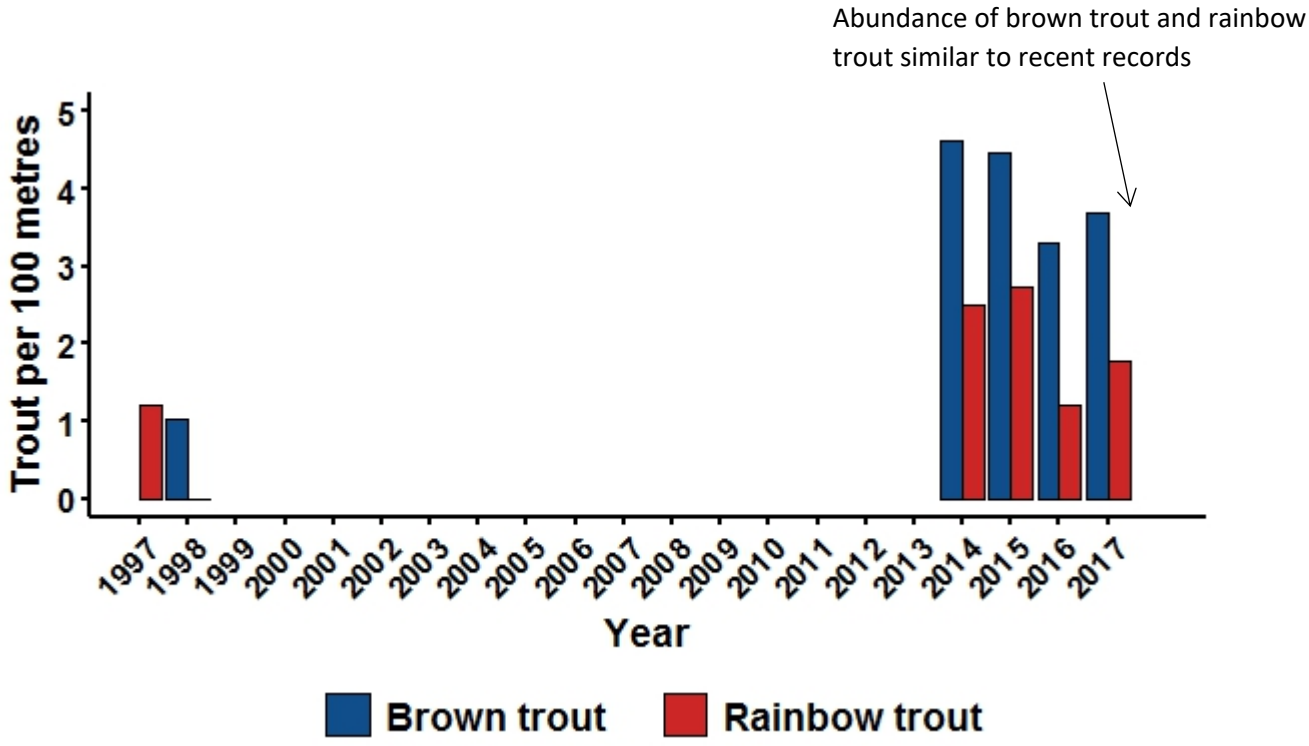
Abundance	⇔
Recent recruitment	Some
Multiple size classes	✓
Mature fish	✓
Overall rating	Good

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 750 m of river		27	13	40
Mean fish abundance (fish per 100 m)		3.7	1.8	5.5
Largest fish	Weight	0.7 kg (1.5 lb)	0.4 kg (0.9 lb)	0.7 kg (1.5 lb)
	Length	37 cm (14.5 “)	31 cm (12 “)	37 cm (14.5 “)
% of catchable (20 cm +) fish		38 %	50 %	41 %
Average size of catchable fish (20 cm +)		29 cm (11.5 “)	25 cm (10 “)	28 cm (11 “)
Abundance of catchable fish per 100 m		1.4	0.9	2.3
Other species present:	2 spined blackfish, common carp, galaxiid minnows, Murray spiny crayfish, redfin perch, roach and yabbies			



Location: Jamieson River





The 2017 survey suggests the Jamieson River supports moderate numbers of brown trout and rainbow trout. Abundance similar to recent years, mature fish capable of spawning are present, and there is evidence of recent recruitment of brown trout and rainbow trout.

Location: Merri and Hopkins Rivers

Surveyed: 20 - 22 Feb. 2017

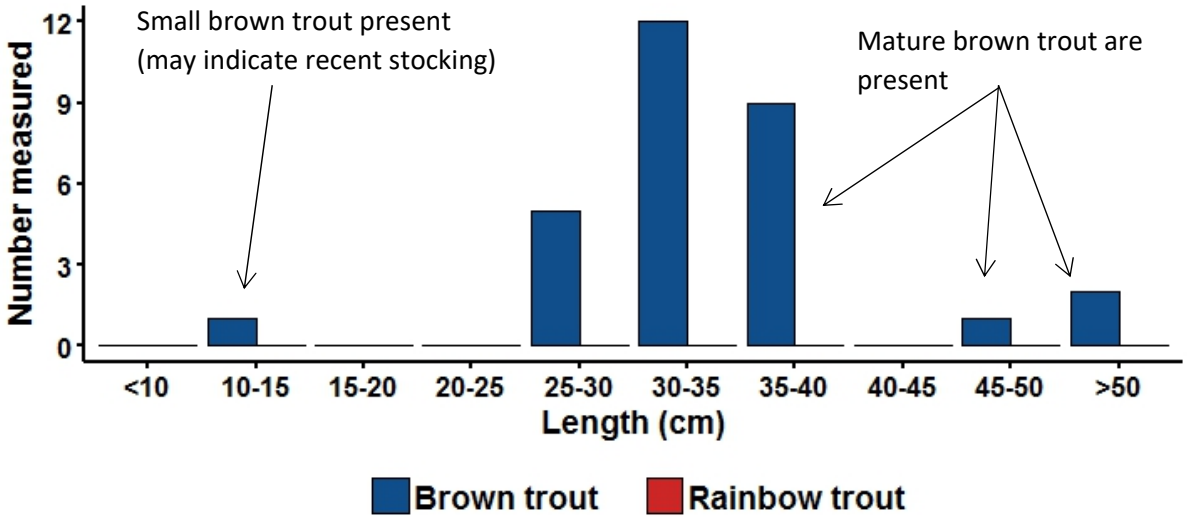
Site A: Albert St/Blighs Road on the Merri River (400 m stretch)
Site B: Grassmere Road Bridge on the Merri River (130 m stretch)
Site C: Warrumyea Road Bridge on the Hopkins River (195 m stretch)
Site D: Ellerslie-Panmure Rd on the Hopkins River (640 m stretch)
Site E: Kents Ford Lane on the Hopkins River (250 m stretch)

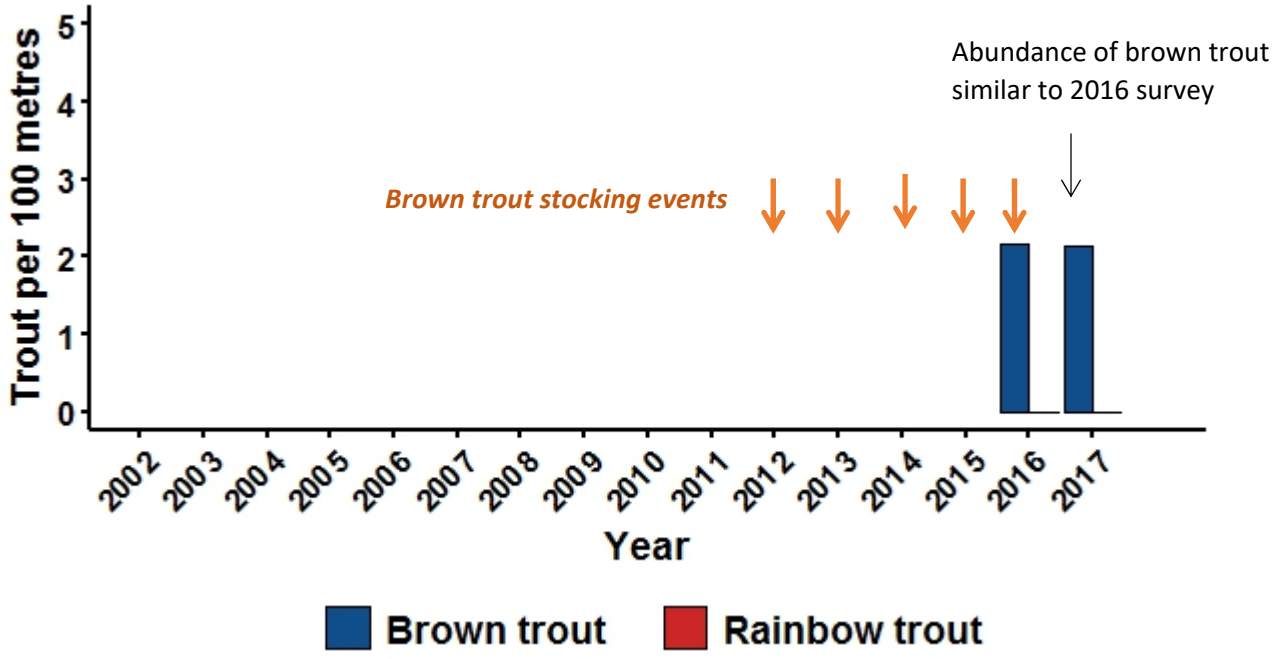
Key health indicators

Abundance	?
Recent recruitment (from stocking)	Some
Multiple size classes	✓
Mature fish	✓
Overall rating	Excellent

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 1.62 km of river		30	0	30
Mean fish abundance (fish per 100 m)		2.2		2.2
Largest fish	Weight	1.9 kg (4.2 lb)		1.9 kg (4.2 lb)
	Length	55 cm (21.5 “)		55 cm (21.5 “)
% of catchable (20 cm +) fish		100 %		100 %
Average size of catchable fish (20 cm +)		31 cm (12 “)		31 cm (12 “)
Abundance of catchable fish per 100 m		2.1		2.1
Other species present:	Australian smelt, flathead gudgeon, galaxiid minnows, mosquito fish, shortfin eel, southern pygmy perch, tench, tupong, yabbies and Yarra pygmy perch			

Location: Merri and Hopkins Rivers





The 2017 survey suggests the Merri and Hopkins Rivers continue to support moderate numbers of medium to large sized brown trout. Abundance is similar to the 2016 survey results. Small brown trout are present, which may be from to recent stocking. Mature brown trout capable of spawning are present.

Location: Mitta Mitta River system

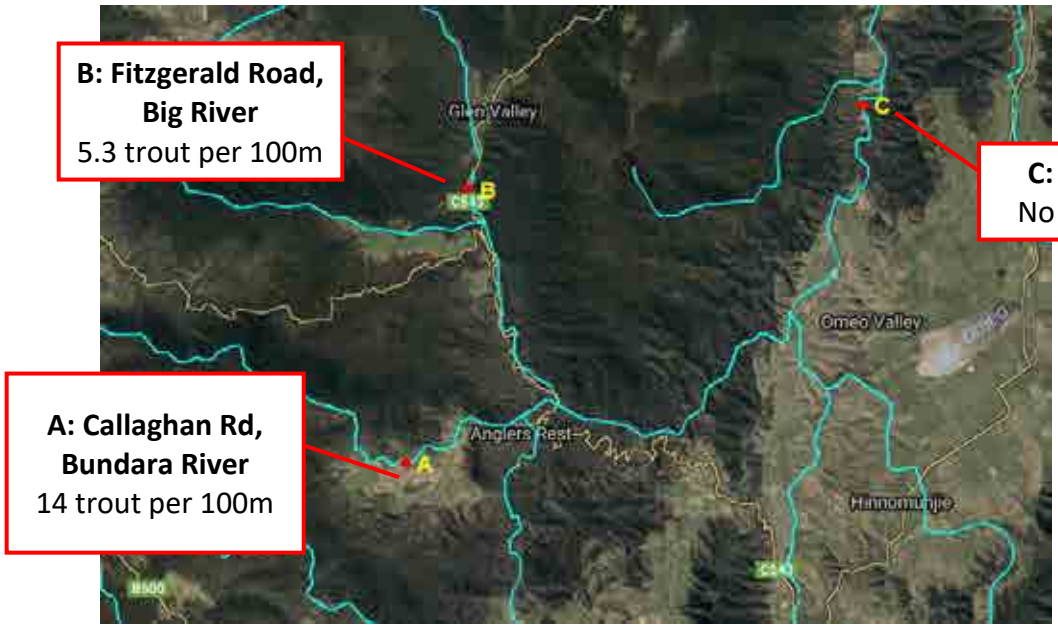
Surveyed: 27 - 28 Mar. 2017

Site A: Callaghan Rd DS Trapyard Gap Track on the Bundara River (190 m stretch)
Site B: Fitzgerald Road on the Big River (170 m stretch)
Site C: Kellys Road campground on the Mitta Mitta River (160 m stretch)

