Report No.18

Hutt, Waikanae and Otaki Rivers Sportsfish Monitoring Results 1999-2019

Prepared on behalf of the Flood Protection Group, Wellington Regional Council and the Wellington Fish and Game Council

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Introduction and methods

In 1999 a regional sport-fish monitoring program was established to survey the abundance and distribution of brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) within the Hutt, Waikanae and Otaki rivers. The monitoring program, established in response to the potential deleterious effects caused by river remediation and diversion works permitted under a resource consent granted to the Wellington Regional Council (WRC), aimed to explore the relationship between trout abundance and the frequency and extent of river control works, in particular cross-blading. Cross-blading (also known as transverse-blading) is a river diversion method where the gravel is pushed from one side of the river channel to the other to alter the channel alignment (Westlake & Manolache, 2016). Death (1996) has found that substrate disturbance removes both invertebrates and periphyton (a potential food source for invertebrates) thereby reducing a food source for trout and other higher-order species. Moreover the technique is particularly harmful to the natural river environment, compromising the preferred diverse habitat requirements of trout (Taylor, 2005) such as deep pools and riffles. Gravel extraction practices are another potentially detrimental flood control technique used to lower riverbed levels manipulate river dynamics by eliminating deep pools and riffles. However, these practices can also be beneficial if engineers incorporate environmentally sympathetic instream habitat for aquatic species.

The GWRC Flood Protection Group acknowledged the likelihood of adverse effects from mechanical river diversion work and, since 1999, have worked with Fish and Game NZ to monitor trout abundance at core river reaches (Appendix 1) and to monitor the potential effects of permitted works on the trout populations. While this work has centred around cross-balding and flood protection works on the Hutt, the proposed gravel extraction for the lower Waikanae river provides an excellent opportunity to look at how engineering can improve aquatic habitat by creating a diverse range of pool, riffle and runs within the river along with deep pools and meanders as part of flood protection works. Should this path of action be chosen by the GWRC Flood Protection Group it would be expected that all aquatic species within the river would benefit and this would be reflected in future drift dive surveys.

The regional monitoring program has established 15 core reaches (Hutt n=8 [approx. 14 km], Waikanae n=4 [approx. 3.7 km], Otaki n=2 [approx. 4.7 km]) where trout abundance data is collected using drift-dive surveys (Appendix 2). The survey method requires divers to drift downstream, line abreast, within underwater sight of each other recording all trout they observe. Three to eight divers are required for the Hutt River depending on river width and water clarity compared with only three on the Waikanae and five on the Otaki reaches.

Core site surveys were completed for the Hutt (02/03/2019), Waikanae (10/12/2018) and Otaki (21/3/2019) rivers with the timing of sampling similar to previous years (see Appendix 1). Data were examined and compared as mean number of trout observed per kilometre across all reaches within each river system. Route regression (Geissler & Noon, 1981) was used to estimate trends in population change (increases or declines) over 7-year periods (and 5- and 6-year periods where sufficient data for 7-year trends was lacking) for all reaches surveyed within each river system.

In addition to the drift dive surveys, water samples were taken from 18 sites within the Hutt catchment to analyse the chemical signature from each (Appendix 3). These chemical signatures will be matched with those from juvenile trout otoliths (ear bones) which will help identify key spawning tributaries for the Hutt river. Research will also investigate contributions the overall contribution each spawning tributary makes to the catchable adult trout population in the Hutt catchment. Research is centred on identifying factors that may impact on the sustainability of the Hutt river fishery. These factors would include detecting barriers to dispersal between lower and upper reaches, particularly with regard to flood protection work may have on the Hutt river trout population. Similarly, investigations will focus on possible behavioural traits within the trout population that may limit dispersal and population stability within the catchment. Research outcomes will then be able to provide guidance for the overall management of sportfish within the catchment.

