Whangarahi River Survey
Coromandel 2008

"Towards Streams for Fish Passage"

Whakanekeneke stream

Eben Wilson

Whangarahi River Survey
Coromandel 2008

Towards Streams for Fish Passage

Eben Wilson

Manu Waiata Restoration & Protection Society
2009

National library of New Zealand
Cataloguing-in-Publication data.
Whangarahi River Survey Coromandel 2008. Towards Streams for Fish Passage.
Includes maps, photographs, and appendix.
ISBN 978-0-473-15188-1(Spiral bound)
ISBN 978-0-473-15189-8(CD)

Contents: Coromandel natural environment – Stream habitat and biodiversity – Fish passage – Landowner education and involvement. I. Wilson, Eben John. II. Manu Waiata Restoration & Protection Society, Wyuna Bay, Coromandel 3581.

Text and photographs by Eben Wilson, 2008, 2009.

Cover photo: Whakanekeneke (Buffalo Creek) in the vicinity of the stamper battery, in the foothills of the Coromandel range.

CONTENTS

FOREWORD

Colonial settlers described shoals of inanga, miles in length, travelling downstream to spawn at the mouths of rivers. Elvers, which migrate in from the sea in spring, were observed in colossal numbers, coming upstream in shoals for hours without ending. This project has enlisted the help of landowners in keeping abundant native fish in our streams.

Habitat is the basis for biodiversity. Where ever we can provide good quality habitat, in sufficient area, free from alien predators and pollution, native biodiversity will thrive. While local body planning ensures that human settlement prospers, we must be aware that we have spread human occupation so far into wildlife habitat that from now on we will need to re-design our settlements so that wildlife can prosper alongside us.

Coromandel town has been built on the flood plain of the Whangarahi river. Forest that held the banks fast and shaded the water, maintaining equitable temperatures and providing insect fall to feed native fish, has been replaced by mown grass, flower gardens, and deciduous orchard trees. Streams have been incorporated into the town's storm water system with the result that chemicals and effluents are held in the mud where fish forage and breed. Stream banks where fish foraged and hid have been armoured with rocks and retaining walls. The main road intersects the tributary streams flowing from the Coromandel – Colville range, so that carelessly designed culverts, fords, and dams impede the passage of fish. The project has assessed the state of Coromandel streams and found ways to provide for wildlife to thrive in the midst of urban settlement.

The Society's work is given force by the Hauraki Gulf Marine Park Act 2000, whereby local bodies must ensure that their management protects, and where appropriate enhances, the life-supporting capacity of the gulf's catchments (s7, s8). The Resource Management Act 1991 protects the natural character of streams and their margins (s6), and the Freshwater Fisheries Regulations 1983 make it unlawful for structures in stream beds to impede the passage of native fish (Reg. 42).

Waikato Regional Council provided a grant of 5000 dollars for the project from the Environmental Initiatives Fund. We trust you will find your rates have been well spent.

Wendy Pond, Secretary, Manu Waiata Restoration & Protection Society.

INTRODUCTION

The main drive for this survey being conducted by Manu Waiata is a love for, and the need to preserve our native fish. Once native freshwater fish were a major component of New Zealand wildlife. They occupied every waterway in the land in their billions. Every waterway down to the tiniest stream felt their presence. With many species traveling hundreds of kilometers upstream from the sea, the entire land was teeming with them right into the interior. Wetlands in the heart of the islands were full of these fish. The mountain ranges were full of these fish, right up into the headwaters. Some species have evolved to prefer traveling from the sea towards the tiny ephemeral streams high in bush clad ranges, where they live in mossy fern clad spring fed pools.

Because these fish are migratory and must travel to and from the sea, it is very important that the veins of our waterways are kept open and healthy for safe travel, for these fish to survive. Every season like a huge in breath and out breath, native fish travel deeply inland and then the currents take their spawn back out to sea again. The maori called these fish messengers from Tangaroa to Papatuanuku (God of the sea to Mother Earth), so that via the waterways a special relationship was shared.

Sadly our freshwater fish numbers are in decline. This is all because of a loss of habitat. The fish are losing the places along their route that they need to spawn. So many of their waterway highways are no longer passable because they are blocked by man made structures. Just by ensuring all our culverts are passable for the fish we could increase the habitat available to them many many times over. We also need to protect our wetland environments and estuaries where they breed and make their homes.

The intention of this survey is to detail all of the impediments to fish passage that exist in our own local area so that we can attempt to at least have healthy freshwater fish populations close to home in Coromandel. We have done this with some basic assumptions in mind. One basic assumptions is that *all streams matter*. We didn't leave any streams in the Whangarahi complex out of our survey. Protecting only some of the streams in a catchment has incredibly less impact in terms of health, compared to a more thorough protection offered. It is like only half cleaning a house. This is especially true in the light of the fact that many fish travel towards the smaller streams in a catchment and use the mainstem rivers as only a means of getting to these smaller streams. Many streams begin in the Coromandel ranges as beautiful strong flowing streams in idyllic bush only to take on the appearance of common

drains when they pass through the Coromandel township urban settlement. Most people are simply unaware that these drains have a beautiful source in the bush, or that, what now seems to be a drain was once a healthy flowing stream and has remained a pathway for native fish. It may be unrealistic to expect that these drains be restored completely to their original character, but there is a lot we can do for them with native planting, culvert restoration and avoiding the use of poisons to ensure safe fish passage and to restore them to health and vitality.

Another basic tenet is that all tree cover is useful. Even if only small sections of river can be planted at a time, any amount of trees improves the fish habitat of the river. Each single tree provides more food and more shade. While it is true that small amounts of trees don't change the basic temperature of the water, the brief shade they bring is a welcome relief as the fish like to be able to hide. They appreciate shadows and like being able to escape direct sunlight. As I conducted the survey I was clearly able to sense the difference in the health of streams where even single old trees overhung the water. Also even lots of small plantings of trees by a landowner could help encourage other landowners to get on board.

Throughout the survey it was found that a large number of confluences were in need of rehabilitation. Confluences were known to maori as hot spots of ecological importance. They serve as major junctures in determining the passage of a native fish. The report gives particular importance to confluences and their rehabilitation. Many were found to be bare of trees and in poor condition.

BASIC AIMS OF THE SURVEY.

- The first aim of the survey is to supply information to local bodies. To deliver a complete picture of the Whangarahi river system. A complete picture of the state of health dealing with all relevant details including all tributaries large and small. Until now there hasn't been a complete survey of the river system describing the habitat and assessing it in relation to fish passage. (Environment Waikato has made a survery of culverts that pass under roads.)

- The second aim of the survey is to educate the community. By doing this survey as a member of the community I myself have gained a comprehensive knowledge of the river system. I can now use this knowledge to educate others in the community.
  The report can now be shown to people in the community giving them knowledge of the state of the ecology in their own back yard. With this knowledge a community can be inspired to take action into their own hands to ensure that their waterways are maintained at optimum health.

- The third main aim of the survey is to inform landowners, who own properties next to streams and rivers of the Whangarahi complex, of their options in terms of what they can do to maximise the health of the waterways they live next to. Steps were taken along route during the survey to inform landowners of the schemes in place provided by the council to aid them in creating more health in their waterways. Landowners were introduced to the Clean Streams project and the Peninsula Project. Each landowner was approached carefully with respect, with the aim of getting a picture of how willing they were to allow rehabilitation of their river banks. Some who have shown willingness have still to be connected to the free or subsidised planting available to them, which is being eked out. It is hoped that the council will use the information gathered in this report to follow up on all the willing landowners who are keen to partake in planting their stream banks and who are eligible for such funding as river works can provide in subsequent funding rounds.

RECOMMENDATIONS.

The recommendations are all to create better habitat for the health of the fish life.
The recommendations of this survey tend to come back to four basic elements.

- **TREE COVER**
  Tree cover constitutes the major part of healthy fish habitat. Tree cover creates biodiversity, creating healthy soil life, insect and bird life. This has the follow on effect of providing the food which native fish need. Trees also provide shade which produces the water temperature that the fish prefer. Correct water temperature keeps the state of the in-stream habitat in correct balance. When water is too warm it allows a different eco-system to develop which doesn't suit native fish such as slime build up. Native fish like to be able to hide and take refuge in shade and bank cover. Trees create the type of bank structure that the fish like. The roots create natural pockets in the form of ledges and holes that are perfect for fish to hide in during their passage.
  This type of shade refuge is an essential part of the habitat required for freshwater crayfish.
  Shade is important in the headwaters of a stream. Sediment generated from erosion and warm water in the headwaters can travel the length of a stream all the way to the harbour.
  It is recommended that landowners are encouraged to participate in stream restoration. A community native tree nursery could be established. Although riparian replanting can be achieved through such projects as river works, there is a shortfall of funding.

- **NATIVE GRASSES**
  Another basic recommendation is the planting of native grasses for inanga and other fish species that spawn on the banks. The survey has a list of incidences where planting of native grasses is recommended in places where it is both suitable and possible. Obviously if inanga don't have the habitat to breed, then they wont exist in our waterways. Inanga are the favourite whitebait. The whitebait catch is an important food source and increasing its population is a public good as well as being ecologically healthy.

- **CLEAR PASSAGE.**
  A common recommendation given in the report is in regard to clear fish passage. The survey lists all the obstructions to fish passage in the river system. In each case a recommendation to remedy the situation is given. A separate additional section lists all these obstacles and plots their position. Good river habitat is of no use if the fish cannot have access to it.

It is recommended that resources be found to help landowners re-site their culverts or replace them with bridges. A single disjunct culvert can cause an entire stream to be unavailable to native fish (eels excepted).

- **CLEAN WATER.**
  The other basic concern is pure water. Freshwater crayfish absolutely require pure water. All native fish need the right chemical balance to flourish. There are several recommendations in regard to pollution.

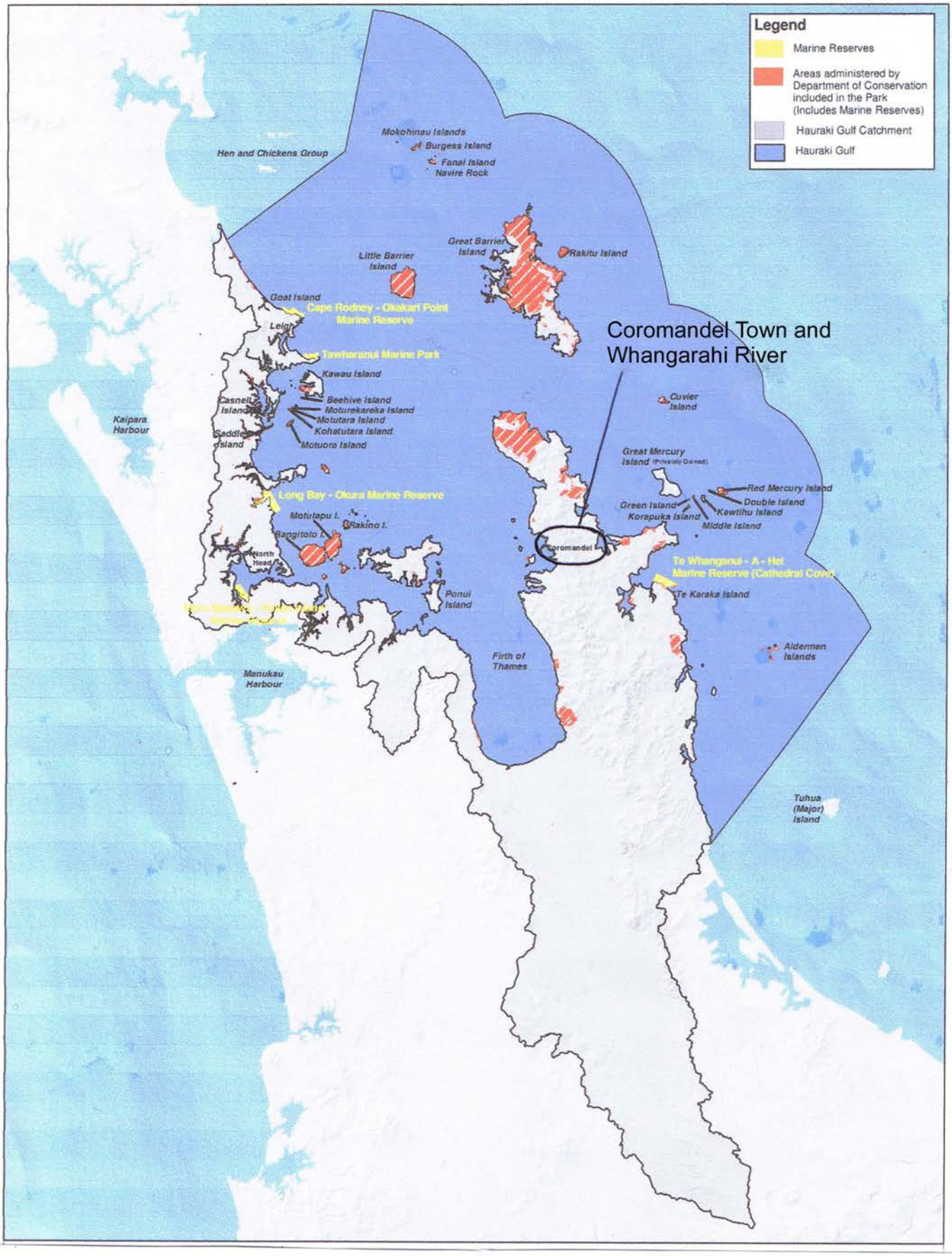
In time it is hoped that with the information the report provides, these recommendations can be carried out, speeding up the attainment of healthy waterways for the Coromandel township.

