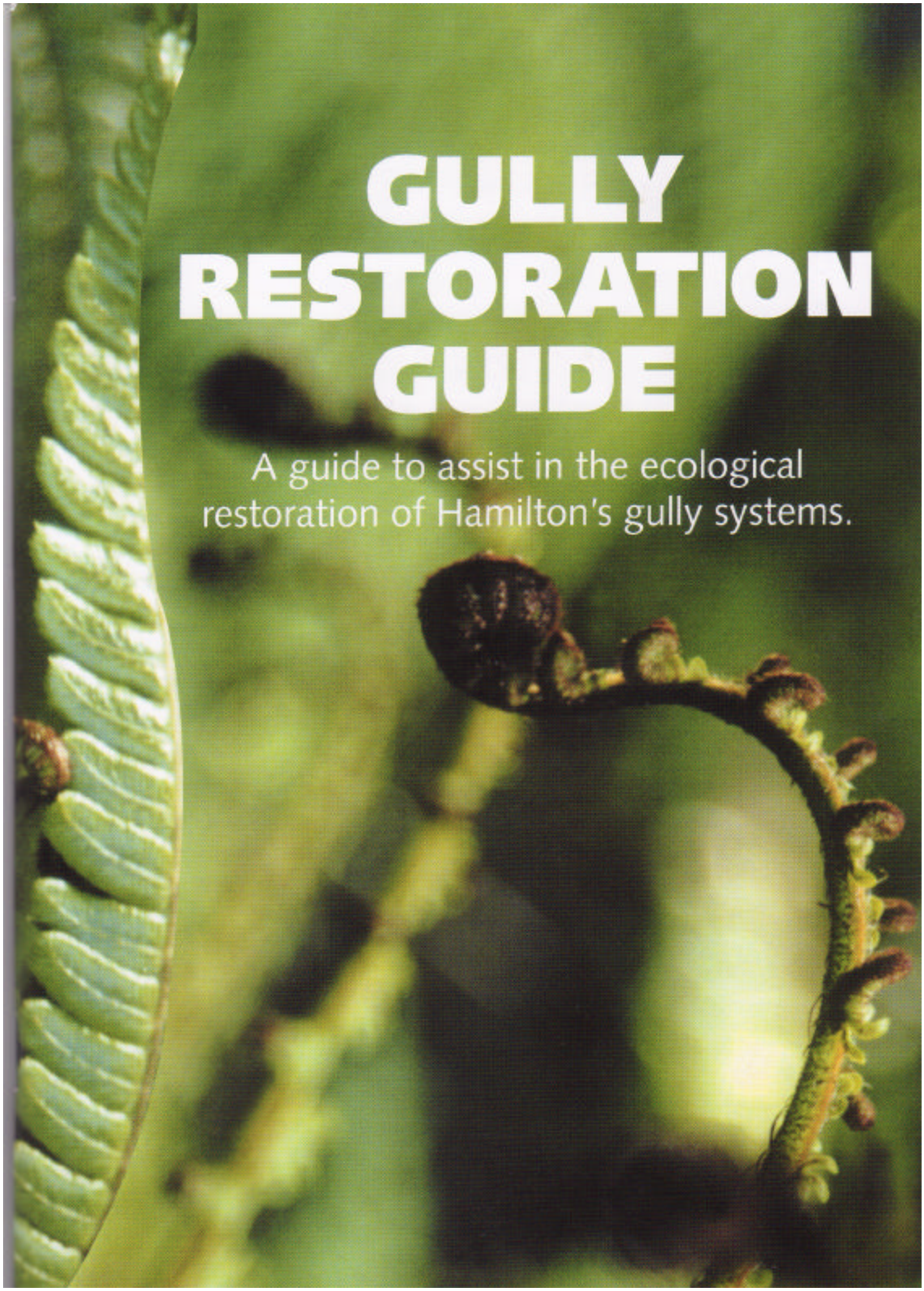
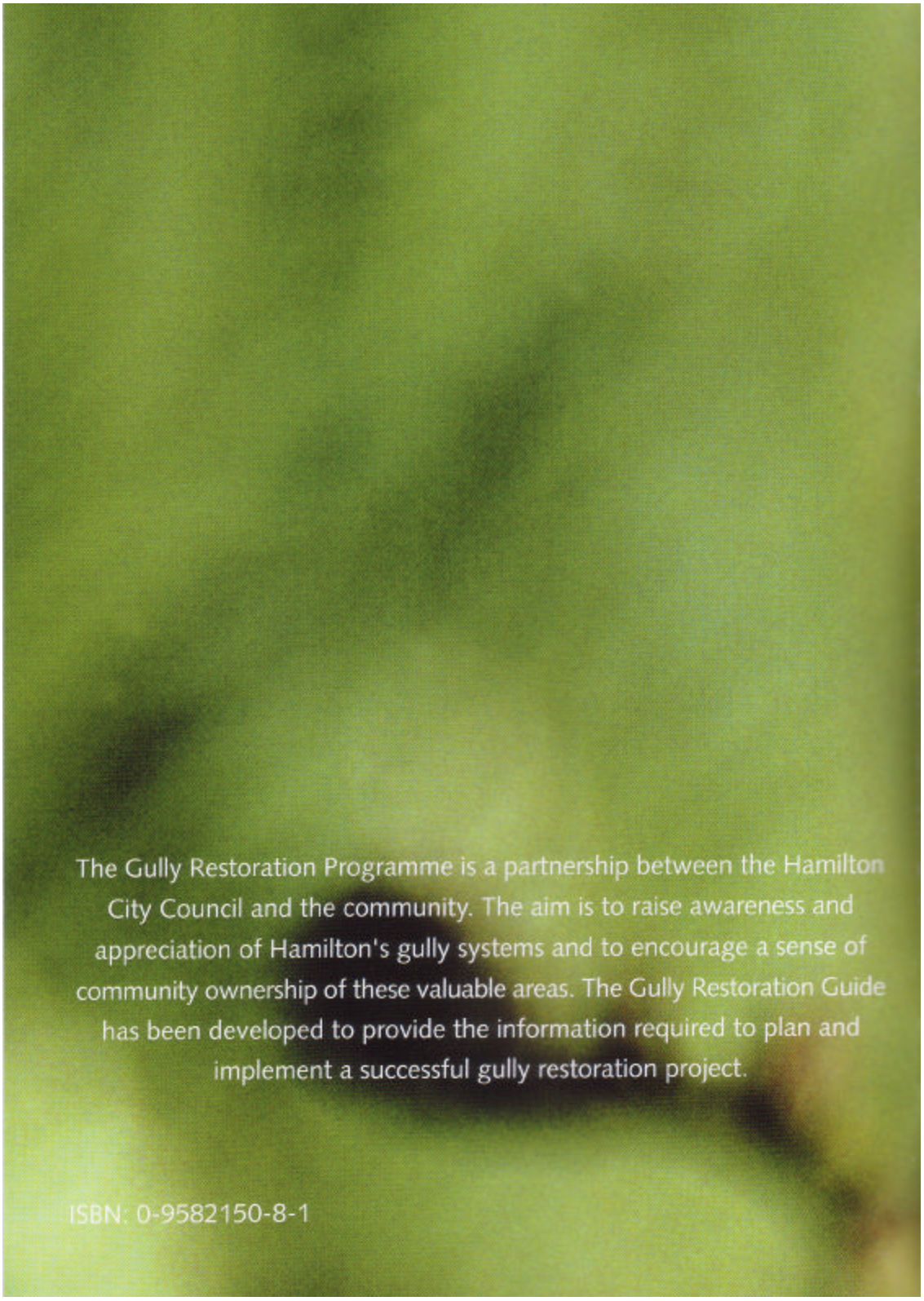

GULLY
RESTORATION
GUIDE
A guide to assist in the ecological
restoration of Hamilton's gully systems.



The Gully Restoration Programme is a partnership between the Hamilton City Council and the community. The aim is to raise awareness and appreciation of Hamilton's gully systems and to encourage a sense of community ownership of these valuable areas. The Gully Restoration Guide has been developed to provide the information required to plan and implement a successful gully restoration project.

ISBN: 0-9582150-8-1

HOW TO USE THIS GUIDE

The Gully Restoration Guide has been designed to help you begin your own gully restoration project. It gives information on the different stages that a restoration project will go through in an easy to follow, step by step layout. See the useful references available in the Appendices for more information to plan your project.

Contents

1 INTRODUCTION

Hamilton's Hidden Treasures

Visitors to Hamilton, and many residents, may not be aware of the extensive gully systems that exist within the city. These gullies add another dimension to the cityscape, providing green space for recreation, visual relief from the urban environment, and habitats (places to live) for a wide range of wildlife. They are also a vital part of the city's walkway and drainage systems.

There are a number of significant gully systems in Hamilton and the remains of others that were largely filled in before their protection in 1987. However, the gullies today don't look how they did before European settlement in the area. Over time, as the city has expanded, the gully's natural features have been degraded and a large proportion of their native flora and fauna (plants and animals) has been lost.

> The Hamilton Ecological District is one of the most modified areas in New Zealand. Only as much as 1.6 % of the original vegetation remains.
>
> (Leathwick et al., 1995)

The Aim of the Gully Restoration Guide

Many members of the community have recognised how important gullies are in realising the vision of restoring indigenous biodiversity back to Hamilton. With approximately half of Hamilton's gullies owned privately, residents and community groups have a major role to play in helping bring back native vegetation and bird life to the city. This guides objective is to help groups or individual members of the community to restore Hamilton's valuable gully assets and will tell you how to:

1. Make an accurate and useful assessment of the project site
2. Develop a project management plan taking into account site specific information
3. Access resources and additional expertise and knowledge
4. Make decisions on how to organise and implement a successful restoration project

Repairing Hamilton's Degraded Gully Systems

Hamilton's gullies are a key landscape and natural feature within the city. "They are estimated to occupy around 750 hectares or 8% of the city area" (Downs et. al. 2000).

How did they form ?

The gulllies are the result of the undermining of a geological formation of sands, silt, peat and gravel known as the Hinuera formation (a deposit formed from the accumulation of volcanic material brought down by the Waikato River from the Taupo area). Around 15,000 years ago, the Waikato River started to cut down through this material to create its present channel and as it deepened, springs were exposed along the riverbanks. As water drained from the surrounding land, these springs undermined the banks causing slips and creating a network of streams draining into the Waikato River. This process was repeated again and again giving rise to erosion and the formation of the steep-sided and intricate network of gullies that adjoin the river today.

MANGAKOTUKUTUKU gully system

Why are they important ?

Hamilton's gully systems have lots of important functions and values. They contain significant areas of native vegetation and provide important green pathways for wildlife. They are used for a variety of outdoor activities and are important for their scenic values. The gullies also have cultural significance for Waikato iwi and contain heritage sites of historical and cultural importance. The gully streams are an essential part of Hamilton's drainage network, channelling water from urban areas into the Waikato River. The quality of water within these streams is particularly important to the health of residents, wildlife and the food chain.

How are we protecting them ?

In 1989 a "Gully Protection Zone" was established as part of the new Hamilton City Council District Plan, providing rules to control development in and around gullies. The plan was reviewed again in 1997 to reflect Council's responsibilities under the Resource Management Act, 1991. Looking after the ecological functions of the gully systems is now an important part of city planning.

Hamilton proposes to adopt a "Green Network Strategy" that will link the city's natural features into a continuous natural corridor and, over time to restore them. The idea of this green corridor is to increase our urban biodiversity (the variety of life forms that exist in a particular place) and to improve the natural environment that supports the city.