Hutt River

Trout abundance was down 25% in the Hutt river in 2019 with 40 trout/km observed by drift divers compared to 53 trout/km last year. The result is not significant owing to the variation between reaches (Kaitoke = 19 trout/km and Birchville = 80 trout/km for example). The largest decreases were observed at the Birchville and Avalon reaches where total numbers of trout observed reduced by 138 (55%) and 74 (52%) observed individuals respectively. More large brown trout (>400 mm) were observed in all reaches, particularly those higher up in the catchment however twice as many medium sized trout (<400 mm) were observed than large individuals at Melling (Appendix 1). The result highlights the variability in habitat within the Hutt river system (deep, cool stable pools at Birchville and the upper areas compared to shallow, modified riffles and runs on the lower sections (including Melling) of the Hutt river and the apparent use of these site by trout at the time of observation. Juvenile trout were observed at the Kaitoke and Te Marua reaches and indicate that trout had spawned upstream of these survey reaches last season.

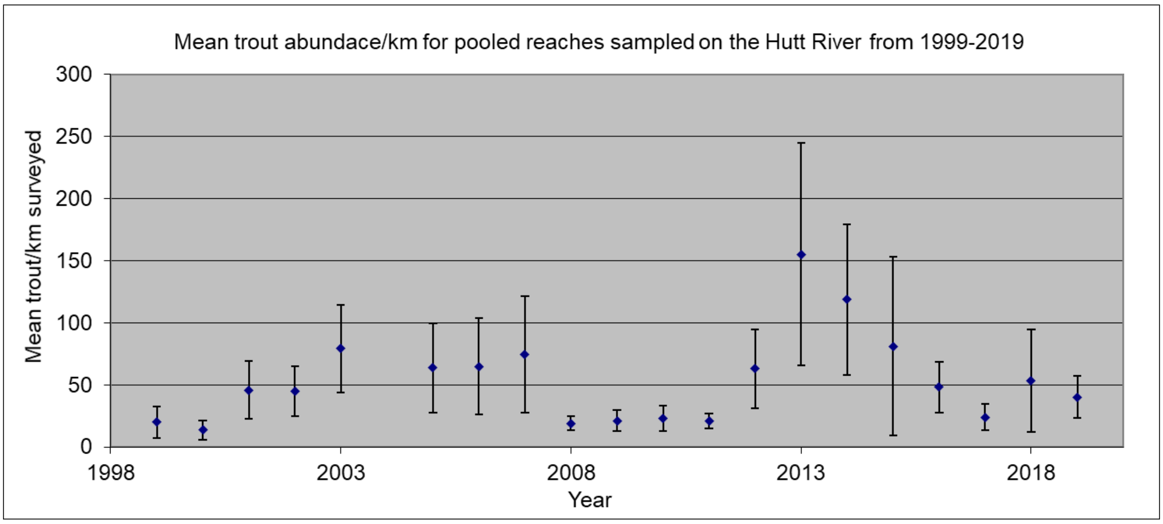


Figure 1. Mean number of trout surveyed during drift-dives within all reaches within the Hutt River. Error bars represent ±95% confidence intervals.

Following on from the reduced population counts by divers, the 7-year abundance trends also displayed a decline in the trout population within the Hutt river (Figure 2). The result is not surprising given the diminishing abundance counts displayed in Figure 1 from 2013 – 2017. Data is indicating a similar trend that was recorded in the mid-late 2000s with trends leading into the decade low in 2010 (bias-adjusted back-transformed $\overline{X}$=0.79) reflecting the results of 2019 ($\overline{X}$=0.80).

