Birdlife

The existing birdlife of the Avoca Valley Stream catchment has been surveyed. A total of 34 species were recorded in the catchment, of which 20 were native. (Refer to appendices for list of bird species occurring.)

Steep Hills and Gentle Slopes Ecosystems

Throughout these ecosystems, both bush and wetland birds are uncommon due to a lack of suitable habitat, such as a large stand of native bush, and a permanent water supply in the stream. Pihoihoi (NZ pipit), a native bird of open grasslands and hillsides, are present here throughout the year, and may occur down to sea level during the winter. Karearea (NZ falcon) also occur on occasion in the head of the Avoca Valley.

Valley Floor Ecosystem

Throughout the Valley Floor ecosystem, small numbers of wetland birds are found along the Avoca Valley Stream. These include a notable abundance of kotare (NZ Kingfisher), and putangitangi (paradise shelduck) and spur-winged plover which feed along the stream banks and adjacent grassy slopes throughout Mary Duncan Park and the market gardens.

Native bush birds are common in the mid-lower valley, where orchards, market gardens, roadside vegetation and private gardens provide suitable habitat. Tauhou (silvereye), piwakawaka (fantail) and riroriro (grey warbler) are all common riparian residents here, while korimako (bellbird) occur mainly in autumn and winter. Pipiwharauroa (shining cuckoo) can be expected as an uncommon spring and summer visitor.

The major factor limiting bird population here is the lack of suitable habitat. The stream has little variation, no wetlands or ponds, is artificially narrow with very high banks in places, and is often dry.

Estuarine Flats Ecosystem

A range of native wetland and wading birds frequent the lower stream. There is a particular abundance of kotare (NZ kingfisher), which nest along the stream. Kuruwhengi (NZ shoveler), parera (grey duck), putangitangi (paradise shelduck) and spur-winged plover also frequent and nest along the stream. White-faced heron feed daily on the abundant mud crabs here, and pukeko are common. Tuturiwhatu (banded dotterel) may nest on salt-meadow habitat. Along with other waders, they are attracted to a developed tidal area for feeding and roosting.

The habitat for wetland and wading birds throughout this ecosystem could be greatly improved. The stream has been reduced to a thin canal with high banks, very little stream side vegetation, and no variation in the channel. All of these have the effect of reducing birdlife along the stream.

Potential and Recommendations

The potential for increasing the native bird population and species range along the Avoca Valley Stream is good. With the stream's close proximity to the Opawaho (Heathcote River) Loop, Ihutai (Avon-Heathcote Estuary), Bromley Oxidation Ponds and Linwood Paddocks, wetland birds are likely to be attracted here after waterway enhancement. The aim is to encourage different bird species in the various habitats and locations along the stream.

Recommendations: **Steep Hills, Gentle Slopes and Valley Floor Ecosystems**

- Waterway enhancement plantings, to provide food, habitat, and a corridor for the movement of birdlife between the Port Hills and sea level
- A significant stand of native bush or shrubland established in the upper valley (otherwise the main beneficiaries of restoration will be the introduced species)
- Creation of freshwater pond areas, to encourage the return of the native papango (NZ scaup)
- Retention of the tussock and grass covered hill and spur tops, and rocky outcrops, which support good numbers of pihoihoi (NZ pipit)
- Provision of dense vegetation areas (ie, of pukio) for nesting, approximately every kilometre along the length of the stream
- Creation of "wet islands", with stands of raupo and/or sedges (such as pukio), to provide a relatively rat and cat free habitat for safe bird dwelling and nesting
- Nest or bird boxes, to encourage birds to nest and reside in the valley.

Recommendations: **Estuarine Flats Ecosystems**

- Widen the stream
- Lower the stream banks
- Restore a more natural stream pattern, as canals and channelised streams are detrimental to birdlife
- Create a tidal basin with islands (providing a relatively safe nesting habitat)
- Restore the salt-marsh wetlands west of the old rubbish tip, which were lost to land reclamation
- Guide birds away from pylons using vegetation screens, as birds such as stilts and swans fly into the pylons and die.

These measures will support a range of native waterfowl and wading bird species. Those likely to return here are:

little black cormorant
kotuku (white heron)
royal spoonbill
South Island pied oystercatcher
caspian tern
pied cormorant
matuku (Australasian bittern)
tete (grey teal)
kuaka (eastern bar-tailed godwit)

General Bush Bird Guidelines

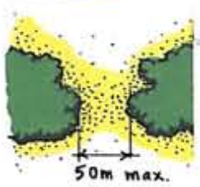
Major factors limiting the abundance of bush birds on the Port Hills:

- Limited and fragmented areas of native forest habitat
- Habitat degradation by browsing animals (eg, goats)
- Pressure from predators (including cats).

Guidelines to encourage the return of native bush birds:

- Increase the size of bush remnant/areas - the abundance and species richness of bush birds is positively related to total plant biomass
- Upgrade the quality of bush remnants
- Encourage regeneration of native bush remnants, by controlling possums and fencing to exclude browsing stock and feral animals
- Seek native areas of at least 100ha, as these can easily sustain populations of most bird species
- To enable smaller native areas to sustain bird populations, link them to other sites, and provide good quality habitat
- Link bush areas and remnants where possible, using bird corridors or small islands of habitat (50-200m apart), to create larger habitats

- Ensure bird corridors are as wide as possible; at least 30m for lengths up to 500m, and at least 50m for longer corridors; gaps should be no larger than 50m, as some species require a continuous forest corridor



- Fence bush areas/remnants to exclude stock, as understorey browsing results in a significant reduction in bush bird numbers
- Control animal pests (eg, possums, goats and other browsing animals, along with cats, stoats and other predators)

- Suitable bird wintering areas are required, with sunny slopes and low altitude forest
- Mixed forest provides the best variety of habitat and food source (the exception to this is pure stands of tall kanuka) .
- Establish native plant species that provide food (eg, fruit/seed, nectar, bud/foliage, insects) for native birds (refer to Plant Cards for the indigenous ecosystems, which identify some of those plants).

Lizards

(predominantly Steep Hills and Gentle Slopes Ecosystems)

Canterbury has some 10 species of lizards which are unique to New Zealand. Because Christchurch City is relatively rich in terms of lizards, there are good opportunities to return them into the Avoca Valley environment.

It should be noted that all lizard species are fully protected under the Wildlife Act (1953), and that predators such as cats, rodents (rats and mice), and mustelids (stoats and ferrets) are a major threat to lizard populations. The most important area for lizard conservation in Christchurch is the Port Hills, where up to five species may still be present:

- The **common skink** is present throughout Banks Peninsula and the Canterbury Plains. It is the most common and widespread lizard in the Christchurch area, living in "wild" areas such as the rural land beside the estuary, and in people's gardens.

- **McCann's skink** is also found in the Christchurch area. It lives in dry, rocky areas in tussock grassland and scrub, where it shelters under rocks, and vegetation such as wild spaniards.
- The **common gecko** is relatively common in specific habitats over the Port Hills. It lives in crevices in rock outcrops, and under nearby rocks throughout the Port Hills, and is very susceptible to disturbance. Recent studies have shown that the "common gecko" comprises several cryptic species, meaning it may be different species that look very similar, making every population very important.
- The **jewelled gecko** is still present on the Port Hills, although now less common.
- In addition, the **spotted skink** was once widespread and quite common in parts of Canterbury. However, they appear to be declining on the mainland, probably due to the effects of habitat destruction and modification, along with predation. The last recorded sighting of a spotted skink on the Port Hills was in the 1970s.

Recommendations

To encourage lizards in the Avoca Valley Stream catchment:

- Provide suitable habitat, with a substrate of rocks, logs and/or deep litter, and a permanent cover of low growing shrubs, or a dense sward of grasses
- Establish native plant species that provide food for lizards - the berries and invertebrates they feed on (refer to Plant Cards appended for the indigenous ecosystems, which identify some of those plants that provide berries for lizards).

Fish life

(predominantly in the Estuarine Flats Ecosystem)

At present the fish life of the Avoca Valley Stream is very depleted, largely due to a lack of suitable habitat. There is a lack of water, sparse overhead shade and streamside cover, some trampled and polluted stream banks, and, in the lower reaches the stream is converted to a farm drain.

The Port Hills Road culvert, and the tide gates at the stream's exit into Opawaho (Heathcote River), are barriers to fish passage in the Avoca Valley Stream. These limit the recruitment of fish into the upper stream, and may need to be modified to ensure they allow fish to pass through. This problem will need to be addressed - while eels can detour around in-stream barriers and structures by climbing the banks, other native fish species do not possess this ability.

NIWA attempted to survey the fish fauna by electric-fishing the stream. This proved to be impossible due to high water conductivity. However, there have been occasional sightings of eel in the stream below Port Hills Road. Shortfinned eel are probably the only fish still resident in the stream. Giant bully may be present in the lower reaches of the stream, where they feed on snails and other invertebrates. There may also be occasional marine itinerant visitors in the lower reaches, such as flounder and yellow-eyed mullet feeding on the high tide, but nothing permanent.

In the past there were black galaxiid and whiskery cray (kewai) in the Avoca catchment, and the lower Avoca catchment was an important resource for mahika kai. (Ruka, P. pers. comm.)

Potential Native Fish Species

There is good potential for increasing the fish population of the lower Avoca Valley Stream. After riparian enhancement, six of the 16 native fish species of Christchurch would be likely to occur here, all of which require access to the sea to complete their lifecycle:

- **Shortfinned eel** live mainly in still waters, characteristically lowland swamps and lagoons, and in stable lower elevation creeks and streams. They are the predominant eel species in these habitats, and can reach high numbers in favourable locations. They spend the majority of their 30-year life in freshwater, migrating as adults to the

Pacific Ocean to spawn and die. The juvenile glass-eels spend about a year returning from the Pacific to New Zealand. Once here, they migrate to freshwater during spring, and move upstream in summer. They eventually grow to a maximum size of about 1m in length, and 3.5kg in weight, with larger eels generally living in deeper water. Shortfinned eels prefer a base of organic debris or soft mud to hide and burrow in. They are opportunistic scavengers with a wide range of prey, often foraging in the shallows at night.

- **Longfinned eel** are found in variable habitats from estuaries upstream. They are similar to shortfinned eels, but have a larger mouth, their dorsal fin extends further forward, and they can reach a larger size (at least 1.75m and more than 20kg). Their life history is as for shortfin, although very large eels are always females, and may be 50 years or older. They require overhanging plant cover around the water's edge to provide refuge, and can swim very long distances upstream, climbing high falls.

- **Common bully** occur in the pools of rivers and streams, which are accessible from the sea. They grow to 150mm (commonly 110mm), and feed on small aquatic invertebrates. Spawning takes place in spring and summer. The larvae go out to sea once they hatch, returning to freshwater once they are about 15mm long, to grow to maturity.

- **Inanga (whitebait)** usually occur at low elevations not far from the sea, in pools, backwaters, swamps and lagoons (being less common in faster flowing waters). They are a small fish (commonly about 100mm), and spawn in autumn on

the high spring tides. Spawning takes place on gently inclined, well-drained stream banks covered with thick, long grass, often near the upper saline limit. Larvae are then washed out to sea on the ebbing tide, returning in the spring as whitebait. They mature over summer in freshwater areas in the lower reaches, with raupo and harakeke (NZ flax) that provide cover from trout and eel predation, and from high water flows. They then spawn, and die the next autumn. They are the most important species in the whitebait catch, and regarded as the best eating.

- Common smelt are a small, streamlined fish, living in rivers, streams and lakes near the sea. They usually occur in large, fast-moving shoals, in still or slowly flowing waters. They feed on small stream insects and crustaceans, commonly growing to 80-100mm in length. Adults migrate from the sea in spring-summer, spawning in the lower reaches of streams and rivers, then dying. Larvae go out to sea, returning only when mature. Interestingly, these fish smell exactly like cucumbers, as they secrete the same odorous chemical.

- Patiki (black flounder) live primarily on the sandy or muddy bottoms of lowland lakes, rivers and streams, penetrating a surprising distance inland. They grow up to 450mm, but typically to about 250mm, and are able to conceal themselves by changing colour. They are thought to migrate downstream to sea to spawn, where they lay thousands of tiny eggs. The larvae look like normal fish until they are about a centimetre long, when the eye on the left side migrates across the snout to the right side. The fish then sinks to the bottom, and spends the rest of life lying on its left side. It is a predatory carnivore, feeding on bottom dwelling insects, snails etc., and on small fishes and migrating whitebait.

