Talk Wild Trout 2016

Conference Proceedings

5 November 2016

Mansfield Performing Arts Centre, Mansfield Victoria

Target One Million

More Victorians fishing, more often

Your fishing licence fees at work

Fisheries Victoria

VICTORIA State Government

Partners:

Editors:

Taylor Hunt, John Douglas and Anthony Forster, Freshwater Fisheries Management, Fisheries Victoria

Contact email:

taylor.hunt@ecodev.vic.gov.au

Preferred way to cite this publication:

'Hunt, T.L., Douglas, J, & Forster, A (eds) 2016, Talk Wild Trout 2016: Conference Proceedings, Fisheries Victoria, Department of Economic Development Jobs Transport and Resources, Queenscliff.'

Acknowledgements:

The Victorian Trout Fisher Reference Group, Victorian Recreational Fishing Grants Working Group, VRFish, Mansfield and District Fly Fishers, Australian Trout Foundation, The Council of Victorian Fly Fishing Clubs, Mansfield Shire Council, Arthur Rylah Institute, University of Melbourne, Mansfield Mt Buller Regional Tourism Association, Mansfield Hunting and Fishing, FlyStream, Philip Weigall, Marc Ainsworth, Vicki Griffin, Pam Hume, Jarod Lyon, Mark Turner, Amber Clarke, Andrew Briggs, FlyLife, Leighton Adem, Dallas D'Silva, Rob Loats, Travis Dowling, Julie Morgan, Kylie Hall, Belinda Lorensini, Ewan McLean, Neil Hyatt, Damien Bridgeman, Paul Petraitis and Hui King Ho.

Project Leaders and chapter contributors: Jason Lieschke, John Morrongiello, Amber Clarke, Jim Castles, Andrew Briggs, John Douglas, Andrew Pickworth, John Mahoney, Justin O'Connor, Canran Liu and Fletcher Warren-Myers.

Authorised by the Victorian Government Department of Economic Development, Jobs, Transport & Resources (DEDJTR), 1 Spring Street Melbourne Victoria 3000. November 2016

ISBN 978-1-925532-62-3 (Print)
ISBN 978-1-925532-63-0 (Online)

Cover photo: John Douglas

Contents

Foreword

Trout fishing gets people of all ages and types out and about and into some of our most beautiful wild Victorian landscapes. Fishing for wild trout is a much loved activity with a rich and long social history that dates back more than 150 years. It also provides a special opportunity for us to spend quality time together with our friends and families.

The Andrews Labor Government values the significant social and economic importance of trout fishing in Victoria. For this reason we are doing some exciting work under our *Target One Million* plan, aiming to get more people, fishing more often. We are busy improving recreational fishing by investing in projects that will make a real difference, such as improving angler access, increasing fish stocking, introducing minimum size limits on trout waters and providing $2,000 grants to support angling clubs. We have acted quickly and recently commenced stocking a number of drought recovering iconic south west trout lakes and have and secured more water for the iconic Toolondo Reservoir fishery.

The *Wild Trout Fisheries Management Program* is a great example of government and anglers working together toward a common goal - better fisheries. Through research, monitoring and meaningful engagement with recreational fishers, the three-year program is bringing a special focus to our valued wild trout fisheries. This work is now in its second year and has already led to some great outcomes from fostering a greater understanding of our trout fisheries, to anglers getting involved in planting streamside vegetation to improve fish habitat in the Delatite River. It's fantastic to see trout fishers investing their own time and effort in partnership with local agencies to restore and protect the waters they love to fish.

I'm sure this year's Talk Wild Trout 2016 Conference will be just as valuable and enjoyable as Talk Wild Trout 2015, and will continue to promote improved trout fishing in Victoria in the future.

Jaala Pulford, MLC

Minister for Agriculture

Conference Program – Subject to change Saturday 5 November

9.30 am	Arrival & morning refreshments	Delegates
10.00 am	Welcome to Country	Taungurung/Mansfield Shire
10.10 am	Foreword	Travis Dowling
10.15 am	Recap – Talk Wild Trout 2015	Anthony Forster

Key Note Address

10.30 am	Angling Advocacy	April Vokey, Renowned Angler/ Conservationist (CA)
11.15	Morning Tea Break	

Theme 1 - Wild Trout Secrets (Session Chair: Rob Loats, VRFish)

11.30 am	The state of trout in Victoria: 2016 overview	Jason Lieschke, Arthur Rylah Institute
11.45 am	Health cards for 12 of our best wild trout streams 2016	Taylor Hunt, Fisheries Victoria
12.00 am	The heat is on!: trout movement on the Delatite River over two years	Jason Lieschke, Arthur Rylah Institute
12.20 pm	Lunch	Delegates, speakers & chair

Theme 2 – Climate & Habitat (Session Chair: Jarod Lyon, Arthur Rylah Institute)

1.00 pm	Climate change and trout – a way forward	Dr John Morrongiello, University of Melbourne
1.30 pm	Angler Partnerships to Restore Rivers	Dr Amber Clarke, DELWP Jim Castles, GBCMA
2.00 pm	Panel Questions & Answers	Delegates, speakers & chair
2.25pm	Afternoon Tea break	

Theme 3 – Fisheries Management (Session chair: Anthony Forster, Fisheries Victoria)

2.50 pm	Stocking trials in the Howqua and Goulburn rivers: What's the catch?	John Douglas, Fisheries Victoria
3.05 pm	Riparian and Instream habitat works work!	Andrew Briggs, NECMA
3.20 pm	Building trout fisher capacity and finding common ground	Terry George, ATF Steven Relf, VRFish
3.40 pm	Panel questions and Answers	Delegates, speakers & chair

Conference wrap up

4.00 pm	What I got out of the conference	Philip Weigall, FlyStream.com
4.15 pm	Close of conference	Travis Dowling

Fisheries Victoria
VICTORIA State Government
Your fishing licence fees at work
Target One Million
More Victorians fishing, more often
Representing Victorian Recreational Fishers
VRFish
Arthur Rylah Institute for environmental research
Australian Trout Foundation
The Council of Victorian Fly Fishing Clubs
M.A.D. Fly Fishers

Overview of the Wild Trout Fisheries Management Program

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.

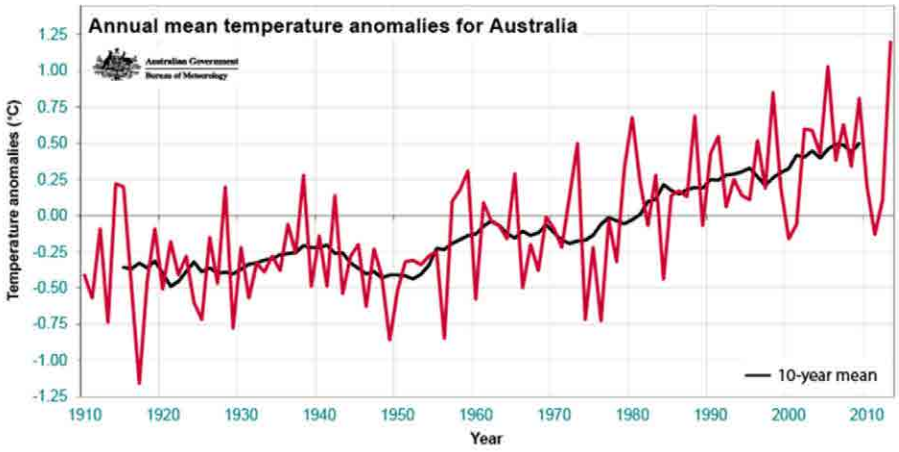


Figure 1: Annual mean temperature anomalies for Australia (compared with 1961–1990 average). Source: BOM 2014.

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).

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.

Recap of Talk Wild Trout 2015 Conference

Anthony Forster

Fisheries Victoria, DEDJTR

Last year's **Talk Wild Trout 2015** Conference was extraordinarily well received by recreational fishers, fisheries management agencies and other resource managers from across Australia. For the first time, the conference brought together more than 170 delegates who shared a private or professional interest in supporting trout fishing in Victoria. For weeks and months after the conference, fishing media and social media covered the conference proceedings.

Talk Wild Trout 2015 was much more than a talk fest, it revealed the first year of three years of research conducted under the **Wild Trout Fisheries Management Program**. In a nutshell, this program was largely funded by recreational fishing licence revenue to *better understand and manage the wild trout fishery in the face of a reported decline in wild trout fisheries through the unusually hot summer of 2013/14*. The key questions to explore through this program:

- How do summer water temperatures impact wild trout fisheries ?
- Is fishing pressure a significant issue?
- Do lake stocked trout contribute to river trout populations?
- How have changes in river habitat compromised wild trout fisheries?
- Is trout stocking in rivers effective?

These questions were the focus of some innovative science projects.

More broadly, the **Wild Trout Fisheries Management Program** posed two other strategic questions:

- How do we better track the performance of our wild trout recreational fisheries?, and,
- How can we communicate and build shared understanding and management of trout fisheries between fishers and resource management agencies?

What we learnt - Highlights

This summary doesn't do justice to the extensive research work and key findings from the first year of the **Wild Trout Fisheries Management Program**. It does however, remind delegates of some of the key messages and themes that came shining through – at least that is for me.

1. Trout Unlimited

The Conference began with a key note address from Dan Dauwalter, a Fisheries Scientist from Trout Unlimited, USA. Dan gave us a staggering account of the scale of recreational fishing driven habitat effort in North America. Trout Unlimited have more than 400 chapters across the states and 150,000 members who contribute some 600,000 hours of volunteer effort toward habitat restoration projects - all aimed at improving recreational fishing outcomes. Dan referred to a now famous Trout Unlimited idiom "Take care of the fish, and the fishing will take care of itself". Key to Dan's talk acknowledgment of the vulnerability of trout to climate change and the need to conserve, protect and restore critical habit throughout the catchment.

2. How are our wild trout populations performing?

- Wild trout river populations are resilient but are highly vulnerable to hot long summers.
- A scorecard survey fishery assessment approach of our top 12 priority trout rivers told us:
  - 5 were rated excellent, 3 good, 2 moderate, 1 low and 1 recovering.
  - Trout abundance was generally depressed in the lower reaches, particularly in summer.

3. How do trout respond to a hot summer?

- 100 acoustically tagged wild trout in the Delatite River told us:
  - Trout (particularly larger trout) movement increased as temperate increased above 22 Degrees Celcius.
  - Movement was always upstream toward cooler water.

4. Climate, habitat and streamside shading?

- The last decade (2005 to 2015) was significantly warmer (2 Degrees Celsius +) than the previous 15 years.
- Rivers that flow East / West (e.g. Delatite, Jamieson, Howqua) are exposed to the sun all day long are vulnerable to warming.
- Streamside vegetation provides critical temperature relief for trout but has been compromised through extensive bushfires and land clearing practices.
- Willow removal can have a local scale shading effects but not at a river or catchment scale.

5. Restoring bankside vegetation?

- A high priority of State Government and local Catchment Management Authorities.
- Increasing interest from recreational fishers and local communities to work alongside CMA's.
- Recreational fishers are probably the greatest beneficiary from riparian restoration and their interest is growing.

6. Smarter stocking

- The Scandinavian salmon farming industry successfully developed a novel way of differentiating hatchery fish from wild fish using food safety approved barium markers.
- This cost effective breakthrough technology is being trialled at Snobs Creek and could enable us to evaluate the effectiveness of a range of fish stocking strategies.

7. What about trout fishing pressure?

- After surveying over 1,400 campers during the summer of 2014/15 across the upper Goulburn River basin in the Mansfield shire we found:
  - Survey - 65% of campers rate themselves as recreational fishers,
  - Very low harvest levels / exploitation rates i.e. less than 5% of fisher retained fish.
- Tagged returns - Of the 100 trout that were tagged in the Howqua River, only 3 trout were reported as captured by fishers.
- Compliance - Over three years and more than 4,300 inspections across North East Victoria, trout fishing compliance rates were around 99% .

Beyond the science and evidence, the momentum generated from the **Talk Wild Trout 2015 Conference** ushered in a new partnership approach to better understanding and get the most from our iconic wild trout fisheries. Trout fishing makes a wonderful social and economic contribution to regional Victoria. Talk Wild Trout 2015 was so successful at engaging trout fishers and sharing information, the approach is now being rolled out as a model to engage other recreational fishing sectors including Murray cod, tuna and Port Phillip Bay.

Keynote speaker

April Vokey,
Renowned Angler/Conservationist

Angling Advocacy

To the outsider, Australia is a place of saltwater, red rocks, and kangaroos. Few North Americans realize that snow falls in the south, Aussies don't only drink Foster's, or that rivers run wild through the vast terrain. Even fewer of us take the time to educate ourselves on the freshwater species that call these rivers home, or the anglers who dedicate their time on the water solely to the trout.

Truthfully, Australia's history of fly-fishing for trout is one which confused me when I first arrived in the 'land down under'. I simply couldn't understand how angling for an introduced species could be more popular than fly-fishing for indigenous Indo-Pacific permit, barramundi, or marlin. Even more startling was when I asked members of the VFFA if any of them fished for alternate species and only a handful of the members raised their hands. I was curious to learn more about this mindset, and was therefore inspired to look further into the Australian trout fisheries near my own home in Sydney.

Over the last fifteen years, I have dedicated my life to travelling the world, and I've been fortunate enough to have experienced some of the most famed international trout fisheries: Canada, the United States, Chile, Europe, New Zealand, Argentina… to name but a few. In this presentation, I will be addressing Australia's trout fishing and how it compares to other fisheries on a global scale — more specifically, I will be referencing my observations and how they pertain to recreational angling, environmental advocacy, and community integration.

Theme 1 - Wild Trout Secrets

Photo: Daniel Kent

The state of trout in Victoria: 2016 overview of survey results

Jason Lieschke, Andrew Pickworth, John Mahoney, Justin O'Connor
Arthur Rylah Institute, DELWP

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

Background:

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

After reviewing results from surveys of twelve priority rivers in 2015, the Victorian Trout Fisher Reference Group chose to replace three priority rivers from 2015 with three new priority rivers to be surveyed in 2016. The new rivers to be surveyed in 2016 were the Barkly, Morass and a southwest river, each with three or four sites to be sampled. The southwest river was sampled as two separate rivers (Merri and Hopkins) with two sites in each river. The existing nine rivers to be surveyed in 2016 (Dargo, Goulburn, Howqua, Jamieson, Kiewa, King, Mitta Mitta and Ovens Rivers and Nariel Creek) all had three or four sites sampled (as per year one) (Figure 1).

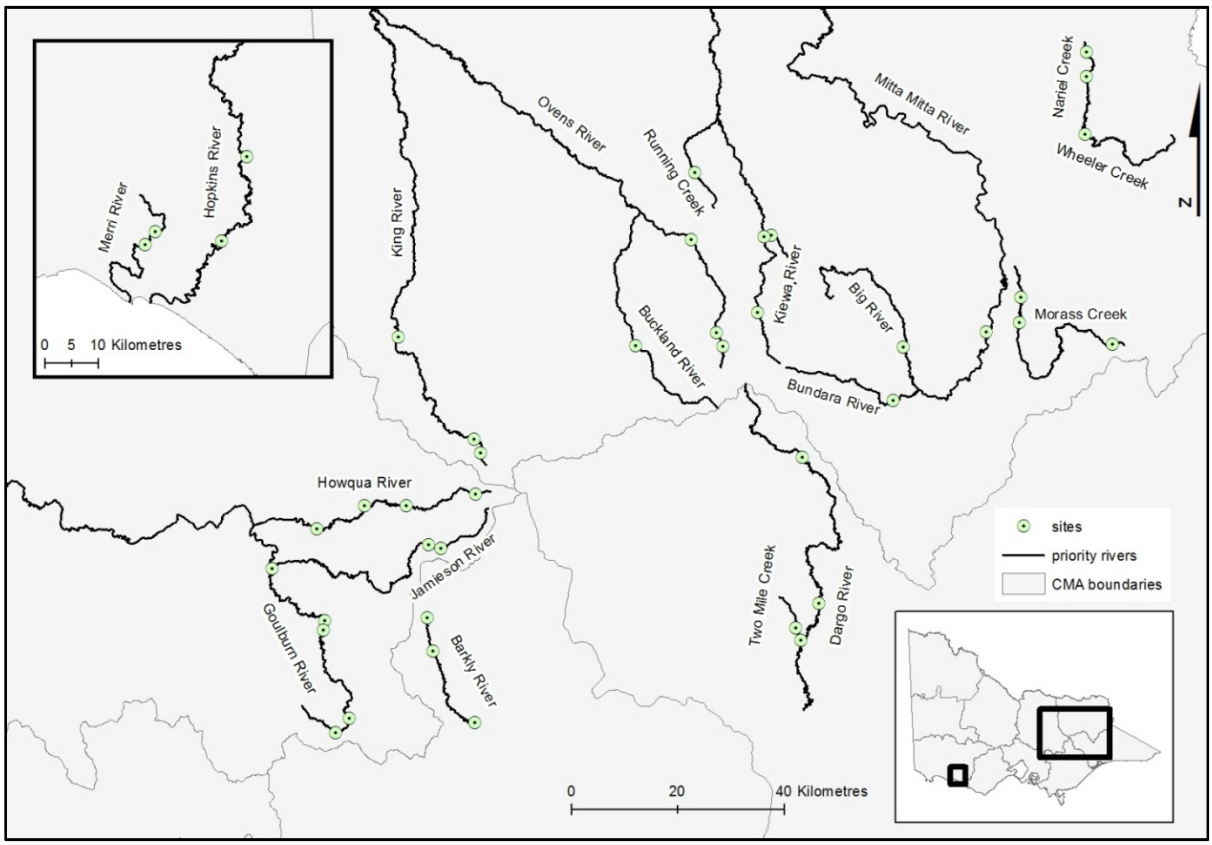


Figure 1. Location of the 12 priority rivers and the 41 sites surveyed across Victoria.

What did we do:

A total of 41 sites across the 12 priority rivers were identified, and then surveyed between 27 January and 10 March 2016.

To keep sampling methods 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.

Figure 2. Electrofishing for trout via backpack, bank-mount and boat electrofishing.

What did we learn:

A total of 1561 trout were surveyed. Brown trout were the most dominant trout species, contributing 77% (1198) of the trout surveyed. Brown trout were also consistently larger (up to 54.5 cm) than rainbow trout (up to 31 cm) (Figure 3).

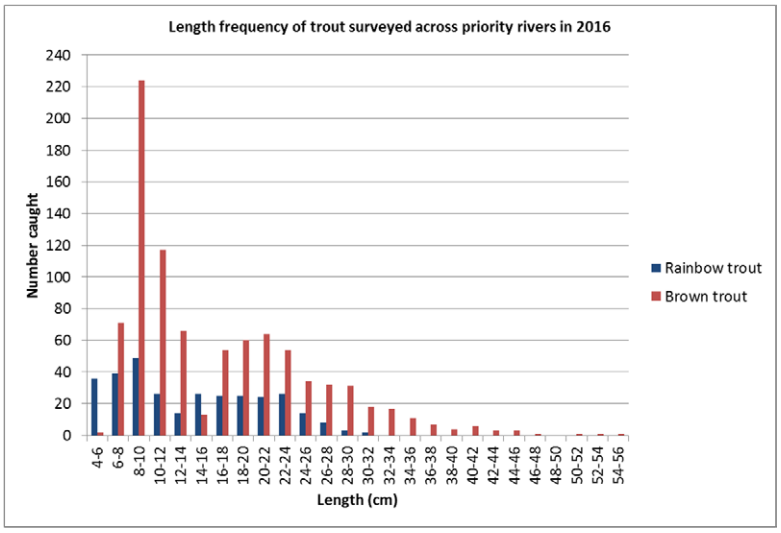


Figure 3. Length frequency of trout across Victoria in 2016.