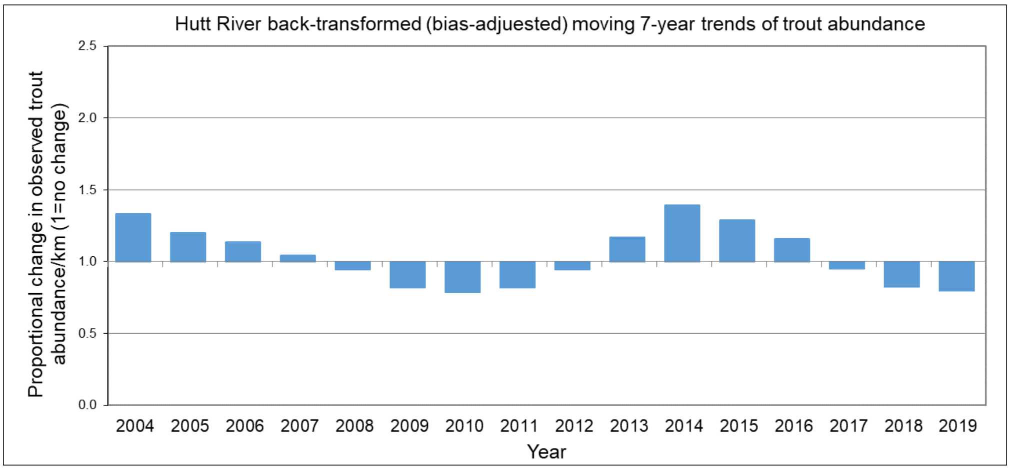


Figure 2. Moving 7-year trend bias-adjusted back-transformed means for surveyed trout/km from 8 reaches of the Hutt River showing a possible cyclical population trend.

Waikanae River

Observed trout abundance in the Waikanae river in 2019 was the lowest recorded since 2000. Pooled mean trout densities across the four sections of the Waikanae River resulted in a nonsignificant decreased in 2019 when compared against the previous nine years and remained in the lower band of observed trout abundance since the pre-2015 levels (Figure 3). There were noted declines in observed trout at Cooke Park (the lowest river reaches surveyed) where only two individuals were spotted compared to 12 in 2018. Both of these trout were of medium size. Juvenile trout were observed within all surveyed reachs and spawning redds (a nest of trout eggs) were overserved and photographed by staff in the upper reaches of the Waikanae in 2018. Close attention will be paid to the creation of instream habitat and refuge areas for trout following the proposed 2020 gravel extraction and the impact of improved habitat on the sportfish population in the Waikanae river.

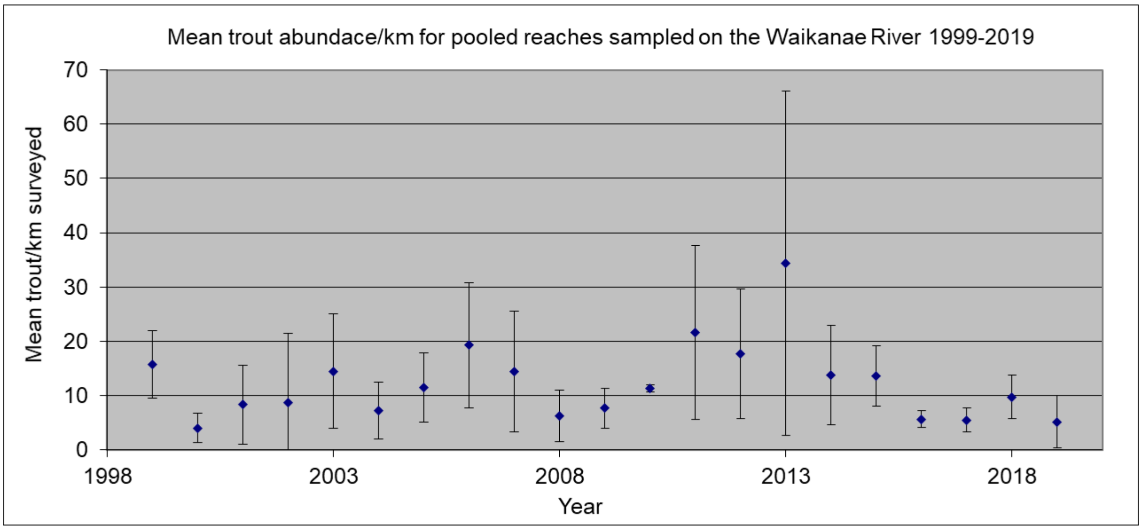


Figure 3. Mean number of trout surveyed during drift-dives within all reaches within the Waikanae River. Error bars represent ±95% confidence intervals.

The seven-year trend in proportional change in trout densities shows a declining population within the river in 2019 following years on diminishing abundance counts after 2013 (Figure 4). Once again, a casual observation could conclude a cyclic pattern similar to that of the Hutt but in a catchment supporting a much lower density of trout.