Source for fish photos: Tony Eldon © 1998

Guidelines for Provision of Fish Habitat

When undertaking waterway restoration along this type of stream, designers need to consider a number of things in order to provide a suitable habitat for fish:

Vegetation:

- Native riparian revegetation, with plentiful streamside and overhanging plants - this provides cover, shade, and a food source for fish (insects falling into the stream)
- A sub-canopy of tussock, flax, and small trees (less than 3m tall), to provide most of the terrestrial food source, and dense shade close to the stream bank
- A canopy of large trees, providing diffuse shade, helping to moderate stream temperature by reducing the effect of midday sun, and stabilising stream banks
- Emergent rushes and sedges, which provide good habitat in low lying areas
- Prevention of damage to riparian vegetation from mowing and grazing

Stream form:

- Provision of a sinuous stream path as opposed to a straight channel
- Variation in stream depth, because different fish species live at different depths, and shallow areas help reduce predation, by excluding larger fish such as trout, which eat the smaller species
- Mid-channel islands, providing refuge and diversity of habitat
- Overhanging stream banks (approximately 30cm) where stable
- Encourage instream debris, such as rocks, fallen logs, weeds and slumped banks, along with emergent rushes and sedges, to create a range of different habitats
- Removal of instream barriers to fish passage (eg, culverts, weirs and drops), as access throughout the stream is very important to many fish species
- Provision of unimpeded access to the sea, as many native fish are migratory

Stream flow:

- Continuity of water, allowing a permanent habitat throughout the year
- Variation in water flow type, including the creation of pool, riffle (mini-rapids) and run sequences, and varying stream depths and widths, to provide a variety of micro-habitats for different fish species, while avoiding the creation of fast flowing "chutes" which inhibit upstream fish migration
- Reduce fast flows in culverts (possibly with baffles), to facilitate the passage upstream of migrating native fish - at the very least, placement of large boulders in fast flows allows resting areas for migrating fish
- Prevent free-falling water throughout streams (and culvert ends) - if they exist, even piled rubble will allow access up the fall for eels and other native fish
- Where trout are not present, do not introduce them because they eat native fish and compete for food and space.

Invertebrates

(Entire Catchment)

Another major and often forgotten component of stream fauna is the invertebrates. These include beetles, flies, moths, bees, weta (Insects), terrestrial and freshwater worms (Oligochaetes), marine worms (Polychaetes) and crabs and shrimps (Crustacea). An abundance of invertebrates is essential for a healthy ecosystem, because a number of bird and fish species feed on invertebrates, and many play other beneficial roles in ecosystems.

When surveyed in 1997, the Avoca Valley Stream was found to be relatively degraded in terms of invertebrate life, and low in taxonomic richness. This was largely due to a lack of suitable habitat, with little or no streamside canopy and shrub cover. There was no variation in stream width, depth or velocity, and the lack of instream cover for invertebrates (especially over the lower reaches), meant there was very little habitat diversity. The stream also has low to no flows, and a highly mobile substrate.

The invertebrate community of the stream was largely dominated by roundworms (Nematodes) and terrestrial and freshwater worms (Oligochaetes). The lower stream had a range of invertebrates, including marine worms (Polychaetes) and mysid shrimp (Mysidacea), which are unique to estuarine environments. There is also an abundance of mud crabs over the lower 500m of the stream. Observations indicated some sections of the stream were stagnating (eg, the presence of mosquitos (*Culex* spp.), which breed in such areas).

Invertebrate Design Guidelines

Due to its freshwater and estuarine nature, running through predominantly rural areas, the Avoca Valley Stream provides special habitat opportunities for invertebrates. However, considerable restoration and enhancement is needed to encourage invertebrate life. Guidelines for revitalising invertebrates include:

- Plant riparian vegetation to provide streamside shrub and canopy cover, for habitat and shade
- Create variation along the stream banks, and in the depth, width and velocity of the stream channel, providing a range of habitats
- Provide instream cover for invertebrate life, including rushes, sedges and other aquatic vegetation
- Create ponds, which are a significant invertebrate habitat
- Provision of a stable (and varied) stream substrate
- Permanent stream flows.

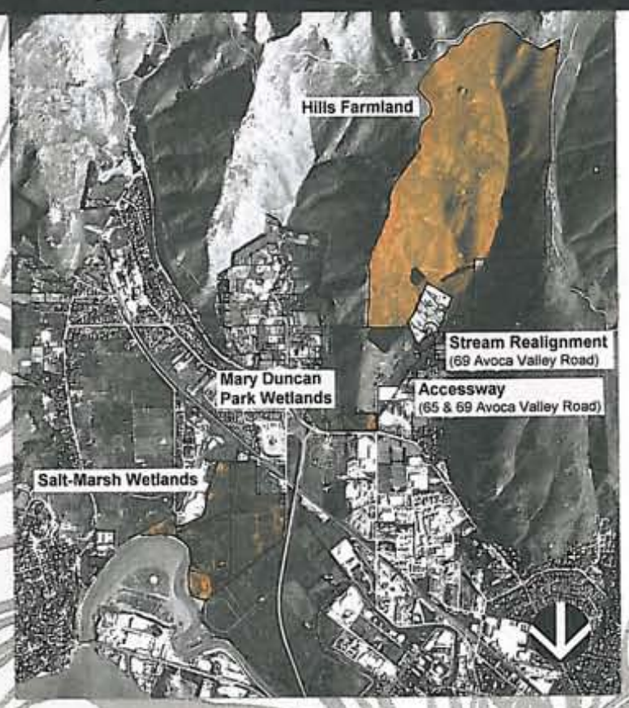
Restoration Proposals

There are opportunities for restoration over almost the entire length of the Avoca Valley Stream. If the landowners are interested and funding is secured, this will allow the creation of a continuous corridor of vegetation and habitat, from the top of the Port Hills down to Ihutai (Avon-Heathcote Estuary).

In order to achieve this enhanced stream environment, the Christchurch City Council and local community, via the Avoca Valley Stream Care Group, are working together on planning restoration. This teamwork approach has enabled effective, acceptable solutions to be reached for a number of difficult problems, for each of the properties along the stream. It should be noted that these solutions are only concept plans, each requiring the details to be worked out in conjunction with individual property owners. (While plans have been developed for each property, this report includes only a few characteristic examples.)

A cooperative approach will allow waterway restoration through the many areas of private land along the stream. This demonstrates the importance of involving the local community in planning, design and management. With the involvement of the landowners and securing of funding, it is hoped the various components of this restoration project will be implemented over the next 10 years.

Key Areas for Restoration



Restoration Guidelines

The Avoca Valley Stream restoration project has been designed in relation to a series of underlying principles, which suggest guidelines for waterway restoration:

Key Principles:

- The return of the "life" of the stream, by encouraging and re-establishing some local indigenous flora and fauna, patterns, processes and connections
- A community based approach, respecting the rights of landowners, and recognising the dependence upon the local community for the success of waterway restoration projects
- Where there is a community investment, secure protection wherever possible. Use a range of methods from purchase, covenants, esplanade strips and easements to setbacks and zoning.

Stream-form:

- Reinstate natural stream patterns (including meanders, gentle banks and wetlands) and processes (as far as practical), allowing streams to function as nature intended
- Restore wetlands (usually a waterway's richest habitat)
- Do not encourage/create artificial or straight waterways
- Re-create naturalistic, regraded profiles for stream-beds; not just an artificial channel or ditch
- Allow for the functioning of the traditional rhythms of nature along streams, by removing tide gates, culvert drops and other obstructions
- Where appropriate, use of stabilised bed materials will help reduce erosion of the stream-bed, to re-establish natural gradients [not appropriate in soft systems]

Stream-flow:

- Protect and retain a stream's springs
- Manage flooding within catchments through the creation of pools and wetlands, and providing for flood flows in the stream channel by widening
- Reduce flood water velocities by restoring riparian vegetation

- Seek to encourage a permanent stream flow, by re-establishing vegetation throughout the upper catchment, which will hold water in the system for longer and slowly release it into the stream - increasing pools and wetlands will also hold back waters after storm events

Biodiversity:

- Re-establish naturally occurring local native vegetation associations along streams and waterways
- Establish habitat designed for the native wildlife likely to inhabit an area - including birds, fish, lizards and invertebrates
- Naturalise stream-beds with pools, riffles, overhangs and variable widths

Water Quality:

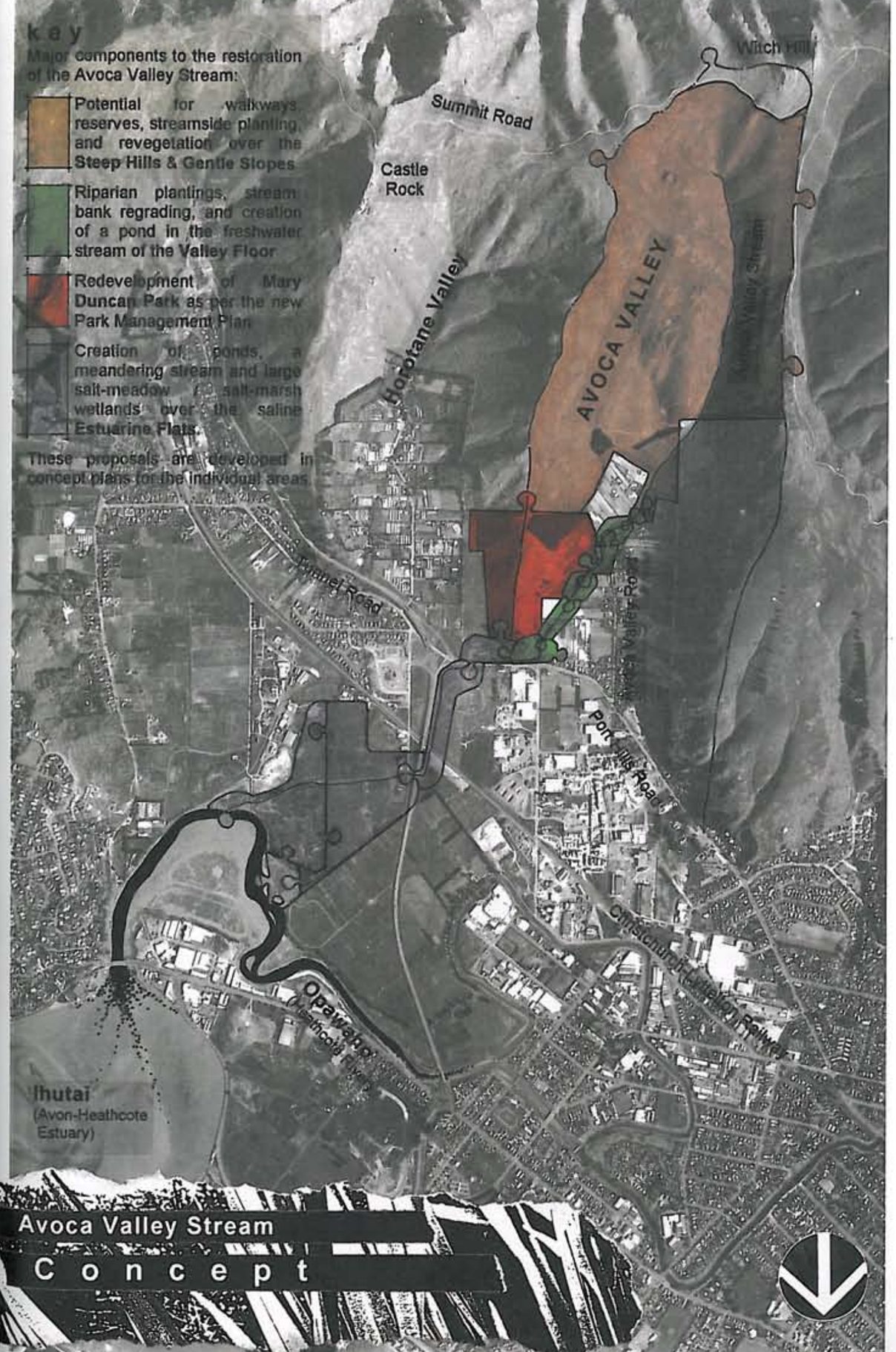
- Reduce sedimentation (from catchment erosion) by re-establishing vegetation throughout the catchment, especially in riparian strips, which will have a filtering effect upon runoff entering the stream
- Reduce / control contaminants, such as sprays and chemicals
- Reduce / control runoff from irrigation
- Reduce / control rubbish in waterways
- Reduce / control stock access to streams

Social:

- Work through proposals with the stream and streamside landowners and lessees, and clarify any misunderstandings
- Seek to work in partnership with communities and individuals
- Clarify land tenure
- Respect and seek to compliment landowners' personal preferences for waterway enhancement
- Ensure fair distribution of funds
- Secure funding over the long term wherever possible

Planning and Design:

- Reduce / control erosion with plantings (catchment, riparian and instream)
- Design proposals in relation and response to the underlying land types, patterns, soils and materials
- Use local natural materials (for example, the use of basalt on the volcanic hills, greywacke on the plains, timber in the peat country, and none of these in the estuary)



Hills Farmland

KANUKA,
houhere, falcon,
Steep Hills ecosystem

TOTARA,
matai, bellbird,
Gentle Slopes ecosystem

The farmland of the Steep Hills and Gentle Slopes ecosystems at the head of the Avoca Valley, are currently used for grazing cattle.