DEVOPMENT OF COMMUNITY PRIDE.

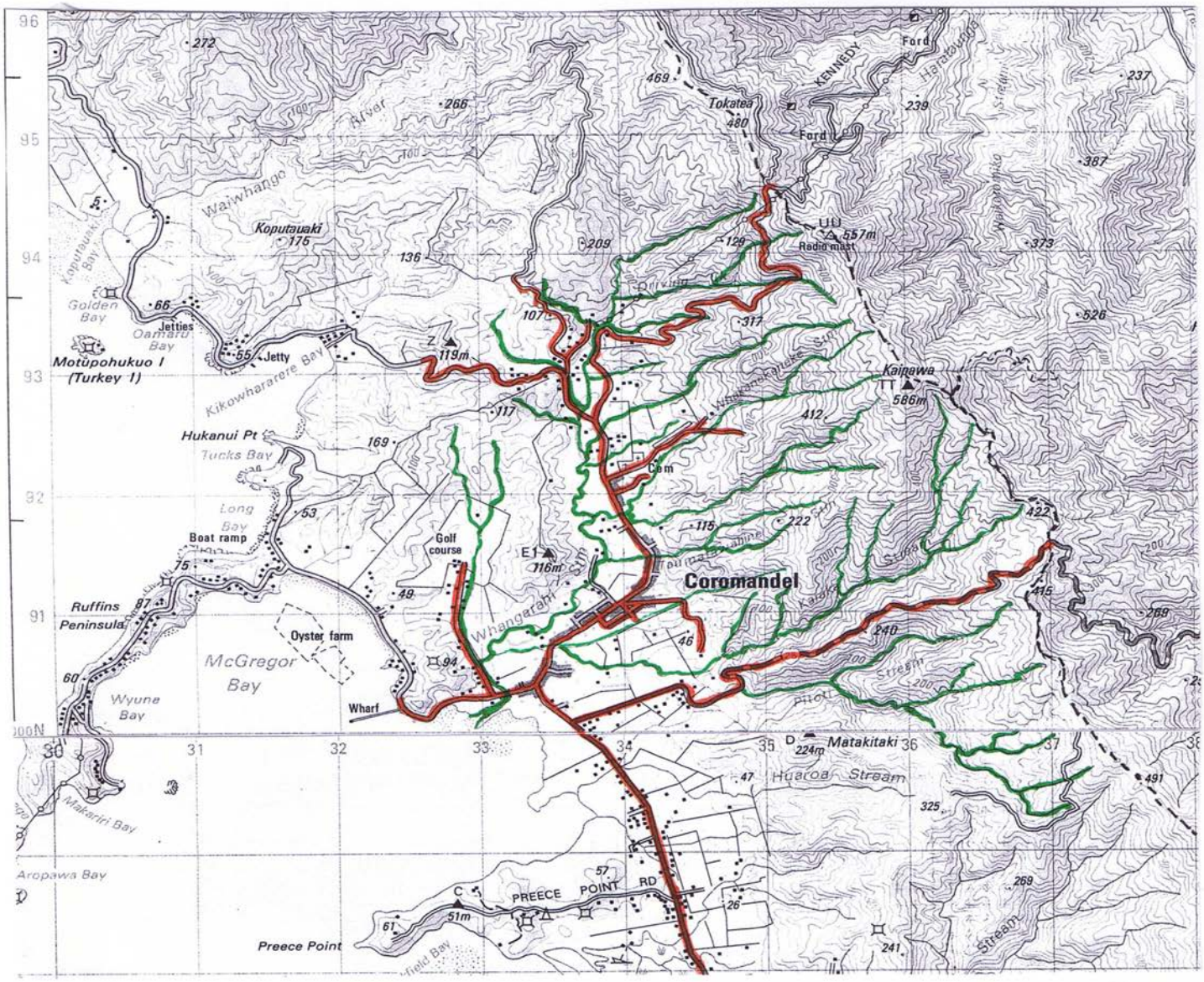
If we could achieve maximum health for the waterways of the Coromandel township with community knowledge and participation, a sense of pride could develop within the community for the abundance of native fish in the in-town waterways. Such an example could be a show case for the country and indeed the world. A feature could be made of it. Articles could be run in the local papers. Signs designed for educational use could be erected informing of the special nature of the waterways and of the existence of spawning grounds. This can be done in conjunction with new local walkways (with bridges) that are being planned and created at the moment.

NUKUMEA. A PAST MANU WAIATA INITIATIVE.

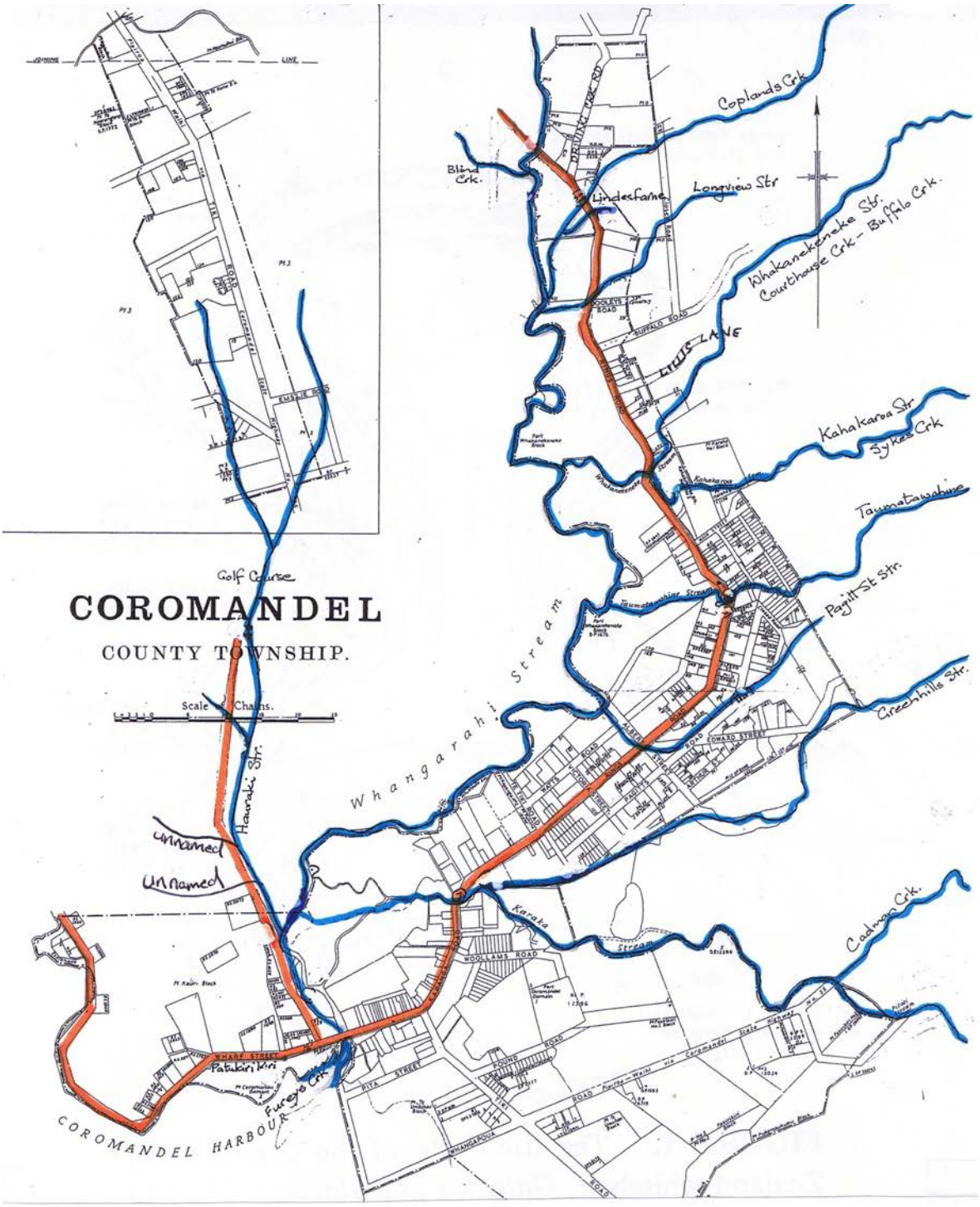
In the Rodney district in Orewa, Manu Waiata carried out a similar survey to this survey documenting obstacles and impediments to native fish habitat in the Nukumea stream complex. It was found to be the home of Giant Kokopu. The Auckland Regional Council is now removing all obstacles along the length of the Nukumea stream!



Map 1. Location of Coromandel town and the Whangarahi river system in the Hauraki Gulf Marine Park



Map 2. Topographic plan of the Whangarahi river system (175 degrees 30` East, 36 degrees 45` South).



Map 3. Cadastral plan of Coromandel town and the Whangarahi river

STREAMS OF THE WHANGARAHI RIVER COMPLEX.

The survey begins at the mouth of the Whangarahi mother stream, travels upstream to the most northerly headwaters in the Coromandel range, and then returns to the tributaries, following each stream through urban settlement into its forested headwaters. All tributaries are spring-fed.

The tributaries that flow into the Whangarahi river from its west bank have their source in low hills and are generally small creeks and "drains", often with mud bottoms. The rocky tributaries along the east bank flow from Te Paeroa, the forested Coromandel range, with force. These are the scenic streams that pass under the main road through historic bricked culverts and bridges.

The Whangarahi mainstem changes names along its route: Fureys creek (estuary) – Kapanga creek (lowland reach through Coromandel town) – Whangarahi river – Driving creek (Top Town reach into the foothills) – Whakaroa creek (headwater source below the Tokatea saddle).

Tributaries from the mouth, traveling upstream.

LB is the true left bank to the east, as for a person traveling downstream from the head of the catchment; RB is the true right bank to the west.

LB TE UMUHAU STREAM.
RB PATUKIRIKIRI CREEK.
LB KAPANGA CREEK.
RB HAURAKI STREAM (flows from the Golf Course)
    RB UNNAMED TRIBUTARY
    RB UNNAMED TRIBUTARY
LB KARAKA STREAM.
    GREENHILLS STREAM (flows from the Greenhills mine)
    CADMAN CREEK (flows from the Cadman mine)
    PETOTE STREAM.
    AITKEN CREEK.
RB HANS CREEK.
LB PAGITT STREET STREAM.
LB TAUMATAWAHINE STREAM.
LB WHAKANEKENEKE STREAM.
    KAHAKAROA STREAM/SYKES CREEK
    COURTHOUSE CREEK/BUFFALO CREEK.
LB LONGVIEW STREAM (flows from the Longview subdivision)

LINDISFARNE CREEK (flows from Lindesfarne)
LB COPLANDS CREEK.
RB BLIND CREEK.
RB UNNAMED TRIBUTARY.
LB UNNAMED TRIBURARY.
RB DRIVING CREEK,
LB MADDERN CREEK.
WHAKAROA CREEK (source of the Whangarahi from the Tokatea saddle)

Inventory of native fish in the Whangarahi river complex

Longfin eel, *Anguilla dieffenbachia*
Shortfin eel, *Anguilla australis*
Whitebait migration:
inanga, *Galaxias maculatus*
banded kokopu, *Glaxias fasciatus*
giant kokopu, *Galaxias argenteus*
koaro, *Galaxias brevipinnis*
[**shortjaw kokopu,** *Galaxias postvectis*]
common smelt, *Retropinna retropinna*
torrentfish, *Cheimarrichathys fosteri*
common bully *Gobiomorphus cotidianus*
redfin bully, *Gobiomorphus huttoni*
giant bully, *Gobiomorphus gobioides*
bluegill bully, *Gobiomorphus hubbsi*
koura (freshwater crayfish), shrimp.

An Australian longfin eel, *Anguilla reinhardtii* has reached Northland & Kaiaua.

The longfin eel is in decline nationally, but Coromandel streams have good numbers.
The giant kokopu is also in decline and there are only four records of its sighting from Coromandel.
The giant bully is found occasionally.
Both koaro and banded kokopu can climb as juveniles and make their way into the forested headwaters.
Banded kokopu are the “tangata whenua” of the Coromandel peninsula, meaning that this is the peninsula’s most numerous species, and that they are more abundant in kauri gumlands than anywhere else in the country.

Walking the Whangarahi
from the sea to the headwaters.

Features of importance relevant to fish passage progressing upstream from the mouth.

Coromandel harbour (the mouth of the Whangarahi).

The Whangarahi mouth at high tide with no mudflats visible.

The Whangarahi stream flows out into Coromandel harbour through a mangrove channel. At low tide, the fresh water flow meanders through a wide stretch of mudflats beyond the mangroves for half a kilometer. The channel is navigable at high tide.

TRUE LEFT BANK**.** At the mouth of the Whangarahi where the mangroves finish coming upstream, there is a short distance of steep bank with eroding clay, with kikuyu tumbling over the edge.
Recommendation: the small area of bank which is eroding with kakuyu grass be planted with trees to provide cover and stop erosion.