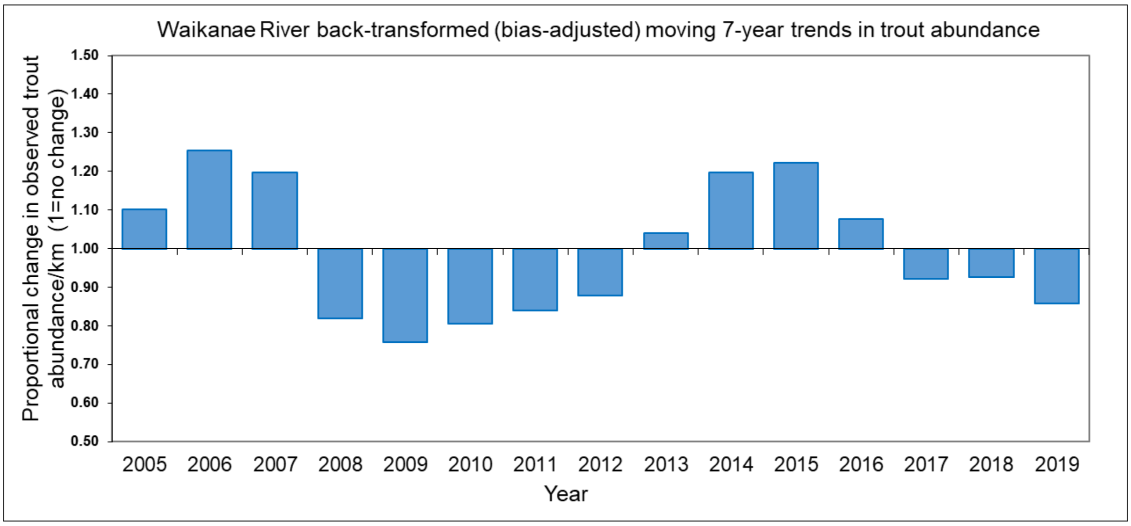


Figure 4. Moving 7-year trend bias-adjusted back-transformed means for surveyed trout/km from four reaches of the Waikanae River. The red line indicates that the 7-year trend for the observed trout population has not changed (proportional change = 1.03).

Otaki River

Data from the two Otaki reaches indicated a small increase in trout abundance in 2019 to 10.6 trout/km, the highest density of trout recorded since 2015 (Figure 5). Most of the individuals observed were large brown trout with a single large rainbow present (Appendix 3). Juvenile trout were also present and indicate trout are continuing to successfully spawn upstream (Figure 6).

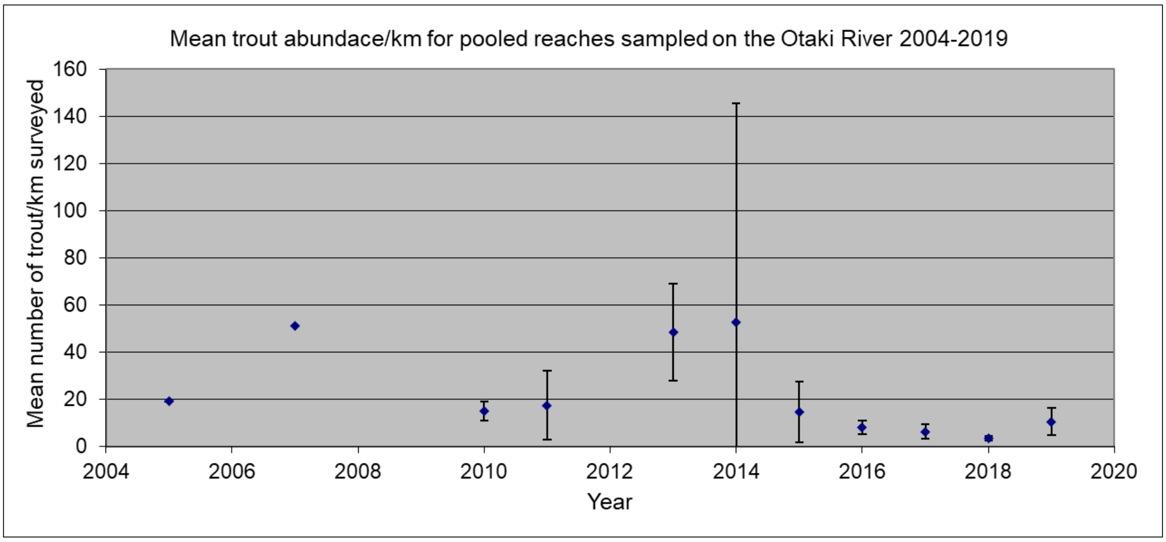


Figure 5. Mean number of trout surveyed during drift-dives within all reaches within the Otaki River. Error bars represent ±95% confidence intervals.