It is not easy to successfully look after and improve the gully system during rapid growth in the city. Providing rules through the District Plan to control aspects of development around gullies is one method, but by itself won't be enough. The Council and the community must use a range of other methods to help achieve these goals, such as:

1. Restoring and replanting gullies in conjunction with the Community Planting Programme
2. Providing information and education to increase public awareness and understanding of environmental issues
3. Controlling weeds and pests on Council land
4. Developing gully management plans
5. Funding the purchase of gullies as reserves

There are a number of initiatives undertaken in Hamilton to protect and enhance gullies. Hamilton City Council's Gully Management Plan and Council's Gully Restoration Programme are a couple of ways Council is working towards improving the city's natural environment. Other community initiatives such as the gully register project, aims to identify and monitor restorations taking place in the city's gullies and is an important part of measuring progress towards restoring indigenous biodiversity back to Hamilton.

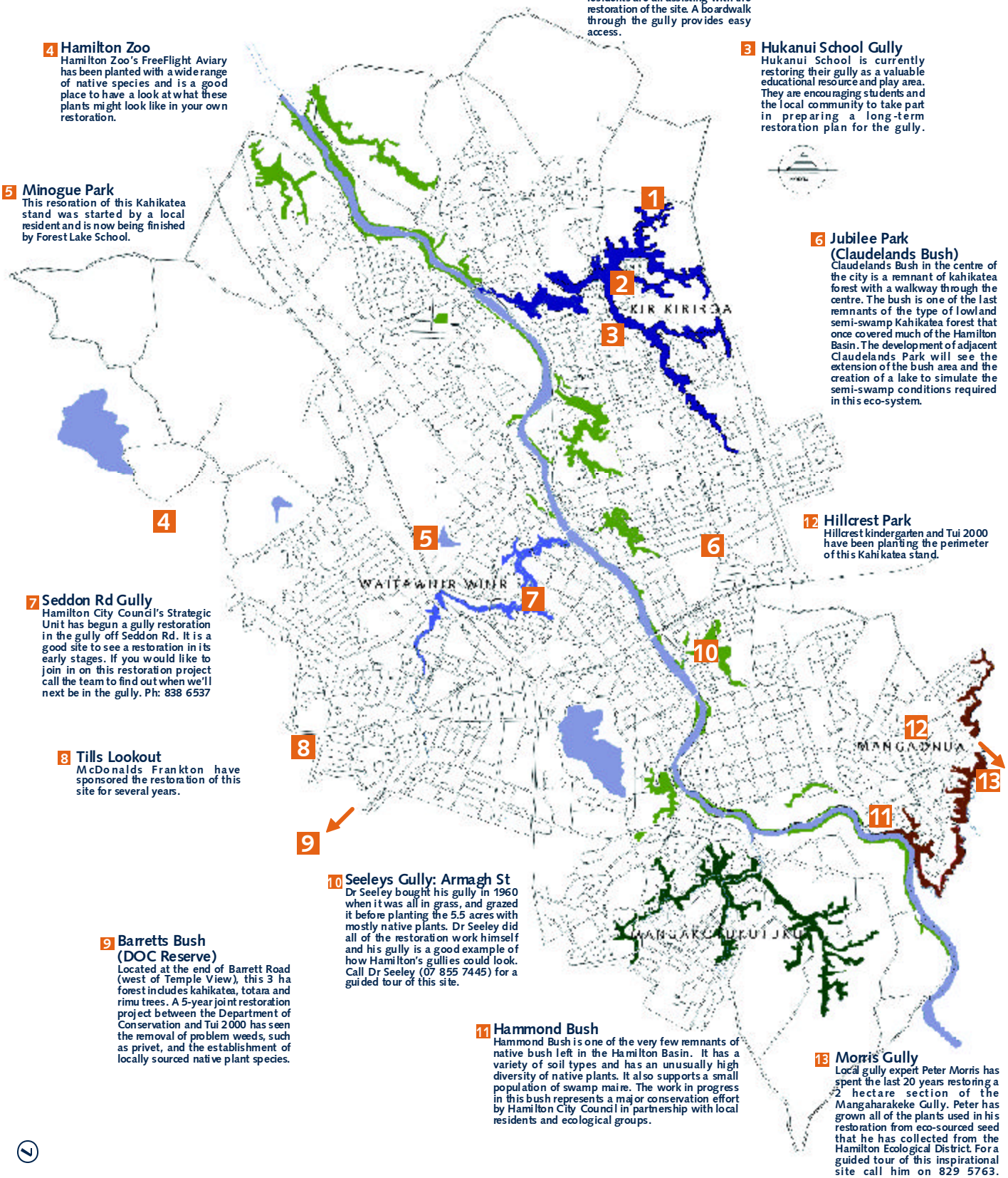
With effort from the whole community, Hamilton City can continue to develop and grow in harmony with its unique gully systems and other important natural features.

How can you help?

Restoring and replanting Hamilton's gullies is a long term process that will take many years to achieve. However, as many Hamiltonians have already found, ecological restoration is an enjoyable pastime. There are a number of groups throughout the city already attempting to repair our neglected gully systems. Working together, we can really make a difference to Hamilton's neglected treasures and the ecology of our city.

> Gullies are the best kept ecological secret of Hamilton City. With appropriate management it is possible to restore many of these habitats to a state that will provide ongoing protection for close analogues of original systems.
>
> (Clarkson et al., 2000).

Where Are They? Hamilton's Gully Systems and Restoration Projects in Progress



1 St James Park Astelia Colony
St James Park residents have started a restoration of this ecologically significant site of Astelia Grandis (native swamp lily's). Call Robin Holdsworth for more information. Ph. 855 4786

2 Mangaiti Gully
Mangaiti Gully is currently being restored as a model of gully restoration. Hamilton City Council, community groups and local residents are all assisting with the restoration of the site. A boardwalk through the gully provides easy access.

3 Hukanui School Gully
Hukanui School is currently restoring their gully as a valuable educational resource and play area. They are encouraging students and the local community to take part in preparing a long-term restoration plan for the gully.

4 Hamilton Zoo
Hamilton Zoo's FreeFlight Aviary has been planted with a wide range of native species and is a good place to have a look at what these plants might look like in your own restoration.

5 Minogue Park
This resoration of this Kahikatea stand was started by a local resident and is now being finished by Forest Lake School.

6 Jubilee Park (Claudelands Bush)
Claudelands Bush in the centre of the city is a remnant of kahikatea forest with a walkway through the centre. The bush is one of the last remnants of the type of lowland semi-swamp Kahikatea forest that once covered much of the Hamilton Basin. The development of adjacent Claudelands Park will see the extension of the bush area and the creation of a lake to simulate the semi-swamp conditions required in this eco-system.

7 Seddon Rd Gully
Hamilton City Council's Strategic Unit has begun a gully restoration in the gully off Seddon Rd. It is a good site to see a restoration in its early stages. If you would like to join in on this restoration project call the team to find out when we'll next be in the gully. Ph: 838 6537

8 Tills Lookout
McDonalds Frankton have sponsored the restoration of this site for several years.

9 Barretts Bush (DOC Reserve)
Located at the end of Barrett Road (west of Temple View), this 3 ha forest includes kahikatea, totara and rimu trees. A 5-year joint restoration project between the Department of Conservation and Tui 2000 has seen the removal of problem weeds, such as privet, and the establishment of locally sourced native plant species.

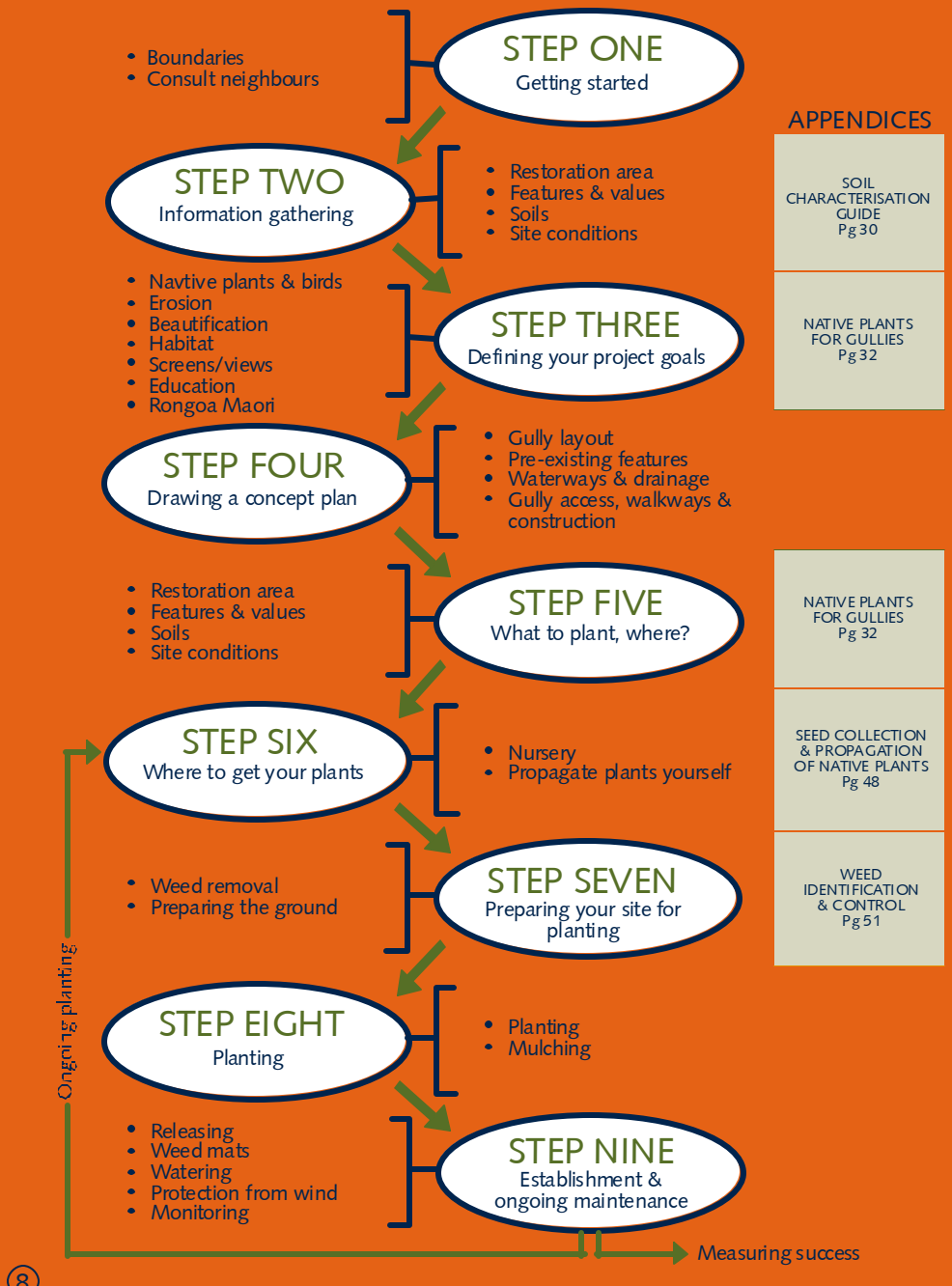
10 Seeleys Gully: Armagh St
Dr Seeley bought his gully in 1960 when it was all in grass, and grazed it before planting the 5.5 acres with mostly native plants. Dr Seeley did all of the restoration work himself and his gully is a good example of how Hamilton's gullies could look. Call Dr Seeley (07 855 7445) for a guided tour of this site.

11 Hammond Bush
Hammond Bush is one of the very few remnants of native bush left in the Hamilton Basin. It has a variety of soil types and has an unusually high diversity of native plants. It also supports a small population of swamp maire. The work in progress in this bush represents a major conservation effort by Hamilton City Council in partnership with local residents and ecological groups.

12 Hillcrest Park
Hillcrest kindergarten and Tui 2000 have been planting the perimeter of this Kahikatea stand.

13 Morris Gully
Local gully expert Peter Morris has spent the last 20 years restoring a 2 hectare section of the Mangaharakeke Gully. Peter has grown all of the plants used in his restoration from eco-sourced seed that he has collected from the Hamilton Ecological District. For a guided tour of this inspirational site call him on 829 5763.

