



NELSON MARLBOROUGH FISH & GAME
ANNUAL FISHERIES REPORT 2018-19

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WELCOME TO THE 2019 ANNUAL FISHERIES REPORT

This season has been a monumental one for this region, a year in which we saw some significant gains in our pilot R3 programme. R3, being Recruitment, Retention & Reactivation is a key focus nationally, and for this region going forward, and our efforts in this space have set somewhat of an example for other regions to look towards.

Accordingly, it appears angler satisfaction is reasonably high in this region - no doubt a product of the hatchery operation, with frequent releases into waterways that anglers, of all age and stage, love to fish.

Lake Argyle - one of our focus fisheries - has seen a large increase in angler patronage. Releases of trophy 10+ pound fish, and a summer tag competition, have been very popular with anglers, and there is potential to build on these concepts to see continued growth in this space.

The season certainly had some challenges, too. After a wet late winter/early Spring, the taps turned off and little rain fell in the region, causing a drought from which there was no relief until April. There were cases where the drought significantly affected some fisheries, mainly in smaller systems, where there were significant mortalities of native fish and sportfish. However, in the main, the larger systems coped well owing to their magnitude of cold water refuge areas.

Though it was sad to see the loss of aquatic life, the drought presented an ideal opportunity to collect evidence in relation to the current inadequate minimum flows in some rivers, which have been very useful for the Marlborough Plan Review and Upper Motueka water allocation.

Despite all of this, angler feedback from across the region was excellent, with many anglers and guides waxing lyrical about the fishing, and the quality of fish brought to net. The extremely stable Spring and Summer precipitated a flourishing invertebrate life, and trout were able to dine royally throughout, without interruptions from flood events. Indeed, one local angling stalwart announced the Motueka to be fishing the best since the 1980's.

Excellent feedback also arose from the Branch/Leatham - one of the season's standout fisheries, and though assisted by Trustpower funded releases, these rivers provide a great destination for local anglers to experience fishing in a wilderness environment, with excellent odds to catch riverine rainbow trout - an experience difficult to find in a region dominated by brown trout fisheries.

Ngā manaakitanga | Best wishes



RELEASE STRATEGY

The Nelson Marlborough region has 87 recognised fisheries, of which around 11 are rainbow fisheries. Since 2017, releases of large (1 kg+) trout have been carried out in a number of rivers in this region.

All release locations have a monitoring programme in place whether this is through drift dives, spawning surveys or electric fishing surveys. Staff have concluded from monitoring work/angler feedback/tag returns, that many of the recent releases have been successful in terms of meeting the following criteria:

- rebuilding reduced adult wild trout populations,
- how well the fish have adapted to release environment,
- tag returns/angler feedback, and
- angler satisfaction

The hatchery programme in this region is effectively cost neutral or cost positive - this from an increase in licences sold as a direct result of hatchery releases, as well as external funding via Trustpower and other grants (for youth sports fishing etc).

Nationally, there is some concern about riverine hatchery releases: their potential biological impact on the wild fishery, the potential effects on native fish, and by raising expectations of licence holders, to name a few. A recent review by Cawthron concluded that releasing small fish into rivers was a waste of money, and that riverine releases, by and large, are questionable. The report did note that the Branch/Leatham releases seemed to work well owing to the large number of fish released (800/year). Currently a National Fish Stocking Policy has been drafted in order to try and address some of these concerns and provide a more rigid framework for when fish releases can take place. Nelson Marlborough region, however, wish to retain the ability to carry out future river releases of trout, based on some of the successful results to date, and accordingly are inputting into policy development.

The table below shows the location and amount of fish released in the past year. All told, 3170, 1 + kg trout (mostly rainbow) were liberated into enclosed waterways and riverine systems, including Challies Island junior fishery. Additional to this, 1490 smaller rainbow trout (280-450 gram) were released into Lake Argyle to get rid of excess stock so they did not become a financial burden as adult fish, and some excess eyed ova were planted in a Spring Creek tributary.

Of the total adult fish released 1309 were released into river systems (880 Branch/Leatham; 200 Taylor River; 100 Rai/Opouri; 129 Spring Creek); Lake Argyle received 1144 fish; and Challies Island 717 adult fish (trout and salmon).

Date	Number	Species	Stage	Size (average)	Tag/Fin Clip	Location	Assessment of effectiveness
4 July 2018	990	Rainbow trout	Juvenile	280 g	Fin clipped	Lake Argyle	✓achieved objective
5 July 2018	100	Rainbow trout	Adult	2.4 kg - up to 5 kg	Fin clipped	Lake Argyle	✓achieved objective
5 July 2018	25	Brown trout	Adult	2.0 kg		Lake Argyle	✓achieved objective
5 July 2018	32	Rainbow trout	Adult	2.4 kg - up to 5+ kg	Fin clipped	Lower canal at State Highway	✓achieved objective
24 August 2018	500	Rainbow trout	Medium	450 g	Fin clipped	Lake Argyle	✓achieved objective
7 September 2018	5000	Rainbow trout	Eyed Ova	Eyed ova		Spring Creek tributary	→ further monitoring required
26 September 2018	155	Rainbow trout	Adult	1.0 kg	Fin clipped	Lake Argyle	✓achieved objective
26 September 2018	21	Rainbow trout	Adult	4 kg	Fin clipped	Lake Argyle	✓achieved objective
18 October 2018	5000	Salmon	Fry	5 grams		Hamilton River, 900masl	→ further monitoring required
18 October 2018	3700	Salmon	Fry	5 grams		Lees Creek, 900masl	→ further monitoring required
31 October 2018	225	Rainbow trout	Adult	1.0 kg	Fin clipped	Lake(200), lower canal(25)	✓achieved objective
13 November 2018	200	Rainbow trout	Adult	1.2 kg	Tagged	Heli-released into Leatham catchment	✓achieved objective
14 November 2018	200	Rainbow trout	Adult	1.2 kg	Tagged	Heli-released into Branch catchment	✓achieved objective
23 November 2018	200	Rainbow trout	Adult	1.2 kg	Fin clipped	Taylor River junior fishery	→ further monitoring required
29 November 2018	120	Rainbow trout	Adult	1.3 kg	Fin clipped	20 lower canal, 100 lake	✓achieved objective
29 November 2018	80	Rainbow trout	Adult	1.3 kg	Fin clipped	Lower Leatham	→ further monitoring required
19 December 2018	92	Rainbow trout	Adult	3.0 kg - up to 7 kg	Fin clipped	Lake Argyle	✓achieved objective
19 December 2018	130	Rainbow trout	Adult	1.2 kg	Tagged	Lake Argyle	✓achieved objective
8 January 2019	129	Rainbow trout	Adult	1.5 kg	Fin clipped	Spring Ck - 60 Stump Ck, 69 Hillocks Rd	→ further monitoring required
8 January 2019	164	Rainbow trout	Adult	1.5 kg	Fin clipped	140 Lake Argyle, 24 lower canal	✓achieved objective
12 April 2019	200	Rainbow trout	Adult	2.3 kg	Tagged	Heli-released into Branch catchment	✓achieved objective
13 April 2019	200	Rainbow trout	Adult	2.3 kg	Tagged	Heli-released into Leatham catchment	✓achieved objective
31 May 2019	100	Rainbow trout	Adult	2.4 kg	Tagged	Rai/Opouri	→ further monitoring required
31 May 2019	80	Rainbow trout	Adult	2.4 kg	Fin clipped	Lake Argyle	✓achieved objective

SALMON SMOLT RELEASE

In October, 5000 salmon fry were heli-released into the Hamilton River, with an another 3700 flown into Lee's Creek. This salmon enhancement has been carried out to attempt to add some diversity to the Wairau run, that to date has relied heavily on spawning within the Rainbow side stream, and the more unreliable mainstem Wairau spawning.



^ Salmon smolt ready for departure.



^ Salmon smolt en route to Lee's Creek

GUIDELINES - NELSON MARLBOROUGH RELEASES

Only used where wild fishery recruitment failing

Small systems only

Wild genetics when possible

Adult fish only (1+kg)

Abundant food / flood refuge

Targeted monitoring pre/post release

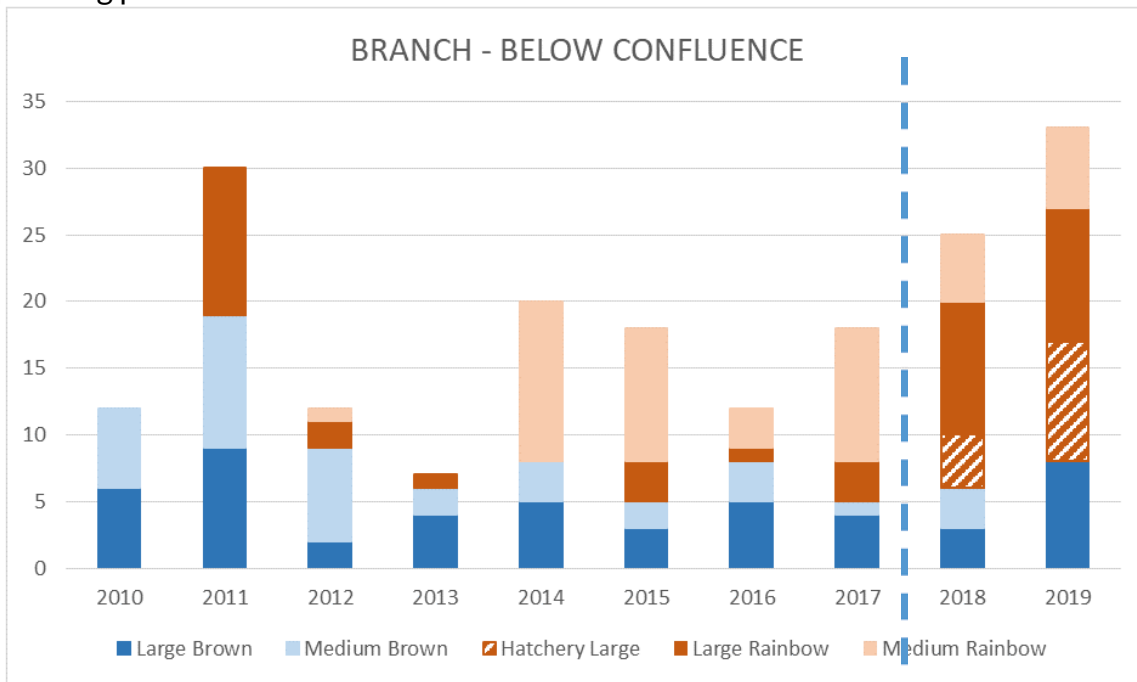
drift dives / e-fishing / tag returns

Monitoring potential effects of releases on native fish

BRANCH & LEATHAM

One of the best examples in terms of meeting all of the above criteria is the Trustpower funded Branch/Leatham releases, which have taken place sporadically since 2009, but with greater regularity and substance in the past two years. Here, 800 1kg+ rainbow trout have been released each year into the upper part of both rivers, with most of the fish holding well in their area of release. Angler feedback from these releases is excellent, with great fishing and well-conditioned fish (meaning they have adapted well to the river). Guided angling has also increased here, which has taken additional pressure off more sensitive brown trout fisheries. Drift dive surveys are undertaken many kilometres downstream of the release sites, with the lowest site graph shown below.

It should be noted that 'hatchery large rainbows' refer to tagged fish released since 2017 only, but that the original 2011 'large rainbows' were also derived from a hatchery source (North Canterbury). The resultant rainbow fishery is now an interesting mix of released hatchery fish, plus 'wild' fish derived from hatchery rainbow spawning post 2011.

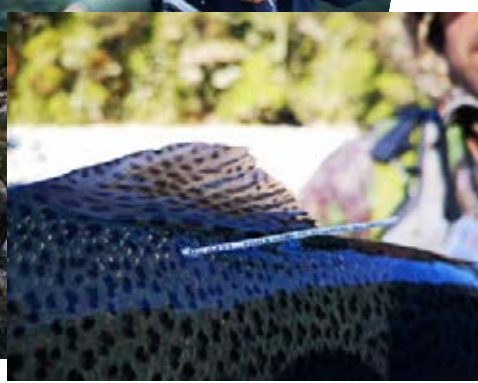
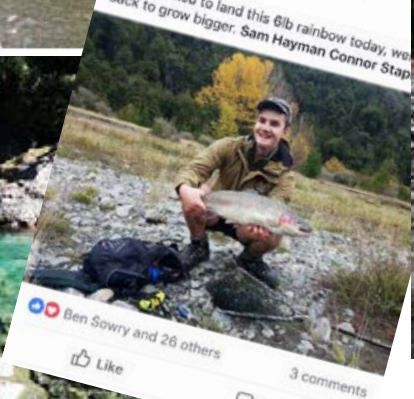


Releases increase to 800 fish/yr

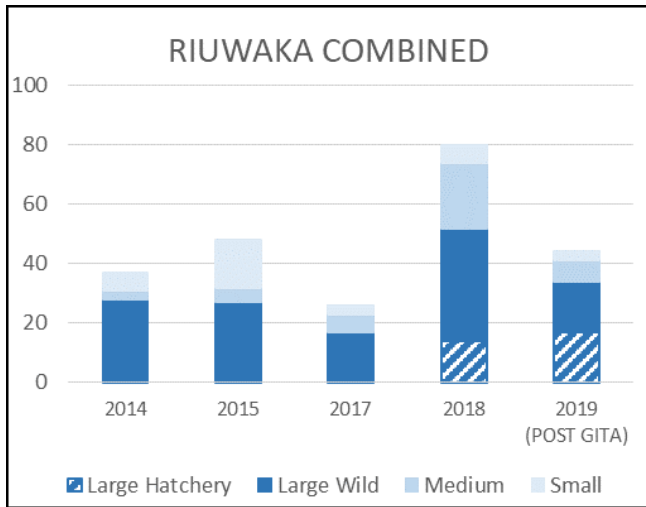
What a valuable resource that F&G and Trustpower have made by the many recent rainbow releases into Argyle, Leatham and the Branch. I picked up me mates flyrod and caught my first trout on a dry fly in over 30 yrs. Might have to search in the sheds rafters and dig out my old 1970s fly gear. Not sure it might be split cane 🍷



Ollie McKenzie ☆☆☆ Fishing Mariborough ☆☆☆
 Pretty stoked to land this 6lb rainbow today, we back to grow bigger. Sam Hayman Connor Stap



The Riuwaka was dived almost a year after Cyclone Gita had ripped through the catchment. Despite having low expectations, the fish population was higher than expected, even in the two lower sites that had been severely impacted by the flood event.



While in no way should the graph imply there was better survivability of hatchery fish compared with wild fish, it can be pointed out that survivability of the hatchery fish was better than what was anticipated, and is somewhat at odds to what is commonly understood of hatchery fish when negotiating high magnitude flood events.

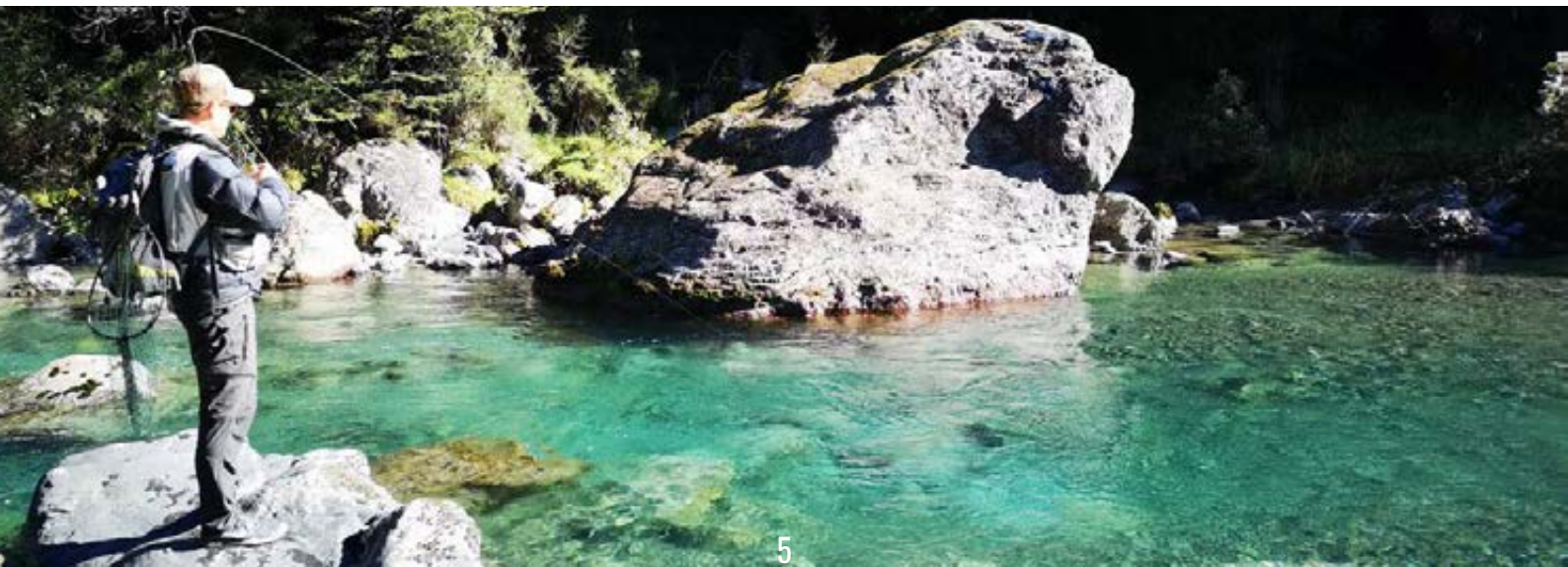
There is more information to be found on the Riuwaka drift dive records in the Population Monitoring chapter.

TAG RETURN INFORMATION

Floy tags were used in most riverine releases to monitor effectiveness of the liberations through angler returns and drift dive surveys. In the past year these have been for the Branch/Leatham and Rai Rivers only.

Some anglers are very good at providing feedback through tag returns and other observations, while many do not take the time to do so, despite the importance of this information to monitor the effectiveness of the releases

The Lake Argyle tag competition, for example, provides an idea of how effective tag returns can be with an incentive. For example, of the 100 tagged fish released into the lake, over 80% were handed in - a very high percentage - so perhaps an incentive could be used to generate better interest in river returns. As the images above suggest, however, quite a number have been handed in over the past year or so, but staff are aware of many instances where anglers are remaining quiet on the subject, despite benefiting greatly from the releases.



ANNUAL RELEASE PROGRAMME 2018-19

2453

1+ kg rainbow trout released into Lake Argyle and some river systems

717

Rainbow trout and salmon released into Challies Island Junior Fish Out ponds

8700

Salmon smolt released into Upper Wairau tributaries - Lee's Creek and Hamilton River

6.3%

Increase in licence sales (only region in NZ to achieve a substantial increase)



R3 RECRUITMENT, RETENTION & REACTIVATION

R3 - being Recruitment, Retention and Reactivation is now a major component of our operational work plan. In 2018, the Nelson Marlborough region became one of four pilot regions implementing an R3 strategy. Since its inception, this region has made some significant gains, seeing a notable increase in participation from anglers at all age and stage, and bucking the national trend of falling licence sales.

Of course, one of the central components to the R3 programme is the hatchery, and the regular fish released which take place into our waterways - whether these take place in kids fish out ponds, Lake Argyle or river systems - they all form part of the R3 plan. However, it is the communication with licence holders, both current and lapsed, and indeed the general public, where the good work gets done. Being a smaller region, this is easier than what would be needed for a larger region - by sheer volume of anglers alone. For this to work, lapsed licence holders are identified by accessing the database and are sent direct emails informing them of the good stuff on offer - principally - the details of the releases that have taken place, or that are in the pipeline. These will be releases of trophy fish, the tag competition, or details of our river releases to name a few. Targeted releases are undertaken at specific times on the calendar to coincide with school holidays, winter fishing season, and start of the regular season, in order to maximise resident licence growth potential.

The hatchery allows this region to 'offer' the angler something which they have been wanting for some time, and that is providing places which have easy access and a good chance of catching a trout or two. It has filled a niche gap in our member audience who, in general, have little interest in traipsing over riverbeds in search of difficult to catch brown trout for which the region is well known for. Indeed, as a general rule, these anglers are not known to place additional weight on our pressure sensitive brown trout fisheries, and thus their added participation is a complete win-win for Fish & Game.

RANGERS AS R3 ADVOCATES

For the coming season our ranger team will focus on R3 as they carry out compliance duties. As the team generally makes contact with over 10% of licence holders, this is actually quite a significant percentage. It has been described by our National R3 coordinator, Steve Doughty, as "a marketers dream" - being able to personally speak with that much of our customer base.

So, for the coming season we aim to arm our rangers with packs of lures, flies, and other useful fishing material, so they can help our anglers catch more fish. Our rangers do a great job, and this September will receive some additional tips on the importance of R3 during compliance interactions, as often the only contact our licence holders ever have with Fish & Game is this waterside interface, so it's important the interaction is a positive one.

R3 activities seek to create new participants or increase participation rates of current or lapsed outdoor recreationists

R3 CASE STUDIES



WINTER FISHING PROMO

In winter 2018, a release of large double digit fish into Lake Argyle was undertaken to promote winter fishing. The release was promoted via social media, and licence sales were tracked post release. On the first Saturday, the usually quiet lake had over 40 anglers there, and there was a spike in winter licences purchased. Three trophy 10 pound plus rainbows were caught on that day.

< Chris Walters with one of the trophy fish caught in winter



TAG COMPETITIONS

For the past two summers, a summer 'lucky tag' competition has been held at Lake Argyle, with the person who catches the lucky tag winning a \$500 Henderson's voucher. The competition was promoted via social media, newspaper and via electronic direct mail. The competitions are hugely popular, with hundreds of anglers seen trying to catch the lucky fish. For the last competition, 100 fish were tagged and over 80 of the tags were handed in - a great return rate.

< David Sulser with a tagged fish



BIG FISH MANIA

Anglers love to catch huge trout - the Twizel canals have proven this. At Lake Argyle, we have tried to create our mini version of the Twizel canals, by multiple releases of large trophy trout (10-15 pounds), at regular intervals throughout the season - both summer and winter. These gained huge attention from anglers via social media, newspaper coverage, and word of mouth. The great thing about releasing these huge fish at Lake Argyle is they soon get caught, and we've had fantastic feedback from anglers, both young and old, who have landed these beasts - a fish of a lifetime.

< Luhan from NMIT about to release a huge rainbow

RETAINING & REACTIVATING - A LAKE ARGYLE EXAMPLE

Just prior to the Christmas Holidays, 90 large trout (5 kg average) and 100 tagged rainbows were released into Lake Argyle as part of the summer fishing promotion. An email newsletter was sent out to all current resident Nelson Marlborough licence holders, and also to lapsed licence holders who had purchased a licence prior but not in the past year.

An email newsletter was sent out to current local licence holders:

The email had a 53% open rate (industry standard 18.1%), and an 11.4% click rate (industry standard 1.9%) – so a very good result.