Te Umuhau stream **("Pita's creek")** A creek runs into the estuary from the true left bank. It has a drain-like character. It could perhaps be contested that Te Umuhau is not worthy of " stream status", however it is depicted as "stream" on Survey Plan

1649 dated 1869; in Hoyte's painting ca 1870; and on Survey Plan 1786 dated 1897. Inland from the confluence, the stream has been reconfigured as a ditch, but it still retains its fork as recorded on Plan 1786, and had a good flow in June 2008.

In 2008 landowners built a retaining wall at the confluence of the stream. There is a net loss of inanga spawning habitat at the mouth of the "Te Umuhau" stream.

Landing Reserve. The land on the south bank is zoned industrial. The owners of Strongman Marine have reclaimed their legal land area by building a retaining wall along the river bank into what would be the natural high tide mark.
Dredging by the Coromandel Harbour and Boating Association has deepened the channel along the retaining wall so that boats can tie up alongside. This was the Tauranga Waka /Landing Reserve protected by Te Ara Kuri and F Woollams in the 1897 survey (Plan 1786 South Auckland), which no longer exists due to these works. Public access along the margin has been fenced off.

Until around 1980, local fishermen netted large schools of small fish in the channel alongside the Landing Reserve.

TRUE RIGHT BANK. Mangroves are currently established along the harbour edge. The right bank has been reclaimed, and the sea's margin is formed by a steep bank of compacted fill. Side channels have been excavated through the mangroves for individual boat jetties, wooden walkways, and docking.

Coromandel Harbour and Boating Association Inc formed in 1989 and holds a lease from TCDC over the reclaimed hard stand area where there is a boat ramp used by tractors and machines driving in and out of the water. The Association funded the dredging of the Fureys Creek channel.

There is no provision for inanga spawning ground under the present land configuration and use. At low tide, the deepest part of the channel holds a dark, smudgy stain.

“Patukirikiri creek”. The creek is depicted in Hoyte’s painting ca 1870. In 2008 an overgrown tidal drain empties into the harbour from the area of the carpark. It has a culvert with a shut lid. Crabs and small fish were observed. Upstream, the drain passes under Wharf road towards the old sea cliffs.

Patukirikiri creek with shut lid.

Recommendations for maintaining life supporting capacity for wildlife

1. Industrial and recreational use of the estuarine river mouth occupies a large part of the area where inanga would have spawned. Inanga spawn in the lower esturine reaches of rivers, within the tidal zone.

Recommendation: The first step is to select areas where it is possible for restoration of inganga spawning within this zone to create habitat; reshape, stabilize, and plant banks; then mark with signs to reserve the area.

The co-operation of adjacent landowners will be needed. This provision needs to be made before any further development of the boat haulage and industrial land occurs.

Recommendation: Occupation of the “Te Umuhau” stream margin to be investigated. The retaining wall has displaced inanga spawning habitat. It is appreciated that making changes to the retaining wall is a huge undertaking, so perhaps the best remedy is to create as much new habitat as possible, such as planting some tree cover on the Te Umuhau where possible and native grasses suited to inanga spawning where possible.

Retaining walls at Te Umuhau mouth.

2. The forested Coromandel ranges provide high value habitat. Access to them via the many streams behind coromandel town is via the bottle neck entrance of the Whangarahi only. It is the only entrance for large numbers of native fish and eels migrating in and out of the river complex. Oil, diesel, lack of cover, noisy machinery, and night-time activity and lighting are impediments to safe fish passage.
Recommendation: Enquire into appropriate conditions on industrial and maritime activity where possible (Especially at spawing and migration times). This would be in accordance with legislation protecting water quality and significant habitat of native fauna. (Respectful consultation and questioning works much better than ultimatums and orders! It is sometimes amazing how the most unlikely people come around in this way!).

3. Along the sea margins there has been spraying of weeds, particularly gorse. This leaves a margin of dead vegetation, and strips the banks of their potential for native regrowth providing stable cover.
Recommendation: Reshape and plant the seaward bank of the Patukirikiri reclamation. This also means expensive spraying is no longer required.
Include rubbish removal from the mangroves in public works.
Erect educational signs with pictures to spread awareness of native fish present in the area and to encourage care to be taken.

TRUE LEFT BANK.
Kapanga Creek This short creek is estuarine, tidal, and silted. Landowners have cleared the mangroves. There are bullies in low tide pools. The banks are grassed.
Recommendation: Revegetate the banks with appropriate grasses for inanga spawning habitat under the Peninsula Project or Clean Streams Project. Native grasses could be

used as a substitute for mangroves so as not to aggravate the neigbouring landowner. There is a severe shortage of coastal swamp for native fish. Planting raupo and creating wetland could be investigated.

LANDOWNER. DoC. Steep, neglected river bank with virtually no tree cover. Small block of parkland, largely in grass. MW has spoken to the landowner, who is agreeable to riparian restoration. A request has been made to DoC and the Peninsula Project for Manu Waiata to trial spray-free maintenance of new planting.
Recommendation: Riparian planting and reforestation as a public park. Include also native grasses for inanga spawning habitat.
Zoned for Peninsula Project restoration.

LANDOWNER John Hunter. Steep, neglected river bank. MW has spoken to the landowner, who is agreeable to riparian restoration. He would particularly like pohutukawa. This landowner has been controlling rampant weeds on DoC land.
Recommendation: Plant trees and native grasses on riparian margin. Include native grasses for inanga spawing habitat.
Zoned for Peninsula Project restoration.

LANDOWNER Niel Wood. Steep, neglected river bank. Landowner has already done some very nice planting along some parts of the bank, including pohutukawa, puriri, cabbage trees and other natives.
MW has spoken to the landowner, who is agreeable to riparian restoration. He would like low trees or trees in groves so as not to effect his afternoon sun. Wind and frost make establishing trees difficult. Kowhai have been knocked over by the wind. The landowner suggests using frost covers. He welcomes free plants and working with nature.
The land floods.
Recommendation: The riparian margin particularly along the river side of a wattle hedge, which runs for aproximately 50m is in need of planting with natives for effective shade cover and fish habitat. Include native grasses for inanga spawning habitat.
Zoned for Peninsula Project restoration..

LANDOWNER DoC. Another small parcel of DoC. Land. Steep, neglected river bank in grass and gorse. Small block. MW has spoken to the landowner, who is agreeable to riparian restoration. EW may have planted a small area.
Recommendation: plant with appropriate natives. Include native grasses for inanga spawning habitat. Zoned for Peninsula Project restoration.

LANDOWNER Robert Alexander. Owns the large flood plain. Stony stream bed, recently dredged by EW. River banks low, clay, covered in kikuyu.No trees. Riparian margin is fenced off with electric fences. Doesn't want to interfere with flood management. However he is open to planting if it is O.K with EW. His wife is an entomologist.

Recommendation: Plant trees in the places that don't impose any flood danger,such as on the northern banks. There are many places like this within this property.
Discuss shaping and sloping of the banks to provide a low flood apron.
Include planting native grasses for inanga spawing habitat
Zoned for Peninsula Project restoration.

An example of fenced off riparian margin with great planting potential on Robert Alexanders land.

TRUE RIGHT BANK ALONG HAURAKI ROAD

The outstanding feature of this reach is the complete lack of cover along the river bank. The banks are steep and higher than the opposite bank. Hauraki road has created an unnatural edge. For a very a long way, the banks are covered in kikuyu grass. Kikuyu is unsatisfactory against erosion because the bank behind the over-hanging kikuyu is left bare and erodes easily.

The stream bed has been dredged. There is no native planting along the stream banks, no logs in the stream bed, and no pools and ripple sequences. Gorse along the stream banks is being controlled by spraying which leaves the banks bare. The water is clearer and less esturine. There are no mangroves.

Recommendation: Establish tree cover alongside road edge to provide shade cover, helping keep water cool and provide food, (falling insects) for fish. There is enough room for planting, though it is only a small width. Planting here would be of tremendous value. A respectful consultation with landowners across the road needs to take place.

Discuss shaping and sloping of the banks and formation of some small bays.
Include planting of native grasses for inanga spawning habitat.
Zoned for Peninsula Project restoration.

One of the places for potential planting along Hauraki road.

"Hauraki stream" confluence

The confluence is tidal and a significant site for inanga spawning. However, it is completely exposed to the sun. Below the confluence, a deep pool has formed with algal deposits on the bottom. As the Whangarahi turns away from the road and heads towards the Karaka, the tidal mud disappears.
Recommendation: Plant grasses and trees around the confluence. Planting on this side of the Whangarahi in this location presents no danger for Coromandel town in the case of floods. Include the planting of native grasses for inanga spawing habitat.
Zoned for Peninsula Project restoration.

The Hauraki stream confluence without trees.

TRUE LEFT BANK

Karaka confluence

Here there is a deep pool below the confluence and the first appearance of small rapids. The banks are still very exposed with little stream edge cover for fish. Where there is any growth at all, it is gorse which is sprayed. Brown slimy algal growth is present on stones in stream bed, but the water is clear. The river bed has been dredged and the banks are covered in bare stones. No logs. Bullies.

Recommendation: Plant the confluence with trees to provide shade cover and food for fish. Planting on the true right side of the Karaka's mouth would present no flood danger as it is away from the main force of flow. On the south true left side of the mouth flaxes and other plants that can handle a flooding ,though also provide shade could be planted. Tree cover could also prevent the slime and algae cover on the stream bed as it tends to grow in warm and unshaded water. Also plant grasses for inanga spawning near water's edge.

Zoned for Peninsula Project restoration.

The Karaka confluence with very little tree cover.

Continuing up the Whangarahi mainstream.

The river is developing more rapids, more meanders. On both sides, the banks are fenced off from stock, though there has been no riparian planting. There is an occasional log and occasional willow cover. Brown algae continues. Where flow is slight and shallow, green slime appears. Even the odd willow hanging over a pool drops litter, provides shade, holds the bank, and improves the stream's health.

Recommendation: Plant trees wherever possible to provide shade and food for fish. This is best done on the areas of bank which are away from the main force of the river's flow, and don't come between a potential flood path and the town. (of which there are many).

On the banks which trees could be a potential flood danger for the town, native grasses, flaxes etc. could be planted. Include native grasses for inanga spawning habitat.
Zoned for Peninsula Project restoration.

There is a pipe that crosses the river 100 m above the Karaka confluence. The pipe dams the stream, creating a pool with a good rapid. Probably not an obstacle to fish passage.

TRUE RIGHT BANK
The town's oxidation ponds occupy the flood plain. Stop banks have been constructed to contain overflow from the ponds. A drain with little flow enters from this area. The river bed is rocks, the banks are clay. Inkweed is establishing on islands of stones in the middle of the bed. Shade on banks is only occasional. (willows, kakuyu and Idesia).
Recommendation: Again more planting of trees, especially on this bank as it is away from flood flow.
Potential for establishment of inanga spawning habitat with grasses as we enter the very uppermost reaches of the tidal zone.
Skinks use the kikuyu on the banks for habitat. Please don't spray in this area.

TRUE LEFT BANK The riparian margin is fenced all the way along the left bank past the Retirement village and town properties.
A storm water pipe protrudes from bank.
A stock crossing with electric fences crosses river. The banks are mostly grassed.
Zoned for Peninsula Project restoration. The riparian margin is fenced from stock but very narrow. There has been some recent planting of flax and hebe and small shrubs. Some rewarewa and cabbage trees. Heavy spraying.

There is what seems might be a drain on left bank, not piped. Seepage possibly contains effluent causing buildup of particularly thick slime. (possibly this slime buildup is caused by a lee in the current here)
Recommendation: Investigate the true nature of this drain.

A stock crossing, double fenced with overhead electrified wires.

TRUE RIGHT BANK
Flood plain has ended. Hills descend to the stream edge. There is a reach with native fern cover and native regrowth. A noticeable improvement.

Approaching Te Tiki road, the river bed is wide, the banks are exposed with no trees, sloping, and covered in stones following widening by dredging. There is an extreme amount of erosion in the form of many small rocks and clay.
Single fence, suspended, with electrified wires.
Recommendation: Planting of trees along this length.
Zoned for Peninsula Project restoration. There has been some riparian planting, heavily sprayed.

Te Tiki Road bridge

TRUE LEFT BANK
Houses are close to the river bank. There is little tree cover. Some wattles, some flax, and lawns mown to the river's edge. There is an unused narrow margin that could be planted. In some places there are tall trees too far back to provide cover. There is some shade cover around the Lions Den backpackers, but still there is slime in the river. Where the river has been dredged there is a lot of erosion, stony banks.
Recommendation: And ongoing work for MW, is to talk to these landowners to see if more planting of trees can be achieved.

Narrow stretch of river, then the stream widens. There is no bank habitat in these reaches.

Zoned for Peninsula Project restoration. Planted natives are neglected. The trees are widely spaced. Closely planted trees would be self-maintaining. Especially if they were planted in conjunction with nursery support trees such as tea tree.
Dredging has been followed by erosion. There appears to be an unresolved conflict between the need to maintain the river banks in shaded vegetation to protect water quality, stabilise banks, prevent erosion, provide root-bound banks and overhead canopy for native fish on the one hand, and the dredging with deposition of rocks along the stream margins on the other.
The newly made stony banks could be kept in place by planting, which would also help prevent erosion and re-silting of the stream bottom.