Figure 6. A trout spawning redd (a nest of trout eggs) in the river gravels of the Otaki River upstream of Otaki forks. The redd is the circular clear patch of gravel within the red circle .

Proportional change in 7-year trends of trout densities displayed a noticeable decline despite the increased abundance counts of 2019. The proportional change better reflects the overall results for the five years after 2014 where observed trout abundance has remained within a band below 15 trout/km.

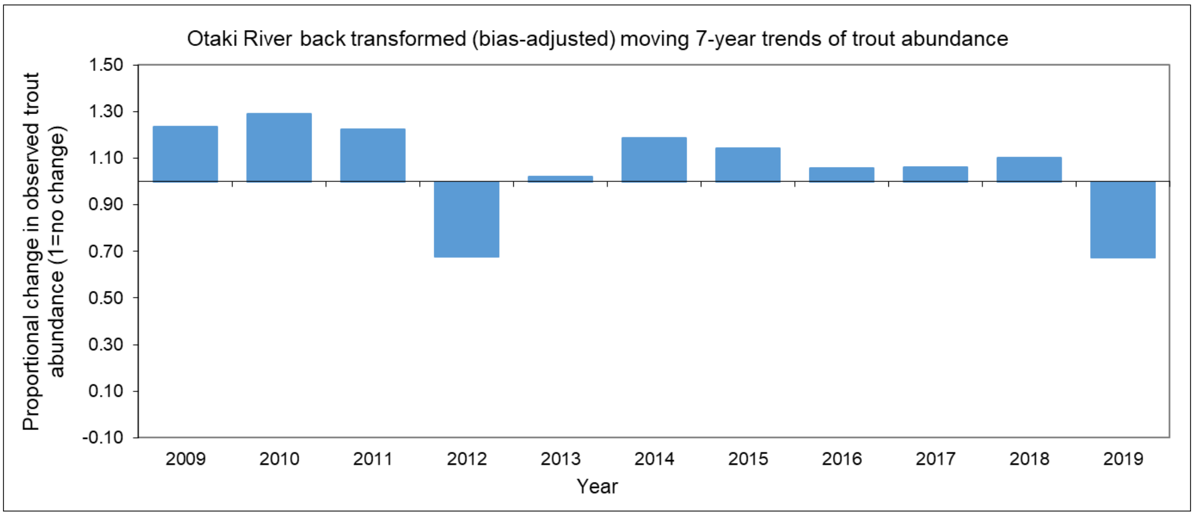


Figure 7. Moving 7-year trend bias-adjusted back-transformed means for surveyed trout/km from 2 reaches of the Otaki River.

Discussion

20 years of data has been collected for the Wellington Fish and Game region's sport-fish monitoring program for the Hutt, Waikanae and Otaki rivers. The monitoring of trout populations within each river has been completed in part to look at the possible deleterious effects of in-stream river diversion work by the WRC Flood Protection Group on trout population densities. While some sites such as the Hutt River are beginning to show some possible anecdotal trends, identifying drivers of population change over that time is not a simple process and more data is needed. The Wellington Fish and Game Council is addressing the need for more data though the otolith research program and will continue with the otolith research in the Hutt catchment this summer.

Data collected this year within each river system surveyed provides evidence that the trout populations have decreased in the Hutt and Waikanae rivers, but not significantly. However, looking at longer term trend data based on 7-year data sets suggests that trout populations within both these catchments are declining. Once again, more monitoring will be needed to determine whether this is an ongoing trend relating to river remediation and diversion works or a multitude of factors. The ongoing low counts on the Otaki are surprising and while not cause for alarm yet, will need to be closely monitored again next year. The fact that juvenile trout are being recorded in each river shows that trout are able to spawn in the tributaries or reaches within these catchments.

