Hamilton Gully Restoration: Integrating Ecology, Propagation, and Planting©

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INTRODUCTION

Hamilton City has only a few tiny remnants of the former indigenous forest cover, perhaps less than 20 hectares in total of high quality indigenous habitat. The largest remnant is Jubilee Park (Claudelands Bush), a 5.2 ha reserve comprising kahikatea (New Zealand white pine, *Dacrycarpus dacrydioides*) forest (Whaley et al., 1997). Another important remnant is Hammond Bush (Fig. 1), floristically the richest of the Hamilton indigenous remnants. Despite its small size (1 ha), it supports an impressive 145 native plant species (de Lange, 1996) and is regularly visited by kereru (New Zealand pigeon, *Hemiphaga novaeseelandiae* subsp. *novaeseelandiae*). Recently, native long-tailed bats (*Chalinolobus tuberculatus*) have also been recorded in the area (E. Ganley, pers.comm. 2001).

Although the indigenous biodiversity resource is very limited, Hamilton City does possess an extensive network of gullies. These extend from the Waikato River through many suburbs of the city, and are considered a unique feature of the Hamilton area (McCraw, 2000). Four major gully systems (Kirikiriroa, Mangakotukutuku, Mangaonua, and Waitawhiriwhiri) and numerous minor systems exist (Fig. 2). As

Figure 1. Hammond Bush, Riverlea, Hamilton. The bush adjoins Waikato River and a small gully system to the east.

Figure 2. Gully systems of Hamilton City. The major four systems (Kirikiriroa, Mangaonua, Mangakotukutuku, and Waitawhiriwhiri) are labeled. (Adapted from Wall and Clarkson, 2001)

McCraw (2000) has shown, the gullies formed in the sediment deposited by the wanderings of the Waikato River over a period of 5000 years, through a process known as spring sapping. The gully systems once had an intimate connection with formerly extensive peat bogs. Water flowing from the peat bogs along buried, impermeable silt layers emerged as springs on the Waikato River bank. These cut back through the sediment toward the source, creating characteristically deep, steep-sided gullies. The gullies have been recognised (Clarkson and Downs, 2000) as the potential focus of a city-wide restoration of indigenous ecosystems.

RESTORATION BACKGROUND

Gullies have been badly treated in the past but still support a resource of indigenous biodiversity. Comprehensive surveys have been conducted of the present vegetation

