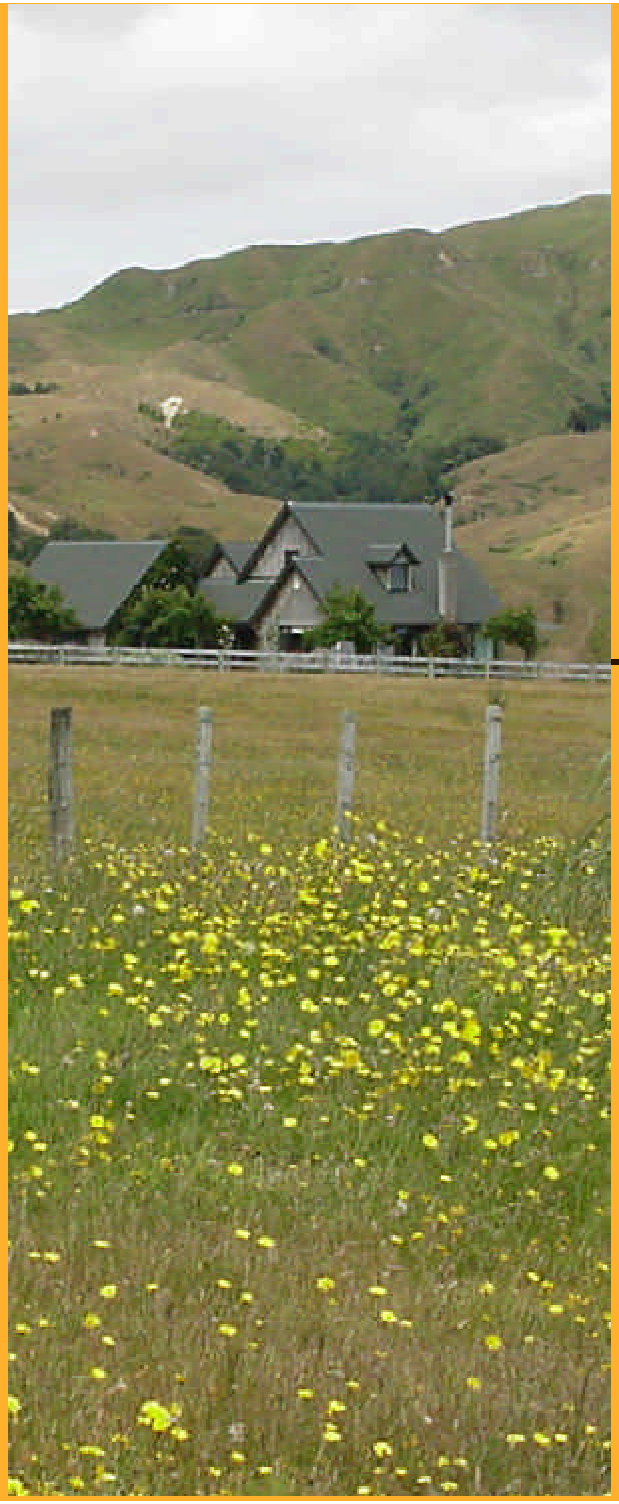

Environmental Guidelines for Rural Living

Kapiti & Horowhenua

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I. Gabites

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Environmental Guidelines for Rural Living

in Kapiti & Horowhenua

Contents

Rural life. It's about space, natural landforms, gracious vistas, freedom to experiment, quiet. It may be a personal choice, but we share it with others and collectively create an environment which may (or may not) look good, which may (or may not) be a healthy place.

If you're about to develop a new section, change the existing land-use or simply enhance an existing property it's likely you'll want to get the best returns on your dollar, and the best long term outcome for the land - and thus your quality of life.

This guide offers a range of ideas, options and advice which might help you through the site development process. It has the support of local and regional councils, who want our rural area to both look good *and* be a healthy place and is based on designing around natural systems.

It 's Your Land, but . . .

You own your patch of paradise but you also have responsibilities that are determined by the wider community and expressed in the District and Regional Plans.

The Resource Management Act (1991) gives a clear signal that what we do with the land must not degrade it, or unduly limit the scope for healthy ecosystems. District and Regional Plans set the baselines 'for what is acceptable and sustainable in the Kapiti-Horowhenua environments.

Anyone wanting to develop resources is required to show that the development will not be detrimental for the environment and that the environment can sustain it. For example, if you want to put down a bore you must do the homework required to show that you won t be affecting the watertable, or your neighbour s bore.

The expense of managing your resources (water, soil, air etc) in a sustainable way can also influence how you design your property. Careful design might, for example, avoid the need for a bore at all.

In Kapiti and Horowhenua the health of some particularly vulnerable resources requires a communal effort. For example, the artesian connections of the water-table in the duneland mean that pollution hazards and availability of water must be managed collectively. What you do on your property will have far-reaching effects, literally.

It 's Changing

Subdivision generally means more buildings, more intense patterns of hedging and shelter trees, perhaps woodlots where there was a paddock, or garden where there was scrub. The landscape constantly changes but sometimes in ways which undermine our original reasons for living in the country.

Those intangibles of space, views, privacy - that 'country feel '- do not have to be intangible at all. If the changing landscape is well planned and designed, those special elements *can* be protected and even enhanced.