The second (reactivation) email was sent to lapsed licence holders (who purchased last year but had not this year):

It had a 43.6% open rate and 5.3% click rate

However, out of the 496 opens by New Zealanders, 87 licences were sold to these recipients in the week following, meaning around 17.5% of those who opened the email went on to purchase a licence - a great result.



JUNIOR FISHING DEVELOPMENT

WAIMEA PARK

It's been another busy year in this area with Challies Island going strong. Organised kids fish out events were held in early Summer and Autumn, and these popular days were fully subscribed for each event

While a number of highly popular events have been held, the pleasing growth area has been when the ponds have been opened to the public, and junior licence holders are able to use their own skills and gear to catch trout.

There have also been a number of charitable groups fish at the pond, an incredibly rewarding experience for all involved.

IN MARLBOROUGH

A junior fishing event was held at the Opawa Loop. 200 large rainbow trout were released into the netted off area, and the event was attended by around 40 kids. Once the nets were lifted, trout entered into the Taylor Junior Fishing Area, and the angling here was popular for some time afterwards.

There has been some work in Marlborough to try and progress the Kids Fish Out pond at Renwick. Prior to a drone survey design draft being completed however, the surveyor has advised that installation of two groundwater tubes to enable measurement of water table behaviour at the proposed site will mean a much more accurate finished pond design concept and gravel extraction volume estimation via the drone survey. MDC River Services has kindly agreed to organise this work on behalf of F&G. Once a few months monitoring data has been collected, which can accurately guess likely summer water table average height, a drone survey will then be completed to inform the resource consent application for this project.



POPULATION MONITORING

Species monitoring makes up a significant portion of the annual work plan, and for trout and salmon, most of this is through drift dives, with some electric fishing and spawning foot counts also carried out.

For the 2018-19 season, a total of 25 rivers were dived in the Nelson Marlborough region, which included 43 different sites within these rivers. Staff also assisted West Coast with the Mokihinui and Grey River dives.

WAIRAU CATCHMENT

WAIRAU RIVER

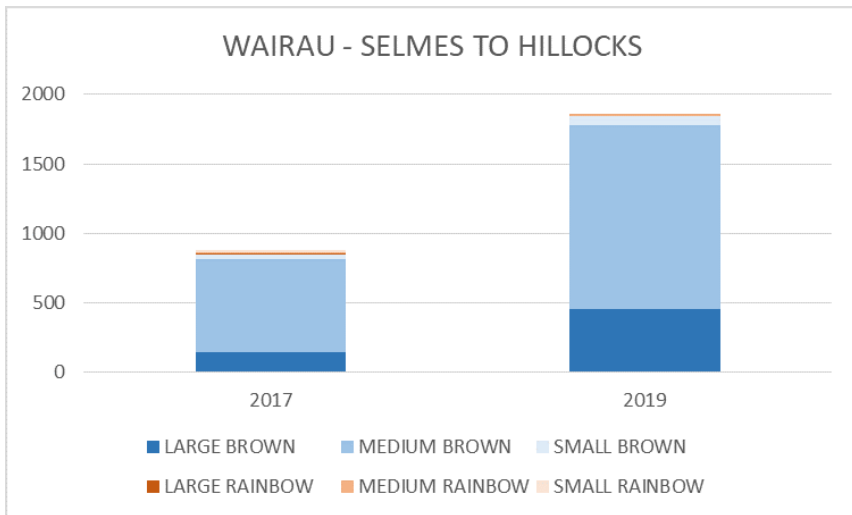
The Wairau experienced incredibly high water temperatures owing to the drought which took hold over the entire top of the South. Staff measured the water temperature on 28 January at Selmes Road which read 26 degrees in flowing water, quite fatal to trout and other aquatic life. In addition, at the lowest flow period during the drought, the Wairau flow was gauged at 3.9 cumecs by MDC at a point upstream of Selmes Rd. However when a short 'unofficial' dive was undertaken above and below the Waikakaho confluence, a school of around 300 brown and rainbow trout were seeking thermal refuge in the cooler waters of the Waikakaho Spring, with zero seen above this site in warm waters.

With this knowledge it was decided to abandon the Rock Ferry site, which had altered considerably over the past few years (now displaying less good holding water with fewer pools), and dive the relatively new Selmes Road site instead, as well as the Proposed Intake Site upstream above the Branch confluence.

Anecdotal feedback from anglers indicated the river was fishing well when water temperatures were suitable. In particular, early morning fishing produced the goods with some epic mayfly hatches recorded. As fish were bunched up in deep pools where there was cooler groundwater flows, when a hatch was on, the pools were simply alive with trout.

On the lower dive at Selmes Road, two adult salmon and 129 smolt were counted, and for the top site five adult salmon and 584 smolt were seen. The smolt appeared to be in excellent condition, and it was the view of staff that they were larger than seen in previous years, potentially due to the stable Spring/Summer meaning rearing conditions were optimal. Several of the adult salmon seen were fantastic specimens in the 10 kg class, and mirrored some of the catches seen at the Diversion.

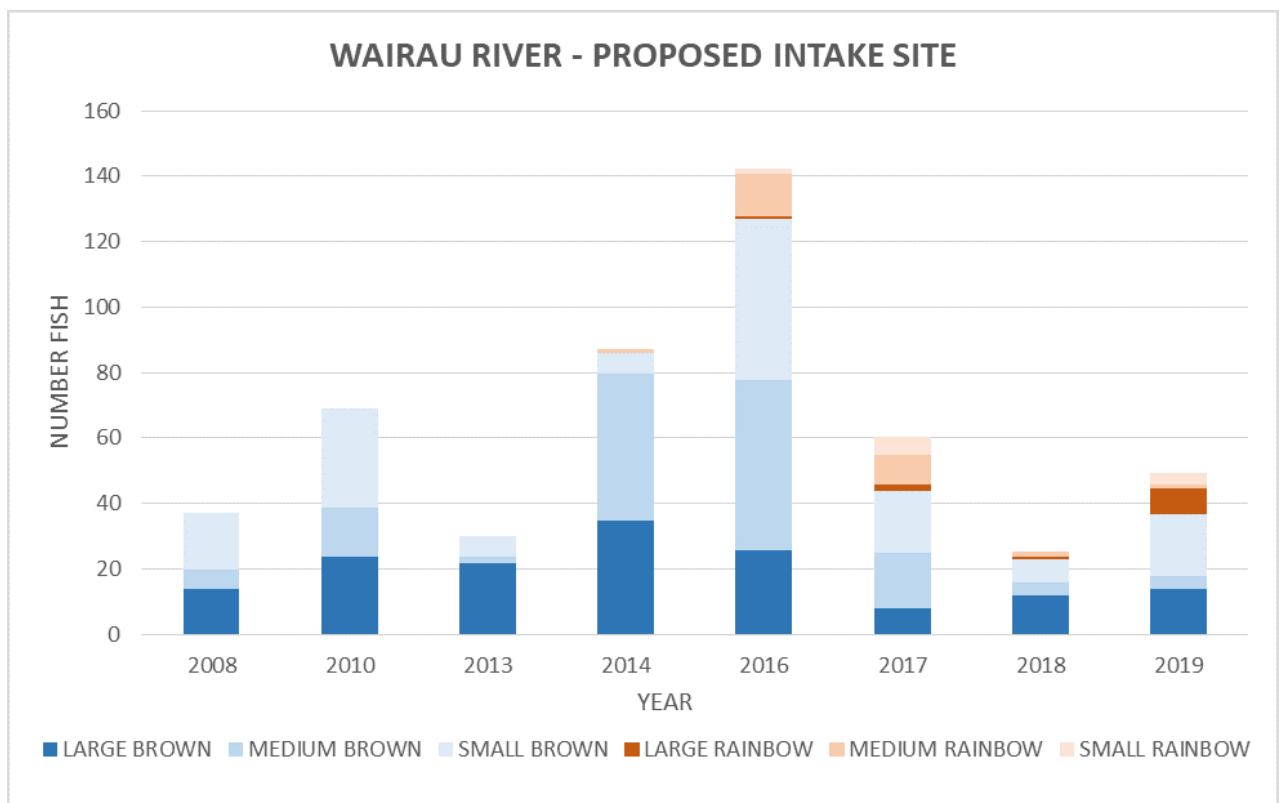
For the Selmes Road dive, the first pool (which had the cooler Waikakaho input as well as depth for cold groundwater flows) yielded a staggering number of trout, with around 500 fish seen in one pool.



Over the course of the dive, 456 large and 1323 medium brown trout were counted, with the highest densities found in cold water refuge areas. If this wasn't fascinating enough, some of the divers came face to face with a resident seal which had locked on to an easy food source and made the pool home. The adjacent graph shows this data, noting that only 10 large/medium rainbows were counted.

The Proposed Intake Site yielded a below average count, in all likelihood due to warm water temperatures and lack of groundwater refuge areas. Angler feedback from the reach above Wash Bridge and up into Rainbow Station indicated the trout had dropped out of the system, waiting for the return of cooler Autumn waters.

Eight large rainbows were seen on this dive, along with one medium and three smalls - this is fewer than what would be anticipated considering the proximity to the Branch River where rainbows enter the system via the Branch weir.



BRANCH & LEATHAM RIVERS

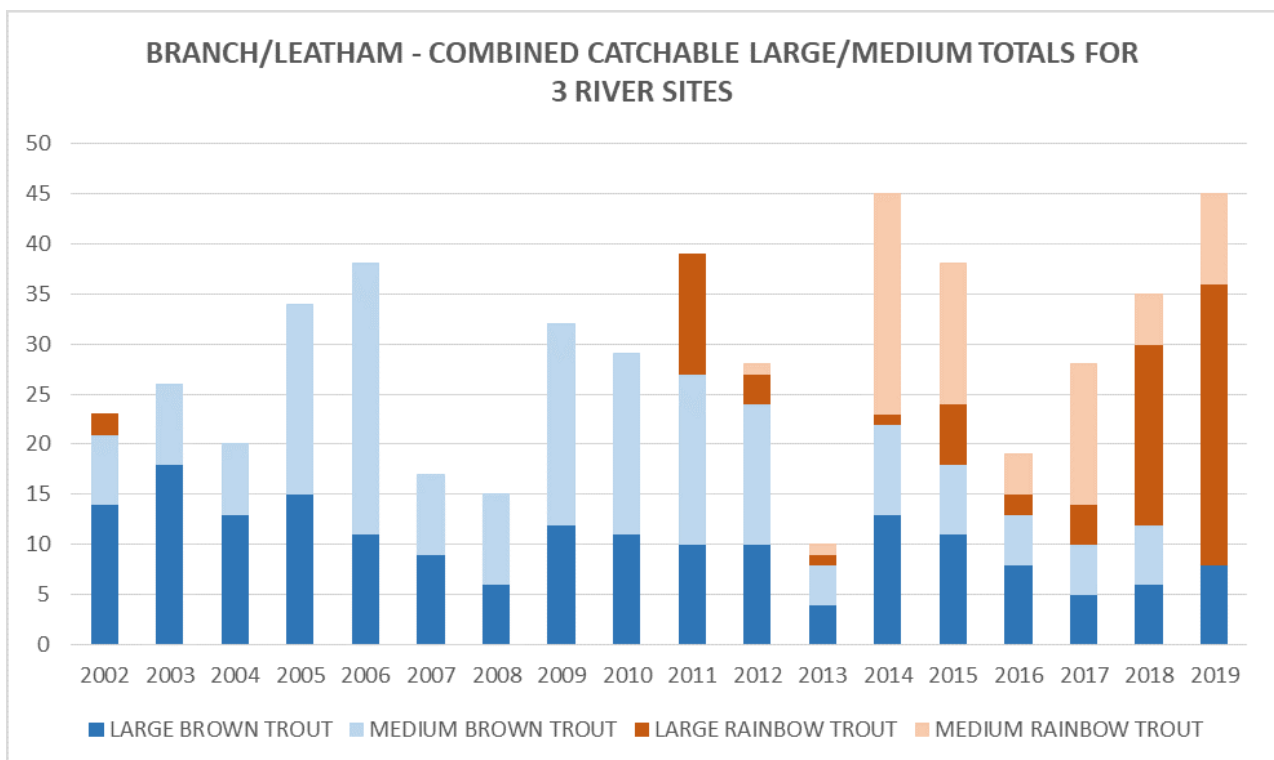
If there was to be a success story for the region as far as quality fishing, participation and positive angler feedback, it would be the Branch & Leatham. Since the number of trout liberated into these rivers increased to 800 fish per year, angler effort has also increased considerably, and the good news is the fishery has been shown to easily cater for the extra pressure coming from recreational anglers as well as guides.

Drift dives are undertaken fairly low in both rivers, however most of the releases take place in the upper reaches of both rivers. If dives were to be undertaken higher in the catchments, an improved count would likely be seen (as evidenced by angler feedback/staff foot counts).

Low numbers of trout were seen in the Leatham dive with just 7 large rainbows seen, noting that zero brown trout were in residence. As water temperatures were reasonably high, it may have been the case that the brown trout dropped out to the cooler waters of the Branch River - quite common behavior for Leatham trout in the lower 10kms of this river.

For the Branch at Nesbitts Creek, a small sediment leak meant water clarity was insufficient for an accurate count, thus for this dive few fish were seen. As this dive site has lost a good deal of its holding water in recent years, it cannot be considered a true reflection of the trout population.

Notably, few small trout were seen, meaning the July flood event (largest in three years) probably had affected the survival rates from the previous years' spawning. The graph below shows the combined count of medium and large fish for all three river sites, with the Branch site (below confluence) to be found on page 4.



ARGYLE HEAD RACE CANAL

A reasonably modest count of fish was seen in the Argyle head race canal, with 55 large/medium brown trout and 33 medium/large rainbow trout however, as fish move freely between the lake and canal depending on lake level/flow, there would have been reasonable numbers residing in the lake, as attested to by angler feedback and what is plainly evident by spotting fish from the lake edge.

SPAWNING & E-FISHING SURVEYS

A winter foot count of spawning redds in the headrace canal was carried out during a fish release into the lake on July 5th, with good results showing the benefits of a flood proof lake/canal. A total of 17 definite redds, and 11 possible redds were observed over 920m from the canal bridge downstream. In addition, 12 adult fish were spotted, 3 of which were rainbows. Apart from one pair of rainbows that had paired up and were yet to spawn, it was assumed most of the spawning activity to date was from brown trout due to all fish holding near redds being brown trout..

CHROME & BOULDER STREAM SURVEYS

Chrome and Boulder Streams were foot surveyed on June 26th 2018, with no evidence of spawning activity located possibly due to a lack of sufficient gravel quantities, and the hydrological regimes of these two systems during the Red Hills type geology/vegetation cover.

NATIVE FISH MONITORING

An intensive 3-day sampling trip utilising two electric fishing teams was undertaken from November 5th-7th 2018, with historic sites re-sampled, and several new sites fished, comprising a total of 15 monitoring sites. This work was undertaken in order to set-up a monitoring system to assess the health of both native fish and brown/rainbow trout recruitment within these catchments given the present rainbow restocking program. This work was repeated in March 2019 and is now programmed to be repeated annually in March each year - see page 35 for more detailed information on this work.



GOULTER RIVER

The Goulter River was dived on 17 January. The upper most site (which is 3.5 kms long) was dropped due to lack of time, and overall there were fewer fish counted within the remaining two drift dive sites this year compared to when it was last dived in 2016.

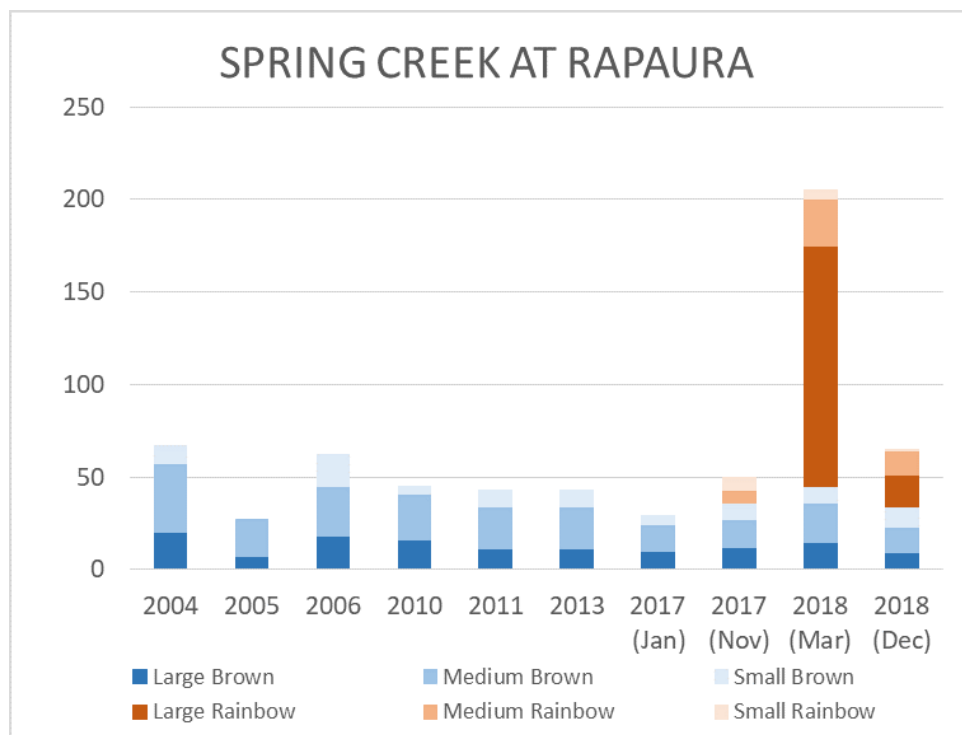
In the upper site dived below Mid Goulter Hut, nine large fish were seen (compared to 17 in 2016) of which five had capture marks/scars, and three were in poor condition. In the lower dive site, six fish were counted (down from 10 fish in 2016), and the majority of these showing signs of stress. It is not really known what the cause for the poor numbers and fish condition is considering the relatively stable period the fish had experienced, and that in 2016 more fish were seen just two months after Cyclone Winston had hammered the Richmond Ranges. However, as was the case in small river systems elsewhere, low flows resulting from the drought may have been the catalyst for fish to drop out to the Wairau. While water temperature in the Goulter appeared to be fine, this doesn't really account for why fish were in poor condition considering the stability of the summer should have seen invertebrates flourish.

Despite the low trout numbers, the dive was memorable for the number of juvenile galaxiids present in the river, particularly in the lower dive. Here, tens of thousands of juvenile dwarf and northern galaxiids were seen living in the pools where brown trout were residing. No doubt the boom in galaxiids had resulted from the stable Spring/Summer, and was similar to what was seen elsewhere on other dive sites such as the Motupiko and Opouri Rivers.

SPRING CREEK

Spring Creek was surveyed in December 2018 showing a fairly normal number of brown trout, and with 30 medium/large rainbow trout in residence.

The high number of rainbow trout seen in March 2018 was a short time after a release of fish into the waterway (at the Rapaura site), and it was expected the fish to disperse over time and, as this is a popular fishing spot, a portion of these fish would end up on a dinner plate.



PELORUS CATCHMENT

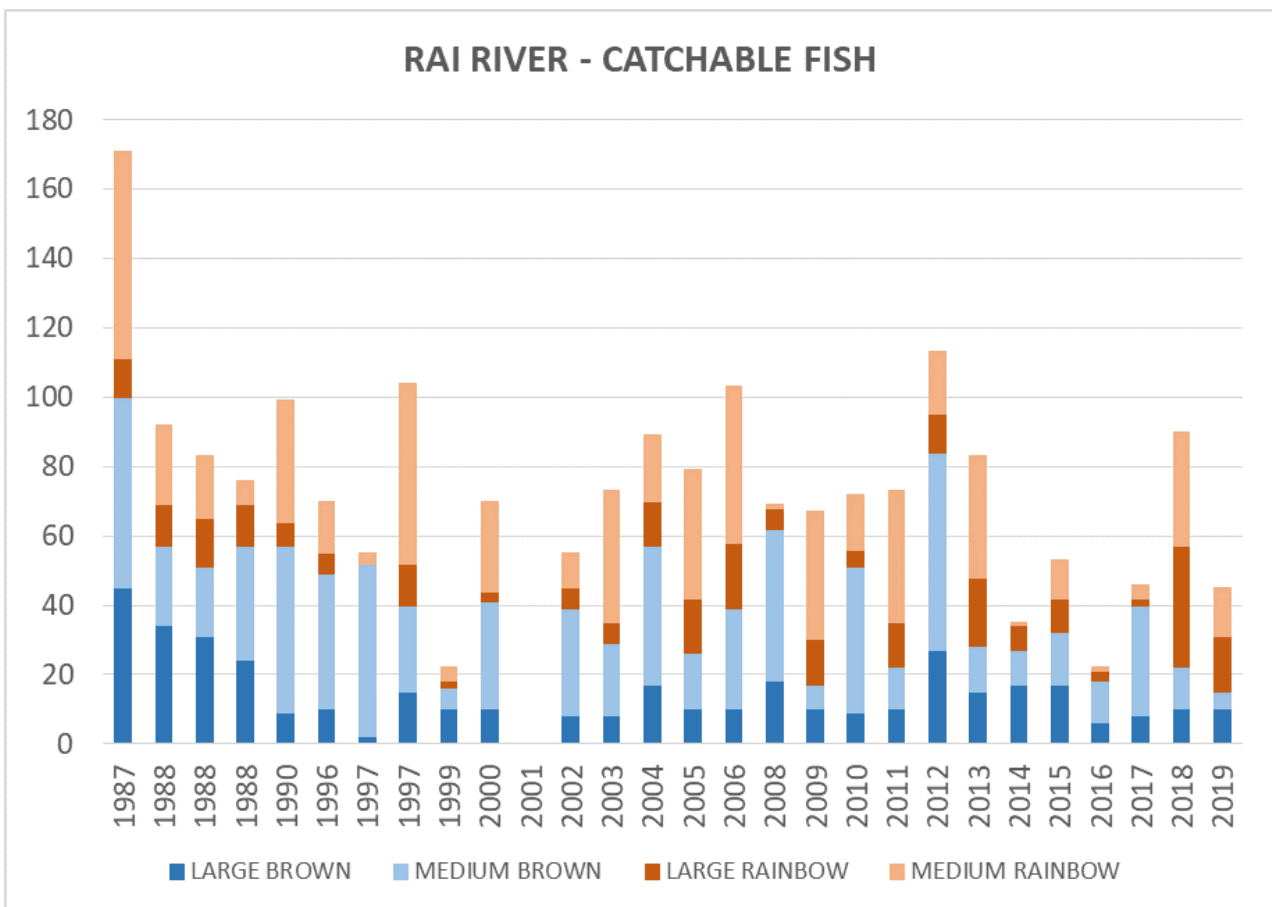
All told the Pelorus catchment had a mixed season fishing wise. The Rai/Opouri produced fish consistently, many of them from recent releases, until the drought took its toll. Angler feedback from the middle to lower Pelorus indicated a revival of sorts, with a surge in medium-large sized rainbows caught, yet the reach above the Pelorus Bridge held few fish (as evidenced by drift dive counts).