2 STEP BY STEP GUIDE TO GULLY RESTORATION



STEP ONE

- Getting started

Walk through the gully

- Get a feel for the site and think about how you might like it to look and feel when it is finished.
- Think about what types of work you might need to do in the gully to reach your goals.
- Visit one of the gullies in the Hamilton area that have been restored for examples, ideas and inspiration.

Find out where your gully boundaries are

- Who owns the gully? Is it on private land or is it owned by the City Council? Talk to Council and find out what rules and regulations apply to this land and what your obligations are. Approach the owners of the property adjoining yours and see if they would like to get involved in the project or will give you permission to work in their area.

Talk with your neighbours

- Make sure that everyone who will be affected by the project knows about what will be happening and has had a chance to have their input.
- Talk with residents living adjacent to the gully. They may like to join in on the project and/or could contribute to the resources needed.

STEP TWO

- Information gathering

Draw a sketch of the gully to use as a base plan. A 'birds eye view' sketch will be useful when planning your restoration as you can record information on the diagram as you go along. Start with a basic layout showing boundaries, distances, streams and entry points to the site. Draw other features onto the map and make detailed notes of useful information.

You may like to obtain a copy of an aerial photo of your gully that shows the gully boundaries on it. Contact Hamilton City Council (Design Services) who will be happy to help you. A small fee applies for this service.

Set a size limit for the area to be restored

Identify which part of the gully you would like to start restoring first.

- Don't bite off more than you can chew! Remember a small, well planned and cared for planting has the best chance of success. Extending the restoration area can be done later on when earlier stages of planting have become established and more resources become available.

Gully features and values retained

There may be areas of your gully that have special features or values that you want to keep. Make a note of these on the sketch of your gully so that you can include them in your design later on.

- Some gullies have remnants, (the remains of original native vegetation) amongst the weeds that you may want to protect. Use the plant identification tables in the back of the guide to help you identify the plants in your gully.
- Other natural features such as streams and natural waterways, rock features, animal and insect habitats (old logs) may be worked into your design.

- You may also find evidence of Maori or early European occupation, treasures that make your site special. If you come across something contact Hamilton City Council who can advise you on how best to protect these items.

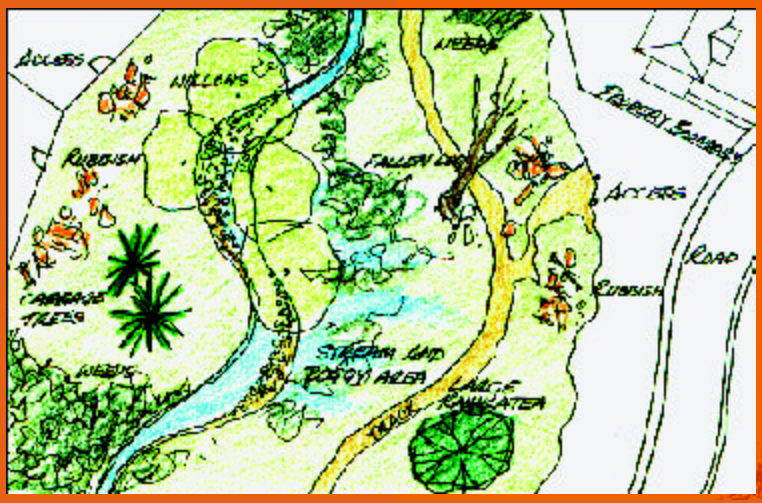
Soils of the gully

The type of soil present in your gully will determine how well your plants grow, and whether or not they will survive through dry or very wet periods. Knowing what types of soil you have in your area will give you an indication of the stability of gully banks and will help you decide what plants to plant and where. Use the 'Soil Characterisation Guide' in the Appendix to help you work out the soil types in each area of the gully.

Site conditions

Mark on your gully sketch the site conditions in your project area. Make a note of:

1. Damp or swampy areas with high water tables (especially in winter)
2. Dry spots (especially in summer)
3. Areas that may be susceptible to frosts (open areas with no vegetative protection)
4. Windy or sheltered regions
5. Steep slopes that are prone to erosion
6. Shady and sunny spaces

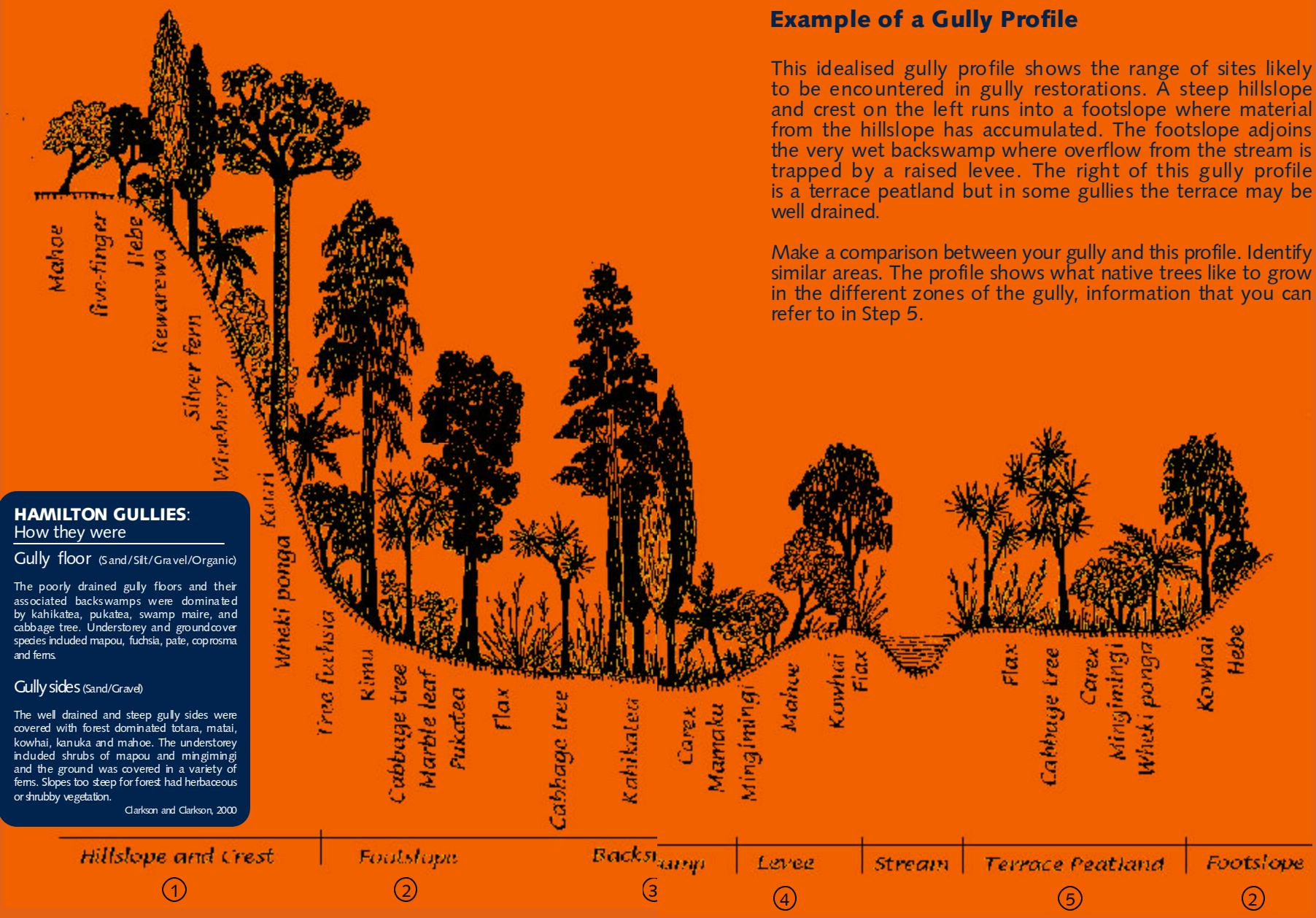


Base plan

Example of a Gully Profile

This idealised gully profile shows the range of sites likely to be encountered in gully restorations. A steep hillslope and crest on the left runs into a footslope where material from the hillslope has accumulated. The footslope adjoins the very wet backswamp where overflow from the stream is trapped by a raised levee. The right of this gully profile is a terrace peatland but in some gullies the terrace may be well drained.

Make a comparison between your gully and this profile. Identify similar areas. The profile shows what native trees like to grow in the different zones of the gully, information that you can refer to in Step 5.



HAMILTON GULLIES: How they were

Gully floor (Sand/Silt/Gravel/Organic)

The poorly drained gully floors and their associated backswamps were dominated by kahikatea, pukatea, swamp maire, and cabbage tree. Understorey and groundcover species included mapou, fuchsia, pate, coprosma and ferns.

Gully sides (Sand/Gravel)

The well drained and steep gully sides were covered with forest dominated totara, matai, kowhai, kanuka and mahoe. The understorey included shrubs of mapou and mingimingi and the ground was covered in a variety of ferns. Slopes too steep for forest had herbaceous or shrubby vegetation.

Clarkson and Clarkson, 2000

STEP THREE

- Defining your project goals

Decide on the aim of the project

The design of your gully restoration plan will depend on the aim of your project – what you want the gully to look like, what it will be used for and what you want the project to achieve. There are many possible aims for your project, and you need to clearly define these before you start.

The aims of your project could include:

1. Restoring former native vegetation
2. Enhancing aesthetic value (making the place more beautiful)
3. Providing habitat (places to live) and food for birds and other animals
4. Controlling erosion
5. Improving privacy or creating views
6. Creating an educational resource
7. Security

Knowing what you hope to achieve is important as it will influence what types of trees and shrubs you should plant and where you should position them.

Native plants

New Zealand's plants are part of our heritage and most of them are not found anywhere else in the world. They are what gives New Zealand much of its distinctive character. Restoring gully systems with native plants not only enhances a particular area but also helps the species to survive. The 'Native Plants for Gullies' table provides information on many native plants that are suitable for gully planting in Hamilton.

Attracting birds

Hamilton's gullies are already home to a number of birds, including morepork (ruru), kingfisher (kotare) , fantail (piwakawaka) and grey warbler (riroriro).

However, local groups have identified that a significant amount of new restoration is needed to bring back birds like the tui and kereru to Hamilton. Individual restoration projects throughout the city become important stepping stones for native birds.

Certain plants are particularly attractive to birds that may feed on nectar, fruit or insects. There are many native trees and shrubs that can be planted to provide a year round food supply, but you will need to select these carefully so that there are fruit and flowers at the right times. Fruit eating birds are attracted to groups of different fruiting plants rather than a single species. Planting the right selection of plants will create an environment suitable for insects that will in turn attract insect feeding birds. See the 'Native Plants for Gullies' table that indicates which species are particularly attractive to birds.

Erosion control

Many native plants offer protection on sites where there is risk of erosion. Plants protect the ground from the direct impact of the rain, bind the soil together with their roots and remove excess water from the ground. The 'Native Plants for Gullies' table shows native species thought to provide stability against erosion.

Maintaining and screening views

Maintaining and screening views may be one consideration in the development of a restoration plan. The 'Native Plants for Gullies' table provides information on what species to plant and where, to meet your goals. Plants can be chosen based on ultimate height, trunk diameter, the ability to be pruned and density of foliage.

Security

When clearing dense undergrowth and putting paths through gullies, think about how this might affect security in your neighbourhood. Keep clear lines of sight, minimise places where people can hide and limit access to properties.

STEP FOUR

- Drawing a concept plan

Your concept plan will be the document that all those involved in the gully restoration will refer to. It will be based on all the information that you have collected about your site and will show how your project should look when you have finished.

It is a good idea to draw up your plan on a large sheet of paper so that you can show a lot of detail on it. When you have finished the plan you may like to laminate it, so that you can take it into the gully when you are working there without it getting dirty or torn.

Use the base plan sketch of the gully that you drew in Step Two to draw up your concept plan.

The area of the gully that you will be working in

Design a broad overall vision for the gully but mark off the area that you can afford to do. Once you know how many plants you will need, clearly mark off the zone that you will be starting on first.

