# Field survey of the fish populations of the lower Mohaka River

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*Cover: Dan Fake on the Mohaka River at Willow Flat*

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## Methodology

A series of tributaries along with a site in the main-stem of the lower Mohaka River were selected to be surveyed by electric fishing. Many of the tributaries and much of the main-stem are both remote and deeply incised with sheer banks which limit access. Therefore sites were picked primarily on accessibility and also to represent the range of available habitat types.

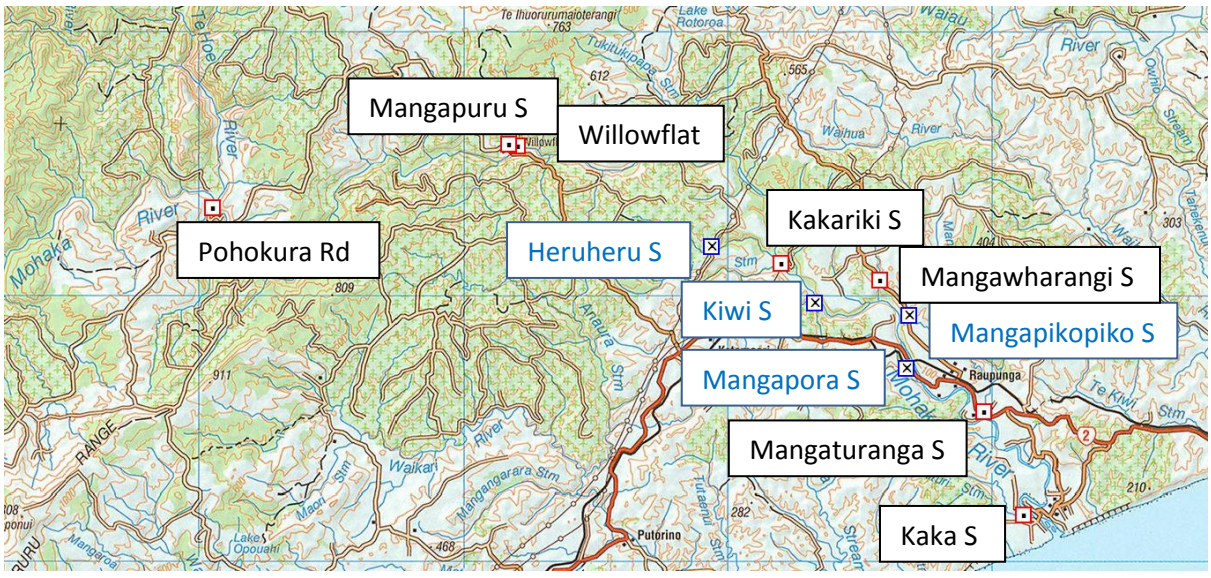
At each site the stream was fished using an EFM300 electric fishing machine set on a pulse width of 3ms and a frequency of 70pps. The operator set the voltage so as to ideally have a maximum of 4 of the 5 lights on the hand wand illuminated and fished back towards a stop net held by a second person using a single pass methodology. The team endeavoured to fish the entire range of the habitat types present, other than where the water was too deep or swift for safe or effective fishing. Attempts were made to capture all the fish seen, these held in a plastic container until the completion of the survey. The fish were then carefully identified including using a hand lens to examine for any pores, measured to the nearest mm and recorded. However where a large number of one species were captured a sample of lengths was taken instead. Fish observed but not captured were also recorded, along with the fishing time of the electric fishing machine. Ideally 20 minutes of fishing time (time the machine was actually on) was undertaken at each site.

Water quality parameters including dissolved oxygen, temperature and conductivity were also recorded at each site using a calibrated YSI Pro2030 meter.

## Study Sites

Six tributaries and a site in the main-stem of the lower Mohaka River between Te Hoe confluence and the river mouth (figure 1, table 1) were surveyed from the 29th April to the 1st May 2014. In addition a further four tributaries (figure 1, table 2) were inspected but proved either unsuitable for fishing or inaccessible.

**Figure 1 The 7 survey sites (▪) in the lower Mohaka River along with the other 4 sites (x) inspected**



The map co-ordinates (NZTM 2000) of each site are presented in tables 1 and 2.