Comparison between 2015 and 2016 survey results (all rivers combined):

More brown trout were caught during 2016 than during 2015, but fewer rainbow trout were caught in 2016 compared to 2015 (Table 1). The maximum sizes remained for both species was similar between years. The number of brown trout over 20 and 40 cm was also similar between years. Even though fewer rainbow trout were surveyed in 2016, the number of rainbow trout greater than 20 cm increased.

Table 1. Abundance of trout captured in 2015 and 2016, with maximum size and abundances greater than 20 and 40 cm. The number of trout captured in 2015 has been recalculated to only include repeat sites and does not include additional trout caught within priority rivers for other components of the WTFMP in 2015, such as stocking or high reward tags.

Brown trout	2015	2016
Number of brown trout surveyed (measured)	804 (766)	1198 (895)
Maximum size brown trout captured	55	54.5
Number of brown trout over 40 cm's	12	16
Number of brown trout over 20 cm's	302	288
Rainbow trout		
Number of rainbow trout surveyed (measured)	441 (345)	363 (317)
Maximum size rainbow trout captured	32	31
Number of rainbow trout over 20 cm's	54	77

Comparison between 2015 and 2016 (repeat rivers only):

As it is hard to compare results between years with different rivers surveyed (e.g. Toorongo River had highest brown trout abundances greater than 20 cm in 2015, but was not resurveyed in 2016), the following section relates to the nine priority rivers (32 sites) that were surveyed in both 2015 and 2016. More brown trout were captured in 2016 compared to 2015 at seven of the nine rivers repeated with abundance doubling at five of the sites (Figure 4). Fewer rainbow trout were caught at six of the seven rivers in 2015 compared to 2016, though this decrease was marginal. Nariel Creek was the exception with the number of rainbow trout captured increasing dramatically in 2016.

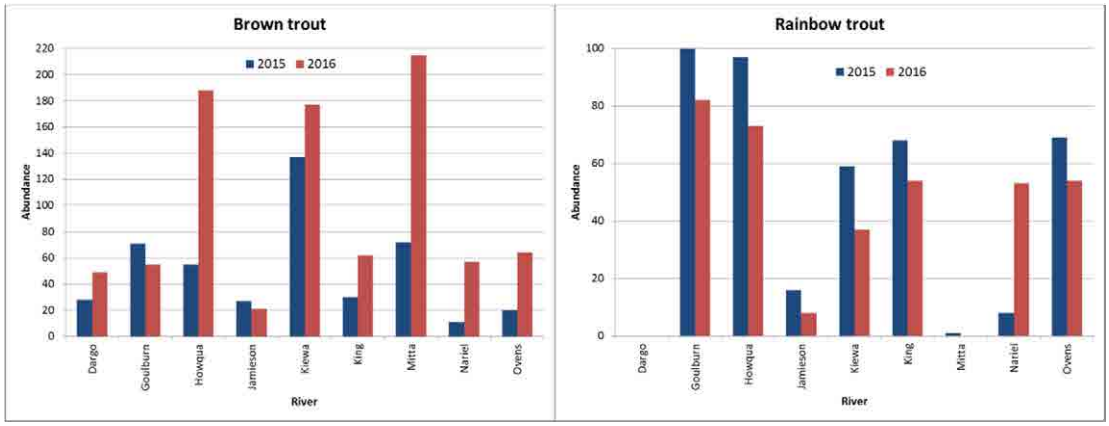


Figure 4. Abundances of brown and rainbow trout from the nine repeated priority rivers in 2015 and 2016.

The majority of the increase in brown trout abundances likely comes from the 2015 spawning event, as categorised by the increase in abundance of 6-8 and 8-10 cm fish (Figure 5). Although rainbow trout were in slightly lower abundances in 2016, there were more fish in the 16-24 cm size ranges, likely a result of the fish in the 8-14 centimetre size ranges in 2015 growing to 16-24 cm range in 2016. There also appears to be a difference in the size of the young rainbow trout between 2015 and 2016. This suggests a delayed spawning event or a reduced growth rate. It is possible that the increase in success of the brown trout 2015 spawning event (large numbers of 6-12 cm fish in 2016) has exerted pressure on the small rainbow trout. Brown trout breed earlier than rainbow trout and therefore may have a competitive edge if conditions are suitable.

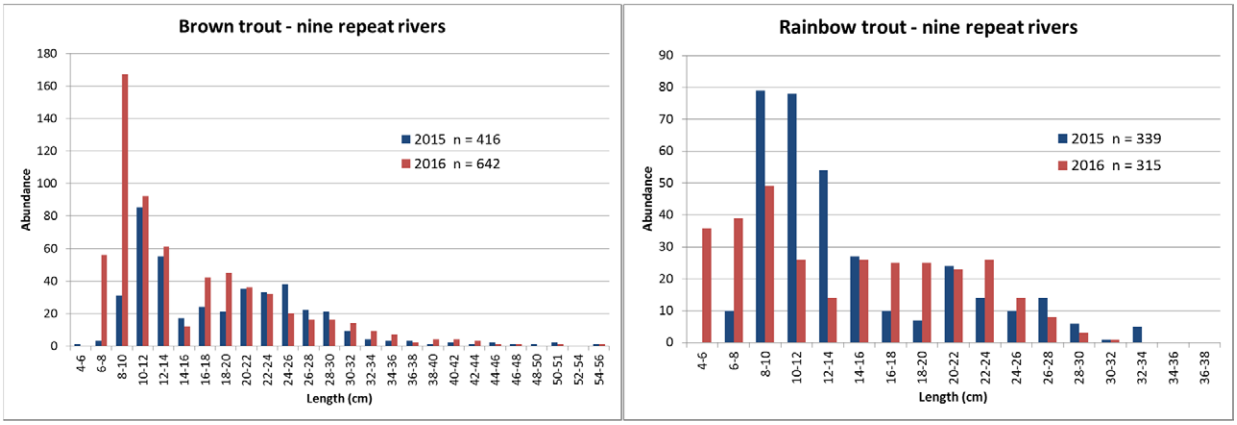


Figure 5. Length frequency of brown and rainbow trout from nine repeated priority rivers in 2015 and 2016

Key findings:

- There was evidence of brown trout recruitment from 2015 spawning in 10 of the 12 priority rivers.
- Brown trout recruitment (as indicated by small fish) was stronger in 2016 compared to 2015.
- No brown trout recruitment was recorded in the Jamieson River and the two southwest streams (Hopkins and Merri Rivers). This is the second year in a row no brown trout recruitment has been recorded in the Jamieson River.
- There was evidence of rainbow trout recruitment from the 2015 spawning in 7 of the 8 priority rivers in which they were recorded in (including the Jamieson River).
- The size of the rainbow trout recruits were smaller in 2016 than 2015 (indicating delayed spawning or reduced growth rates – possibly competition from increased brown trout recruitment).
- The Barkly, Goulburn, Howqua, Kiewa, King and Mitta Rivers all had at least one site with > 50 trout captured per 100 m surveyed.
- The Howqua had one site with > 100 trout captured per 100 m surveyed (with Kiewa close at 93).
- The Ovens River showed further signs of trout recovery following the 2013 fires and sediment impact; brown trout were collected from the Ovens River upstream of Harrietville (absent in 2015), indicating the population is showing signs of recovery.
- Nariel Creek went from just over three trout per 100 m in 2015 to almost 13 trout per 100 m in 2016. Both brown and rainbow trout increased, with all size ranges recorded.
- Generally, trout were in higher abundances at the higher altitude sites (same as in Year 1).

Next steps:

Monitor trout populations in 2017, including assessing levels of recruitment from the 2015 and 2016 spawning events.

Health cards for 12 of our best wild trout streams 2016

Taylor Hunt[1] and Jason Lieschke[2]
[1] Fisheries Victoria, DEDJTR, [2] Arthur Rylah Institute, DELWP

Aim:
Produce health cards for each of our monitored streams to give fishers and managers a better understanding of 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 electrofishing. Electrofishing is an effective sampling tool for providing a snapshot of the presence and abundance of fish present in a stream. However, electrofishing is not perfect and does not catch all fish present. For example, some studies suggest electrofishing catches around 28% of trout present at a site. The numbers of fish presented in the Health Cards should therefore 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. 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 cards provide a snapshot insight into the current health of a variety of trout populations in Victoria.

How to read the Health cards:

The green **Key Health Indicators** box give you an easy to read overall evaluation of key health attributes of the trout population and an overall rating.

The pink **Monitoring Results** section provides a summary the fish surveys and provides information to the reader regarding the number of brown and rainbow trout caught, percentage of fish that were over 20cm in length (defined as catchable), largest trout, average size and density of catchable trout and what other fish species are in the stream. The map provides locations of each survey site and density of trout sampled in the surveys.

The reverse of the card provides important information about the shape of the population (size structure) and the relative abundance compared with previous surveys. Finally, a simple overview summary statement of the health card report is provided.

Talk Wild Trout 2016

Location: Barkly River

Three sites surveyed 18 February 2016:

Site A: 240m stretch near branch junction
Site B: 280m stretch near track crossing
Site C: 220m stretch downstream Glencairn road bridge

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Very Good**

Monitoring results

Total number of trout caught:
203 brown trout (BT) in 740m of river

% Catchable (20cm+) trout: 28% (BT)

Largest trout: 33cm/13in and 425g/1lb

Average size of catchable (20cm+) trout: 26cm/10in

Overall catchable (20cm+) trout density: 7 trout per 100m

Other species present: Short finned eel, river blackfish, Australian smelt, spiny crayfish and yabbies

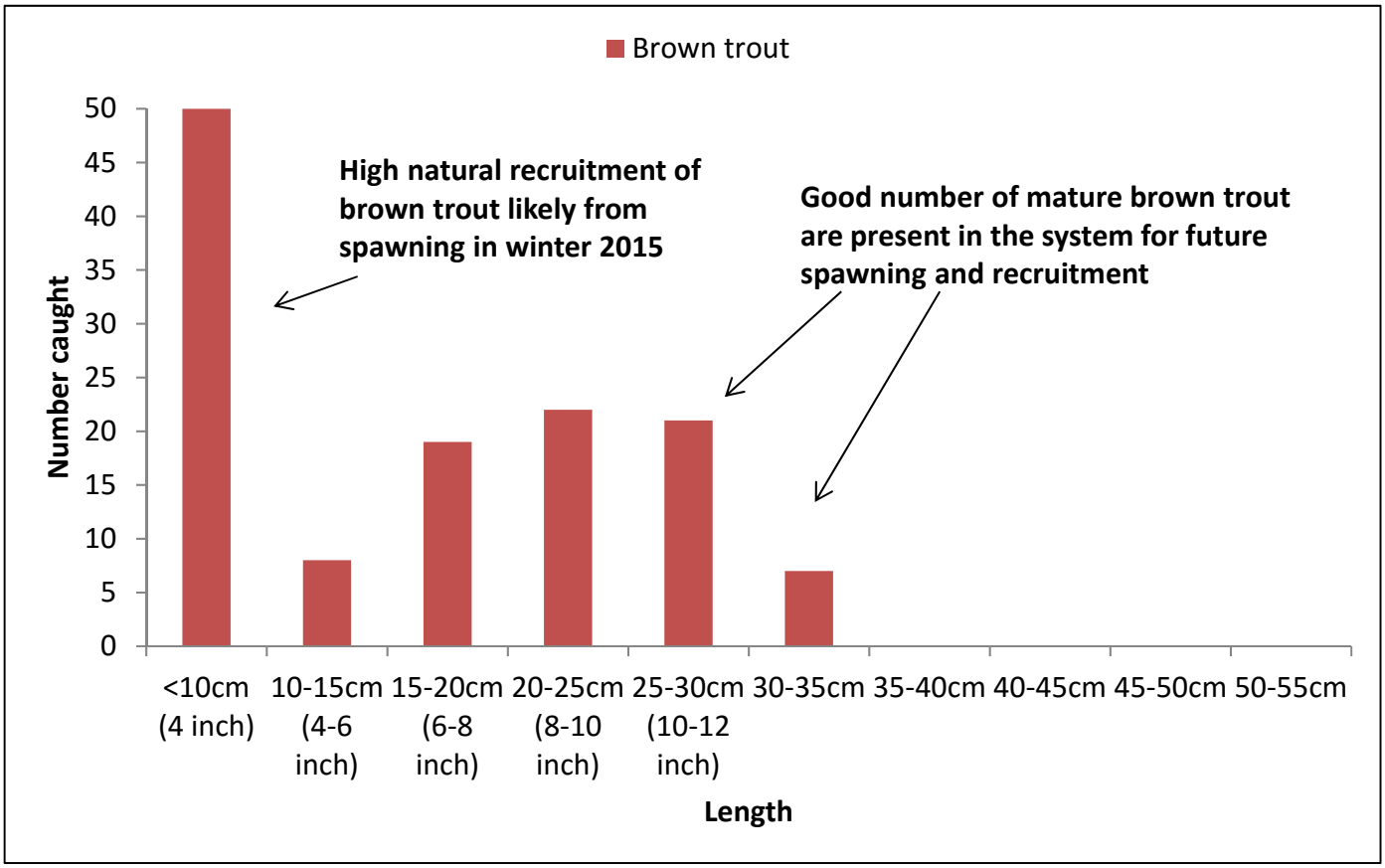
A: Branch Junction
50 trout per 100m

B: Track Crossing
18 trout per 100m

C: Glencairn rd bridge
2 trout per 100m

Location: Barkly River

Multiple size classes present in brown trout population



Relative abundance of brown trout is compared to previous years is unknown as surveys were conducted at different sites

The 2016 survey suggests the Barkly River currently supports a healthy brown trout population with strong recent recruitment of small fish, multiple size classes and good numbers of mature brown trout.

Location: Dargo River System

Four sites surveyed 17 February 2016:

Site A: 280m stretch on King Spur Track
Site B: 223m stretch Twiggy Track
Site C: 290m stretch Upper Dargo Road
Site D: 240m stretch Two Mile Creek Junction

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	**Some**
Overall Rating:	**Good**

Monitoring results

Total number of trout caught:
103 brown trout in 1033m of river

% Catchable (20cm+) trout: 18%

Largest trout: 35cm/14in and 498g/1lb

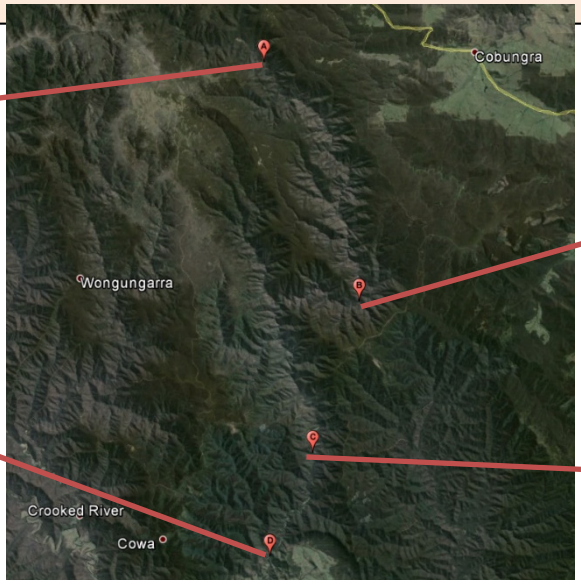
Average size of catchable (20cm+) trout: 26cm/10in

Overall catchable (20cm+) trout density: 2 trout per 100m

Other species present: Australian Grayling, Short finned eel, Long finned eel, river blackfish, galaxid minnows, tupong, Australian smelt and spiny crayfish

A: King Spur Track
16 trout per 100m

B: Twiggy Track
2 trout per 100m

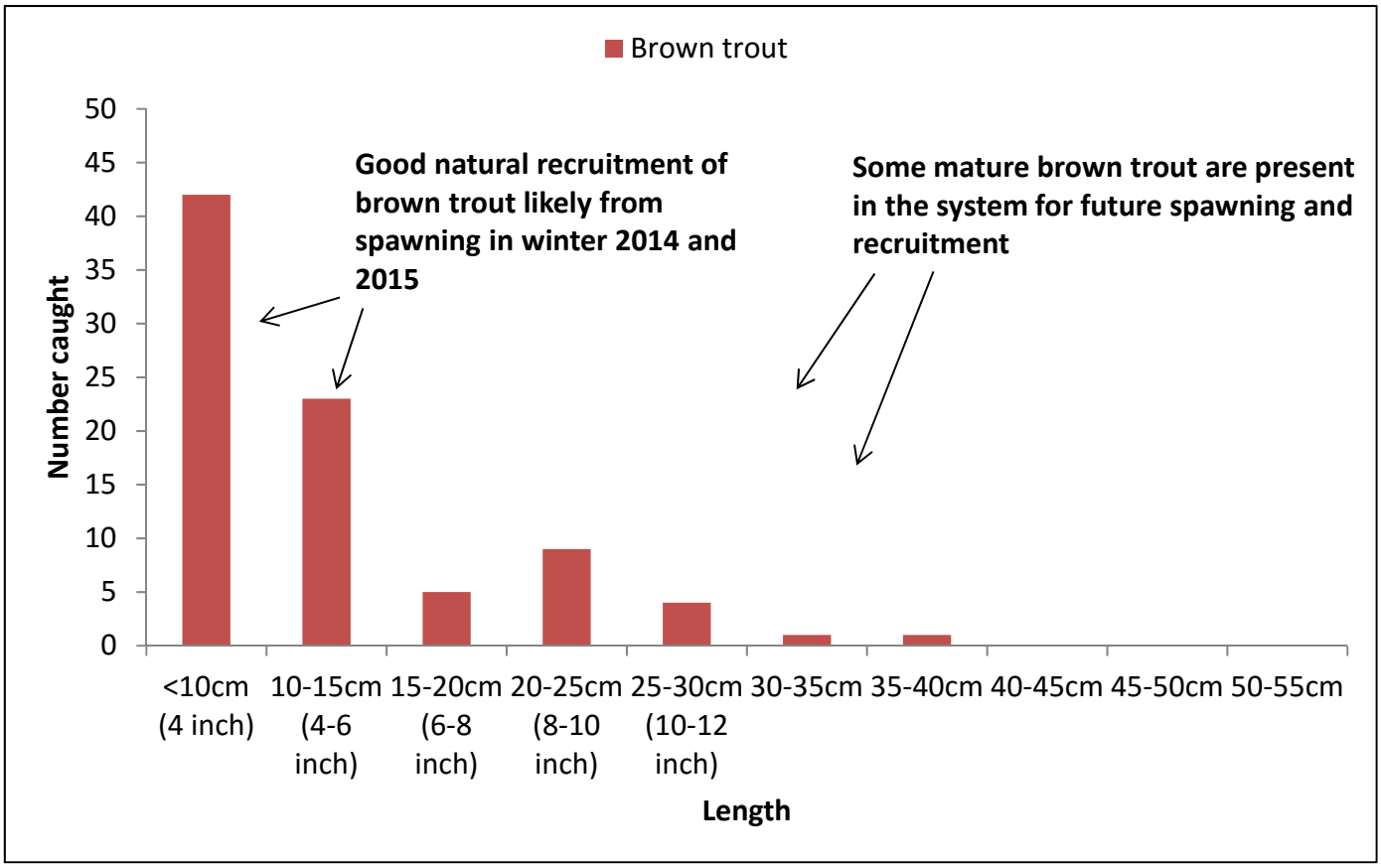


D: Two Mile Creek
23 trout per 100m

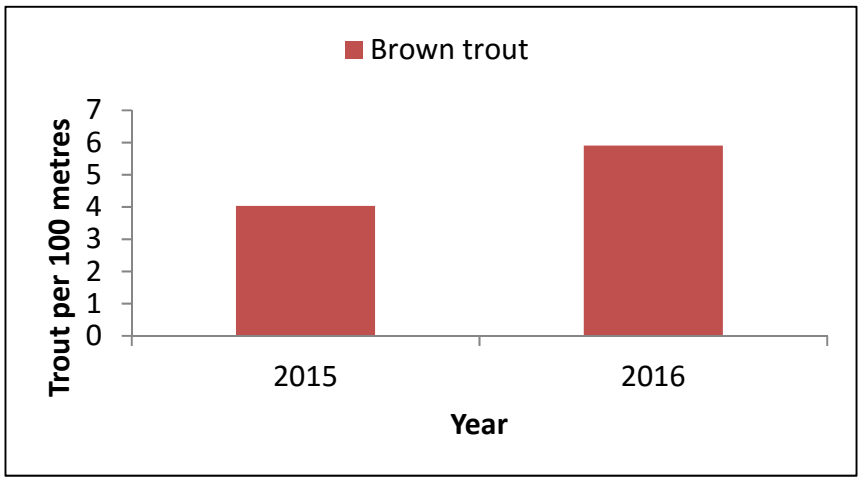
C: Upper Dargo Road
1 trout per 100m

Location: Dargo River System

Healthy population structure including multiple size classes of brown trout present in population



Abundance of brown trout is significantly higher than last year



This figure includes survey data from only sites A,B and C, which were consistently sampled in both 2015 and 2016. Site D was more extensively sampled in 2016.