It must be remembered, however, that drift dive counts are just a moment in time, and in times of low water or high water temperatures, fish may largely vacate the water for more suitable conditions elsewhere. Most of the time drift dives are carried out in fairly normal conditions to try and maintain consistency from year to year, but in cases such as the drought seen this summer this is not always possible to achieve.

RAI RIVER

The Rai was dived on 22 January during the peak of the drought. The river was very low with the flow at 1.1 cumecs at Rai Falls. While the water temperature was still cool, the trout count was fairly low, with 10 large and 5 medium browns seen. The count of large rainbow trout was reasonable with 16 large and 14 medium fish seen. 259 juvenile rainbows were also seen - a fairly normal count for this river (see graph below).

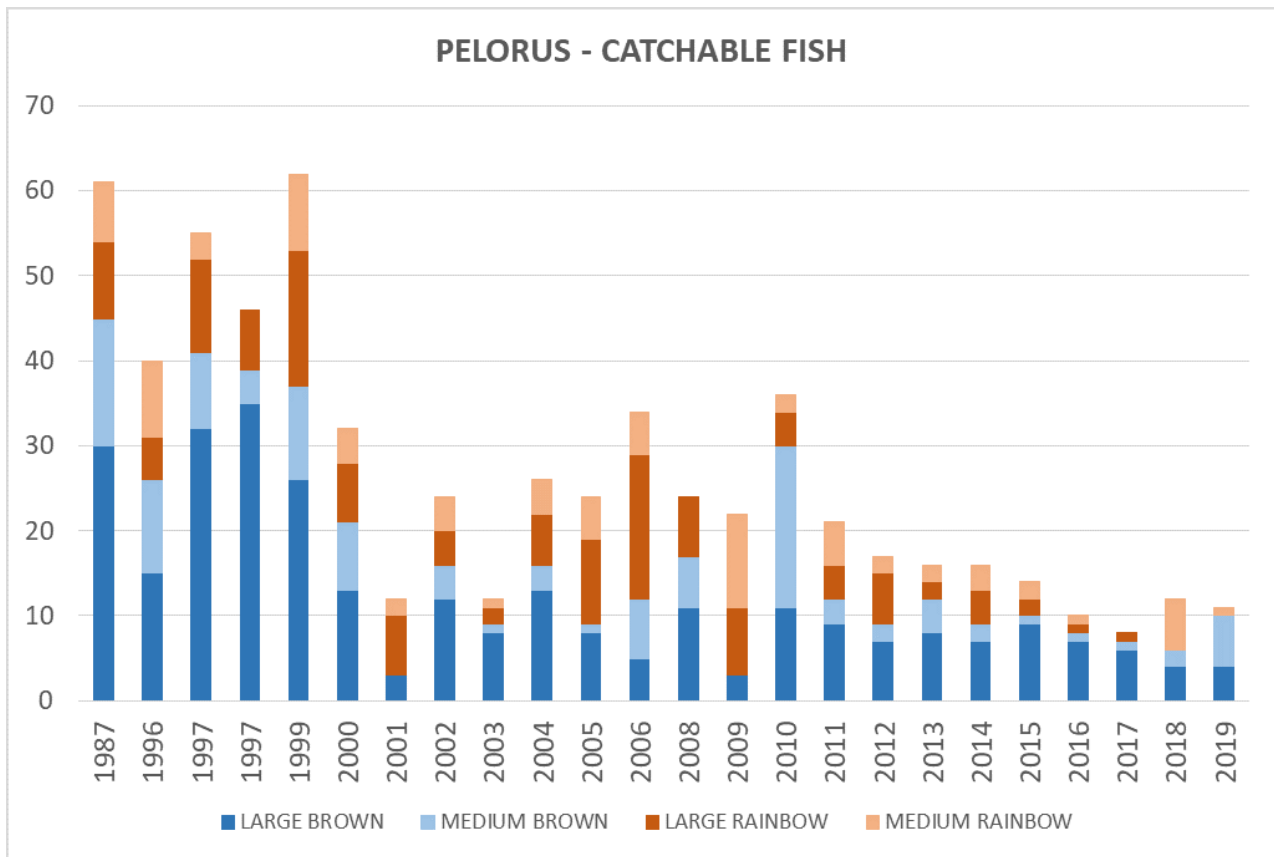
Though the count of large rainbows was lower than in 2018, this would have been due to the proximity of the release to the 2018 drift dive where a number of recently released tagged fish were seen. There was a fairly steady stream of tag returns from the Rai over the past season indicating fairly decent fishing.



PELORUS RIVER

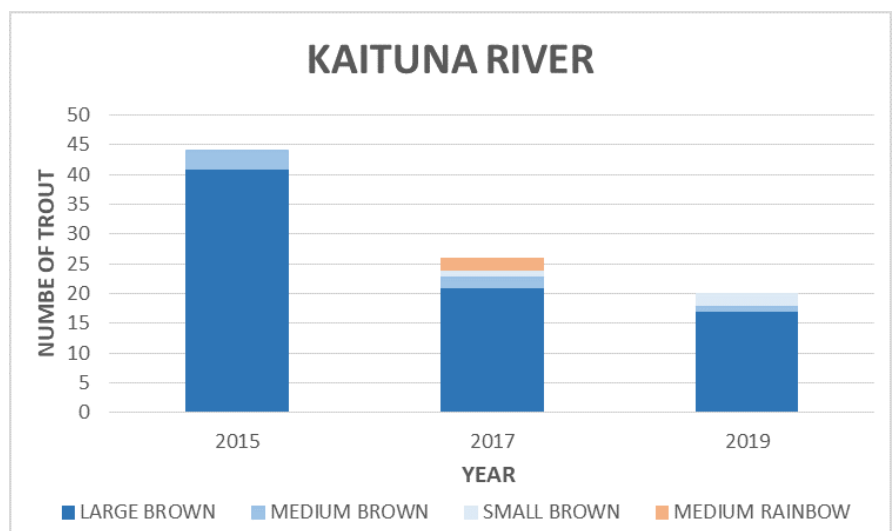
Like the Rai, the Pelorus was dived during the peak of the drought, yet in contrast to the Rai the Pelorus was very warm and subsequently the count was poor (potentially due to fish seeking thermal refuge in groundwater flows in lower Pelorus), though it must be recognised that the upper Pelorus has been in a state of decline for around a decade now. Notably absent were the 'catchable' rainbow trout, with just one medium seen and zero larges seen. The count of juvenile rainbows taking up residence in shallow ripples was higher than normal, however, at around 400 fish seen during the 2 km dive.

Angler reports from the lower Pelorus were much better and, without getting over confident, it appears there may be a partial recovery for the Pelorus below the Rai confluence. This part of the river has some nutrient enrichment from the Rai which may be of some benefit to the productivity of the river, with the river above Rai stemming from ultramafic geology and may be fairly low productivity and incapable of supporting many trout. Historically though, up until 1999 the Pelorus supported far higher numbers of brown and rainbow trout, and it is of staff belief that either the magnitude and frequency of flood events have been the main cause for the decline in this part of the river, or alternatively increasing peak summer water temperatures above the Rai are also creating issues for the fishery.



KAITUNA RIVER

The Kaituna was dived on 28 January during very low flows. No fish were seen in the first six pools where the water is shallower, however as cover and depth increased downstream fish started appearing. While the count was lower compared to previous dives, with 17 large browns and 1 medium in residence, the fish seen were deemed to be in excellent condition.

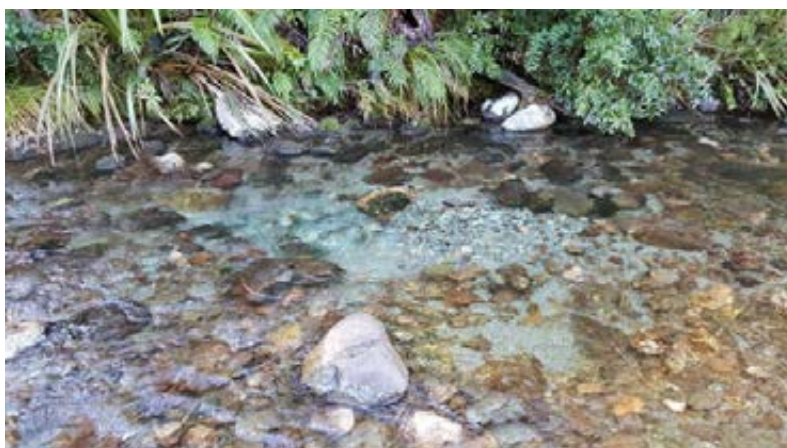


TINLINE RIVER

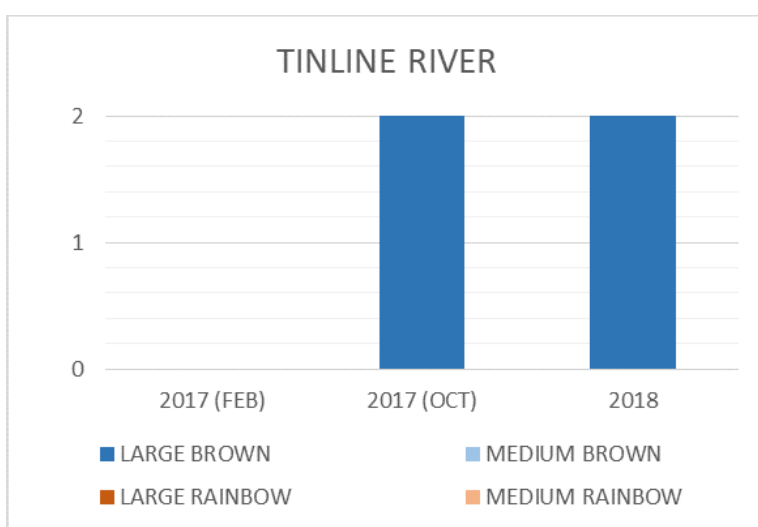
This system was surveyed on 27 June 2018, whilst undertaking a release of 800 fin clipped yearling brown trout. A mainstem foot count was undertaken for 1 km downstream of locked forestry road bridge which crosses the Tinline. The main side stream tributary (site of last year's rainbow ova implant), was also surveyed for a distance of approximately 1 km. A surprisingly high number of trout redds were located at both these sites. The mainstem Tinline yielded 9 definite redds, and 7 possible redds, along with one pair of adult brown trout noted within a pool. The tributary site also yielded 5 definite and 5 possible redds. These results were very surprising as past investigations had yielded very low redd counts, followed by very low juvenile brown trout during follow up e-fishing.

A follow up foot survey of the Tinline on August 7th was undertaken to try and determine whether rainbows were using this system. This date was chosen after Pieter Wilhelmus informed us that several rainbows collected from the Rai catchment were ripe. A 400m section of the tributary site which revealed brown trout redds earlier, was walked from the road bridge upstream- no fish or redds were observed. Additionally, a 300 m stretch of the mainstem was walked - no redds were observed however a pair of fish that appeared to be rainbows paired up were observed here whilst driving the road. The site was surveyed again on 27 August 2018 to see if any more rainbows had arrived, but none were observed.

The Tinline was dived in early October and zero rainbow trout were seen. Considering the significant number of fish released here this result indicates the environment is not suitable to hold good numbers of fish and, as a result, future releases here will likely cease.



^ A well defined deep large redd within the mainstem Tinline



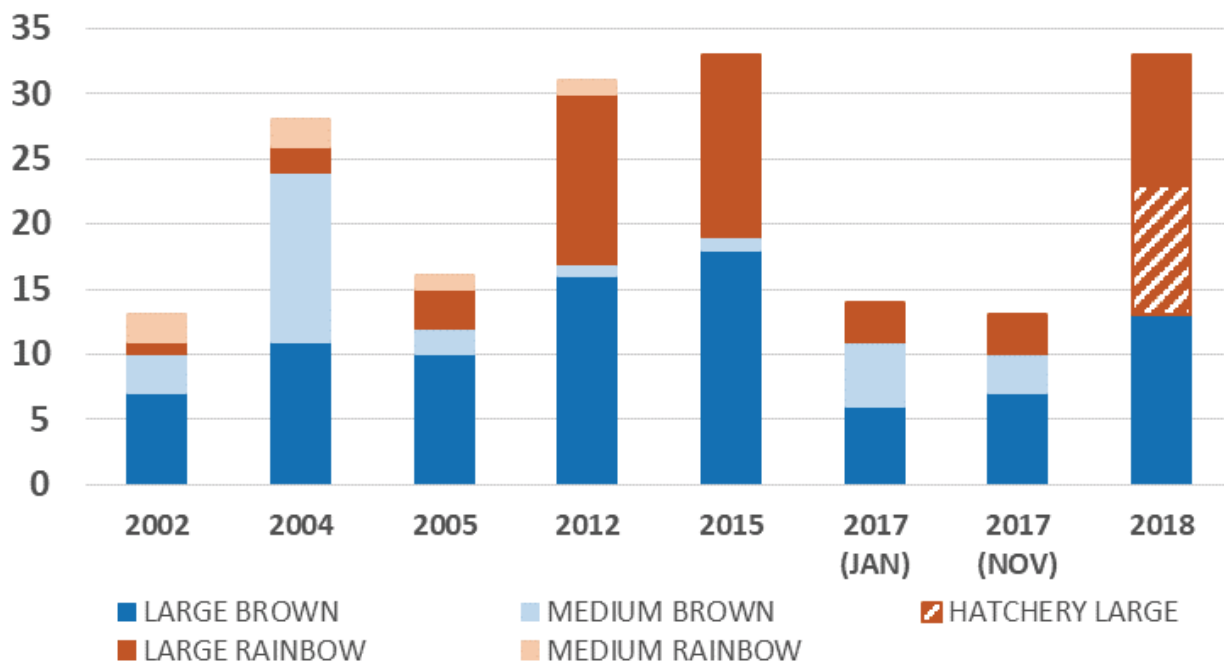
OPOURI RIVER

The Opouri was clearly the most affected river during the summer drought, with the river going dry for a significant portion and widespread casualties of trout and native fish - see page 41 for more information. Prior to the drought, the river was dived in mid-December 2018, and while it was low, still had reasonable holding water and cool temperatures.

The trout population was healthy with good numbers of large brown and rainbow trout, and the highest count of juvenile trout on record with 785 seen over the 2 km dive. Zero medium trout were seen, which is very typical of the Rai and Opouri dives, where it is thought most of these reside in the lower reaches of the Pelorus.

Of the large rainbows in residence, at least seven of these were hatchery fish from the February 2018 release, and number of other rainbow trout were thought to be from the November 2017 release (this was unable to be confirmed due to the tags parting from the fish), however it was estimated this to be at least three fish, based on tag scanning during the dive. It was noted that all fish were in good condition.

OPOURI RIVER



The Oporuri mainstem was surveyed for redds on 27 August 2018 for 1 km downstream of the second road bridge, but no evidence of spawning was located, however several old redds were noticed immediately upstream of the confluence of the Ronga River by staff undertaking electric fishing later, on October the 10th, indicating some mainstem spawning does occur within this system.

The Brown River was surveyed for spawning rainbows on August 24th 2018 but none were encountered.

v Jack Bryan with an Oporuri brown trout



MOTUEKA CATCHMENT

Angler feedback from the mainstem Motueka for this season was excellent, with one long-time experienced angler claiming the river was fishing the best since the 1980's. Indeed, staff validated this through their own fishing efforts on the river where, put simply, there were trout everywhere. On many days the river was seen to 'boil' with trout rising throughout the day.

Our drift dive observations from the five mainstem sites below the Wangapeka added weight to the glowing reports fielded by staff. Surprisingly, angler effort on the river was relatively sedate throughout Spring and early Summer, however this increased considerably in March when the 'Mot' can really come into form.

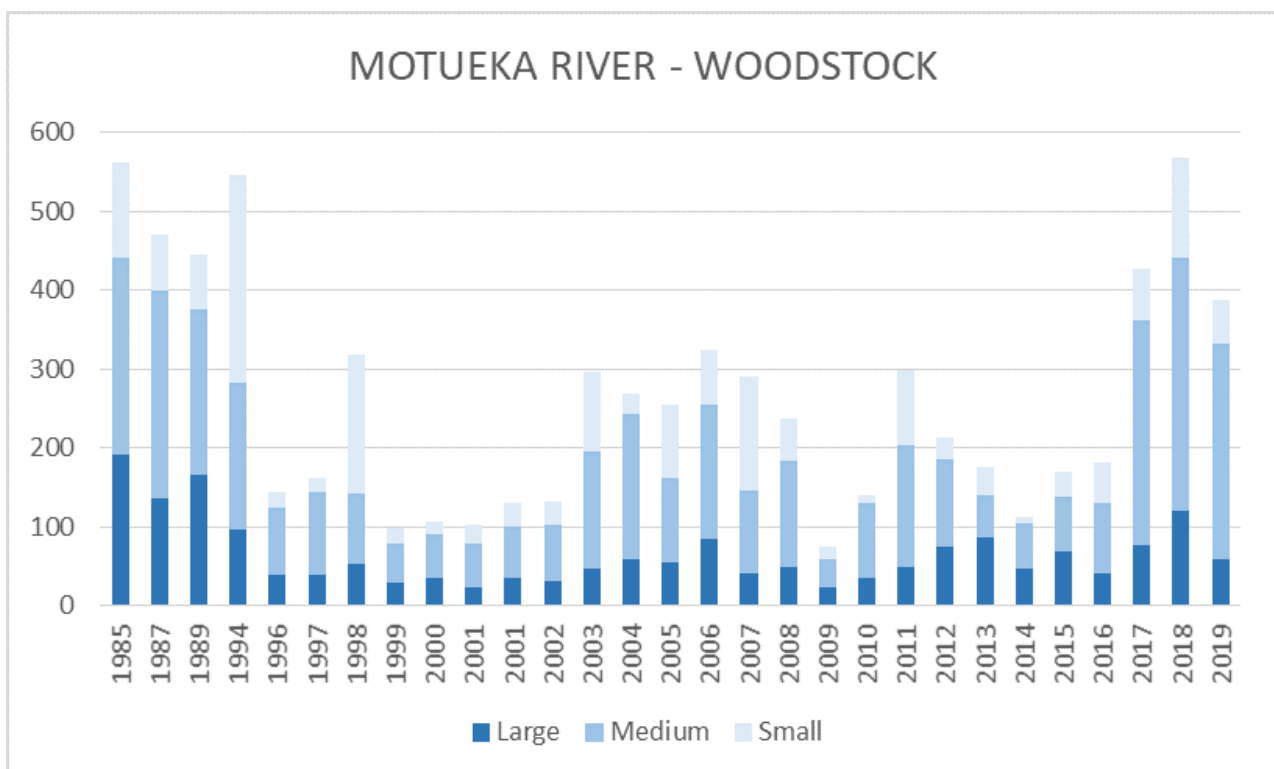
The Motueka area did not escape the drought, and while the mainstem Motueka and Wangapeka Rivers survived the drought well, the same cannot be said for tributary rivers like the Dove, Tadmor and Motupiko. The mainstem Motueka is a very resilient fishery during drought periods, owing to it's deep pools with ground water flows, as well as cold water inputs from tributary streams such as the Graham and Pearse, where trout seek thermal refuge in times of warm water temperatures.



MOTUEKA RIVER

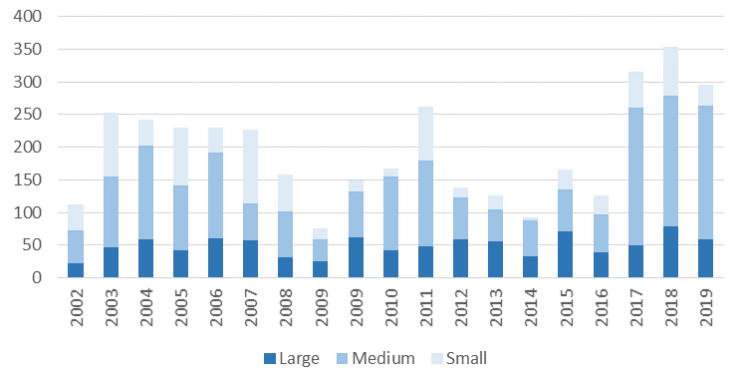
The Motueka was dived on 11 February with the flow very low at 6.5 cumecs at Woodstock. For the five sites, a total of 513 large and 1074 medium fish were counted, equating to 274 catchable trout per kilometre.

The drift dive results at most sites was right up there, with the success of the past three years hailing back to the stable late winter/Spring recruitment periods of 2015 and 2016. The graph of the Woodstock site, which has the longest data set, is seen below and shows that, while slightly down on the previous two years, the figures are excellent and rival what was observed in the 1980's.

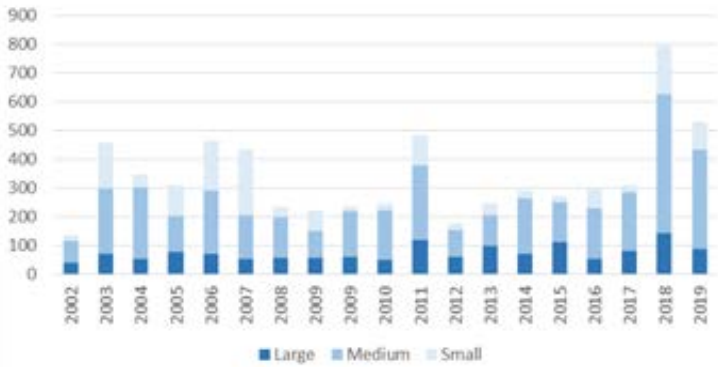


The individual dive sites for the Motueka River can be seen here, noting that the Woodstock site is a historical site that combines part of the MacLeans and Dove sites.