Remember, it is best to start restoring one corner of your site first rather than plant too sparsely over a larger area (but keep in mind a broad vision for the whole site).

Streams and drainage pipes or channels

If you need help to identify where drainage systems are in the gully, contact the Hamilton City Council for advice.

Details of gully access, walkways & construction

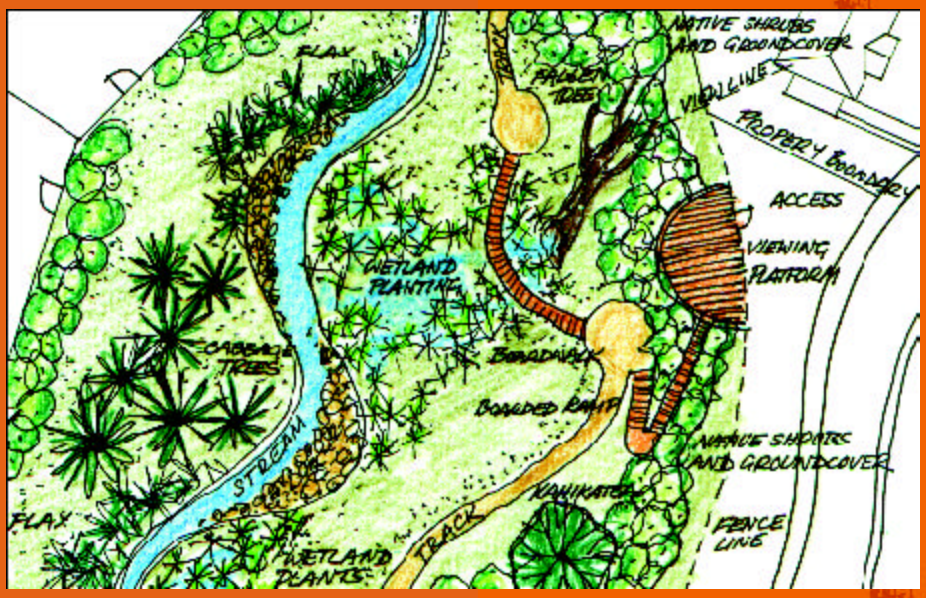
Mark on the concept plan where you will be building paths or viewing areas, and the points of entry into the gully. This will influence what types of plants you grow around these areas. Also, be aware of any existing or future uses of the gully when you plan pathways through the site.

Pre-existing features

Clearly note on the plan features at the site that you want to keep. Old logs that might be a habitat for animals and insects, large trees and areas of native vegetation may have a place in your restoration project. Noting them on your plan will show everyone working at the site that these features shouldn't be removed.

Maintaining and screening views

Mark clearly on your plan 'view lines' from properties adjacent to the gully. Some residents may not want their view blocked by large trees and some may prefer views framed by trees or denser vegetation for privacy. This information will influence what trees and shrubs you will be planting in certain areas.



Concept plan

Once the Concept plan is completed you will need to think about where you will source the plants for your restoration.

STEP FIVE

- What to plant, where?

Planning what you are going to plant and where will depend on the aims of your planting project and the needs of the plants (what conditions they will grow best in). Plants will also need to be chosen based on whether or not they are early or late successional species. What does this mean! First successional (or early stage) species grow well in the open and their fast growth suppresses weeds. They also attract birds to encourage natural seeding of other native species. Second and third successional (middle and late stage) species need less light than the early ones and can be planted once you have established some initial cover. The 'Native Plants for Gullies' section will show you what plants will grow best in the early, middle or late stages of your planting.

Initially you will only need to budget for plants that will grow in the early stages of the restoration as middle or late plants can be planted further on into the project.

Plant selection

The 'Native Plants for Gullies' table will help you find plants that will suit both your needs and the conditions at your site. Use the information that you collected in Step Two about site conditions (soil type, drainage, shade etc.) and your project goals from Step Three (erosion, views, bird life etc.) to select the right plants for the right spot.

Once you have decided what plants are going where, draw them on to your Concept plan, showing the names of each plant in the position that they will be planted. This will ensure that everyone working on the project will know where certain plants are supposed to go. This will also help you work out how many plants you are going to need overall and how much of the area you can afford to do at any one stage. As more resources become available you can progress into other areas.

There are a few native plants that are poisonous if eaten. Be aware of these plants when using them in a restoration. All parts of rangiora and kowhai are poisonous. For both of these plants seek medical advice immediately. Do not induce vomiting or give fluids.

Tips for planning your planting

- **Think carefully about where different plants should go.** Placing plants randomly with little thought to the final appearance of the planting is unlikely to create a pleasing result. Imagine how the tree or shrub might look when it is mature and how much space it is likely to take up.

- **Plant in groups or clumps** of the same species avoiding straight lines or rows. This will help the planting look more natural and allow the grouped trees to shelter and support one another.

- **Plant densely.** On average you will need one plant per square metre. This will help to reduce weeds by shading them out, and will copy natural forest conditions. However, take into account how large the plant will grow.

- **Leave openings for views and for safety.** Create areas with views framed by trees and shrubs. Make sure plants do not hang over walkways, blocking lines of sight and creating places where people can hide.

- **Look for a balance in your plantings,** with variations in plant heights, light and shade, shapes and textures.

- **Your planting programme should take into account the various stages that occur throughout a restoration.** Try and copy the natural stages of growth in a forest and plant early species first. Leave spaces amidst your planting for later species that will need shade, shelter and protection from the cold. Prepare a list of the different species you want to include in your gully restoration and mark them according to the stage at which they should be planted.

- **Planting in groups of the same species** will aid pollination so that your plants will self seed and produce fruit and nectar for birds. Some species need both a male and female plants, and you can't tell male and female seedlings apart. Having 4 or 5 of one plant will increase your chances of ending up with some of each. Check with your local nursery to find out which plants have both male and females.

STEP SIX

- Where to get your plants?

Getting the plants for your restoration may take some time, depending on whether you are going to buy them or grow them yourself. Start planning where you will get your plants from well before your planting date. Remember, plant in stages. Don't attempt to plant all at once.

NOTE:
When selecting plants for your restoration project, try to use 'eco-sourced' plants, (plants sourced locally from the Waikato area). Planting native plants grown from material collected in this region will help to retain the special natural character of the plant by avoiding cross-breeding with foreign plants. These plants are well-adapted for the climate and soils of this area and will generally do better and flower and fruit more. In general, large plants grown in the right sized pot will do better as they are less likely to be smothered by weeds. Avoid large plants that have become root bound in small pots.

Purchase plants from a local nursery

Local nurseries may be able to provide you with some 'eco-sourced' native plants, but may not have the full range that you require. A contractual arrangement with a reliable nursery to collect local seed and grow the plants for you could be one way to obtain good plants at a low cost. Linking up with other organisations interested in re-vegetation may enable you to share the plants and the cost. If your property borders a Council owned gully and you wish to be involved in planting the public area, the Council may be able to provide you with plants and assistance.

Growing your own plants

Seed collection and propagation of your own native plants is worth considering as costs are likely to be lower. Ideally, the best 'eco-sourcing' of seed is from vegetation already existing in your gully. If there aren't enough trees and shrubs in your gully providing seed, contact Hamilton City Council who will advise you on where you can collect seed and will give the permission to do so. See the 'Seed Collection and Propagation of Native Plants' table in the Appendices for more information.

STEP SEVEN

- Preparing your site for planting

The success of a gully restoration is dependent on good site preparation. Your plants will grow faster if there is no competition from weeds for light, soil nutrients and water, and where there is suitable drainage.

Which weed, where?

Weeds are plants that are growing where they are not wanted. Many have been brought into New Zealand as garden plants and because of the different growing conditions in New Zealand, have become a problem. Weeds can smother or strangle plants and trees and can stop natural regeneration (new seedlings coming through). There are many different types of weeds that might be present in your gully. The 'Weed Identification and Control Methods' table in the Appendices will help you identify what they are and give advice on the best method to remove them.

Weed removal

Although weeds will usually undo all your hard work, there are some cases where you could get weeds to work for you. On steep banks weeds can be used to stop erosion as their root system helps bind the soil, and their foliage will help stop soil washing away. On sites where weeks have been sprayed, you can plant through the natural mulch of dead weeds. You will need to have a look at your site and decide whether or not the weeds present will be a help or a hindrance.

Physical control

Try to control weeds by physically removing them, even though it might take a little extra effort. Where possible, minimise the use of chemical sprays for weed control, as some chemicals may have an impact upon the environment:

1. Hand pull or dig out small plants and their roots
2. Large plants can be cut and their stumps painted with a chemical gel or paste
3. Some plants can be mulched and composted, however there are weeds that will survive this process and will need to be landfilled
4. When clearing vegetation from each planting position, chip off the surface vegetation in a 1/2m circle. This will help prevent re-growth of weeds

Chemical control

There are some situations where weeds can only be effectively removed by chemicals. If this is necessary then the chemicals you use should have the lowest toxicity rating and environmental impact necessary to control that particular weed. Try to use only as much spray as is required. Doing this will not only reduce environmental effects but will cost you less.

- Cut and paint stumps of woody weeds where possible as this uses fewer chemicals than spraying. 'Vigilant' is a new herbicide gel that can be applied directly to the cut stem or foliage, killing the weed without harming the surrounding environment. See the Appendices for contact information.
- If you do need to spray individual planting sites, do so in a 'Z' pattern rather than spraying in a circle. Circular spraying applies too much spray in the centre and the chemicals may affect your plants. There will also be too little spray at the edge and weeds will rapidly take over.
- It is also recommended that an additive such as Codacide Oil or Pulse is mixed with the spray. It acts as a penetrant and antidrift agent and enhances the rainfastness of the chemicals applied.

Preparing the ground

Observe how heavy rain soaks or runs away at each of your planting sites. You may need to improve the drainage by digging channels to remove water.

In sites that are likely to be waterlogged in winter, dig a small mound and plant into the top of it. Raising the planting area in this way will let water drain from the plant's roots and will increase the chances of survival. In heavy clay, dig the mound and place soil on top of the clay.

In dry areas, dig a small hollow so that water will collect in the base and keep the plant moist.

STEP EIGHT

- Planting

Now that you have your site prepared and your plants are old enough, you are ready to start planting. Planting can be done at any time of the year as long as you have access to a good water supply at your site. However, planting in winter or late autumn is more likely to overcome the problem of dry spells and takes advantage of the soil being damp. At sites where frosts are likely, planting in late winter or spring is best, but you will need to water the plants throughout summer. Mulching will help plants to survive at any time of the year, especially on open sites.

Planting

- Set the plants out in their positions (see your Planting Plan). Make sure they have been soaked in a bucket until the pot stops bubbling and are not sitting in the sun.
- Dig a large hole, deeper and wider than the root ball, so that the roots are not cramped. Loosen the soil at the bottom of the hole to make it easier for the roots to get started and to help drainage. If the plant is root bound, very gently tease the roots out to help them to grow.
- Put the plant in the hole about 10cm deeper than the final position you want and replace the soil around the roots. If adding fertiliser make sure it doesn't touch the roots as it will burn them. Pull the plant up so that the top of the root ball is 2cm below the level of the soil. This will straighten any roots that are twisted or swept up. Fill in the rest of the hole.
- Gently firm the soil around the plant with your hands or sole of your foot and leave the soil on top light and loose. Leave a small depression around the base of the plant to trap water. Be careful not to over compact.
- Water at the time of planting!
- Surround with mulch to keep weeds out and to keep the soil moist.

Mulching

Mulching will help to control weed growth, reduce moisture loss and add nutrients to the soil. Many materials can be used as mulch including (untreated) wood shavings or sawdust, compost, grass clippings, plant material, stones, wet newspaper and even old (non-synthetic) carpet. However, do not use mulch on wet sites or anywhere near water flow as it is likely to be washed away and could cause stream blockages.