The 2016 survey suggests the Dargo River System currently supports moderate numbers of brown trout with a healthy population structure.

Location: Upper Goulburn River

Four sites surveyed 2-4 February 2016:

Site A: 200m stretch on Johnson Hill Track
Site B: 260m stretch Clarke Spur- Abbot Link Track
Site C: 180m stretch at Picnic Point
Site D: 215m stretch Blue Hole

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	**Some**
Overall Rating:	**Moderate**

Monitoring results

Total number of trout caught:
84 brown trout (BT) and 82 rainbow trout (RT) in 855m of river

% Catchable (20cm+) trout: 27% (BT), 0% (RT)

Largest trout: 55cm/22in and 1.1kg/2.4lb

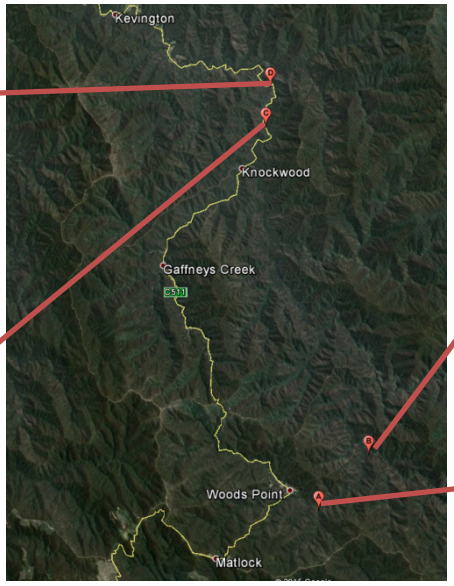
Average size of catchable (20cm+) trout: 25cm/10in

Overall catchable (20cm+) trout density: 3 trout per 100m

Other species present: Two-spined blackfish, galaxid minnows, carp, redfin and spiny crayfish

D: Blue Hole
1 trout per 100m

C: Picnic Point
2 trout per 100m

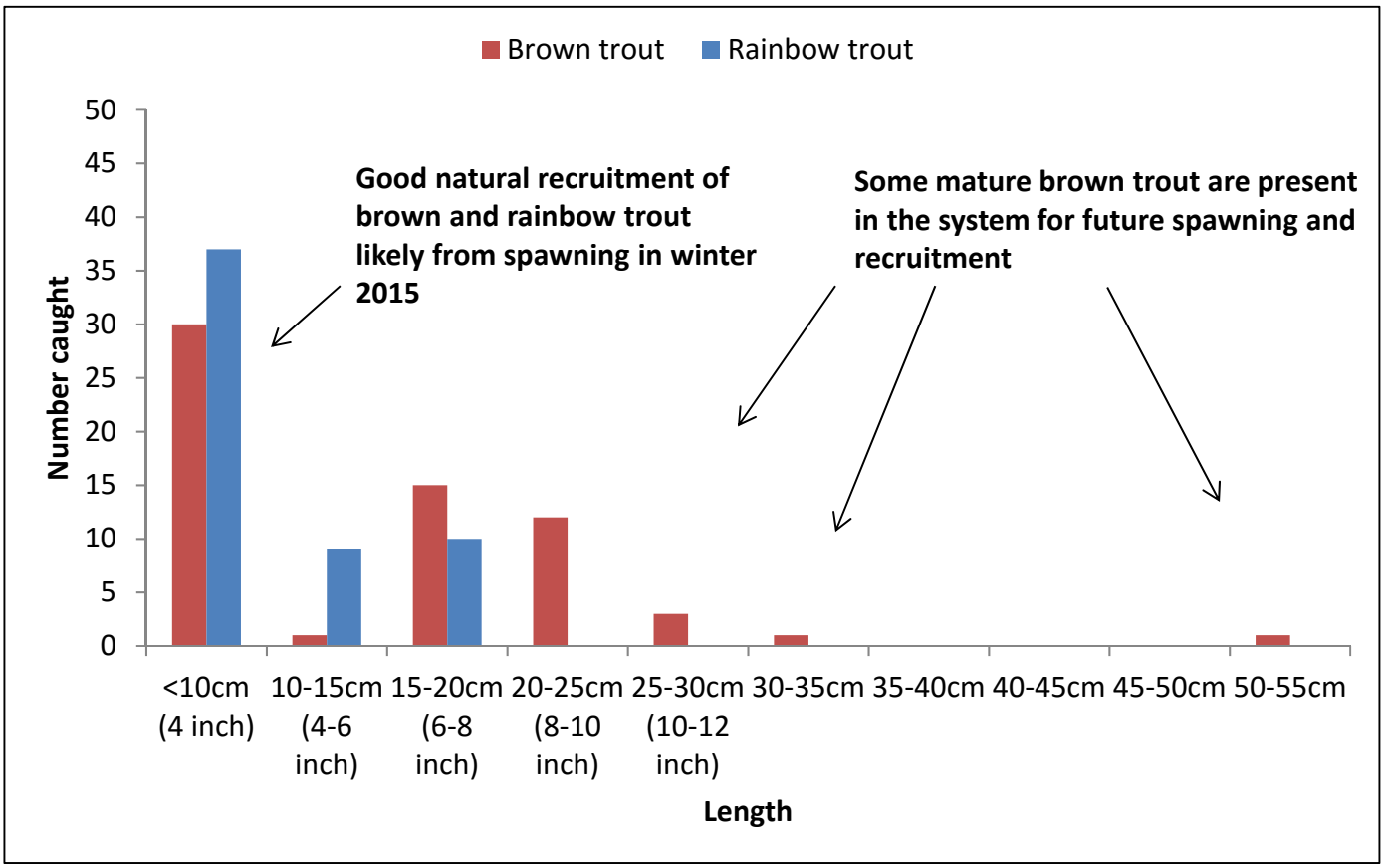


B: Clarke Spur Abbot Link Track
3 trout per 100m

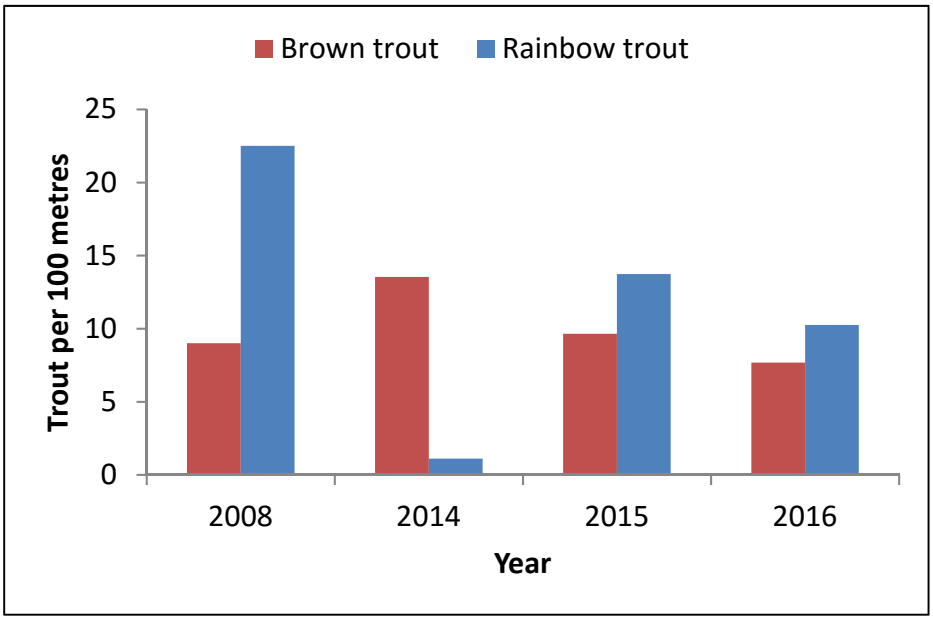
A: Johnson Hill Track
65 trout per 100m

Location: Upper Goulburn River

Multiple size classes present in population of brown and rainbow trout



Relative abundance of brown and rainbow trout is consistent and typically lower than from surveys in previous years



The 2016 survey suggests the Goulburn River currently supports moderate numbers of brown and rainbow trout with a healthy population structure.

Location: Howqua River

Four sites surveyed 3-25 February 2016:

Site A: 290m stretch near Running Creek Camp reserve
Site B: 250m stretch at Frys Hut
Site C: 200m stretch at 7 Mile Flat
Site D: 200m stretch at Bindaree

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Excellent**

Monitoring results

Total number of trout caught:
231 brown trout (BT) and 85 rainbow trout (RT) in 940m of river

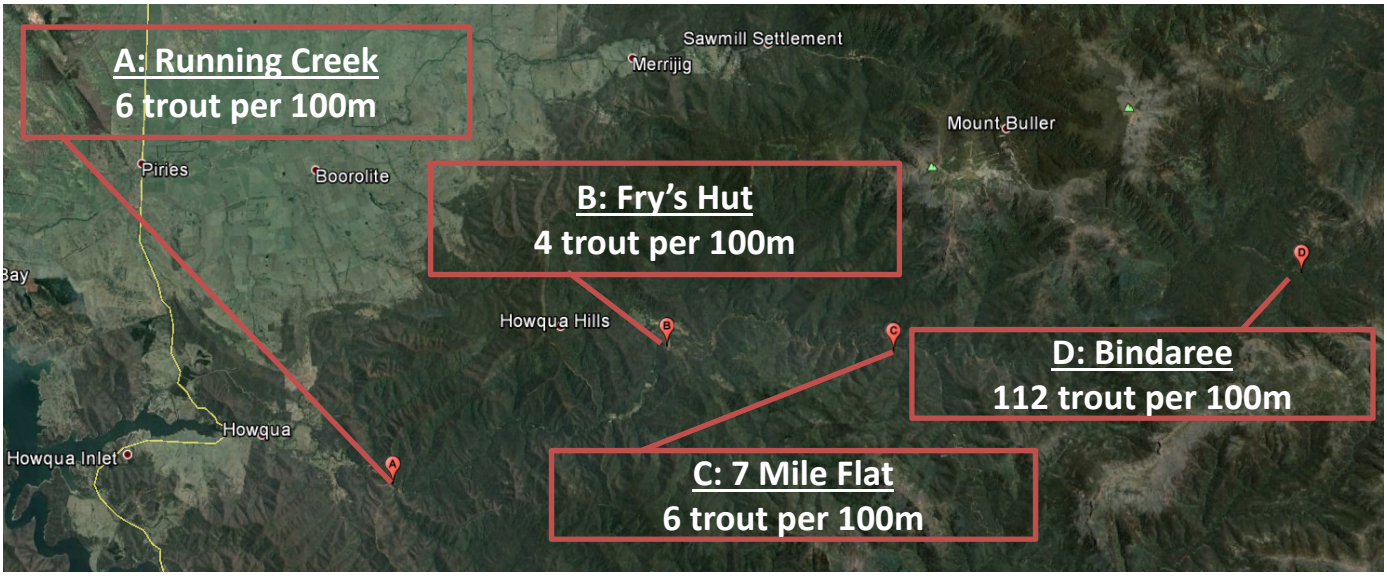
% Catchable (20cm+) trout: 19% (BT), 9% (RT)

Largest trout: 53cm/21in and 1.5kg/3.3lb

Average size of catchable (20cm+) trout: 26cm/10in

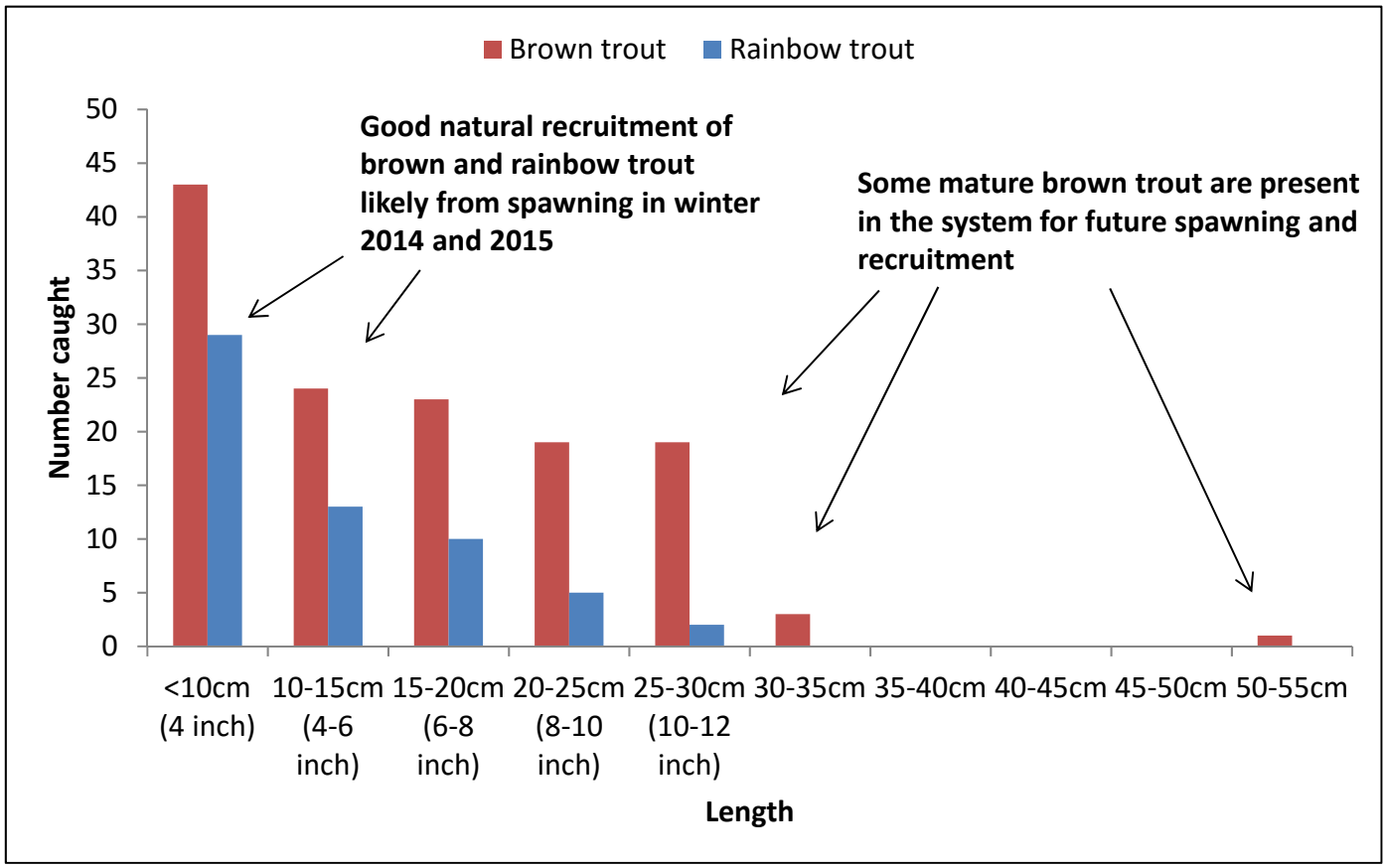
Overall catchable (20cm+) trout density: 3 trout per 100m

Other species present: Carp, redfin, roach, two-spined blackfish, galaxid minnows and spiny crayfish

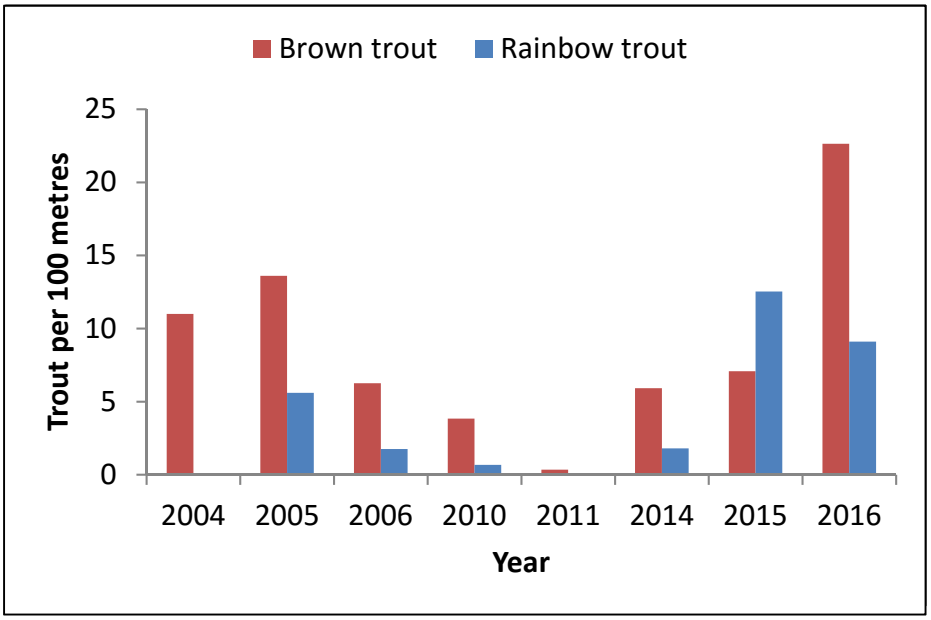


Location: Howqua River

Multiple size classes present in population of brown and rainbow trout



Relative abundance of brown and rainbow trout is relatively high compared with surveys in previous years



The 2016 survey suggests the Howqua River continues to support good numbers of brown trout and rainbow trout, with brown trout abundance high compared with previous years.