TRUE RIGHT BANK
Opposite the low-lying margin on Kenny Leggins' land, hills run down to the river. The current is now clear and fast flowing, with some deep swimming holes and

rapids. There is no slime on the rocks. Some oily traces were found in clay on the water's edge.

There is a reasonably wide, fenced-off margin, heavily sprayed, planted with widely spaced trees. There is dead gorse, sprayed and willows chopped out, leaving remaining root masses falling into the stream. A short, ramshackle retaining wall has been built by landowners. There are some willows. Where the willows hang over the river dropping leaves, the river seems healthier.
Recommendation: Get planting underway to replace the willows as soon as possible.

"Hans creek". A stream runs down from the forested hillside. In its lower reach it has been reshaped as a drain and recently culverted for a road crossing.
The new culvert is severely disjunct, and the stream banks need re-afforestation. It was probably until recently a good small, stream running freely out of the hillside.
Recommendation: Restore Hans creek. Replace culvert with a bridge.
Zoned for Peninsula Project restoration. EW has planted some of the riparian margin. Ginger has been sprayed by EW.

The severely disjunct culvert at "Hans Creek"

Approaching Albert Street, properties on the high, true right bank are very close to the stream. These houses are subject to flooding and some have been purchased by EW.

TRUE LEFT BANK
LANDOWNER Mr Turner has lived here all his life. He said, "the stream was much narrower in his childhood. The stream has been widened, trees pulled out, the margins replanted, neglected, and turned into a desert."

LANDOWNER Mr Ken Leggins owns the river bank from Te Tiki Road to Albert Street and has riparian rights. This is low flood plain on the river's inner bend, with the old full flow bank set back, under kanuka. It is pretty much all grass on Kenny Leggins' bend. There is no permanent fencing on the left bank. Electric fencing keeps the sheep out. Mr Leggins is quite willing to have a continuous line of trees along the bank, and will do his own weed releasing. He is also willing to provide electric fencing to protect it. At the moment there is very little riparian planting.
Recommendation; Provide Landowner with riparian planting as provided for in the peninsula project.
Zoned for Peninsula Project restoration. EW has poisoned some of Mr Leggins riparian trees without asking him, which has made him wary, however he is very willing.

An example of riparian margin typical on Kenny Leggin's property. Just waiting to be planted.

Pagitt Street stream" confluence at Albert Street.

During 2006 consents were granted to the District Council for the Pagitt Street stream to be piped without provision for fish passage. The culvert outlet is high above the level of the river. The river bank has been protected with riprap and a Gambian basket. No stream bed was formed by the works. During summer, the flow from the "Pagitt Street stream" flows under the riprap and fish passage is precluded.

Peninsula Project river dredging works end here. However, the Peninsula Project riparian planting continues. The objective is thick riparian planting upstream from the Albert St. bridge in order to slow flood flows, in contrast to less planting downstream.

Downstream, the objective is to allow faster release of flood waters by widening the river bed with dredging, and to alleviate flood danger by restricting planting. Upstream in contrast , the objective is to plant as many trees as possible.

Above Albert St bridge

TRUE RIGHT BANK

Just above the bridge there is a lot of space for planting.

A road follows stream for a distance. On the riverside, the road has been stabilized with rocks and large chunks of concrete. Concrete has been poured onto the bank to create home-made retention walls.

The stream is now deeper with stronger flow. Banks are steep and the river cuts deep like a canyon. Water clear. Stretches of no trees. Moving upstream, tree cover increases. Undercut banks are held by tree roots in places, providing cover for native fish. Stretch of many willows, poplars and ginger. Large exotic trees.

Recommendation: Plant trees towards Taumatawahine confluence and along the opposite bank.

Zoned for Peninsula Project restoration

Good space for planting above the Albert st. bridge.

TRUE LEFT BANK

The margin between the fence and the river is very narrow. Grass and small trees laid flat shows evidence of flooding. In one section there is some erosion and no trees, just grass and sprayed gorse.

LANDOWNER Mr Paul of Hebditch of Auckland. Low-lying flood plain has recently been subdivided and reticulated for urban housing.

Zoned for Peninsula Project restoration The riparian strip became council owned when the area was subdivided. It is 20m wide. There is no physical indication that it exists. Not planted. Sprayed.
Recommendation: Plant the council riparian strip in full. This is a fair deal for being able to subdivide on a flood plain.

A small section of the riparian margin now owned by T.C.D.C. The margin is not indicated and follows along the fence line on the grassy paddocked side of the fence and is 20m wide.

Taumatawahine confluence.

TRUE LEFT BANK
The confluence and lower reach of the Taumatawahine has been stop-banked and is overgrown with kikiyu grass. The stream has small flow through aprons covered in grass. There is slime on rocks in the mainstream at the confluence.
LANDOWNER Confluence is owned by TCDC.
LANDOWNER lower Taumatawahine. Alan Wan, Hamilton Wants the stream to be planted. He is happy for the stream to be dug out if it is necessary first.
Recommendation: planting along the lower reach of the Taumatawahine heading inland could be got underway in conjunction with the clean streams project.
Restore the confluence which is owned by T.C.D.C with planting.
Zoned for Peninsula Project restoration

The Taumatawahine confluence.

TRUE RIGHT, A hundred meters above the Taumatawahine, the fence is very close to the river's edge, keeping away cows. Tea tree provides shade. Even though the vegetated margin is narrow, this is one of the nicer pieces of bank, because the tea tree is tall, with tree ferns.

TRUE LEFT. Going north there is a fenced-off area, mostly kikuyu. Teatree and willow grow thinly along edge of the river.

About 100 m above confluence the river has a steep eroding bank on the true left that is bare with only kikuyu overhanging a deep pool.
Recommendation: Plant a pohutukawa here. This would be an effective way to provide shade for the pool in the long term with minimal effort.

Going upstream, native tree numbers are increasing. There are frequent spaces amongst the scrub that could be inter-planted with large native species. Frequent ginger.
Recommendation: plant kahikatea in available spaces as they are good big trees that like the water's edge.

There are some beautiful pools occurring on sharp bends, with sometimes ferns on the banks, but they are often bare with gorse, tea tree, willow. (Sharp bends are possibly the character that gave rise to the name whakanekeneke).

Whakanekeneke confluence

This is the first really nice confluence. The banks have tall teatree cover and ferns. The river flows free and clear into a deep pool.

Whakanekeneke confluence.

Kelso Lane bridge

Stock crossing without a structure just past bridge.. No problem.

Paddocks with widely spaced kanuka on both banks for about 50 m.
Recommendation: plant native shade cover in the spaces if agreed to by the land owner.

TRUE RIGHT BANK
Paddocks stop on true right bank, and margin becomes gorse and teatree. There is a house with its lawn mown to the water's edge. Another sharp bend with a deep pool
Recommendation: Again a pohutukawa would provide lovely shade for what could be a lovely pool, providing lovely habitat

Bare pool which a pohutukawa could shade

LANDOWNER Mat Hare. Mat Hare has said he would be willing to allow more planting. There is one pool shaded by tall kahikatea. A minor track crosses the river, then a bridge crosses with corrugated iron flaps. The banks are unplanted, and grassed. Another deep pool. Then a grove of native trees, and some beautiful individual large trees in places, briefly providing shade and a sense of a "living" stream.
Recommendation: Plant more trees in the spaces available. The landowner has stated his willingness for planting to occur.
Zoned for Peninsula Project restoration

Upstream of Mat Hares' land, the river has a beautiful canopy of large trees, both native and introduced, with lovely epiphytes on the boughs.

TRUE RIGHT. Grassed land fenced off from paddock. Patches of kanuka and flax on both banks, with natives regenerating.
Recommendation: Encourage the regenerating bank with more planting.

TRUE LEFT BANK
"Longview Stream" confluence
In Mary Foreman's property is the small confluence of the Longview Stream, under a canopy of trees, some native (nikau, punga).Very nice. Some ginger and bamboo. It being difficult to see, makes it difficult to gage the strength of the stream.


Longveiw confluence.

LANDOWNER Mary Foreman. Part of the Crown grant in 1856 to Charles Ring. Native trees planted along margin, cabbage trees, flaxes, with old, tall kanuka on the flood

plain. Stretch of young willows. Pond. The house is on high ground and is the original homestead of Charles Ring. Great old oaks and old Taraire.

There is a small trickle seeping into the river from a pond, and a large pool on a bend of the river (Mary Foreman's swimming pool).

The Whangarahi river runs through the property and is bridged.

Coplands creek confluence

In Dave Foreman's property is the hidden confluence of Coplands creek ("Ara Manawa") under a low canopy of trees.
LANDOWNER David Foreman. "Taraire Gardens". Part of the Crown grant in 1856 to Charles Ring. The property has been developed as a public gardens with ponds. A wooden hanging fence is slung across confluence. Ginger, bamboo, kawakawa, native grasses, ferns. Great old taraire. The river banks are vegetated and well shaded. There is a distinct flood terrace on true left bank. This is a beautiful, shaded reach of the Whangarahi mainstream.

Coplands creek confluence.

TRUE LEFT. LANDOWNER Naomi Pond. "Rings Road Herbal dispensary". Part of the Crown grant in 1856 to Charles Ring. River banks vegetated with old kanuka and privet and new plantings of flax and native trees. Distinct flood terrace on true left bank. Along the northern boundary is flood plain.

TRUE RIGHT BANK
LANDOWNER Moody. Rank grass. Oleanthus, privet, tall kanuka. Flood plain infilled for house site.

LANDOWNER David Foreman. “Driving Creek villas”. Bank densely vegetated with native trees, mainly man made plantings,

Blind creek confluence

In David Foreman’s property is the hidden, forested confluence of Blind Creek.

LANDOWNER TCDC. “Frazer Reserve”. This is a small scenic reserve with an old forested margin and recent planting of a kauri plantation. A water take access has been bulldozed down to the water for roadworks tankers to fill up. The reserve is protected by Friends of the Frazer Reserve (Michelle Walker).

Here the river makes a right angle turn under a high, resistant cliff. A deep swimming hole has formed on the outer bend.

Rings Road bridge

The stream flows under Rings Road Bridge.
Peninsula Project planting ends here.

The Whangarahi is in the foothills of the Coromandel range as it flows along Driving Creek Road. This reach of the river is commonly known as Driving Creek, although Driving Creek is a specific tributary.

TRUE RIGHT BANK.
Kapanga mine creek

Driving creek / Kerosine creek

Gold was found at the junction of Driving creek and the Whangarahi.

TRUE LEFT BANK

Maddern creek

Whakaroa stream

The Whangarahi stream from the Rings road bridge upwards is in healthy condition and is free from recommendations in regard to fish habitat from Manu Waiata.

END OF WHANGARAHI MAINSTEM STREAM.

Walking the tributaries of the Whangarahi river

Hauraki Stream.

CONFULENCE.
The confluence of the Hauraki Stream and the Whangarahi is completely exposed and in need of planting (see Whangarahi mainstream).

The Hauraki stream from the confulence upstream starts as a very straight deeply dug drain. The course of the drain has been completely straightened, losing all its natural character and is about 2m wide.
The stream bottom has an unnatural orangey look.
This section of the stream is mostly covered by thick by thick gorse.
Recommendation. Inter-plant the gorse with natives.
After 500m from the confluence there is a large culvert. The culvert is not disjunct, low set and large.

Hauraki stream culvert.

TRUE RIGHT. A large grass verge where a school planting project has been undertaken.
TRUE LEFT. The town oxidation ponds.

The stream becomes deeper with grassy banks. There is lots of weed in the water.

Recommendation. Plant native trees and remove the weeds.

The stream follows a slight meander back to the road.
TRUE RIGHT. A side stream enters from under Hauraki road. It is very weed choked and has an unnatural orange slime growing on all the weeds. It has a drain like appearance, although it meanders with the curve of the shallow valley that it drains.
Recommendation. Remove all the weeds and the source of pollution causing the orange slime buildup. There are eels and native fish in the Hauraki stream and it is important not to endanger their health with contaminants that may enter from any source.

Weed choked tributary with orange slime buildup.

TRUE RIGHT. A side stream comes in under Hauraki road. It is weed choked but of a fair size. Locals report lots of eels present in this stream. An eel was sighted during the survey in Hauraki stream near here.

Tributary with weeds, reported to have eels.

A large new culvert. It is well set and not a serious fish impediment.

As the Hauraki approaches the Golf Course it passes through a stretch of farmland. Some parts of this are a little nicer with some tree cover and ferns. However there are still weed chocked areas.
Recommendation. Plant all the banks to create shade to help prevent weed continuing weed congestion. Remove the weeds. Fence off the stream.
TRUE LEFT. Two places where degraded wet lands feed into the stream. They are stock trampled.
Recommendation. Fence off the wetland areas to allow restoration.

GOLF COURSE EXIT. As the Hauraki Stream exits the Golf Course, it exits a very long culvert where it has been piped under the entire width of the Golf Course. This exit has a water fall over a small dam. This dam is passable to fish when a hatch is open. During the survey the hatch was seen both open and closed on different days. More often than not this dam is unpassable for fish. The dam exits from a small pond.
Recommendation. It is recommended that it is made sure this hatch always be kept open, or the nature of this dam be changed. Kokopu have been recorded in the stream above the Golf Course and it is very important that their safe passage is always ensured.