Current sport fish regulations for the three rivers are identified in Table 1 below. Given the current data, it is recommended that the 2018/19 regulations for the Hutt, Waikanae and Otaki rivers be applied for the 2019/20 season with further observation of the Waikanae river in 2020 and throughout the gravel extraction process. Otolith research planned for the 2019/20 summer will help to identify key spawning areas for the Hutt River. Outcomes from this research may have an impact on regulations regarding fishing methods and size limits.

Table 1. 2018/19 sport fishing regulations including season, permitted fishing methods and daily bag limits per angler on the Hutt, Waikanae and Otaki rivers.

River	Open Season	Permitted methods	Daily bag limits
Hutt River*	All year	Fly and spin fishing only	2 (max 450 mm)
Waikanae	1 Oct- 30 Apr	Fly and spin fishing only	1 (max 450 mm)
Otaki	All year	Fly, spin and bait fishing	1 (max 450 mm)

* Bait fishing is permitted by child licence holder on the Hutt river.

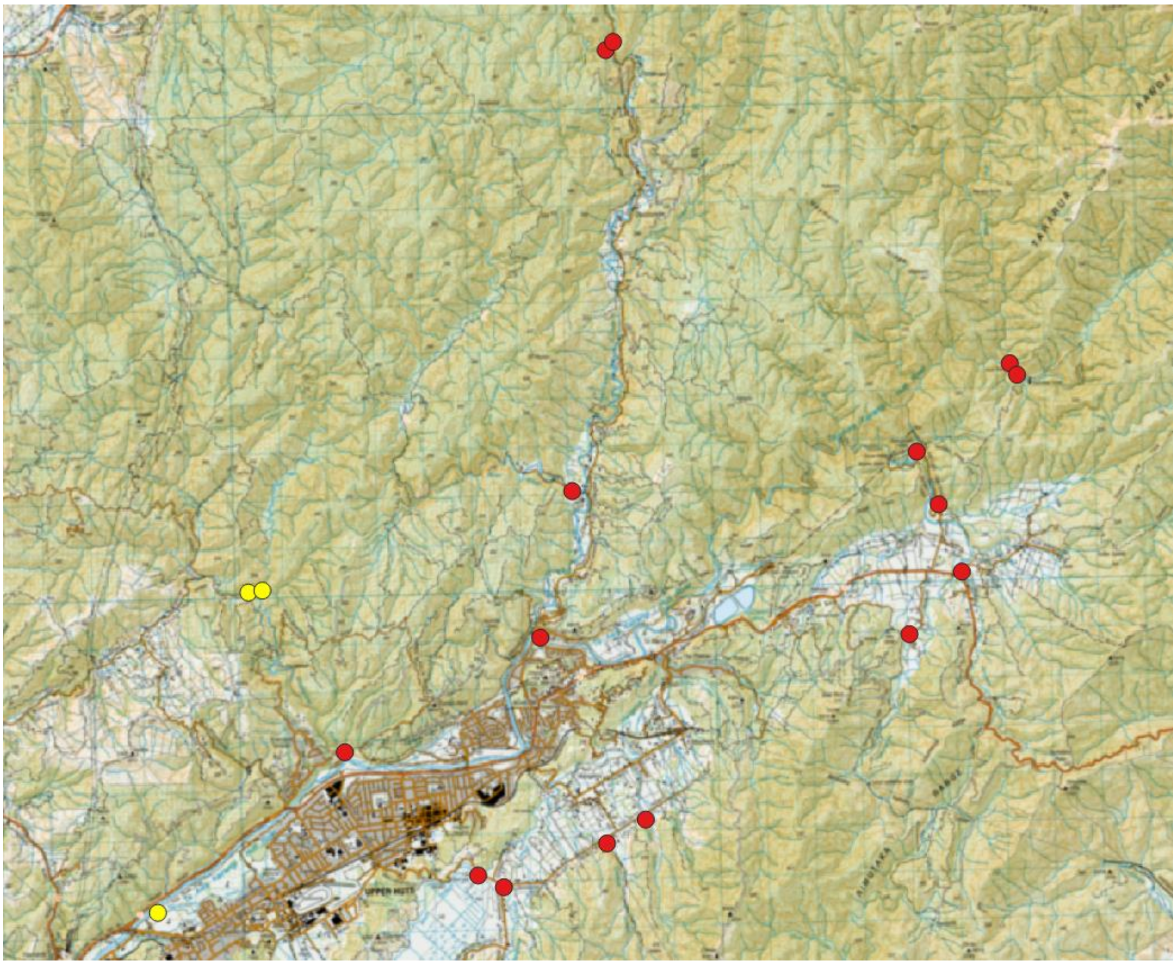
Appendix 1. 2019 Drift dive survey core site data for the Hutt, Waikanae and Otaki rivers for the Wellington Fish and Game Council sportfish regional monitoring program.