Location: Jamieson River

Three sites surveyed 2-3 February 2016:

Site A: 280m stretch at Jamieson Caravan Park

Site B: 220m stretch Saddle Road Bridge

Site C: 250m stretch at Brocks Road Bridge

Key health indicators

Recent recruitment	✗
Multiple size classes	✓
Mature fish	**Some**
Overall Rating:	**Low**

Monitoring results

Total number of trout caught:
36 brown trout (BT) and 9 rainbow trout (RT) in 750m of river

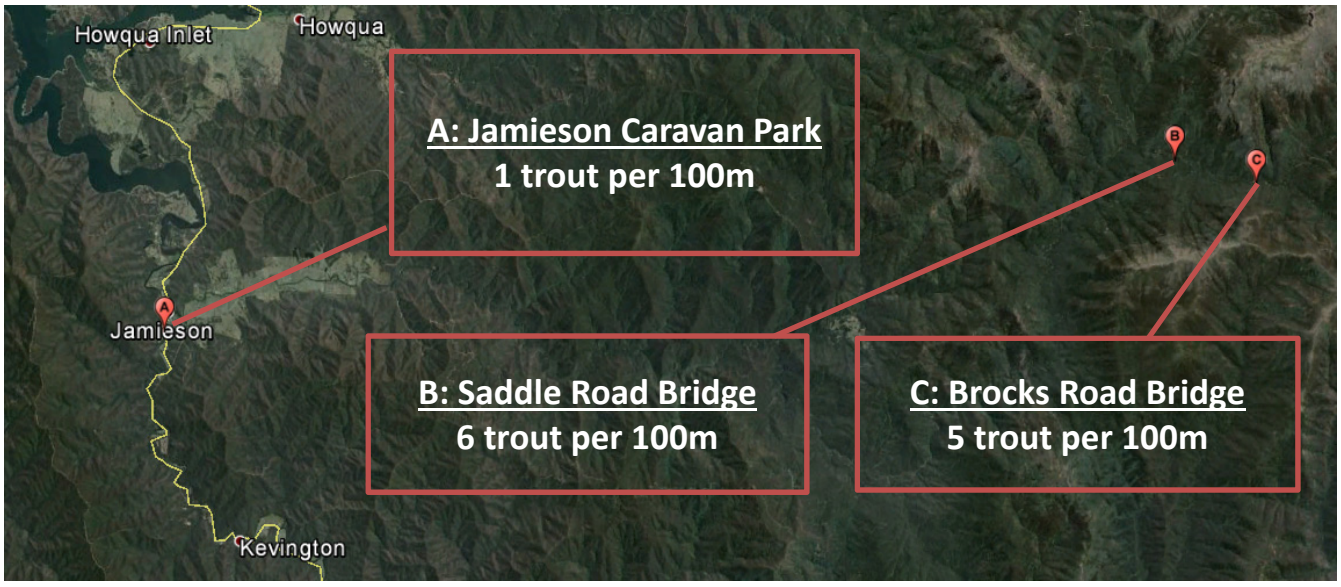
% Catchable (20cm+) trout: 100% (BT), 63% (RT)

Largest trout: 37cm/15in and 508g/1lb

Average size of catchable (20cm+) trout: 28cm/11in

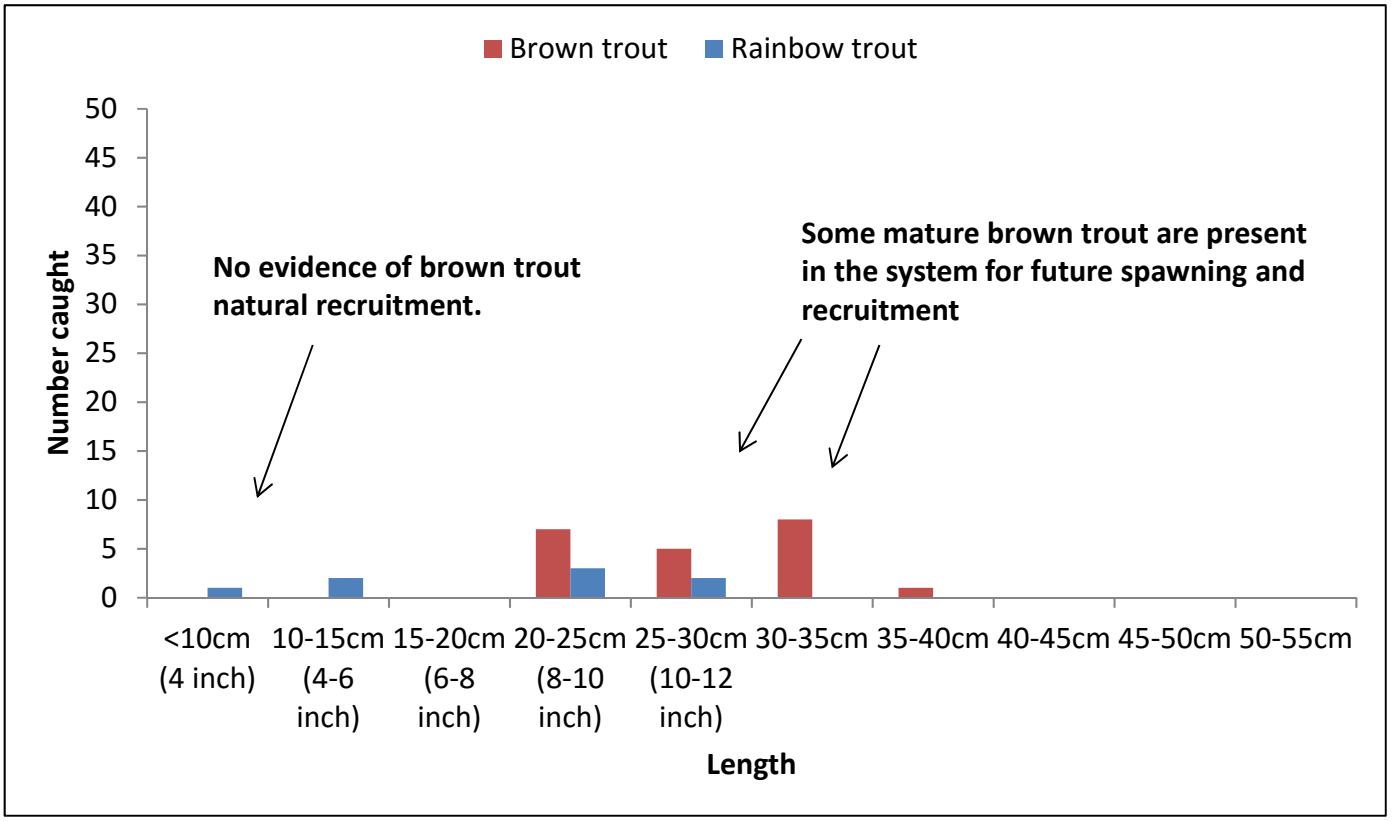
Overall catchable (20cm+) trout density: 4 trout per 100m

Other species present: Two-spined blackfish, galaxid minnows, flathead gudgeon, carp and spiny crayfish

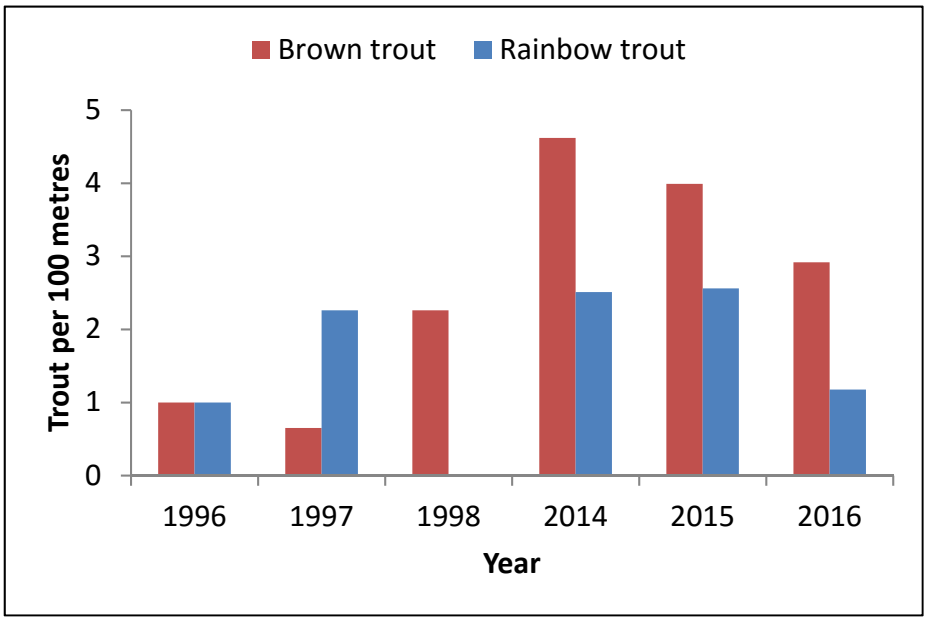


Location: Jamieson River

Although catchable fish were present in the Jamieson River, no evidence of brown trout recruitment was detected



Relative abundance of brown and rainbow trout is similar to low compared with surveys in previous years



The 2016 survey suggests the Jamieson River supports low numbers of mature brown and rainbow trout, which is relatively consistent with previous surveys. Lack of evidence for brown trout recruitment for the second consecutive year is noted and will be closely monitored and considered.

Location: Kiewa River System

Four sites surveyed 7-9 March 2016:

Site A: 170m stretch on Running Creek
Site B: 220m stretch at Mount Beauty
Site C: 210m stretch at Damms Road
Site D: 250m stretch at Dungey Track

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Excellent**

Monitoring results

Total number of trout caught:
263 brown trout (BT) and 59 rainbow trout (RT) in 850m of river

% Catchable (20cm+) trout: 15% (BT), 22% (RT)

Largest trout: 52cm/20in and 1.7kg/4lb

Average size of catchable (20cm+) trout: 26cm/10in

Overall catchable (20cm+) trout density: 4 trout per 100m

Other species present: Two-spined blackfish, galaxid minnows, redfin, spiny crayfish and yabbies

A: Running Creek
93 trout per 100m

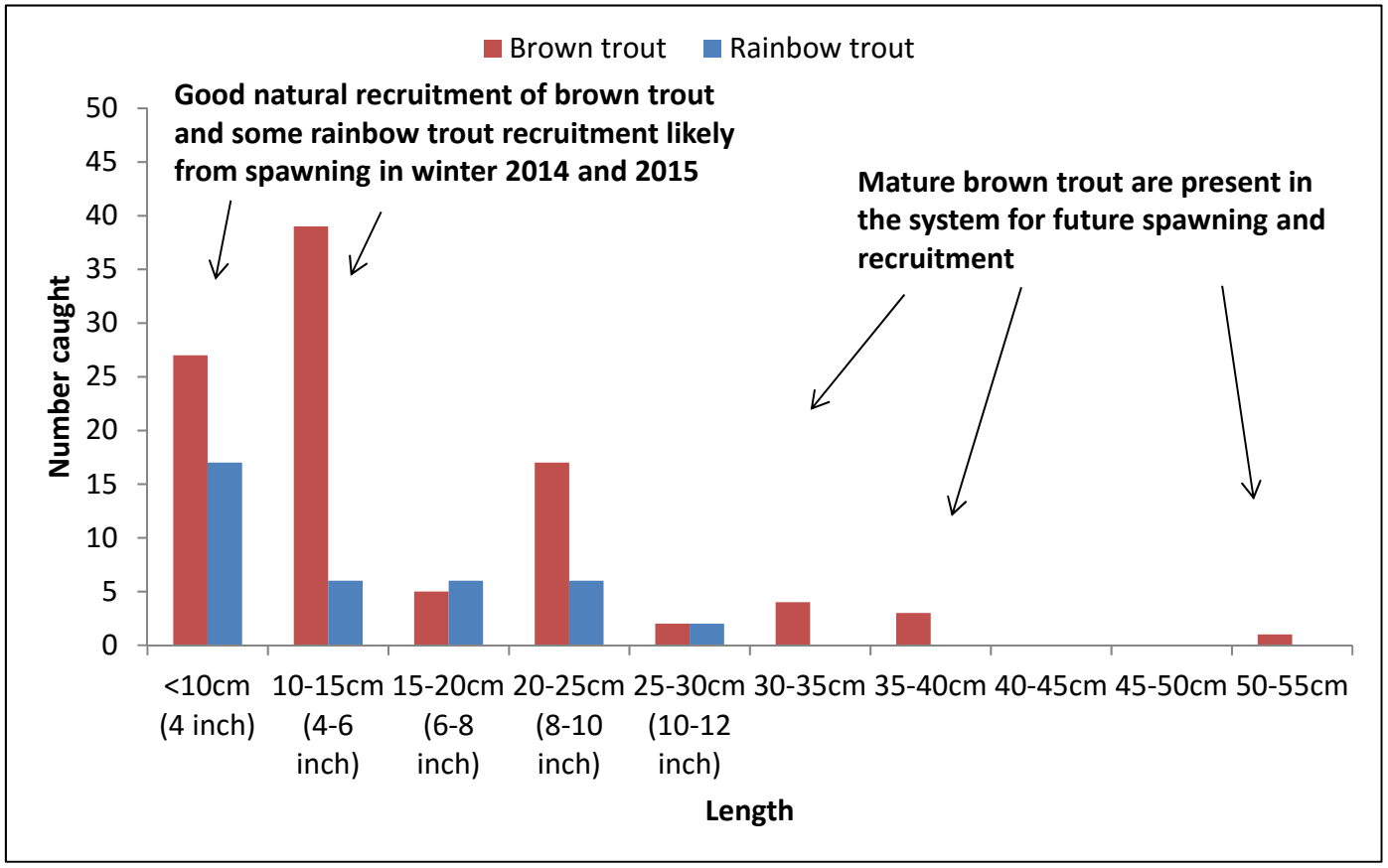
B: Mount Beauty
2 trout per 100m

C: Damms Road
3 trout per 100m

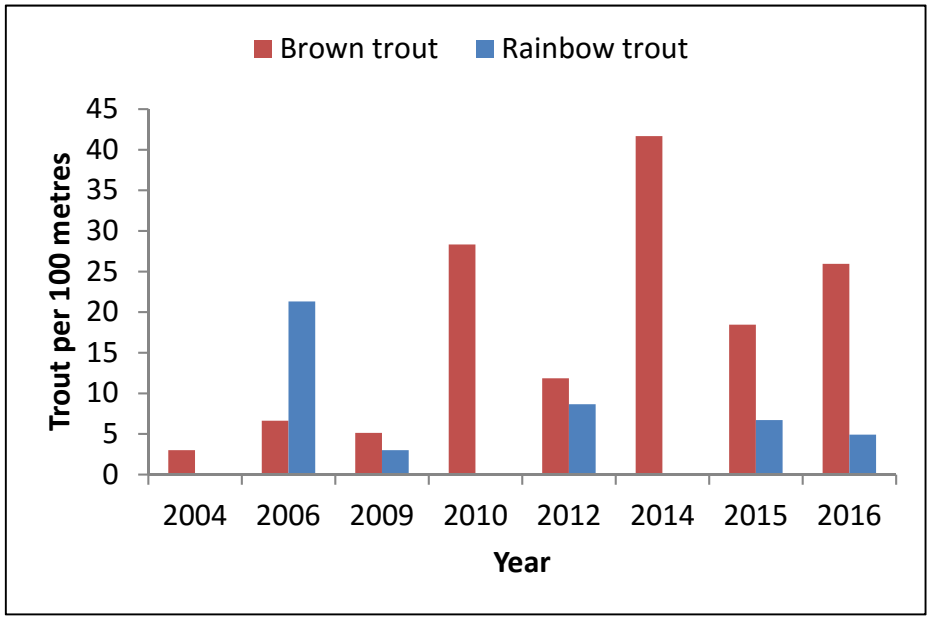
D: Dungey Track
25 trout per 100m

Location: Kiewa River System

Multiple size classes present in population of brown and rainbow trout



Relative abundance of brown and rainbow trout is relatively consistent with surveys in previous years



The 2016 survey suggests the Kiewa River System currently supports good numbers of brown and rainbow trout with a healthy population structure, consistent with previous surveys.