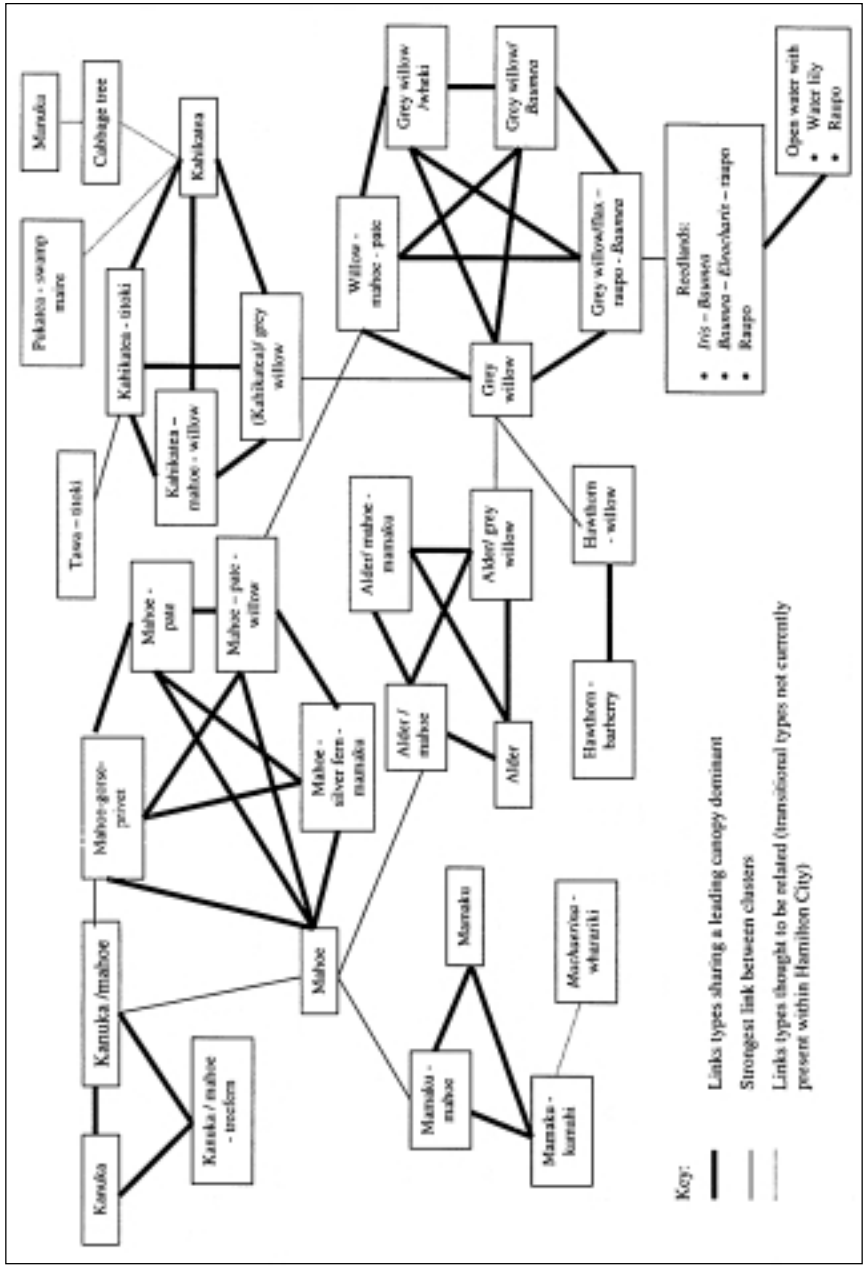

Figure 3. Major present-day vegetation types of Hamilton City (From Downs et. al., 2000)

(Downs et al., 2000). Vegetation (Fig. 3) ranges from kanuka (*Kunzea ericoides*) forest of well-drained river and gully scarps to raupo (*Typha orientalis*) reedlands fringing peat lakes, with many intermediate types. Gully floor vegetation is frequently dominated by grey willow (*Salix cinerea*), though beneath this is often an understorey dominated by indigenous plants including ferns, mahoe (*Melicytus ramiflorus*), and cabbage tree (*Cordyline australis*). Even where weeds are dominant gullies still provide some important ecosystem services, such as supporting desirable wildlife. Native birds persist even in these highly modified systems, with seven species including morepork (native owl, *Ninox novaeseelandiae* subsp. *novaeseelandiae*), kotare (New Zealand kingfisher, *Halcyon sancta vagans*), silvereye (*Zosterops lateralis lateralis*), fantail (*Rhipidura fuliginosa placabilis*), and grey warbler (*Gerygone igata*) widespread (Innes, 2000). The original gully vegetation can be deduced from historical records, the composition of extant remnants, and from macrofossil deposits (Clarkson and Clarkson, 2000). We therefore know what species to plant, where to plant them (Fig. 4), and how to look after them (Wall and Clarkson, 2001). There is a diverse range of native plants that can be used in these restorations (Morris, 2000).

The benefits of gully restoration are varied and numerous. These include improved environmental, aesthetic, scenic, and cultural values. Native plants perform important ecosystem functions; for example, the nectar-producing kowhai (*Sophora microphylla*) feeds the native birds, the fleshy fruits of the native conifers like rimu (*Dacrydium cupressinum*) also feed the birds and in turn are spread by them, and