**Table 1 Location of downstream and upstream boundaries of each survey site (NZTM 2000)**

| Site | Survey Date | Start | Finish |
|---|---|---|---|
| Pohokura Rd | 29 April 2014 | 1930546E, 5673321N | 1930408E, 5673338N |
| Mangapuru Stream | 29 April 2014 | 1941727E, 5675736N | 1941617E, 5675696N |
| Willowflat (main-stem) | 29 April 2014 | 1942074E, 5675663N | 1941846E, 5675396N |
| Kakariki Stream | 30 April 2014 | 1952030E, 5671226N | 1951809E, 5671122N |
| Mangawharangi Stream | 30 April 2014 | 1955776E, 5670602N | 1955685E, 5670840N |
| Mangaturanga Stream | 1 May 2014 | 1959703E, 5665634N | 1959663E, 5665801N |
| Kaka Stream | 1 May 2014 | 1961214E, 5661728N | 1961063E, 5661718N |

**Table 2 Location of additional sites inspected and reasons these were not surveyed**

| Site | Location | Reason for not surveying |
|---|---|---|
| Heruheru Stream (above waterfall) | 1949400E, 5671875N | Heavily overgrown |
| Kiwi Stream | 1953300E, 5669725N | Appears high quality but inaccessible due to sheer cliffs |
| Mangapora Stream | 1956775E, 5667275N | Inaccessible, very steep bed rock channel and low value |
| Mangapikopiko Stream | 1956875E, 5669275N | Very low flow and heavily overgrown |

## Results

The first survey day coincided with clearing weather and then sunny conditions which subsequently prevailed over the remaining two survey days. The main river was low and clearing and the tributaries settled and clear. Of note a significant fresh (121.2 cumecs at McVicars Bridge) had previously occurred on the 18th April 2014.

The physical parameters measured at each location at the time of survey using a calibrated YSI Pro2030 meter are shown in table 3.

**Table 3 Dissolved oxygen (mg/l and % saturation), conductivity (uS/cm) and water temperature ($C^{o}$) for the survey locations in the lower Mohaka catchment 29th April to 1st May 2014**

| Location | Dissolved oxygen (mg/l) | Dissolved oxygen (% saturation) | Conductivity (uS/cm) | Water temperature ($C^{o}$) |
|---|---|---|---|---|
| Pohokura Rd | 10.64 | 100.2 | 219.9 | 11.4 |
| Mangapuru Stream | 10.96 | 101.9 | 174.3 | 11.4 |
| Willowflat (main-stem) | 11.46 | 106.1 | 76.4 | 11.3 |
| Kakariki Stream | 11.18 | 101.3 | 212.8 | 9.2 |
| Mangawharangi Stream | 10.68* | 96.9 | 131.4 | 10.1 |
| Mangaturanga Stream | 12.60* | 115.1 | 144.2 | 10.9 |
| Kaka Stream | 10.88 | 102.1 | 366.5 | 12.5 |

* The meter was displaying instability and these measurements may potentially be incorrect

Pohokura Road

This small stream drains out of farmland and is lined with watercress in the lower part, with fine silt in the quieter areas and cobbles and boulders where the fall is greater. A short distance from the confluence with the Mohaka River the stream flows under Pohokura Road and the rise up to the culvert is likely impassable to many fish species. However a single rainbow trout and both species of eel were caught above this point. Above the culvert there is only a short length of stream before a series of low falls accentuated by debris blockages, and a major waterfall occurs one kilometre above this again.

**Downstream of the road culvert**

The list of the number and size of each fish species caught is provided in table 4. Note that eels were classified as (T)iny (<100mm long), (S)mall (101 – 300mm), (M)edium (301m – 500mm) or (L)arge (>500mm).

**Table 4 Details of the number and size of fish species caught at the Pohokura Road site (EFM set at 100 volts, 15 minutes actual fishing time, 160m of stream channel fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Unid. eel | 1 S, 2 M | | | | |
| Shortfin eel | 2 S, 4 M, 1 L | | | | |
| Longfin eel | 1 M, 2 L | | 650 | | |
| Bluegill bully | | | | | |
| Cran's bully | | | | | |
| Common bully | 1 | | 50 | | |
| Redfin bully | | | | | |
| Brown trout | 3 | 112 | 138 | 123 | |
| Rainbow trout | 3 | 84 | 158 | 120 | |
| Unid. trout | 2 | | | | |
| Koura | 4 | | | | |

**Debris jams occur a short distance above the culvert**

Mangapuru Stream

This steep and incised stream flows out of an established forestry plantation. It is of high gradient and unstable over the surveyed reach, comprising lots of very small pools interspersed with papa cobbles and rocks. In the quieter areas there is significant fine sediment and the bed is highly embedded. There are also several papa bedrock shutes and falls and the stream falls over a bedrock shute approximately 25 metres high to enter the Mohaka River.