Location: King River

Three sites surveyed 22 February 2016:

Site A: 250m stretch at Gauging station, D/S Lake William Hovell

Site B: 230m stretch on King Basin Road

Site C: 190m stretch at Speculation Road bridge

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Good**

Monitoring results

Total number of trout caught:
98 brown trout (BT) and 75 rainbow trout (RT) in 670m of river

% Catchable (20cm+) trout: 27% (BT), 22% (RT)

Largest trout: 47cm/19in and 1.4kg/3lb

Average size of catchable (20cm+) trout: 28cm/11in

Overall catchable (20cm+) trout density: 5 trout per 100m

Other species present: Two-spined blackfish, Murray cod, galaxid minnows, redfin, spiny crayfish and yabbies

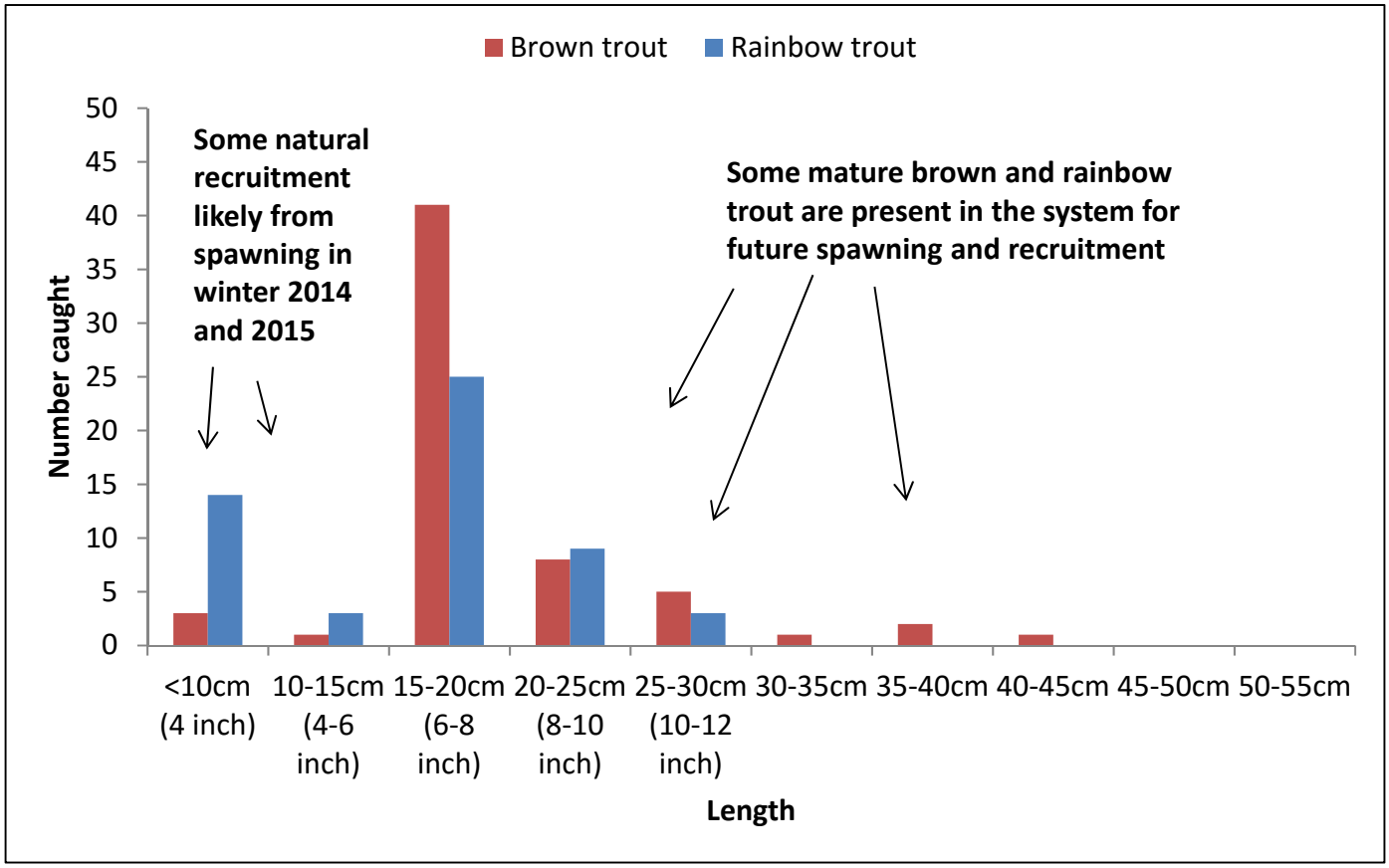
A: Gauging station
2 trout per 100m

B: King Basin Road
6 trout per 100m

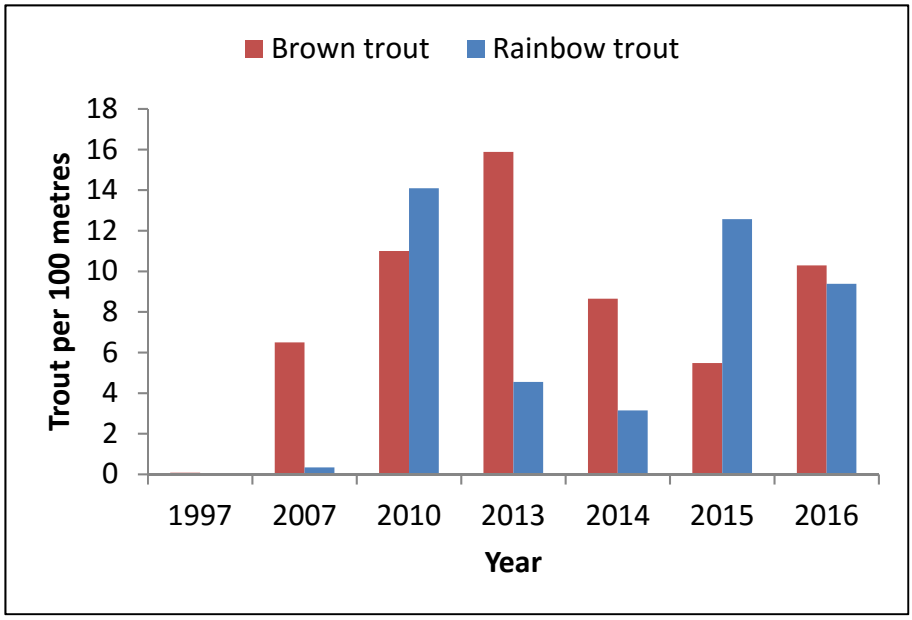
C: Speculation Road bridge
51 trout per 100m

Location: King River

Multiple size classes present in population of brown and rainbow trout



Relative abundance and size structure of brown and rainbow trout is consistent with surveys in previous years



The 2016 survey suggests the King River System currently supports good numbers of brown and rainbow trout with a healthy population structure, consistent with previous surveys.

Location: Merri and Hopkins Rivers

Four sites surveyed 27-28 Jan 2016:

Site A: 429m stretch near Bligh Road
Site B: 130m stretch near Grasmere
Site C: 194m stretch near Warrumyea Road
Site D: 169m stretch near Framlingham

Key health indicators

Recent recruitment (from stocking) ✓

Multiple size classes ✓

Mature fish ✓

Overall Rating: **Excellent**

Monitoring results

Total number of brown trout caught: 27 in 922m of river

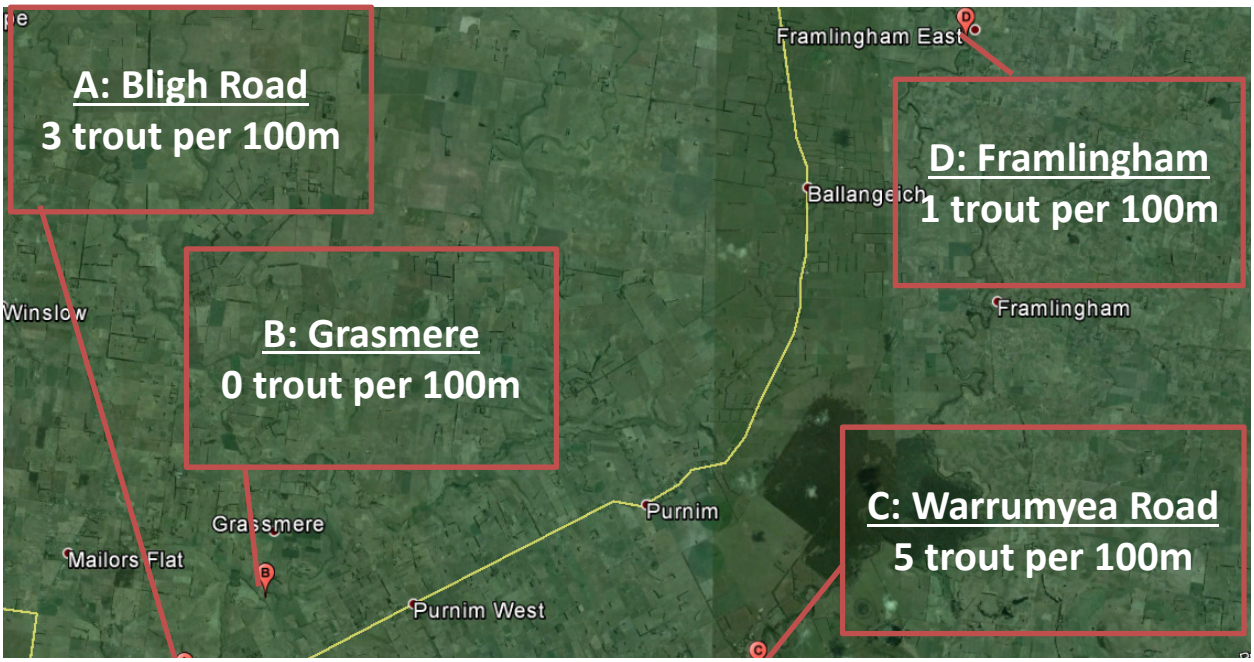
% Catchable (20cm+) brown trout: 91%

Largest brown trout: 54 cm (21 inch)

Average size of catchable (20cm+) brown trout: 35cm (14 inch)

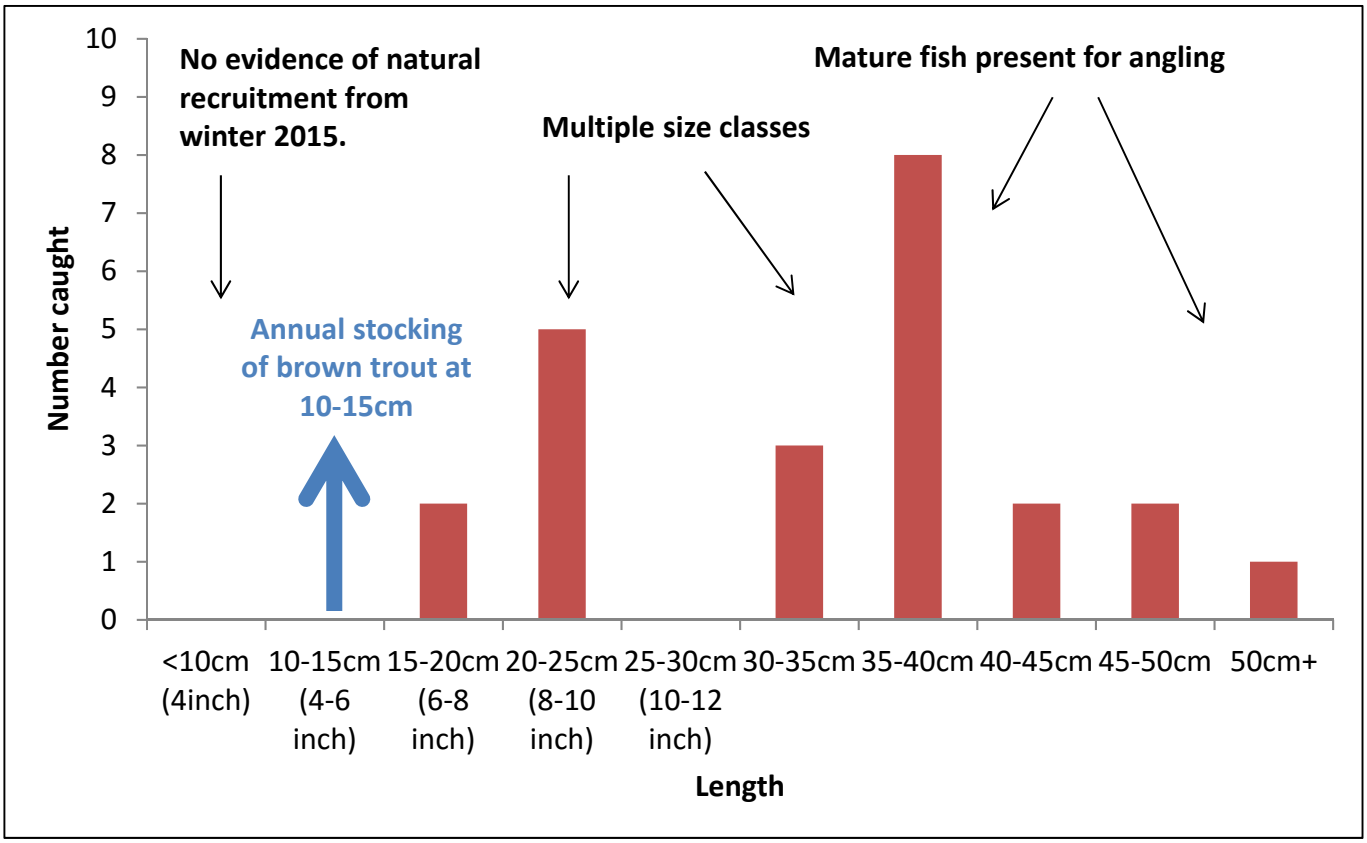
Overall catchable (20cm+) brown trout density: 3 fish per 100m

Other species present: Shortfinned eel, southern pygmy perch, galaxid minnow, flathead gudgeon, Australian smelt, mosquito fish, yabbies



Location: Merri and Hopkins Rivers

Multiple size classes of brown trout indicate a healthy population



- *The 2016 survey suggests the Merri and Hopkins Rivers continue to support good numbers of large brown trout consistent with previous years.*

- *The 2016 survey found there is no evidence of natural recruitment derived from spawning in Winter 2015*

- *This finding is consistent with previous surveys including a study by Hall and Douglas in 2003/04 that found the Merri River, Hopkins River and Mt Emu Creek trout fisheries were principally maintained by stocking as demonstrated by a high proportion of fin-clipped trout in angler catches.*

- *There is no evidence of overfishing and high compliance with harvest regulations in the Merri and Hopkins Rivers.*

Location: Mitta Mitta River System

Three sites surveyed 16 Feb - 8 March 2016:

Site A: 300m stretch in Bundara River off Callaghan Road

Site B: 220m stretch in Big River

Site C: 200m stretch at campground off Kelly's Road

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Very Good**

Monitoring results

Total number of trout caught:
303 brown trout (BT) in 720m of river

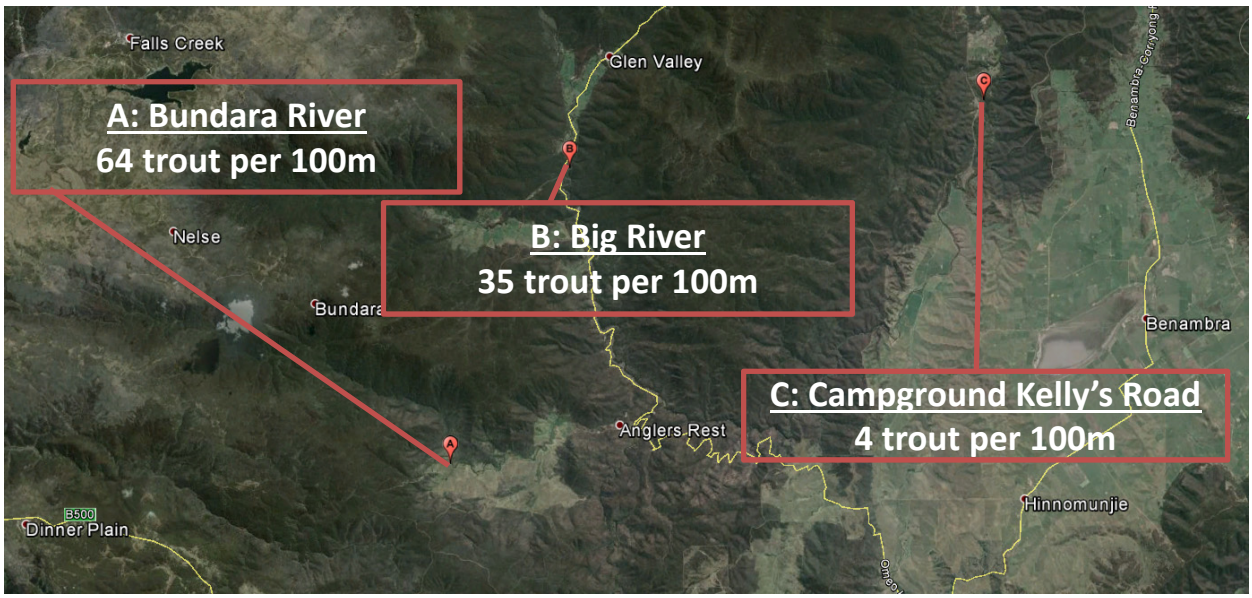
% Catchable (20cm+) trout: 3% (BT)

Largest trout: 30cm/12in and 285g/1lb

Average size of catchable (20cm+) trout: 25cm/10in

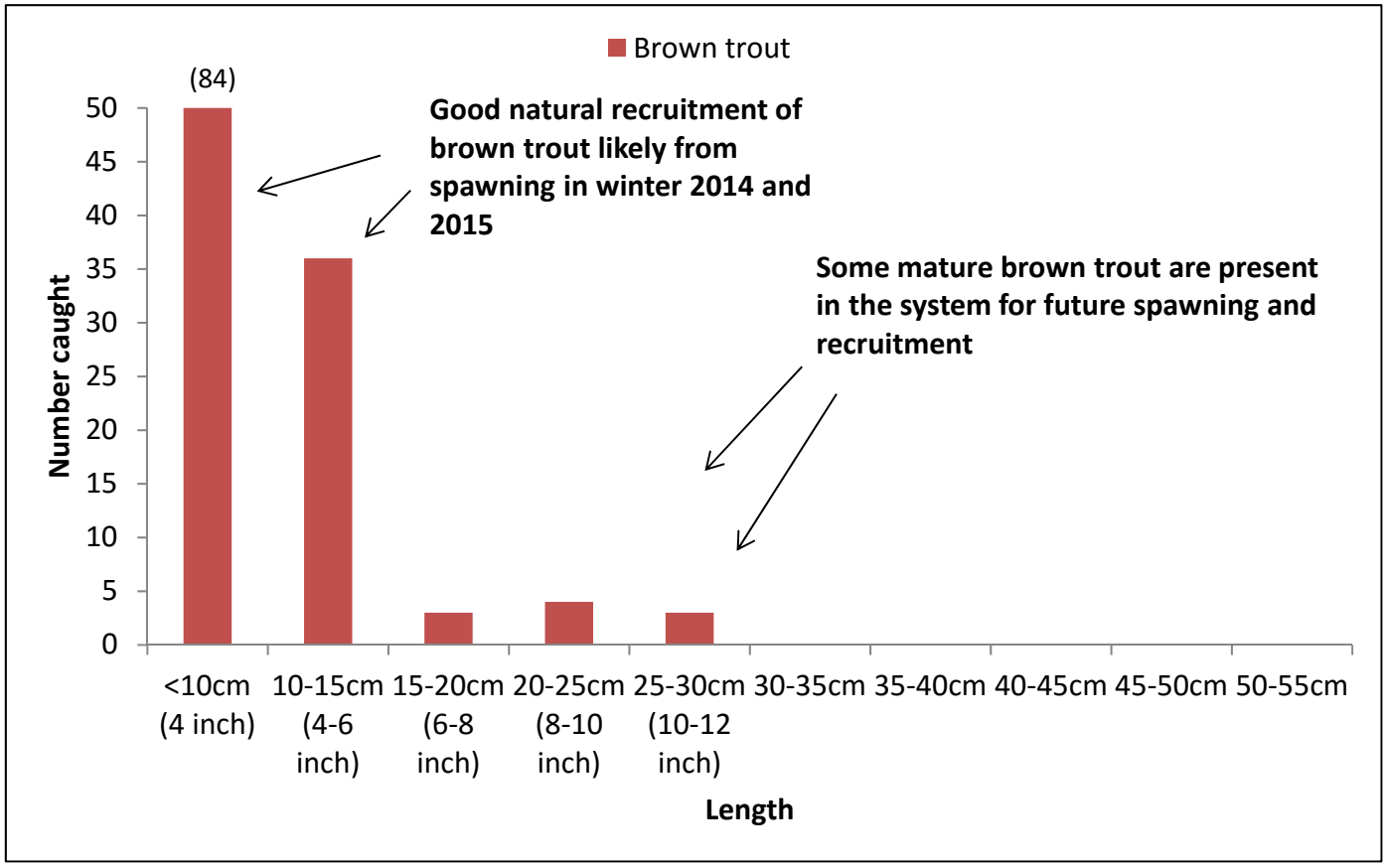
Overall catchable (20cm+) trout density: 1 trout per 100m

Other species present: Two-spined blackfish, river blackfish, Macquarie perch, galaxid minnows, spiny crayfish and yabbies

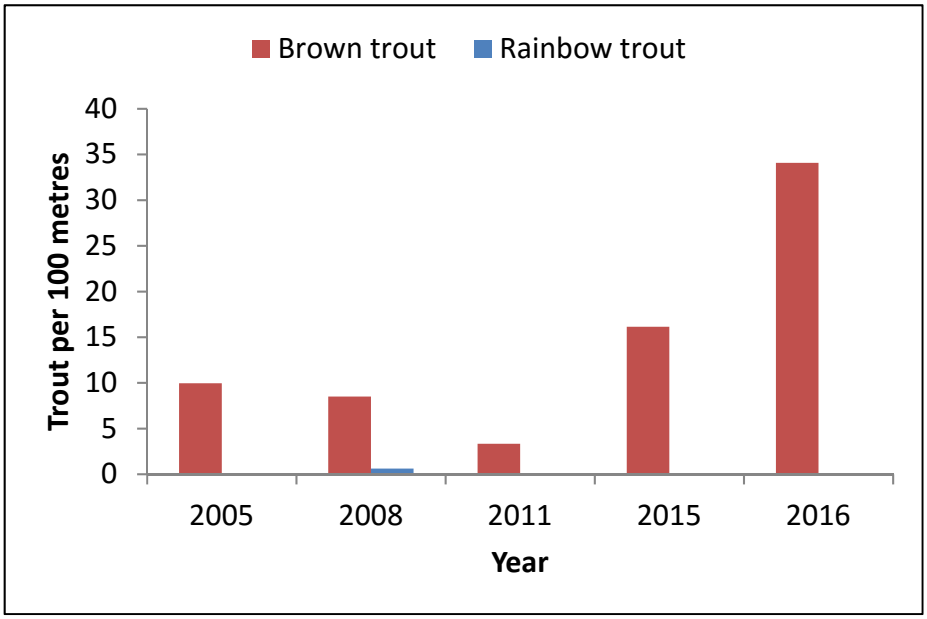


Location: Mitta Mitta River System

Multiple size classes present in population of brown and rainbow trout



Relative abundance of brown trout is very high compared to surveys in previous years



The 2016 survey suggests the Mitta Mitta River System currently supports very high numbers of small to medium sized brown trout.