Issues

- Erosion (due to past over-grazing)
- Lack of significant vegetation
- Ephemeral stream - dry much of the year
- Retention of water for stock in the upper reaches of the stream
- Landowner is considering the possibility of subdividing the lower areas for residential, providing in exchange walkways, covenanted riparian revegetation and reserves
- Good land and stock management.

Suggestions

- Native riparian plantings as buffers of significant width along the stream
- Planting of harakeke (NZ flax) and houi (lacebark) around the springs at the top of the valley - identified as important to takata whenua
- Native revegetation throughout the catchment - this will assist with erosion control, slowing the passage of water off the hills, and holding it in the catchment for longer
- Encouraging a year-round stream flow by protection of the stream's springs, and through increased vegetative cover
- Potential walkways, linking with Castle Rock Reserve, Rapaki Track and the Crater Rim Walkway (possibly named "Mac Track", after the landowner)
- Reserve land contributions in association with subdivision.

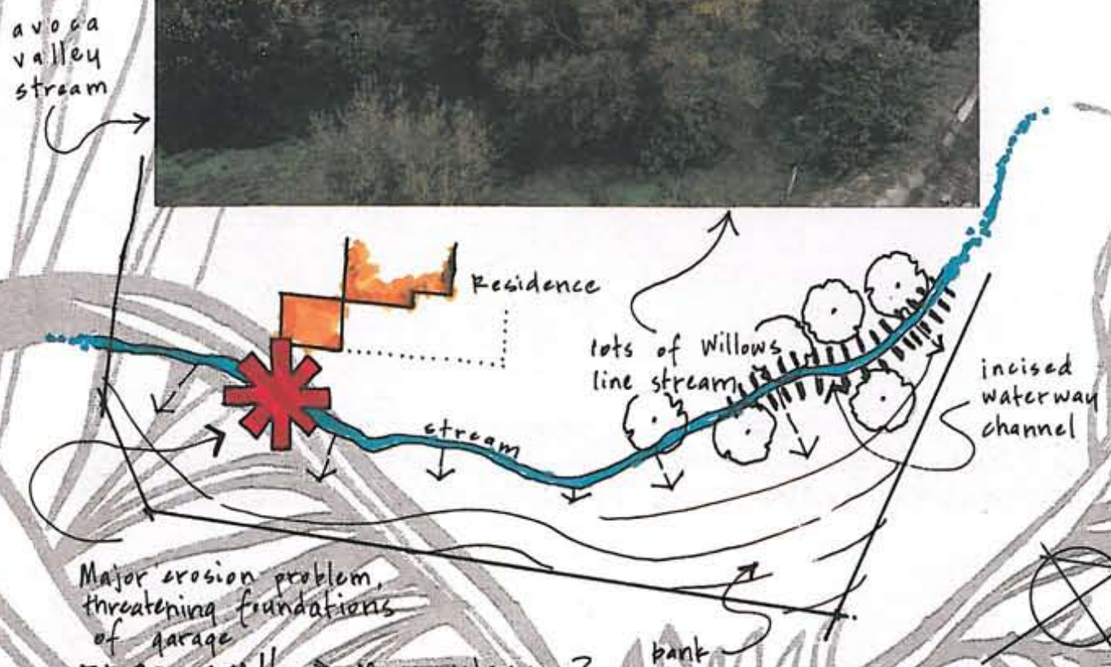
Future Opportunities for the Steep Hills and Gentle Slopes farmland

Stream Realignment (69 Avoca Valley Road)

KAHIKATEA,
pokaka, kingfisher,
Valley Floor ecosystem

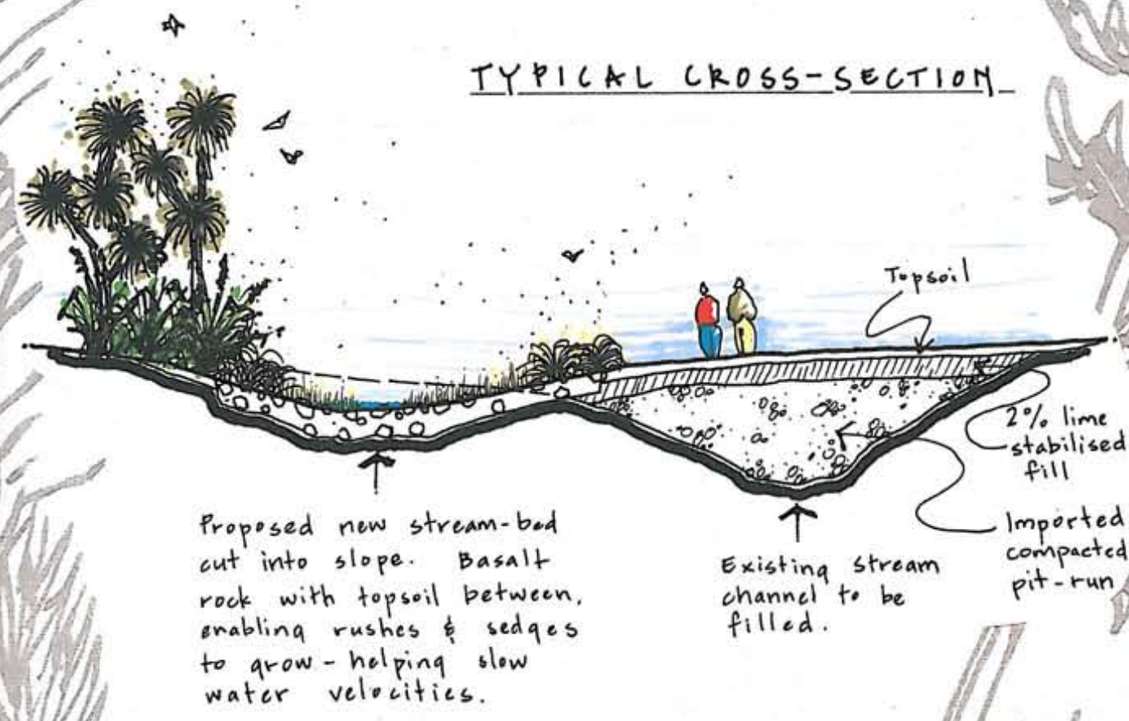
Issues

- Over recent years several large holes have been scoured out of the stream-bed here, one from a waterfall, which threatens the foundations of the owners' garage
- Past attempts to fix further erosion have been unsuccessful
- Potential loss of useable land because the stream cuts off part of the property.



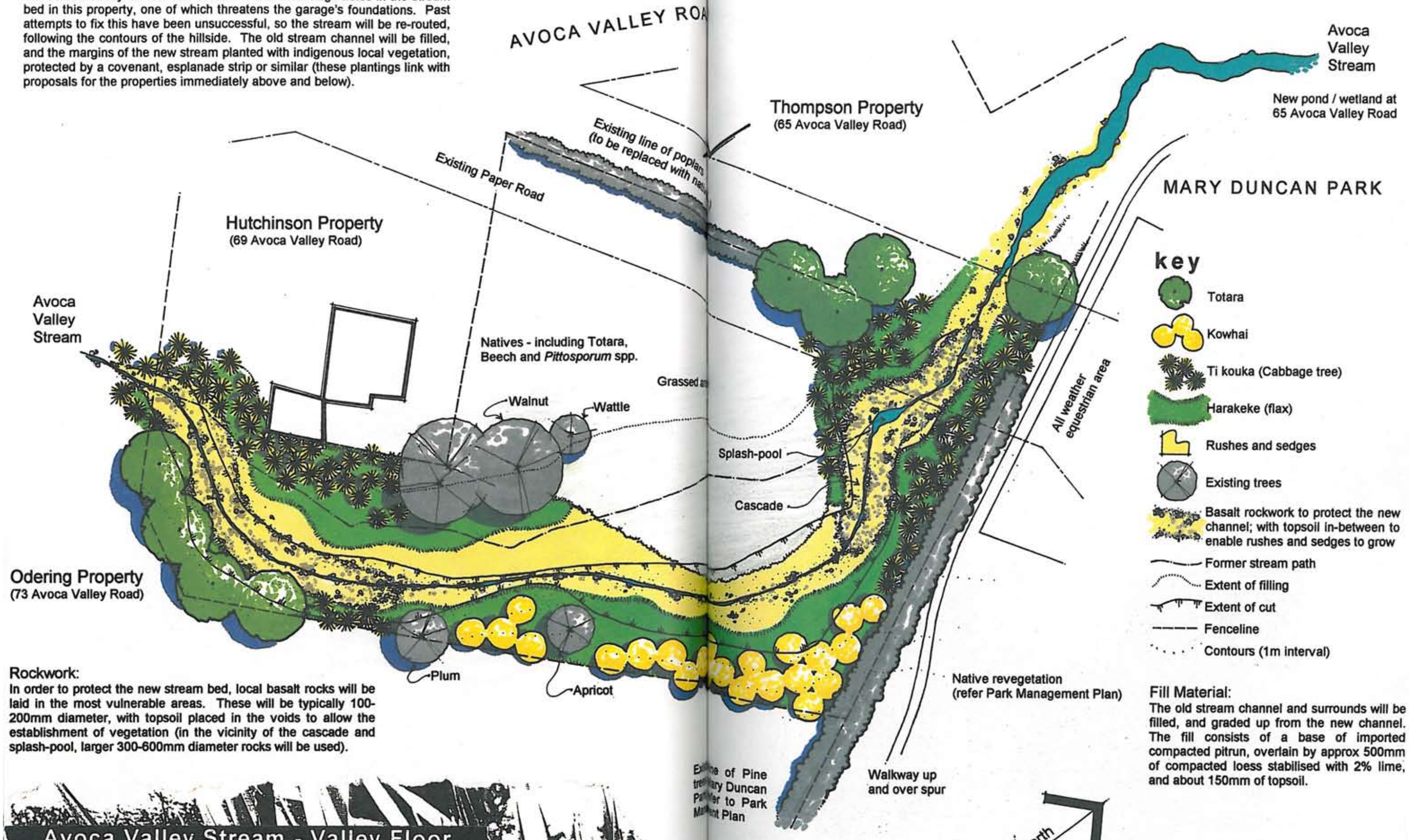
Proposals

- Re-route the stream (already a modified channel) away from the existing holes and waterfall, to follow the contours of the hillside
- Use of local rock, stabilised fill and plantings to prevent future scouring of the new channel
- Fill in and stabilise the existing stream channel
- Native riparian planting along the stream (protected by an esplanade strip), with replanting of rushes and sedges in the stream-bed to help slow the water
- Establish a legal esplanade strip, to protect the land either side of the stream and the native vegetation to be planted there for future generations
- The potential for future public access is under discussion
- Maintenance works are scheduled for eroded sections of the stream near buildings. However, no stream realignment works will be scheduled unless the land involved is protected by purchase, covenant or esplanade strip. It is likely any realignment will be delayed until the land is secured in public ownership.



Waterway Realignment:

The Avoca Valley Stream has scoured out several large holes in the stream bed in this property, one of which threatens the garage's foundations. Past attempts to fix this have been unsuccessful, so the stream will be re-routed, following the contours of the hillside. The old stream channel will be filled, and the margins of the new stream planted with indigenous local vegetation, protected by a covenant, esplanade strip or similar (these plantings link with proposals for the properties immediately above and below).



Rockwork:

In order to protect the new stream bed, local basalt rocks will be laid in the most vulnerable areas. These will be typically 100-200mm diameter, with topsoil placed in the voids to allow the establishment of vegetation (in the vicinity of the cascade and splash-pool, larger 300-600mm diameter rocks will be used).

Fill Material:

The old stream channel and surrounds will be filled, and graded up from the new channel. The fill consists of a base of imported compacted pitrun, overlain by approx 500mm of compacted loess stabilised with 2% lime, and about 150mm of topsoil.

ting Trees:

n from those shown, the existing along the stream bed will be ved (predominantly willows).