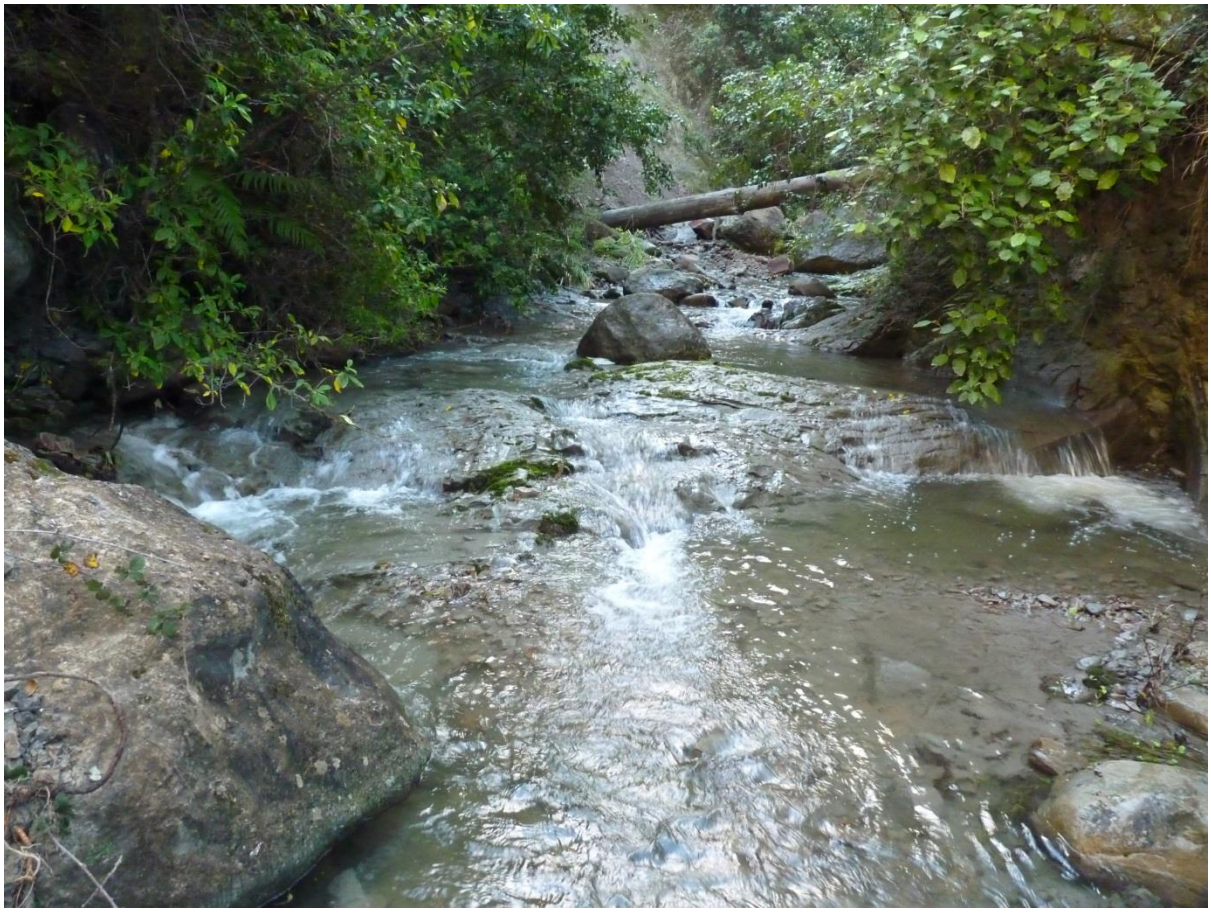
**The Mangapuru Stream enters the Mohaka River over a waterfall and then across this papa sill**

The electric fishing results (table 5) indicate that this fall is passable to some eels though the very low incidence suggests it is on the limit of their climbing abilities.