Location: Morass Creek

Three sites surveyed 8-9 March 2016:

Site A: 300m stretch near Benambra Corryong Road

Site B: 300m stretch at Tablelands track crossing

Site C: 450m stretch off Benambra Limestone Creek Road

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Very Good**

Monitoring results

Total number of trout caught:
109 brown trout (BT) and 2 rainbow trout (RT) in 1050m of river

% Catchable (20cm+) trout: 49% (BT), 22% (RT)

Largest trout: 33cm/13in and 444g/1lb

Average size of catchable (20cm+) trout: 25cm/10in

Overall catchable (20cm+) trout density: 5 trout per 100m

Other species present: Platypus, two-spined blackfish, galaxid minnows, spiny crayfish and yabbies

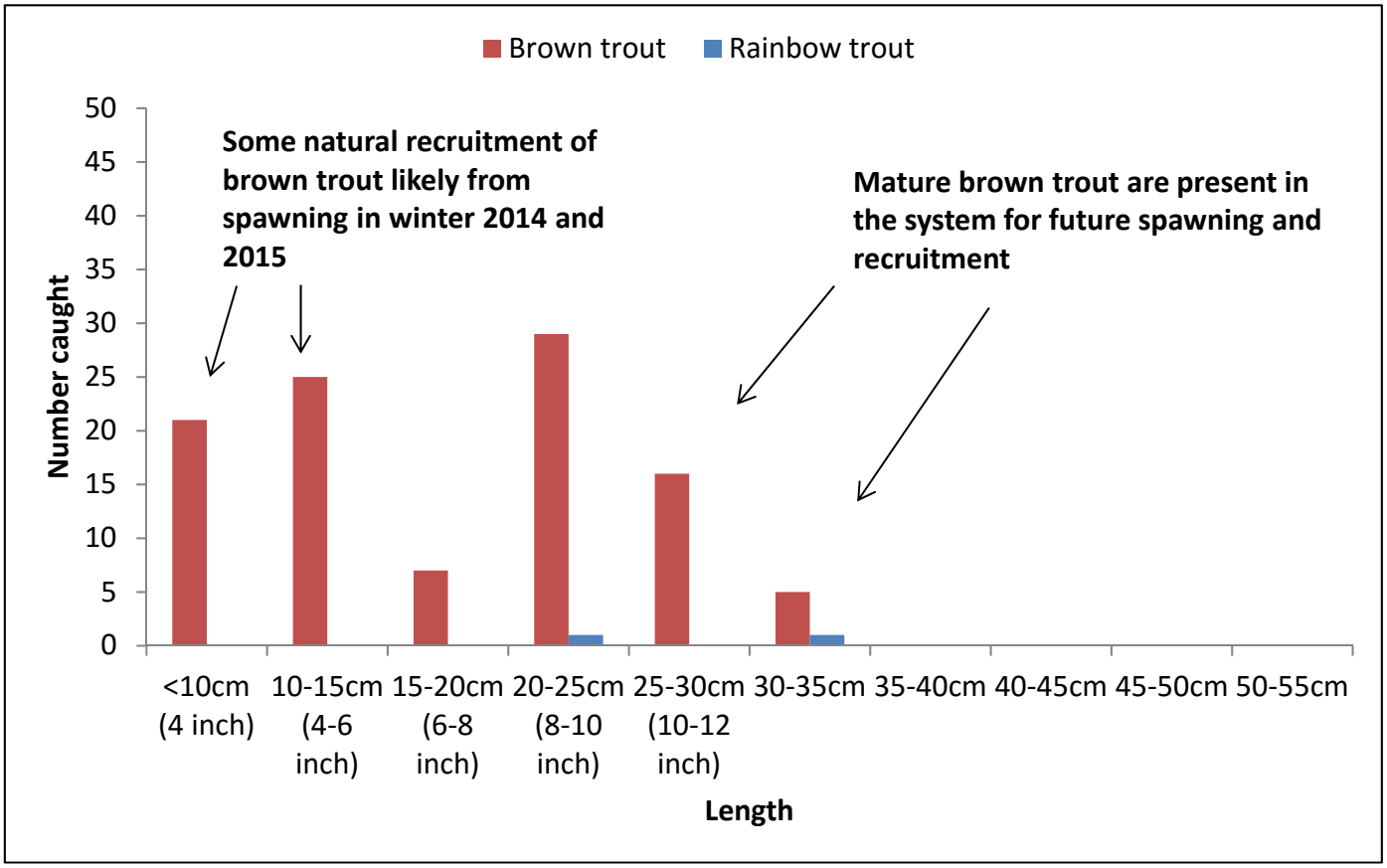
A: Benambra Corryong Road
17 trout per 100m

B: Tablelands Track
0 trout per 100m

C: Benambra Limestone Creek Road
12 trout per 100m

Location: Morass Creek

Multiple size classes present in brown trout population



Relative abundance of brown trout is compared to previous years is unknown as surveys were conducted at different sites

The 2016 survey suggests Morass Creek currently supports a healthy brown trout population with strong recent recruitment of small fish, multiple size classes and good numbers of mature brown trout.

Location: Nariel Creek System

Three sites surveyed 9-10 March 2016:

Site A: 350m stretch at Carmody's Bridge on Benambra-Corryong road

Site B: 300m stretch at Stacey's Bridge

Site C: 200m stretch at Wheeler's Creek Log Track

Key health indicators

Recent recruitment	**Some**
Multiple size classes	✓
Mature fish	✓
Overall Rating:	**Good**

Monitoring results

Total number of trout caught:
66 brown trout (BT) and 65 rainbow trout (RT) in 850m of river

% Catchable (20cm+) trout: 61% (BT), 53% (RT)

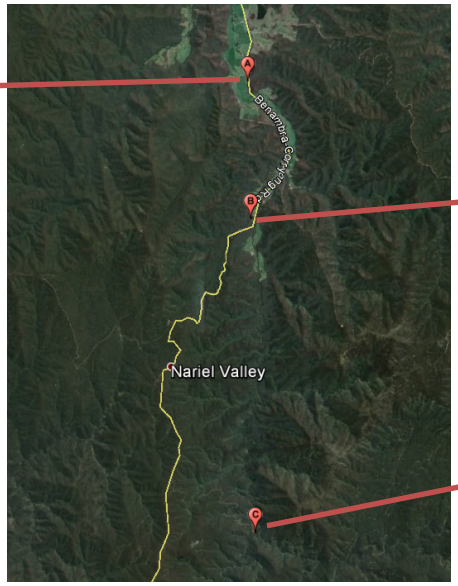
Largest trout: 46cm/15in and 923g/2lb

Average size of catchable (20cm+) trout: 29cm/12in

Overall catchable (20cm+) trout density: 7 trout per 100m

Other species present: Two-spined blackfish, galaxid minnows and spiny crayfish

A: Carmody's Bridge
16 trout per 100m

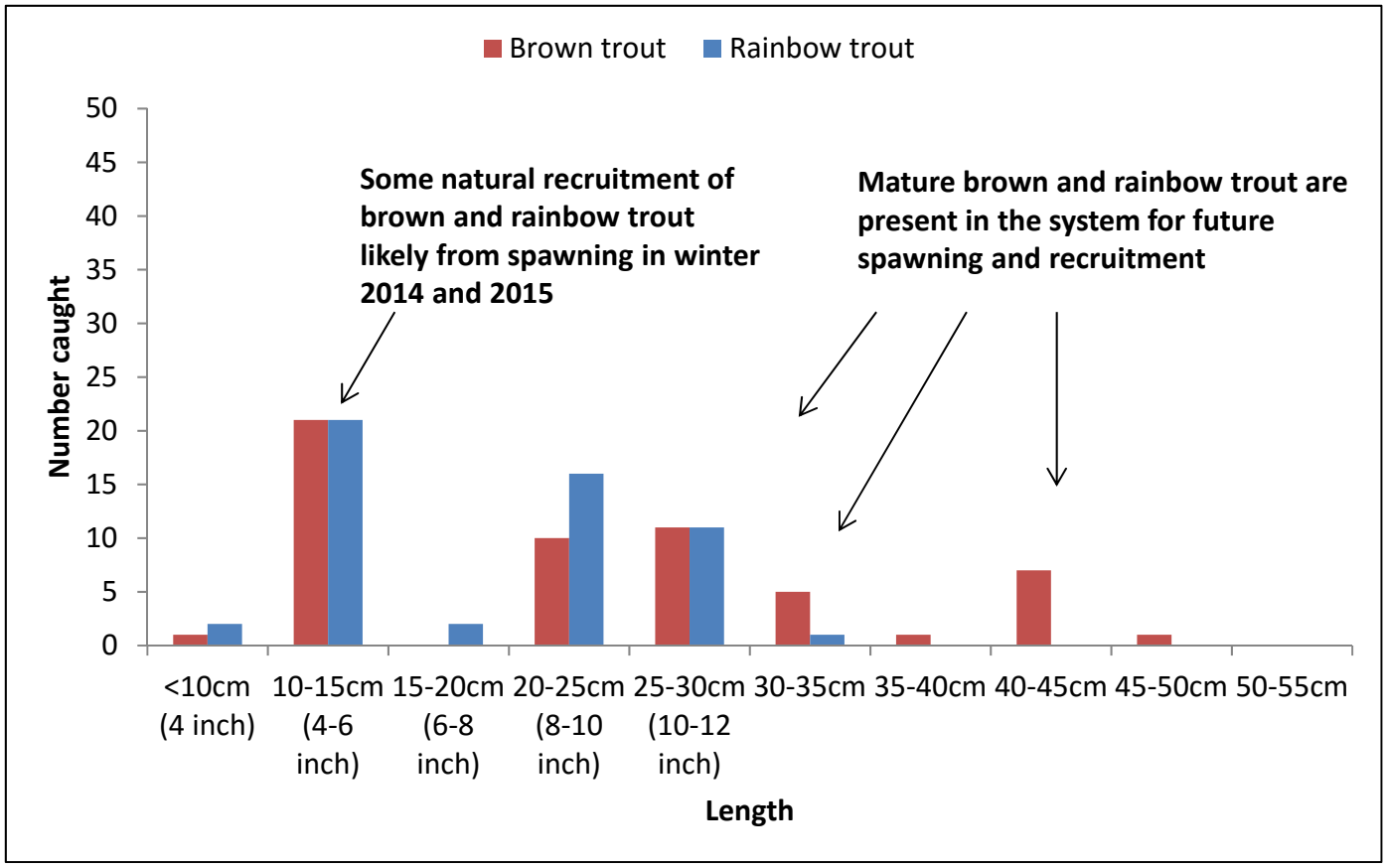


B: Stacey's Bridge
10 trout per 100m

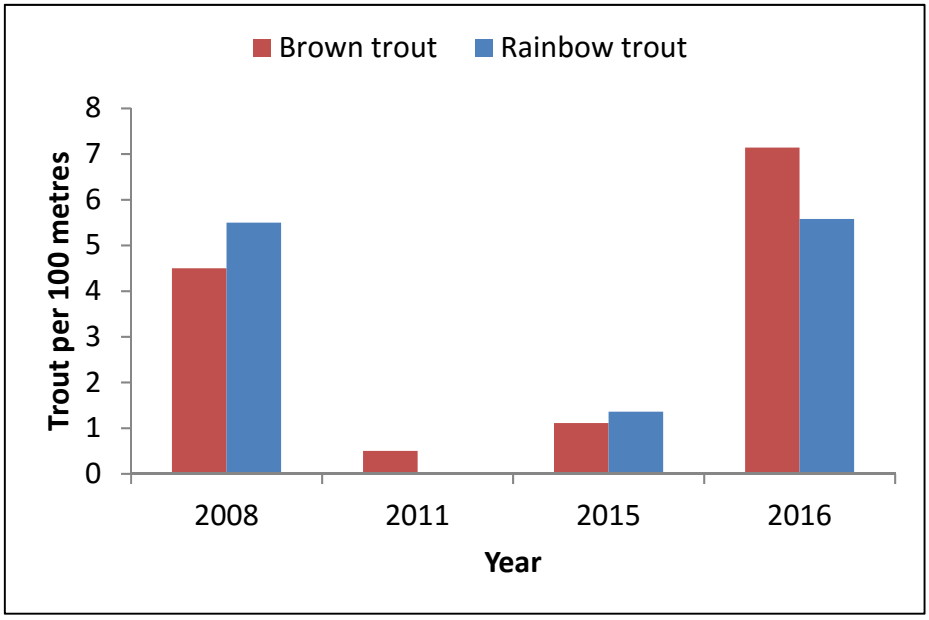
C: Wheelers Creek
13 trout per 100m

Location: Nariel Creek System

Multiple size classes present in population of brown and rainbow trout



Relative abundance of brown and rainbow trout is high compared with surveys in previous years



The 2016 survey suggests the Nariel Creek System is recovering with an increase in abundance coming from both natural recruitment and immigration of large mature fish.

Talk Wild Trout 2016

Location: Ovens River System

Four sites surveyed 16 Feb – 9 Mar 2016:

Site A: 220m stretch on Buckland River
Site B: 260m stretch opposite Germantown Caravan Park
Site C: 250m stretch at Harrietville
Site D: 280m stretch East Ovens Track

Key health indicators

Recent recruitment	✓
Multiple size classes	✓
Mature fish	**Some**
Overall Rating:	**Moderate**

Monitoring results

Total number of trout caught:
85 brown trout (BT) and 72 rainbow trout (RT) in 1010m of river

% Catchable (20cm+) trout: 25% (BT), 44% (RT)

Largest trout: 36cm/14in and 545g/1lb

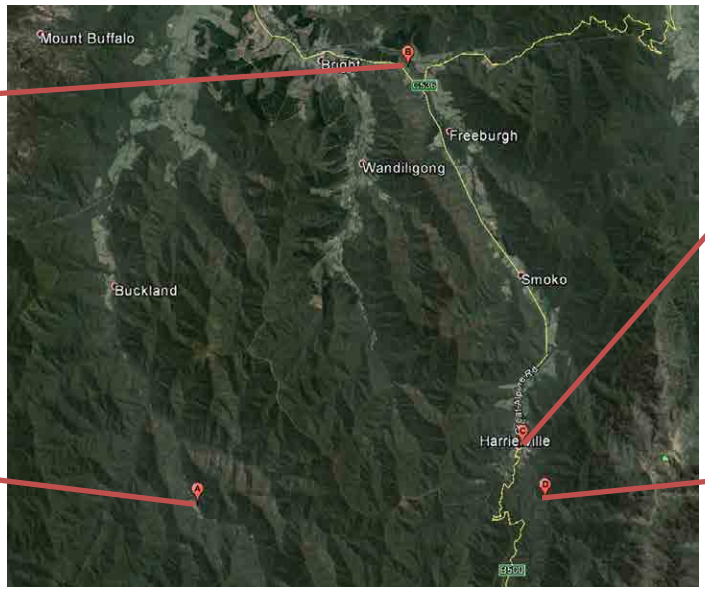
Average size of catchable (20cm+) trout: 29cm/12in

Overall catchable (20cm+) trout density: 4 trout per 100m

Other species present: Two-spined blackfish, galaxid minnows, redfin and spiny crayfish