Your planting is more likely to be successful with strong and healthy plants, correctly prepared sites, good planting techniques and the right selection of plants for the area.

Planting tips for successful restoration

- The right plant in the right site, at the right time equals success. Get advice from a professional if you are unsure.
- Plant on a cool morning or an overcast day and avoid windy days. Soak plant in a bucket of water until rootball is thoroughly wet.
- Don't pull the plant out of the bag by its stem. Cut the bag or turn the plant upside down and carefully remove.
- On hot and dry sites, mulch around plants to keep soil cool and moist.
- Where severe frosts are likely, plant sensitive plants on north facing gully sides or beneath trees.
- At windy sites, shelter behind wind tolerant plants, stake or construct a windbreak.

STEP NINE

- Establishment and ongoing maintenance

Now that you have your plants in place, your work isn't over yet! One of the most important stages in any restoration programme is on-going maintenance. This is essential to ensure that all your plants survive and that your site doesn't get taken over by weeds. Neglecting to look after your gully may mean that you will have to start all over again, losing all the time and resources that you put in to it in the first place.

The ongoing maintenance stage is also a good time to monitor any successes or failures that you may have encountered. You can use this information when you begin further zones in your restoration and it could save you time and money in the future. While you are maintaining your planting is a good time to start propagating your own trees and shrubs for the next stage of your restoration.

Maintenance task and methods

- Releasing (Weed control)
  Releasing is the removal of weeds from around planted trees and shrubs and is essential to ensure the survival of your plants. Use a tool such as a grubber or slasher for cutting back vegetation, or pull weeds by hand being careful not to damage the roots of your plants. In gullies where weeds such as Wandering Jew or Japanese Honeysuckle are a problem, releasing should be done every month during the growing season.

- Weed mats
  Weed mats are a good way to stop weeds from taking over your site and from strangling your plants. Old (non-synthetic) carpet cut into squares and placed around each tree is a great way of keeping the weeds at bay and the carpet will break down over time.

- Watering
  Make sure your plants are kept watered until they are well established and can look after themselves, especially throughout the summer months.

> **Protect from the wind**
On windy sites, tie young trees loosely to a stake for support with flexible ties that allow the plant room to grow. Place the stake so that it supports the plant from the prevailing wind direction, often a double stake is best. Drive in stakes before planting to avoid damaging roots.

> **Monitoring**
Keep a record of any plant losses and the reasons why you think they may have died. Every gully is different and there may be some conditions in your gully that certain plants don't like. This information will be useful when you move on to other areas.

> **Ongoing planting**
Replace failed plants with suitable alternatives if necessary. Middle and late stage plants can be planted once your early plants are well established and some canopy cover is achieved. This could take a couple of years from the time of your first planting. Once the canopy is established it will start to control the weeds so other slower growing species can be planted along with ground covers and ferns. Seed collection and scattering at your restoration site is a good method for enhancement after the first stages of restoration have been completed.

> **Measuring success**
There are a number of ways that you can measure the success of your gully restoration.

1. Natural regeneration of plants and trees from seed dropped by vegetation that you have planted or that has been brought into the site by birds and wind
2. The amount of bird and animal life in the gully
3. The extent of weed populations
4. The extent of community ownership of the gully area and the restoration project

CARE OF YOUR GULLY

Make regular checks of your plants for signs of animal pests or weed invasion and deal with the problem.

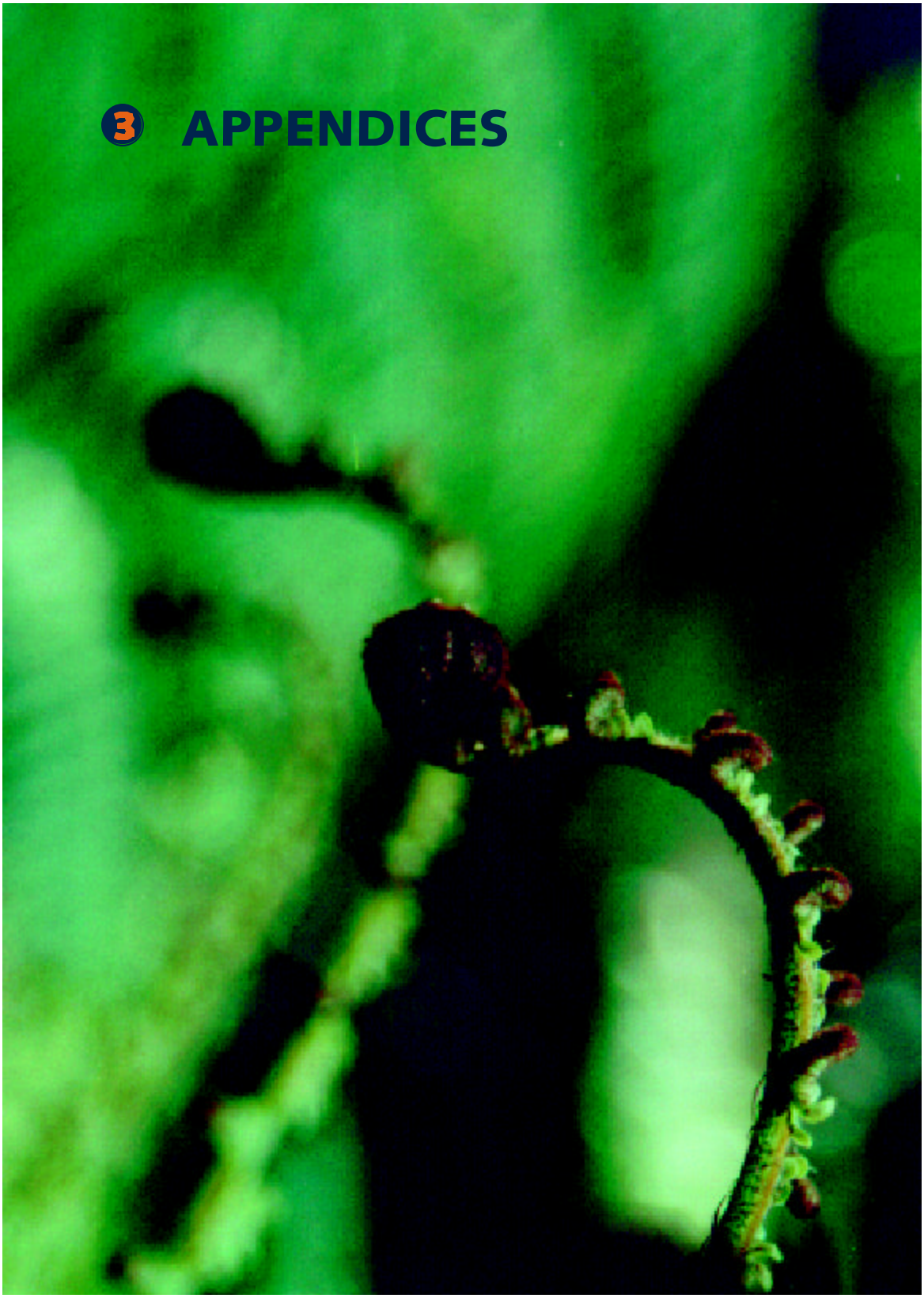
Don't dump garden waste into gullies as it may include plants or seed that may spread and infest native plantings. The dumping of garden waste into gullies is how many of Hamilton's gullies have become overridden with weeds.

Keep your plants watered, especially over spring and summer.

Look out for your first naturally regenerating seedlings and make sure they don't get smothered by weeds.

Keep your cats in at night when birds are nesting or looking after young, to encourage the return of native birds to gullies.

3 APPENDICES



Expertise and Information

Organisations and groups that can offer information and assistance

Hamilton City Council	
• Parks and Gardens Unit	07 838 6622
• Sustainable Environment Team	07 838 6483
• Design Services Unit	07 838 6903
The University of Waikato	
• Centre for Biodiversity and Ecology Research	07 856 2889
Environment Waikato	07 856 7184
Plant Pest Officers	0800 4 WEEDS
Department of Conservation	07 838 3363
Tui 2000	07 856 6944
Ecologic Foundation	07 825 9918
Hort Research	
• 'Vigilant' herbicide for woody weeds	07 858 4742
• www.hortresearch.co.nz/products/vigilant	

Funding

Hamilton City Council Envirofund
Environment Waikato Environment Initiatives Fund
WEL Energy Trust

Native plant nurseries

Some nurseries will need prior notice to ensure that the plants you receive are eco-sourced.

Commercial Nurseries

Full Boom Flora
Tony Ho
524 Morrinsville Rd, Hamilton
(07) 856 4515

Oakwood Nursery
Alan Mosen
47 Watkins Rd, Cambridge
(07) 827 4194

Treeline Nursery
Diane Edmonds
477 Tauranga Direct Rd, Rotorua
(07) 332 3313

Community Nurseries

Peter Morris
Matangi
(07) 829 5763

Waikato Tree Trust
Helen McPherson
(07) 858 4347 evenings
helen@waikatodiocesan.school.nz

HCC Nursery
Community PlantingProgramme
(07) 838 6699

Useful References

Auckland Regional Council 1997: National Surveillance Plant Pests

Clarkson, B.D.; Clarkson, B.R.; Downs, T.M. 2001: Indigenous vegetation types of Hamilton Ecological District. Centre for Biodiversity and Ecology Research, The University of Waikato, Hamilton. 15pp

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* Clarkson, B.R. and Clarkson, B.D. 2000: Indigenous Vegetation Types of Hamilton City, Landcare Research and Centre for Biodiversity and Ecology Research.

* Clarkson, B.D.; McGowan, R.; Downs, T.: Hamilton Gullies. A workshop hosted by the University of Waikato and sponsored by the Hamilton City Council, 29-30 April 2000. Centre for Biodiversity and Ecology Research, University of Waikato.

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* Crowe, A. 1997: The quickfind guide to growing native plants. Viking, Auckland.

Department of Conservation: Tree planting for native birds, Fact Sheet, June 2000.

Downs, T.M.; Clarkson, B.D.; Beard, C.M. 2000: Key Ecological Sites of Hamilton City: Volume 1 Survey Report. CBER Contract Report Number 5. Centre for Biodiversity and Ecology Research, The University of Waikato, Hamilton.

Metcalfe, L. 1997: The propagation of New Zealand Native Plants.

* Leathwick, J.R.; Clarkson, B.D.; Whaley, P.T. 1995: Vegetation of the Waikato Region. Current and Historical Perspectives. Landcare Research, Hamilton.

* Porteous, T. 1993: Native Forest Restoration: A practical guide for landowners.

Riley, M. 1994: Maori healing and herbal, Viking Seven Seas.

Roy, B. et al. 1998: An illustrated guide to Common Weeds of NZ, NZ Plant Protection Society.

* Bay of Plenty Regional Council: www.boprc.govt.nz/www/green/weedindc.htm

Environment Waikato
www.ew.govt.nz/ourenvironment/land/biodiversity/index.htm
www.ew.govt.nz/ourenvironment/pests/index.htm

Hort Research
www.hortresearch.co.nz/bet/products/vigilant

* Publication used in the preparation of this guide.

Soil Characterisation Guide

The following section will help you identify what types of soil are present at your site. Once you know what soils you have in your area you can work out what trees and shrubs you can plant.

What soil type and where?

There are a number of very different regions within a gully and each has different types of soils. Your gully may have some, or all of the regions that are shown on the following 'Gully profile', and include the hillslope and crest, footslope, backswamp, levee and terrace. The major types of soils found in gullies can be divided into simple classifications, including sand (ash), pumice soil, clay, organic material and peat. Recognising these types of soils at your site will help you decide what plants will grow best in the different areas.

The soils of the hillslope and crest are usually sandy and are very well drained. Often in summer only plants that can withstand droughts will survive here in the early years of planting. Very little organic material is found in this zone as it is usually washed down the slope. Depending on the gradient of the gully side, these soils are often prone to erosion and the right plants must be selected to retain site stability.