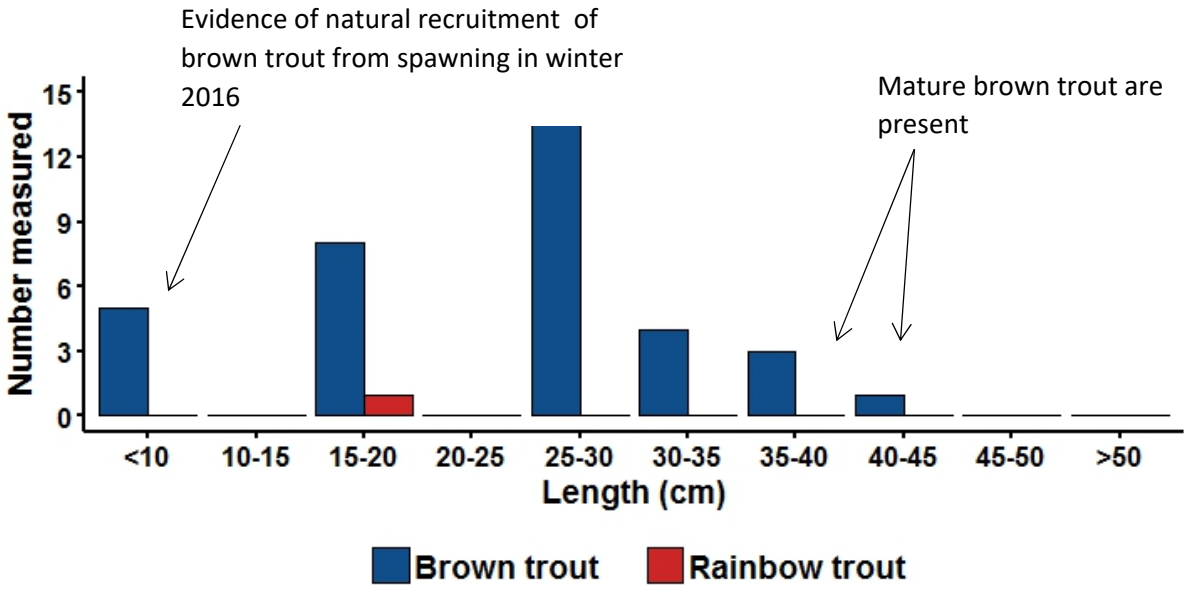
Key health indicators

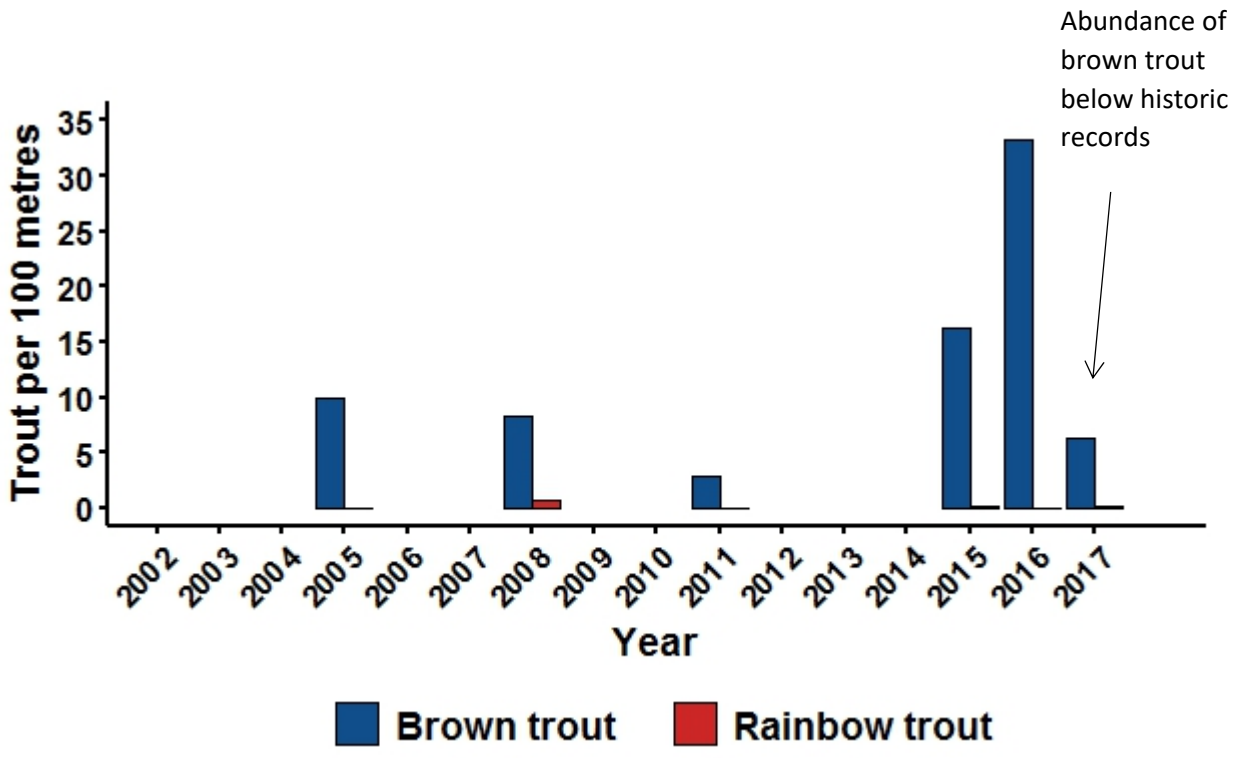
Abundance	⇩
Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall rating	**Good**

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 520 m of river		35	1	36
Mean fish abundance (fish per 100 m)		6.3	0.2	6.5
Largest fish	Weight	0.7 kg (1.6 lb)		0.7 kg (1.6 lb)
	Length	38.5 cm (15 “)	13.4 cm (5.3 “)	38.5 cm (15 “)
% of catchable (20 cm +) fish		54 %	0	53 %
Average size of catchable fish (20 cm +)		25 cm (10 “)		25 cm (10 “)
Abundance of catchable fish per 100 m		3.4	0	3.4
Other species present:	2 spined blackfish, Macquarie perch, galaxiid minnows, Murray spiny crayfish and yabbies			



Location: Mitta Mitta River system





The 2017 survey suggests the Mitta Mitta River system supports moderate numbers of medium sized brown trout. Although abundance in the 2017 survey is below historic records, there is evidence of recent recruitment and mature brown trout capable of spawning are present.

Location: Nariel Creek system

Surveyed: 28 - 29 Mar. 2017

Site A: Carmodys Road Bridge on the Nariel Creek (170 m stretch)

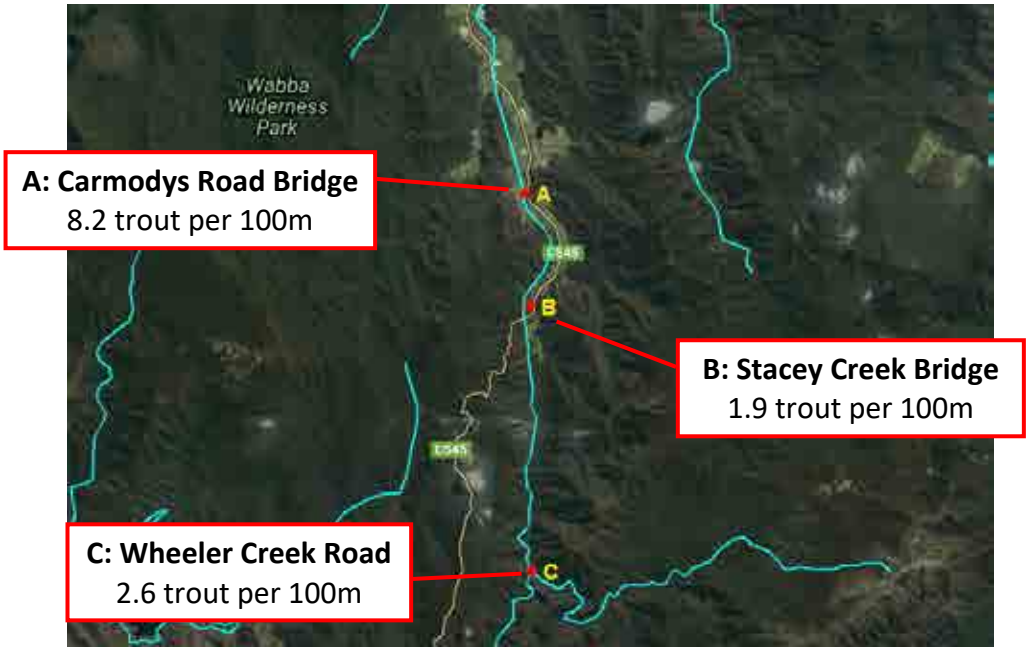
Site B: Stacey Creek Bridge on the Nariel Creek (210 m stretch)

Site C: Wheeler Creek Road bridge on the Wheeler Creek (235 m stretch)

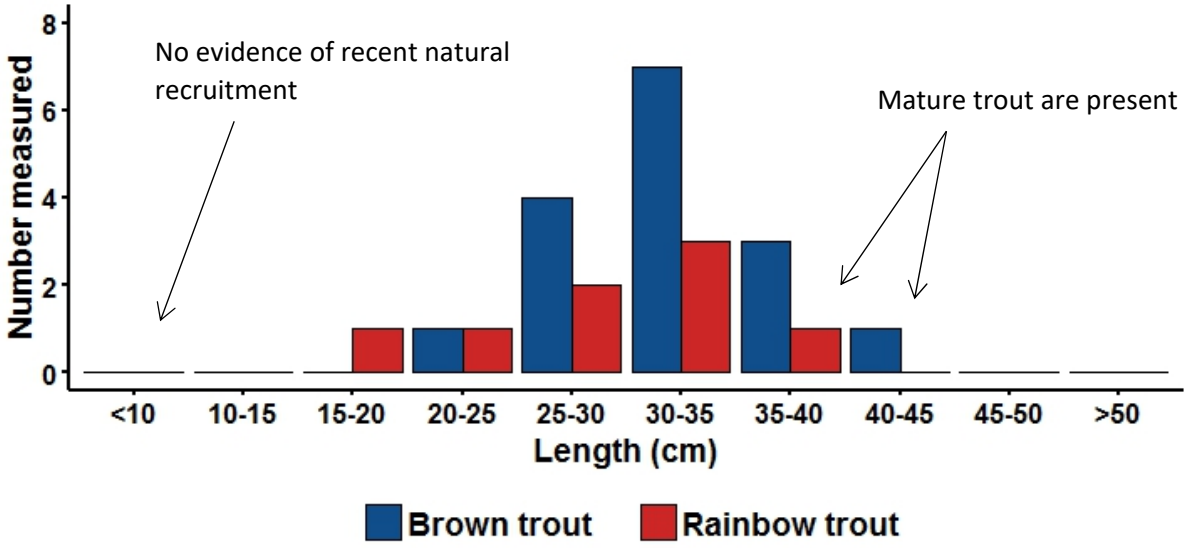
Key health indicators

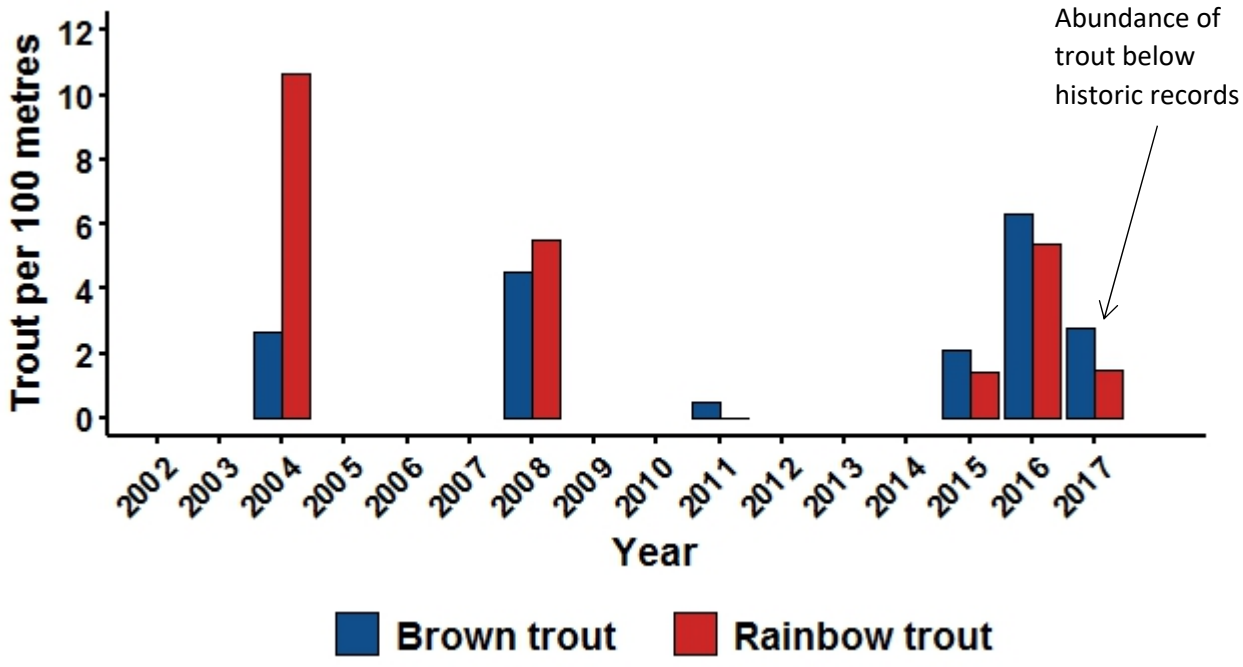
Abundance	⇩
Recent recruitment	✘
Multiple size classes	✓
Mature fish	✓
Overall rating	**Low**

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 615 m of river		16	8	24
Mean fish abundance (fish per 100 m)		2.8	1.5	4.2
Largest fish	Weight	0.5 kg (1.1 lb)	0.4 kg (0.8 lb)	0.5 kg (1.1 lb)
	Length	36 cm (14 “)	32 cm (12.5 “)	36 cm (14 “)
% of catchable (20 cm +) fish		88 %	60 %	78 %
Average size of catchable fish (20 cm +)		27 cm (10.5 “)	27 cm (10.5 “)	27 cm (10.5 “)
Abundance of catchable fish per 100 m		2.5	0.9	3.3
Other species present:	2 spined blackfish, burrowing crayfish, galaxiid minnows and Murray spiny crayfish			



Location: Nariel Creek system





The 2017 survey suggests the Nariel Creek system supports moderate numbers of trout. The increase in abundance observed in the 2016 has no followed through to 2017, and abundance in 2017 is down compared to historic records. Although mature fish capable of spawning are present, there is no evidence of recent recruitment.