Avoca Valley Stream - Valley Floor

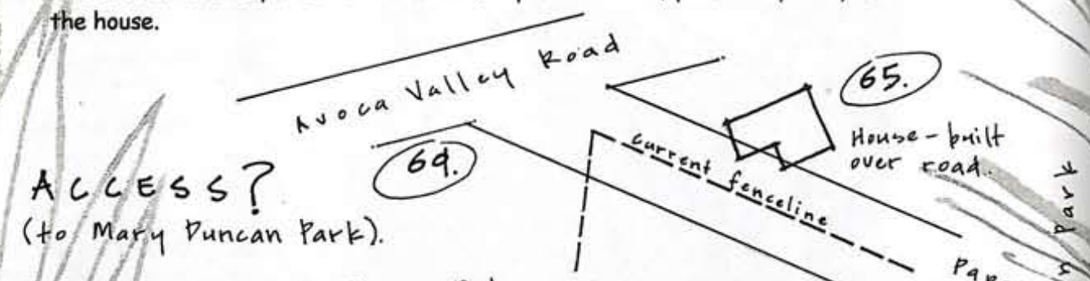
Realignment at 69 Avoca Valley Road

Accessway (65 & 69 Avoca Valley Road)

KAHIKATEA,
pokaka, kingfisher,
Valley Floor ecosystem

Issues

- There is an unformed legal road running through the property, from Avoca Valley Road to Mary Duncan Park - theoretically providing public access
- Maintaining opportunities for public access from Avoca Valley Road to Mary Duncan Park is desired
- Part of the house has been built onto this paper road
- Property is unsaleable in its present situation
- Public use of the paper road would encroach unacceptably on to the residence; so solutions are required to the need for public access, preferably away from the house.

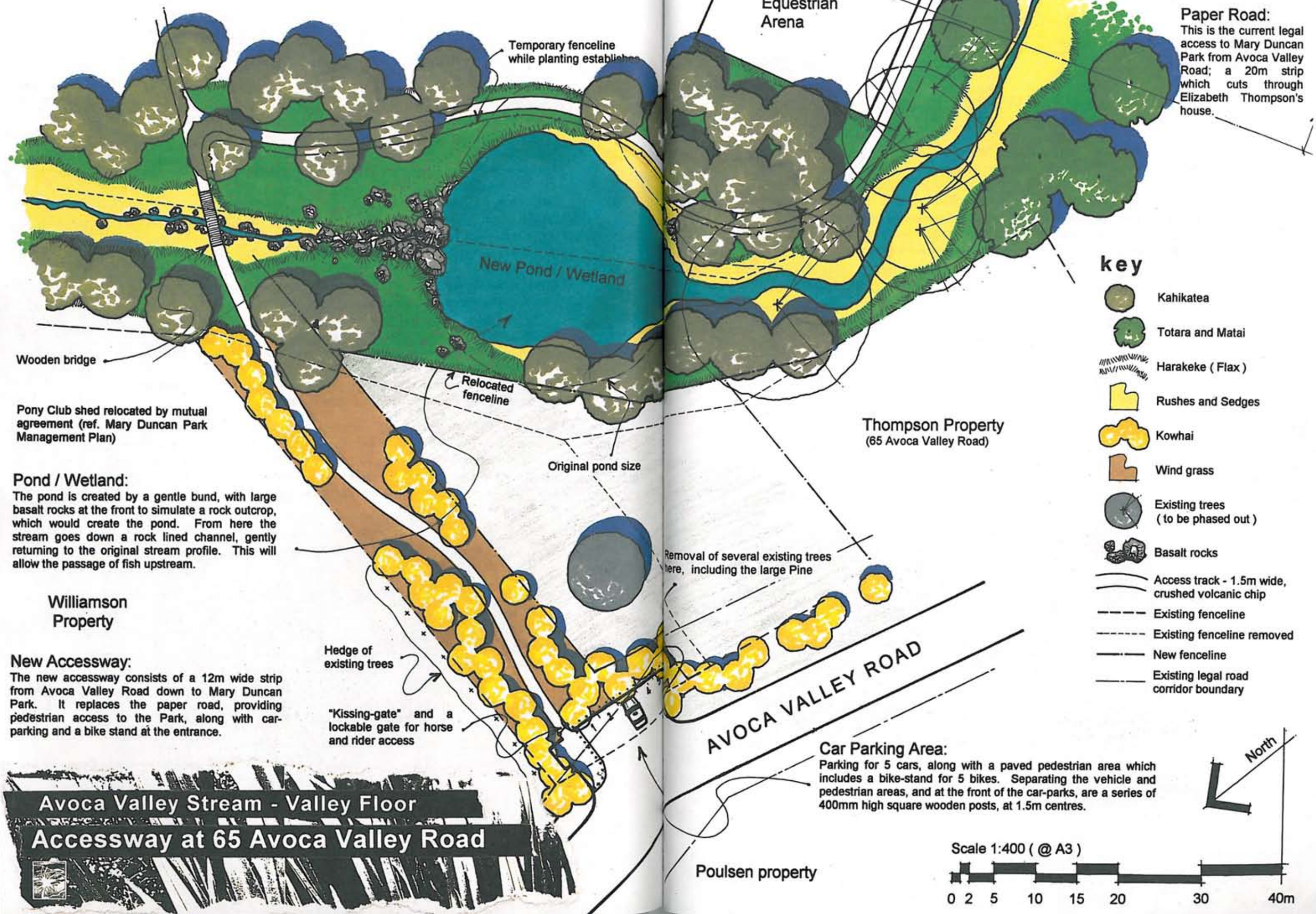


Proposals

- Create a legal pedestrian accessway to Mary Duncan Park which will replace the current paper road, away from the residence
- Provide limited car-parking beside Avoca Valley Road
- Establish a buffer of native vegetation between the accessway and the surrounding properties
- Legally "stop" the existing paper road
- Create a small wetland within the stream-bed, confined by a gentle bund along with the surrounding contours
- Select plants that naturally occur in local ephemeral situations, because this wetland is not expected to remain full throughout the year
- Establish native riparian revegetation alongside the stream and new wetland, with naturally occurring local native plants
- Seek protection of the wetland and plants via a covenant or esplanade strip
- Create a riparian strip of an acceptable and adequate width
- Provide separation between the public and Pony Club areas on the Mary Duncan Park side of the stream, to reduce conflicts
- Incorporate this concept plan into the proposed Mary Duncan Park Management Plan (prepared by landscape architect John Marsh)

- This proposal is under much discussion, particularly with the adjoining landowners along Avoca Valley Road. The most effective option for maintaining public access into this corner of Mary Duncan Park will be advertised, and submissions will be called for, as part of the Park Management Plan process. The Council's Parks Unit will coordinate these submissions and the opening of public access in the future.

MARY DUNCAN PARK - refer to Management Plan for details



Paper Road:

This is the current legal access to Mary Duncan Park from Avoca Valley Road; a 20m strip which cuts through Elizabeth Thompson's house.

key

- Kahikatea
- Totara and Matai
- Harakeke (Flax)
- Rushes and Sedges
- Kowhai
- Wind grass
- Existing trees (to be phased out)
- Basalt rocks
- Access track - 1.5m wide, crushed volcanic chip
- Existing fenceline
- Existing fenceline removed
- New fenceline
- Existing legal road corridor boundary

Pond / Wetland:

The pond is created by a gentle bund, with large basalt rocks at the front to simulate a rock outcrop, which would create the pond. From here the stream goes down a rock lined channel, gently returning to the original stream profile. This will allow the passage of fish upstream.

Williamson Property

New Accessway:

The new accessway consists of a 12m wide strip from Avoca Valley Road down to Mary Duncan Park. It replaces the paper road, providing pedestrian access to the Park, along with car-parking and a bike stand at the entrance.

Car Parking Area:

Parking for 5 cars, along with a paved pedestrian area which includes a bike-stand for 5 bikes. Separating the vehicle and pedestrian areas, and at the front of the car-parks, are a series of 400mm high square wooden posts, at 1.5m centres.

Avoca Valley Stream - Valley Floor
Accessway at 65 Avoca Valley Road

Mary Duncan Park Wetlands

OIOI,
marsh ribbonwood, tuturiwhatu,
Estuarine Flats ecosystem

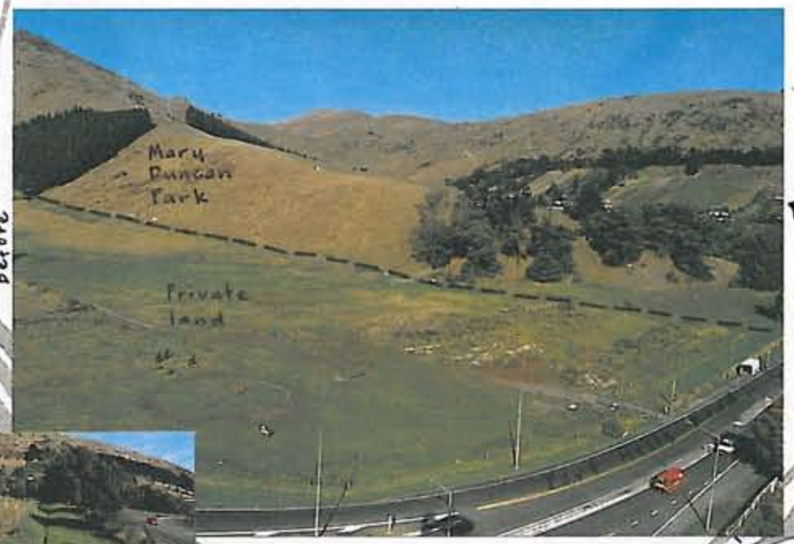
The area of Mary Duncan Park beside Port Hills Road would be an excellent site for an area of extensive wetlands. While currently in use as a grazing paddock, this area was originally wet and swampy (before being "filled"), with the underlying Motukarara soils indicating the estuarine environment once extended this far.

This area proposed for the wetlands includes some private land adjacent to the Park. However, the land owners here are keen to see the proposal go ahead. These wetlands will provide a highly visible demonstration of the project (and waterway restoration) near the entrance to Mary Duncan Park, along with habitat for wildlife and an area of public amenity.

Issues

- The proposed wetlands include land from the neighbouring property; land tenure needs to be finalised, as public land or protected private land
- LPG pipeline with a 12m easement through this area, with many restrictions regarding earthworks and planting
- Loss of potential grazing land for the Pony Club
- Sedimentation at Port Hills Road culvert.

before



Proposals

- Create large wetlands, fed primarily by groundwater, along with any stream flows
- Design wetlands primarily for provision of habitat for wildlife (in consultation with an ornithologist and freshwater fish ecologist)
- Realign the waterway immediately upstream from the wetlands, to follow the natural patterns of the land
- Wetlands will help trap sediment, preventing it from reaching the estuary
- Provide an area for public use/recreation, with a separate entrance from Port Hills Road
- Develop a cycleway/walkway alongside Port Hills Road
- Create a walkway in the Mary Duncan Park, linking around over the spur to the new accessway (at 65 Avoca Valley Road)
- Installation of a viewing area, where the public can view the wildlife of the wetlands without being seen.

Anticipated Wildlife

- The following native birds are likely to use these wetlands:
  - kuruwhengi (NZ shoveler)
  - kotare (NZ kingfisher)
  - putangitangi (paradise shelduck)
  - spur-winged plover
  - white-faced heron
  - parera (grey duck)
  - poaka (pied stilt)
  - possibly tete (grey teal)
  - possibly papango (NZ scaup), dependant upon fresh water
  - possibly cormorants and shags from the Woolston Loop, where the trees they nest in are dying
- Six species of native fish are likely to frequent the pond, as long as there is access to the sea:
  - shortfinned eel
  - longfinned eel
  - common bully
  - inanga (whitebait)
  - common smelt
  - patiki (black flounder)

Inanga are likely to spawn and/or rear in these wetlands, and the appropriate habitat will be created with this in mind.

after

This concept for wetlands has been specifically designed to provide habitat for native wildlife. It also allows for natural stream / wetland patterns and local native vegetation to be restored.

The wetlands will be fed primarily by groundwater, with a water depth of up to 2m in places, and a possible tidal influence in future. The proposal incorporates land from Mary Duncan Park and the neighbouring property, with allowance for staging of development (Stage One in Park; Stage Two in neighbouring land). The cycleway / walkway will incorporate a viewing area.

Avoca Valley Stream - Estuarine Flats

Mary Duncan Park Wetlands

McCulloch / Foxton Property

MARY DUNCAN PARK

SPUR

Walkway over spur to new accessway

Boundary fence; a portion will be removed

Possible access track

Revegetation of spur with Totara / Matai forest (refer to Park Management Plan)

12m LPG easement

12m LPG pipeline easement: due to restrictions, plantings within the easement will consist of grasses, rushes, sedges and harakeke (flax). There will generally be a 1.5m minimum cover over the pipeline, with concrete pads where the stream crosses it.