B: Germantown Caravan Park
12 trout per 100m

A: Buckland River
3 trout per 100m

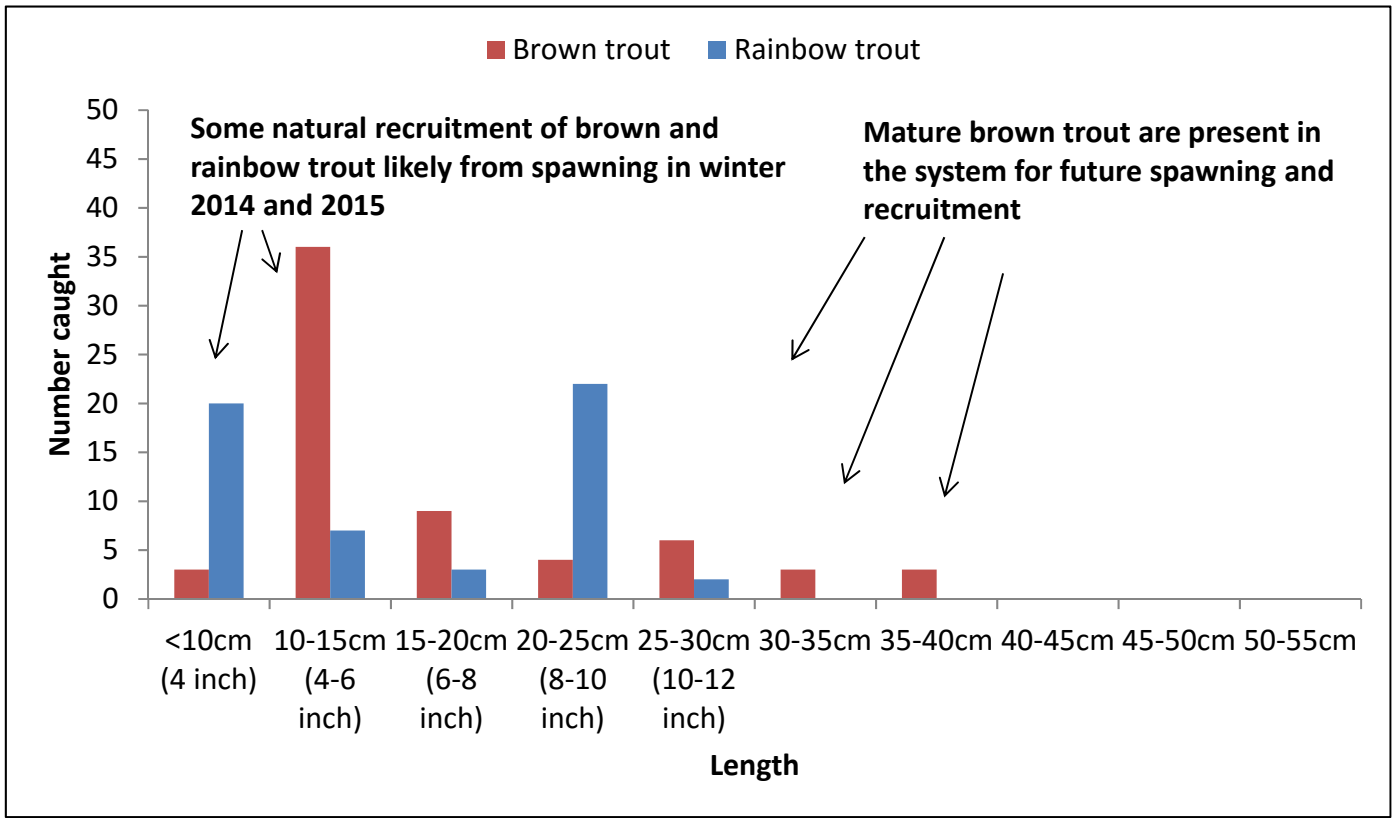


C: Harrietville
22 trout per 100m

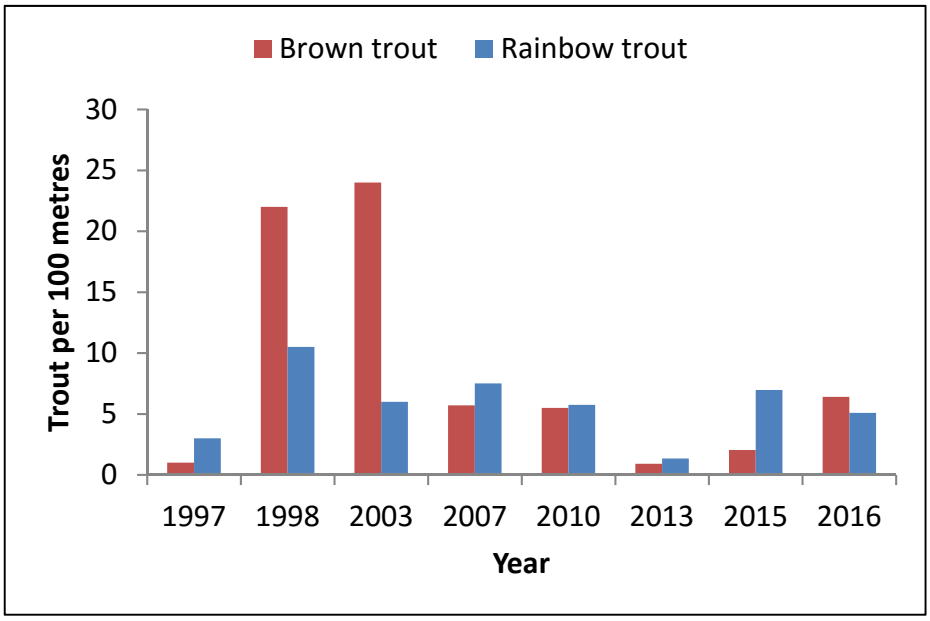
D: East Ovens Track
10 trout per 100m

Location: Ovens River System

Multiple size classes present in population of brown and rainbow trout enabling further recovery



Relative abundance of brown and rainbow trout is consistent with surveys in previous years



The 2016 survey suggests the Ovens River system currently supports improving numbers of brown trout across a healthy population structure of small and large fish.

The heat is on! Trout movement on the Delatite River over two years

Jason Lieschke, Canran Liu, Andrew Pickworth, John Mahoney
Arthur Rylah Institute, DELWP

Aim:

To determine how river trout respond to changes in water temperature

Background:

Trout are a cold water species with a narrow temperature tolerance suited to higher altitudes and pool/dam habitats. When water temperatures exceed their tolerance limit, their fate remains unknown i.e. do they actively move away, or die.

Improving our understanding of how fish respond to increased water temperatures will benefit anglers and give them a better idea where to find fish and adapt their fishing practices accordingly. Fisheries managers will also gain an understanding of how water temperatures may affect the trout fishery in the future.

What did we do:

We acoustically tagged 100 brown trout and tracked their movement behaviour relative to water temperature? The transmitters send out an acoustic signal at regular intervals (see Figure 1). When the fish are in range of a receiver, the signal from the transmitter is picked up, and the identity of the fish is recorded, along with the date and time.

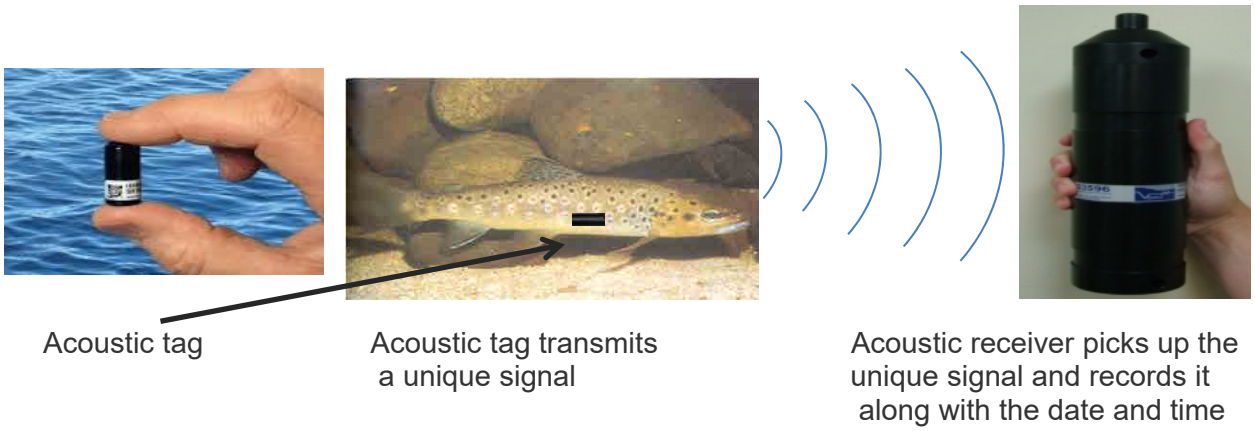


Figure 1. How a transmitter and receiver work.

Nine acoustic receivers (seven with temperature recording) were deployed in the Delatite River, from Mirimbah to Lake Eildon (Figure 2) in October 2014 to record the movement behaviour. Four receivers were placed above the Mansfield water supply offtake and five below, including one in Lake Eildon (Figure 2). In October 2015, four additional receivers were placed in the Delatite River to complement the existing nine acoustic receivers (1a, 3a, 5a and 5b - Figure 2).

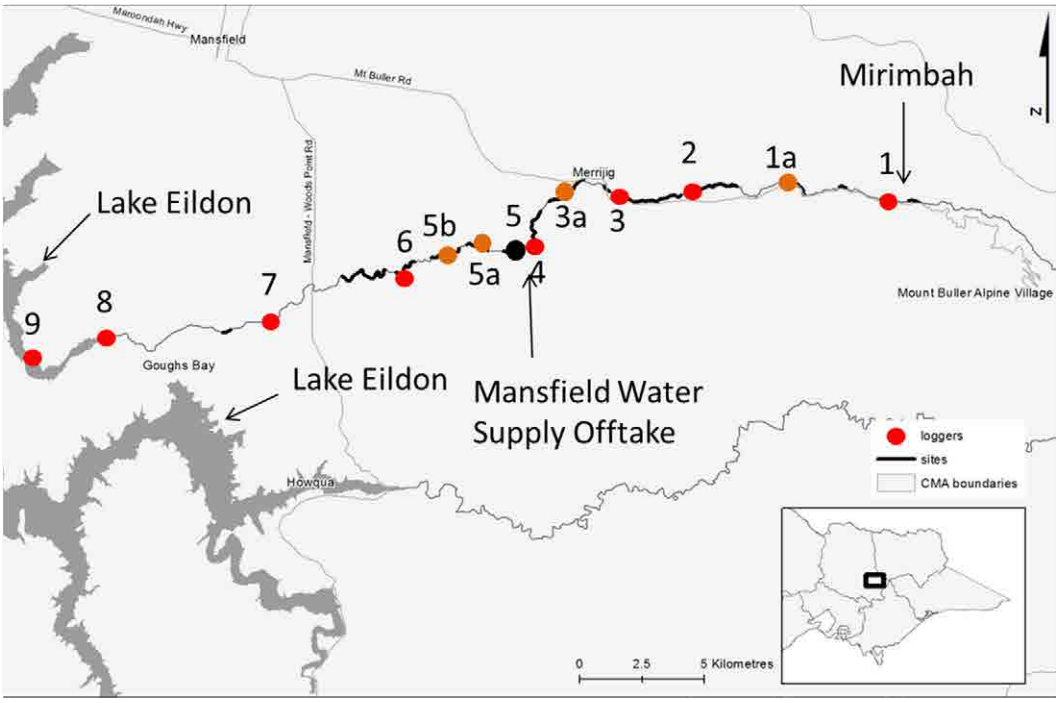


Figure 2. Location of receivers in the Delatite River. Note darker sections of the river represent areas where brown trout were tagged. Existing receiver locations are red and new receiver locations are orange. The black dot indicates a broken receiver.

One hundred brown trout were captured via electrofishing between Lake Eildon and Mirimbah between October and November 2014. Captured fish were anaesthetised, measured for length, weighed and tagged (acoustic transmitter and externally tagged with a t-bar tag). Fish ranged from 19.5 cm to 57 cm fork length and 100 to 1860 grams (4 lb). Fish were tagged throughout the whole river, with over 22 river kilometres fished. All fish were released back into the river at their capture site.

Photos of capturing trout via backpack and boat electrofishing and a brown trout following implantation of a transmitter.

Key findings and implications:

Water temperature

The water temperature of the river was higher in the non-forested area (see Figure 3). The summer of 2015-16 was hotter, with higher maximum water temperatures in 2015-16 compared to 2014-15 (see Table 1). The peak water temperature at Receiver 7 was the highest at 29.0 °C, however its daily variation was only 5.6 °C (not as much as upstream receivers 1 and 2).

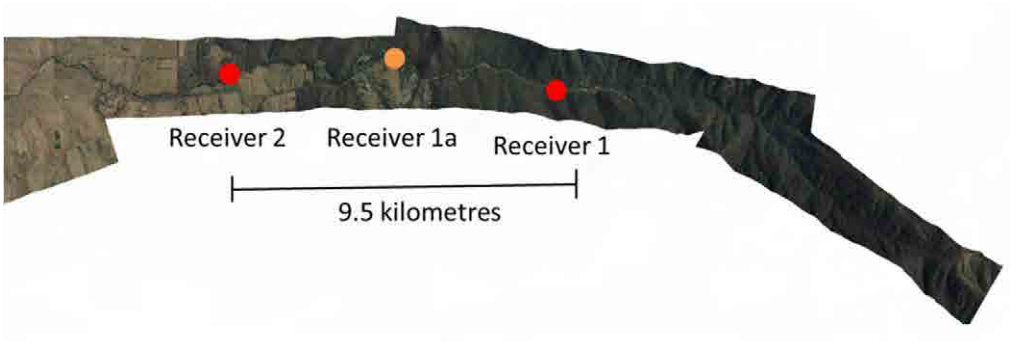


Figure 3 Aerial imagery of receiver locations 1, 1a and 2, showing differences in tree cover

Table 1. Maximum water temperature and variation in maximum daily water temperature for 2014-15 and 2015-16.

Receiver	Location	Forested	Maximum Temp. 2014-15	Variation in Maximum Daily Temp. 2014-15	Maximum Temp. 2015-16	Variation in Maximum Daily Temp. 2015-16
1	Mirimbah	Yes	23.1	7.2	24.2	9.2
2	Timberwood	One bank only	27.8	9.8	28.7	11.0
7	Mansfield-Woods Point Road	No	29.0	5.6	29.4	7.0

As we have no previous data on instream water temperature data, the maximum daily temperature from Mount Buller was used as a surrogate for instream water temperature. The summer of 2014-15 was mild compared to previous years. For example, during the millennium drought and in the summer of 2013-14 the number of hot days was greater than in the summer of 2014-15. (Figure 4.). The summer of 2015-16 was warmer with 6 days of 25°C or above; one in December, one in January and four consecutive days in the middle of March (late historically).

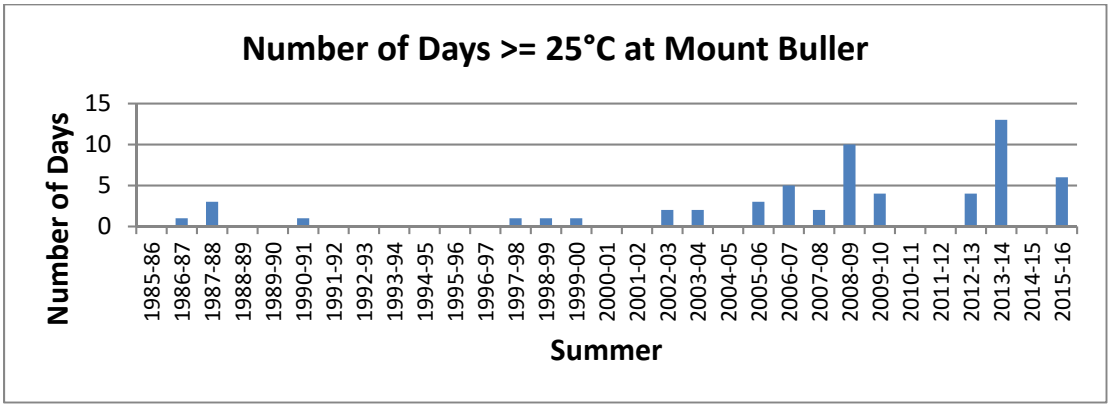


Figure 4. Number of days with maximum temperature of 25°C or above at Mount Buller. Used as a surrogate for water temperature where instream water temperature data is not available. Note there were no days 25°C or above in summer of 2014-15 and 6 days in the summer of 2015-16.

- Water temperature peaked above 29°C by mid December 2015 at receiver 6 (Delatite Lane).
- Water temperatures throughout the Delatite River decreased by 8-10 degrees over a two week period in late March 2016.

Trout movement and temperature (2014-15 recap)

We investigated the relationship between fish movement, fish length, water level and water temperature and found that:

- Larger fish were more active than smaller fish;
- Fish movement increased as water level increased;
- Fish movement increased slightly as temperature increased; however, movement increased abruptly when temperature was above 22 °C;
- Long distance movements (between receivers, 3+ km) increased as temperature increased.

Trout movement and temperature (2015-16 update)

- 41 of the 100 tagged fish were detected by receivers;
- 15 of the 100 fish were recorded on multiple receivers (i.e. from 3 to 7.5 km apart);
- Four fish moved past Mansfield Water Supply offtake (MWS);
    - Two fish upstream on 4-5 January 2015 (both smaller fish);
    - One fish downstream in July 2015 (larger fish);
    - One fish downstream July-September 2015, then upstream 16-18 November (larger fish);
    - No fish moved to lower reaches or into Lake Eildon.

Movement dependent on size of fish:

- Small tagged fish (19.4 – 28.2 cm);
    - Eight of 30 detected (27%);
    - Only one had a long distance movement (28 cm);
- Medium tagged fish (28.6 – 37 cm);
    - 16 of 40 detected (40%);
    - Only two had long distance movements;
- Large tagged fish (34 – 57 cm);
    - 17 of 30 detected (57%);
    - 12 had long distance movements (40% of large fish tagged, but 71 % of large fish detected by receivers);
- Six of the twelve largest fish had long distance movements;
- All four largest tagged fish (49 – 57 cm) undertook long distance movements;
- The 59 fish not detected were assumed to be alive (recaptured during surveys) but remained between receivers.

Long Distance Movement (> three kilometres)

- Temperature was a key indicator of the probability of fish undertaking movements between receivers (see Figure 5).

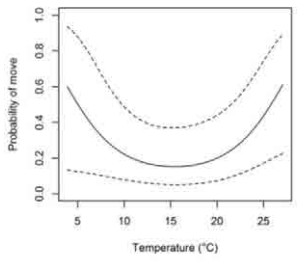


Figure 5. The probability of a fish moving long distances (between receivers) and water temperature. The solid line is the predicted probability and dotted lines are 95% confidence intervals.

Smaller Movements - multiple detections on same receiver at least one hour apart (indicator of activity)

- water level (Delatite gauge off Goughs Bay Road)
- temperature
- fish length

All indicators of movement (see Figure 6)

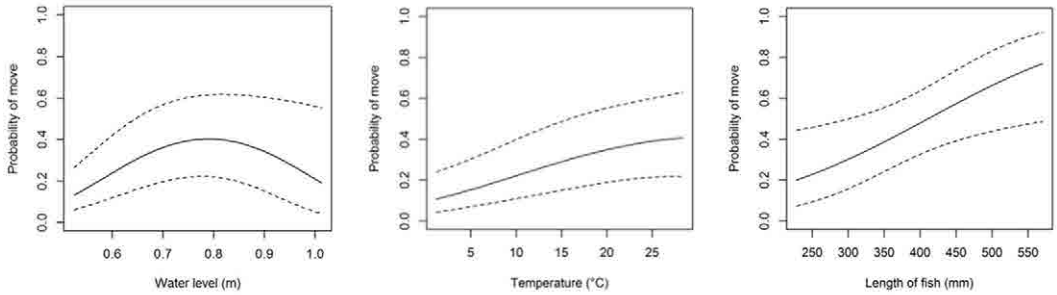


Figure 6. The probability of a fish moving short distances in relation to for water temperature, water level and fish length. The solid line is the predicted relationship and dotted lines are 95% confidence intervals.

- Fish were more active at night compared to during the day (Figure 7).

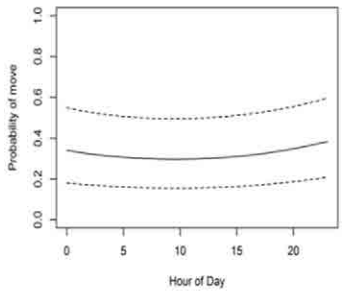


Figure 7. The probability of a fish moving dependant on the time of day. The solid line is the predicted relationship and dotted lines are 95% confidence intervals

Summary of fish movement activity

- Larger fish were much more likely to move than smaller fish;
- Temperature was a key indicator for larger fish to move long distances;
- Temperature, water level and fish length were all important for predicting smaller scale movements

What does it all mean?

- The only time when fish might be actively feeding on a hot day during the summer is very early in the morning (they are stressed when water temperature is > 20 °C);
- November appears to be a time when larger fish tend to move further upstream.;
- November, March and April were the months when water temperature and flow coincided with increased probability of movement (greater activity); but this will vary from year to year.