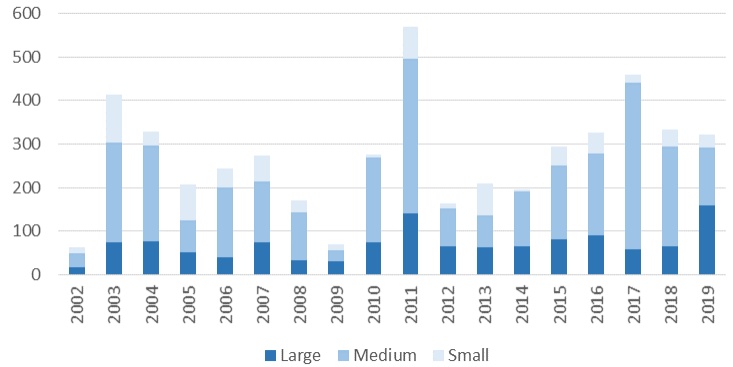
MACLEANS



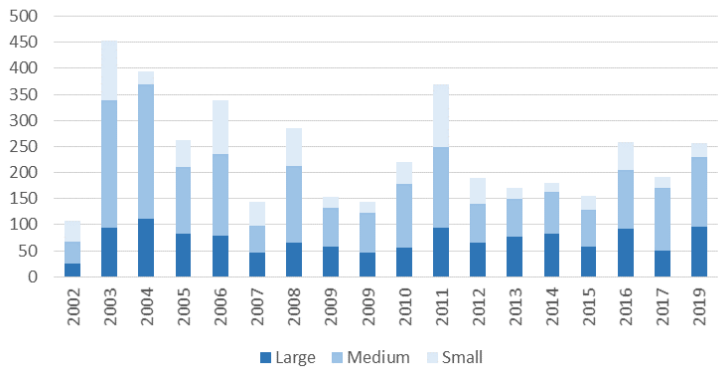
DOVE CONFLUENCE



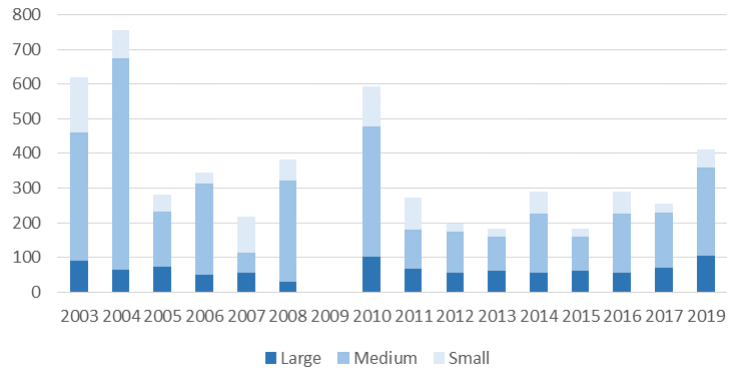
PEARSE CONFLUENCE



POKORORO

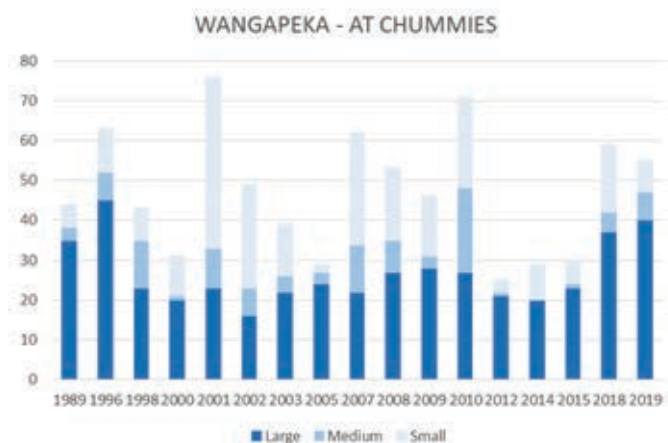


MOTUEKA RIVER LODGE

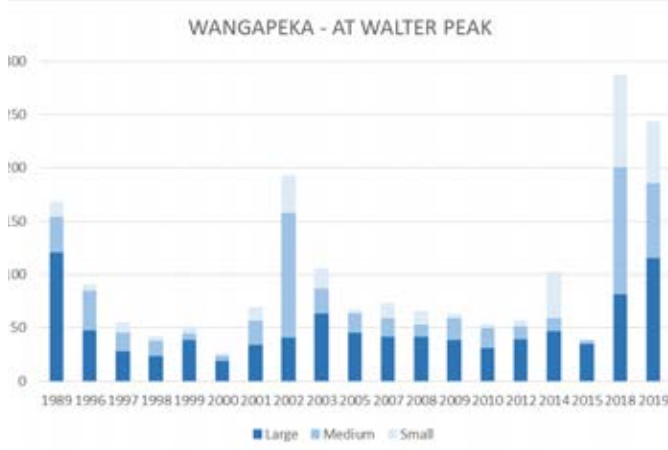


WANGAPEKA RIVER

Reports from anglers and guides deemed the Wangapeka to be in good shape, producing good numbers of quality fish, just like the season prior (which had a very good trout biomass). The Wangapeka was dived in early March with the flow at Walter Peak at 2.65 cumecs, a 70 year plus drought flow.



Despite the drought, fish numbers and fish condition were again excellent for the upper Chummies dive site, and yielded a similar count to 2018 with 40 large, 7 medium and 8 smalls in residence over the 1200 m dive. Water clarity was excellent at 11.6 metres, however around 30% of the shallow ripples were covered with didymo.



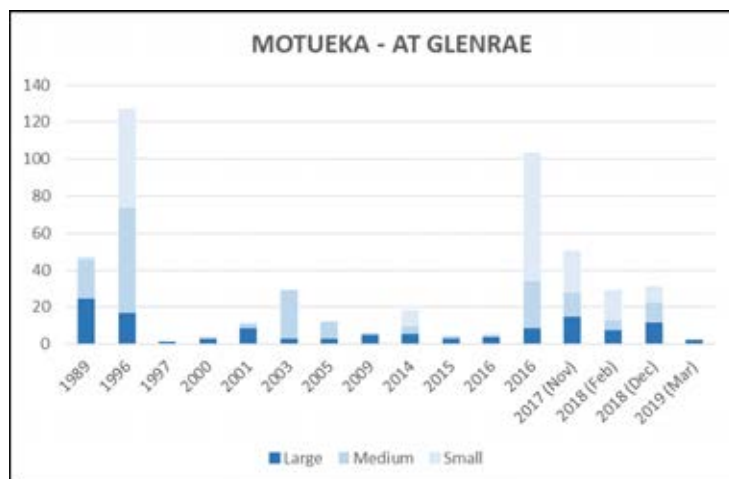
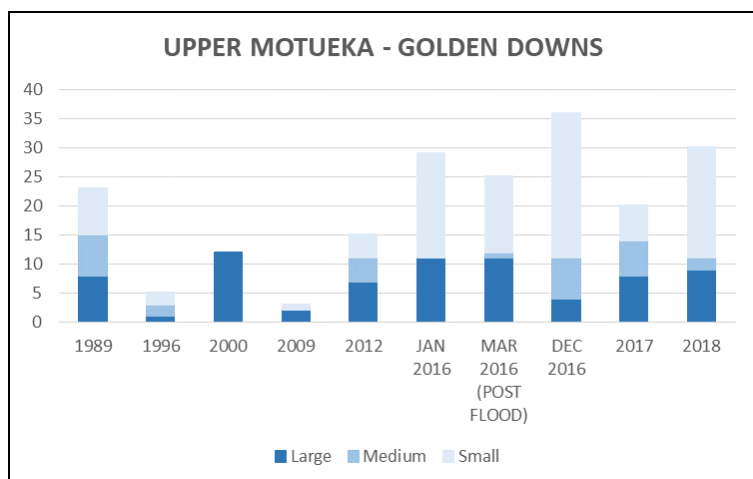
The Walter Peak site was again very high - the second highest count on record. As was the case last year, staff attribute this to fish dropping out from the upper Motueka and entering the cooler Wangapeka waters during the drought and the warm flows produced. Immediately after this dive, the Upper Motueka was dived at Glenrae, not far upstream of the Wangapeka confluence and only 2 trout were seen, where as when the same site was dived in December 12 large, 11 medium and 8 smalls were seen.

The trout were deemed to be in average condition in this lower reach, in all likelihood due to drought induced stresses. No didymo was seen, showing that a small amount of agricultural influence can elevate nutrient levels sufficiently to curtail didymo.

UPPER MOTUEKA

The Upper Motueka comprises of two dives - the Golden Downs site downstream of Janson Bridge, and the above mentioned Glenrae site below Tapawera. These sites were dived on 18 December when river flow was decent, yet it was noted at the Glenrae site that the water temperature was warmer than usual, and many trout were located in thermal refugia (upwelling areas/deep pools/Hinetai Spring).

Both dive sites yielded fairly normal counts of fish, with the exception of the Glenrae site when re-dived in March as described above.

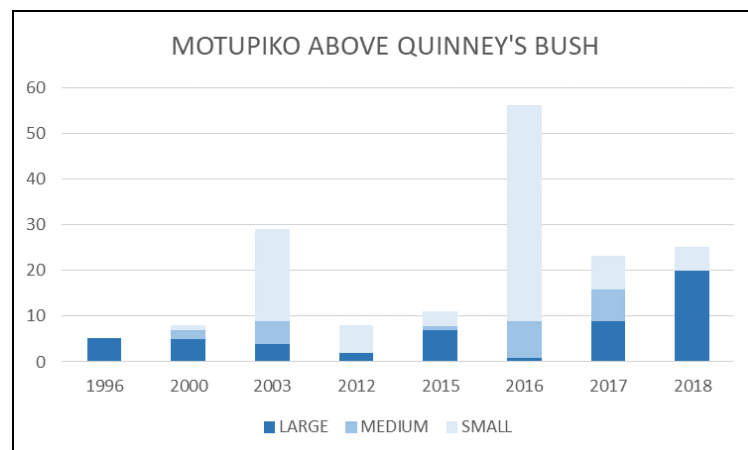
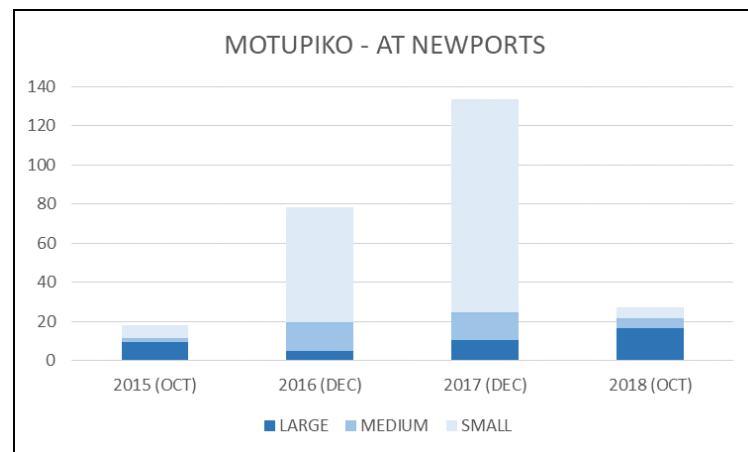


MOTUPIKO RIVER

The Motupiko was dived in October at Quinney's Bush (lower) and Newport's (upper), and while the river was fairly low, water clarity was excellent at 9.6 metres. It is pleasing to witness the fruits of the change in river engineering practices by TDC, now using rock groynes as opposed to rip rap which was widely used previously. This new Council approach of utilising groynes wherever possible when installing rock has seen some improvements here with a few more medium and large fish than in the past, many of which were located around pools formed through flood scour around recently installed groynes. Interestingly enough staff also observed large shoals of dwarf galaxiid juveniles within shaded backwaters where groynes jutted out of in-situ tree willow, however these fish were not present at groyne sites where willow shade/cover was absent. So as well as benefiting the salmonid fishery, if willow cover is allowed to establish between/adjacent to groynes, they also appear to provide excellent juvenile non-migratory galaxiid rearing habitat. Long stretches of bitter/shrub willow however, did not provide the same habitat values for both salmonids or dwarf galaxiids, possibly as they don't create enough hydraulic flow diversity that is created around groynes by comparison.

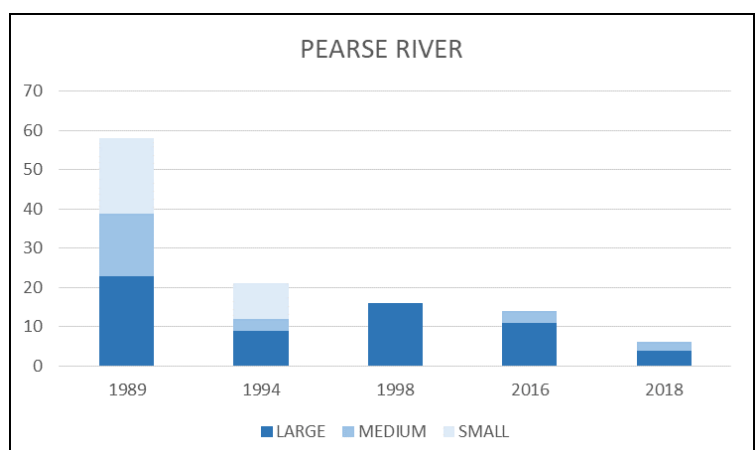
The upstream site at Newport's has been dived twice in October and twice in December, and some interesting observations can now be made of the seasonal variations in fish numbers. This years' October count showed a healthy population of large fish in this reach (possibly from post spawners holding in the system), while there were few smalls seen. Conversely in both December dives, large numbers of small fish were observed - not surprising due to its proximity to productive rearing streams such as the Rainy. This should be treated as just an observation at a glance, without looking heavily into how Winter/Spring flows may have affected juvenile recruitment success. The higher than usual number of large trout can probably be attributed to the peak in numbers the Motueka is currently experiencing.

The lower Quinney's site shows the use of rock groynes is starting to deliver an adult brown trout population recovery within the heavily engineered y-rated section of the Motupiko, at least within this drift dive site above Quinney's Bush. Here 7/20 large trout were located in pools formed by rock groynes. Large numbers of juvenile dwarf galaxiids were in residence, owing to the very stable Spring flows. Similar observations of native fish numbers were also seen in rivers elsewhere.



PEARSE RIVER

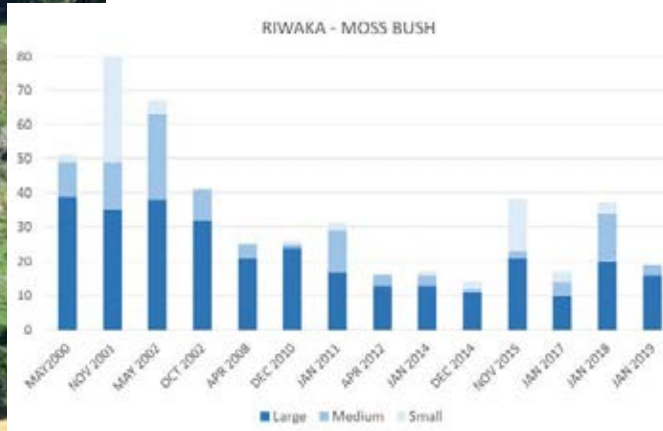
The Pearse River was dived in December, and was the lowest count of the five times the dive has been completed. Just four large and two medium fish were observed, however as the dive site is close to the mainstem Motueka it is feasible that fish move freely between these rivers so little inference should be made here, especially considering the Motueka is at a peak in the trout cycle. Additionally, all five dives have been completed at varying times of the year.



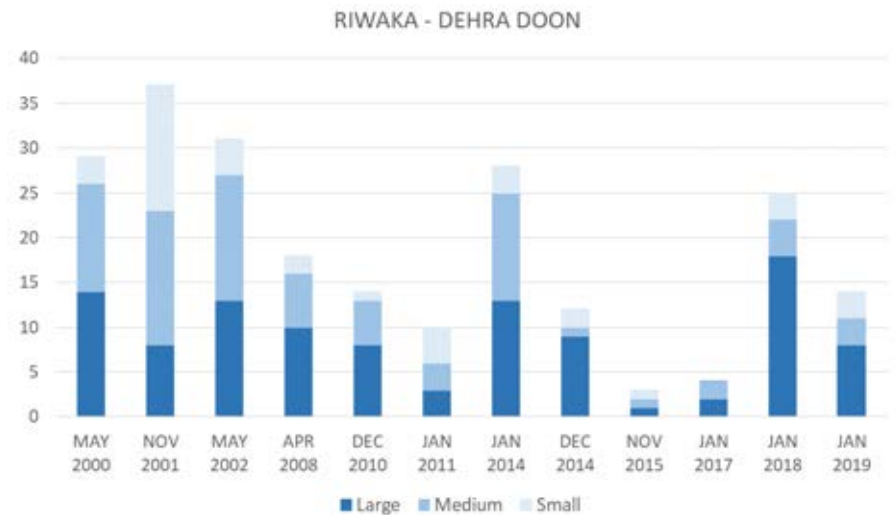
RIUWAKA | DRIFT DIVE RESULTS

After Cyclone Gita, staff did not hold very high hopes for the Riuwaka, yet, despite significant modifications to the river and excessive sediment in the lower half of the river, the trout population was better than expected. Gita arrived in February 2018 after the drift dive that year, so it was almost a year afterwards that the Riuwaka was dived.

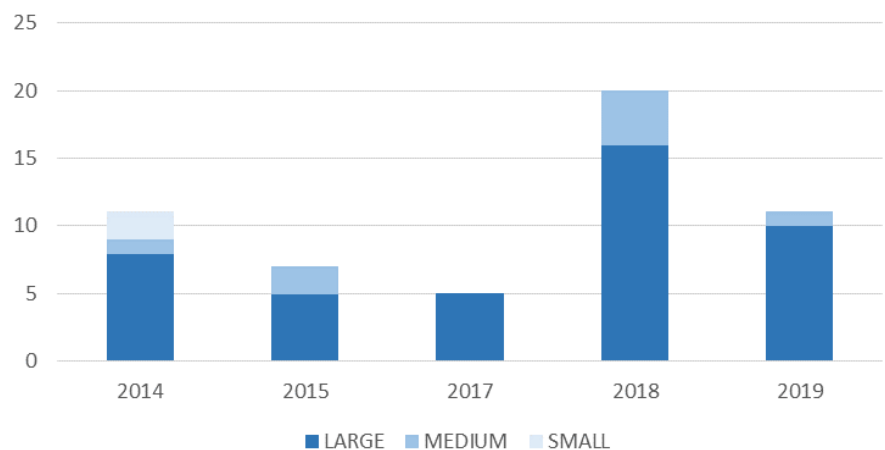
At Moss Bush there was significant pool loss as a result of Cyclone Gita however, as most of the slips entered the river further down the river, sedimentation was not significant, and there appeared to be reasonable invertebrate numbers. As a result, reasonable number of larges were seen, yet mediums and smalls had taken a hit as a result of the Gita flood event.



The Dehra Doon and Hickmott's sites fared much worse in terms of the physical impacts to the river bed, mostly through significant sedimentation throughout much of the lower reach. Indeed, the lower river was more akin to a sandy tidal stream than one with a good cobble/gravel substrate. Again, staff were surprised at the number of trout in residence, far higher than anticipated despite what could be considered poor habitat.



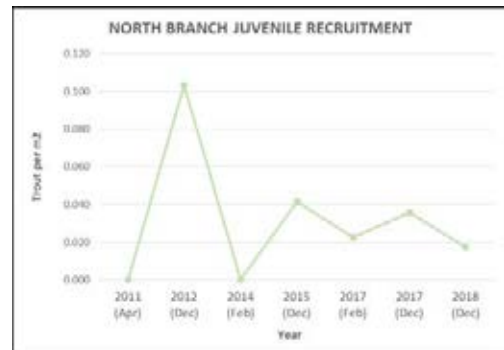
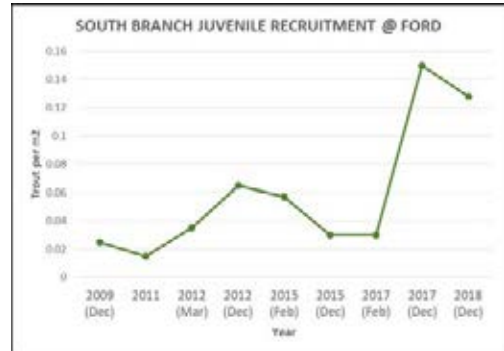
LOWER RIUWAKA - HICKMOTTS



RIUWAKA | ELECTRIC FISHING MONITORING

It is encouraging to see the density of juvenile brown trout increase at the South Branch Ford site over the last two seasons, however this increase was not mirrored at the other two sites. The density observed in the South Branch graph over 2017/18 is around the average density generally observed across the region. It should be noted however that a large main stem rearing site like this is much more vulnerable to 'flood thinning' of juveniles, than smaller side stream spawning sites normally utilised in other river systems. While there was a peak in juvenile trout density in 2012 across all sites, it must be recognised that there can be significant differences in rainfall/flood events in the two catchments, hence this may be why results don't always mirror each other.

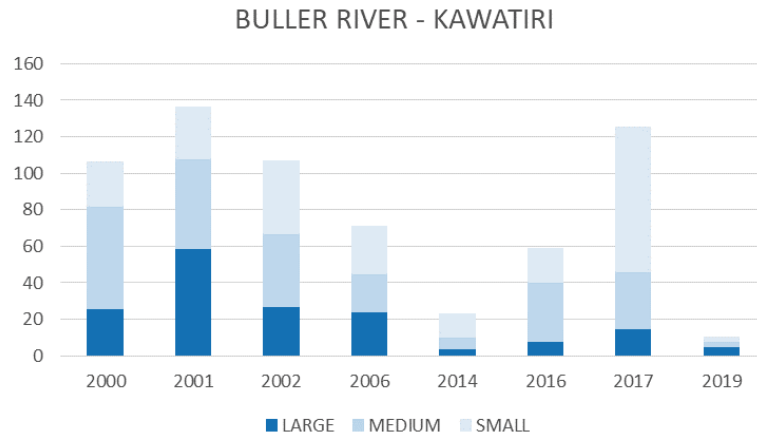
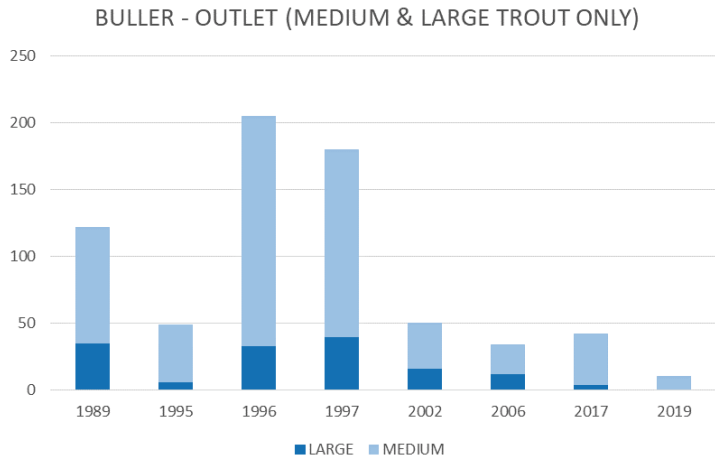
Year	Location	Area Sampled (m ²)	No. of juvenile trout	No. Trout (per m ²)
Dec-09	South Branch (Ford)	200	5	0.025
Apr-11	South Branch (Ford)	190	3	0.016
Mar-12	South Branch (Ford)	140	5	0.036
Dec-12	South Branch (Ford)	244	16	0.066
Feb-15	South Branch (Ford)	191	11	0.058
Dec-15	South Branch (Ford)	200	6	0.030
Feb-17	South Branch (Ford)	200	6	0.030
Dec-17	South Branch (Ford)	200	30	0.150
Dec-18	South Branch (Ford)	266	34	0.128
Dec-09	South Branch (Woolshed)	200	6	0.030
Apr-11	South Branch (Woolshed)	180	1	0.006
Dec-12	South Branch (Woolshed)	200	11	0.055
Feb-14	South Branch (Woolshed)	186	6	0.032
Dec-17	South Branch (Woolshed)	200	0	0.000
Dec-18	South Branch (Woolshed)	200	1	0.005
Apr-11	North Branch	230	0	0.000
Dec-12	North Branch	184	19	0.103
Feb-14	North Branch	157	0	0.000
Dec-15	North Branch	120	5	0.042
Feb-17	North Branch	177	4	0.023
Dec-17	North Branch	168	6	0.036
Dec-18	North Branch	115	2	0.017



BULLER RIVER | KAWATIRI

Angler feedback and drift dive records from the previous year indicated that the Buller may have experienced a partial revival, yet this was not to be the case as evidenced by the 2019 dive, as well as feedback from the Nelson Angling Club who, at the request of Fish & Game, fished the Upper Buller river in October with little return.