GOLF COURSE ENTRY.
The entry of the Hauraki stream into the very long culvert is grassy and fairly overgrown. It is however passable for fish. This culvert is far too long to be ideal for fish passage. Kokopu have been found this side of the culvert.

The culvert exit at the Golf Course. The hatch is pictured closed on the right of the picture, where small dribbles can be seen.

The Karaka .

The Karaka stream is a major tributary of a size comparable with the Whangarahi main stem stream.
At its confluence with the Whangarahi, the banks of the Karaka have been contoured during dredging and are overgrown with kikuyu. Following dredging, the river's lower reach runs fairly straight along a single course. Historically it meandered across the flood plain following other courses.

Peninsula Project. During 2006, the river bed was widened and the banks artificially stabilized with piles of large boulders at intervals. The bed and banks are completely bare, with not a speck of shade from the confluence to Hauraki House. The banks have been fenced off from stock. EW has planted willow poles in lines along the top of the banks.
Recommendation: Thick tree planting on both banks, with individual large species (puriri, pohutukawa, kahikatea). This will also help alleviate the slime evident in the river bed.

Slung across the river is a wire cable/ hose followed by a stock crossing with hanging electric fences on each side, about 100 m from confluence.

TRUE LEFT. The ground is very high and descends steeply to the river.
Peninsula Project. A small patch of flax has been planted on the true right bank. Also some native grasses. Flax planting continues thinly. Willows have been planted on the lower flood terrace.

Second electric hanging fence with pipe about 100 m before Kapanga Road bridge. The purpose of fence unclear as this part of the river is stock free.

Slime on the rocks continues along the unshaded reaches.

Kapanga bridge

The first shade the Karaka river enjoys is the Kapanga bridge. A small amount of native shrub cover at Hauraki House brings relief. Fantails enjoy the shade and insects. Here, banks have been stabilized with large boulders to contain meander as the river makes a sharp turn.

"Green Hills stream" confluence. On the true right bank is the confluence of the Green Hills stream, hidden under ferny banks and some exotic trees. The stream has a deep, narrow flow. Water from this tributary is much colder than the Karaka.
Recommendation: Extra planting needed.

Electric fence slung across Karaka.

TRUE LEFT. Short reach with high sides with cabbage trees, flaxes and fantails.

A brief stretch of minor shade relief on the Karaka.

Peninsula Project The banks are fenced off from stock. There are willows planted by EW. The bed has been dredged and stones from bed placed on the banks.

Willow and flax planting, thin and meager.
Recommendation: Plant karaka trees here. It would be nice to have Karaka trees on the "Karaka" river in honour of its name.

There is a concrete wall on true left bank for 20 m, then the Kohanga Reo building with a couple of kauri, rimu and totara.
Willows have continued to be planted in lines.
Clumps of boulders have been placed periodically to stabilize the banks. The occasional hebe has been planted and one rewarewa.

A cable has been slung across stream.

TRUE RIGHT. Green Hills subdivision is separated from the river by a paddock. A culvert empties stormwater into a small pool completely separated from the Karaka by an embankment of stones.

One lacebark and one cabbage tree have been planted amongst the willow plantings.

A stock crossing with two hanging electric fences. Then the Green Hills subdivision extends down to river margin on true right bank.
The willow and flax plantings continue.
Another stormwater culvert drains from the subdivision.
A patch of cedars or redwoods has been planted, along with one flax, three native grasses and one rewarewa.
At end of the subdivision there is another hanging electric fence crossing.

A river bend with an alluvial fan. There has been a major clearance here followed with a line of willows planted.

Clearance with willows planted on the alluvial fan.

"Pound creek". Small overgrown tributary on true left bank, grazed by sheep. Banks not fenced off.
Recommendation: Recreate a wet land here if the owner agrees.

Possible site for wetland restoration.

Above the bend the Karaka stream travels through low, unfenced banks with kikuyu and sheep. The line of willows continues with the river still unshaded.

LANDOWNER. Mick Walker house on true left bank. There are resident pet eels living under concrete poles along the bank. I witnessed about 40 very large black eels feeding on snapper remains.

True left bank is low. A hanging electric wire fence.

LANDOWNER. Lynette and Hank The river is bridged for a driveway. The landowners are agreeable to planting of specific sorts. They don't want flax because they feel it would encourage rats. They would very much like Pohutukawa.
Recommendation: Plant pohutukawa along the river edge.
Peninsula Project. EW planting and dredging continues

LANDOWNER Reg and Linda. Have a thin line of native and introduced shrubs lining the bank with some nice Nikau. The landowners are happy for more planting to be done and to do their own weed releasing. They would like to have a part in choosing which species are planted. Small swimming hole in river.
Recommendation; Provide the landowners with trees to plant.
Zoned for Peninsula Project.

TRUE RIGHT is high and steep.
Peninsula Project. New EW willow planting on lower terrace. Pine debris left from pine clearance will make weed releasing difficult.

Petote stream..

The Petote flows into the Karaka on its true left bank via a high waterfall with concrete poured over the stones.
At the top of the waterfall is a ford culverted with round pipes. Water flows onto a concrete shelf before descending over the fall. The ford is used by a number of properties. The waterfall does not allow fish passage. Bushmen from the previous generation report an abundance of fish passage in the upper reaches of this stream in the old days.
Recommendation: Plant around the ford for shade cover.

Investigate the possibility of a fish ladder being installed at the waterfall.

The waterfall at the Petote stream confluence does not allow fish passage.

LANDOWNER: Frank Johnston
From here on, the Petote flows through flat paddocks grassed with kikuyu, with very low banks grazed by sheep. This paddock is a natural wetland. The stream here is very narrow and very clear. Then there is a thick mixture of natives, gorse and tobacco weed.
Recommendation: There is great potential for planting in an animal-free area.
Talk to landowner.

The stream bed carries on through grass and willows providing shade. There is the odd native. Then there are some pungas.
Recommendation;Good planting area.

TRUE LEFT. Whangapoua road .
There is a large stop bank on the corner as the road starts uphill into the ranges with good native cover below stop bank over the stream.

TRUE RIGHT. The Petote has native bush cover extending from the foothills of the range.

Whangapoua road

The Petote stream flows under Whangapoua road through a large culvert, congruent with the stream bed at both ends, therefore without being an impediment to fish passage.

Above the road crossing, the Petote stream flows through a stretch of pampas grass, then forms a pool with a small waterfall. Then there is kanuka canopy on both banks as the stream flows from the range. The banks are not fenced off from stock, however they are so steep that stock can not access the stream. Thereafter there is native forest on both banks.

The Petote has two main arms which descend from the summit of the Coromandel range, south of SH25 (Whangapoua Road), at around 400 m. The older generation of bushmen report that the Petote catchment abounded in native fish.
The ford and pipeline at the entrance to the Petote are a serious adverse effect on a catchment which has been densely populated by native fish.
Recommendation: Construction of a bridge or provision of alternative access for residents.

Confluence of Cadman and Karaka.

Cadmans creek.
The creek has a shady, forested canopy with natives on both sides. This shows how a forested stream can be achieved with just a narrow margin of tall kanuka and tree ferns providing a corridor with an interior with all the beauty and micro-climate of a forested stream.
Recommendation: Investigte the use of kanuka and tree ferns for riparian margins. The presence of these two species creates a powerful habitat and they are both easy to grow. They have a natural role as nursery trees. They quickly and effectively provide a genuine forest feel.

The beginning of Cadmans' creek has steep banks and a narrow margin with just kanuka and ponga.

Cadmans Creek has its headwaters in the lower slopes of the Coromandel range.

The Karaka continues to gather flows from forested tributaries. The mainstem is visible in a deep, steep,.forested gully parallel with SH 25 (Whangapoua road) and has its headwaters at the summit ridge, at 422m.

The northernmost headwater tributary of the Karaka flows from the south east face of Kaipawa hill at 586 m.

“Greenhills Stream”

CONFULENCE.
The “Greenhills stream” has its confluence with the Karaka at Hauraki House. Here it gently disgorges into the Karaka as a narrow, deep stream with cold water. It has good ferny, shady banks with some exotics. There is short grass on true right bank. The true left bank is shaded by pungas and mixed trees.

The bed is mostly soft-bottomed. There are islands of watercress. There is a chaotic mix of arum lilies and willows along banks. There are occasional deep pools with lots of little falls and rapids. Lots of branches and debris lie in the water. It is very narrow and shady up to the new Greenhills subdivision which was completed in 2008. The stream cuts a narrow deep groove in the ground.

Public observation is that the Greenhills stream does not flood.

TRUE RIGHT. Just below the Greenhills subdivision a drain enters.

Within the subdivision shade cover stops, then is partially recovered for a short distance, then open ground resumes. Here the stream has become choked by two species of foreign “nuisance” weed, *Egeria densa* and *Ludwidgia* sp. There is a pool without shade.
Recommendation: Plant shade cover to help prevent weed buildup.Remove weeds from stream


Weeds choking the Greenhills stream.

TRUE RIGHT, a fish-cleaning table in the Holiday Park empties into a side drain. *Source of pollution.* The bed of the drain has a coagulated orange growth. Two pipes cross the Green Hills stream.

Recommendation: Ask the holiday park if perhaps they could dispose of fish remains in a different way.

The fish cleaning site at the Coromandel Holiday Park backs onto a drain just before it enters the Greenhills stream.

There is a deep pool, below a waterfall about two feet high, with rock bank reinforcing.
Recommendation: Install a fish ladder.

The stream takes on a long, straight, drain-like character, chocked with aquatic weeds. Some ferns on banks.

A drain enters from true right bank.

The stream passes under subdivision bridge then under a historic footbridge.

The subdivision ends. The stream meanders again with some willows and grass, then comes to a small waterfall about two feet high. A half mussel buoy has been fitted in the stream bed at the top of the fall damming a deep,ssssss still pool.
Recommendation: Remove the mussel buoy as it is an obstacle to fish passage.
If the small waterfall still remains, then install a fish ladder.

As the stream enters a farm property cows have been grazing the banks and trampling the stream bed.
Recommendation; Talk to land owner about fencing off stream banks and introduce him/her to the clean streams project.

An example of degradation where cows can access Greenhills stream.

TRUE RIGHT. A small dug drain enters.
Gorse and willows provide some cover.
The stream is choked with weeds.

There is a culvert for a driveway off the end of Albert Street. Corrugated iron swings from a wire across stream just before the culvert. The culvert is not disjunct but has a concrete gradient.

Beyond the culvert the stream is grassy, weed-choked and narrow with willows along the banks. There is farmland fenced off on true right bank.
On true left is a paddock surrounding a house, used by sheep.
Recommendation: Investigate planting along this stretch of stream, especially on the side that is fenced off. Perhaps kanuka would fit in this narrow strip.

The stream comes to a fenced off, park-like area with large ponds in the stream. onds
The ponds are very established, cherished and loved.

Just below the ponds there is a concrete ford for vehicles. Water flows over the top with enough depth for fish passage.

There are a few water slides formed from willow roots.

There is a terraced dam creating large pond, say 20 m across.
Recommendation: Install a fish ladder.

This dam exiting a pond on the greenhills stream could do with a fish ladder.

There is lots of weed in the pond.

Water slides over willow root mass.
Beyond the ponds there are paddocks on both banks with no fencing.The grass is grazed by sheep. There are some willows. The stream is very narrow, two feet wide and deep cut. There are pools and riffle sequences.
The stream becomes shaded with a few more trees and by its own deep cut banks.

TRUE LEFT. A degraded wetland drains in via a grass-choked slope. The wetland is trampled by stock.
Recommendation: Investigate wetland restoration in conjunction with the clean streams project.

The stream makes a sharp bend north It is still narrow (2 feet), though deeper (2 meters). Manuka starts to appear on the banks. The stream is shaded by its own high banks and ferns on the inside faces of the banks and by tree ferns above. The true left bank is now fenced off from stock.

TRUE LEFT. A small stream drains in, grazed by cows. A Side stream comes out of a pipe which is high above the main stream (2m). This is a severely disjunct culvert impeding fish passage.
Recommendation: Reshape this confluence, perhaps in conjunction with a fish ladder. Replant the side stream. Introduce the land owner to the clean streams scheme.

Log-choked dam creating a meter drop. The dam impedes fish passage.

Recommendation: Investigate if action needs to be taken.

There is a culvert under a driveway with a scour pool at the end of Edward street. The culvert is broken internally, and is disjunct (1 m high) above stream.

Recommendation: Repair the Edward St. culvert.
Install a fish ladder. It could possibly be made by making a sloping mound of rocks and cement.

The culvert at Edward St. that needs a fish ladder.

Foothills of the Coromandel range

Above the Edward St culvert, the stream flows from the foothills through a bush-clad gully, though the understory around the stream is thin made mostly of grass and weeds. There was some evidence of possibly stock grazing. A man made track follows the stream with seats installed. There was an old concrete dam with a hole below water level allowing fish passage. A newly made fence crosses the river.

Then there is a confluence of an unnamed tributary stream on true right bank.

The tributary flows through native bush for 100 m.
During 2008 a new subdivision was developed on the steep ridge forming the headwater of this tributary.
A deep deposit of fill comprising metal and clay has infilled the gully. A mound of earth 10m high and large enough for a house site has literally been dumped over the top of two streams. These streams have now been piped and disgorge through plastic sleeves high above the stream bed making fish passage impossible. The fill is not contained at its base and tumbles onto the stream margin and into the stream.
No resource consent has been recorded by EW.