Location: Ovens River system

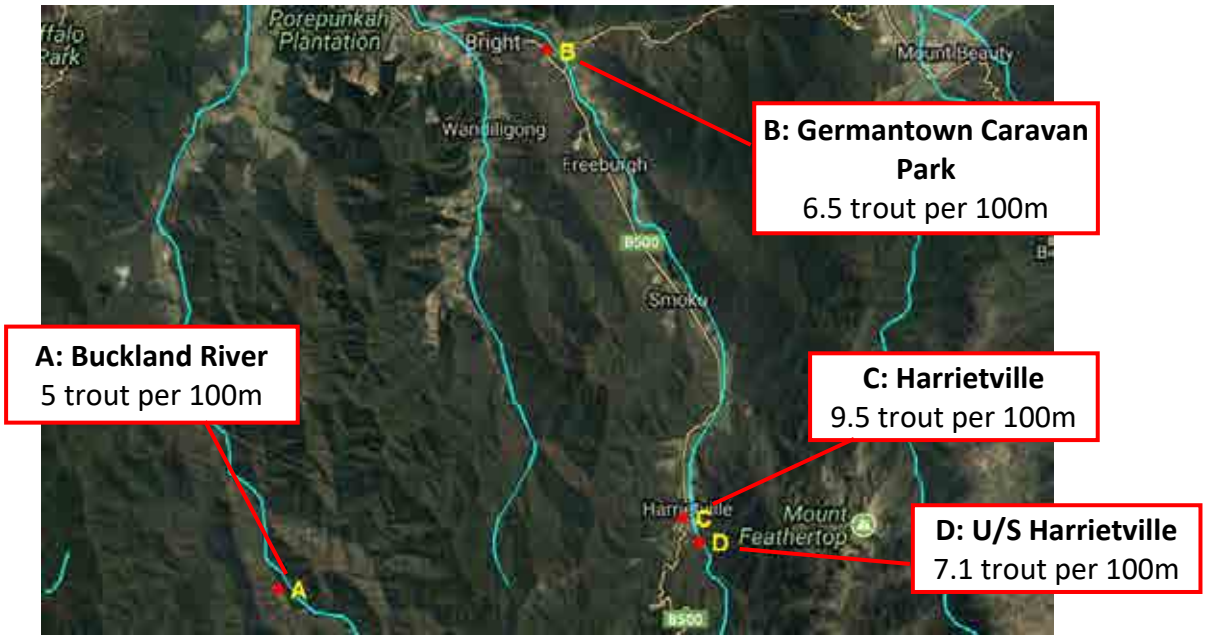
Surveyed: 3 - 28 Mar. 2017

Site A: Buckland River Road (5km US Junction) on the Buckland River (160 m stretch)
Site B: Germantown Caravan Park on the Ovens River (200 m stretch)
Site C: Harrietville on the Ovens River (210 m stretch)
Site D: Upstream of Harrietville on the Ovens River (295 m stretch)

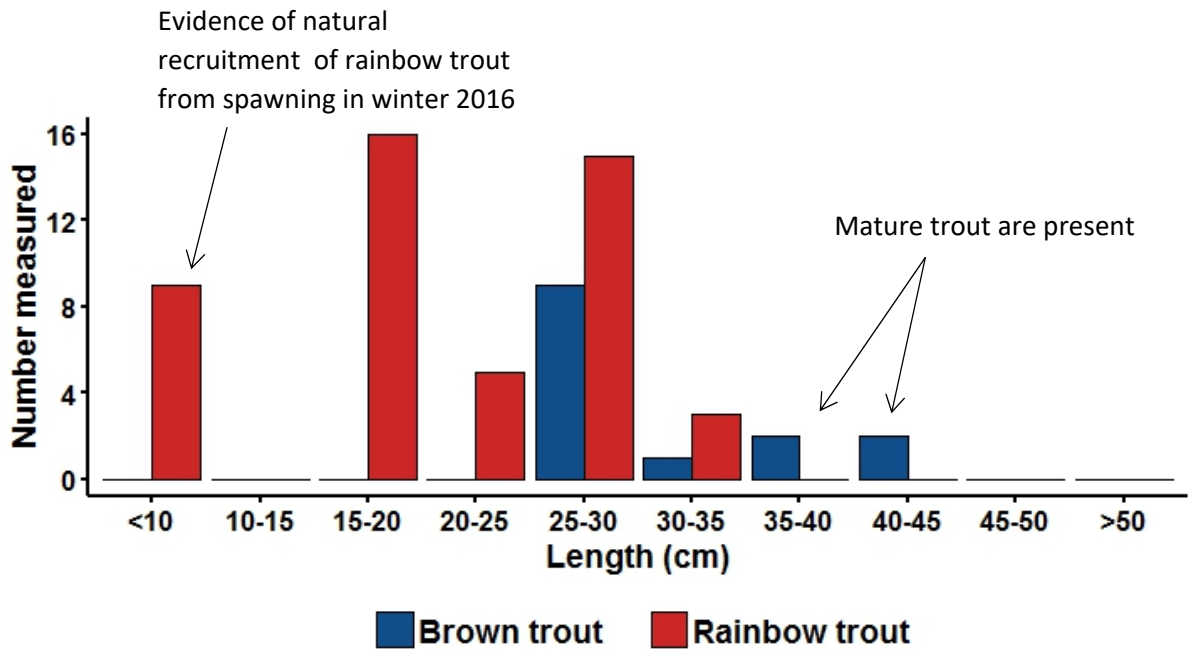
Key health indicators

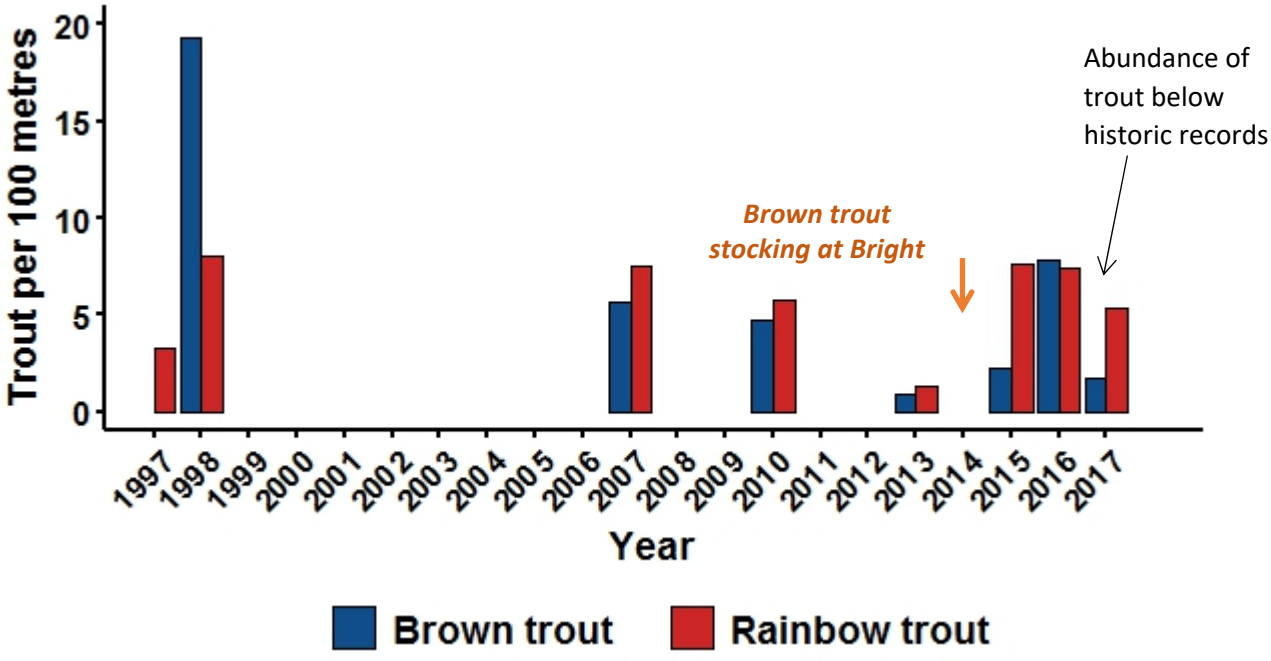
Abundance	⇩
Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall rating	Moderate

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 865 m of river		14	48	62
Mean fish abundance (fish per 100 m)		1.7	5.4	7.0
Largest fish	Weight	0.7 kg (1.5 lb)	0.3 kg (0.7 lb)	0.7 kg (1.5 lb)
	Length	39 cm (15 “)	28 cm (11 “)	39 cm (15 “)
% of catchable (20 cm +) fish		100 %	35 %	49 %
Average size of catchable fish (20 cm +)		27 cm (10.5 “)	24 cm (9.5 “)	25 cm (10 “)
Abundance of catchable fish per 100 m		1.7	1.9	3.4
Other species present:	2 spined blackfish, galaxiid minnows and Murray spiny crayfish			



Location: Ovens River system





The 2017 survey suggests the Ovens River system supports good numbers of trout, especially medium sized rainbow trout. Although abundance is down compared to historic records, mature fish capable of spawning are present and there is evidence of recent rainbow trout recruitment.

Location: Traralgon Creek

Surveyed: 6 Feb. - 10 May 2017

Site A: Lower Traralgon Creek Road on the Traralgon Creek (420 m stretch)

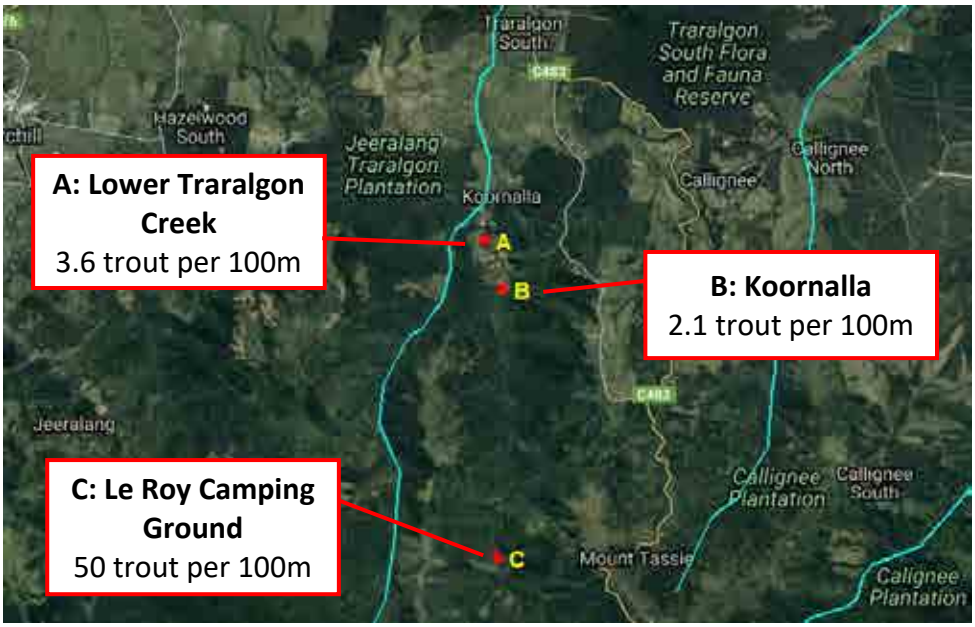
Site B: Koornalla on the Traralgon Creek (340 m stretch)