As it can be seen from the graphs below, both the Kawatiri and Outlet dives had the lowest count on records, which was disappointing to say the least. Didymo coverage was much greater than the previous two years which may have had some part to play in the decline. The Outlet dive yielded just 10 medium and 10 smalls (note the graph has had small fish removed to make the data easier to read), while the Kawatiri site showed just 5 large, 3 medium and 2 small trout.

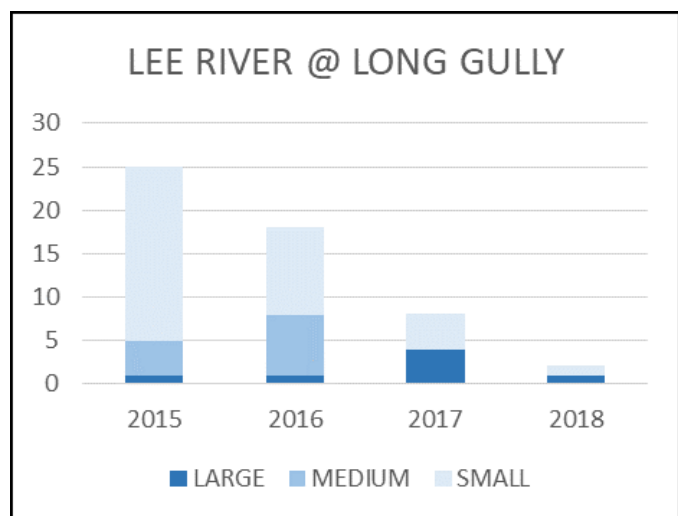
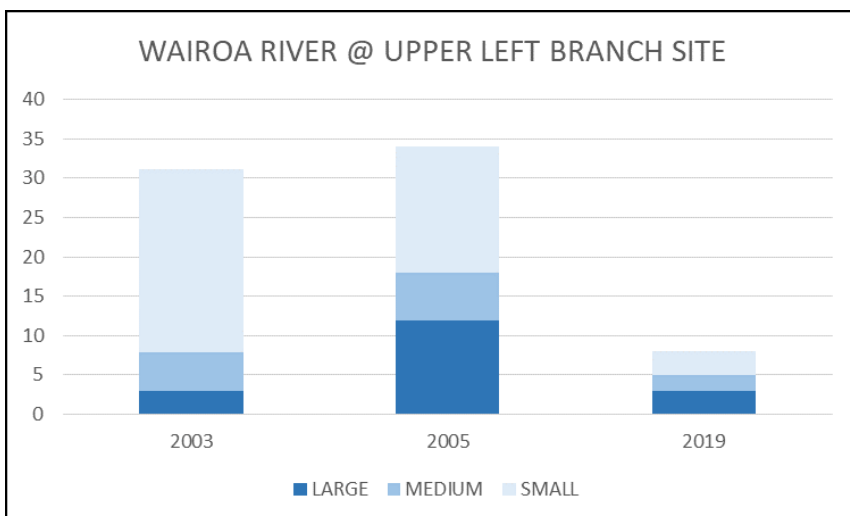


WAIROA | LEE

The Waimea and Lee Rivers were dived in October, and the Wairoa later on in January. Graphs for the Wairoa and Lee can be seen below (the Waimea is not graphed due to the changeable nature of the dives making it difficult to make comparisons between years). For this dive the Left Branch Wairoa site was chosen instead of the normal site starting at the Lee confluence. The Left Branch site was last dived in 2005, and this year the trout count was far lower than previous dives (3 large, 2 medium, 3 small), disappointing considering a release of 100 large brown trout a year prior.

Two other monitoring sites were created above and below this dive site with regard to be able to cover more water if future releases take place.

The Lee was also very disappointing with the lowest count of the four dives since the site was created in 2015 in order to monitor any potential effects of the Lee Valley dam. Just one large and one small fish were observed over the 2 km dive, which is very poor indeed.



RODING SPAWNING SURVEY

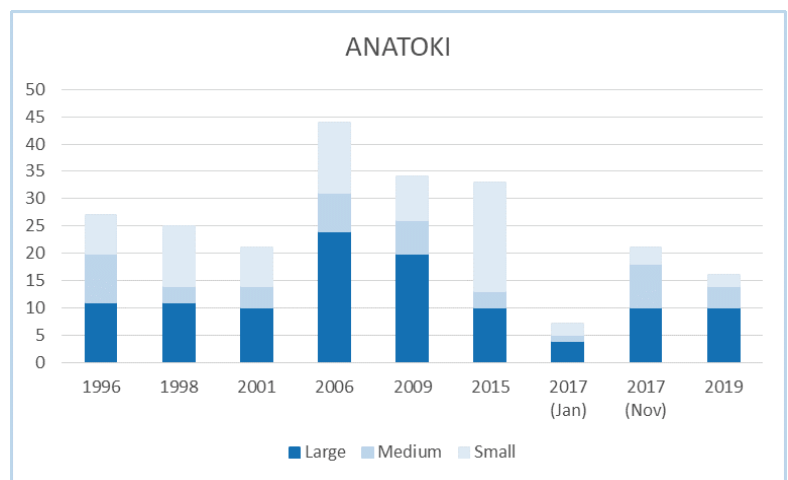
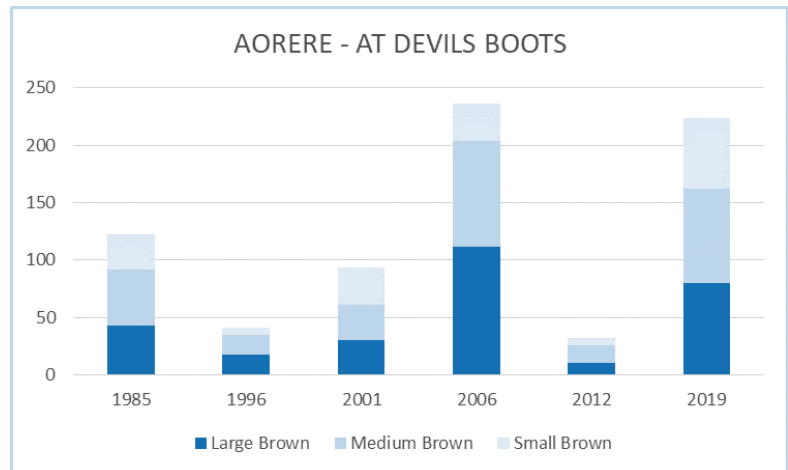
This river was surveyed for approximately 1.4 km on June 21 2018 in response to a NES generated enquiry from PF Olsen around use of the Roding ford for increased log truck movements due to forest harvest work. Two trout Redds were located approximately 800 and 600 metres below the ford. Advice was given to forestry company that harvest work should therefore be deferred until October, or alternatively mitigation options could be explored with, as increased truck crossing frequencies would likely damage or destroy the two trout Redds located. Interestingly, these appear to be the highest trout Redds within the Roding system as no more were located above the ford up to the weir bypass tunnel.

Golden Bay rivers were surveyed on 26-27 February during the middle of the drought. As the rivers all stem from the high rainfall Kahurangi National Park, river flow and temperatures were far better than what was experienced over the hill in Tasman.

The Aorere had not been dived since 2012, two years after the devastating flood of 2010. As the river is one of the regions largest, it can only be dived when the river is very low, and this year was an opportune time to do so with a flow at Devils Boots at 6.5 cumecs.

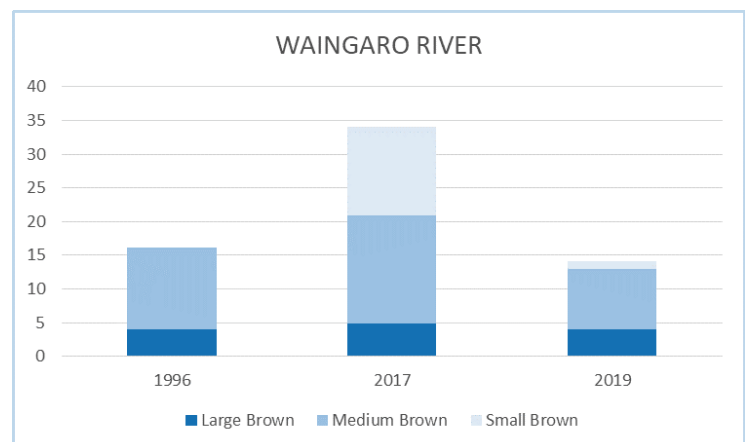
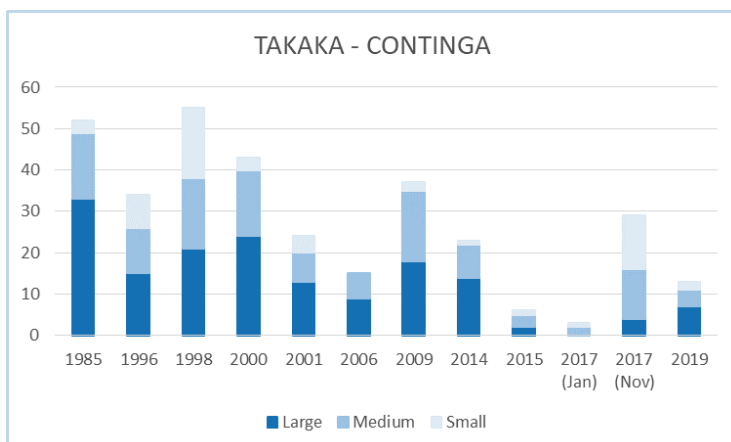
Pleasingly, the fishery had recovered somewhat from the 2010 flood, and showed a healthy mix of fish in all size categories, with 80 large, 83 medium and 60 small fish over the ~2 km dive. While some fish were located in feeding ripples, many were found in deep pools, with much of the great looking water largely unoccupied, and making for challenging angling.

The Anatoki showed a fairly typical number of fish with 10 large, 4 medium and two smalls. The river was low but cold and, interestingly, didymo coverage was low at around 10% coverage - far less than usual.



The Takaka River above the drift dive site had all but stopped flowing, it was only due to the Waingaro that flows for the Kotinga dive was possible. Again, didymo coverage was lower than normal for the Takaka site. Despite the low flows more large fish were observed than the three years prior, yet at just 7 fish seen this hardly makes for an enticing angling opportunity, and it could be said that the lower Takaka remains in a depressed state.

The Waingaro has a limited data set with just three dives since 1996, therefore little inference can be made into the state of the fishery. The river had clearly been affected by Cyclone Gita with significant erosion of unstable banks. Because the substrate is very large, trout spotting can be difficult in this part of the river, particularly if the trout have been disturbed prior, as was the case with a fishing guide going through a few hours before the dive. As such, the guide mentioned two fish seen in one specific pool that the divers did not locate.



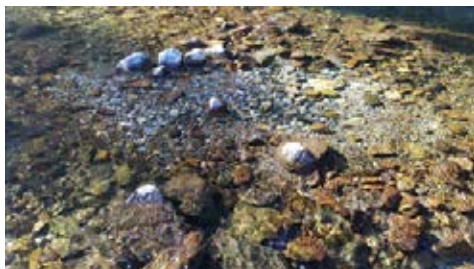
WAITUI STREAM - UPPER TAKAKA

The Waitui Stream was investigated in response to a request from landowner Nigel Harwood around potential riparian planting options, along with assessment of the hydro spawning tailrace enhancement work. Now the hydro scheme is fully operational, the Waitui at this location remains flowing all summer, meaning it could potentially contribute significantly to increased salmonid recruitment within the Upper Takaka in future. As well as permanently re-watering a seasonally dry section of the Waitui River bed, another goal of the hydro scheme was to try and enhance the amount of 'flood-proof' spawning habitat available within the Waitui.

A foot survey of the Waitui from the Power scheme tailrace to Cobb Rd bridge was undertaken (~0.9km) on June 29th, 2018. Two trout Redds were located immediately where the tailrace discharges into the first riffle within Waitui Stream, and a 3rd Redd was located 25m below this point. All 3 Redds were located within a 90-metre flood-proof side braid of the Waitui Stream, fed by the power scheme flow only. There were no Redds for the rest of the 800m survey within the mainstem Waitui, despite excellent gravels being present. The spawning trout appear to have found the side channel the most attractive spot to spawn, presumably due to its flood-proof status, and stable hydro station flow. It is recommended a follow-up electric fishing survey be undertaken in early summer, with a site surveyed within the flood-proof tailrace discharge channel, and also a site surveyed within the mainstem Waitui channel below this point.



^ Redds 1 and 2, with tailrace in background



^ Redd 1, tailrace confluence with Waitui side-braid



^ Redd 3, 25m below Redds 1 & 2 side-braid

The present resource consent for the hydro scheme states that efforts will be made to install fine gravels into the tailrace discharge. This requirement should be reviewed as there are plenty of fine gravels beyond the tailrace channel, and future effort should instead be invested in ensuring the Waitui does not re-enter this historic side-braid so it retains its flood-free status for approximately 80-90m. The depth of the tailrace discharge channel prior to it entering the historic Waitui side-braid, is also too deep to ever provide suitable hydraulic conditions for spawning trout. Rather than lining this channel with fine gravels as was originally stipulated therefore, it is suggested instead that some modest habitat enhancement work instead be undertaken for yearling brown trout and eel habitat. An excavator could be used to create 3-4 separate piles of cobble sized (~rugby ball size) stones, perhaps with a manuka branch stem or similar anchored amongst stones, lying downstream against the side of the tailrace. This would create both interstitial and vegetative cover for yearling brown trout and the occasional eel. It is difficult if not impossible to provide planted cover at this location due to hard mudstone substrate present. It was very positive to observe the spawning benefits created by the hydro scheme for brown trout, and future electric fishing will determine whether this translates to trout population improvements overall within the Waitui Stream.

LAKE DANIELL SPAWNING SURVEY

Staff visited the Lake on August 17th 2018 for poaching surveillance purposes (trail Cam installed). A total of 26 definite, and 6 possible rainbow redds were counted in the Lake Outlet stream over a distance of 300 metres, with 56 rainbows and 3 browns (egg eating), located. Some redds were also observed around the Lake edge.

v Rainbow trout holding on a redd at the Lake Daniels outlet



TADMOR RIVER WINTER SPAWNING SURVEY

A late foot survey was undertaken in the upper Tadmor on July 12th 2018. No Redds were located however this may have been due to a recent fresh which had elevated instream levels by close to 1m, so any prior Redds would probably have been flattened out. Of note was the presence of one adult brown trout and one juvenile brown trout within a tributary Stream (Donald Creek). This tributary had ideal spawning gravels and riparian cover and was the location of numerous spawning fish last season (possibly related to a prior release we undertook). It is recommended an earlier foot survey be undertaken over this same site next year.

There was a considerable amount of winter feed cropping for dairy cows present in both the lower Tadmor and Dovedale catchments, posing some significant winter water quality threats during adverse weather conditions. A land based alluvial gold mining operation is also in progress above Bushend Rd bridge, however this operation does not have a discharge to water according to the resource consent for it. Also of note was the thalweg shape of the Tadmor channel below Tui Rd Bridge. At this area, the human intervention in channel location and length has been negligible, meaning there are significantly more meander loops (and consequently pools) than the mid-lower Tadmor near Bushend Rd bridge, where historic straightening (cutting out loops), combined with Crack Willow removal, and use of rock riprap and smaller willow species, has seen significant pool loss (~70% according to TDC's recent River morphology baseline survey). This situation mirrors other spawning waterbodies such as the Wai-iti, also shown to have had 2/3rds of its pools disappear according to the river morphology baseline survey data.

A similar situation exists within the Dove exacerbated by low summer flows due to pine afforestation in the upper catchment. Interestingly, past anecdotal comments from landowners in both the Wai-iti, and the Tadmor, indicate that when Crack willow removal occurred, many pools disappeared, as did the eels and trout residing within them at the time. These historic observations have recently been validated by the baseline river morphology survey TDC undertook for a number of Tasman rivers. The Tadmor, Dove, and Wai-iti will be priorities for staff working with TDC/Taylor's in future on any river repair works, to ensure an effort to get 'pool-creating structures' in place when erosion repairs are done.

NELSON TROUT FISHING CLUB | UPPER BULLER FIELD TRIP

The Nelson Trout Fishing Club assisted staff with a foot survey of the Upper Buller River in late June. The area had not been surveyed for quite some time. Spawning counts from Station Creek, Speargrass, Black Valley & Bavin's Raceway were completed by three groups, and it was a thoroughly enjoyable day out with the club.

While it is not surprising that the redd count was well down from historical surveys, there was still reasonable spawning taking place in some areas. Station Creek had 11 definite redds over 5.8 kms, and Bavin's Raceway had three definite redds in the short 400 m reach. Black Valley Stream is generally very productive and for this survey 12 redds were seen over the 900 m reach - a fairly normal amount.

Staff would like to thank the Nelson Trout Fishing Club for their assistance on the day.

> *Bavin's Raceway had three redds over the 400m reach*



^ *Nelson Trout Fishing Club provided able assistance on the day - here at Speargrass Creek.*





BACKCOUNTRY FISHERIES MANAGEMENT

There have been considerable moves to implement better management of non-resident anglers on pressure sensitive fisheries. Currently the only hard management approach available is through controlled fisheries, which staff believe are a dated form of fisheries management, have little application to many pressure sensitive brown trout fisheries, and do not deal with the greater issues which have come to the fore on many other South Island rivers in the past decade or so.

While controlled fisheries are good at preventing instances of angler contacts as is the case with the Greenstone River in Otago, they are cumbersome to implement and have limited capability to manage the growing issues on sensitive brown trout fisheries that this region has experienced, along with most other South Island regions. Instead, it is believed better results can be achieved through adopting some of the management systems which have worked well in other countries who have gone through similar issues as those New Zealand is currently experiencing. For example, changes to the licencing system i.e., river specific licences and non-resident quotas, can be introduced for visiting anglers, while having little or no restrictions placed on resident anglers.

In light of this, a "Pressure Sensitive Fisheries" workshop was held in Dunedin last year and it was agreed there was a need to better manage non-resident anglers on sensitive fisheries. As a result, a project plan has now been put in place to look at what systems may best work for the New Zealand situation - see appendix 1. At a glance, the project will firstly outline the nature of the problem, then go on to surveying international management strategies to find out what applications would best suit the New Zealand system i.e., aspects of the British Columbia system. Once all the cards are laid out on the table, Fish & Game regions can chose to opt in to the method which suits the region best, or in some cases in the North Island where there are few issues, not opt in to anything at all, and carry on with the status quo.

Having a system that is region (and river) specific, is a more useful model than the current thinking by many to unfairly hike the price of non-resident licences to such a degree where there will be push back by foreign anglers, and which in all likelihood would not get past Minister officials anyway and, remembering that, with declining resident angler participation across the country, non-resident licences remain an important revenue source (around 12-13% of fishing revenue).

As an aside, at the National Conference it was also decided to adopt the name "Pressure Sensitive Fishery" to encompass what Fish & Game have historically termed a "Backcountry Fishery" and formally use "Classified Water" in place of "Designated Backcountry Fishery".

TRAVERS TRAIL CAMERA MONITORING

Now into its second year, the Travers trail camera study is delivering some worthwhile results on actual use on this important Nelson Marlborough fishery. In the past there has been a good deal of hype and conjecture about the Travers, including how overcrowded it has become, so some investigation was required by Fish & Game to monitor usage.

Cameras were deployed at three sites in the lower, middle and upper Travers. While we had some issues with the functionality of the cameras at the lower and upper site, the key site at the middle Travers was in operation almost the entire season, as was the case last season, and has provided some valuable data on actual angler use.

As it can be seen in the table below, the more accessible lower site showed anglers on 45% of the days, though the camera was in operation for just 77 days. Similarly, the top site had similar issues with the camera only working for a few weeks after the battery/card had been changed and was in operation for 88 days, for which 27 (31%) of the days had anglers visit. The middle site, which also had a long data set last season, and is an excellent site as the pool is well known to anglers, had anglers fish here on 32% of the 2017 days. For the 2017-18 season both the lower and middle sites were visited by more anglers (while the cameras were in operation), and it may have been the case that the very low river levels the Travers experienced this season were a factor in receiving less attention.

Camera location	Number of days fished	% days fished 2018-19	% days fished 2017-18
Lower Travers	35 out of 77 camera operating days	45%	50%
Mid Travers	67 out of 207 camera operating days	32%	40%
Upper Travers	27 out of 88 camera operating days	31%	N/A



^ Lower Travers site



^ Middle Travers site



^ Upper Travers site

BACKCOUNTRY ENDORSEMENT - A SUMMARY

This season a total of 2429 backcountry endorsements (BCE) were issued, with 1284 (53%) of these issued to non-resident anglers - see table below. Of these 1284 non-resident endorsements issued, 504 were purchased in this region, meaning 780 of the endorsements issued to NR's were purchased in other regions.

B/C endorsement issued	2016-17	2017-18	2018-19
Resident	738	1004	1145
Non-resident	796	1256	1284
Total	1534	2260	2429

Out of 1145 resident BCE's issued, 978 were to local Nelson Marlborough licence holders, with the shortfall comprising of resident anglers from other regions.

While there is a large discrepancy between the first two years (due to two additional rivers being designated in 2017-18), there were an additional 144 backcountry endorsements (BCE) issued to resident anglers (possibly due to a general increase in licences purchased), while there was a flattening out of demand from non-resident anglers, with just 28 additional BCE's issued.

FISH CATCHABILITY OBSERVATIONS | BRANCH LEATHAM

In response to some concerns about the Branch/Leatham becoming over fished, impacting on fish catchability, a short fishing survey was undertaken early season in November during a time of lower pressure, and in late season (March and April) after the area had received significant angler attention. This was done while carrying out electric fishing surveys of the main-stem Branch/Leatham and tributary streams (with the exception of the April trip).

In areas that were more accessible, i.e., around Silverstream, there were good numbers of feeding fish present, however they were very selective and difficult to catch. One popular beat (below Greigs) when fished by staff in November yielded high numbers, yet just 1 fish was caught in March.

However, when the Leatham beat (above Barbers) was repeated, more fish were caught in March than in November, and the fishing was deemed excellent. The same can be said when the same beat was re-visited in April, with excellent fishing despite the run having been fished two days prior by another angler (note only two fish were caught from the release that had taken place a week earlier). With the exception of one fish, all trout in this Upper Leatham reach were either tagged fish from the Wilhelmus farm, or fin clipped from North Canterbury releases, and were in very good condition.