**Table 5 Details of the number and size of fish species caught at in the Mangapuru Stream (EFM set at 200 volts, 10 minutes actual fishing time, 150m of stream channel fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Unid. eel | 1 | | | | |
| Shortfin eel | 1 S | | | | |
| | | | | | |

**The Mangapuru Stream a short distance above the waterfall**



Willowflat (main-stem of the Mohaka River)

This is a high gradient site characterised by papa sills and occasional large boulders and sedimentary cobbles. In the quieter areas there is significant fine silt which creates a highly embedded bed except for some very soft areas along the edge.

The catch (table 6) was sparse, dominated by bullies although two torrentfish were also caught.

**Table 6 Details of the number and size of fish species caught at Willowflat (EFM set at 100 volts, 16 minutes actual fishing time, 430m of stream edge fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Unid. eel | | | | | |
| Shortfin eel | | | | | |
| Longfin eel | | | | | |
| Bluegill bully | 1 | | 58 | | |
| Cran's bully | | | | | |
| Common bully | 12 | 30 | 66 | 38 | |
| Redfin bully | 3 | 60 | 72 | 66 | |
| Torrentfish | 2 | 64 | 82 | 73 | |
| | | | | | |

**Mohaka River at Willow Flat**

Kakariki Stream

This stream is deeply incised and surrounded by farmland though the river trench itself is shrub and forest covered. Unlike many other streams there is no fall near the confluence or other impediment to fish migration though a major fall occurs approximately 3.5km upstream. The stream within the surveyed reach is of moderate gradient and comprises papa bedrock sills with some sedimentary cobbles and boulders and fine silt out of the flow and along the banks. There are also small amounts of water cress along the edges.

**The Kakariki Stream immediately upstream of the confluence with the Mohaka River**

A diverse fish fauna was captured (table 7) though most species occurred in only low numbers.

**Table 7 Details of the number and size of fish species caught in the Kakariki Stream (EFM set at 100 volts, 20 minutes actual fishing time, 280m of stream channel fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Unid. eel | 2 E, 1 S | | | | |
| Shortfin eel | 1 | | 80 | | |
| Inanga | 1 | | 78 | | |
| Bluegill bully | 1 | | 70 | | |
| Cran's bully | 39 | 42 | 70 | 58 | |
| Common bully | 5 | 40 | 87 | 66 | |
| Brown trout | 3 | 152 | 160 | 155 | |
| Rainbow trout | 3 | 109 | 181 | 153 | |
| Torrentfish | 1 | | 54 | | |

**Hard papa sills are a feature of parts of the Kakariki Stream**

**Other areas of the lower Kakariki Stream provide diverse habitat**

Mangaturanga Stream

An incised stream of low gradient in the lower reaches with extensive pools lined with papa bedrock and a gravel and cobble bed with occasional boulders. There is a lot of fine sediment and the bed is embedded, with occasional silt patches along the shallow edges and small areas of watercress. The catchment is steep sided with native shrubs, weeds and willows.

**Mangaturanga Stream**

The deeper slow moving pools were difficult to fish effectively nevertheless a diverse assemblage of species was recorded (table 8).

**Table 8 Details of the number and size of fish species caught in the Mangaturanga Stream (EFM set at 200 volts, 20 minutes actual fishing time, 180m of stream channel fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Unid. eel | 5 S, 3 M | | | | |
| Shortfin eel | 4 T, 6 S, 2 M | | | | |
| Longfin eel | 3 S, 2 M, 2 L | | 750 | | |
| Inanga | 1 | | 58 | | |
| Redfin bully | 2 | 70 | 74 | 72 | |
| Cran's bully | 3 | 60 | 72 | 67 | |
| Common bully | 13 | 54 | 100 | 72 | |
| Unid. bully | 8 | | | | |
| Brown trout | 1 | | 138 | | |
| Rainbow trout | 1 | | 148 | | |
| Torrentfish | 3 | 54 | 116 | 85 | |
| Shrimp | Occasional | | | | |

Mangawharangi Stream

This is a low gradient stream flowing over a hard bed rock sill with occasional sedimentary boulders. There are limited gravels but extensive undercut banks and some in-stream woody debris. A weir just above the Putere Road Bridge backs the flow up for many metres and there is an extensive deposit of fine silt through this section. This weir is probably impassable to all except climbing fish species, however a short distance below the bridge the stream falls approximately 150 metres to the Mohaka River below. While a single very large longfin eel was caught the lack of any small eels suggests that for all practical purposes this section prevents fish and eels entering the stream.