The main Greenhills stream bends south east. Above the true left bank is a house. A semi-cleared track folows the true left bank. It becomes unshaded on true left bank for a short distance through grass and weeds. The track is freshly bulldozed.
Once in the ranges and true bush the stream is good size and clear-running, with waterfalls, pools, boulders and beautiful moss.
Greenhills stream has its headwaters in the lower, western slopes of the Coromandel range.

"Pagitt Street Stream"

This small stream was originally a tributary of the Green Hills stream, joining Greenhills at Edward Street.

Residents near the streams upper reach in Pagitt Street and Oxford Street, report the stream contained native fish in their childhood and still did before the piping was installed in 2007.

Albert Street reach. The confluence with the Whangarahi is immediately below the Albert Street bridge. The stream was previously in use as an open road ditch and storm water drain. It was piped in 2007 to upgrade storm water reticulation. The new pipes are long and unlit, and have not been retrofitted for fish passage. The flows in the pipes are generally too shallow. The pipe outlet was set above the mainstream (bad practice in terms of fish passage), and riprap was used to prevent erosion of the stream bank. Also a gamabian basket was placed in the outflow, in the centre of the confluence. The water mostly seeps underneath the riprap of the basket. In summer there is no fish passage. In winter a small rivulet at the side of the Gambian basket provides some possible traction.
Recommendation: The confluence needs rehabilitation with native planting to provide shade and stability;
A stream bed be formed through the rip-rap;
Pipes be retrofitted to create locks for fish passage.

The gambian basket placed in the middle of the stream at Pagitt St. confluence where it exits from the long piping. (300 m approx.).

In Pagitt Street, the stream enters the piping at the intersection of Rings road and Edward street. The open stream bed is mud-bottomed and thickly choked with grass and weeds. There is a strong steady flow of spring-fed water.

An open park is planted with five planted trees followed by a group of flax, tree ferns and various trees.
Recommendation: Support this planting with some more trees to provide effective shade cover and help control weeds.

Pagitt Street reach. The stream is straight with a drain like appearance and has received further piping under three properties. The banks along the open stream have been recently bulldozed.

The stream becomes choked. An ephemeral stream enters on the true right, with a very small pipe under a driveway.

On the true left bank is a deeply cut tributary which leads southeast through a series of properties with disjunct culverts and disappears at the top of Edward St.

Residents at the end of Pagitt Street who had grown up alongside this stream recalled native fish in the stream in their childhood and confirmed that they are still there.

Foothills

LANDOWNER Ray Morely. The main Pagitt Street stream heads north east into the foothills through an unshaded, boggy area with pungas. In the property of Celadon Motels (Ray Morely) it descends as a rocky mountain stream through pools in a steep, forested gully, with tree ferns and bush. There is a steady flow of water, with good regeneration of kohekohe, nikau, puriri. Ray Morely described how he has restored native bush to an area of felled pine plantation. He reported the presence of bullies and koura (freshwater crayfish).

LANDOWNER Nick Notman. Above Ray Morely's boundary the stream flows through paddocks where it is trampled by stock, and the bush has been thinned out from the stock presence.
Here the flow becomes reduced in boggy ground. There is a tiered series of muddy pools. The headwater flows come from a number of dry fingers in grassed, semi-shaded hillside, that spread out like a fan at the very head of the small gully.
Recommendation: Investigate the reforestation of this headwater delta through introducing the landowner to the clean streams project.

Taumatawahine

LANDOWNER Confluence is owned by TCDC. The confluence with the Whangarahi mainstream has been stop-banked. Ground is covered in kikuyu with gorse and tobacco weed on upper banks. The water flows through grass. There is a small grassed apron at the confluence. Adjacent landowner Alan Wan wants streambed dug out and banks planted.
Recommendation:Restore confluence which is owned by TCDC.
Zoned for Peninsula Project restoration

LANDOWNER Alan Wan, Hamilton. The bed is straight and narrow, being a dug channel with stop banks for about 100 m through Wan property. A clump of eroded willow roots blocks the flow. Large chunks of clay fallen from the stop bank forms little islands. Fenced off on true left bank.
Clean streams project:Landowners Shirley and Alan Wan are keen on rehabilitating the stream to a natural eco-system.
Recommendation:Planting on both banks could be got underway.

LANDOWNER Kim Raddick. Owns both sides of the Taumatawahine. In the Kim Raddick property the stream resumes its natural character with a rocky bottom.

Cattle fence slung across stream. Presently, stock have access to the stream but owner is willing to fence off the stream and install troughs. Tall kanuka along natural banks, natural meanders, natural formation of pools and rapids, but the water quality is very poor due to stock trampling.
Wire netting fence slung across stream,
There is a driveway with a ford with two pipes which are disjunct.
Recommendation: Install a fish ladder where the disjunct pipes are.
Install two stock crossings using bridges (a large property).
Connect the landowner with the clean streams project. He has expressed a keen willingness to get the stream protected. He will pay for fences and put in troughs as an alternative drinking source for his stock.

Cow degradation of the Taumatawahine.

Disjunct driveway culvert across the Taumatawahine.

Next property: Stream surrounded by tall, shading bush to Rings Road.

Rings Road

The road bridge is bricked, and carries a historical plaque commemorating the discovery of gold by Charles Ring in 1852. However, the actual site of the discovery was Driving Creek.

TRUE RIGHT. **"Taumatawahine side stream"**. Rings road occupies a former swamp on the true right bank of the Taumatawahine. Springs continue to flow in 2008, feeding a small, mud-bottomed stream which has been dug out to serve as an open stormwater drain alongside Rings Road. Banded kokopu use the drain as a migration route into ponds formed by landowners: a spring in Jenny Stone property, a spring in Francis Denham's property, and a spring in the ditch itself at about 70 m from the Taumatawahine. A resident eel in the ditch was named "Ernie". The use of the ditch as a native fish migration route was reported in the Hauraki Herald, 2 March 2007.

During May – July 2008 the ditch was piped without resource consent and without regard for the agreed resolution to retain the natural character of the stream.

The pipe runs for 68 m, without lighting. The culvert outlet at the Taumatawahine mainstream was above the water level in May and June 2008. The workmen reported removing around 80 native fish and around 7 eels during excavation for the piping.Then an open drain was placed next to the pipe to try and alleviate the problem. However the flow being divided between the pipe and the drain means that the flow is to small in either for fish passage most of the time.
The open drain is also lined with rocks so with the limited flow it is very difficult for fish to negotiate the drain.

The open drain designed to help fish passage from the Taumatawahine is rocky bottomed with very poor flow impeding fish passage.

Recommendation:???

From Rings Road, upstream, the Taumatawahine is rocky and the remainder of the stream's route is bush clad in established, second-growth forest. The Taumatawahine track follows the stream on its true right bank. A corrugated iron fence is slung across

the bed. The stream bank has kiekie in the trees and on the forest floor and abundant nikau.
A very pretty and idyllic bush setting. Beautiful pools are formed by large boulders. A truly beautiful example of a stream!

Taumatawahine has its headwaters on the lower western flank of the Coromandel range at around 300 m.

Whakanekeneke

Also known as Courthouse Creek and Buffalo Creek.

This rocky mountain tributary of the Whangarahi flows all the way in established native bush. The Whakaneke is a natural, beautiful, meandering stream with rapids and large pools on bends. Nekeneke describes the crawl of a baby and a caterpillar. Not a surprising name for such a winding meandering river.

The confluence with the Whangarahi is shaded with tall kanuka and tree ferns; the stream delivers beautiful clear water into the mainstem.

Moving upstream, the stream soon takes a large bend with a large pool. There is lots of shade and a natural bed, through several properties.
TRUE RIGHT is fenced off with a metre thick margin of trees. There are gaps where potentially more planting could be done.
Recommendation: Provide landowner with trees via the clean streams project.

Passes under a bridge under Rings Road.

TRUE LEFT. Confluence with the Kahakaroa.

Stream passes under a driveway bridge. Small area of grass with less shade through urban properties. Otherwise, this is a stream of beautiful quality which retains its shade for most of the way. A beautful grove of young puriri grow in a mown lawn.

The Whakanekeneke flows under Lillis Lane. The culvert is disjunct.
Recommendation: Either redesign ford or install a fish ladder.

The Lillis Lane culvert.

Three dead possums were seen lying in a pool just above the ford.
The river travels through stunning bush and mossy pools then alongside Buffalo Road and the Stamper Battery.
The Stamper battery has a small old concrete dam, about two feet high.
Then there is a second dam about 3 meters high.
Recommendation: Install fish ladders.

The second dam above the Buffalo stamper battery.

From here on, the Whakanekeneke has the most beautiful reach of all the Coromandel streams: large boulders covered in iridescent green moss, water falls filled with light, large pools, wide reaches, moss and boulder corridor.

The stream is in the foothills but continues to pass through private properties where it remains bush clad. Landowners have undertaken voluntary planting of native trees.

An example of the upper Whakanekeneke..

The south arm of the Whakanekeneke originates from the western face of the Kaipawa summit, at around 586 m.

The north arm flows from the summit of the Coromandel range a short distance further north.

Kahakaroa /Sykes Creek

From its confluence with the Whakanekeneke, the Kahakaroa runs along Rings Road, where it is shaded.
Recommendation: several trees could be added along the road verge. Talk to the community board.

There is a nice well set culvert under Taurua place.

TRUE LEFT. There is an old concrete resevoir . Water enters into it, though there is no restriction to fish passage.

The Kahakaroa is a well shaded stream all the way, despite passing through several proterties.

The south arm flows from the western flank of the Coromandel range, with its headwaters at about 450 m. The north arm flows from the Kaipawa hill at around 520 m.

Longview Stream

LANDOWNER: Mary Foreman. Confluence with the Whangarahi mainstream is in Mary Foreman's property. Here the stream is shaded by mixed trees then there is a short bare patch.
In its lower reach, this is a small, rocky stream with good natural character, natural meanders and pools and tiny rocky rapids.
The stream through Mary Foreman's property is fairly well shaded with kanuka and pungas but there is little understory and the surface of the banks is quite bare. There is a small culvert under a grassy vehicle crossing.

A culvert under Rings Road is severely disjunct. The water drops 2 metres in a narrow ribbon from an overhanging pipe with deep scour pool.

Recommendation: Replace the culvert on install a fish ladder (could be challenging for a 2 meter height).

Disjunct Rings Road culvert at the top of Mary Foreman's property.

Above Rings Road, the intake of the road culvert is in a deep ditch below Rings Road. The pipe entrance is hard to see because it is choked with kikuyu.

From here on, the stream is in the foothills but has a soft bottom, and flows through a rapid succession of sharp-angled bends. Possibly the absence of a rocky bottom

indicates a historic landslide, or possibly it indicates sedimentation due to forest clearance for farming.

There is an unshaded reach through Beach Lane. A gully has been heavily planted with flax and teatree and is not yet providing shade.

The Beach Lane subdivision is in former pasture land. The gully has been modified to accommodate Beach Lane within the riparian margin. The streambed has been partly straightened and the banks re vegetated.
The banks of the gully are planted but the stream bed in 2008 was often muddy and weedy, possibly because the levels for the two road culverts are not congruent with the overall gradient of the gully. The stream seeps through choking grass.
Recommendation: These reaches could be planted in raupo to form in-stream wetlands.

There are two culverted driveways. The lower culvert apron has been retrofitted for fish passage. The higher culvert is badly set. An attempt has been made at creating a fish ladder across the apron. While fish ladders are often the best thing that can be done, it is far better to set culverts properly at the outset. This is often ignored as developers would rather take the cheapest option. This culvert was installed in recent times. In this day and age it this is unsatisfactory.

TRUE LEFT. Landowner Irene Wykes. A small pipe empties into the stream.
Recommendation: Investigate the nature of the pipe.
Connect the landowner with the clean streams project. She is very friendly and keen to make the stream nice as possible.

The stream has a series of sharp-angled turns.

LANDOWNER: Lindesfarne.(property of Erica and Mike). As soon as the stream enters the Lindisfarne property, there are two ponds with stone and cement walls. There is no provision for fish passage. On the boundary with Beach Lane the wall of a pond forms a dam in the stream bed.
Recommendation: Talk to Erica and Mike about changing the nature of their ponds.

One of the dams for the ponds at Lindesfarne.

LANDOWNER: Brown. From Lindesfarne, the stream flows under the boundary fence and over a steep rocky slope with water seeping under boulders below culvert under old drive.

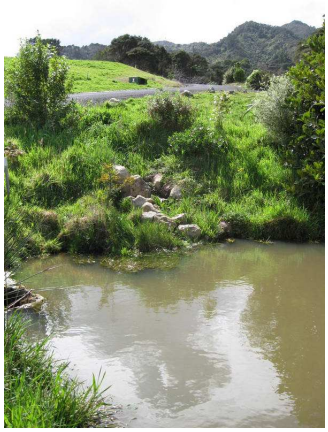
Stream goes through a wetland choked with kikuyu.

LANDOWNER: Longview subdivision. The stream follows a steep grassy slope to newly formed, sealed road with a culvert.
Access to pipe is steep, covered in boulders and the pipe not designed for fish passage. It is a fish passage impediment.
Recommendation: Remove boulders and create a form of flow that fish can negotiate. Possibly using fish ladders.