The footslope is a narrow zone with fertile soils and is often the best zone in the gully for planting and growing. This is commonly the site where organic material from the gully slopes has accumulated and has abundant nutrients for good plant growth. The footslope has good drainage where it meets the hillslope and poorer drainage near the terrace peatland.

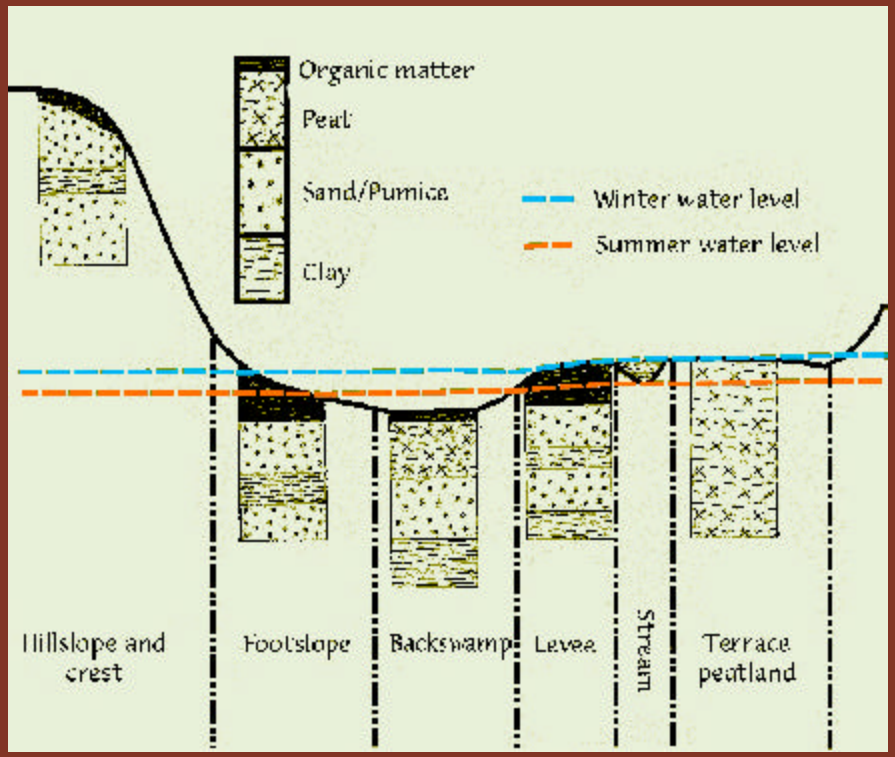
The backswamp is a very poorly drained area and at certain times of the year may be covered in water. The soils of the backswamp are largely waterlogged peat and only swamp plants are likely to grow in this area.

The levee is a slightly raised and better drained habitat adjoining the stream.

The terrace is a flat alluvial plain adjacent the stream. Some terraces comprise peatland which can be of considerable depth. Many plant species are not tolerant of peat soils and will not survive so identification of these areas is very important. Other areas are well drained with silts and loams and are much easier to restore.

Water table

The water table will vary at each of the different regions of the gully and will also fluctuate between winter and summer. Knowing where your water table is and how wet or dry the soil is will influence what you plant, where, and whether or not you will need to water certain areas over summer. See the soil profiles for an indication of where the water table might be in the areas of your gully.



Soil Types Bookmark

SAND:
Fine and gritty soil that will not form into a ball when squeezed.

PUMICE:
Light coloured and porous soil with different sized pieces of pumice within the horizon (layer).

CLAY:
Moist soil that is very firm and greasy or sticky. Can be rolled into a ball.

ORGANIC MATTER:
Dark brown topsoil. May contain the decomposed remains of plant and animal life.

PEAT:
Dark black, raw slightly organic matter accumulated under swamp conditions.

Guide To Symbols
Restoration Aim

Attracts Birds
F = fruit
N = nectar
S = seed

Suitable for Erosion Control

Screen

Rongoa Maori
(Traditional Maori medicine)

10m Maximum Height Plant will Grow to

Allows Views

Planting Conditions

Planting Zone

1. Hillslope and crest
2. Colluvial footslope
3. Backswamp
4. Levee
5. Terrace (Peatland)
   Plants that will tolerate peat soils are shown as 5P

Best Planting zone shown in bold. Subsequent zones listed in order of priority.

Light

prefers full sun | prefers partial shade | prefers full shade

Soil Water (Drainage)

well drained soil | medium soil drainage | poorly drained soil

frost sensitive | requires shelter

Native Plants for Gullies

The following **'Native Plants for Gullies'** table provides information on a selection of native trees, shrubs and ferns found in Hamilton's gullies.

Fold out the 'Guide To Symbols' page for easy reference.

How to use the symbols

Plant Name
Plants have been listed by Common name, Maori name (or both) and the botanical name is given below this in italics. A photo of the plant will help you to identify it or to visualise it when selecting plants for your project.

Habitat and Visual Description
A description of the plant is given to help you identify it and additional information is provided on the conditions that this plant prefers to grow in.

When to Plant

Early stage — Can be planted in the first stage of the restoration and will provide protection for the next stage. Their fast growth suppresses weeds and they attract birds to encourage natural seeding of other native species.

Middle stage / Late stage — Middle and late plants need protection from frost and wind and can tolerate lower light levels than early plantings. Protection from early plantings will speed up their growth.

Restoration Aim

Attracts birds to feed on the fruit (F), seeds (S), or nectar (N).

10m — The maximum height to which this plant will grow. In metres (m) or centimetres (cm).

Suitable for erosion control.

Can be planted as a screen to hide certain areas.

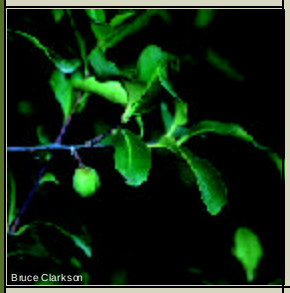
Will not block out views.

Rongoa Maori. This plant is a traditional Maori medicine.

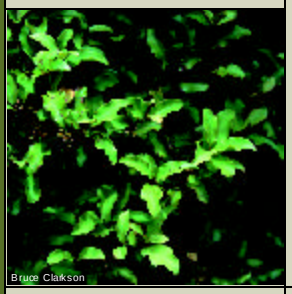
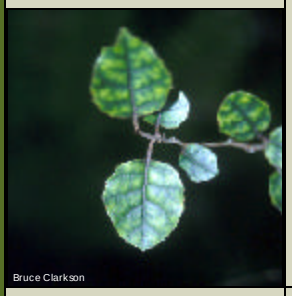
Planting Conditions

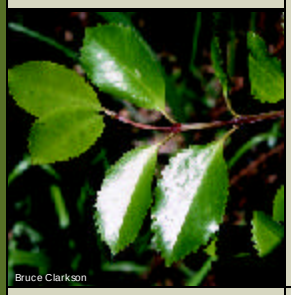
Zone	Area of gully plants prefer to grow in. See **'Gully Profile'** diagram.
Light	Amount of light plants tolerate or prefer.
Drainage	Amount of water in the soil that plants tolerate or prefer.
Wind/Frost	Indicates if plant requires shelter or if it is sensitive to frost.

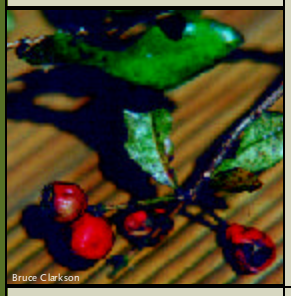
Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
CABBAGE TREE TI KOUKA Cordyline australis  Bruce Clarkson	Slender trunk, spiky leaves on tufted heads. Good in groups with flax. Very adaptable but best in wet soils. Tolerates a range of site conditions.	early to late	FSN **10m**	❷ ③ ④ ⑤ ⑤p			
KAHIKATEA Dacrycarpus dacrydioides  Bruce Clarkson	Tall tree, conical when young. Red fruit in autumn. Prefers damp, open sites with rich soils. Separate male and female trees.	early	FS **30m**	❷ ③ ⑤p			
KAIKOMAKO Pennantia corymbosa  Bruce Clarkson	Small tree with a twiggy juvenile stage. Produces abundant white flowers. Fast Growing.	early	F **8m**	❷ ④			

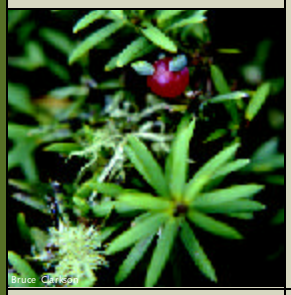
Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
KAURI Agathis australis  Bruce Clarkson	Tall tree with blue/grey hammer-marked bark. Thick and leathery leaves with large female cones, 5-8cm. Slow growth and pyramidal shape. Tolerates poor soil.	early to late	**25m** (10m in 30yrs)	1			
KOHUHU Pittosporum tenuifolium  Bruce Clarkson	Small tree with varied leaf colour. Dark red, scented flowers. Will not tolerate water logging or very dry sites. Tolerates poor soils (sand/clay/ pumice).	early	FSN **8m**	1 2 5			
KOWHAI Sophora microphylla  Bruce Clarkson	Small deciduous tree with bright yellow flowers and spreading twiggy habit. Feathery leaves with 20-40 pairs of leaflets. Diverse open sites, stream banks, rocky places. Fast growing.	early	N **8m**	2 4 5			

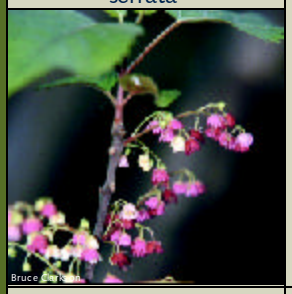
Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
LACEBARK Hoheria sexstylosa  Bruce Clarkson	Fast growing tree with deeply toothed narrow leaves. Mass display of white flowers in autum. Tolerates poor alluvial soils. Frost hardy.	early	**10m**	1 2 4 5			
LANCEWOOD HOROEKA Pseudopanax crassifolius  Bruce Clarkson	Hardy tree with thick leaves. Young plant has long leaves, like toothed spears on a straight branchless trunk. Adult plant has much shorter, broader leaves.	early to middle	F **8m**	1 2 4 5			
MAHOE Melicytus ramiflorus  Bruce Clarkson	Small tree with a white trunk. Purple-blue berries along the twigs. Moist to wet soil. Fast growing and good as a nurse tree.	early to middle	FS **8m**	1 2 4 5			

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
MAPOU Myrsine australis  Bruce Clarkson	Small tree with red stems and light green leaves. Small round black fruit. Fast growing and hardy.	early	FS **8m**	●1 2 5			
MARBLE LEAF **PUTAPUTAWETA** Carpodetus serratus  Bruce Clarkson	Small fast growing tree. Juvenile tree has distinctive zig-zagging interlacing branchlets Needs shelter. Prefers rich soil. Frost hardy.	early to middle	FSN **8m**	●2 4 5			
MATAI Prumnopitys taxifolia  Bruce Clarkson	Tall tree with grey/brown hammer-marked bark. Juvenile plant has tangled appearance and is fast growing. Alluvial, well drained sites. Frost tolerant.	early	F **20m**	●2 4 5			

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
PIGEONWOOD **POROKAIWHIRI** Hedycarya arborea  Bruce Clarkson	Small tree with dark glossy leaves on black branches. Bright orange/red fruit on female trees.	early to middle	F **6m**	**1** 2 3			
PUKATEA Laurelia novae-zelandiae  Bruce Clarkson	Large tree with glossy toothed leaves. Needs deep, dark, damp soil in swampy areas. Requires shelter.	late	**25m**	**2** 3 5 5p			
REWAREWA Knightia excelsa  Bruce Clarkson	Tall tree, slender upright habit, showy red flowers. Dry to moist soil. Will not stand water logging. Needs shelter.	early to middle	N **25m**	**1** 2 5			