River System	Reach	Reach Length	Date surveyed	Large brown trout <400 mm	Medium brown trout	Large rainbow trout <400 mm	Medium rainbow trout	Total
Hutt	Avalon A & B	3150	2/03/2019	48	21	0	0	69
Hutt	Birchville	1400	2/03/2019	57	55	0	0	112
Hutt	Heretaunga	2500	2/03/2019	69	39	0	0	108
Hutt	Kaitoki	1400	2/03/2019	21	5	0	0	26
Hutt	Melling	1800	2/03/2019	36	77	0	0	113
Hutt	Taita	1000	2/03/2019	39	19	0	0	58
Hutt	Te Marua	1800	2/03/2019	19	9	0	0	28
Hutt	Whakatikei	1400	2/03/2019	20	9	0	0	29
Otaki	Below SH 1	2750	13/03/2018	14	7	0	0	21
Otaki	Pylons	2000	13/03/2018	23	3	1	0	27
Waikanae	Cooke Park 1	870	10/12/2018	0	1	0	0	1
Waikanae	Cooke Park 2	570	10/12/2018	0	1	0	0	1
Waikanae	Treatment 1	1000	10/12/2018	4	2	0	0	6
Waikanae	Treatment 2	1250	10/12/2018	13	5	0	0	18

Appendix 2. Geographic coordinates of core-river reaches start and end points for the Hutt, Waikanae and Otaki rivers

River system	Reach	Latitude start	Longitude start	Latitude end	Longitude end
Hutt	Avalon A	41°10'12.42"S	174°57'37.26"E	41°10'37.42"S	174°57'0.95"E
Hutt	Avalon B	41°10'37.42"S	174°57'0.95"E	41°11'25.58"S	174°56'5.82"E
Hutt	Birchville	41° 5'24.85"S	175° 5'57.36"E	41° 5'56.54"S	175° 5'24.96"E
Hutt	Heretaunga	41° 7'33.11"S	175° 1'51.63"E	41° 8'19.47"S	175° 0'30.67"E
Hutt	Kaitoke	41° 3'24.08"S	175°11'33.57"E	41° 3'19.30"S	175°10'57.96"E
Hutt	Melling	41°11'41.05"S	174°55'22.41"E	41°12'17.76"S	174°54'20.64"E
Hutt	Taita	41° 8'51.80"S	174°59'38.75"E	41° 9'16.85"S	174°59'10.76"E
Hutt	Te Marua	41° 5'14.25"S	175° 7'59.31"E	41° 5'37.46"S	175° 7'32.39"E
Hutt	Whakatikei	41° 6'49.21"S	175° 3'4.51"E	41° 7'15.78"S	175° 2'21.53"E
Otaki	Below SH 1	40°46'16.23"S	175° 8'39.52"E	40°45'38.27"S	175° 6'58.21"E
Otaki	Pylons	40°48'20.56"S	175°11'14.30"E	40°47'26.62"S	175°10'39.22"E
Waikanae	Cooke Park 1	40°52'57.61"S	175° 3'9.47"E	40°52'54.95"S	175° 2'35.58"E
Waikanae	Cooke Park 2	40°52'54.95"S	175° 2'35.58"E	40°52'42.28"S	175° 2'26.41"E
Waikanae	Treatment 1	40°53'41.87"S	175° 4'27.91"E	40°53'18.66"S	175° 4'17.59"E
Waikanae	Treatment 2	40°53'18.66"S	175° 4'17.59"E	40°52'55.06"S	175° 3'44.75"E

Appendix 3. 2019 water collection sites within the Hutt river catchment sampled in 2019 (red circles). Yellow circles are additional sample sites for sampling in 2020.



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