Theme 2 – Climate & Habitat

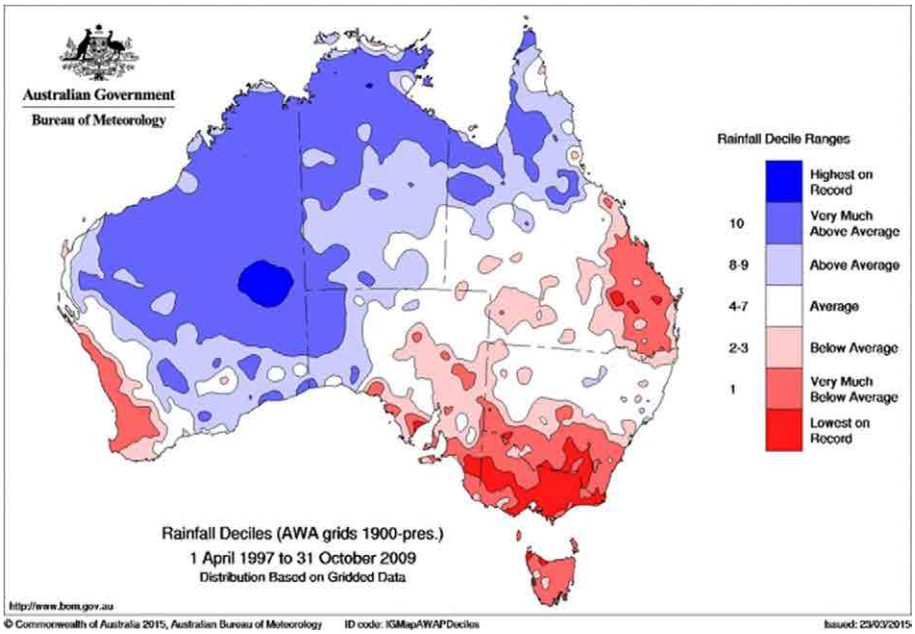
Photo: NECMA

Climate change and trout – a way forward

Dr John Morrongiello, School of BioSciences, University of Melbourne

Brown trout hail from the cool rivers of southern England and were first brought to Australia some 150 years ago. Since then, they have successfully been stocked, and naturally spread, throughout the foreign rivers and streams of southern Australia. The fact that trout have historically thrived in Australian waters and now support a valuable recreational fishery is testament to their amazing ability to adapt to new environments. But what will the future hold, and what can we do to help our trout fisheries?

The recent Millennium Drought (1997-2009) is still fresh in the mind of many an angler and provides a telling glimpse of what our future trout fisheries may look like if we don't acknowledge, understand, and then act on the risks posed by climate change.

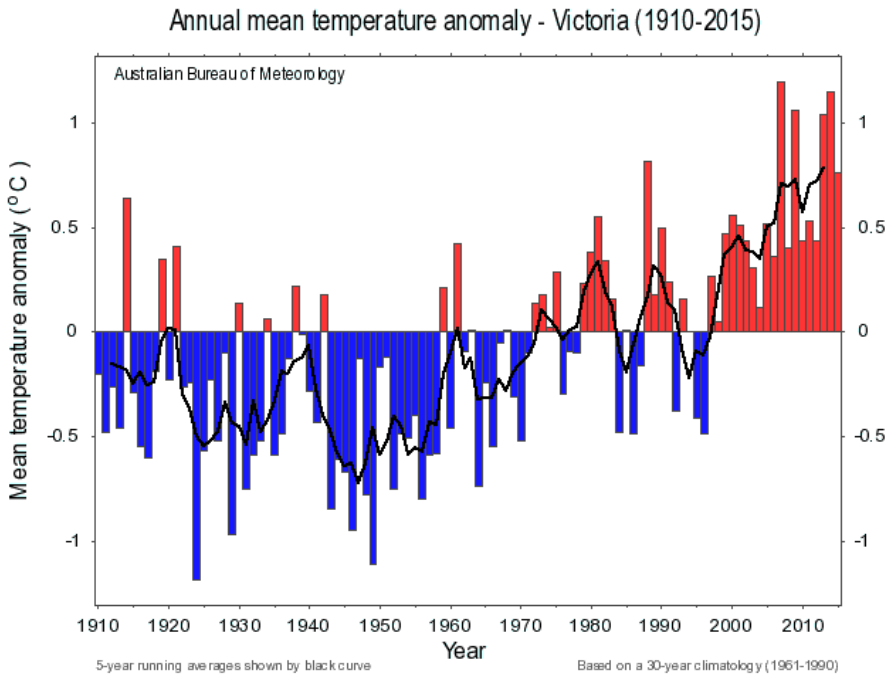


Rainfall deficiencies for the Millennium Drought (1997-2009) showing record low rainfall for southeast Australia

During the Millennium Drought, much of southern Australia experienced record low rainfall, and the flows that kept our favourite trout streams cool and well oxygenated were reduced to a trickle. Further, vast swathes of the tinder dry bush were ablaze in the major bushfires of 2003, 2006-07 and 2009. These catastrophic events burnt valuable riparian vegetation and dumped silt and ash into streams. As a consequence, reduced shading led to water temperatures rising further still, and stream cobbles (habitat for trout food) were buried.

The Millennium Drought caused a significant reduction in the distribution and abundance of trout right across Victoria, making trout angling in many places very difficult. When the rains returned in 2010 so too did the trout, but these remarkable fish are now facing one of their biggest challenges yet.

Climate change is already impacting on our freshwater environments and has serious implications for trout. This is not just an Australian problem: tell-tale signs of climate stress are being observed across some of the world's most famous trout fisheries including the rivers and lakes of Montana, New Zealand and Tasmania. Globally, temperature continues to rise, including more lethal extreme-heat days in summer, and locally average rainfall is declining. These climate trends will continue into the foreseeable future. Further, in southeast Australia we will experience an increasing frequency of severe events like drought, flood and bushfire. Recent modelling suggests that all these environmental changes could result in up to a 50% decline in trout range across Victoria over the coming decades.



Victorian annual mean temperature anomalies for the period 1910-2015 based on Bureau of Meteorology weather records. Temperature anomalies are the difference between a year's average temperature and long-term average, with blue bars representing cooler than average years, and red bars warmer than average years. The black line is the 5-year running average showing the strong warming trend through time.

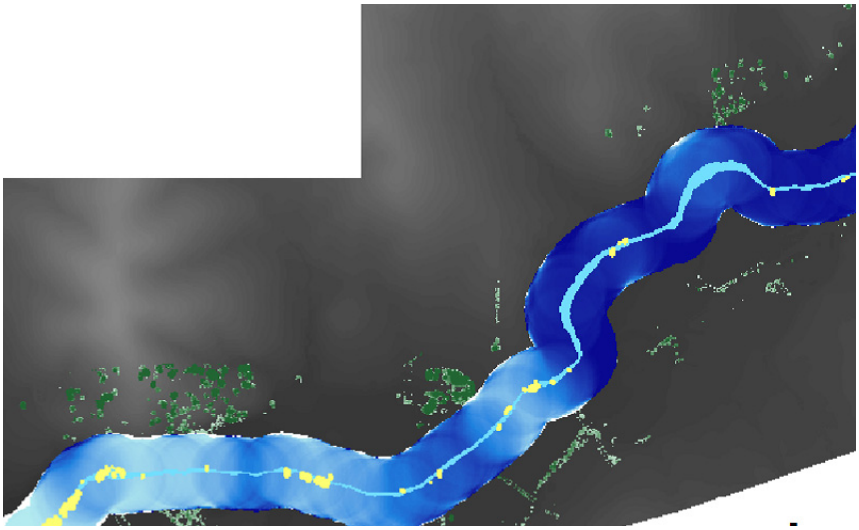
A way forward

As the climate changes, we too need to change in terms of how we view and manage our trout fisheries. For example, we cannot expect to keep catching trout in what was already marginal habitat because it will become even more marginal. We can, however, take a range of actions that might buffer trout populations in climate-sensitive areas and also buttress populations in core habitat. In the USA over US$1 billion is spent annually on river restoration, with 100s of millions of this directed to projects associated with climate change impact mitigation.

What practical options are available to us to mitigate climate impacts and help protect our valuable trout fisheries? Fisheries Victoria has commissioned the University of Melbourne to conduct a forward-thinking two-part project to explore this exact question.

Firstly, we are conducting a global review of the costs and benefits of practical options available to manage trout fisheries under a warmer and drier future. Options include: targeted revegetation to maximise stream shade, improved management of dams and water flow, promoting changes in angler behaviour (e.g. voluntarily not fishing on hot days to reduce fish stress), the development of trout 'sanctuaries' (protecting cooler habitats) and barrier removal to allow trout to more readily move through systems. Some of these options are obviously more feasible and have greater benefit than others, but it is essential that we objectively consider them all to ensure the best management decisions are made for the future.

Secondly, we are developing an easy-to-use tool that will help waterway managers to prioritise riparian revegetation works to maximise stream shading, and thus contribute to keeping trout streams as cool as possible. This revegetation tool can be used to help guide the collaborative replanting efforts of recreational anglers and catchment management authorities.



A 1 km section of the Delatite River showing the shading benefit of riparian revegetation along the stream channel. Darker blue areas are where tree replanting will have the greatest benefit. We can use this data to help prioritise revegetation across whole trout streams.

Theme 3 – Fisheries Management

Photo: John Douglas

How does trout stocking contribute to wild trout fisheries?

John Douglas[1] and Jason Lieschke[2]
[1] Fisheries Victoria, DEDJTR, [2] Arthur Rylah Institute, DELWP

Aim:

To understand whether trout stocking helps the wild brown trout river fisheries recover.

Background:

Fish stocking is an important tool in fisheries management and has been used for centuries in various applications.

One of the most important questions regarding stocking is “Do the stocked fish increase the overall number of fish in the population?”. Stocking results can vary depending on the environment and scenario, therefore we can’t assume it work’s every time. For example, stocking can be very effective when recruitment is lacking—like the trout fisheries in many of Victoria’s lakes—however, it has found to be less effective when there is natural recruitment occurring.

Past fisheries research in Victoria on wild trout fisheries, and on fisheries worldwide, suggest that stocking on top of existing self-sustaining (breeding) populations is generally an ineffective long-term strategy to enhance wild stocks, because it often provides a very low-return to anglers at considerable expense. In many instances, it is the other environmental conditions that constrain the size of the fish population, not recruitment levels.

However, anglers have a strong affinity with fish stocking as it seems to be logical that if you put fish in then there will be more fish in the river. Under this context, stocking can often be seen as a fisheries management panacea or cure all, but the issue is much more complex and revolves about what is the limiting factor(s) of the population, and then, what is the best approach for intervention. If recruitment is an issue then stocking may be an effective option.

There is a case to reassess the effectiveness of fish stocking to enhance the wild trout fisheries in Victoria and to better communicate findings, educate stakeholders and re-examine the cost-effectiveness of this management option.

Fish stocking is an important fisheries management tool for improving fishing in key places and this project assessed whether it can assist wild trout fisheries recover.

What we did:

Undertake two stocking trials, one in the upper Goulburn River above Lake Eildon and another in the Howqua River. To date there have been three stocking events in each river, and two assessments in each river. Each river has received 5,000 one-year-old brown trout in 2014, 2015 and again in 2016. To identify the stocked fish from the wild fish, the stocked fish have been fin clipped. This update reports on the findings of the two assessments undertaken to date and prior to the 2016 stocking. A third assessment is planned for next year to monitor the 2016 stocking.

All stocked fish have been clipped by the volunteers from the Mansfield and District Flyfishing Club who also assisted in the release. The proportions of stocked fish and changes to overall fish abundance in the trout fishery and population is being assessed as part of the monitoring of trout populations and through the original angler creel survey of 2014-15.

Volunteer Mansfield fishers assisted finclipping and stocking the fish for the trial.

Key findings and implications to date:

The surveys have confirmed that some stocked fish survived in both rivers, which is a start, however the number of these survivors was very low. Only one clipped fish was sampled from the Goulburn River and six clipped fish sampled from the Howqua River in 2015. The 2016 surveys only caught four finclipped fish in the Howqua River and zero stocked fish were sampled from the Goulburn River. The 2016 survey was undertaken after 10,000 fish had been stocked, into each stream over the two year period. The results indicate the stocked fish do not appear to have significantly added to either the overall trout population, or, to angler catches. It also seems that the stocked fish did not last long in the river. No stocked fish from year 1 were collected in year 2 of the surveys.

Year	River	Distance surveyed	No clipped fish sampled
2015	Goulburn River	1 km	1
2015	Howqua River	14 km	6
2016	Goulburn River	1 km	0
2016	Howqua river	2.5 km	4

The failure of stocking to increase populations in the Howqua and upper Goulburn rivers is not unique. Numerous stocking trials have been undertaken in various Victorian streams in the past, and most of these trials have had similar results. Similar results have also been reported from stocking studies in other countries too. It appears that where there is an existing breeding trout population, the natural population is far more efficient at recovering the population than stocking fish into the system.

The stocked fish seem to have poor survival in streams. However, as we know from our reservoir stockings, the stocked fish do well in lakes. The reasons for this are unclear.

It is possible that the stocked fish are domesticated and do not fend or compete well in the wild.

The stocked fish are grown up in hatcheries and have grown in a predator-free food-filled environment of the hatchery. These domesticated fish could be at a competitive disadvantage to the wild fish that were born and adapted to local conditions.

It is widely known that the stream environmental conditions limit trout populations . If the stream is at carrying capacity for the wild trout population, then adding more trout on top of the existing population through stocking adds to the existing competition pressure and if the stocked fish do not have the ability to compete with the wild stocks for the better feeding lies and territories, they will have to move or even perish. There is evidence the offspring of wild fish survive better than the offspring of domestic fish.

Some studies have also shown that domestic strains may be more susceptible to angling. However, the lack of tagged trout caught and reported from the Delatite and Howqua rivers would suggest that angler harvest from our trout streams is not high.

Size of fish stocked can make a difference to angler returns. Higher returns in streams occurs as larger fish are stocked. However, this return is almost immediate and is common in planted fisheries where catchable trout are stocked into the stream. Planting fish is a different management goal to assisting the recovery of wild stocks.

Another possibility is that there may be many more fish in the river than we actually think. Electrofishing efficiency varies with many factors and it does not catch all fish, or sample in the larger deeper pools. Angling cannot be used to predict population numbers as trout catch rate is typically not related to population size. Angler skill and other factors have greater influence in catching fish, than the number of fish present. A lack of fish captures may influence angler perception, but may not necessarily reflect the size of the population. Stocked fish could just swamped by the number of fish already in the stream.

It seems that there are many more questions than answers when it comes to stocking streams where wild trout are present.

The good news is that there are trout in the system and that populations do recover naturally. However, if we want to accelerate any recovery in stream trout populations, we may need to look to other strategies such as habitat rehabilitation. Stocking trout into rivers may just waste stocks that could be better going elsewhere such as lakes and reservoirs where they are known to perform.

Next steps:

- Stocking has ceased. The final stocking of 5000 fish into each water occurred in winter 2016.
- Follow up surveys will provide further information on the proportion of the population made up by the stocked fish and how long the stocked fish stay in the population.
- Investigate potential answers to why stocked fish are not represented in the samples.

Creation of improved habitats for high energy streams

Andrew Briggs. Senior Project Officer, North East Catchment Management Authority.

The need for complex in-stream habitats in high energy, upland streams is every bit as important as it is in the lower, slower moving reaches of our rivers. The presence of high quality instream habitat is inextricably linked to achieving healthy, resilient trout populations in waters all over the world, and particularly in Australia where trout populations are under considerable pressure.

Re-establishing instream habitat into high energy waterways requires an entirely different approach to the techniques engaged further downstream. There are many reasons for this: Extreme, powerful flood events, large cobbles (rocks) and generally much shallower water mean that the use of “fish motels” and individual, un-tethered root balls is inappropriate.

The purpose of the structure is also subtly different. In addition to such services as shelter from predators and ambush sites for predatory species, habitat in high energy waterways also has to provide a “velocity refuge” for fish to be able to rest out of the main current. Structures also have to re-shape the actual bed and banks of the waterway so that they provide all of the complex tasks required of them, whilst withstanding to pressures of an extremely dynamic environment.

In recent years the North East and Goulburn Broken CMA’s have pioneered several techniques for improving instream habitat in high energy waterways. Bed seeding, constructed log-jams and LUNKERS are just some of the approaches now being utilised to great effect. This exciting work has only been possible through working closely with recreational fishers, fly-fishing clubs and, of course, the Recreational Fishing Licence funding program.

“They can’t all be big ones!!”

This questionnaire is to help us to improve on the content and delivery of Talk Wild Trout conferences. Please answer the questionnaire as frankly and openly as possible. You are not required to write your name on the questionnaire.

Please Circle your answer using the scale **1** (unsatisfactory) to **5** (very good) or **X** is no opinion)

How would you rate	Unsatisfactory			>	Very good	
The general organisation of the conference	1	2	3	4	5	X
The relevance of the themes chosen	1	2	3	4	5	X
The experts' contribution	1	2	3	4	5	X
The time allocated to discussion	1	2	3	4	5	X
The official documents distributed	1	2	3	4	5	X
The venue and its facilities	1	2	3	4	5	X
Relevance of this conference to **your** fishing	1	2	3	4	5	X
Relevance of the conference to **your** knowledge needs	1	2	3	4	5	X
Extent to which **you** have acquired information that is new to you	1	2	3	4	5	X
Usefulness for **you** of the information that you have acquired	1	2	3	4	5	X
Extent to which the content of this conference matched the announced objectives	1	2	3	4	5	X
Overall usefulness of this conference	1	2	3	4	5	X

Do you fish for trout **Only** **Mainly** **Sometimes** **Hardly** **Never**

What is the MAIN technique you use: **Bait** **Lure** **Fly**

What did you find most useful/least useful in the conference?

Best bit was: _____

Worst bit was: _____

What key topic(s) would you like Talk Wild Trout 2017 to cover in future conferences?

_____

_____

_____

_____

Please indicate any other comments/suggestions for follow-up
(use back of sheet if you need more room)

_____

_____

_____

_____

Thank you for completing the questionnaire

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

Anthony Forster

Current membership of Victorian Trout Fisher Reference Group

Graham Godber	Mansfield & District Fly Fishing Club
Steven Relf	VRFish
Mick Hall	Australian Trout Foundation
Doug Braham	Council of Victorian Fly Fishing Clubs
Philip Weigall	Fishing Guide, Journalist
Tom Camp	State-wide roundtable forum
Merv McGuire	State-wide roundtable forum
Matt Byrne	Australian Trout Foundation
Dallas D'Silva	VRFish
Pat Sheridan	Northern Suburbs Fly Fishing Club
Daryl Horwood	Upper Goulburn Community Association
Trevor Hawkins	Independent trout fisher
Michael Nolan	Fly Fish Australia
Terry George	Australian Trout Foundation
Anthony Forster	(Chair) Fisheries Victoria
John Douglas	Fisheries Victoria
Taylor Hunt	Fisheries Victoria

Target One Million
More Victorians fishing, more often

Fisheries Victoria

VICTORIA State Government

Your fishing licence fees at work

Representing Victorian Recreational Fishers

Arthur Rylah Institute for environmental research

Australian Trout Foundation

The Council of Victorian Fly Fishing Clubs

M.A.D. Fly Fishers