Cycleway / walkway

Culvert

Access from State Highway retained

PORT HILLS ROAD

Scale 1:1000 (@A3)

0 10 20 50 100 150m

key

- Kahikatea
- Totara / Matai forest revegetation
- Houi (marsh ribbonwood)
- Harakeke (Flax)
- Rushes and Sedges
- Shallow shelf in pond (100 - 200mm deep)
- Wildlife / bird retreats
- 1.5m wide cycleway / walkway
- Existing fenceline
- New fenceline
- 1m water depth
- 2m water depth

Continue planting as far as landowner desires

Pony Club cottage

Car park (8 cars)

Pony Club stable / yards

Oak tree retained (Mary Duncan's request)

Gate

"Hospital" paddock

Realigned stream, access track, and bridge position, to allow the stream to follow the natural patterns of the land

Public entrance

Fenceline (to be removed)

Pony Club entrance

Cycleway / walkway

North

Salt-Marsh Wetlands

OIOI,
marsh ribbonwood, tuturiwhatu,
Estuarine Flats ecosystem

This proposal is for the open, flat, pasture land of the Estuarine Flats ecosystem, between Tunnel Road and Opawaho (Avon-Heathcote River) surrounding the Avoca Valley Stream. The area is currently used as grazing land, and includes the old Heathcote County Council rubbish tip. However, this area was once part of the estuarine environment, covered with a network of salt-meadow and salt-marsh wetlands. The patterns and channels of these wetlands are still evident in the land today, and given the areas low level status of landuse, there is an excellent opportunity for their reinstatement.

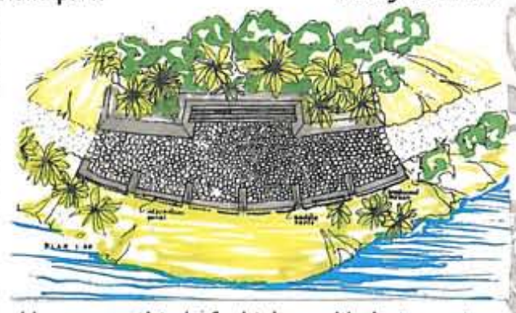
Issues

- This is one of the last large, open, undeveloped areas in Christchurch, which is currently under pressure for urban growth
- Both the Council and a key landowner agree on opportunities for wetland creation with limited public access - land purchase or covenanting are options under discussion
- The current artificial stream course (a straight drainage channel) is limiting habitat and stream-life, and has little value for wildlife
- The low lying land here is particularly vulnerable to flooding from storm flows in the stream and high tide events, relying upon the maintenance of flood protection devices.

Proposals

- Restore the salt-meadow and salt-marsh wetlands, by allowing water to flow along the old channels once again, enabling the ongoing maintenance of the drainage systems here to be abandoned
- Accompanying this restoration, "bunding" or filling of the surrounding land zoned for residential or industrial purposes would need to be undertaken
- Salt-meadow vegetation will naturally recolonise in the areas of the strongest saline influence, consisting of species like *Salicornia* which grow to 15cm high
- Salt-marsh will occur where the saline influence is less, consisting of saline tolerant rush and sedge species such as *Leptocarpus similis* (oioi) and *Juncus maritimus* (wiwi)
- Plant the salt-marsh in patches, which will then spread out and colonise
- Establish large drifts of marsh ribbonwood (houi), along with mixed drifts of harakeke (NZ flax) and toetoe
- Establish areas of "estuarine forest" on the higher ground, including the old rubbish tip site
- Provide large areas of wildlife habitat
- Create interpretation facilities and walkways, linking with the proposed Opawaho (Avon-Heathcote Estuary) walkway
- Develop the area as an estuarine wetland park
- Provide a viewing hide, designed in response to the landscape, and giving views over the wetlands and associated wildlife
- Purchase the land required, or provide some other form of land protection (eg, covenants or esplanade strips).

Viewing hide - PLAN



Anticipated Wildlife

- Up to 25 bird species can be expected here, one third of which are likely to nest
- These species include kotare (NZ kingfisher), kuaka (godwit), poaka (pied stilt), pied oystercatcher and spur-winged plover

Viewing hide, designed by Peter Kent, Architect.

Avoca Valley Stream - Estuarine Flats
Salt-Marsh Wetlands

This concept is based around the reinstatement of large salt-meadow and salt-marsh wetlands, utilising the patterns still evident in the land. By allowing water to flow along the old channels, this vegetation will naturally recolonise, giving a network of wetlands similar to what once occurred here and providing a major area of wildlife habitat.

key

- "Estuarine forest"
- Harakeke and Toetoe
- Houi (Marsh ribbonwood)
- Salt marsh
- Salt meadow
- Silver tussock
- Existing shelterbelts / plantings
- Legal boundaries

Note: a viewing hide and public walkways will be developed after wildlife has established.

North

Scale 1:3500 (@ A3)

0 20 50 100 200 300m

Butts Valley Drain

Drain

Pylons

Drain

Avoca Valley Stream

Redevelopment of Avoca Valley Stream alongside Tunnel Road; reinstatement of meandering stream pattern, native planting

Scruttons Road

Area retained by property owners

Christchurch-Lyttelton Railway

Truscotts Road

Potential site for viewing hide

Macrocarpas retained until cover establishes (good bird habitat)

Avoca Valley Stream

Potential area for public facilities

Old fill site (owned by the Christchurch City Council)

OPAWAHO
(Heathcote River)

McCulloch / Foxton land

TUNNEL ROAD

Existing salt-meadow in need of a clean-up; incorporate into proposal

Pylons

Link into proposed track along Heathcote River

Implementation

The implementation programme for this project depends on many factors, which may affect the order of restoration works. These factors include:

- On-going funding. In order to finance the on-going works in this project, the community will need to seek outside funding and sponsorship. The Christchurch City Council is unable to sustain the on-going costs for all works, but will support the implementation as far as possible.
- Obtaining protection for planting and other work on private lands with public investment (eg, via covenants, esplanade strips or purchase)
- Community feedback and suggestions.

The project relies upon an **on-going partnership** between the Council and local residents, including:

- A range of alternative sources for funding the restoration works
- Community planting days
- School planting days, to involve local children and encourage a sense of ownership
- On-going involvement in management, maintenance and monitoring
- Involvement of groups such as the Pony Club who have offered to help with planting.

Programme for Restoration Works

Year	Action to be taken
1. 1996	Funding received from the Ministry for the Environment's Sustainable Management Fund for 2 years Stream Care Group formation Planning for stream restoration begins
2. 1997	Detailed planning for Avoca Valley Stream and Mary Duncan Park Riparian planting at 77 Avoca Valley Road (Planted June 7 1997)
3. 1998	Avoca Valley Stream Plan and Video finished Stream realignment and planting at 69 Avoca Valley Road Mary Duncan Park ponding and planting (stage one, within Mary Duncan Park) Negotiations underway regarding land tenure along the Avoca Valley Stream's mid section
4. 1999	Mary Duncan Park ponding (stage two) With land owners' approvals and no objections: legal "stopping" of paper road and associated land swap at 65 Avoca Valley Road Possible creation of new pond, and planting, at 65 Avoca Valley Road
5. 2000	Dependent upon outcome of City Plan hearing, and other factors: begin development of salt-meadow and salt-marsh wetlands in lower catchment by the Estuary Mary Duncan Park redevelopment (dependent upon Parks Unit, CCC)
6. 2001	Development of salt-meadow and salt-marsh wetlands Mary Duncan Park redevelopment continues
7. 2002	Development of salt-meadow and salt-marsh wetlands Mary Duncan Park redevelopment continues
8. 2003	Stream realignment and planting alongside Tunnel Road Mary Duncan Park redevelopment continues
9. 2004	Continuation of stream enhancement alongside Tunnel Road Mary Duncan Park redevelopment continues Start planting and regrading of stream alongside Zealandia Glasshouses
10. 2005	Planting of upper catchment farmland Mary Duncan Park redevelopment continues

Protection

All proposals involving public investment in waterways and wetlands on private land should be legally protected, to safeguard them for future generations. Other than purchase, there are two main methods proposed for the Avoca Valley Stream - Conservation Covenants and Esplanade Strips. It should be noted that there are a range of other protection methods available, including other forms of covenants, along with reserves, setbacks, easements and zoning.

Protection Method	Main Features	Land	Issues
Conservation Covenants Administration Body: Local Authority Legislation: Reserves Act (1977)	• Preserve the natural environment, or landscape amenity, or wildlife or freshwater-life or marine-life habitat, or historical value • Local authorities may offer financial and/or resources aid to landowner • May be able to negotiate rates decrease or relief (Rating Powers Act 1988) • Public access negotiable	Private land; or leased Crown land Urban and Rural	• Set-up, management, & maintenance costs to local authority & landowners • Local authorities are responsible for monitoring & enforcement • Can be time-consuming
Esplanade Strips Administration Body: Local Authorities Legislation: Resource Management Act (1991)	• Creation of an esplanade strip by: 1) agreement between a local authority and the landowner (compensation may be a factor) 2) a condition in a resource consent for subdivision • Ownership of strip is retained by the owner of the adjoining land • No provision in RMA for territorial authorities to manage the land • Management and costs are agreed between the parties • Public can be excluded from the strip for conservation purposes • Strip boundaries move with the water • The strip is registered on the land title and binds future owners • Esplanade strips do not require surveying, but must be clearly identified on a survey plan	Private land	• Requires management agreement with owner • Only along waterways • Possible conflict with landowners • No fixed boundary on title

Conclusion

- Healthy streams represent the well-spring of life and provide ecological connections through the land. Many streams have been seriously degraded. With planning, committment and effort, a community can seek to restore much natural life - creating "green arteries" through the land, whether rural or urban
- In planning a stream restoration project, identifying the different types of land through which it travels provides a guide to appropriate stream form and patterns - curvature of the alignment, shape of banks, channel form, and, the type of rock that might line a stream. These underlayers are the basis to the nature of a place.
- Identifying the different underlying indigenous ecosystems provides a guide to the plants and animals that belong (the natural biodiversity) so that restoration opportunities for the stream corridor can be assessed. Based on land types, these can be identified at various levels of detail and their re-introduction planned.
- Restoration is as much about working with people as working with land and water
- It is essential to work in partnerships for restoration planning and implementation, with a community stream care group, takata whenua and professionals working together as a committed restoration TEAM that can be highly successful, given time. Local children can also be important participants for both short and long term stream care.
- Stream restoration work must respect the rights of landowners but is not necessarily confined to public land. A public-private partnership for ownership and management is desirable, not just a planning partnership.
- Where there is a community investment in funding planning or implementation on private land, secure protection is desirable wherever possible. Various methods may be appropriate - public purchase, covenants, management agreements, esplanade strips, easements, setbacks or zoning.
- Commitment of effort and time to restoration planning are worthwhile for effective results. Months, or even years of discussion (with good leadership), are good investments when solving age-old historic and complex issues
- Adequate time is essential for implementing stream restoration works - eg. doing earthworks when stream levels are low, getting plants contract-grown, planting in appropriate seasons, and, maintenance in the initial establishment years.
- Many communities have every element it takes to successfully implement restoration projects. They may need to recognise their own skills, and, be supported in developing them and in believing in themselves.
- Staging of a project is essential to ensure resources and community are not over-committed, either in doing the works or in maintenance.
- A restoration project involving a wide spectrum of people, the appealing vision of restoring nature and the appealing task of planting, can be an inspiration to others elsewhere.