Site C: Le Roy Camping Ground on the Traralgon Creek (300 m stretch)

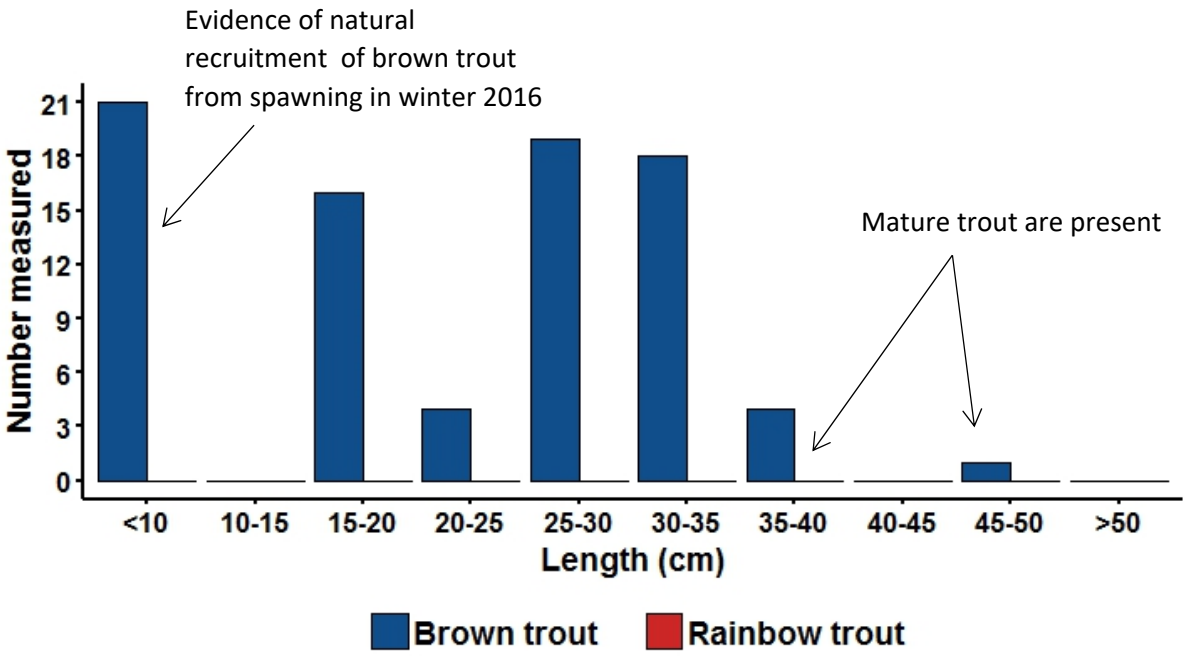
Key health indicators

Abundance	?
Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall rating	Excellent

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 1.06 km of river		171	0	171
Mean fish abundance (fish per 100 m)		18		18
Largest fish	Weight	0.6 kg (1.3 lb)		0.6 kg (1.3 lb)
	Length	40.5 cm (16 “)		40.5 cm (16 “)
% of catchable (20 cm +) fish		47 %		47 %
Average size of catchable fish (20 cm +)		25 cm (10 “)		25 cm (10 “)
Abundance of catchable fish per 100 m		8.5		8.5
Other species present:	Australian smelt, longfin eel, river blackfish, shortfin eel, Gippsland spiny crayfish and tupong			



Location: Traralgon Creek



The 2017 survey suggests the Traralgon Creek supports very good numbers of brown trout. There is strong evidence recent recruitment as indicated by the presence of a large number of small (<10 cm) brown trout, and mature trout capable of spawning are present. There is no historic abundance records to compare with current results.

Location: Wellington River

Surveyed: 26 - 27 Apr. 2017

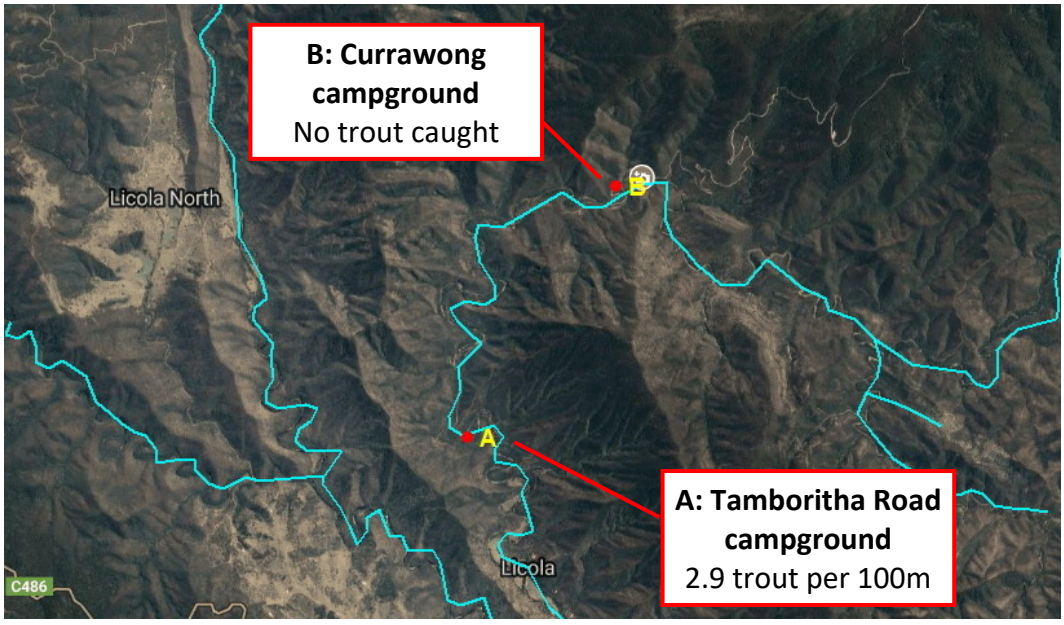
Site A: Currawong campground on the Wellington River (350 m stretch)

Site B: Tamboritha Road campground on the Wellington River (310 m stretch)

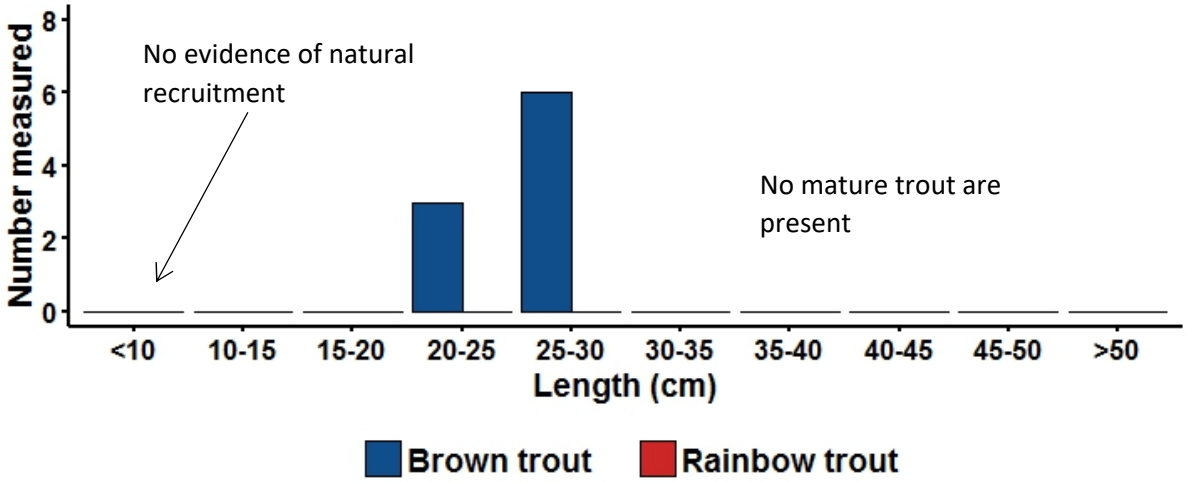
Key health indicators

Abundance	?
Recent recruitment	✘
Multiple size classes	Some
Mature fish	✘
Overall rating	Low

Monitoring results		Brown trout	Rainbow trout	ALL TROUT
Total number of fish caught in 660 m of river		9	0	9
Mean fish abundance (fish per 100 m)		1.5		1.5
Largest fish	Weight	0.1 kg (0.3 lb)		0.1 kg (0.3 lb)
	Length	24 cm (9.5 “)		24 cm (9.5 “)
% of catchable (20 cm +) fish		67 %		67 %
Average size of catchable fish (20 cm +)		22 cm (8.5 “)		22 cm (8.5 “)
Abundance of catchable fish per 100 m		1.0		1.0
Other species present:	spined blackfish, Australian smelt, common carp, galaxiid minnows, Murray spiny crayfish, redfin perch and yabbies			



Location: Wellington River



The 2017 survey suggests the Wellington River supports moderate numbers of medium sized brown trout. However, there is no evidence of recent recruitment and no mature fish present. There is no historic abundance records to compare with current results.

Appendix I: Surveyed streams

Wild trout streams surveyed as part of the *Wild Trout Wild Trout Fisheries Management Program.*

Wild Trout stream	***Health cards* Report***		
	2015	**2016**	**2017**
Aire River	X		
Barkly River		X	
Dargo River System (Two Mile Creek and Dargo River)	X	X	
Upper Goulburn River	X	X	X
Goulburn River tailrace			X
Howqua River	X	X	X
Jamieson River	X	X	X
Kiewa River system (Kiewa River and Running Creek)	X	X	
King River	X	X	
Merri and Hopkins Rivers		X	X
Mitta Mitta River system (Bundara River, Big River and Mitta Mitta River)	X	X	X
Morass Creek		X	
Nariel Creek System (Nariel Creek and Wheeler Creek)	X	X	X
Ovens River Systems (Buckland River and Ovens River)	X	X	X
Tooronga River	X		
Traralgon Creek			X
Wellington River			X
Yarra river	X		

* Hunt and Lieschke (2015), Hunt and Lieschke (2016), Ingram *et al.* (2017, this report).

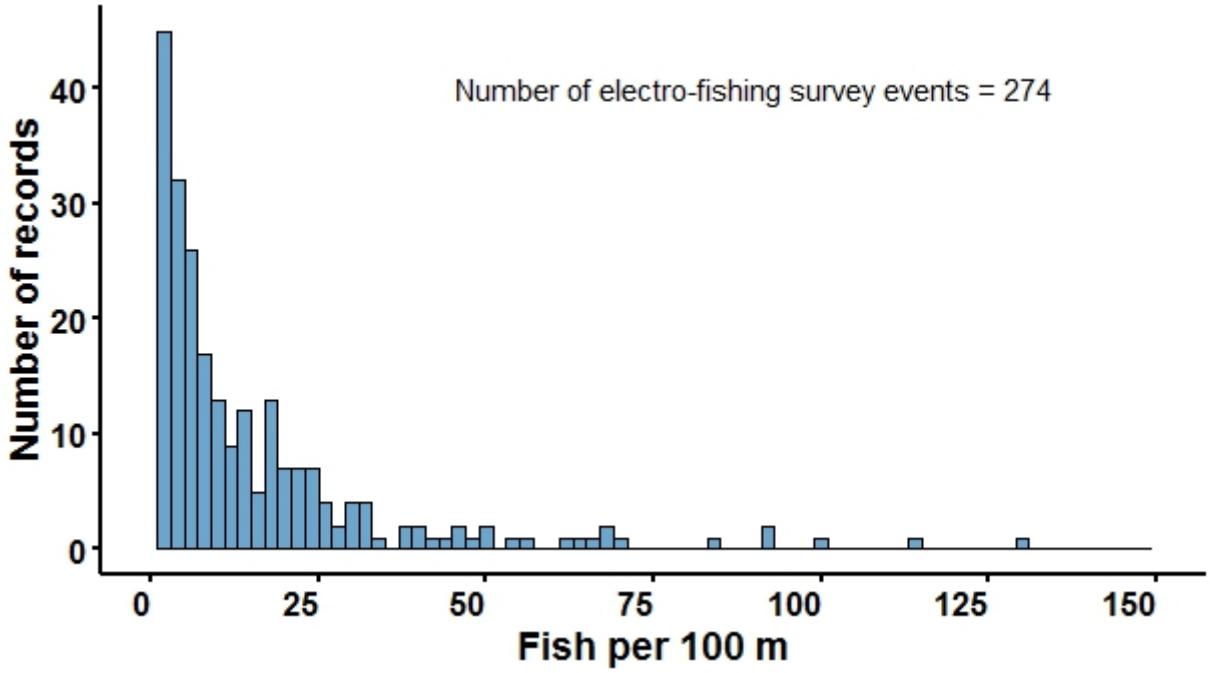
Appendix II: Stocking history for streams surveyed in 2017

The stocking history over the past five years for wild trout streams surveyed in 2017 is presented below.