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
RIMU Dacrydium cupressinum  Bruce Clarkson	Cone shaped tree with weeping cord like foliage. Dark brown bark scaling off in large flakes. Diverse lowland sites.	early to middle	25m	2 1 5			
SWAMP MAIRE WAIWAKA Syzygium maire  Bruce Clarkson	Locally rare tree typically inhabiting swampy conditions. White flowers and red berries. Develops breathing roots in waterlogged soils.	early to late	F 15m	2 3 5 5p			
TAWA Beilschmiedia tawa  Bruce Clarkson	Large spreading tree with willow like foliage. Black fruit in autumn. Prefers rich, well drained soil. Requires shelter.	late	FS 15m	2 1 5			

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
TITOKI Alectryon excelsus  Bruce Clarkson	Tall tree with spreading crown. Large shiny leaves and capsules with black oily seeds surrounded by scarlet red flesh in summer. Young plants frost intolerant.	early to late	FS **15m**	1 2 4 5			
TOTARA Podocarpus totara  Bruce Clarkson	Tall tree with thick grooved bark. Narrow, stiff and sharply pointed leaves. Slow growing. Drought and frost tolerant.	early	F **20m**	2 4 5			
TREE FUCHSIA KOTUKUTUKU Fuchsia excorticata  Bruce Clarkson	Small tree with spreading habit and drooping greenish flowers. Purple/black fruit and distinctive papery bark. Deciduous in exposed sites. Moist gullies. Drought intolerant.	early to late	FN **6m**	2 5			

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
WINEBERRY MAKOMAKO Aristotelia serrata 	Fast growing small tree. Clusters of pink flowers in spring followed by berries in summer. Rapid growth in moist open sites.	early	FSN 6m	1 4			
KANUKA Kunzea ericoides 	Distinctive tree with tiny, soft narrow leaves. Leaves with a pleasant aromatic scent. Small narrow capsule and white flowers. Sunny, alluvial, hill slopes.	early	5-7m	1			
KARAMU Coprosma robusta 	Large shrub with dark green leaves. Grows in diverse, moist open habitats. Good as a nurse crop. Shiny orange/red fruit, bird distributed.	early	FS 2-4m	1 2 4 5			

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
KOROMIKO Hebe stricta 	Hardy shrub with narrow leaves, white/lilac flowers. Open ground to riverbanks and bush margins. Fast growing.	early	N 2m	1 2 5			
MANUKA Leptospermum scoparium 	Fast growing small tree/shrub with many white flowers in late spring. Leaves more prickly tipped than kanuka. Will grow on a wide range of soils. Two varieties: hillslope has broader leaf, peatland has narrower leaf.	early	4m	1 3 5 5p			
MINGIMINGI *Coprosma propinqua* 	Twiggy shrub with small narrow leaves. White/blue fruit in autumn and spring. Prefers boggy soils.	early	4m	3 5 5p			

native shrubs

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
PATE Schefflera digitata 	Large shrub with large soft leaves. White and purple berries in autumn. Plant with shelter on a moist site. Damp soil aids rapid growth.	early to middle	FS 5m	4			
RANGIORA Brachyglottis repanda 	Large shrub. Large soft leaves with white undersides. Open ground to riverbanks and bush margins. Tolerates poor, dry soil.	early	3m	1 2 5			
SWAMP COPROSMA Coprosma tenuicaulis 	Erect shrub with interlacing, slender branchlets and black fruit. Needs swampy boggy ground.	early	F 3m	3			

native shrubs

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
FLAX HARAKEKE Phormium tenax 	Upright dark green leaves with red flowers and erect seed capsules. Withstands flooding and dry conditions. Good in swampy areas and for protecting banks of streams/drains. Particularly attractive to tui.	early	N 2m	2 3 4 5 5p			
FLAX WHARARIKI Phormium cookianum 	Fans of long drooping leaves. Tall spikes of orange or yellow flowers with drooping seed capsules. Usually smaller than Flax (*P. tenax*).	early	N 1.5m	2 3 4 5 1			
KAKAHA BUSH LILY Astelia fragrans 	Arching flax like leaves with honey scented flowers. Large leafy clump, good under trees. On poorly drained gully floors the larger *Astelia grandis* is a more dramatic alternative.	late	1m	2 4 5			

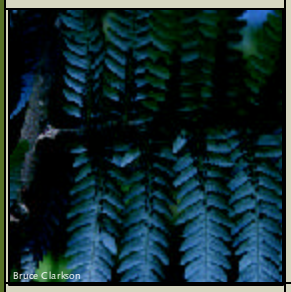
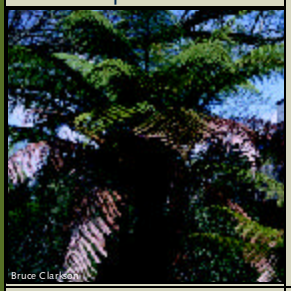
tussock herbs

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
SWAMP SEDGE Carex secta 	Tussocky sedge, tough and versatile. Open sunny grasslands, wetlands, to partly shaded forest margins. Prefers moist soil. Can be split or grown from seed.	early	  **1m**	3 5	 	 	
SWAMP SEDGE Carex virgata 	Tussocky sedge. Open sunny grasslands, wetlands, to partly shaded forest margins. Slightly better drainage than carex secta. Can be split or grown from seed.	early	**1m**	3			
BAUMEA Baumea rubiginosa 	Reed like sedge which tolerates swampy conditions.	early	**1m**	3			

sedges

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
KIOKIO Blechnum novae-zelandiae  Bruce Clarkson	Small bushy clump with pink young fronds. Two forms: One in swamps, one on dry banks. Easy to grow.	late	**75cm**	2 3 4 5			
HEN & CHICKEN FERN Asplenium bulbiferum  Bruce Clarkson	Graceful fern with many little plantlets growing on the fronds. Prefers moist, shady areas with fertile soils.	late	**50cm**	2 5			
MAMAKU **BLACK PONGA** Cyathea medullaris  Bruce Clarkson	Large tree fern with a robust trunk and thick black young fronds and stems. Plant with shelter in a moist site. Fast growing.	middle	**15m**	2 3 4 5			

native ferns

Plant Name	Habitat and Visual Description	When to Plant	Restoration Aim	Planting Conditions			
				ZONE	LIGHT	DRAINAGE	WIND/ FROST
PONGA SILVER TREE FERN Cyathea dealbata  Bruce Clarkson	Medium tree fern. The underside of mature fronds are silver. Wide crown. Plant with shelter in damp shaded site. Needs good drainage.	middle	10m	1 2 4 5			
WHEKI ROUGH TREE FERN Dicksonia squarrosa  Bruce Clarkson	Smaller tree fern with slender and often branching trunk. Can form large clumps. Rough scratchy fronds.	middle	5m	1 2 4 5			
WHEKI PONGA Dicksonia fibrosa  Bruce Clarkson	Hardy tree fern with thick trunk. Retains dead fronds as an attractive skirt. Hardy, moist open or shady sites. Frost tolerant.	middle	6m	1 2 4 5			

Epiphytes and groundcover can be planted at the latter stages of a restoration once you have achieved a good canopy cover.

Epiphytes are plants that grow while attached to other plants.

CLIMBING RATA
Metrosideros fulgens

Climber with orange red flowers and glossy leaves.

Well drained site at base of tree.

CLIMBING RATA
Metrosideros perforata

Climber with white flowers and gland dotted small leaves.

Well drained site at base of tree.

HANGING ORCHID
Earina mucronata

Grassy leaved epiphytic orchid with fragrant delicate flowers.

Attach to branches or tree ferns as for Perching Lily.

Nertera
Nertera dichondrifolia

Small creeping herb with attractive fleshy fruits and small hairy leaves.

Plant in semi shade on hillslope or footslope.

PANAKENAKE
Pratia angulata

Small creeping herb with small toothed leaves.

Attractive lobed flower and bright pink-purple fruit.

Plant in semi shade on hillslope or footslope.

Grows well in poorly drained soil.

PERCHING LILY
Collospermum hastatum

Tufted perching lily with flax like leaves.

Secure in crotch of tree with twine or netting.

Pack with sphagnum moss to cover roots.

Seed Collection and Propagation of Native Plants

Propagation from seed is the easiest and most commonly used method of propagating native plants. The following overview will tell you how to go about growing your own seeds and the table outlines the different techniques to use for different species. Remember, if in doubt sowing "fresh is best".

Seed collection

Seeds should not be collected without the permission of the landowner or controlling authority. Contact Hamilton City Council (Parks and Gardens) for advice on where to collect seeds.

Laying a sheet for a number of weeks beneath trees that are dropping seed is an effective and easy way to collect a large amount of seed. Make sure the sheet isn't waterproof so that seed don't sit in pools of water. A piece of 'windbreak' fabric works well.

Seed cleaning

Before sowing or storing seed for sowing later, some seed must be cleaned to remove material such as fleshy fruit and seed husks. The following table identifies the best ways to clean seeds from different species and an explanation of abbreviations used is given:

FS= friction, sieve
SFSD= soak, friction, sieve, dry
FSS= friction, sand, sieve

Soak:	Soak the seeds in water for 2-3 days.
Friction:	Rub the seeds together to break husks.
Sieve:	Sieve the seeds to remove any fleshy or dry material.
Dry:	Spread seeds in a warm place to dry to prevent fungal growth.
Sand:	Mixing with sand will help seperate sticky seeds.

Seed treatment

Treatment of seeds can speed up germination in some species. The main types of seed treatments are:

Mechanical:	Breaking the seed coat with a knife.
Cold treatment:	Placing moist seeds in the fridge (4°C) for a specified length of time. This simulates the natural conditions over winter before seeds germinate in spring.

Storage of seed

Seed that has been collected and cleaned can be stored in dry conditions (airtight containers) at 4.5°C for future use.

Seed sowing

Use clean plastic or wooden trays or pots that allow for drainage. Fill the container with seed raising mix and firm lightly. Spread seed evenly and not too densely on the surface of the mix. Cover with a fine layer of pumice sand. Fine seeds will scatter more easily if mixed with sand. Water well using a spray bottle or a watering can and cover the container with glass or enclose in a plastic bag to reduce moisture loss. Place in a warm location sheltered from wind and strong sunlight. Keep the seed mix moist and ventilated, and remove the cover once germination begins.

When the seedlings are a few centimetres high transplant into small pots or trays. Transplant again when the seedlings are larger and the roots need more space. Larger pots or containers such as old milk cartons with holes for drainage are ideal. Plants are ready for planting out once they reach at least 50cm in height. They will need to be larger for more cold sensitive species.

Seed Collection, Cleaning and Treatment

To maintain the genetic diversity, plants used for restoration of natural vegetation should be propagated from seed, or from cuttings taken from a large number of individual plants.

Common or Maori name	Colour of ripe fruit	Seed collection time	Seed cleaning	Seed Treatment		Comments
				Sow fresh	Stratify at 4°C (weeks)	
TREES						
Cabbage tree	Cream	Feb-Mar		Yes		Best results from ripe seed
Five Finger	Dark burgundy	Jan-Apr	SFSD		8	
Kahikatea	Indigo-red	Mar-May		Yes		
Kanuka	Reddish brown	Mar-May	FS	Yes		Remove capsules anytime and dry to release seed
Manuka	Reddish brown	Anytime	FS	Yes		
Kauri	Dark green cone	Feb-Apr	FS	Yes	2	Good seed is flat and firm
Kohuhu	Black	Apr-Jun	FSS		5-6	Sticky seeds (use sand)
Kowhai	Yellowish brown	Jul-Aug	FS			Prick with a pin
Lacebark	Brown	May-Jun	FS	Yes	3	Fast growing
Lancewood	Dark burgundy	Jan-Apr	SFSD		8-10	
Mahoe	Purple	Feb-Apr		Yes		
Marble leaf	Black	Mar-May	SFSD		6	
Matai	Dark bluish black	Feb-May	SFSD		20	Seeds slow to germinate
Pigeonwood	Dark purple	Nov-Jan	SFSD		14	Not necessary to remove seed from seed shell
Pukatea	Brown	Apr-Jun	FS		2	Does not store well
Rewarewa	Brown	Apr-Jun		Yes	4	Store seed less than 1 year
Rimu	Black/red	Jan-Apr	FS		3	
Swamp maire	Red	Nov-Mar	FS	Yes		
Tawa	Dark purple	Dec-Feb		Yes		
Titoki	Red-black	Oct-Dec	FS		4	
Totara	Green-red	Apr-May	SFSD	Yes		Sporadic seeder
Tree fuchsia	Dark red to black	Feb-Apr		Yes	2	Plantlets thin leaved and prone to drying out
Wineberry	Deep red	Jan-Feb		Yes	3	Seed needs to be well dried
SHRUBS						
Flax/ (Harakeke, Whahariki)	Black	Jan-Mar		Yes	3	Flax plants can be split up and the outside leaves trimmed back
Hebe	Brown	Nov-Mar		Yes	2	
Karamu	Orange	Mar-Apr	SFSD		3	Germination uneven
Mingimingi	Blue	Mar-May	SFSD		3	
Rangiora	Off-white	Jan-Feb	FS		4	Light germination. Cover seed with thin layer of gravel
FERNS	Scatter dry fern fronds (with spore cases apparent) in areas where you want ferns to grow. Tree ferns will usually colonise naturally.					