In another Branch beat (above Greigs Hut), the fishing was far better in March than what was experienced in November. Of the 41 fish landed over the March and April excursions, 10 were wild and the rest tagged or clipped. In the pool immediately adjacent to Siberia Hut (where you would expect greater pressure), 8 trout were in residence of which 5 were caught (all hatchery). There were instances in this stretch when trout were very selective and got the better of the angler, however they were not spooky, and in the opinion of staff, this is actually good to see, meaning they have adapted to the river well, and are behaving like wild fish that you would expect to get more difficult to catch as the season progresses.

The table below shows the details of fish caught, and while this work has not scientific or statistical justification, it merely provides an insight into the fishing experienced.

Location	Month	Fish hooked	Fish landed	Tagged	Fin clipped	Wild	Hours fishing	Fish hooked/hr
Leatham - above Barbers	November	6	3		2		1	2.00
Leatham - above Barbers	March	12	9	2	7		3	4.00
Leatham - above Barbers	April	45	38	20	18		8	5.63
Branch - below Greigs	November	11	10	2	3		5	2.75
Branch - below Greigs	March	1	1				1	0.25
Branch - above Greigs	November	4	3	1			2	1.00
Branch - above Greigs	March	8	6	3			3	2.67
Branch - above Greigs	April	25	22	13	6		3	5.00
Branch - below Siberia	March	15	13	7	2		4	3.75
Summary	November	21	16	3	5		8	1.91
Summary	March	36	29	5	13		4	2.57
Summary	April	70	60	33	24		3	5.38





SALMON

There was considerable interest in salmon this season, and during summer a dose of salmon fever affected anglers in the top of the South. In January there was a flurry of salmon caught at the Wairau mouth leaving some anglers very positive for the season ahead.

Due to the very dry summer, salmon were congregating outside the Wairau mouth waiting for a rainfall event to trigger their migration upstream to spawn. For a time there was some very good fishing on offer, with several fish caught around the 10 kg mark – far heavier than your typical Wairau salmon. Looking at the condition of these fish, it appears that they had been dining royally over spring and summer, potentially on the abundance of krill observed. This was further observed by staff during drift dives, and also by weighing and measuring dead salmon at the Rainbow spawning stream where fish were far heavier than the normal Wairau salmon.

It is thought the Wairau fish run the coastline from Marlborough Sounds through to Ward, generally within 10 kms of shore, and often running underneath schools of kahawai which locate bait fish. Prior to spawning salmon spend 5-10 days around the river mouth in the mixing zone in order for their bodies to accept freshwater before they run up the river. When rivers were low as they had been, salmon were residing even closer to shore than normal, and are more available to anglers at the mouth, hence why the Wairau Diversion was fishing well for a time



Significant media attention precipitated a further rush at the mouth, including from six year old Remy Bourgeois, who snared a 6.5 kg salmon he could barely hold aloft, and there was a small spike in licence sales. Several experienced salmon anglers staff were aware of also fared well up-river.

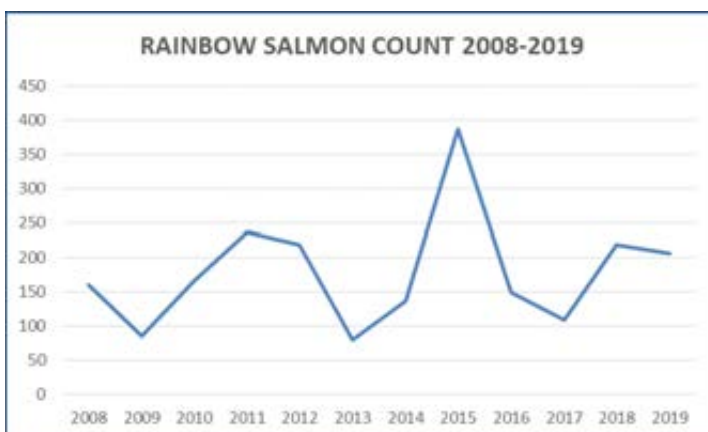
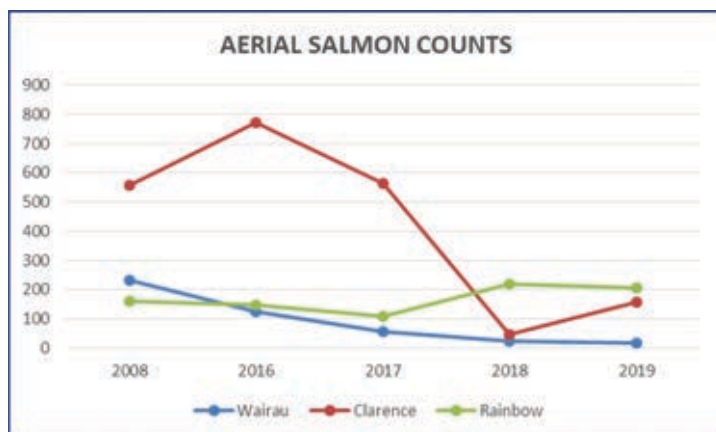
There was some concern about potential over fishing due to the lack of rains triggering the fish to run upstream and seeing fish congregate for longer at the mouth. Indeed, there was further concern about the warm temperatures of the Wairau affecting upstream migration. As seen in the below salmon monitoring figures, the number of mainstem Wairau spawning was very low, so the warm temperatures may have had an effect here, yet the number of salmon spawning in the Rainbow were fairly normal.



ANNUAL SALMON MONITORING

Aerial salmon counts were carried out May 7, initially a flight from the Branch confluence to the head of the Wairau, including the lower Rainbow and side stream, then into Molesworth for a census of the Acheron and Clarence catchments.

As it can be seen from the graphs below the main-stem Wairau continues its downward decline, with just 17 fish seen from the Branch confluence to the headwaters. Staff were more hopeful of a decent run in the Clarence as there had been several accounts of salmon in the Acheron seen by trout anglers, and fishing at the Clarence mouth had been fairly decent, yet while there were slightly more fish seen in the Clarence this year the run was still fairly poor with 157 fish seen. The Rainbow side stream - the most consistent spawning location in this region - yielded 206 salmon, a slightly higher than average count. Note: the graph on the left is from aerial counts only, and on the right is a combination of aerial and foot counts of the Rainbow River.



Dr John Hayes observed there may well have been mainstem spawning mortalities, and also a delay to the migration (trapping them in unfavourable waters), due to the low flow and elevated water temperatures present in the Wairau this summer.

SALMON ENHANCEMENT

A visit was made to the Rainbow side stream to collect brood stock for future salmon enhancement releases. After running into difficulties in the previous two years attempting to catch ripe fish, staff fared better this year with around five ripe hens and a number of jacks caught and stripped. It will hopefully prove a good year to do so due to the excellent size of the fish, and we hope these traits will be passed on to the offspring of these fish, which will be released in Spring into several Wairau tributaries, in an attempt to generate a second spawning tributary within this catchment.

Additional to this, liver and kidney samples were taken for an MPI study looking into the presence of Rickettsia-like organisms (RLO's) in farmed salmon, for which routine surveillance to detect the presence of RLO's in wild salmon was needed also. Here, around 30 samples were collected from the Rainbow, and 10 from the Clarence catchment. A second flight into the Clarence was made on behalf of MPI on 27 May, however just two additional samples were able to be collected, with nearly all of the 150 odd salmon seen in early May having been lost to nature.



^ Collecting liver and kidney samples for MPI study



^ Fish weight and length recorded



^ Some decent fish made it to spawn, this jack would have been 8-10kg at the mouth



NATIVE FISH MONITORING

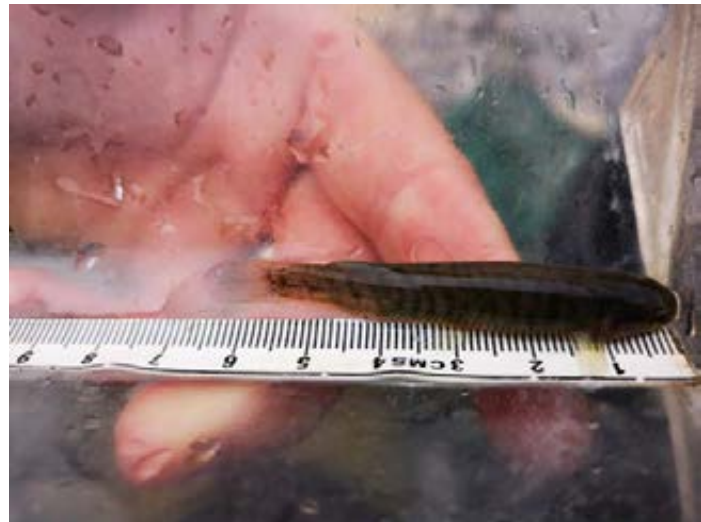
Monitoring of native fish populations with respect to potential population limiting factors has been carried out by staff in a number of areas including the Branch/Leatham, Opouri & Riuwaka Rivers, as well as multiple sites in Golden Bay. Primarily, this is to monitor any potential effects our trout release programme is having on native fish, and also try and determine what are the population limiting factors in streams and rivers elsewhere, whether this is climate change induced stresses, water quality, habitat loss etc.

BRANCH LEATHAM STUDY

An intensive 3-day sampling trip utilising two electric fishing teams was undertaken from November 5th-7th 2018, with historic sites re-sampled, and several new sites fished, comprising a total of 15 monitoring sites. This work was undertaken in order to set-up a monitoring system to assess the health of both native fish and brown/rainbow trout recruitment within these catchments given the present rainbow restocking program. This work was repeated in March 2019 and is now programmed to be repeated annually in March each year.

Results of the Nov 2018 survey work were interesting, with very low numbers of both native fish and juvenile trout present within the mainstem Branch/Leatham sites which had been reamed out during a prior significant (450 cumecs) July winter flood event. Partial recovery of mainstem galaxiid numbers was observed during subsequent March 2019 sampling. In contrast to the flood prone main river sites, many smaller tributary sites hold a very high biomass of both dwarf and northern galaxiids. The tiny forest clad stable un-named tributary opposite Caves Bluffs for example, has huge numbers of these native galaxiids present.

> *A northern galaxiid from the March monitoring*



Even tributary sites however seem at times vulnerable to localised flood damage, with Nesbits having been flood damaged between the 2018 and 2019 sampling occasions leading to massive infilling of habitat and almost complete loss of the prior galaxiid biomass which had been present. Juvenile trout on the other hand, had been able to remain within the Nesbits tributary site, utilising the white water within rapids as proxy cover for lost interstitial space cover due to fine gravel infilling, so trout were not displaced unlike the slower velocity preferring galaxiids. Local pilot Willy Sage confirmed with staff that localised heavy thunderstorms are quite common within the Branch Leatham catchment, and it is not uncommon for specific tributaries to get hammered by localised downpours. A similar pattern of native fishery decline due to flood damage was also observed by staff in October 2018, within trout free native forested catchment Golden Bay streams such as the Turimawiwi and Anatori Rivers which had been decimated by Cyclone damage.

Year	Location	Area Sampled (m ²)	No. of juvenile trout	No. of dwarf galaxiids	No. of Northern galaxiids	Total No. Galaxiids (per m ²)	Comments
2018	Branch below SH63	200	0	0	0	0	Nil fish caught
2019	Branch below SH63	200	2 Bt	4	0	0.02	7 upland bullies.
1992	Branch below weir	80	occasional 1 Bt	occasional 1	occasional 1	occasional	
1993	Branch below weir	372	11 Bt	1	11	0.032	3 upland bullies, 1 fl eel
2018	Branch below weir	200	1 Bt, 1 Rt	1	0	0.005	4 upland bullies
2019	Branch below weir	200	0	0	1	0.005	6 upland bullies, 1 elver
1999	Boulder stream above ford (*1.5km upstream of ford)	50	0	3	0	0.06	28 upland bullies
2018	Boulder stream (*first good riffle above ford)	200	2 Bt	0	0	0	2 upland bullies, flood damaged/sedimentation
2019	Boulder stream (*first good riffle above ford)	200	1 Rt	18	1	0.095	5 upland bullies
2002	Leatham 150m below Caves swingbridge	400	4 Bt	common	0	?	31 upland bullies
2018	Leatham 150m below Caves swingbridge	200	0	0	0	0	Flood impacted from July 2018 flood 450 cumecs
2019	Leatham 150m below Caves swingbridge	200	2 Bt, 1 Rt	1	0	0.005	11 upland bullies also captured
1978	Leatham mainstem below Caves bluffs	?	14 Bt	27	0	?	10 upland bullies, 5 fl eels also caught
2018	Leatham mainstem below Caves bluffs	200	0	0	0	0	11 upland bullies
2019	Leatham mainstem below Caves bluffs	200	1	12	5	0.065	10 upland bullies, 1 elver
2002	Leatham trib. opposite Caves Bluffs	200	5Bt	14	9	0.115	DOC record
2018	Leatham trib. opposite Caves Bluffs	100	0	40	8	0.48	Forested -unaffected by July flood - stable
2019	Leatham trib. opposite Caves Bluffs	100	0	60	20	0.8	1 upland bully - very stable trib.
1990	Bobs Stream (Leatham trib.)	30	0	14	88	1.02	5 upland bullies
2018	Bobs Stream (Leatham trib.)	100	1Bt	9	7	0.16	1 elver captured also
2019	Bobs Stream (Leatham trib.)	100	2Bt	0	2	0.02	Reamed out by flooding
1993	Branch below Leatham confl.	100	3Bt	4	2	0.06	34 upland bullies - NMFQC record
1993	Branch below Leatham confl.	110	3Bt	4	2	0.055	DOC record
2005	Branch below Leatham confl.	55	2Bt	3	0	0.055	34 upland bullies - NWA record
2018	Branch below Leatham confl.	200	0	0	0	0	7 upland bullies - impacted by 450 cumec flood (8/7/18).
2019	Branch below Leatham confl.	200	4 Bt	0	1	0.005	10 upland bullies
2003	Nesbits above confl. Branch	180	4 Bt	5	9	0.078	Upland bullies common
2018	Nesbits above confl. Branch	200	3Bt, 2Rt	31	3	0.17	4 upland bullies
2019	Nesbits above confl. Branch	140	8Bt, 1 Rt	1	1	0.014	4 upland bullies, 1 fl eel. Flood reamed/all fine gravel now, nil interstitial spaces left
2002	Branch below Nesbits confl.	50	0	5	0	0.1	DOC record
2018	Branch below Nesbits confl.	200	1Bt, 2Rt	5	0	0.025	3 upland bullies, upstream/different habitat from 2002 site
2019	Branch below Nesbits confl.	200	1Bt	7	1	0.04	11 upland bullies
2002	Branch below May Stm confl.	200	4Bt	14	0	0.07	7 upland bullies, DOC record
2018	Branch below May Stm confl.	200	1Bt	2	0	0.01	400 m downstream from 2002 site
2019	Branch below May Stm confl.	200	5Rt	0	1	0.005	3 upland bullies, 400 m downstream from 2002 site
1990	Alan Stream above confl. Branch	25	1Bt	common	abundant	?	
2018	Alan Stream above confl. Branch	80	1Rt	1	23	0.3	3 upland bullies. Above/below ford sampled
2019	Alan Stream above confl. Branch	80	3Rt	54	10	0.8	4 upland bullies. Flood impacted
2003	Silverstream above confl. Branch	250	8Bt	2	3	0.02	Upland bullies common
2018	Silverstream above confl. Branch	200	0	2	0	0.01	Flood impacted from large July 2018 flood
2019	Silverstream above confl. Branch	100	1Rt	0	5	0.05	Flood impacted
1990	Greigs Stream above confl. Branch	100	1Bt	0	occ.	?	Unstable
2018	Greigs Stream above confl. Branch	100	1 Bt	0	1	0.01	1 eel. Flood reamed
2019	Greigs Stream above confl. Branch	100	6Bt	0	4	0.04	
2018	Branch below Greig stm confl.	100	0	0	0	0	Flood reamed
2019	Branch above/below Greig stm confl.	200	8Rt	4	3	0.035	Galaxiids all in shallows (<10cm depth)

Despite apparent flood damage to native fishery biomass within some Branch/Leatham monitoring sites, the adult trout populations remained healthy and fish were in great condition due to a super-abundance of invertebrate food, including free-swimming mayflies, and even some *Stenoperla* stoneflies. The distance between adult fish within these extensive braided systems means there is an abundance of invertebrate drift food for fish within each river section, which explains why heli-released fish have done so well within the Branch/Leatham catchments to date. While invertebrates get taken out by floods, full biomass recovery generally occurs within 6 weeks (unlike fishery recovery which can take years to rebuild for both trout and native fish).



Overall, the only observable trend so far apparent within the 15 monitoring sites is a significant increase in the proportion of juvenile rainbow trout located whilst electric fishing, which is an indicator of the success of the increased riverine restocking commissioned by Trust Power from 2010 in mitigation for the Branch hydro scheme weir impact on the wild salmonid fishery.

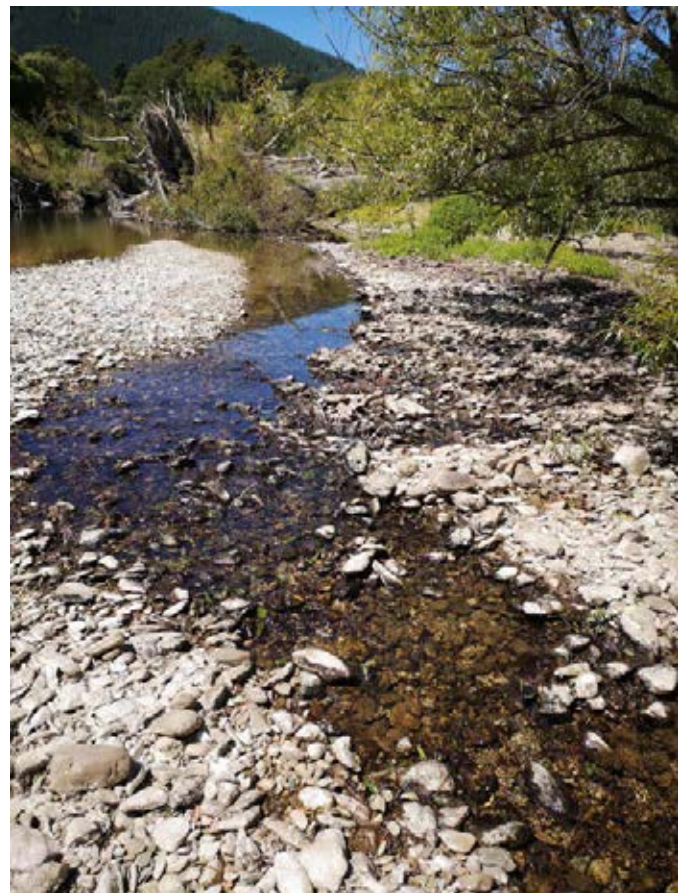


^^ A juvenile rainbow trout
 ^ Main-stem monitoring site at Caves Bluff

While it is still too early to draw conclusive trends from the monitoring work, so far observed historic/present densities of native galaxiids appear to indicate that abiotic (flood frequency/intensity), rather than biotic (trout restocking) factors are driving the overall native fishery biomass within the Branch/Leatham system, similar to the situation within the Rainy River, as defined by 10 years of intensive monitoring by the Cawthron Institute. Several more years of monitoring data, ideally over a stable 12-month period with only small floods, will be needed to verify this however.

OPOURI RIVER | DWARF GALAXIAS

In October the Opouri River, then a healthy brown and rainbow trout fishery, was surveyed for dwarf galaxias (*Galaxias divergens*). One site was surveyed above the Ronga confluence, where over an area of 56 square metres, 108 *divergens* and 3 upland bullies were counted - and at around 2 fish/m² makes for a very healthy population indeed. Similarly, an upstream site near the Tunakino Bridge revealed 68 *divergens* and five upland bullies over an area of 75 m². The results would have been even higher had all the fish seen been caught - the shallow nature of the ripples meaning quite a number of fish were missed. Since this survey work the Opouri has dried up so it will be interesting to track native fish recovery times in annual electric fishing surveys.



> *Galaxias divergens* country in the Opouri - this site had 2 fish/m²

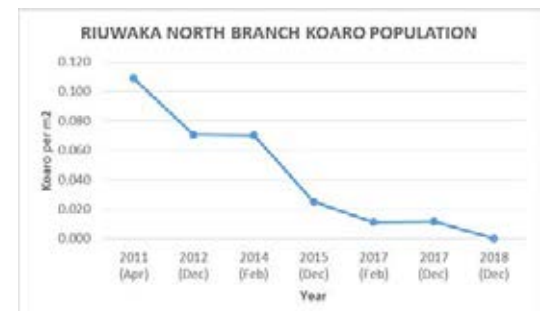
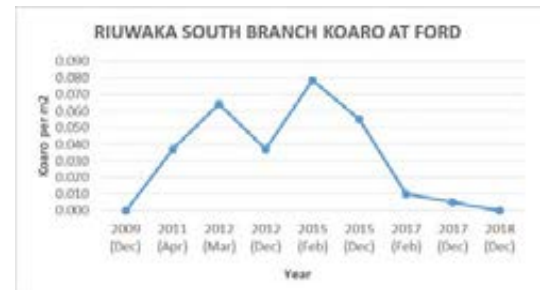
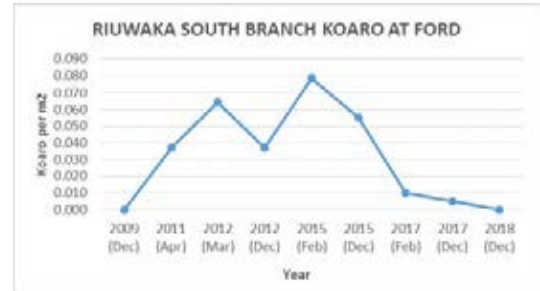
< *Galaxias divergens* (dwarf) are abundant in the Opouri.

RIUWAKA RIVER

The Riuwaka River was the subject of some significant efforts in the past decade, with annual electric fishing surveys in the North & South Branch to monitor juvenile trout numbers/native fish - see table below for data on native fish. Additional to this, the South Branch was spotlighted by scientist Dr Adam Canning and Nelson Marlborough staff as part of Adam's broader study, and two Riuwaka tributaries were surveyed by electric fishing in the wake of Cyclone Gita (Jordan Stream, Foleys Creek).

It was clearly apparent how the high magnitude flood event from Cyclone Gita had affected all Riuwaka sites. Even the resilient eel population had taken a battering in Jordan Stream, and zero native fish (with the exception of low numbers of long fin eel) were counted in Foley's Creek (where in 2013, 13 koaro, 10 koura and 6 red fin bully were observed on top of abundant eel).