Stream	Location	Year	Number stocked	
			Brown trout	Rainbow trout
Goulburn River tailrace	**Thornton**	2012	10,000	
		2013	9,000	
		2014	10,000	
		2015	10,000	
		2016	12,000	
Upper Goulburn River	**Jamieson**	2014	5,000	
		2015	5,000	
		2016	5,000	
Hopkins and Merri Rivers	**Mortlake (Hokins R.)**	2012	4,000	
		2013	3,600	
		2014	4,000	
		2015	4,000	
		2016	6,000	
	Warrnambool (Merri R.)	2012	8,000	
		2013	7,200	
		2014	8,000	
		2015	8,000	
		2016	8,000	
Howqua river	**Sheepyard Flat**	2014	5,000	
		2015	5,000	
		2016	5,000	
Ovens River system	**Bright**	2014	2,500	

Appendix III: Historic trout abundance

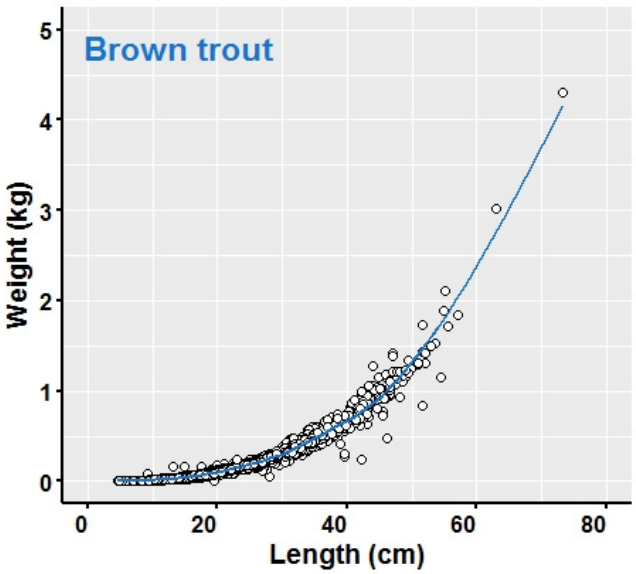
Abundance of trout (fish per 100 m) estimated from historic and contemporary electro-fishing surveys (274 events) of trout streams as part of the *Wild Trout Wild Trout Fisheries Management Program* (Appendix I).

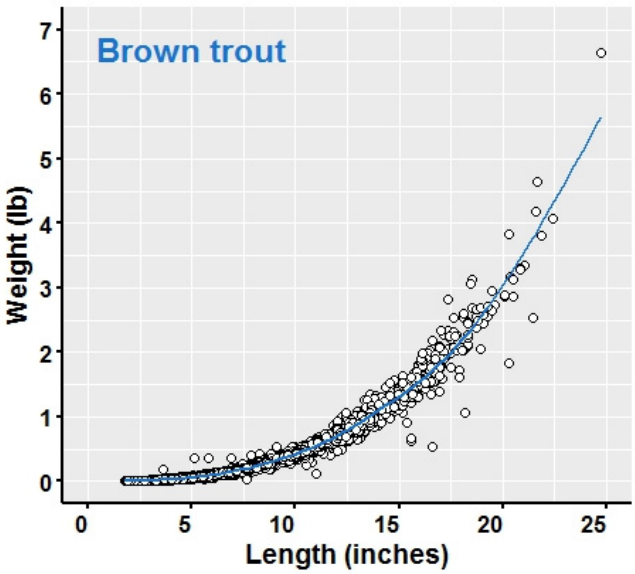


Abundance:	Low	< 1 fish per 100 m
	Moderate	1 –5 fish per 100 m
	Good	5 – 15 fish per 100 m
	Very good	15 – 25 fish per 100 m
	Excellent	25 – 50 fish per 100 m
	Exceptional	> 50 fish per 100 m

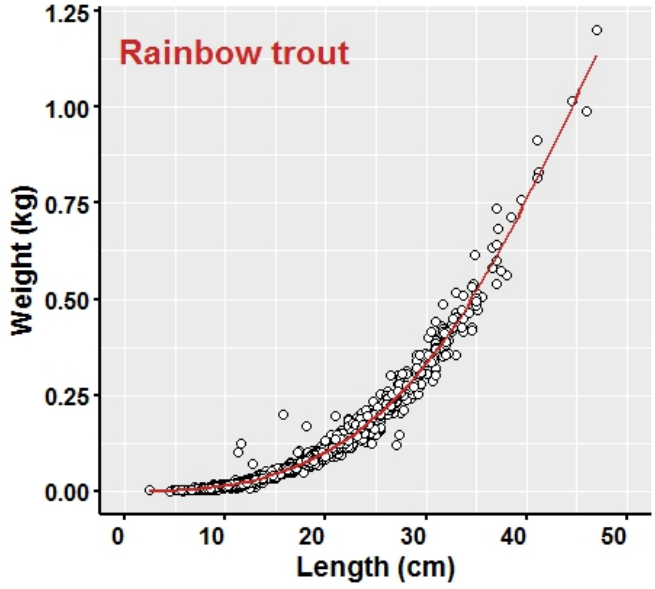
Appendix IV: Trout length – weight relationships

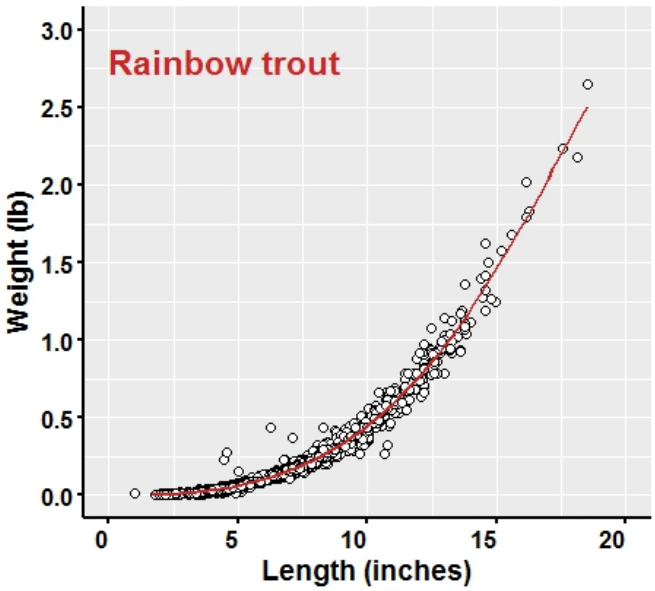
Brown trout





Rainbow trout





'My Catch' – Fishing for angler catch data

Anthony Forster
Victorian Fisheries Authority

With 295 registered angling clubs operating throughout Victoria, including thousands of anglers whom fish hundreds of waters every year, there is a vast and largely untapped record of fishing data that resides is dusty angling club log books. This treasure trove of catch history, provides us with a valuable insight on the performance of our key recreational fisheries. Only in recent years, have Fisheries Managers realised the value of this data to measure the performance of our recreational fisheries. For example, the Lake Purrumbete and Camperdown Angling Club catch history was used to evaluate the effectiveness of Chinook salmon stocking going back to the 1980's. This data was used to set stocking rates that has since revived the trophy salmon fishery of yesteryear.

Angler catch and effort data helped to recover the Chinook salmon trophy fishery in the crater lakes.

Imagine then, if we could work directly with angling clubs to understand their catch history by species, by number, by waterway and, importantly to measure their catch rates over time. By doing this, we can establish a "Catch per unit effort" measure of the performance of our key recreational fisheries. Catch and effort is widely used as an indicator of fish population abundance in commercial fishing sectors.

Data management in the modern age

Computer technology and mobile phone connectivity is forever changing the way people interact and how data is collected, managed and presented. This revolution provides great opportunity to collect meaningful information about the performance of our recreational fisheries in more efficient, cost effective and engaging way. By working closely with angling clubs to understand and meet their needs, we can encourage and incentivise angling clubs to report their catches online.

There are a number of fishing apps on the market that provide platforms for reporting recreational catch but few, if any, are designed to help clubs manage their catch and competition data and, at the same time, provide robust data that can help us understand and improve fishery management.

Most clubs have long term catch and effort data that could help us better manage the fishery.

"My Catch" - An online data management and reporting tool

In 2015, inspired by this opportunity, Fisheries Managers engaged Interact Sport P/L to develop a pilot web portal product called "My Catch". Interact Sport are Australia's leading provider of online data management and reporting services for sporting clubs. One of their products called "My Cricket", for example, services the needs of Cricket Australia and is actively used by more than 5,000 (96%) cricket clubs throughout Australia. The My Catch product can be readily converted to an IPhone and android app.

A pilot My Catch product is currently being testing by the Victoria Fisheries Authority prior to being presented to a reference group of ten angling club administrators.

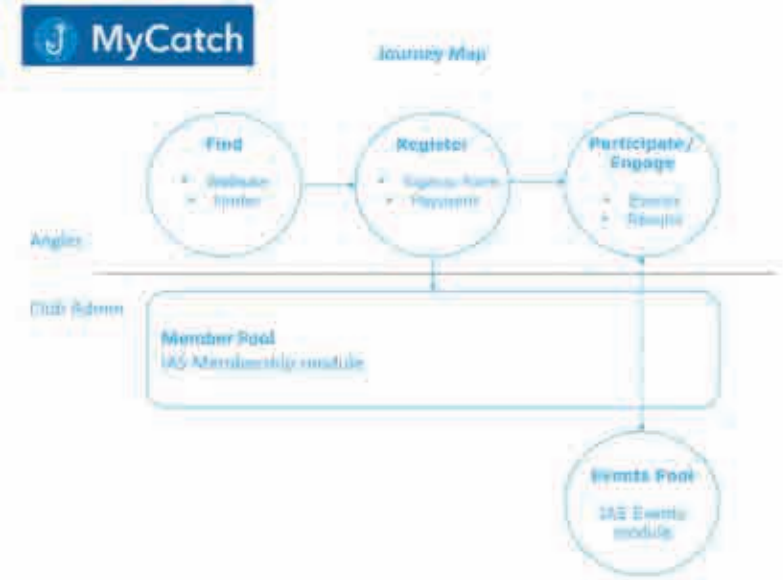


Figure 1 - My Catch enables fishers to find angling clubs, register for competitions and, for clubs to manage events and produce multiple reports.

Some of the key benefits:

For angling clubs

- Automated competition results compilation (saves time & energy)
- Historical record of competitions (to inform where to fish)
- Angler diary record (helps fishers catch more fish in the future)
- Rich historical data on catch results by location and effort
- Links to social media
- Central point to promote competitions and fishing events
- Automated signups to competitions, payment collection and financial reporting

As a general trend, a high proportion of traditional angling club members are of retirement age and the use of on-line tools to promote and report angling club competitions events through My Catch is a great way to attract younger members.

For the individual fisher

- Central point to find all upcoming fishing competitions and events
- Personal angler diary record helps fishers review past performance and catch more fish in the future
- Easy way to sign up to fishing competitions & events

For fishery management

- Reports on fishery population health of waters by location, year, species (year class)
- Standardized catch data informs fish stocking effectiveness
- Better engagement with angling clubs
- Build angling club fishery knowledge and stewardship of waterways
- More cost effective than fish population surveys.

Figure 2 – CPUE for one angling club at the Lower Goulburn River showing changes in catch rates for Murray cod, golden perch, Redfin and carp.

Figure 3 – Example data from one angling club showing fish length distribution for Murray cod, golden perch, Redfin and Murray cod at the lower Goulburn River.

The number of fish caught per hour is a standardized measure of the abundance of fish within a recreational fishery. The more data we have, the more accurately it reflects the performance of the recreational fishery.

The fish length histogram (above) shows us the population structure and the abundance of different year classes of fish, including whether there has been successful breeding or how fish stocking has contributed to the fishery.

Catch and effort feedback from angling clubs can help us maximise returns from fish stocking.

Measuring improvement to recreational fishing.

The State Government's *Target One Million* initiative to get more people fishing, more often, provides unprecedented investment to improve recreational fishing outcomes, including a doubling of fish stocking, development of new fisheries and removal of netting in Port Phillip Bay. The systematic collection of catch and effort data from recreational fishers (My Catch) will enable us to, over time, objectively and cost effectively measure the benefits that come from this investment. This data will also help us learn from various fishery management interventions such as fish stocking, river restoration, removing barriers to fish movement etc.

Other recreational fisher data collection opportunities

The software architecture of My Catch could also be used to develop data collection system for IPhone or Android mobile Apps for:

- Expanded Diary Angler Program - for individual fishers to record their catch and effort data.
- Research Angler Program - for scientific anglers to enter their fish catch & effort data.

Angling clubs interested in learning more about the development of My Catch, should feel free to contact the author.

Theme 2 – Fisheries Management

Photo: Phill Weigall

We are not overfishing our trout

Kylie Hall[1] and Khageswor Giri[2]
1 Victorian Fisheries Authority, DEDJTR
2 Agriculture Research, DEDJTR

Aim

Investigate usage patterns of anglers to assess the fishing pressure on wild trout river fisheries in the Upper Goulburn basin and examine if the fisheries are being overfished.