Culvert not designed for fish passage

On uphill side of Longview road is a pond, Pond I

LANDOWNER: Brown. Fish passage impediment: Above Pond I is a very small pipe taking flow from under a dam. The pipe feeding into Pond I is disjunct and not suitable for fish passage.
Recommendation: As an alternative to the pipe create a slow fed sloping waterfall with fish ladder qualities.



Pond 1 is fed be a very small underground pipe flowing under the rocks just barely visible in the background and is impossible for fish to negotiate.

A dam creates a pond, Pond II, which is fed by a weed-choked stream bed. Which in turn is fed by a pipe from another dam, which also serves as a driveway, with a large pond, Pond III, on the uphill side of the driveway.

LANDOWNER: Brown. Fish passage impediment: The pipe between ponds II and III is not suitable for fish passage.
Recommendation: Instead of an underground pipe, create a slow fed concreted, sloping stream, with lots of rocks inset to act as a fish ladder.

Above the third pond, the natural stream resumes with a cover of kanuka and tree ferns.

LANDOWNER: Waitati Gardens. High in the foothills is a large, ephemeral wetland, noted for its eels, which has been covenanted under QE II Trust.

LANDOWNER: Property of Kate and Graham A pond, Pond IV, has been dug into the headwater of the stream. Flow from the headwater spring is ephemeral, but the pond holds water all year round.
The pipe providing access to the pond is too small for fish passage.
Recommendation: Remove the pipe and replace it with suitable fish passage.

The Longview stream has its headwater in foothills on the lower western flank of the Coromandel range at about 100 m.

Coplands Creek ("Ara Manawa")

LANDOWNER: Taraire Gardens (David Foreman). Confluence at the Whangarahi mainstream is quite well shaded with some native cover.

Coplands Creek confluence with the Whangarahi.

A little old wooden bridge hangs across just beyond the confluence.

There is a cave on true left bank from which emerges a spring.
A pond below the spring is fed by a small alkathene pipe.
The pond exits through another pipe and seeps across the ground into the Whangarahi, just downstream of the confluence of Coplands Creek.

The creek flows through good native cover for 30 – 40 m, then through a large pond with an old wind-up dam with a bridge at the downstream margin of the pond. Fish passage impediment: The dam forms a sheer wooden wall with a 2 m drop. The purpose of the dam is to contain the large water lily pond.
Recommendation: Install a fish ladder or remove pond. It is a challenging height for fish ladders.

Dam for pond which obstructs fish passage

A cedar plantation along the riparian margin has been felled, leaving banks exposed.

LANDOWNER: Naomi Pond. A Corrugated iron gate is slung across the stream. The stream is shaded with kanuka and punga and landowner planting.
The banks are fenced ineffectively from sheep. Two foot bridges cross the stream. The stream has cut down quickly over the last 30 years, creating a beautiful deep ferny tunnel. It is a rocky stream with pools. The daily flow is not deep, but the stream floods readily.

Rings Road Bridge is a large historical bricked culvert. Scour hole has been filled with boulders topped with poured concrete.

Above Rings road, Coplands Creek continues through lovely native bush margin through several properties, maintaining natural character and meanders with boulders, rapids.

Stream enters Havalona where its character is preserved, then Driving Creek Railway. On true left bank is a small tributary, still in native bush.

As far as the Driving Creek railway bridge, the stream is still walkable.

Coplands Creek has its headwaters near the summit of the Coromandel range.

Manu Waiata Reports

Following is a short series of reports done by members of Manu Waiata Restoration and Protection Society in the Driving Creek area. The reports investigate the state of the river in regard to fish habitat in the upper reaches of the Whangarahi.

On 4 and 5 January 2003 a party comprising Steven Eldon, Paul Woodard, Maureen Woodard, and Wendy Pond investigated relationships between mining shafts, streams, and native fish.

During a period of summer drought, we walked up Flays road into Tramway road as far as the confluence of the Whangarahi and Driving Creek streams. Steve's working hypothesis is that Charlie Ring's discovery of gold in 1852 took place at this confluence.

We persisted into the bush along a reach of the creek with a gentle gradient in the foothills, scrambled over a massive landslide left by the Coromandel "storm bomb" of June 2002, and stopped at a juncture where the hillside steepens. Above this reach the creek loses its water.

At our feet were shallow pools where transparent maori trout sped back and forth: juvenile galaxids, identified by Paul Woodard as whitebait of banded kokopu at ca 14 months. The coloured markings of the fish blended with the oxidisation on the quartz rocks. (See note on algae, below.)

The lower reach of Driving Creek is perennial, fed by two sources.

Source in Kapanga mine

Firstly, within the pools water wells up from a hole in the rock strata, with such force as to create a mound of water. Steve's deduction is that the water originates from the Kapanga mine. The Kapanga mine was closed around 1905. At some time later, prospectors dammed an upper reach of Driving Creek so they could at will divert the stream into a shaft connected to the Kapanga mine. When the minefields were abandoned, the stream remained diverted into the Kapanga shaft. The water re-enters Driving Creek here, in a lower reach of the creek bed, at the foot of a steep ascent.

Source in sluicing tunnel

Secondly the pools are fed by a running stream which emerges from an arched tunnel hewn through a headland so as to by-pass a meander of the old stream bed.

Halfway along the tunnel the floor becomes dry. That is, no water runs into the upstream end of the tunnel. The flow originates as water seeping through permeable strata at the base of the tunnel.

Steve's researches have established that the tunnel was constructed in conjunction with a man-made channel into which Driving Creek stream was diverted. Along the floor of the tunnel there would have been wooden riffles and a carpet of corduroy. That is, the tunnel floor acted as a sluice for panning gold.

The prospectors would have released water from the dammed creek into a man-made diversion channel and then into the sluicing tunnel. The upstream entrance to the sluicing tunnel is dry because the stream higher up has remained diverted into the Kapanga mine shaft.

A closet of blue water

Beyond the upstream end of the sluicing tunnel is a shaft (vertical tunnel) cut into the rock. The bottom of the shaft is visible, filled with fallen rocks. We were unable to determine whether the rocks covered an underwater adit (horizontal tunnel).

The shaft is surrounded by a high circular wall of rock and shaded by a canopy of overhanging trees. It is filled with pure water, pale tonguestone blue. Small black maori trout swim placidly as in an aquarium. (jeuvenile galaxids, identified by Paul Woodard as whitebait of banded kokopu at ca 14 months).

The man-made diversion channel which would have fed the shaft is dry (because Driving Creek remains diverted into the Kapanga mine), yet the water is not stagnant. It is as pure and oxygenated as spring water, and we concluded that the shaft must be fed by an underground body.

This is the last outpost for the banded kokopu in Driving Creek. Rainfall will provide ephemeral flows by means of which the smaller recruits can climb the rock face. They then face a formidable dryland crossing to the upper reach of Driving Creek. As the kokopu in the shaft grow larger, their bodies will become too heavy to climb the rock face and they will remain in their aquarium of pure water, prey of kingfisher.

In a further expedition we will determine the numbers and sizes of the population in the shaft, and explore the upper reaches of Driving Creek where the stream flow has not been intercepted.

Wendy Pond

"Dry bed" creek.

Our objective was to explore a tributary of Driving Creek which has well defined banks cut through rock, but currently a dry bed. The bed has been dry since Steve Eldon began mapping in 1988.

From a confluence below the sluicing tunnel in Driving Creek, we climbed steeply up a dry tributary to a flat occupied by old mahoe trees. During the weather bomb in June 2002 this section of the bed became buried under rock and sand. The ground is ploughed by the rooting of pigs. At mahoe flat there are no channels formed by subsequent stream flow or surface water run-off.

Above mahoe flat the stream bed continued dry, with steep gradients. The morphology of the old stream bed was clearly delineated: steep margins mossed in places; sequences of falls and scour pools. Occasionally, scour holes in the dry bed held pockets of black, stagnant water.

The weather bomb of June 2002 brought down a great body of water and rubble which scoured the old margins in numerous places. In a deposit of sand, Steve found the claw of a koura (*Paranephrops planifrons*, freshwater crayfish). The claw fits a creature with body length 74 mm. We concluded there must be koura living in an upper, watered reach of the stream.

Continuing uphill we came to a location where clear stream water, flowing from the upper reach of the stream, disappears into the ground. Rock and sand deposited during the 2002 storm had accumulated in the bed. We did not excavate the rubble. Our working hypothesis is that the stream's water has been captured by a mine shaft.

The upper reach was trickling in summer drought. Pools are shallow and muddy, infilled with rubble from raw slips. We did not find koura or fish.

Wendy Pond

A comment on the state of the Coromandel bush

From a distance the Coromandel range appears bushclad, but beneath the canopy is a foundation in chaos. The landscape has been torn apart. Hillsides were stripped of vegetation and destabilised by mining from the 1860s to 1950s; storm water has caused subsequent slips in the loose rubble; pigs root in the soft ground. As the bush is opened up by pigs and possums it is invaded by ginger. Ginger is shallow rooted and does not create an absorbent mat of fibre and humus.

These are the precursors to the massive landslides which occurred during the Coromandel storm bomb of June 2002.

Steve Eldon

Note on Algae in Driving Creek 2003. The algal specimens had begun to break down when received for identification by Stephen Moore at Landcare Research.

1 Banded Kokopu, lower shallow pool. Green slime, behaves like seaweed.
Common unicell motile green algae.Typical in sunny slow flowing waters. Moderate to high nutrient levels. Several common diatom species were present.
gives off the green colour we saw. In still waters it can become a floating green blanket. Steve suspects that it had attached itself to an existing plant, hence the seaweed appearance. Another specimen in better condition may be a good idea.

2 Banded Kokopu, lower pool. Brown sediment, settles on rocks and dead leaves. Iron rich soil. Iron oxide and Iron bacteria. Some Diatom species present. Earth movement natural or by human will expose these particles and will end up in the water course.

3 Lower, non fish pool. Thick green slime. Microspora. Common unbranched filamentous green algae. Very adaptable. Typical in sunny, still to slow flowing waters. Moderate nutrient levels.

4 Lower non fish pool. Thick red sediment. Filamentous bacteria plus iron oxide. Bacteria using Iron as an energy source. Few Diatoms. Iron oxide present as in 2, earth movement. Wendy this Algae can move around. It looks like a green dot with a tail. When in mass it

Tributary at Driving Creek Wildlife Refuge.

Driving Creek Fish Ladders

At the end of the day, the Society drove into Coromandel township to "Top Town", where the potter Barry Brickell has built a railway line up into the hills. The line began as a means of conveying clay, and has become a famous scenic railway journey, whereby the public travel through the bush and view the streams without leaving footprints.

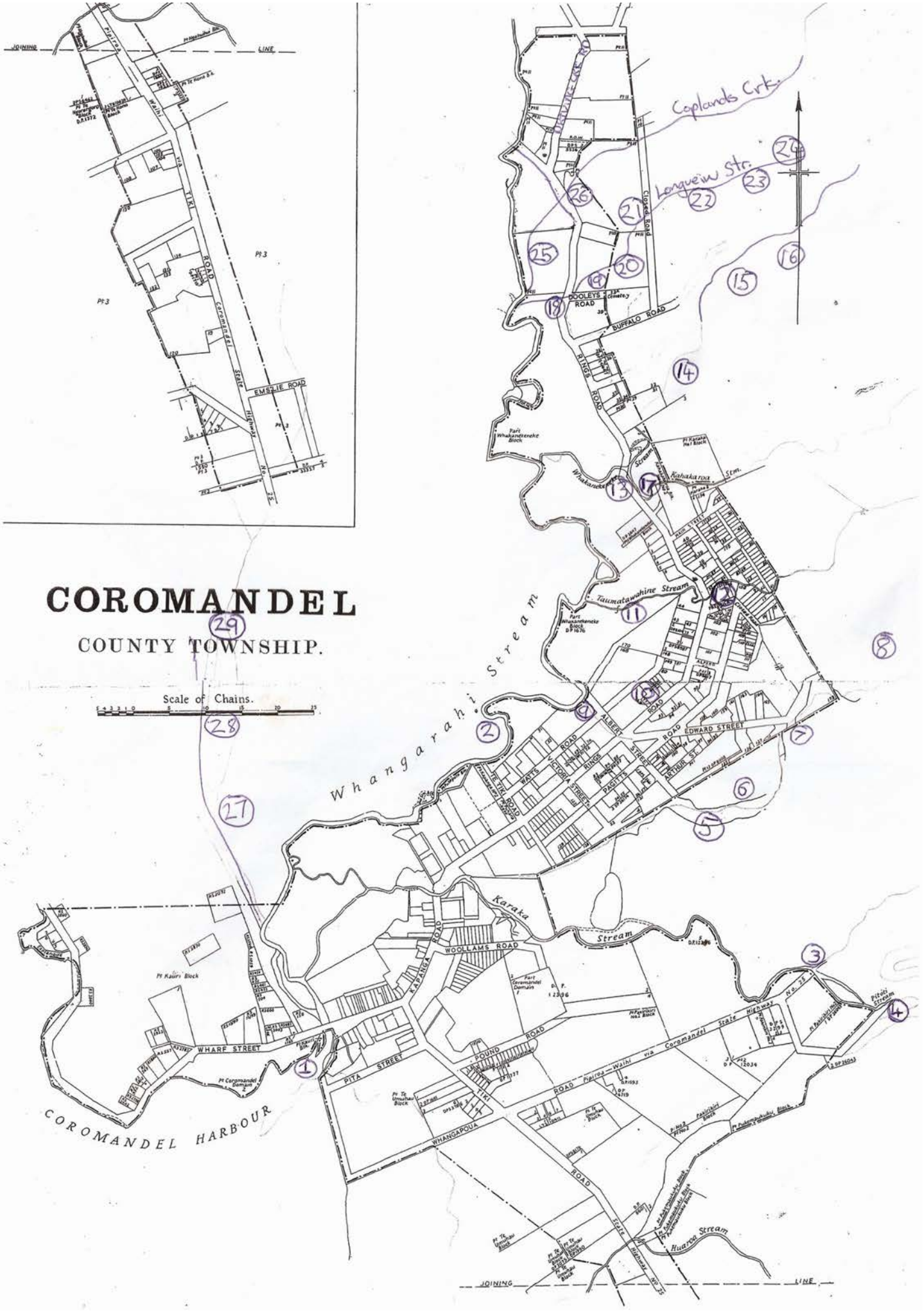
Adjacent to the pottery, a predator-proof fence is being built along a ridge line to enclose a sheltered basin, through which a stream runs. The stream will be culverted and grilled at each end to keep out rats and stoats. The need for safe havens for ground-nesting birds is so pressing that it has taken priority in the design of predator-proof fencing. There has not been a comparable genius in designing means to cross a stream so as to exclude rats and stoats while sustaining passage for native fish. A viable proposal would increase the Society's mana. Please send designs to *Ichthyofile*.