Year	Location	Area Sampled	No. of koaro	No. koaro (per m ²)	Comments
Dec-09	South Branch	200	0	0.000	1 LF eel, 1 upland bully
Apr-11	South Branch	190	7	0.037	7 Koaro, 6 LF eel, 1 upland bully
Mar-12	South Branch	140	9	0.064	9 Koaro, 8 LF eel
Dec-12	South Branch	244	9	0.037	9 Koaro, 6 LF eel, 7 koura, 3 upland bully
Feb-15	South Branch	191	15	0.079	15 Koaro, 5 LF eel. Stable Spring
Dec-15	South Branch	200	11	0.055	11 Koaro, 10 LF eel.
Feb-17	South Branch	200	2	0.010	2 Koaro, 8 LF eel
Dec-17	South Branch	200	1	0.005	1 Koaro, 2 koura, 15+ LF eel
Dec-18	South Branch	266	0	0.000	0 Koaro, 6 LF eel, 2 koura - post Gita
Dec-09	South Branch (Woolshed)	200	1	0.005	1 Koaro, 5 LF eel
Apr-11	South Branch (Woolshed)	180	3	0.017	3 koaro
Dec-12	South Branch (Woolshed)	200	3	0.015	3 Koaro, 2 LF eel
Feb-14	South Branch (Woolshed)	186	25	0.134	25 Koaro, 6 LF eel, 2 sjk possibly sighted?
Dec-17	South Branch (Woolshed)	200	6	0.030	6 Koaro, 8 LF eel
Dec-18	South Branch (Woolshed)	200	0	0.000	zero natives - Cyclone Gita?
Apr-11	North Branch	230	25	0.109	25 Koaro, 1 LF eel
Dec-12	North Branch	184	13	0.071	13 Koaro, 3 koura
Feb-14	North Branch	157	11	0.070	11 Koaro, 16 LF eel, 10 year return flood
Dec-15	North Branch	120	3	0.025	3 Koaro, 1 SF eel, 1 LF eel,
Feb-17	North Branch	177	2	0.011	2 Koaro, 12 LF eel
Dec-17	North Branch	168	2	0.012	2 Koaro, 7 LF eel
Dec-18	North Branch	115	0	0.000	1 LF eel - post Gita



While there is considerable variability within koaro density data, it is interesting to note that the two South Branch sites transitioned from nearly zero koaro in 2009, back to zero nearly 10 years later in Dec 2018, with significant declines evident at both North/South Branch sites by Feb 2017, prior to the release of 150 adult 1kg brown trout on March 15th 2017. It should also be noted that Cyclone Gita ravaged the Riuwaka on Feb 3rd 2018, which appears to have completely eliminated koaro at all sites (this observation was replicated within Jordan/Foleys Creek also).

These observations indicate to staff that the koaro population in the Riuwaka may be either 1) driven by the frequency and size of large bed moving floods, and/or 2) driven by the size and success of preceding seasonal whitebait runs from Tasman Bay. There is little evidence from this information to suggest that the one-off release of 150 adult 1 kg brown trout was detrimental to the adult koaro population, as a serious koaro population decline had occurred prior to this release, assuming these 3 sites are reasonably representative of the wider system. A much more detailed and expensive monitoring program would be required to ground truth these observations with statistical significance tests, however as with drift diving data, they still give resource bound fishery managers a reasonable feel for trends occurring within the Riuwaka in relation to both the native and trout fishery population abundance. Given similar serious declines in native fisheries were observed in a number of trout free Golden Bay Streams arising from native forest catchments in late 2018, it appears climate change induced Cyclone frequency increases are likely to be a major issue for native as well as trout fishery health in future. Also of interest, the locating of an occasional short-jawed kokopu within the Riuwaka South Branch above the Woolshed site, provides us a unique future opportunity to trial native fish population rebuilding techniques (through growing and releasing adults) with DOC/Iwi if there is interest – such a project may allow us to also continue with occasional salmonid releases in future if required, once it is clear to all parties that Cyclones rather than brown trout population biomass, drive the native fishery biomass.

GOLDEN BAY

F&G Scientist Adam Canning came to the Nelson area as part of his wider study looking at the potential impacts of trout on native fish abundance. Golden Bay was chosen as one of the study areas, as the manager had been involved in native fish monitoring around 18 years ago, and it was thought that a repeat visit of some of the same streams would provide valuable baseline information to draw some basic comparisons.

All told a diverse array of around 15 rivers and streams were sampled at night using spotlighting, some with trout present and some without. This included larger waterways which are trout free or in very low abundance such as the Waitui, Brown, Anatori and Turimawivi; small streams such as those entering into the Aorere (Elliot, 15 Mile), One Spec Creek, and Pukatea (Turimawivi); as well as rivers where trout are present i.e., Waingaro.

While results from Adam's study are not yet available, at a glance it appeared that weather events such as Cyclone Fehy and Gita had had a marked effect on the native fish population in some areas, whether in streams with trout present, or not. As an example, the trout free Pukatea Stream near Turimawivi with intact Northern Rata catchment cover, had an abundant population of giant kokopu 18 years ago, and in last years' monitoring few were seen in this creek despite no land cover changes since it was last monitored, 18 years ago.

Other rivers like the Kaituna and Brown were totally annihilated by Cyclone Gita, yet in the less affected area of East Takaka, the Wainui River, for example, held a very solid population of short jaw kokopu - similar to what was seen from earlier monitoring surveys nearly two decades ago.



^ Short jaw kokopu are still abundant in some Golden Bay streams (picture from rarespecies.nz website)

v Giant kokopu are commonly found in Western Golden Bay (picture from rarespecies.nz website)



NATIVE FISH MONITORING

- Native fish monitoring has been carried out in a number of areas to determine population limiting factors, and the potential effects of fish releases on galaxiids.
- Areas that have been surveyed include Branch/Leatham; Opouri; Riuwaka catchment & Golden Bay.
- A mix of main-stem and tributary sites were surveyed.
- Though in the early stages of data collection, it appears that flood frequency and magnitude are drivers of native fish populations in this region
- For example, in the Opouri River, there was a flourishing dwarf galaxiid population living in unison with a functioning trout fishery; and the Goulter had incredible numbers of juvenile galaxiids due stable Spring/Summer flows.
- It is recognised that trout do eat native fish, however the flood regime (global warming), water quality, and habitat loss are the main drivers, within the context of NZ's present day native fish distribution.



COMPLIANCE

It has been a productive year in terms of ranger engagement with anglers and, pleasingly, our target of reaching 10% of licenceholders was easily obtained.

All told, 475 licence checks were carried out by staff and voluntary rangers over the summer fishing season and, pleasingly, incidences of non-compliance were very low. Only one major offence was detected, and that was for a French angler fishing in the Taylor River Junior only fishery.

Though minor in nature, incidences of anglers fishing a backcountry designated river without their endorsement were very low, with just one angler warned of this. This is very pleasing to see, considering there were quite a number last season.

Total licence checks	475	
Total on designated backcountry rivers	48	10%
Total non-resident on ALL rivers	78	16%
Total non-resident on backcountry rivers	21	44%
Total non-compliant	2	0.004%

LAKE DANIELL TRAIL CAMERA

After hearing reports of potential illegal activity at Lake Daniell, staff set up a covert camera at the outlet. On analysing the images, one group of anglers (two adult males and one young female) were found to be fishing there during the closed season. Staff will consider whether future compliance efforts need to be made here.

CONSERVATION (INFRINGEMENT SYSTEM) ACT 2018

In December 2018 the Conservation (Infringement System) Act 2018 was passed amending the Conservation Act 1987 to enable DOC and Fish & Game councils to be able to issue infringement notices for a variety of offences. Infringement notices are a very efficient and appropriate way to deal with most of the offending Fish & Game deals with and will be a real advantage to the organisation. Work is ongoing at present in setting up policy and processes to enable the infringement system to see the light of day. For rangers, when an infringement system is in place, actual field work and processes with offenders will remain the same as at present – all prosecution decisions will be made by staff in the office after assessing all relevant information and ascertaining that all evidential aspects are met and that a prosecution (including issuing an infringement notice) is in the public interest. It will mean that for the majority of offences resolution will be quick, clean, and with a minimum of fuss.



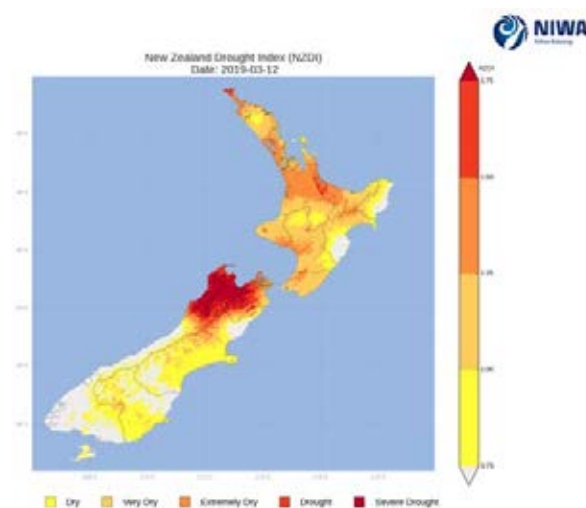
2019 DROUGHT

It was nearly two decades between droughts, the last significant drought hitting the Tasman area in 2001: after a wet winter the taps ran dry and stayed that way until April when some relief was finally provided - see NIWA graphic below. The Opouri River was most affected, running dry for a number of kilometres resulting in significant losses of trout and native fish. As the Opouri had a significant population of dwarf galaxiid, upland bully and tuna (eel), mortalities here were catastrophic. The cease take at Rai Falls of 1 cumec is clearly too low, as irrigation was still in effect as the river dried up - see next chapter for more information on Marlborough Environment Plan Review. An attempt was made to relocate some stranded fish into larger pools upstream, however on inspection a few days later even these larger pools had dried up.

Motueka tributaries such as the Dove, Tadmor and Motupiko were also significantly affected, the latter going dry for at least one kilometre in its lowest reach - a real concern for the out-migration on juvenile trout from the upstream part of the river. Losses of adult trout were probably lower in these rivers as fish would likely have dropped out of the system, prior to drying

The Waimea catchment was dangerously low, and irrigators were on Stage 4 rationing meaning a 65% reduction in allowable take, however few trout deaths were reported as trout were confined to deep pools in the lower part of the river.

Elsewhere, it was simply a case of high water temperatures occasionally affecting fish behavior and angling success. In some rivers throughout January and February, the fishing was over by the early afternoon with trout, in effect, shutting down. As mentioned in Chapter 3, in diverse catchments such as the Wairau and Motueka the fish fared much better, congregating in cold water areas such as deep pools for groundwater flow, or cool tributaries such as the Waikakaho (Wairau) and Graham (Motueka).



Responsible anglers cut their day short or started early and finished early in order to reduce instances of harm to fish. Yet there are still a magnitude of suitable fishing options in times like these if the angler knows where to look.

Even in Nelson Lakes, there were reports of the Travers and D'Urville running dry for a number of kilometres. This may have been one of the reasons why it appeared the Travers had less angler traffic as opposed to last year - the river was simply too low - see picture below of the lower Travers.

< Nine trout were stranded in this Opouri pool.





RESOURCE MANAGEMENT ADVOCACY

As always Resource Management processes took a considerable amount of senior staff time this season, particularly Marlborough and Tasman resource consents and the completion of Marlborough Environment Plan hearings. Resource Management advocacy, while not valued or understood well by many licence holders, remains one of our key avenues to achieve improved Local Authority management and retention of the 'natural capital' that supports the fish and gamebird resources. Much Resource Management work often focuses on water quality and quantity issues, which tend to affect salmonids more than gamebirds, however this is appropriate given 80% of Fish & Games national income (as is the case for this region) is derived from fish licence sales.

Staff prioritized effort on the Marlborough second generation plan review hearings with national assistance from Peter Wilson (national fish and game planner), and national RMA funding. A total of 97k national funding over two years was spent on engaging a hydrologist to tease out the issues within the Marlborough Environment Plan and legal assistance for the hearings. Submissions on all new water permits applied for within the Rai/Pelorus, Kaituna, and Wairau catchments since the plan was notified also continued to be lodged, to ensure consistency with our submission on the plan, around minimum flows and water allocation within these catchments.

During the latter part of this reporting period, work on Tasman District Councils 2019 bona-fide review of resource consents within the Upper Motueka catchment also kicked off. Given TDC have not indicated any timeframe to address these water planning matters within the TRMP, the consent renewal process is our only legal avenue currently available to seek these matters be addressed.

MARLBOROUGH ENVIRONMENT PLAN REVIEW

The largest issue of concern within the present plan related to the proposed allocation of a lot more water out of trout fisheries of interest to Fish & Game, with inadequate assessment or provision for flows to protect instream values. Related to this allocation of new water, were the likely flow-on effects of more intensive land-use arising from new water, and likely increased nitrate leaching rates in catchments such as the Rai and Kaituna Rivers, which are already above levels deemed to be healthy for aquatic ecosystem management.

These issues were well traversed in detail during our February 2019 hearing evidence on the Marlborough environment Plan, with expert input from our hydrologist Marrienne Watson and national planner Peter Wilson. The 2019 drought was also very timely for our case, with video footage of a dry Opouri riverbed with many native fish and trout perishing, providing compelling evidence to the panel for a need for better low flow management moving forward. We also received social media praise from a member of the public sitting in on the hearings which was pleasing.

Decisions on the Marlborough Environment Plan hearings are due out December 2019, and an appeals process will be considered depending upon decisions.

hi guys. I just wanted to thank you for your succinct and consise legal submission on water allocation for the Marlborough Environment plan hearing held today. Many may not be aware that native fish are not covered by the Resource Management Act so are afforded little protection. salmon and trout however are and as such by submitting as you did today, you are also protecting the fresh water water values that our native fish also need to thrive. thank you, thank you, thank you for your efforts, your expert witnesses and your passion for our fresh water fisheries. The Department of conservation has big footsteps to follow in tomorrow, let's hope they can step up to the plate and somehow get the freshwater fisheries act included in an RMA planning document. big ups to your organisation, you guys rock. credit where credit is due! please feel free to share this message to your page. I did try but couldn't. have a great day, I most certainly am :)

^ Comments from an iwi representative on the Fish & Game submission.

MARLBOROUGH RESOURCE CONSENTS

Close to 15 resource consent applications (both renewals and new water applications) have had submissions lodged seeking 10-year terms only, and much higher cut-offs (for new water), to ensure consistency with our Marlborough Environment Plan submission on these matters. Most applicants so far have agreed these matters are best addressed through the Marlborough Environment Plan hearing and decisions process, and so have agreed to what we sought in our submissions as an interim holding pattern until these matters have been settled, post plan decision stage.

TASMAN DISTRICT COUNCIL PLANNING AND CONSENTS

The February 2019 drought saw several kilometres of the lower Motupiko and Tadmor Rivers go dry, while catchment irrigators were only on 50% cuts as imposed by the dry weather taskforce. In addition, the Dove River went virtually completely dry prior to a cease-take directive being issued for this catchment. These rivers are all recognized and protected as “contributing waters for trout spawning and rearing”, within the Motueka Water Conservation, however low flow management is left to the Tasman Resource Management Plan, and dry weather taskforce directives, an approach observed to be ineffective during the February 2019 drought. Currently there is also no planning horizon for TDC to investigate and address these matters within the Tasman Resource Management Plan (and Council refuse to even signal a likely date), which is of very serious concern given the scale and pace of hop orchard developments currently occurring within the Upper Motueka catchment. At present, the 2019 catchment water permit renewal process is the only legal avenue to try and get some of these matters addressed.

Tasman District Councils refusal to even limited notify the 2019 catchment consent renewals saw Nelson Marlborough Fish & Game seek legal advice around our affected party status, in order to try and get TDC to the table to discuss our significant water management concerns in this area. At the time of writing, Ngati Tama, Ngati Kuia, and possibly Te Atiawa are also interested in this process as they have similar concerns around affected party status. A High Court judicial review is under consideration if the Council continues to refuse to address these matters, and funding from the national F&G legal fund has been sought to support us on these issues.

TDC RIVERWORKS UPDATE

Significant progress is slowly being made towards improved practice within the TDC River Engineering Department, with different approaches now being employed within the Motupiko and other rivers (use of groynes and proactive willow planting, in the place of rock riprap). This progress is now contributing to improvements within the adult trout population within the engineered section of the Motupiko River, which has been detailed on page 23.

Greater use of rock groynes rather than (or in conjunction with) riprap, is assisting to address the historic loss of pools within the y-rated section of the Motupiko due to historic channel homogenisation flood control work that led to significant adult trout habitat loss. This is a good example of flood control engineering being also able to deliver habitat benefits for fisheries if the correct design approach is used. Groynes function to recreate pools that mature Crack Willow historically created prior to wholesale crack willow removal within the y-rated section of Motupiko. Additional tree willow shading in future created through proactive pole planting will also be positive, particularly if planted between groynes.



^ TDC are now using rock groynes with live willows anchored to provide future shading and bank stabilisation



^ What will TDC do here? An area requiring stabilisation on the Waimea River.



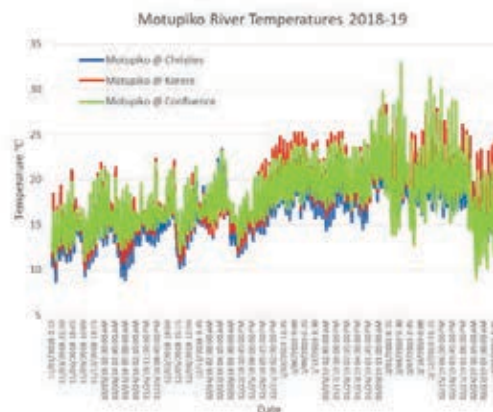
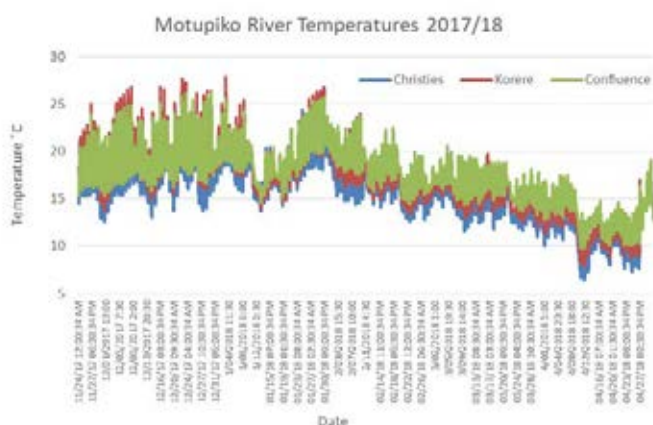
TEMPERATURE DATA

Fish and Game again carried out water temperature monitoring during the 2018/19 summer in the upper Motueka catchment, with staff deploying 11 Onset Hobo pendant water temperature data loggers in the upper Motueka Catchment and tributaries between early November 2018 and early March 2019, with temperatures recorded at 15 minute intervals.

Unfortunately the data logger and chain that was located on the Tadmor River at Tadmor could not be found (willow had collapsed) when staff went to retrieve it, so no data is available for the 2018/19 summer at that location and a data logger wasn't deployed in the Dove this year.

The remaining 10 loggers however produced some useful temperature data. Unlike the 2016/17 & 2017/18 summers which were unusually wet, this summer was more typical, albeit with drought conditions experienced.

MOTUPIKO



As can be seen from the above graphs, this 2018/19 summer was more typical with water temperatures warmest during January/February (during the 2017/18 summer, water temperatures were warmest in late November through until early January). Maximum water temperatures recorded were 25.90 °C at Christies (same as 2017/18), 28.3°C at Korere Bridge (27.8 °C in 2017/18) and 32.9°C at the confluence with the Motueka - however it must be noted the Motupiko River ran dry at the lower confluence site (in February judging by the temperatures), which is likely to be the cause of such extreme temperatures. Temperatures however are pretty extreme for trout in the mid and lower Motupiko, with pretty much all of the period from January through to March exceeding 20 °C.

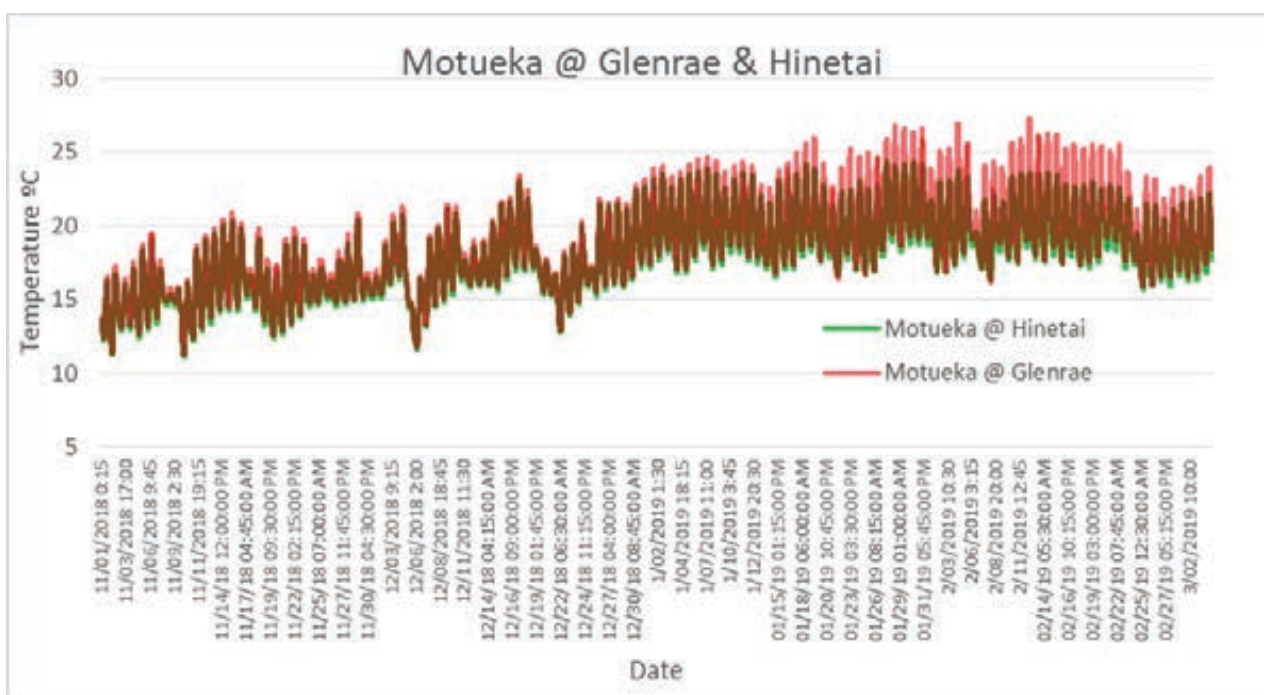
Further analysis of the data shows while the lower site at the confluence experienced more extreme temperatures (and dried up), the amount of time temperatures exceed 23 °C was actually less (1668 “15 minute” occasions) compared with the Korere site (2048 “15 minute” occasions). This is likely to be the result of ground water upwelling at the lower confluence cooling the water temperatures – when its not dry.

Given brown trout thermal tolerances, it is likely water temperatures in the Motupiko particularly in the middle “Korere” reach of the Motupiko is likely to be having a significant detrimental effect on trout behaviour, growth and ultimately survival.