**Table 9 Details of the number and size of fish species caught in the Mangawharangi Stream (EFM set at 100 volts, 19 minutes actual fishing time, 320m of stream channel fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Koura | 3 | | | | |
| Longfin eel | 1 L | | > 1 M | | |

* a small green frog was also caught in the stream

**Mangawharangi Stream above the impact of the weir**

**The weir backs the water up and has caused an extensive deposition of fine silt upstream**

**A single very large longfin was caught. Whether it managed to negotiate the falls downstream or was previously released here is unknown.**

Kaka Stream

This stream within the survey reach is highly entrenched, of low to moderate gradient and comprises shallow riffles and pools. It provides unrestricted passage from the Mohaka River and drains from farmland, the steep banks covered in toitoi, weeds including gorse and wilding pines. The bed comprises largely gravels and cobbles with extensive areas of water cress in what is often very shallow water (< 100mm deep). These areas of water cress held significant numbers of large inanga (table 10). Similarly small numbers of large smelt were obvious in many of the deeper pools.

**Table 10 Details of the number and size of fish species caught in the Kaka Stream (EFM set at 100 volts, 20 minutes actual fishing time, 240m of stream channel fished)**

| Species | Number | Minimum length (mm) | Maximum length (mm) | Average length (no. measured) | Comments |
|---|---|---|---|---|---|
| Unid. eel | 13 T, 3 S, 4 M | | | | |
| Shortfin eel | 3 T, 14 S, 15 M | | | | |
| Longfin eel | | | | | |
| Inanga | 17 | 64 | 96 | 81 | |
| Smelt | 11 | | | | |
| Common bully | 13 | 34 | 72 | 43 | |
| Unid. bully | 3 | | | | |
| Brown trout | 4 | 100 | 205 | 141 | |
| Rainbow trout | 2 | 112 | 320 | | Excellent condition |
| Unid. trout | 1 | | | | |
| Shrimp | Occasional | | | | |

**Kaka Stream just upstream from the confluence with the Mohaka River and below Mohaka Coach Road bridge.**

**The water cress along the stream margins was extensively used by inanga**

## Discussion

The lower Mohaka main-stem is deeply incised within steep to sheer cliffs along much of its length. From our limited inspection the bed has significant areas of smooth papa bedrock with limited undercut banks or in-stream debris, along with high sediment loads which clog the spaces between any rocks. As a consequence habitat values appear low, consistent with which were the low fish numbers and diversity at the one site fished at Willowflat. The key value of the lower Mohaka River is therefore likely as a corridor to the high quality habitats upstream and in some of the tributary streams for the many species of fish which also spend part of their lifecycle in the sea (diadromous). Diadromous species encountered in the catchment in this survey included bluegilled (*G. Hubbsi*) , redfin (*G. huttoni*) and common (*G. cotidianus*) bullies, torrentfish (*Cheimarrichthys fosteri*), inanga (*Galaxias maculatus*), common smelt (Retropinna retropinna), shortfin (*A. australis*) and longfin (*A. dieffenbachii*) eels.

The surrounding land is often several hundred metres higher and many of the inflowing tributaries 'fall' off these hills into the Mohaka River. As a consequence the tributaries are often characterised by steep papa bedrock shutes or waterfalls at their confluence or a short distance upstream. These features prevent access by less vigorous species such as inanga and bully species and depending on their magnitude are impassable to even the most energetic climbing species such as eel elver. For example only a very few eels were detected in the Mangapuru Stream above a 25m papa fall and one in the Mangawharangi Stream. Most tributaries below the Te Hoe confluence are affected by falls at or close to their confluence with the Mohaka main-stem which severely limits their value to the freshwater fishery.

By contrast several streams do have unrestricted access for at least for some kilometres upstream. Given the paucity of such streams then these streams assume greater significance for the freshwater fishery in the Mohaka River.