Within the Driving Creek Wildlife Refuge the stream has been further dammed and culverted. Our mission was to assess fish ladders below the culvert. The ladders have be built as a chain of pottery bowls, embedded in concrete. We suspect that kokopu will climb via the continuous concrete surface, as long as it remains wetted, rather than leap from bowl to bowl, but the aesthetic beauty of the fish ladders enchants.

The members of the party that found new and compelling evidence for the existence of the koaropu were Paul Woodard, Dale Saunders, Wendy Pond, Dene Andre.

APPENDIX

MAP AND LIST OF LOCATIONS OF OBSTACLES TO FISH PASSAGE



COROMANDEL

COUNTY TOWNSHIP.

Scale of Chains.

FISH PASSAGE IN THE WHANGARAHI AND TRIBUTARIES. LIST OF FISH OBSTACLES IN WHANGARAHI COMPLEX

CORRELATES TO MAP.

This table lists all culverts found in the Whangarahi river system. This is because even the culverts that are constructed according to best practice become fish obstacles over time as sediment and debri mount up, and the level of the stream bed changes. It is commonly perceived that we can go on constructing culverts as long as they are done according to best practice guidelines. The society aims to convey that no culvert is better than the best type of culvert.

WHANGARAHI. THE MAINSTEM STREAM.

1. PATUKIRIKIRI.

Once a drain, documented of old as a stream, fish to enter the Patukirikiri must negotiate a closed concrete lid!

2. DISJUNCT PIPE

A small stream enters the Whangarahi on the true right bank about half way between where it flows between Albert street and Te Tiki road. Fish passage into this stream is impossible due to two small disjunct pipes.

KARAKA STREAM.

3.CULVERT / WATERFALL AT THE PETOTE-CADMAN STREAM CONFLUENCE.

The Karaka river finishes where the Petote and Cadman stream flow into it. The Petote flows into the confluence over a dam and waterfall obstructing fish passage.

4.PETOTE CULVERT UNDER WHANGAPOUA ROAD.

This bridge and box culvert has no serious obstruction to fish passage.

GREENHILLS STREAM.

5.CULVERT ON DRIVEWAY AT THE END OF ALBERT ST.

While some fish may be able to negotiate this culvert, it exists in an area that would otherwise be habitat for fish that can't climb (inanga) for some way upstream if the stream were in natural condition.

6.a. PROPERTY WITH POND AND DAM.

This dam obstructs fish passage.

6.b. POND.

7. DISJUNCT CULVERT AT THE END OF EDWARD ST.

This culvert makes for impossible fish passage.

8. TWO DISJUNCT CULVERTS UNDER HOUSE SITE.

These culverts are just off the main stem of Greenhills stream in a tributary as it enters the main ranges. The house site is located in upper Edward St. A pile of earth over 10 meters high covers two branches of this stream for the house site.

One pipe is set far too high with a plastic sleeve, the other is just far too high.

PAGITT ST. STREAM.

9.DISJUNCT CULVERT ENTRANCE AT CONFLUENCE WITH THE WHANGARAHI.

A large Gambian basket has been placed at the stream mouth in front of the culvert severely obstructing fish passage.

10.SECOND CULVERT

A second culvert is where the stream exits from under properties just off Pagitt Street itself. It is sufficiently well set below the waterline allowing clear passage for fish.

TAUMATAWAHINE STREAM.

11.DISJUNCT CULVERT

This culvert is part of a private driveway. It is set above the stream at normal flow levels.

12a.CULVERT UNDER RINGS RD.

This is an old bricked culvert, with a nice open flow.

12b. PIPED DRAIN ENTRANCES FLOWING INTO THE CULVERT UNDER RINGS RD.

This drain was until 2008 an open streamlet that native fish used to access spring-fed ponds on nearby private properties. The pipe is 67 meters long with no light and three changes of angle. The three manholes have lids instead of grills, creating total darkness. 3 springs once fed the flow. The flow has been divided between the new pipe and a new open stream bed, diminishing fish passage.

pipe outlet to new drain

The entrance to the new open stream bed is also a culvert. Flow was inadequate for fish passage in September. 2008

The new open stream bed has been lined with rip rap.. The original drain was a mud bottomed stream. With such a small diminished flow this type of bottom makes it difficult for fish passage.

WHAKANEKENEKE STREAM.

13.RINGS ROAD BRIDGE

Bridges are the best type of structure for roads crossing streams.

14. FORD ON DRIVEWAY AT THE END OF LILLIS LANE.

These culverts are set a little high. Though it is in the habitat zone of climbing fish this ford is a main contender for a fish ladder.

.

15.DAM JUST ABOVE BUFFALO STAMPER BATTERY.
This dam is also in climbing fish habitat. A fish ladder is appropriate.

16.SECOND DAM ABOVE BUFFALO STAMPER BATTERY.
This second dam is considerably higher and certainly needs a fish ladder.

KAHAKAROA STREAM.

17.CULVERT NEAR RINGS ROAD.

A nice low set large culvert providing for fish passage.

LONGVIEW STREAM.

18. CULVERT UNDER RINGS ROAD.

All fish passage stops with this culvert!

19. 1st CULVERT IN BEACH LANE SUB-DIVISION.

This culvert was set too high. Some attempt at mitigating the effects has been made. A rocky fish ladder has been set in front. If the culvert hadn't been set high the passage would have been relatively smooth.

20. 2nd CULVERT IN BEACH LANE SUB-DIVISION.

This culvert also has a fish ladder. This recently placed culvert would have been much better by being set lower.

21.PONDS WITH DAMS ON LINDISFARNE PROPERTY.

The dams for these ponds make fish passage impossible.

22.CULVERT SET TOO HIGH WITH BOULDERS

This culvert in the Longview subdivision is set too high. Also the steep bank preceding it is covered in boulders, blocking fish passage.

22b. Boulders at culvert outlet prevent fish passage.

23.POND WITH PIPE RUNNING IN.

This pond is fed by a pipe that fish cannot enter. The pipe entrance is hidden under the boulders in the background.

24. 2nd POND.

This pond is drained by a very small pipe that does not allow fish passage.

COPELAND'S CREEK. (ARAMANAWA)

25. DAM LEADING INTO PRIVATE POND.

This dam makes fish passage impossible very near to the beginning of the upstream journey.

26. CULVERT UNDER RINGS ROAD.

This is an old brick culvert and allows good spacious flow.

HAURAKI STREAM

27.CULVERT UNDER DRIVEWAY.

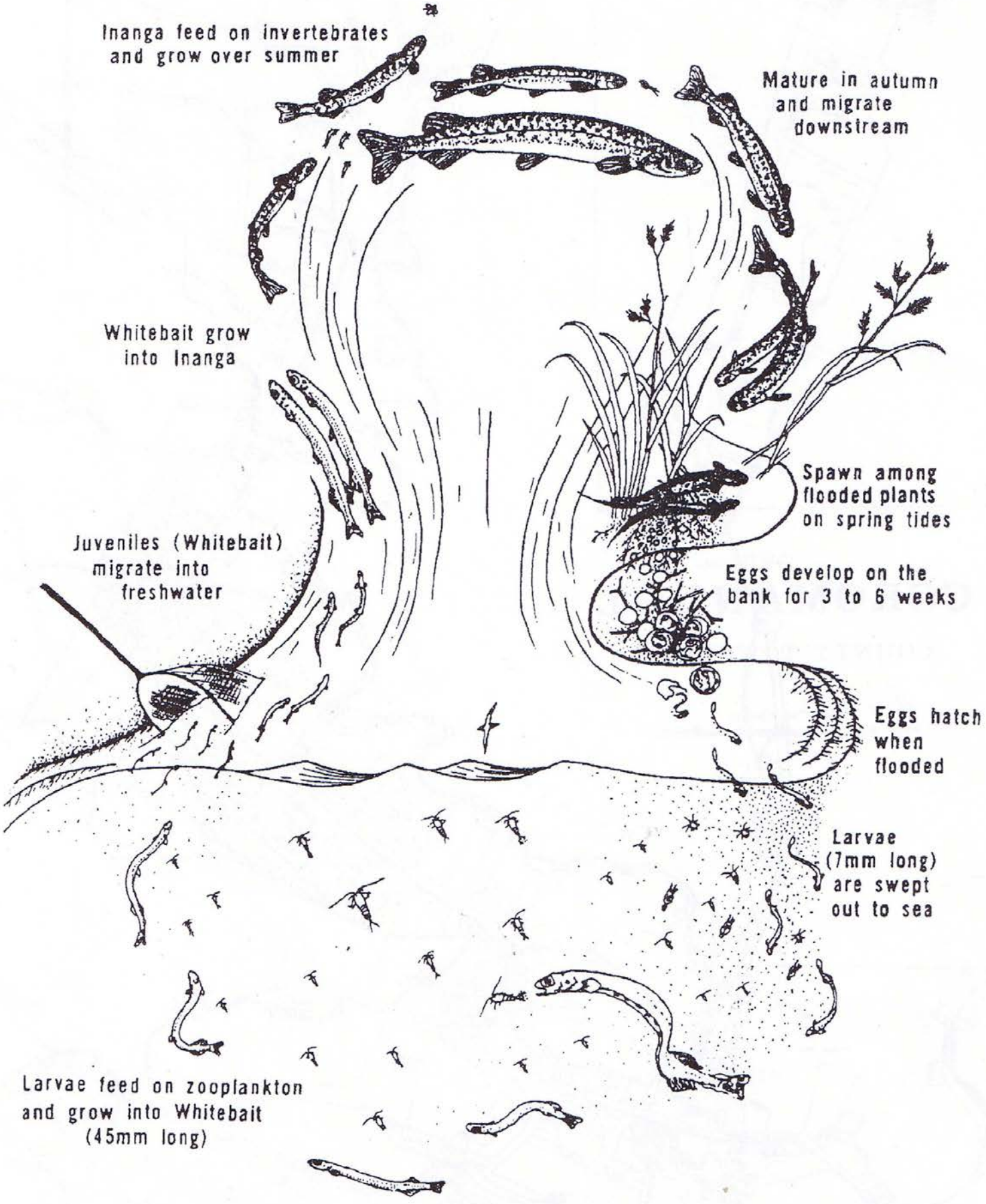
This culvert is set well, allowing an unbroken flow.

28. OUT FLOW FROM LONG CULVERT UNDER THE GOLF COURSE.

This entrance is inadequate for fish passage as seen in this photo. The dammed flow hard to see on the lower right is adjustable. It does improve when this is lowered. From this pond the stream is piped for about a kilometer.

29. IN FLOW OF THE GOLF COURSE CULVERT.

This inflow is a little over grown.



The life cycle of the common New Zealand whitebait, Galaxias Maculatus. (Inanga)

Up stream Migration Times of Some Species of Native New Zealand Freshwater Fish Species in the Middle Reaches of Rivers and Streams.

J = Juvenile, A = Adult, S = Spawning.

Species	Age	Summer			Autumn			Winter			Spring		
		D	J	F	M	A	M	J	J	A	S	O	N
EELS *Anguilla australis* and *Anguilla dieffenbachii*	J												
MULLET *Mugil cephalus*	J A												
TROUT *Salmo trutta* and *Oncorhynchus mykiss*	J A S												
LAMPREY *Geotria australis*	A												
TORRENTFISH *Cheimarrichthys fosteri*	J A												
SMELT *Retropinna retropinna* (riverine stock)	J A												
INANGA *Galaxias maculatus*	J A S												
GIANT KOKOPU *Galaxias argenteus*	J												
BANDED KOKOPU *Galaxias fasciatus*	J												
COMMON BULLY *Gobiomorphus cotidianus*	J												