Background

Many of the waters upstream of Lake Eildon in the north-eastern region of Victoria (Goulburn River basin, Mansfield Shire) support wild, self-sustaining, trout fisheries. These streams are in areas that are very popular with holiday makers and visitors, many of whom fish. There have been concerns that the impact of anglers on these streams may reduce trout numbers.

Determining the usage of these streams by anglers (Figure 1) provides information about the level of impact from anglers on these wild trout fisheries.

What was done

Three lines of inquiry were undertaken to investigate the impact of anglers on the Upper Goulburn basin wild trout populations, these included angler interviews, tagged fish returns and an analysis of compliance records. Two rounds of investigation were undertaken: over the summer of 2014–2015 and repeated over the summer of 2016–2017.

1. Angler interviews

Interviews were undertaken on-site within the Upper Goulburn basin (Figure 2) over the 2014–2015 and 2016–2017 trout seasons. In the 2014–2015 trout open season, 45% of the interviews were conducted near Howqua River (8 adjacent campsites) and 34% were adjacent to Goulburn River (12 adjacent campsites), and in the 2016–2017 trout open season, more interviews (49%) were conducted adjacent to Goulburn River and less (39%) of the interviews were conducted near Howqua River. In both years some interviews were also conducted adjacent to Big River (4 campsites), Jamieson River (1 campsite) and Delatite River (2 campsites), with access to these rivers limited largely due to inaccessibility.

Figure 1. Anglers were interviewed to provide information about the impacts of fishing pressure on wild trout populations in the Upper Goulburn basin.

Visitors were interviewed regarding their demographics, fishing preferences, avidity (how often they fish),, what they had caught and how much effort they spent in catching those fish. From January to April the creel clerk completed 13 days of interviews in 2015 and 15 days in 2017 Interviews were conducted with visitors, with attempts made to identify and interview fishers specifically, to investigate how many of the visitors are fishing, how often they are fishing and how many fish they are taking.

2. Tag recaptures

Three different tags were active in the survey area over the entire study period.

High Value tags

In 2014–2015 a tag reward program was established in the Howqua River (as a case-study) to improve understanding of the trout harvest. Eighty two brown trout were caught during fish population surveys, dart-tagged and released at their capture location. These tags offered a high value reward ($100) for reporting by anglers (Figure 3) during 2015 (tags were valid from December 2014 to November 2015).

Transmitters and tags

In the Delatite River, nearly one hundred trout were caught during fish population surveys, surgically implanted with an acoustic tag, dart-tagged and released to provide location tracking data. The dart-tags in these fish allowed anglers to identify the acoustically tagged fish and to encourage their reporting and subsequent release if caught, (so as not to compromise the location tracking data provided by these fish).

Fin clips

Over the last three years 15,000 yearling brown trout have been stocked into each of the Upper Goulburn River and the Howqua River to trial stocking as an option to supplement the wild population.

Figure 2. Map of on-site angler survey locations in the Upper Goulburn basin, north eastern Victoria.

Figure 3. Anglers catching and reporting tagged fish provided information about the fishing pressure on wild trout populations in the Upper Goulburn basin in 2015.

The adipose fin clipped yearling brown trout were stocked into the Upper Goulburn River from the junction of Edwards Creek downstream to Jamieson and in the Howqua River from Sheepyard Flat to the junction of Running Creek. Stockings occurred in September in 2014, August in 2015 and June in 2016.

3. Compliance data

The number of fishery offences, particularly in relation to breeches of exceeding the allowable number of fish, indicate the level of non-compliance with fishery regulations. Data recorded by local Fisheries Officers in relation to offences were summarised. Local Fisheries Officers travel in excess of 45,000 kilometers each year; predominantly patrolling salmonid fisheries within the Shires of Murrindindi and Mansfield, and annual records are kept (financial year) of inspections. Fisheries Officers patrol (both uniformed and undercover surveillance) on weekdays, weekends and public holidays, including hours outside of the typical 9am–5pm work hours.

Key findings and implications

1. Angler interviews

- The area is popular with visitors: In 2015, 172 parties representing 1,401 people were interviewed adjacent to streams in the Upper Goulburn River basin in the Mansfield Shire and in 2017 206 parties representing 1,428 people were interviewed (not all individuals, groups or camps observed were interviewed — the intent was to focus on likely fishers).

- Visitors are all ages: In 2015 309 age group categories were reported and in 2017 364 age group categories were reported. In both survey years the median age group of those interviewed was 30 to 39 years. About 5-% of those interviewed were 70+ years old.

- Most visitors are not local and stay for several days: In 2015 there were 4 local residents and one holiday home owner among those interviewed. Eight parties were day visitors. In 2017 no residents were interviewed and only two of the parties were day visitors. In both years the majority of the parties (90-95%) were staying for 2–7 days and less than 10 parties were staying 1–4 weeks (5 parties in 2014, and 8 in 2017).

- Not every visitor is there to fish: In both years around 65% were fishing parties, whereby either the interviewee, or someone within their party had either been fishing, was fishing, or intended to fish. In 2015 the number of people represented by the fishing parties was 988 and in 2017, 1,034. Of those 1,401 people interviewed in 2015, 294 were 'fishers', and in 2017 of the 1,428, 355 were fishers..

- Fishing is not the primary reason for visiting the area: Each party was asked to rate the 'importance of fishing' in their choice of destination (on a 1–5 scale where 1 was very important and 5 was not relevant), and in both years for 'fishing' parties, the average score for the importance of fishing in destination choice was around 3.

- Most of the visitors are casual anglers: Fishing parties were asked to rate the most experienced fisher in their group, (or themselves if solo), as a trout angler with categories of 'committed', 'advanced', 'active' or 'casual' and in both years, the majority (62% and 56% respectively) of fishers were 'casual' by definition (Table 1, on next page). In both years 19% of fishers were 'committed'. As expected of angler typology, casual anglers fished for the least amount of time in both years.

- Catch and release is practiced by many anglers but release rates vary between angler types and is not consistent: In 2015, active anglers (58% of this group) reported that they would usually release 'all' or 'most' of any trout caught were the). Similar proportions of 'advanced' and 'casual' fisher types stated that they would also usually release 'all, or most' of the trout caught (52% of committed anglers, 40% of advanced anglers, 58% of active anglers and 39% of casual anglers). In 2017, 'committed' anglers were the group who proportionally had the greatest numbers of anglers stating they would usually release 'all, or most' of the trout caught' (63% of committed anglers, 19% of advanced anglers, 21% of active anglers and 44% of casual anglers).

- Visitors to the area are generally not local: In both years the postcodes of visitors provided an indication of visitation to the Upper Goulburn region, and distances travelled. In both years, the majority of fishing party members were Victorian (less than 6% non-Victorian), and only 4% of postcodes indicating 'local' visitors from Mansfield and district.

- Opinions on catch rate vary over years and between anglers: Fishing parties who'd been fishing or who were fishing at the time of interview who identified that they'd fished in the region more than 5 times in the past 2 years were asked to compare catch rates: in 2015, 16% of parties were unsure, 14% thought catch rates were the same, 58% thought catch rates were lower (inc. 3 residents) and 12% thought catch rates were higher. In 2017, 16% parties were unsure, 41% thought catch rates were the same, 34% thought catch rates were lower and 9% thought catch rates were higher.

Table 1. Angler type categorisation matrix.

Angler type	Fishing as a leisure activity	Fishing focus	Fishing frequency	Fishing location	Fishing tackle use	Fishing target	Fishing persistence
Committed	Central focus of life	Social life revolves around fishing	Fishes as often as possible. Devotes most time to fishing related activities	Based on premium quality even if they are distant	High-quality, species-specific tackle and applies latest techniques.	Always targets a particular species and tends to release any fish that are caught	Typically continues to fish even when the fish do not appear to be biting
Advanced	The most important leisure activity	Circle of friends includes many anglers	Fishes often, devotes a substantial fraction of leisure time to fishing	Usually based on good quality and may travel long distances	Prefers high quality tackle and is aware of latest innovations in fishing	Usually targets a particular species and often releases fish	Rarely loses interest even when the fish are not biting
Active	Fishing is one leisure activity among many	Occasionally goes fishing with a few friends	Fishes regularly but also invests considerable time in other leisure activities	Usually relatively easy to access often close to home	Prefers common techniques and proven fishing tackle, some knowledge of latest innovations in fishing	Often targets a particular species and usually takes any legal fish caught home	Occasionally loses interest when the fish do not appear to be biting
Casual	Fishing is not an important leisure activity	Social life rarely involves fishing.	Fishes only occasionally and spends much leisure time pursuing other activities	Always based on convenience and easy access	Prefers common techniques and proven fishing tackle, not aware of latest innovations in fishing	Primarily targets whatever species is biting on a given trip and harvest all fish that are legal to keep	Often loses interest when the fish are not biting well

- Fish captures are generally low in visiting anglers: In 2015, 25 brown and rainbow trout were caught by 14 parties of visitors (44 fishers) interviewed, In 2017, 30 brown and rainbow trout were caught by 12 parties of visitors (35 fishers). 23 fishing parties comprising 66 fishers were successful in catching fish; in addition to trout, these included redfin, blackfish, and carp (and freshwater crayfish). In comparison to the visiting fishers' catches, 3 resident fishers (advanced and committed) reported catching upwards of 20 trout in the 2014–2015 trout open season up to their time of interview (Feb–March), 2 of these fishers releasing all fish and 1 fisher releasing most.

- Trout of all age classes (sizes) were caught: Trout caught in 2015 ranged in size from 75 to 350 mm; with only 8 trout retained (32% of the trout caught). In 2017, trout caught ranged in size from "undersize" 80 mm to 609 mm (609 mm being the metric equivalent of 'about 2 foot'); with only 5 fish retained (17% of the trout caught).

- No fin clipped fish were reported by interviewees in the 2017 survey of anglers.

- Fishing methods varied in their success: In 2015, 17 fishing parties comprising 47 fishers were successful in catching trout (including the 3 resident fishers as individual fishing parties).; 4 (24%) of the successful fishing parties were using baited lines only (15% of the successful fishers), 3 parties (18%) were using lures only (19% of fishers) and 2 parties (12%) were fly fishing only (4% of the fishers). 24% of fishing parties were using both baited lines and lures (36% of fishers), 2 (12%) of the fishing parties were using baited lines and flies (13% of fishers) and 2 (12%) of the successful fishing parties were using both lures and flies (13% of fishers). In 2017, 12 fishing parties comprising 35 fishers were successful in catching trout; 4 (33%) of the successful fishing parties were using baited lines only (37% of the successful fishers), 2 parties (17%) were using lures only (9% of fishers) and 1 party (8%) were fly fishing only (11% of the fishers). 8% of fishing parties were using both baited lines and lures (11% of fishers), none of the fishing parties were using baited lines and flies, none of the successful fishing parties were using lures and flies and 4 (33%) of the successful fishing parties were using bait, lures and flies (31% of fishers).

- Fisher satisfaction varied between surveys: Fishing parties who'd caught trout were asked if they were satisfied with their fishing: In 2015, 17 parties had caught fish and all 17 parties responded to the question of whether they were satisfied with their fishing; 9 parties were unsatisfied (53%) (including 3 residents), 5 were satisfied (29%), 3 were unsure (12%).In 2017, 12 parties had caught trout and 11 parties responded to the question of whether they were satisfied with their fishing; 2 parties were unsatisfied (18%), 6 were satisfied (55%), 3 were unsure (27%).

- Fishers' perceptions of impacts on their fishery varies: In 2015, general comments from fishers related to increased carp (and redfin) presence; cormorants; decreased flows and low water levels; increased water temperatures especially in lower reaches; increases in number of people/fishing pressure/water cleanliness/rubbish; blackberries along river edges and tracks; removal of willows in lower reaches and the impact on fishing of resource allocation ie too many swimmers near the camps to fish. In 2017, general comments from fishers were very similar to previous comments, related to increased carp (and redfin) presence; cormorants; decreased flows and low water levels; increased water temperatures especially in lower reaches; increases in number of people/fishing pressure/water cleanliness/rubbish; blackberries along river edges and tracks; removal of willows in lower reaches; resource allocation ie too many swimmers to fish. There were several comments indicating that the fishing activity was of parents (mostly fathers) taking children fishing, and that many fishers had seen fish (blackfish, redfin, trout and carp), even having hits, but without catches.

- Fishers were willing to assist in research: In 2015, only 5 fishing parties (4%), summing 15 fishers (5%), declined to answer the type of licence they held (Table 2). In 2017, 10 fishing parties (8%) summing 21 fishers (6%), declined to answer the type of licence they held (Table 3).

Table 2. Numbers and percentages of parties and fishers reporting licence types, 2015 surveys.

Licence type of fishers, 2014–2015 trout open season	Number of parties (N=113)	%	Fisher count (N=294)	%
Declined to answer	5	4	15	5
Exempt <18	5	4	14	5
2 day	1	1	6	2
28 days	3	3	6	2
1 year	30	27	67	23
3 years	43	38	115	39
3 yr and exempt <18	3	3	9	3
1 yr and exempt <18	1	1	2	1
Other groupings (eg 3yr & 1 yr; 3yr & exempt 70+; 1 yr & exempt 70+; exempt other; 3yr & 2 day)	19	17	55	19
Exempt >70	3	3	5	2

Table 3. Numbers and percentages of parties and fishers reporting licence types, 2017 surveys.