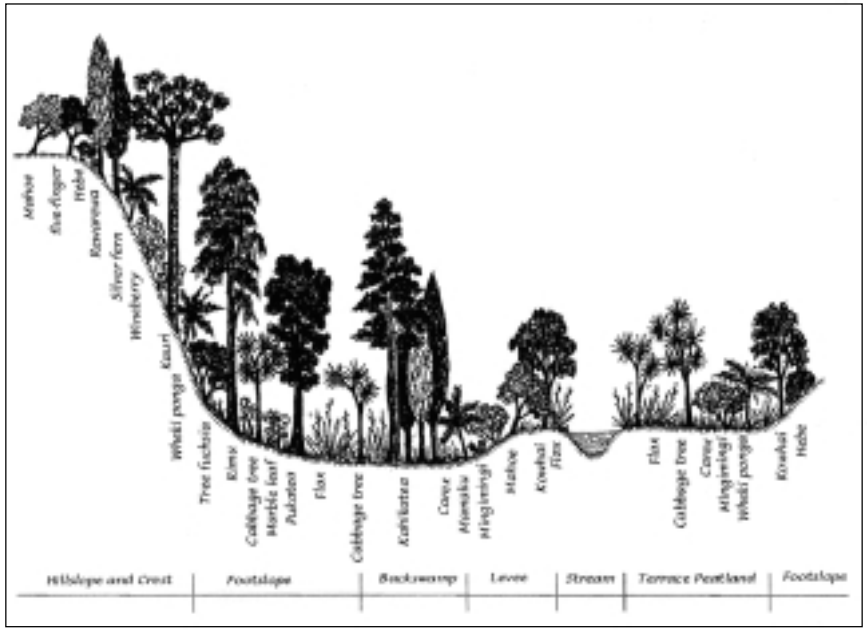

Figure 4. Idealised gully profile and original vegetation (From Wall & Clarkson, 2001)

the lacebark (*Hoheria sexstylosa*) flowers profusely every autumn and grows into a good-sized nurse tree within 5 years. Reintroducing a range of plant species once found in Hamilton gullies could address the local shortage of native plant resources for rongoa (traditional Maori medicine) (McGowan, 2000). As well as enhancing terrestrial habitats, gully restoration benefits aquatic life in streams. Riparian planting leads to cooler, more shaded streams with stable undercut banks; the preferred habitat of some native fish species including the banded kokopu (*Galaxias fasciatus*) and redfin bullies (*Gobiomorphus huttoni*) (Hicks, 2000).

From the pioneering work of people like Alwyn Seeley (Fig. 5), Peter Morris, and the Edgar family, we know that it is possible to have a good canopy cover of native trees established in a gully setting within 20 years. But there is still much to accomplish and a Waikato Science Fair project (Clarkson, 2000) has modeled the approximate magnitude of restoration required to return the native nectar-feeding bird tui (*Prosthemadera novaeseelandiae*) to Hamilton City. Tui are an icon for restoration success, as elegantly identified many years goes by local community organization Tui 2000. A comparison with other North Island cities shows it may be necessary to have almost 100 hectares of quality habitat within Hamilton City or

Figure 5. 'Seeley's Gully'. This restoration project on private land at Gibbons Creek, Hamilton began 35 years ago.

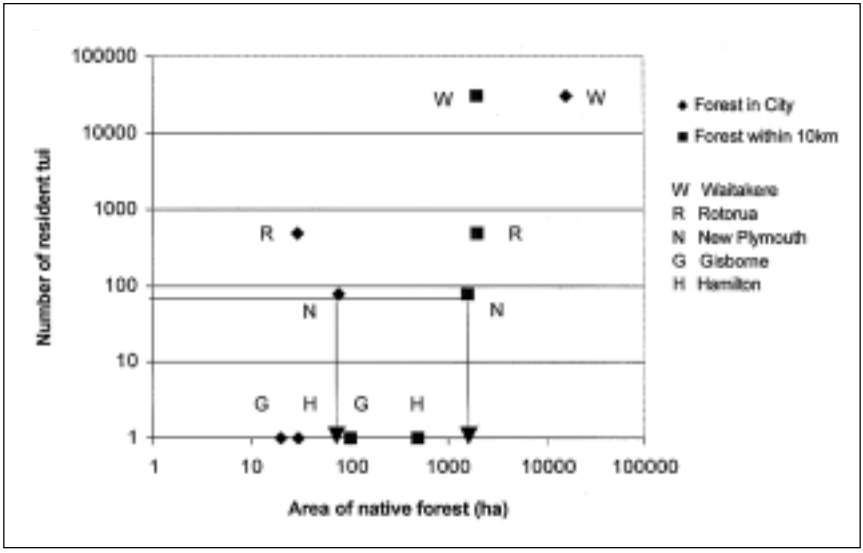

Figure 6. Area of native forest within and around selected New Zealand cities and number of resident tui.