Such streams fished in this survey include;

1. **Kakariki Stream** Of moderate gradient and diverse habitat (though with significant areas of smooth papa bedrock) the fish fauna in the survey reach was dominated by cran's bully (*Gobiomorphus basalis*) which is a non-migratory species. However inanga, bluegill and common bullies, torrentfish and shortfin eels were also recorded along with both rainbow and brown trout. Given the nature of the habitat it is also possible that a more extensive survey upstream might reveal two other whitebait species in banded kokopu (*Galaxias fasciatus*) and koaro (*Galaxias brevipinnis*)
2. **Mangaturanga Stream** Of reasonably low gradient and with more pools and in-stream debris than some other tributaries this stream has a diverse fish assemblage and in particular reasonable numbers of longfin eels, some of large size.
3. **Kaka Stream** Close to the sea and shallow, of relatively low gradient with lots of in-stream vegetation, this stream was particularly important for inanga, smelt and shortfin eels. Potentially it may also be important for longfin eels which may migrate further upstream and so not show in this survey which was undertaken close to the confluence.

In terms of efforts to improve the Mohaka fishery then focusing initial restoration or enhancement efforts on one or more of these streams would appear a sound approach. By and large these streams

are incised and farming and forestry activities are back from the escapement. From what we observed issues revolve around keeping stock out, control of goats within the stream corridor, control of plant pests and in particular wilding pines which destabilise the banks when they fall creating sediment sources and potential debris blockages, and identifying and removing existing barriers to migration.

As a first step confirming the fish species and quantifying the extent of potential habitat upstream, along with any adverse impacts or threats to the stream would enable prioritisation of any future work.

Also potentially important streams not included in this survey but which we became aware of include;

4. Lower reaches of Anticline Creek downstream of the Pohokura Road site
5. Heruheru Stream downstream of the waterfall (probably best accessed from Kakariki Pit Road)
6. Kiwi Stream downstream of the Kakariki Stream. Sheer cliffs prevent access into this stream but looking into it the stream appears of high quality and similar to the Kakariki though with more overhanging cover.

These streams are relatively inaccessible and the stream corridor lined in vegetation so in the first instance tend to look after themselves and as such would be a lower priority.

The survey site in the Mangawharangi Stream is within a current restoration project being undertaken by Ngati Pahauwera. In terms of possible actions to improve the stream then removal of the weir which is no longer used as a water intake would enable the silt which has collected upstream to pass through, returning this section to a hard bottom characteristic of this part of the stream. Given the silt is sitting on a solid bottom it will likely mobilise very readily and this work would be best timed to co-incide with a fresh to wash it right through the river. Consideration could also be given to removing the numerous wilding pine trees growing along the banks. As these age they will fall often tearing up the bank and mobilising significant sediment. In addition they may form debris dams in the stream. Once the pines are removed and the light gets in then the blackberry will rapidly take over at this site. In itself blackberry is effective at protecting the banks but for other reasons control maybe necessary until the native shrubs establish themselves.

The falls downstream preclude access by migratory fish species. However the large longfin eel captured in the stream highlights that eels can do well if they reach or are released here. Potentially there is an opportunity here to transfer small eels into the Mangawharangi Stream to either support a managed harvest and/or if they can survive passage back downstream to contribute to the wider spawning population. This survival (and opportunities to assist eels to climb up) will be dependent on the exact nature of the falls which is unknown at this stage.

The presence of a small number of eels above the 25m high bedrock shute on the Mangapuru Stream highlights their climbing ability and raises the potential to assist eels to climb over similar obstacles. Potentially a trial to enhance an upstream eel population could be considered using mussel ropes or the like laid down a suitable papa shute to provide an improved climbing surface.

On an initial observation the Mangapuru Stream would be a suitable trial site with secluded but ready access though it is not known how far upstream the eels can continue on.

**Wilding pine trees are relatively short-lived and when they fall destabilise the banks and often create debris blockages**

## Summary

The incised nature of the lower Mohaka catchment means the tributary streams and mainstem are relatively protected and unmodified. However the papa catchment provides significant sediment and combined with the numerous falls this limits the quality of the native fishery in many streams. As a consequence those few streams with unrestricted access from the Mohaka River assume high importance for the native fisheries.

## Acknowledgements

Technically Trout would like to acknowledge the valued assistance and welcome company of Dan Fake and also thoughtful discussion provided by staff of HBRC.