Licence type of fishers, 2016–2017 trout open season	Number of parties (N=133)	%	Fisher count (N=355)	%
Declined to answer	10	8	21	6
Exempt <18	8	6	13	4
2 day	2	2	4	1
28 days	5	4	18	5
1 year	37	28	99	28
3 years	42	32	123	35
3 yr and exempt <18	2	2	5	1
1 yr and exempt <18	1	1	3	1
Other groupings (eg 3yr & 1 yr; 3yr & exempt 70+; 1 yr & exempt 70+; exempt other; 3yr & 2 day)	18	14	57	16
Exempt >70	8	6	12	3

- The majority of fishers released fish: Some of the groups had more than one fisher, and some of the groups caught more than one trout, and kept some and released some, so in 2015, 18 fishers out of 44 retained fish (41%). Some of the same anglers also released some fish, so 28 fishers out of 44 released fish (64%). In 2017, 13 fishers out of 35 retained fish (37%), and 28 out of 35 fishers released fish (80%). Each of the angler types were represented by the most experienced fisher in the parties that released all or some fish.

- Most anglers self-regulate with regards to keep-able trout: In both survey years anglers did not take all the trout they caught and appeared to self-regulate with regards to 'keep-able' sized fish. Avid anglers appeared to catch larger fish than casual anglers (thus, when avid anglers did retain trout, they were generally of a larger size than those retained by casual anglers). While the smallest trout retained (200 mm) was by a party of casual anglers, the largest fish (around 60 cm) reported released was also by a party of casual anglers. Committed anglers did not retain any fish.

2. Tag recaptures

- Tag reporting indicates low exploitation: If exploitation rate was high, then a considerable number of the high value tags would be expected to be reported. As of end August 2017, 8 trout had been reported caught out of the 82 initially tagged in the Howqua River in 2014–2015 (high value tags). Details of tags reported are presented in Table 4 (on the next page).

- All of the tagged trout were caught within the vicinity of their initial point of capture and release within the Howqua River. These fish had exhibited little or no movement (1 km maximum). The brown trout caught 11/4/2017 was tagged on 13/03/2015 (length 240 mm) upstream of Frys Hut. It thus exhibited low overall movement and growth of 120 mm in 1 year and 1 month.

- The creel clerk reported a low awareness of tagging, and a low awareness of the brown trout stockings amongst the visitors in the surveys and no finclipped trout were observed in the trout seen and measured by the creel clerk.

- Of the nearly 100 acoustically tagged fish in the Delatite River, three have been caught and reported.

Table 4. Recapture dates and locations reported by anglers of trout tagged in 2015.

Recapture Date	Recapture Location	River	Species	Tagging Date	Tagging Location	Tagging Length	Recapture length	Recapture weight	Released	Tag No.
early 2015	Bindaree bridge	Howqua	Brown trout						Yes	unknown
2/05/2015		Howqua	Brown trout	15/04/2015	u/s of Tobacco Flat	325	?		Yes sans tag	132868
15/05/2015		Howqua	Brown trout	15/04/2015	d/s of Frys Hut	272			Yes	132864
29/09/2015	Five Mile	Howqua	Brown trout	16/04/2015	Six Mile	480	530	1300	No	132877
30/10/2015	Bindaree bridge	Howqua	Brown trout	4/12/2014	u/s of Bindaree bridge	236	300		No	132821
21/11/2015	Sheepyard Flat	Howqua	Rainbow trout	16/04/2015	Sheepyard flat	314	400		No	132874
11/12/2015	400m u/s of the Upper Howqua camp ground	Howqua	Brown trout	11/03/2015	u/s of Bindaree bridge	248	260		Yes	132840
11/04/2016	Between bridge of CPR and Frys Hut	Howqua	Brown trout	13/03/2015	u/s of Frys Hut	240	360		No	132858

3. Compliance data

- Over-bagging is not affecting trout populations; Data from the Alexandra Station were provided for financial years 2012–2013 to 2016–2017 with the number of contacts, and the number of offenders. From the many contacts, the number of offences is extremely low, with less than 1% being over-bagging offences. Over the study period, compliance officers averaged around 1,750 contacts each year.

- The data supplied included all over-bagging offences for the station and therefore could include non-salmonid species. However, even if all the over-bagging offences were salmonids, the average number of over-bagging offenses each year has been around 0.3% of offences over this period, and, at this level, are not thought to impact the trout population.

Key findings:

1. Low exploitation. The time series weight of evidence suggest that harvest rates appear low, and that anglers are not overfishing the Upper Goulburn basin wild trout rivers.
2. High compliance; few over-bag prosecutions.
3. Many visitors, few fishers, and even casual anglers release fish.
4. No anglers reported retaining their allowable daily bag/possession limit in either year of the surveys; a very low proportion of anglers are retaining the fish they catch.
5. Relatively low overall catch rates reported by interviewees.
6. The majority of visitors interviewed were not local.
7. Fishing is not the main drawcard for visitors. Tourist visitation appears to be largely independent of trout populations, and trout populations appear to be independent of impact from the current visitation, which will be limited by the availability of campsites.

Smarter stocking to improve our trout fisheries – the final chapter

Hui King Ho
Victorian Fisheries Authority

Introduction

The stocking of trout is often seen by fishers as a simple answer to fix a poorly performing fishery, where reduced catch rates and low recruitment is experienced. It is a solution that is often perceived by us that is obvious, simple and should be used more often. This leads to a strong belief that more fish stocked should equal more fish caught, and "…it's as simple as that"….or is it?

In places such as lakes and impoundments, but also in some rivers, stocking is a valuable tool and can help in maintaining, improving or recover the fishery. This is particularly effective where water bodies display poor recruitment – like trout fisheries in many of Victoria's lakes. But where there are existing breeding trout populations, stocking on top of these populations has failed to positively influence the wild trout fishery. This experience is not only seen in Victoria, but also globally. The behaviour of a dynamic natural environment (like rivers, lakes and streams) is complex and the effectiveness of possible solutions is influenced by many limiting factors, such as climate, environment (habitat, food source, etc) and the biology of the fish.

The VFA wild trout program presented a case to reassess the effectiveness of stocking and to better communicate the findings, educate stakeholders and re-examine the cost effectiveness of this popular management option. A three-year stocking trial was initiated in 2015 and concluded this year (2017).

Method

Yearling trout from the Victorian Fisheries Authority hatchery at Snobs Creek were stocked annually into the Howqua and upper Goulburn rivers from 2014 to2016 across three seasons. The fish could be identified as hatchery fish—and thus stocked fish—by a fin clip. As in the previous two year, 5000 fin clip brown trout were stocked in each of the Howqua and upper Goulburn rivers again, bringing the total stocked at each site to 15,000 fish. Electrofishing surveys were undertaken in 2015, 2016 and 2017 subsequently to survey the trout populations in the rivers and count the number of fin clipped fish caught.

If the stocked fish survived in any numbers, then the proportion of those fish represented in the electrofishing surveys would be expected to be high.

Outcome

The results (table below) showed that few stocked fish were captured in the 2017 survey, and these did not contribute significantly to the stream population sampled. Of the 15,000 brown trout that was stocked only 0.11% or a total of 17 fish was recaptured. These results are not that unusual and reinforces the continuing trend throughout the study that, stocked fish do not provide good returns on the investment. There are many examples from Victoria, and from overseas, that indicates stocking trout on top of self-sustaining trout populations is not an effective long-term strategy to enhance wild stocks.

Survey year	River	Cumulative fish stocking No.*	Distance surveyed	No. stocked fish captured
2015	Goulburn River	5,000	1 km	1
	Howqua River	5,000	14 km	6
2016	Goulburn River	10,000	1 km	0
	Howqua River	10,000	2.5 km	4
2017	**Goulburn River**	**15,000**	**1 km**	**0**
	Howqua River	**15,000**	**1 km**	**6**

* fish stocked in year prior to survey year

While there are various factors that could contribute to this, such as fish behaviour and genetics, the overarching influence that trout populations in streams have to contend with are the environmental conditions. It is the environmental conditions, including water flows, water temperatures, amount and type of habitat, in combination with the amount and type of food, and the presence of competitors and predators, that ultimately dictate the trout populations. These factors affect the population regardless of the source of the fish (e.g. wild or stocked).

While this trial has shown even with continual stockings in streams, where an existing trout population are present, the returns are low. However, the good news is that trout populations are very resistant. Numbers of trout in a population may fluctuate widely, depending on the year, trout can, and do, recover very quickly when conditions are suitable.

Making sense of it all

Fish stocking has its place and is a useful management tool to help improve struggling fish populations under certain conditions. However, in systems where a healthy trout population already exists, stocking efforts is best focused for other waters to provide best returns.

Smarter trout stocking – marking update

Brett Ingram
Victorian Fisheries Authority, Snobs Creek

Aim

(a) To determine if brown trout stocked into Lake Eildon contribute to river trout fisheries.

(b) To improve management of trout stocking programs by implementing a cost effective method of mass-marking hatchery-bred trout to distinguish them from wild-born fish.

(c) To use genetic marking to monitor recruitment of trout implanted in Scotty –Jordon boxes to the fishery.

Movement of trout between Lake Eldon and feeder streams

What we did:

Fisheries Victoria periodically releases brown trout and rainbow trout into Lake Eildon to support the lake fishery, but it is uncertain if these fish contribute to the river fisheries in the lake's feeder steams. Understanding the contribution of lake fish to the river fishery, and river fish to the lake fishery, will improve management trout fisheries supported by stocking.

To answer this question, 17,000 brown trout yearlings bred at Snobs creek were fin-clipped by volunteers before being released into the lake in 2016. A further 5,000 fin-clipped yearlings were released into the upper Goulburn and Howqua rivers as part of the stocking trial... Subsequent electro-fishing surveys of the Howqua, Jamieson and upper Goulburn rivers were conducted in early 2017 to assess trout stocks and recapture fin-clipped fish.

What we found:

In excess of 315 brown trout were captured during electro-fishing surveys of the feeders streams conducted in early 2017, six of these fish were fin-clipped.

Next steps:

The small number of fin-clipped fish caught in surveys suggests little evidence of large-scale movement of fish between the lake and inflowing rivers. The number of fin-clipped fish that were released into the lake may have been insufficient to yield data that are more conclusive. Fin clipping may not be the most suitable method marking large numbers of fish. There are a number of different methods to identify hatchery-bred fish, each has it pros and cons which depend on the objectives of the tagging program. Fin-clipping is time-consuming and labour intensive so is appropriate for marking relatively small numbers of fish only. However, large numbers of hatchery bred fish can now be marked using, for example, barium treatment (see below). Genetic profiling is also being used to evaluate implanting trout eggs in streams (see below).

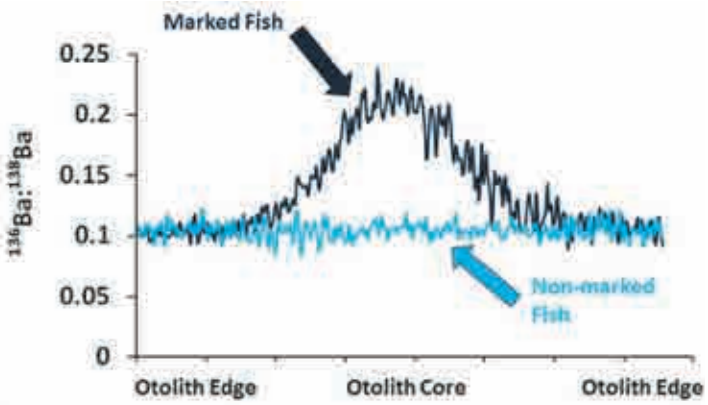
Mass marking hatchery-bred trout

What we did:

Barium marking was selected as a cost effective method for mass marking salmonid eggs. In 2015 trials were conducted to determine an appropriate Barium concentration to mark brown trout, rainbow trout and Chinook salmon eggs. In 2016, trials were repeated on newly hatched trout larvae.

What we found:

Results from the 2015 trials showed that—unlike international experiences on Atlantic salmon—,brown trout, rainbow trout and Chinook salmon could not be effectively marked as eggs. However , results from the 2016 trials, demonstrated that newly hatched trout larvae could be successfully marked with a number of different barium isotopes (Warren-Myers *et al.* 2017).



Graph showing how barium-marked fish are distinguished from non-marked fish

Next steps:

There is now a cost-effective, quick and simple method of mass marking hatchery bred trout produced at Snobs Creek. In the long-term, being able to distinguish between stocked and wild fish will have broader implications for the future assessment and improved management of Victorian trout stocking program.

Genetic marking trout

What we did:

DNA profiling is being used to monitor survival and recruitment of brown trout that were implanted into streams as eggs.