1000 hectares within 10 km of the city to support resident tui (Fig. 6). Increasing the current area of habitat towards these threshold figures would at least result in more regular tui visitors than at present.

SUCCESSFUL GULLY RESTORATION

The key ingredients for successful gully restoration identified by Clarkson and Downs (2000) and Morris (2000) are summarised here. It is sensible to use existing remnants or sites with a significant indigenous component as nuclei for restoration projects. The development of corridors and linkages and buffering issues can then be considered. A range of different restoration strategies from complete clearance and replanting of the site to canopy manipulation of willow and other exotics is available. The strategy adopted will vary depending on the budget available, access to volunteer labour, and the need to protect extant specimens of native plants. The value of ecosourcing rests mainly in the superior performance of locally sourced ecotypes or races, as well as the need to conduct authentic restoration in important reserves such as Hammond Bush. Native species propagated from ecosourced plant material have been used successfully in numerous restoration projects throughout the city, and this is a technique now employed by staff at the Hamilton City Council Nursery.

Matching species preferences to site conditions through careful site selection is rewarded by greater survival and growth of the species planted. There are also considerable benefits obtained by mimicking natural succession processes and it is necessary to consider enrichment planting or spreading of seed of later successional species once a good canopy cover of trees has been established. Regular aftercare, and weed and pest control are all important for the continuing success of a restoration project.

WIDER RESTORATION PLANS

It is apparent merely by inspecting a map of Hamilton City that the restoration of gullies cannot be conducted in isolation from other restoration projects. Not only do the individual gullies need to be restored but they need to be linked to the Waikato River, the peat lakes, and the extant forest remnants. Thinking even wider, it is necessary to establish riparian plantings or corridors along the Waikato River north to the forest on the Hakarimata Range and south to Maungatautari Scenic Reserve in order to facilitate a regional scale restoration. The Gully Restoration Guide (Wall and Clarkson, 2001) and the Hamilton City Council Gully Management Plan (2001) provide the information base on which to commence a city-wide restoration, and there is evidence of an ever-increasing number of community group, school, and private gully restorations. A recent advent has been the first advertisement for a housing subdivision proclaiming a gully enhancement approach.

Because of some far-sighted decision making by the Hamilton City Council, there are currently some unique opportunities at the proposed Claudelands Park and at Horseshoe Lake (Waiwhakareke) to begin the wider restoration plan. At Claudelands Park there is the prospect of increasing the size of the Claudelands Bush kahikatea forest by several hectares. Even more significant are the possibilities of a major restoration project at Horseshoe Lake. With a coordinated Waikato Polytechnic and Hamilton City Council approach, there is the prospect of doubling the area of indigenous forest within the City; providing a significant stepping-stone for native birds. There is also the possibility of erecting a Waikato designed Xcluder™ Pest Proof fence (Xcluder™ Pest Proof Fencing Company Ltd, Cambridge) around some areas; protecting native birdlife and plants from introduced mammals once these have been eradicated within.

CONCLUSION

By bringing together ecological understanding and the best-practice techniques of native plant propagation and planting, successful citywide and regional restoration is achievable. While it is important to consider the broader long-term restoration task, the higher level goals are best attained through a series of smaller, manageable stages. Increased use of indigenous species in a range of settings, such as hedge plants, specimens in parks, and as integral components of home gardens, will positively influence and buffer the restoration projects being undertaken. Changing ecosystem dominance from deciduous trees to evergreen trees will assist but not completely solve some of the current weed problems. Shifting the local seed rain balance from exotic to indigenous brings us closer to the threshold where it will be more likely that regeneration and recruitment will be of indigenous species rather than ubiquitous exotics. Consideration of all components of the ecosystem, not just the trees, promotes a functioning restored ecosystem. Successful restoration projects will be more likely within the developing citywide strategy based on community support and partnerships. It is therefore a definite prospect that within one human generation, and for the new generation, tui will once again be resident in Hamilton City.

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