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KANUKA, houhere, falcon, Steep Hills ecosystem

FOOD: *No matter how much sweet is...*
F = Fruit/seed
N = Nectar
B = Bird foliage
I = Insects
L = Fruit for Lizards

PLANT TOLERANCES
To sweep, shade, moist, dry and windy conditions shown as
■ = necessary or needs
□ = intolerant
½ = tolerant of some
t = tends to be stubbier

PLANT LISTS Plants natural to these steep to very steep, dry, well-drained, shallow Evans soils on volcanic rock & colluvium with abundant rock outcrops

Bold = species suitable for planting in ephemeral stream channels and seepages
M = Main species for relatively fast growing first stage planting into open sites

			Tolerances					
TREES & TALL SHRUBS		Food	sun	shade	wet	dry	wind	
Coprosma lucida	shining karamu	F	■	■	■	■	■	M
Coprosma robusta	karamu	F	■	■	■	■	■	M
Cordyline australis	**ti kouka, cabbage tree**	F,N,I	■	½	■	■	■	M
Discaria toumatou	matagouri	F,N,I	■	□	½	■	■	
Dodonaea viscosa	akeake		■	□	□	■	■	* M
Griselinia littoralis	kapuka, broadleaf	F,B,I	■	■	■	■	■	M
Hoheria angustifolia	houhere, hout, narrow-leaved lacebark	F,I	■	□	½	■	■	M
Kunzea ericoides	kanuka	N,I	■	□	½	■	■	M
Myoporum laetum	ngaio	F,N	■	½	□	■	■	t M
Olearia avicenniifolia	a tree daisy	N,I	■	□	½	■	■	M
Olearia paniculata	akiraho, golden akeake	I	■	□	□	■	■	M
Pittosporum tenuifolium	kohuhu, black matipo	F,I	■	■	■	■	■	M
Pseudopanax crassifolius	horoeka, lancewood	F,B,I	■	½	■	■	■	
Pseudopanax ferox	toothed lancewood	F,B,I	■	□	□	■	■	
Solanum laciniatum	poroporo	F	■	½	½	■	■	t M
Sophora microphylla	South Island kowhai	F,N,I	■	½	½	■	■	t M
SHRUBS								
Carmichaelia australis	a NZ broom		■	□	□	■	■	
Coprosma crassifolia	thick-leaved mikimiki	F,L	■	½	□	■	■	M
Coprosma propinqua	**mikimiki**	F,I,L	■	½	■	■	■	M
Coprosma virescens	pale green coprosma	L	■	½	½	■	■	M
Corokia cotoneaster	korokio	F,N	■	□	□	■	■	M
Helichrysum lanceolatum	niniao		■	□	□	■	■	
Melicytus alpinus	porcupine shrub	F,L	■	□	□	■	■	
Muehlenbeckia astonii	shrub pohuehue	F,N,L	■	□	□	■	■	M
Muehlenbeckia complexa	**pohuehue**	B,L	■	□	½	■	■	
Olearia odorata	a fragrant shrub daisy		■	□	□	■	■	M
Ozothamnus leptophyllus (Cassinia)	tauhinu, cottonwood	I	■	□	■	■	■	M
Sophora prostrata	dwarf kowhai	N	■	□	□	■	■	t
Teucridium parvifolium	NZ shrub verbena		■	□	½	½	□	
VINES & SCRAMBLERS								
Clematis afoliata	pohue, leafless scrambling clematis		■	□	□	■	■	
Clematis marata	a small scrambling clematis	I	½	½	½	■	½	
Rubus schmidelioides	**tataramoa, fine bush lawyer**	F,B	■	½	½	■	■	

GROUNDCOVERS

		Food	Tolerances: sun	shade	wet	dry	wind
Festuca "Banks Peninsula blue tussock"	Banks Peninsula blue tussock	F	■	□	½	■	■
Hierochloe redolens	**karetu, holy grass**		■	□	■	½	■
Isolepis (Scirpoides) nodosa	**knobby clubrush, wiwi**		■	□	■	■	■
Juncus gregiflorus, J distegus, J sarophorus	**wiwi, tussock rush**		■	□	■	□	■
Libertia ixioides	mikoikoi, NZ iris		■	■	½	■	■
Linum monogynum	rauhuia		■	□	□	■	■
Microlaena stipoides	meadow rice grass		□	■	□	½	□
Poa cita	**silver tussock, wiwi**	F	■	□	½	■	■
Poa colensoi	blue tussock	F	■	□	½	■	■
Pteridium esculentum	rauruahu, bracken fern		■	½	½	■	■
Rytidosperma spp	danthonia bunch grasses		■	□	□	■	■

Food: For **native birds**, **F** = Fruit/seed, **N** = Nectar, **B** = Bud/foliage, **I** = Insects. For **lizards**, **L** = fruit

Plant tolerances for sunny, shady, moist, dry and windy conditions shown as:
■ = tolerates or needs □ = intolerant ½ = tolerant of some

Bold = species suitable for planting in ephemeral stream channels and seepages
M = Main species for relatively fast growing first stage planting into open sites

* = to establish, protect from frost in flats; t = toxic for toddlers

houhere = narrow-leaved lacebark

TOTARA, matai, bellbird, Gentle Slopes ecosystem

FOOD: for ***native birds*** shown as:
F = Fruit seed;
N = Nectar;
B = Bud foliage;
I = Insects.
L = Fruit for *Lizards*

PLANT TOLERANCES:
for ***sunny, shady, moist, dry and windy conditions*** shown as:
■ = tolerates or needs
□ = intolerant
½ = tolerant of some
t = toxic for toddlers

PLANT LISTS Plants natural to these rolling to moderately steep, moderately to imperfectly drained **Clifton** and **Scarborough** Hill soils on mixed volcanic and loess colluvium

Bold = species suitable for planting along stream banks

M = Main species for relatively fast growing first stage planting into open sites

TALL TREES

		Food	Tolerances: sun	shade	wet	dry	wind	
Elaeocarpus dentatus	hinau	F.I	½	■	½	½	□	
Podocarpus hallii	mountain totara	F.B.I	■	½	■	■	■	
Podocarpus totara	totara	F.B.I	■	½	■	■	■	M
Prumnopitys taxifolia	matai, black pine	F.B.I	■	■	■	■	■	

TREES

Carpodetus serratus	**putaputaweta, marbleleaf**	F.B.I	½	■	½	□	□		
Cordyline australis	**ti kouka, cabbage tree**	F.N.I	■	½	■	■	■		M
Corynocarpus laevigatus	karaka (pre-European introduction)	F	■	½	½	■	■	t	f
Dodonaea viscosa	akeake		■	□	□	■	■	*	M
Griselinia littoralis	kapuka, broadleaf	F.B.I	■	■	■	■	■		M
Hoheria angustifolia	houhere, houi, narrow-leaved lacebark	F.I	■	□	½	■	■		M
Kunzea ericoides	kanuka	N.I	■	□	½	■	■		M
Myoporum laetum	ngaio	F.N	■	½	□	■	■	t	M
Olearia paniculata	akiraho, golden akeake	I	■	□	□	■	■		M
Pittosporum eugenioides	tarata, lemonwood	F	■	■	½	■	□		M
Plagianthus regius	**manatu, lowland ribbonwood** (deciduous)	F.I	■	½	■	½	■		M
Pseudopanax arboreus	whauwhaupaku, fivefinger	F.I	■	■	½	½	½		M
Pseudopanax crassifolius	horoeka, lancewood	F.B.I	■	½	■	■	■		M
Sophora microphylla	South Island kowhai	F.N.I	■	½	½	■	■	t	M

TALL SHRUBS

Coprosma linariifolia	narrow-leaved coprosma, yellow-wood	F.I.L	½	■	■	½	½		
Coprosma lucida; C robusta	shining karamu, karamu	F	■	■	■	■	■		M
Coprosma repens	taupata (a pre-European introduction)	F	■	■	½	■	■		M
Coriaria arborea	tutu (on shaded stream banks)	F	■	½	½	½	□	t	M
Griselinia lucida	puka (can be epiphytic)	F	■	½	■	■	½		
Lophomyrtus obcordata	rohutu, NZ myrtle	F	■	■	■	■	■		
Macropiper excelsum	kawakawa	F	½	½	□	½	½		
Melicope simplex	poataniwha	F.I	■	■	■	½	½		
Melicytus ramiflorus	mahoe, whiteywood	N.B.I	■	■	½	□	½	*	
Myrsine australis	mapou, red matipo	F.I	■	■	½	■	■		
Pittosporum tenuifolium	kohuhu, black matipo	F.I	■	■	■	■	■		M
Solanum laciniatum	poroporo	F	■	½	½	■	■	t	M

SHRUBS & FLAX-LIKE PLANTS

***Coprosma* aff. *parviflora* (sp. t.)**	**mikimiki**	F.I.L	■	½	■	■	■		
Coprosma crassifolia	thick-leaved mikimiki	F.L	■	½	□	■	■		
Coprosma propinqua	**mikimiki**	F.I.L	■	½	■	■	■		
Cortaderia richardii	**toetoe**		■	□	½	■	■		
Hebe salicifolia	**koromiko**	I	■	½	½	■	■		
Isolepis (Scirpoides) nodosa	**knobby clubrush, wiwi**		■	□	■	■	■		
Phormium tenax	**harakeke, NZ flax**	N.L	■	□	■	■	■		

		Food	Tolerances: sun	shade	wet	dry	wind
VINES & SCRAMBLERS							
Clematis afoliata	pohue, leafless scrambling clematis		■	□	□	■	■
Clematis foetida	scented clematis		■	½	□	½	■
Clematis paniculata	pua wananga, bush clematis	N	½	■	½	□	□
Muehlenbeckia australis	**pohuehue**		■	½	■	½	■
Parsonsia spp.	NZ jasmine	B	½	■	½	½	½
Passiflora tetrandra	kohia, native passionvine	F	½	■	½	□	□
Rubus schmidelioides	**tataramoa, fine bush lawyer**	F,B	■	½	½	■	■
GROUNDCOVERS							
Anemanthele lessoniana	**bamboo tussock, wind grass**		■	■	½	■	■
Astelia fragrans	**kakaha, bush flax**	F,I	□	■	½	½	□
Carex forsteri, C solandri	**sedges**		□	■	■	□	□
Carex virgata	**makura, tussock sedge**		■	½	■	□	■
Juncus gregiflorus	**wiwi, tussock rush**		■	□	■	□	■
Libertia ixioides	**mikoikoi, NZ iris**		■	■	½	■	■
Microlaena stipoides	meadow rice grass		□	■	□	½	□
Ranunculus reflexus	**a native buttercup**		□	■	½	□	□
Uncinia uncinata	**watau, hook sedge**		□	■	■	½	□
ADDITIONAL PLANTS REQUIRING SHELTERED SITES:							
TREES & TALL SHRUBS							
Alectryon excelsus	titoki	F	■	■	½	□	□ *
Aristotelia serrata	makomako, wineberry (semi-deciduous)	F,I	½	½	½	□	□
Coprosma rotundifolia	**round-leaved coprosma**	F,I	½	■	■	½	½
Hedycarya arborea	porokaiwhiri, pigeonwood	F,I	■	■	½	□	□ *
SHRUBS							
Coprosma areolata	**veined coprosma**	F,L	½	■	½	½	□
Coprosma rhamnoides	red-fruited mikimiki	F,B,I	■	■	½	■	■
Coprosma rubra	**red-stemmed coprosma**	F,L	■	½	■	½	■
TREE & GROUND FERNS							
Asplenium bulbiferum	**manamana, hen and chicken fern**	B	□	■	■	□	□
Cyathea dealbata	**ponga, silver fern, a tree fern**		□	■	■	□	□ *
Dicksonia squarrosa	**wheki, rough tree fern**	I	½	■	■	□	□ *
Hypolepis ambigua	**rough pig fern**		½	■	■	□	□
Pellaea rotundifolia	**tarawera, button fern**		■	■	½	■	■
Phymatosorus pustulatus	**maratata, hound's tongue fern**		½	■	■	■	½
Polystichum richardii	**pikopiko, shield fern**		½	■	■	½	□
Polystichum vestitum	**puniu, shield fern**		½	■	■	□	□

Food: For **native birds**, **F** = Fruit/seed, **N** = Nectar, **B** = Bud/foliage, **I** = Insects. For **lizards**, **L** = fruit

Plant tolerances for sunny, shady, moist, dry and windy conditions shown as:
■ = tolerates or needs; □ = intolerant; ½ = tolerant of some

Bold = species suitable for planting along stream banks

M = Main species for relatively fast growing first stage planting into open sites

* = to establish, protect from frost; f = protect from frost; t = toxic for toddlers

matai = black pine

KAHIKATEA, pokaka, kingfisher, Valley Floor ecosystem

FOOD: *for native birds shown as:*
F = Fruit/seed;
N = Nectar;
B = Bud/foliage;
I = Insects;
L = *Fruit for Lizards*

PLANT TOLERANCES:
for sunny, shady, moist, dry and windy conditions shown as:
■ = tolerates or needs
□ = intolerant
½ = tolerant of some
t = toxic for toddlers

PLANT LISTS Plants natural to these rolling to gently undulating, very moist (and wet), imperfectly to poorly drained **Heathcote** and **Horotane** (wet) soils on loess colluvium and alluvium of the valley floor

Bold = species suitable for planting alongside the stream and in swampy areas

M = Main species for relatively fast growing first stage planting into open sites