UPPER MOTUEKA

As can be seen from the graph below water temperatures in the mainstem of the Motueka from late December to March frequently exceeded 20 °C. There were also several days in late January which saw elevated water temperatures where water temperatures ranged between 24-26 °C at all the 5 sites. With the exception of the Hinetai site (max temperature 24.35 °C), temperatures exceeded 25°C on a number of occasions at the other four monitored sites on the mainstem of the Motueka. North's Rd Bridge site recorded a maximum of 26.97 °C, Tapawera Bridge 26.39 °C, Glenrae 27.27 °C and Woodstock reaching 25.51 °C.

Of particular interest, is the relative frequency (number of 15 minute) occasions the different sites exceeded 23°C or more. As can be seen below, it is apparent both the Tapawera Bridge and Hinetai sites are likely to be influenced by groundwater upwelling, which results in cooling the river water temperatures. This was not always the case though at the Tapawera Bridge site, as on some occasions the cooling effect wasn't detectable, which is likely to be a result of fluctuating groundwater levels. Conversely the site at Glenrae is in an area where at low flows, water is generally being lost to groundwater, without groundwater upwelling influences, and frequently exceeded 23 °C during the 2018/19 summer. This was particularly noticeable in January and February and in the opinion of FO Davey, likely to be influenced and exacerbated by water abstraction – which in the upper Motueka largely is from groundwater bores.

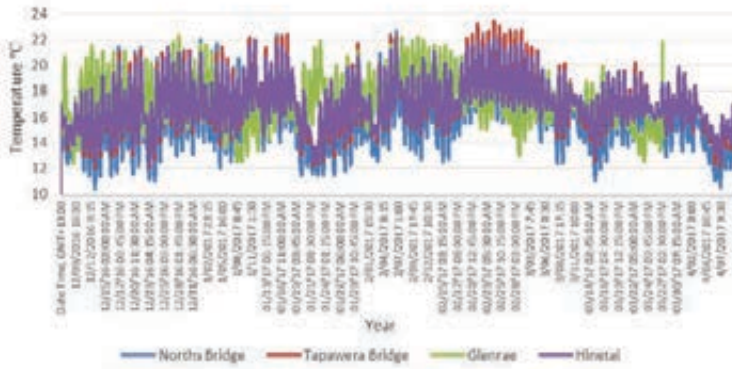


	Norths	Tapawera	Glenrae	Hinetai	Woodstock
Max Temps	26.977	26.39	27.272	24.351	25.513
Occasions >23 °C	1286	652	2370	451	1066

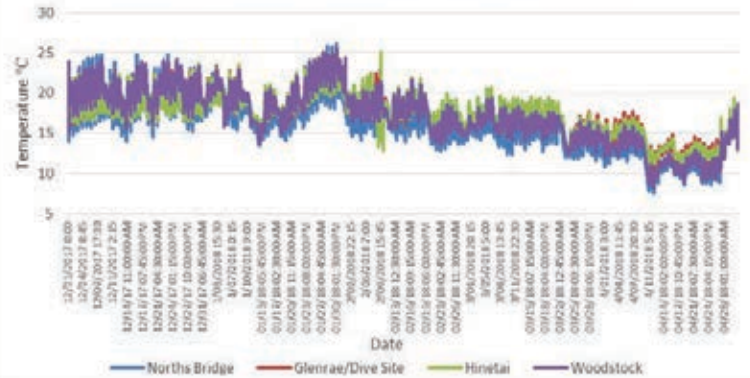
As can be seen from the above graph, the influence of groundwater upwelling and the Hinetai Spring is quite apparent on reducing the Motueka River water temperatures. Water temperature differences of up to 3.788 °C cooler were recorded at the Hinetai site which is only approximately 2km downstream of from the Glenrae site.

As can be seen from the graphs below, the 2018/19 summer water temperatures were more typical of what we would historically expect, with a hot dry January & February period, coinciding with low river flows. In comparison the 2017/18 summer had low flows and hot temperatures in December, but then experienced high river levels and cooler temperatures through much of January, February & March. The 2016/17 summer was particularly unusual in that regular rainfall was experienced throughout the summer and temperatures never really got particularly hot.

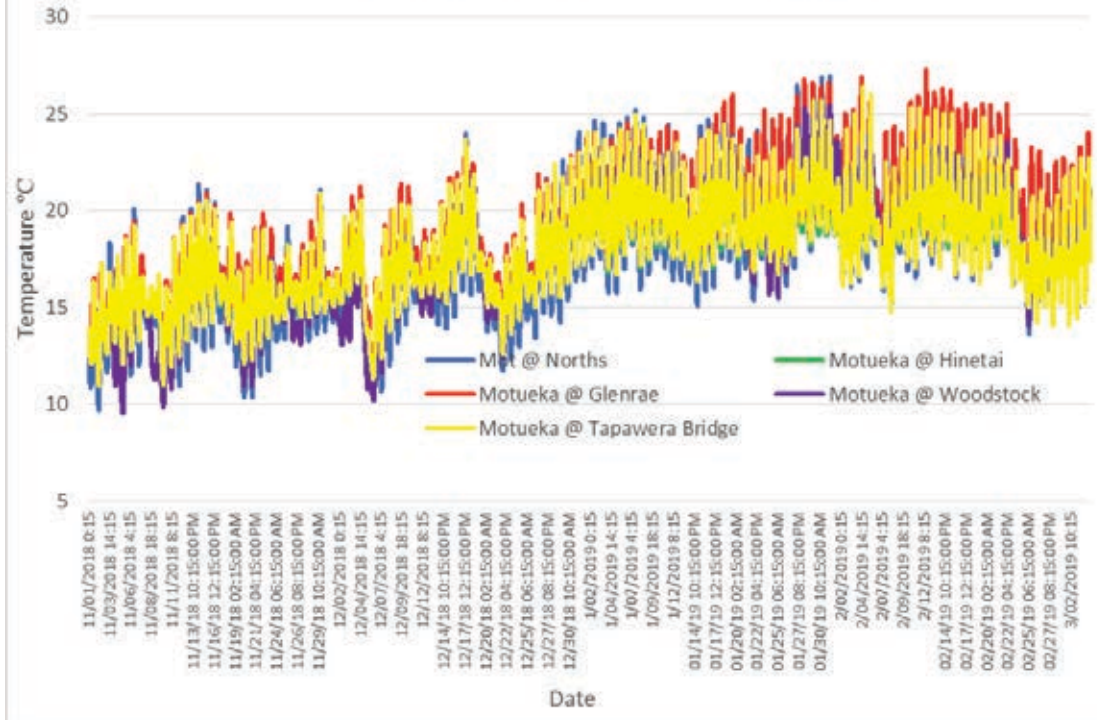
Upper Motueka River Temperatures 2016/17



Mainstem Motueka River Water Temperatures 2017/18



Mainstem Motueka River Temperatures 2018/19



RIVER FLOWS

Unfortunately the upper Motueka River doesn't have a continuous water recorder to enable assessment of the flows in the upper river, however Tasman District Council Staff did carry out some spot gauging's at low flows during the 2019 summer. Gauging measurements taken on the 21st of February 2019 were as follows:

Low flow river gaugings undertaken by TDC

Location	Litres/second
Motueka at Norths Bridge	1020
Motueka at 1400m u-s Tapawera Br	930
Motueka at Hyatts	837
Motueka at Tapawera Bridge	987
Motueka at u-s Tadmor Confl	719
Motueka at 800m d-s Tadmor Confl	687
Motueka at Glenrae	633
Motueka at 600m u-s Wangapeka Confl	986

While it has to be acknowledge we were experiencing a relatively severe drought, the above river gaugings highlight the inadequacy of the Tasman District Councils Water Management regime for this part of the Motueka River. While the headwater spawning streams of the Upper Motueka and Motupiko are afforded some protection by the Motueka Water Conservation Order, unfortunately the section of the Motueka River around Tapawera wasn't deemed to be nationally outstanding and therefore relies on the TRMP for maintenance and protection of flows and habitats. Unfortunately this year highlighted the inadequacy of the TRMP as the Motupiko had run dry in its lower section, yet irrigation was still occurring. A cease take direction was however introduced for the Motupiko zone on Monday the 25th of February 2019. As can be seen above, the mainstem of the Motueka downstream of Tapawera was gauged at 633 l/s at Glen Rae and as a consequence of warm temperatures and shallow water depths offered little habitat for trout and other aquatic life.

Fish & Game understands that as least 780 l/s of water was allocated in the upper Motueka Catchment upstream of the Wangapeka Confluence. Putting this into perspective, on the 18th of February 2019 while there was a cease take for the Rainy River Zone and stage 4 restrictions (which equated to a cut of 65%) in permitted allocation in the Motupiko, however only Stage 1 restrictions (20% cut) were in place for the Tapawera, Glenrae and Tadmor zones.

Upper Motueka water allocation

Zone	Allocation (Litres/second)	Restrictions 18/2/19	Permitted use after restrictions (litres/second)
Rainy	25	Cease Take	0
Motupiko	85	65%	29.75
Tadmor	56	20%	44.8
Glen Rae	300	20%	240
Tapawera	314	20%	251.2
Total	780		565.75

As can be seen from the above table, with the water restrictions in place, this resulted in an overall allocation restriction of 27.5% upstream from the Wangapeka confluence at the time of the river gaugings were carried out on the 21 February 2019. On the 25th of February, a cease take direction was introduced for the Motupiko zone and Stage 2 (35% cut) introduced for the Tapawera, Glen Rae and Tadmor zones, which equated to an overall reduction in allocation by 44% for the upper Motueka Zone. This still allowed for 435.5 l/s to be used for irrigation.

While it has to be recognised this is a significant reduction and impacted on landowners, however putting it into perspective the river flow at Glen Rae was only flowing at 633 l/s (and most likely even less by the time restrictions took effect on the 25th of February). Permitted water allocation therefore represented approximately 70% of the Motueka River flow at Glen Rae and as can be seen from the images below, it was suffering and combined with high water temperatures was a pretty hostile environment for many aquatic fish and invertebrate species. Of interest however river water quality appeared to be pretty good at Tapawera, with little algal growth present. However downstream at the Glen Rae and Hinetai monitoring sites filamentous green algal growth covered the river bed as can be seen from the photos below, which is likely to be a result of increase nutrient levels and warm water temperatures.



^ Motueka River at Glen Rae monitoring site 5/3/2019



^ Motueka River at Tapawera Bridge 5/3/2019



^ Motueka at Hinetai Monitoring site 5/3/2019

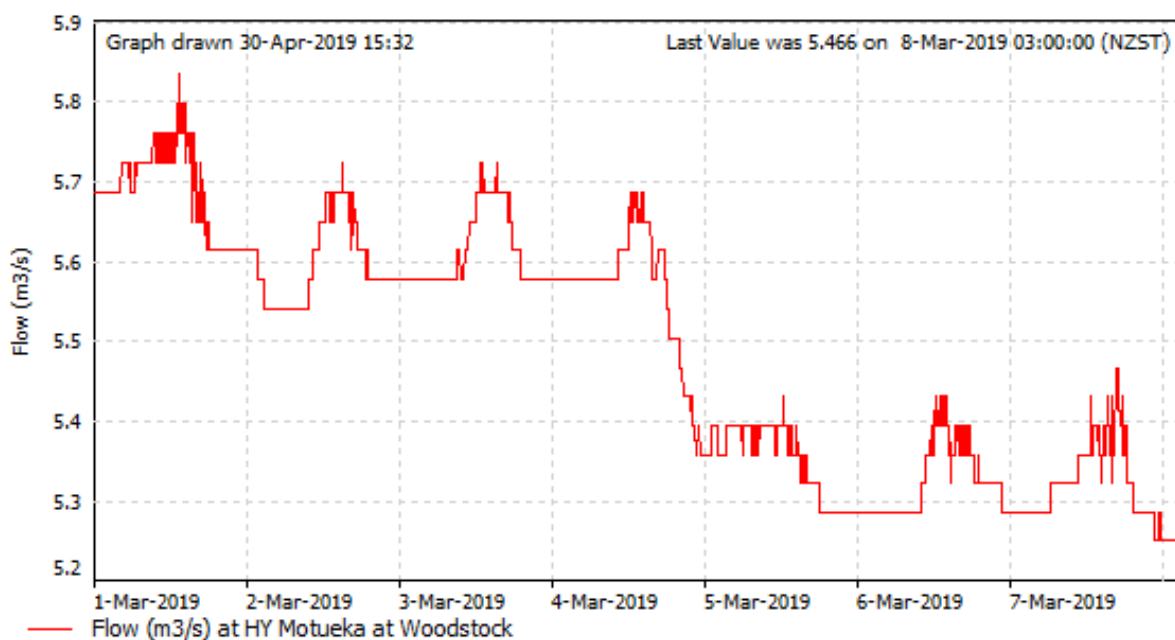


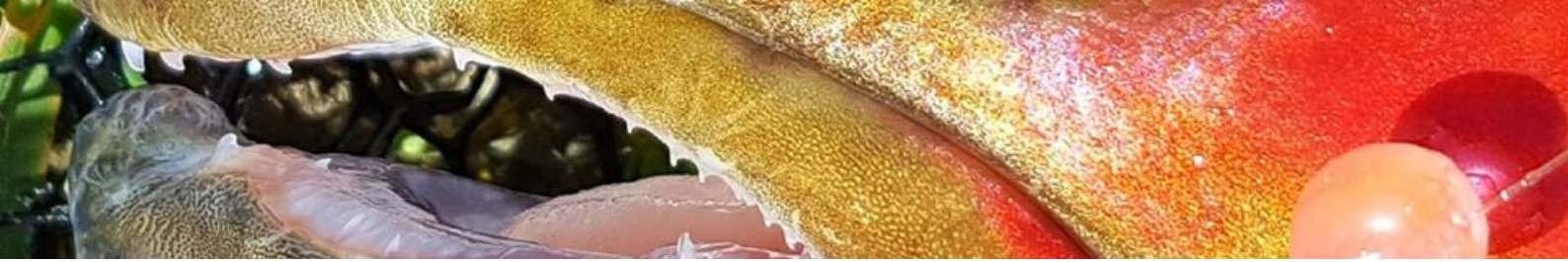
^ Tadmor at Wangapeka-Baton Road Bridge 5/3/2019



^ Motupiko at Korere Bridge 5/3/2019

As can be seen from the above below, the flow at Woodstock got down to approximately 5.25 m³/s which is estimated to be approximately a 30 year return drought.





GENERAL

GUIDES LICENCE UPDATE

Unfortunately, progress with the guides licence has been stalled due to work DOC has been required to undertake on upland game properties with special conditions and the setting up of approvals and Order in Council for Schedule 3 Wildlife Act provisions. DOC head office staff are also busy on regulations to support the conservation infringement system introduced last year. It is understood that the next step with the guide licence proposal is for DOC to have further discussion with the Guides Association, Fish & Game and DOC Taupo before consultation round with government officials. No clear timelines have been communicated to NZ Fish & Game Council on this yet.

DIDYMO RESEARCH

NMIT student David Stephens and NIWA scientist Cathy Kilroy continued work on didymo distribution in this region, as well as doing a desk top exercise relating didymo blooming behaviour to underlying geology maps. David carried out a summer didymo sampling programme from numerous rivers throughout the Nelson/Marlborough (and a couple in the West Coast) region. Sampling was done in a number of rivers, particularly focusing on areas where it blooms prolifically or is absent (or is only present at low levels) to try and tease out what is limiting (or causing its growth). Over the coming months he will be analysing the water sampling results with the write up due to be completed later this year.

FISHERS' RIGHT-OF-WAY TO OPEN BESIDE RIUWAKA RIVER

The deal sees a public right-of-way opened along nearly a kilometre of riverbank off Riuwaka Valley Left Branch Road to where the river leaves Kahurangi National Park.

When a subdivision was proposed on the south branch of the Riuwaka in the Tasman district, Fish & Game Nelson-Marlborough Regional manager Rhys Barrier saw the opportunity to legalise access to a highly valued brown trout fishing river. He approached the NZ Walking Access Commission which agreed to support long-term access. "The present landowner is very good about letting anglers onto the riverbank to fish," says Mr Barrier. "But we were worried this could easily change. Unfortunately, there is a stretch of the Riuwaka River where a landholder has claimed exclusive rights where there are gaps in legal access."

Walking Access Commission regional field advisor, Penny Wardle, said it was satisfying that people would no longer require landowner permission to walk along or fish in this stretch of the Riuwaka south branch. The co-operative approach set a great example.

"Access to their outdoors is a major concern for New Zealanders and it is great to see the Tasman District Council recognising this and being proactive in ensuring the public's rights are not only recognised but enhanced."

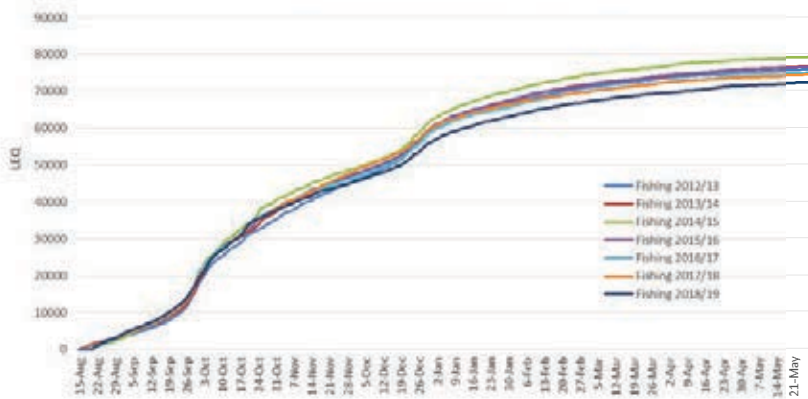




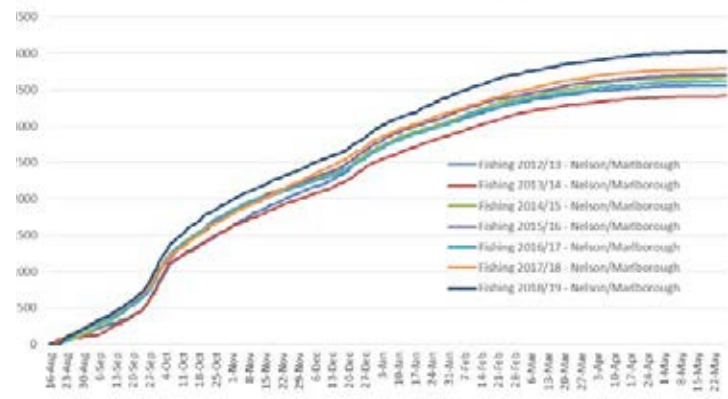
LICENCE SALES

It has been a year of considerable growth for this region with a significant increase in licence sales, on top of the previous years' growth also. A breakdown of the various licences can be seen in the table below, however in terms of Fish Full Licence Equivalents (LEQ's), this year 4,029 LEQ's were sold, a 6.3% increase on 2017-18. For a small region such as Nelson Marlborough this equates to an increase of \$36,700.

National - Daily Cumulative LEQs to 27 May



Nelson Marlborough Region LEQs to 27 May



The most growth came in the Resident Day and Winter licences (an effect of Lake Argyle), and small to moderate growth was seen in all other Full Season licences (Family, Whole Season Adult, Loyal Senior, Local Area and Junior licences), while the Long Break licence remains the poorest seller - see table below. Note: this is up to 27 May, since then there have been more sales of winter/day licences.

	Resident								Non-Resident				Total LEQ		
	Family	Whole Season Adult	Loyal Senior	Local Area	Day Adult	Winter	Short Break	Long Break	Whole Season Junior	Day Junior	Whole Season Adult	Day Adult		Whole Season Junior	Day Junior
	2017-2018	641	1,434	193	131	406	55	116	22	185	64	847		1,272	16
2018-2019	699	1,511	218	188	600	96	114	23	239	60	872	726	27	24	4,029

There was a notable decrease in non-resident day licences purchased this season, yet Whole Season Adult licences remained steady. This is somewhat perplexing as all fishing guides/lodges appeared to be very busy, and tourism trends are seeing more foreign tourists arrive each year. This same trend was also seen nationally, with a reduction of approximately 5,700 non-resident day licences issued - a similar percentage loss for this region (see table below).

Non-resident licence purchases account for around 12.5% of the total National income derived from fish sales.

National Non-resident Licences Sold - all regions

	Whole Season Adult	Day Adult	Whole Season Junior	Day Junior	Non-Res LEQ	Natioanl LEQ	% Non-Res Income
2017-18	6,437	17,093	169	573	9,271	74,343	12.47%
2018-19	6,997	11,331	248	384	9,044	72,234	12.52%

PROPOSED CONTENTS OF THE REPORT

- **Outline the nature of the problem.**
 - o Essentially the project's definition. I'd like to agree on this at our meeting on Friday.
 - o We need to determine who the management strategy is intended to benefit:
 - § The resource; or
 - § New Zealand anglers; or
 - § A combination.

- **Establish the guiding principles.**
 - o Central to this is establishing a usership hierarchy.
 - § Proposed:
 1. The resource.
 2. New Zealand anglers.
 3. Guided anglers, international and domestic.
 4. Unguided non-resident anglers.
 - o When a waterway becomes oversubscribed usership is limited hierarchically. Until that point, there is no limitation on access other than holding a licence.
 - o We should also look at establishing an objective measure for oversubscription, where possible.

- **Survey of international management strategies.**
 - o British Columbia is by far the most applicable international study as they have significant pressure directed at a publicly owned and accessible resource.
 - o Most international fisheries that would be considered 'outstanding' and susceptible to pressure (based on popularity and the nature of the fishery) are privately owned, and access limited by price. Others, such as many rivers in the United States, have sufficiently high fish counts that, whilst public angling effort is substantial, can sustain it.

- **Survey of NZ research on pressure sensitive/backcountry/headwater fisheries.**
 - o There is a significant body of research here, much of it up to thirty years old. However, in this instance rather than becoming less relevant this research is increasingly relevant as their very consistent recommendations have largely not been acted on.

- **Unique aspects of NZ's fishery & unique management requirements.**
 - o One common thread across the research is that our fishery is unique. This section will set out why it is unique, and why this necessitates specific management strategies.

- **Distinguishing categories of NR's.**
 - o Our management strategy should be targeted at the problem, not non-resident's generally. A more nuanced understanding of non-residents will allow this, informed by the recent Otago University Tourism Department report.

- **Approaches adopted so far and how effective they have been.**
 - o Ballot system for Greenstone/Caples & Ettrick Burn.
 - o Beat system on Oreti etc.
 - o Backcountry licence.

- **Prospective strategies, their benefits and limitations.**
 - o This section will outline strategies, both borrowed from overseas and unique.
 - o It will assess their feasibility and their likelihood to solve the problem.

- **Recommendations.**

APPENDIX 1

UNDERTAKEN SO FAR

- Literature review of international fishery management strategies, with a strong focus on British Columbia.
 - o Will be added to throughout the process.

- Literature review of New Zealand backcountry/headwater/pressure sensitive fisheries science, with a focus on what makes these fisheries unique, what makes them so highly valued and what the impact of angling pressure on the resource is.
 - o Will be added to throughout the process.

- Survey written for managers/regions to get perspectives on the nature of the problem, list of waterways they believe are pressure sensitive etc.