DNA profiling (parentage testing) works on the understanding that every offspring inherits half their genetic information from their mother and half from their father. For this method to work requires the creation of a library of DNA profiles of all the parents (male and female) that produced the implanted eggs. DNA profiles of trout caught in the stream are then compared against the parent library. If there is a match the fish is considered an offspring and therefore implanted, if not they are considered to be wild trout.

Eyed eggs from brown trout broodstock spawned at Snobs Creek were loaded into scotty-Jordan boxes then implanted into selected streams. A finclip was taken from each of all the parents (male and female) that were used to produce the eggs. These samples will be used to create a library of parent DNA profiles.

What we found:

The incubator trials are on-going and require assessment. The eyed eggs loaded into the incubators and deployed into the study streams and left to allow the eggs to hatch. Several weeks was allowed for the newly larvae to absorb their yolk sac, and leave the incubator, before the incubators were removed from the stream Estimates of hatch rates were conducted visually and ranged between 75-95%.

Next steps:

Electro-fishing surveys of the trial rivers will be undertaken in the late summer-autumn 2018 to assess if fish from the incubators are present. The DNA of any young of the year trout will be assessed to determine if their parents were from Snobs Creek hatchery — and thus hatched from the incubators— or from wild stocks.

Jordan Scotty Incubator Trials

Terry George
President, Australian Trout Foundation

The stocking of yearling hatchery fish into streams with existing wild trout populations is ineffectual in improving fish numbers. The precise reasons for this are unknown but the learned behaviour of fish grown in hatcheries may be a contributing reason.

Fish hatcheries are useful and appealing as the numbers and sizes of the required fish can be produced and form the basis of Victoria's fish stocking program. In Victoria, there is also a tendency to stock larger trout—typically yearlings—as bigger fish have less predators and are thought to have the best chance of survival. While this works well in lakes, stocking trials of hatchery produced trout in the Goulburn, Jamieson and Howqua, show this is not necessarily the case in rivers. And history indicates that stocking in general, has not been successful strategy to enhance existing, breeding, stream trout populations.

Because the trout have grown up in the hatchery, they may have learned some behaviour that may suit them well in the crowded competitive world of a hatchery trout race— but the same characteristics may not help them in a natural stream and when competing against existing wild trout.

Hatchery raised fish have to compete for food in a very crowded, artificial environment. Research has shown that when hatchery -raised fish are stocked into a stream, they behave much differently than the existing wild fish. Stocked fish may show more aggressive feeding, spend more time in faster water and rapids, and generally move about much more than the wild fish. All this activity uses up energy that the fish can't recoup from the food they have to find, and therefore they don't get enough food to maintain themselves, and lessens their ability to compete with existing wild trout.

The learned behaviours are likely to contribute to the ineffectiveness of the hatchery-raised fish to survive and contribute to the overall stream trout population.

The Australian Trout Foundation has been working in partnership with recreational fishing clubs and the Victorian Fisheries Authority to enhance and maintain wild trout fisheries. The Australian Trout Foundation are keen to investigate other methods to aid recovery of depressed trout populations. One such method is in-stream incubation of eggs.

Enter the Jordan Scotty incubators.

The Jordan/Scotty Fish Egg Incubator is a commercially available plastic unit which was developed to incubate salmon or trout eggs in-stream. The design of individual housed eggs eliminates or minimizes fungus infection and eggs are protected from predators. The stocking of eggs eliminates the hatchery forced learned behaviour and the young fish therefore may ultimately lead to higher survival of stocked fish compared to stocking hatchery-grown yearling trout.

A trial of the incubators was initiated.

What was done: The Trial

Brown trout eggs were stripped and incubated to the eyed stage at Snobs Creek. DNA samples were taken from the parent trout so that fish hatching from the eggs stocked in the incubators could be subsequently identified to assess the trial.

Once eyed, the eggs were loaded into the Scotty Jordan boxes, and then transported and deployed in the King and Jamieson rivers and Traralgon Creek. Anglers from several angling clubs were involved in the loading and deployment of the incubators.

The incubators were removed several weeks after deployment, once the eggs had time to hatch and the trout larvae absorb their yolk sac and leave the incubators.

On removal, a quick check indicated high hatch rates from most incubators.

The future

Electrofishing sampling of young fish is scheduled for the streams in 2018. DNA samples from these fish will be used to differentiate stocked from wild fish and gain insights into the success of the trial.

The intention is to repeat the trials over the next year and the VFA have committed to providing eggs sourced from wild trout for these ensuing trials.

Acknowledgements

The incubator trial involved many people and the ATF would like to thank the volunteers who assisted in the loading of the incubators.

We were most fortunate to have a great bunch of the volunteers to assist with this delicate task of loading the incubators at Snobs Creek: Graham Godber – Mansfield and District Fly Fishing Club (MDFFC) & Australian Trout Foundation (ATF), Matt Byrne - MDFFC& ATF, Andy Mattenson – MDFFC & ATF, Shane Kirley – MDFFC & ATF, Stan Brown – MDFFC & ATF, Steve Jordan – MDFFC & ATF , Alan Burgess – MDFFC & ATF, Nick Kirley – MDFFC & ATF , Doug Braham – Council of Victorian Fly Fishing Clubs (CVFFC) & ATF, Ray Buckland - ATF & Yarra Valley Flyfishing Club, Tony Borrack - ATF & APYAC, Terry George - ATF & Victorian Fly Fishing Association (VFFA), Neil Highett, Will Ingram & John Douglas – Victorian Fisheries.

Matt Byrne performed an Instructor's role, having thoroughly studied the Youtube videos and Jordan Scotty documentation on the internet with Graham Godber, Shane Kirley and the other Mansfield and District Fly Fishing Club members.

We are also grateful to the many volunteers who ably assisted in the installation and removal of the incubators into and from the streams: Dave Guertin – ATF, Andrew Briggs – North East Catchment Management Authority, Graham Godber – MDFFC & ATF , Matt Byrne – MDFFC & ATF, Mike Smith – Wangaratta Fly Fishing Club (WFFC) & ATF , Bryan King- WFFC & ATF, Erhan Cinar- Southern Fly Fishing Club (SFFC) & ATF, Martin Lampitt – SFFC & ATF, Trevor Hawkins – VFFA, Kris Leckie – VRFish plus Four ATF members from Latrobe valley Fly Fishing Club, "Pickles", Lachie, James & Wayne.

Lots of hard work mingled with lots of fun and laughter.

Recreational anglers and clubs are welcome to be involved and to assist in the 2018 Jordan Scotty trials; please feel free to register your interest today at the ATF stand, or visit www.atfonline.com.au.

Theme 3 – Angler Involvement

Goulburn Broken and North East CMA Angler Riparian Partnership Program 2016-17

Jim Castles[1], Andrew Briggs[2], Terry George[3], Dermott O'Brien[4], Kris Leckie[5]
[1] GBCMA, [2] NECMA, [3] ATF, [4] VFFA, [5] VRFish

The $1 Million State Government funded Angler Riparian Partnership Program was announced at the Talk Wild Trout Conference in 2016.

The Angler Riparian Partnership Program has allowed Victorian Catchment Management Authorities and anglers to work together and plan and implement some large riparian (stream side) habitat enhancement projects over the past 12 months.

The response and support from anglers keen to help to plan and assist with projects on waterways in the Goulburn Broken and North East CMA areas has been very encouraging.

Angler Riparian Partnership Program Projects in 2017

In the Goulburn Broken region, more than 120 volunteers from 10 angling groups and 4 community groups were involved in riparian enhancement projects in 2017.

Approximately 1,900 Trees and shrubs were planted along 2 kilometres of the Jamieson River, Little River, Delatite River tributary, Ryans Creek, and Hughes Creek.

Fencing was erected on the Ryans Creek and a tributary of the Delatite River to control grazing, and 12 hectares of Desert Ash control was completed on Hughes Creek on these streams prior to revegetation.


Jamieson River Habitat Project – September 2017


Little River Tree Planting day – August 2017

In the North East region, the Authority has been working closely with groups such as the Australian Trout Foundation, Corryong Fishing Club, Alpine Fly Fishers and the King Valley Tourism Association to deliver on ground works and develop applications for habitat projects across the Nariel and Little Snowy Creek's and the Ovens, Buckland, Mitta Mitta, Kiewa and King Rivers. On ground works have focussed on log jams and bed seeding installations, as well as fencing and revegetation. In total over 300 logs have been added to waterways, and approximately 60 boulders have been placed.

An insight into the works is well demonstrated in Dermot O'Brien's overview of the Victorian Fly Fishers Association planting day on Little River

Case Study: Little River tree planting day

Question: What are the three most important things about Victorian trout into the future?

Answer: Habitat habitat habitat!

With that in mind, twenty VFFA members headed for Taggerty on Sunday August 6th. The trek up was made with some trepidation, because the weather forecast was horrible. The Black Spur was wet and there was no break in the clouds. Not good signs.

We converged on the Taggerty General Store and were met by Sue Kosch a horticulturist with the Goulburn Broken Catchment Management Authority (CMA). The plan was to plant hundreds of seedlings along the banks of Little River as part of a two-year re-vegetation program.

Two years ago this stretch of Little River was choked with blackberry and Japanese Honeysuckle, both non-native and invasive. These invasive plants had such a strong stranglehold on trees along the river, the CMA was forced to call in heavy machinery to help clear the banks.

We are all familiar with blackberry, but Japanese honeysuckle is another shocker. It has been declared a noxious weed in some American states, lives for 70 to 100 years, chokes trees and shrubs and prevents native plants establishing anywhere near it.

The CMA and the Taggerty Community Progress Group had been working in partnership to remove the "invaders" and also weeds, restore access and improve the general habitat of the Little River riparian zone.

Twenty of us, donned in oil-skins and rubber boots, and got stuck in.

The rain was holding off.

We planted the 400 seedlings that had been laid out along the river. The natives going in were: Manna Gum, Blackwood, Prickly Currant Bush, Hazel Pomaderris, Tea-tree species and Sedges. These are all native to the local area.

Sue Kosch was keen to get the job done, giving the seedlings the best chance to establish their roots in Spring in preparation for a hot and dry summer.

In less than a couple of hours the job was done and local volunteers treated us to magnificent hot homemade soup and a bar-b-q.

The local volunteers said it would have taken them a couple of weekends to do the same plantings.

The tree planting at Taggerty was an important project for the VFFA. Important for several reasons. The streams in that region, the Rubicon, Acheron, Steavenson, Taggerty and others and the wonderful Goulburn River are heavily connected with the history of the VFFA. Many members over the decades have stalked those waters and it was an opportunity for us to put something back.

The locals were happy to see us involved and remain concerned, like us, about healthy streams, improved riparian zones and the increased fencing off and therefore the reduction of fishing access.

The Goulburn CMA may have another similar project next year should we want to be involved. A worthwhile project for sure.

The VFFA Council was delighted with the turn out. Twenty members in the conditions was fantastic and all involved should be congratulated.

The members involved on the day all enjoyed themselves and agreed that it was a very worthwhile project and said they would be happy to get involved again.

As we were saying our farewells the rain started coming down again. It had held off for the entire time.

I guess the trout gods were smiling on us that day. And let's hope it continues throughout the upcoming season!

Thank You!

The Goulburn Broken and North East CMA's are very thankful for the support from volunteers from the following angling clubs, community groups and agencies, and we are looking forward to working together to plan bigger and better projects in 2017 and 2018:

Australian Trout Foundation
Mansfield and District Fly Fishers Club
Northern Suburbs Fly Fishing Club
Tatong Anglers Group
Jamieson Community Group
VR Fish
Nagambie Angling Club
Victorian Fisheries Authority
Taggerty Community Progress Group
Corryong Fishing Club
Victorian Fly Fishers Association
Southern Fly Fishers
Latrobe Valley Fly Fishers
Up2Us Landcare Alliance
Native Fish Australia
Benalla Angling Club
Wangaratta Fly Fishing Club
Arthur Rylah Institute
King Valley Tourism Association
Alpine Fly Fishers

An Expensive Trout

Jon Clewlow
Fly fishing guide and part owner Millbrook Lakes, Gordon , Victoria.

Flyfishing is synonymous with challenges, attributes, health benefits, mateship and not to mention the beautiful places it takes you--it is easy to sink into the sport.

Jon Clewlow, a guide and part owner of Millbrook Lakes, first started flyfishing in the womb. His failure to catch anything only spurred him on and by the age of 3, Jon was representing Australia in the Junior World Fly Fishing Championships.

Variously described by his peers as flamboyant, neat, fastidiously clean and just a little testy, Jon is perhaps best known in flyfishing circles as the only person who wears a red fly vest (and oh alright, as a former columnist for FlyLife magazine.)

To say fly-fishing and trout have been a big part of Jon's life is an understatement. It's been a constant for him that saw it's genesis in an Aussie mountain stream. An obsession of sorts that has provided relationship challenges, financial challenges and the odd injury. All counterbalanced by joy, satisfaction, fresh air, mateship etc.

But if only he'd known all this at the start ……..would he have let the genie out of the bottle?

'Working together to build community awareness, understanding and action that will enrich our fisheries into the future.'

Anthony Forster

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Arthur Rylah Institute for environmental research

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