		Food	Tolerances: sun	shade	wet	dry	wind	
TALL TREES								
Dacrycarpus dacrydioides	**kahikatea, white pine**	F,I	■	½	■	□	■	M
Elaeocarpus dentatus	hinau	F,I	½	■	½	½	□	
Elaeocarpus hookerianus	**pokaka**	F,I	■	½	■	□	□	
Podocarpus totara	totara	F,B,I	■	½	■	■	■	M
Prumnopitys taxifolia	**matai, black pine**	F,B,I	■	■	■	■	■	
TREES								
Carpodetus serratus	putaputaweta, marbleleaf	F,B,I	½	■	½	□	□	
Cordyline australis	**ti kouka, cabbage tree**	F,N,I	■	½	■	■	■	M
Hoheria angustifolia	houhere, houi, narrow-leaved lacebark	F,I	■	□	½	■	■	M
Pennantia corymbosa	**kaikomako (slow growing)**	F,N,I	½	■	■	□	½	
Pittosporum eugenioides	tarata, lemonwood	F	■	■	½	■	□	M
Plagianthus regius	**manatu, lowland ribbonwood** (deciduous)	F,I	■	½	■	½	■	M
Sophora microphylla	South Island kowhai	F,N,I	■	½	½	■	■ t	M
Streblus heterophyllus	**turepo, small-leaved milk tree** (slow)	F	½	■	■	□	□	
TALL SHRUBS								
Coprosma lucida	shining karamu	F	■	■	■	■	■	M
Coprosma robusta	**karamu**	F	■	■	■	■	■	M
Coriaria arborea	tutu (on shaded stream banks)	F	■	½	½	½	□ t	M
Griselinia littoralis	**kapuka, broadleaf**	F,B,I	■	■	■	■	■	M
Leptospermum scoparium	**manuka**	N,I	■	□	■	■	■	M
Lophomyrtus obcordata	**rohutu, NZ myrtle**	F	■	■	■	■	■	
Melicope simplex	**poataniwha**	F,I	■	■	■	½	½	
Myrsine australis	mapou, red matipo	F,I	■	■	½	■	■	
Pittosporum tenuifolium	**kohuhu, black matipo**	F,I	■	■	■	■	■	M
Pseudopanax arboreus	whauwhaupaku, fivefinger	F,I	■	■	½	½	½	M
Pseudopanax crassifolius	lancewood	F,B,I	■	½	■	■	■	
SHRUBS & FLAX-LIKE PLANTS								
Clematis foetida	scented clematis		■	½	□	½	■	
***Coprosma* aff. *parviflora* (sp. L)**	**mikimiki**	F,I,L	■	½	■	■	■	
Coprosma propinqua	**mikimiki**	F,I,L	■	½	■	■	■	
Coprosma wallii	mikimiki	F	■	½	½	½	■	
Cortaderia richardii	**toetoe**		■	□	½	■	■	M
Hebe salicifolia	koromiko	I	■	½	½	½	■	M
Melicytus micranthus	**manakura, shrubby mahoe**	F	■	■	■	□	□	
Myrsine divaricata	**weeping mapou**	F,I	■	■	■	½	■	
Phormium tenax	**harakeke, NZ flax**	N,L	■	□	■	■	■	M

GROUNDCOVERS FOR SHADED SITES

		Food	Tolerances: sun	shade	wet	dry	wind	
Anemanthele lessoniana	bamboo tussock, wind grass		■	■	½	■	■	M
Astelia fragrans	**kakaha, bush flax**	F,I	□	■	½	½	□	
Carex forsteri; C solandri	**sedges**		□	■	■	□	□	
Carex secta; C virgata	**pukio, makura, tussock sedges**		■	½	■	□	■	
Juncus gregiflorus; J pallidus	**wiwi, tussock rush**		■	□	■	□	■	
Libertia ixioides	**mikoikoi, NZ iris**		■	■	½	■	■	
Microlaena avenacea	**bush rice grass**		½	■	■	□	□	
Ranunculus reflexus	**a native buttercup**		□	■	½	□	□	
Uncinia uncinata	**watau, hook sedge**		□	■	■	□	□	

ADDITIONAL PLANTS FOR SHELTERED SITES:

TREES & TALL SHRUBS

Alectryon excelsus	titoki	F	■	■ ½ □ □	
Aristotelia serrata	makomako, wineberry (semi-deciduous)	F,I	½	½ ½ □ □	M
Coprosma linariifolia	narrow-leaved coprosma, yellow-wood	F,L	½	■ ■ ½ ½	
Hedycarya arborea	porokaiwhiri, pigeonwood	F,I	■	■ ½ □ □	*
Melicytus ramiflorus	mahoe, whiteywood	N,B,I	■	■ ½ □ ½	

SHRUBS

Coprosma areolata	**veined coprosma**	F,L	½	■ ½ ½ □	
Coprosma rhamnoides	red-fruited mikimiki	F,B,I	■	■ ½ ■ ■	
Coprosma rubra	red-stemmed karamu	F,L	■	½ ■ ½ ■	
Pseudopanax anomalus	**shrub pseudopanax**	F,N	½	½ ■ □ ½	

TREE & GROUND FERNS

Asplenium bulbiferum	**manamana, hen and chicken fern**	B	□	■ ■ □ □	
Cyathea dealbata	**ponga, silver fern, a tree fern**		□	■ ■ □ □	*
Cyathea smithii	**katote, soft tree fern**	I	□	■ ■ □ □	*
Dicksonia fibrosa	**kuripaka, wheki ponga, a tree fern**	I	□	■ ■ □ □	*
Dicksonia squarrosa	**wheki, rough tree fern**	I	½	■ ■ □ □	*
Histiopteris incisa	**mata, water fern**		½	■ ■ □ □	
Hypolepis ambigua	**rough pig fern**		½	■ ■ □ □	
Pellaea rotundifolia	**tarawera, button fern**		■	■ ½ ■ ■	
Phymatosorus pustulatus	hounds tongue fern		½	■ ■ ■ ½	
Polystichum richardii	pikopiko, shield fern		½	■ ■ ½ □	
Polystichum vestitum	**puniu, shield fern**		½	■ ■ □ □	

VINES & SCRAMBLERS

Clematis paniculata	pua wananga, bush clematis	N	½	■ ½ □ □	
Parsonsia spp	NZ jasmine	B	½	■ ½ ½ ½	
Passiflora tetrandra	**kohia, native passionvine**	F	½	■ ½ □ □	

Food. For **native birds**, **F** = Fruit/seed, **N** = Nectar, **B** = Bud/foliage, **I** = Insects. For **lizards**, **L** = fruit

Plant tolerances for sunny, shady, moist, dry and windy conditions shown as:
■ = tolerates or needs, □ = intolerant, ½ = tolerant of some

Bold = species suitable for planting alongside the stream and in swampy areas
M = Main species for relatively fast growing first stage planting into open sites
* = to establish, protect from frost; t = toxic for toddlers

kahikatea = white pine

OIOI,
marsh ribbonwood, tuturiwhatu,
Estuarine Flats ecosystem

FOOD: for native birds shown as:
F = Fruit/seed,
N = Nectar,
B = Bud/foliage,
I = Insects,
L = Fruit for Lizards

PLANT TOLERANCES:
for sunny, shady, moist, dry and windy conditions shown as:
■ = tolerates or needs,
□ = intolerant,
½ = tolerant of some

PLANT LISTS Plants selected from vegetation natural to these gently undulating, poorly drained, wet & salty sands, silts and clays of the saline gley **Motukarara** soils

Bold = species suitable for planting low in the stream-bed, and in frequently flooded areas
M = Main species for relatively fast growing first stage planting into open sites

SHRUBS

		Food	Tolerances: sun	shade	wet	dry	wind	
Coprosma propinqua	mikimiki	F,I,L	■	½	■	■	■	M
Leptospermum scoparium	manuka, tea tree	N,I	■	□	■	■	■	M
Muehlenbeckia complexa	pohuehue	B,L	■	□	■	■	■	
Plagianthus divaricatus	marsh ribbonwood, houi		■	□	■	□	■	

TUSSOCK GRASSES & FLAXES

Bolboschoenus caldwellii	**a sedge**		■	□	■	□	■	
Cortaderia richardii	toetoe		■	□	½	■	■	M
Cyperus ustulatus	umbrella sedge, upoko tangata		■	□	■	½	■	M
Hierochloe redolens	holy grass, karetu		■	□	■	½	■	
Juncus maritimus	**wiwi, sea rush**		■	□	■	□	■	
Leptocarpus similis	**oioi, jointed wire rush**		■	□	■	□	■	
Phormium tenax	**harakeke, NZ flax**	N,L	■	□	■	■	■	M
Schoenoplectus pungens	**three-square**		■	□	■	□	■	
Schoenoplectus validus	**lake club rush**		■	□	■	□	■	M

GROUNDCOVERS

Apium prostratum	sea celery		■	½	½	½	■	
Leptinella dioica	cotula		■	½	½	½	■	
Limosella lineata	NZ mudwort		■	□	■	½	■	
Samolus repens	**sea primrose, moakoako**		■	□	■	½	■	
Sarcocornia quinqueflora	**glasswort**		■	□	■	½	■	
Selliera radicans	**selliera**		■	½	■	½	■	

oioi = jointed wire rush; **tuturiwhatu** = banded dotterel

Native Birds

caspian tern	*Hydroprogne caspia*
kahu, australasian harrier *	*Circus approximans*
karearea, NZ falcon	*Falco novaeseelandiae*
karoro, Southern black-backed gull *	*Larus dominicanus*
kawau, black cormorant *	*Phalacrocorax carbo*
kawaupaka, little cormorant *	*Phalacrocorax melanoleucos*
kereru, NZ pigeon	*Hemiphaga novaeseelandiae*
kiwi	*Apteryx australis*
korimako, bellbird *	*Anthornis melanura*
kotare, NZ kingfisher *	*Halcyon sancta*
kotuku, white heron	*Egretta alba*
kuaka, eastern bar-tailed godwit	*Limosa lapponica baueri*
kuruwhengi, NZ shoveler *	*Anas rhynchotis*
little black cormorant	*Phalacrocorax sulcirostris*
matuku, Australasian bittern	*Botaurus stellaris poiciloptilus*
papango, NZ scaup	*Aythya novaeseelandiae*
parera, grey duck *	*Anas superciliosa*
pihoihoi, NZ pipit *	*Arthus novaeseelandiae*
pipiwharauroa, shining cuckoo *	*Chrysococcyx lucidus*
piwakawaka, South Island fantail *	*Rhipiduraa fuliginosa*
poaka, pied stilt	*Himantopus himantopus*
pukeko *	*Porphyrio porphyrio*
putangitangi, paradise shelduck *	*Tadorna variegata*
rirororiro, grey warbler *	*Gerygone igata*
rock pigeon *	*Columba livia*
royal spoonbill	*Platalea leucorodia regia*
South Island pied oystercatcher	*Haematopus ostralegus finschi*
spur-winged plover *	*Vanellus miles*
tarapunga, red-billed gull *	*Larus novaehollandiae*
tauhou, silvereye *	*Zosterops lateralis*
tete, grey teal	*Anas gracilis*
tuturiwhatu, banded dotterel	*Charadrius bicinctus*
weka	*Gallirallus australis*
welcome swalllow *	*Hirundo tahitica*
white-faced heron *	*Ardea novaehollandiae*

* Bird species occurring within the Avoca Valley Stream catchment

Introduced bird species currently occurring within the Avoca Valley Stream catchment

blackbird	*Turdus merula*
chaffinch	*Fringilla coelebs*
dunnock	*Prunella modularis*
goldfinch	*Carduelis carduelis*
greenfinch	*Carduelis chloris*
greylag goose	*Anser anser*
house sparrow	*Passer domesticus*
mallard	*Anas platyrhynchos*
redpoll	*Carduelis flammea*
skylark	*Alauda arvensis*
song thrush	*Turdus philomelos*
starling	*Sturnus vulgaris*
white-backed magpie	*Gymnorhina tibicen*
yellowhammer	*Emberiza citrinella*

Appendix A: Biodiversity

Plant Pests

Canterbury Regional Council: Regional Pest Management Strategy (1998)

Control Plant Pests

Common Name	Scientific Name
African Feather Grass	*Pennisetum macrourum*
African Love Grass	*Eragrostis curvula*
Baccharis	*Baccharis halimifolia*
Broom	*Cytisus scoparius*
Bur Daisy	*Calotis lappulacea*
Coltsfoot	*Tussilago farfara*
Entire Marshwort	*Nymphoides geminata*
Gorse	*Ulex europaeus*
Montpellier Broom	*Teline monspessulana*
Nassella Tussock	*Stipa trichotoma*
Nodding Thistle	*Carduus nutans*
Old Man's Beard	*Clematis vitalba*
Ragwort	*Senecio jacobaea*
Saffron Thistle	*Carthamus lanatus*
Taurian Thistle	*Onopordum tauricum*
White Broom	*Cytisus multiflorus*
White-Edged Nightshade	*Solanum marginatum*

Surveillance Plant Pests

The sale, propagation and distribution of these plants is prohibited.