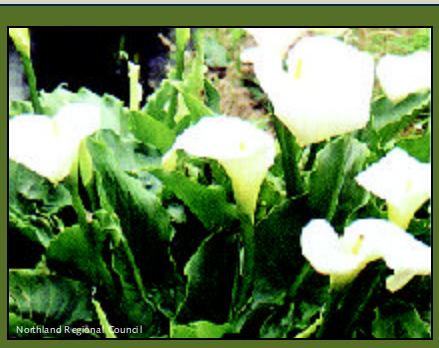
Weed Identification and Control Methods

The following guide on weed identification and control methods provides information on problem weeds found in Hamilton gullies. Information is given for both physical and chemical control. Where possible avoid the use of sprays and chemicals and remove weeds by physically removing the vegetation. If chemical control is necessary it is recommended that an additive such as Codacide Oil is mixed with the spray as it will act as a penetrant and will enhance the rainfastness of the chemicals applied.

Recommended weed killers include Vigilant, Armitrole, Roundup, Glyphosate or Woody Weedkiller and for a concerted effort among a community where there is large area to be covered, Escort can be cost effective.

For further information contact your local Plant Pest Officer (Ph: 0800 4 WEEDS).

The following are weeds that you need to consider when restoring a gully. Some are classified plant pests under the Biosecurity Act and the Waikato Regional Pest Management Strategy.



ARUM LILY

Zantedeschia aethiopica

Description: Tuberous herb extends rhizomes and forms clumps. Large green leathery leaves. White/green spathe with yellow spike of flowers. Also cultivar known as "Green Goddess" is a problem.

Recommended control: Pull out small infestations. Stem and leaves can be mulched but burn or landfill rhizomes. Cut stems and apply Vigilant to rhizomes. Spray when in active growth.

Status: general nuisance weed in gullies.

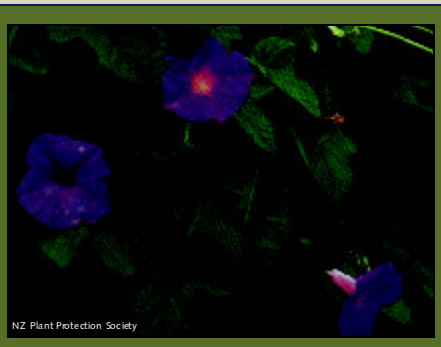
BLACKBERRY

Rubus fructicosus agg.

Description: Scrambling, thorny bush with stems up to 8m long and suckering plants. Flowers Nov-Apr. Fruits Nov-May.

Recommended control: Cut, slash or burn when canes are brittle enough. Apply Glyphosate + penetrant to healthy plants Dec-Apr. Spray with Escort, Jan-Jun.

Status: must be removed if requested by a Plant Pest Officer.

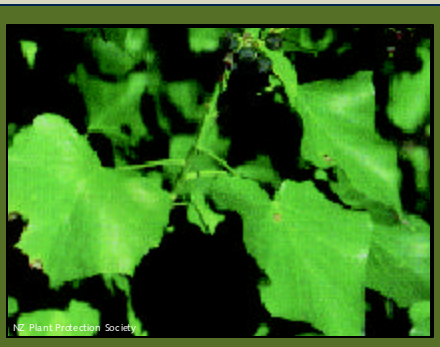


BLUE MORNING GLORY

Ipomoea indica

Description: Fast growing, climbing perennial vine with purple/blue trumpet flower.

Recommended control: Hand pull small infestations ensuring all roots are removed. Caution must be exercised as plant can grow readily from stems. Paint stems of large plants with herbicide or spray with Glyphosate + penetrant. Follow up will be required.
Status: banned from sale, propagation and distribution.



COMMON IVY

Hedera helix

Description: Woody climber with dark green or variegated ivory/white leaves. Common ivy has many distinctive forms varying in leaf shape and colouring.

Recommended control: Pull or dig out. Cut stem and paint with herbicide or spray with Tordon brushkiller. Do not mulch or compost as plant can grow from cut material.

Status: general nuisance weed in gullies.

ELEPHANT EAR

Alocasia brisbanensis

Description: Large robust plant with fleshy rhizomes (underground stems). Thick stems with milky sap. Shiny green leathery, ribbed leaves with white patches. Red/orange glossy berries. Shades out natural groundcover.

Recommended control: Pull out tubers and landfill or burn. Apply Escort + penetrant. Take care when cutting this plant as sap is toxic and can irritate eyes and skin.

Status: general nuisance weed in gullies.

GREY WILLOW

Salix cinerea

Description: Shrubby small tree forming thickets. Grey/green hairy shoots.

Recommended control: Cut down and burn or treat with herbicide. Paint stumps with Vigilant or spray with Glyphosate Jan-Apr before leaf fall. Early detection and prompt destruction of isolated plants is essential. Cut material can grow into new plants. Seek advice of Noxious Plants Officer.

Status: general nuisance weed in gullies.

JAPANESE HONEYSUCKLE

Lonicera japonica

Description: Vigorous climber with purplish stems when young. Oval leaves with fragrant white/yellow tube like flowers in pairs. Black berries.

Recommended control: Pull or dig out. Apply Vigilant to cut stem. Spray with Escort. Glyphosate spray is ineffective. Remove all parts of plant as nodes will re-sprout.

Status: banned from sale, propagation and distribution.

JASMINE

Jasminum polyanthum

Description: Evergreen climbing shrub with fragrant white flowers. Glossy black fruit.

Recommended control: Cut near ground level and remove all roots and stems. Plant will resprout if mulched. Cut stem and paint roots. Spray foliage with glyphosate + penetrant. Large infestations will require several applications of chemicals.

Status: general nuisance weed in gullies.

KAHILI GINGER

Hedychium gardnerianum

Description: Robust perennial with large lance shaped leaves. Massive branching rhizomes. Yellow fragrant flowers with red stamens in Jan-Mar. Threat to NZ forests.

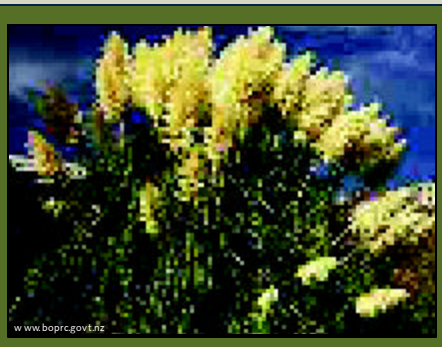
Recommended control: Depends on site assessment. Cut back the foliage when in active growth and apply Vigilant to the cut rhizomes. Rhizomes can be left in place as they provide good bank stability. Pull out young seedlings. Do not mulch rhizomes as they will spread.
Status: must be removed.

MOTH (kapok) PLANT

Araujia sericifera

Description: Woody climbing plant with milky juice. Stems covered in very fine hairs. Dark green oblong leaves. Small white flowers in clusters, Dec-May. Large choko-like green fruit, with fluffy (kapok) seeds.

Recommended control: Cut the plant from the stems that are touching the ground, and treat the cut stumps with Woody Weedkiller.
Status: banned from sale, propagation and distribution.



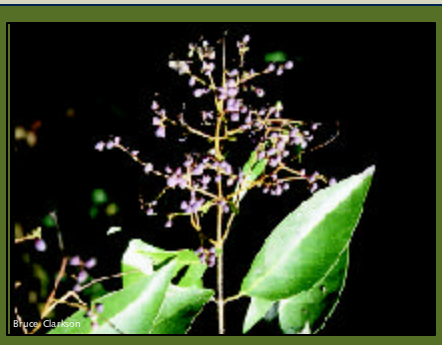
PAMPAS GRASS

Cortaderia selloana

Description: Tall growing cutting grass with purple/pink tufted seed heads.

Recommended control: Pull or dig out small plants. Graze or use digger for large plants. Spray with Glyphosate + penetrant. For individual large plants put the spray nozzle into the middle of the plant and give it a 5 second burst. Plants can be composted or mulched.

Status: banned from sale, propagation and distribution.



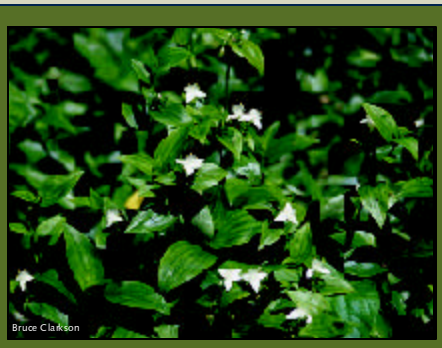
TREE PRIVET

Ligustrum lucidum

Description: Evergreen tree with glossy leaves, small white fragrant flowers and blue/black berries. Largest of the privets in NZ. The smaller Chinese Privet has dull green hairy leaves.

Recommended control: Pull or dig out seedlings and chainsaw large trees. Trunk poison trees or paint stumps with Vigilant. Remove all plant debris from site to avoid re-infestation.

Status: must be removed if requested by a Plant Pest Officer.



WANDERING JEW

Tradescantia fluminensis

Description: A ground cover with succulent stems, rooting readily at nodes. Spreads vegetatively and lacks seeds.

Recommended control: Whole plant is easily broken and is best removed by rolling up mats of stems. Bury or burn all vegetative parts. Stems can survive composting. Apply Vigilant with a paint roller over the area or spray with Glyphosate. Follow up.

Status: general nuisance weed in gullies.

WOOLLY NIGHTSHADE/ TOBACCO WEED

Solanum mauritianum

Description: Invasive small tree, that forms dense stands. Prevents natural regeneration. Large grey, furry, pungent smelling leaves.

Recommended control: Pull out seedlings when soil is damp. Cut and paint stumps of large plants with herbicide. Remove mature plants to avoid re-infestation from seeds. Spray stems and foliage with Glyphosate + penetrant. Best results in Oct-Feb.

Status: must be removed.

Notes

Remember. Every little bit of restored native bush helps by creating stepping stones for birds and other wildlife to travel into the City area.

Notes

If you're restoring part of a gully, let us know. We'll include your project on the Ecologic Foundations city gully register and will keep track to gully restoration in your area. Ph: 07 838 6483

Acknowledgements

The guide was funded by the Hamilton City Council's Sustainable Environment Team and developed by a working group comprising representatives from the Hamilton City Council, The University of Waikato, Environment Waikatoand local experts. Information presented in the guide has been sourced from individuals and organisations with expert local knowledge of gully environments and restoration methods.

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Presentation and layout: Digital Stream
Graphics: Catherine Beard and Geoff Mardon
Cover Photo: Adrienne Grant

Published by

Hamilton City Council
Te kaunihera o Kirikiriroa

First published March 2001
2nd Edition August 2002

ISBN: 0-9582150-8-1

Printed on recycled, chlorine free paper.


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