Common Name	Scientific Name
All Stipa (except natives)*	*Stipa* spp.
Alligator Weed	*Alternanthera philoxeroides*
Artillery plant*	*Galeobdolon luteum*
Australian sedge	*Carex longebrachiata*
Banana Passionfruit	*Passiflora molissima, Passiflora mixta*
Barberry*	*Berberis glaucocarpa*
Bartlettina	*Bartlettina sordida*
Bathurst Bur*	*Xanthium spinosum*
Blackberry (wild aggregates)*	*Rubus fruticosus agg.*
Bladderwort	*Utricularia gibba*
Blue Morning Glory*	*Ipomoea indica*
Blue Passion Flower*	*Passiflora caerulea*
Bog Bean	*Menyanthes trifoliata*
Boneseed*	*Chrysanthemoides monilifera*
Boxthorn*	*Lycium ferocissimum*
Broomsedge	*Andropogon virginicus*
Buddleia*	*Buddleia davidii* (excluding hybrids)
Burdock*	*Arctium minus*
Cape Honey Flower*	*Melianthus major*
Cape ivy*	*Senecio angulatus*
Cathedral Bells*	*Colbaea scandens*
Chinese Pennisetum	*Pennisetum alopecuroides*
Chilean Needle Grass	*Stipa neesiana*
Clasped Pondweed	*Potamageton perfoliatus*
Climbing Asparagus	*Asparagus scandens*
Eel Grass	*Vallisneria* (Lake Pupuke, Meola Creek varieties)
Egeria Oxygen Weed	*Egeria densa*
Fountain Grass	*Pennisetum setaceum*
Fringed Water Lily	*Nymphoides peltata*
German Ivy*	*Senecio mikanioides*
Goats Rue*	*Galega officinalis*
Green Cestrum	*Cestrum parqui*
Hawthorn*	*Crataegus monogyna*
Heather*	*Calluna vulgaris* (excluding double flowered cultivars)

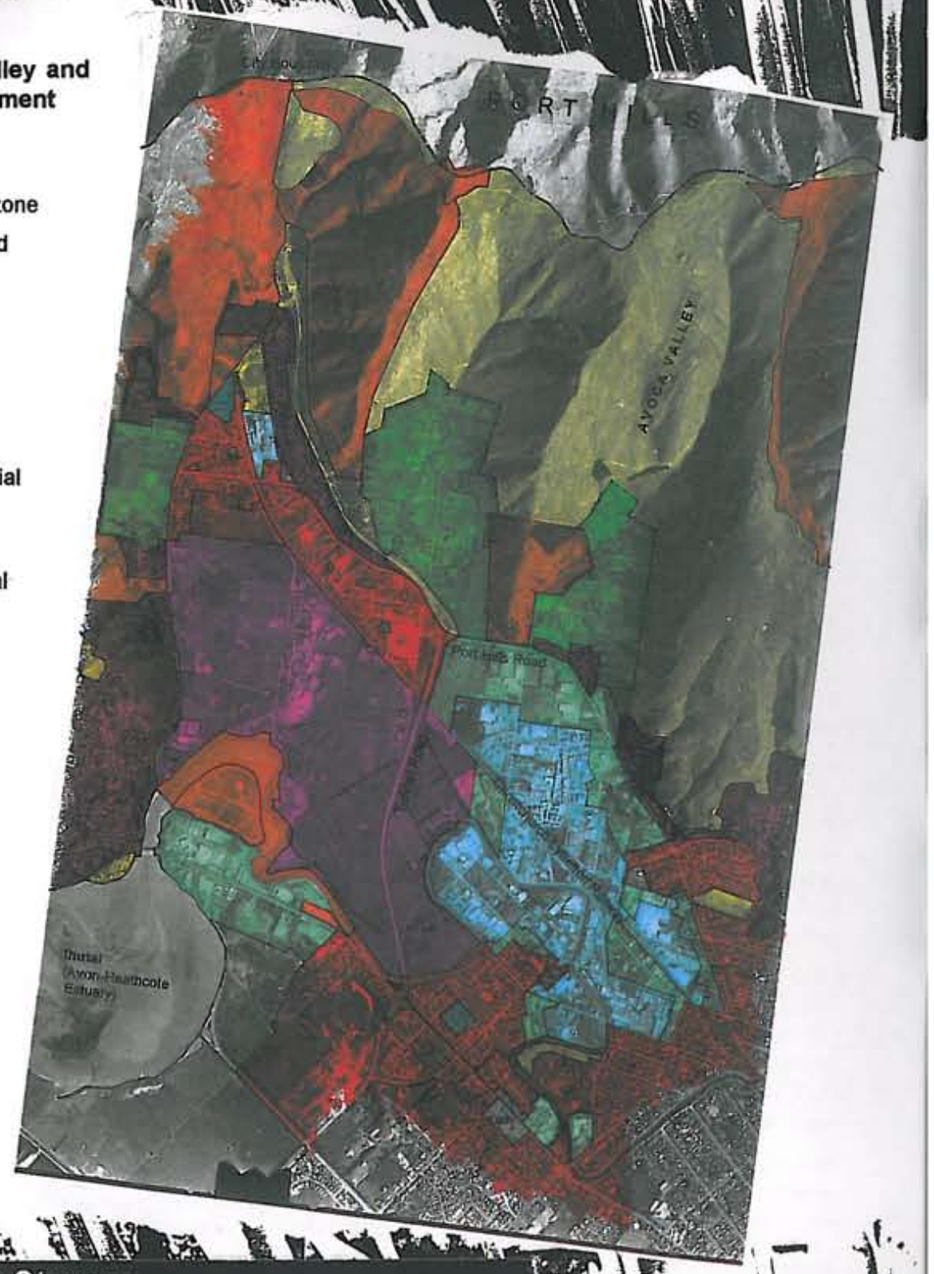
Common Name	Scientific Name
Hemlock*	*Conium maculatum*
Himalayan Honeysuckle*	*Leycesteria formosa*
Hornwort	*Ceratophyllum demersum*
Horse Nettle	*Solanum carolinense*
Horsetail*	*Equisetum arvense*
Houttuynia	*Houttuynia cordata*
Hydrilla	*Hydrilla verticillata*
Italian Buckthorn*	*Rhamnus alaternus*
Japanese Honeysuckle*	*Lonicera japonica* (including cultivars but not hybrids)
Japanese Spindle Tree*	*Euonymus japonicus*
Lagarosiphon Oxygen Weed*	*Lagarosiphon major*
Lodgepole Pine*	*Pinus contorta*
Manchurian Wild Rice	*Zizania latifolia*
Mexican Daisy*	*Erigeron karvinstianus*
Mignonette Vine*	*Anredera cordifolia*
Mile-a-Minute	*Dipogon lignosus*
Mistflower	*Ageratina riparia*
Moth Plant*	*Araujia sericifera*
Nardoo*	*Marsilea mutica*
Noogoora Bur	*Xanthium occidentale*
Nutgrass	*Cyperus rotundus*
Oxylobium	*Oxylobium lanceolatum*
Palm Grass	*Setaria palmifolia*
Pampas Grass*	*Cortaderia selloana, C. jubata*
Parrots Feather	*Myriophyllum aquaticum*
Perrenial Nettle*	*Urtica dioica*
Phragmites*	*Phragmites australis aquaticum*
Phragmites*	*Phragmites australis*
Plectranthus*	*Plectranthus ecklonii, P. ciliatus, P. grandis*
Plumeless Thistle*	*Carduus acanthoides*
Port Jackson Fig	*Ficus rubiginosa*
Privet - Chinese*	*Ligustrum sinense*
Privet - tree*	*Ligustrum lucidum*
Sagittaria*	*Sagittaria graminea* ssp. *Platyphilla*
Senegal Tea*	*Gymnocoronis spilanthoides*
Sheeps Bur*	*Acaena agnipila*
Skeleton Weed	*Chondrilla juncea*
Smilax*	*Asparagus asparagoides*
Spanish Heath*	*Erica lusitanica* (excluding double flowered cultivars)
Spartina*	*Spartina* spp.
Spiny Broom	*Calicotome spinosa*
St Johns Wort*	*Hypericum perforatum*
Sweet Briar*	*Rosa rubiginosa*
Sweet Pea Shrub*	*Polygala myrtifolia* (excluding cultivar "Grandiflora")
Tuber Ladder Fern*	*Nephrolepis cordifolia*
Tutsan*	*Hypericum androsaemun*
Variegated Thistle*	*Silybum marianum*
Velvet Groundsel*	*Senecio petasitis*
Water Poppy	*Hydrocleys nymphoides*
Water Primrose	*Ludwigia peploides* ssp. *Montevidensis*
White Monkey Apple	*Acmena smithii*
Wild Cotoneaster*	*Cotoneaster glaucophyllus, C. franchettii*
Wild Elaeagnus*	*Elaeagnaceae x reflexa*
Wild Elaeagnus*	*Elaeagnus x reflexa*
Wild Lantana*	*Lantana camara* var *aculeata* (Yellow-pink and Yellow-red varieties)
Wild Ginger*	*Hedychium gardnerianum, H. flavescens*
Woolly Nightshade	*Solanum mauritianum*
Yellow Flag*	*Iris psuedacorus*
Yellow Water Lily	*Nuphar lutea*

* Known to be present in Canterbury as at 1 April 1996.

Appendix B: Legal

Zoning of Avoca Valley and surrounding environment

- Rural Hills
- Rural Hills Horticultural sub-zone
- Conservation Land
- Living Hills
- Living Surburban
- Business General Industrial
- Business Surburban Industrial
- District and Local Business Centre
- Ferrymead Special Purpose Zone
- Open space and Recreation Land
- Schools



Avoca Valley Stream Zoning

Appendix B: Legal
Rules and Rights for Christchurch Waterways

Proposed City Plan: Objectives, Policies and Rules for Waterway Management

The Christchurch City Council has developed a Proposed City Plan under the Resource Management Act (1991). The Proposed City Plan lists all the objectives, policies and rules that the Council requires for the sustainable management of the city's natural and physical resources.

The Proposed City Plan has a chapter on the natural environment (Chapter Two) where waterways and wetlands are listed as some of the key resources the Christchurch City Council manages. Waterways are important natural resources. This plan has significant changes in terms of waterway rules, which residents may not be fully aware of, since they have only been in operation since 1995,

New Rules to Protect Waterways

The Proposed City Plan includes rules designed on sound catchment management principles by protecting the function of waterways and ensuring land drainage. Since 1991, the rules have changed considerably for development along and adjacent to waterways.

The Proposed City Plan requires proposed development to be set back 5, 12, 15, 20 or 30m from the edge of the bank, depending on the type of waterway. Anyone planning a building or other development such as filling or excavating near a river, stream or estuary needs to check which setback applies to them.

When development intrudes into the waterway setback, a resource consent application to the Christchurch City Council is required. If consent is granted, conditions may include a requirement to plant local native species along the waterway in order to mitigate the effects of development.

Spraying within 3m of the waterway requires a Canterbury Regional Council resource consent, unless it is to control noxious or plant pests.

Setback Distance

Owners will need to familiarise themselves with the Proposed City Plan (copies are held at the City Council's Service Centres and all libraries) if they are planning any filling, building or excavation within a given setback distance. For the Avoca Valley Stream the setback distance is 15m. This is not a "hard and fast" rule, but means that if anyone is planning any form of development within the setback, they will need to apply for a City Council resource consent. If consent is given to develop closer than 15m, applicants may need to mitigate their development through conditions placed by the Council.

Refer to Section 9, Part 5 of the General City Rules, particularly Part 5.2.4 for details.

Note that esplanade reserve status does not apply to the Avoca Valley Stream, because there are no sections more than 3m average width.

Residents' Rights

Land along waterways can be broadly classified as either private, or land owned by the Crown. People do not, as of right, have access along land adjacent to waterways. Yet there are several ways in which there are rights of access.

- Where land adjacent to a waterway is in private ownership, access across that land usually requires the consent of the owner.
- Where land is owned by the Crown, rights of access may exist if the land is either a marginal strip, an esplanade strip or reserve, access strip, legal road, walkway, open space covenant, or other reserve.
- If a waterway is tidal or navigable, people have a common law right of access in the river. A river is navigable if it is of sufficient width and depth to be used for navigation by boats, barges, punts or rafts. If the river is not navigable, there are no automatic rights of access without the consent of the owner (either a private owner or the Crown).

To understand your rights more clearly, look at the detail in your certificate of title for your land. In some cases there is a need to clarify boundaries and ownership details. For clarification, contact Land Information New Zealand (previously named DOSLI). Legal survey may be required for clarification of boundaries on the ground.