Intensification of land use will clearly impact on the environment that sustains us all. Water demand may exceed supply, topsoil may be lost with earthworks, felling large trees may expose a site to wind. Human activities may destroy bird nesting sites, disturb roosting areas or degrade fish spawning grounds.

When you move into a new area it can be difficult to recognise which are the important parts to treasure, and how to create the least detrimental impact. How do you get the most out of your site without compromising natural values and design opportunities, or accidentally degrading areas of historical importance?

This guide is not meant to replace the advice of specialists or the tangata whenua knowledge base - but to encourage you to tap into their local knowledge and help you recognise the various aspects of 'sound 'rural design and planning.

And so are the rules

It is essential you know about District and Regional Plan rules. Below are a few pointers of what to look out for. These comments are **not** a substitute for the rules. If you are contemplating any development consult the authorities about the rules before you have firm plans so that the rules don t come as a surprise, requiring a major rethink and a more costly consent process.

So what are the key rule areas?

Land uses and developments (i.e. what goes on top of the land) may require a consent from District Councils. The rules that apply address things like buildings, roads/driveways, vegetation clearance, heritage features and planting (shelter belts and forestry). The rules also address activities like home occupations, pig farming, roadside stalls, forestry, and those that generate dust, odour, or noise.

The New Zealand Historic Places Trust should be contacted for information on its **registered historic places and known archaeological sites**. You will need their approval if you affect any archaeological sites. There are many known sites in coastal Kapiti and Horowhenua, and many more which may not be publically known.

Archaeological Sites are places associated with pre-1900 human activity. They may include: Maori pa, cultivation areas, gardens, terraces, storage pits or middens; shipwrecks, evidence of whaling, trading, gold mining or the remains of a missionary or military presence.

Water use, or effects on water resources, may require a consent at certain thresholds. Regional Councils administer the water rules. The rules that apply include (but are not limited to) extracting water from groundwater or a water course (say for irrigation, or domestic supply), changing the course of water (say diverting a stream), dams, building over, culverting, weirs or fords in a water course, erosion control, or discharging contaminants into water.

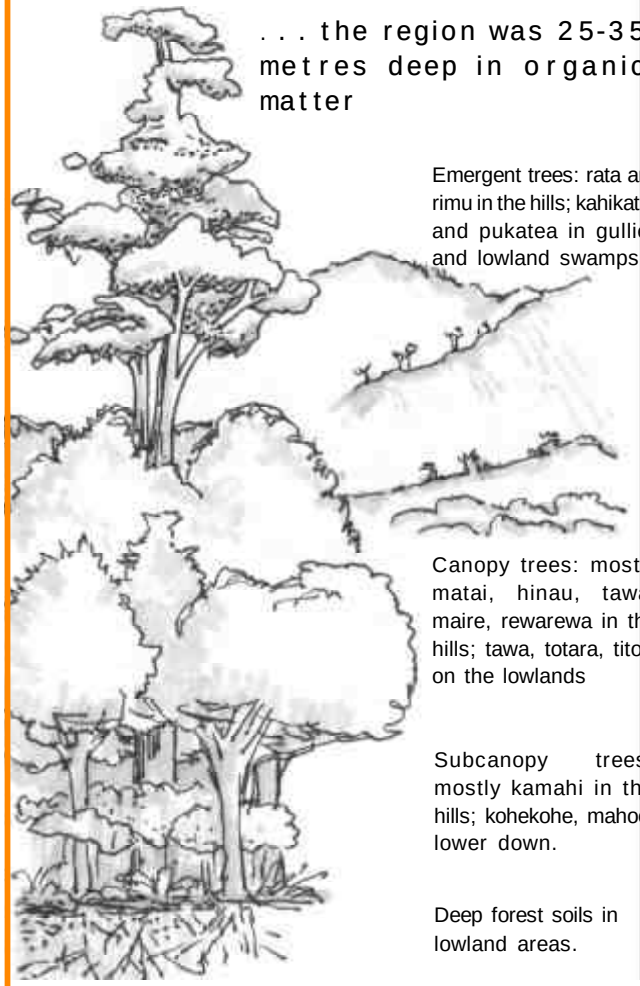
Discharge of contaminants may require a consent at certain thresholds. Regional Councils administer these rules. They include (but are not limited to) the disposal to land of greywater and stormwater, development of landfills, dumps and tips, and disposal of agricultural contaminants such as by offal pits, and effluent disposal from dairy sheds. THey also cover discharges to air (e.g. spray drift).

Soil disturbance on a large scale, and within any erosion prone area, requires consent. Both Regional and District Councils administer the soil rules. The rules apply to roading and tracking, any disturbance of large quantities of soil, and vegetation disturbance.

The contact details for the District and Regional Councils can be found at the back of the guidelines.

What came before . . .

. . . the region was 25-35 metres deep in organic matter



Emergent trees: rata and rimu in the hills; kahikatea and pukatea in gullies and lowland swamps.

Canopy trees: mostly matai, hinau, tawa, maire, rewarewa in the hills; tawa, totara, titoki on the lowlands

Subcanopy trees: mostly kamahi in the hills; kohekohe, mahoe, lower down.

Deep forest soils in lowland areas.

Smooth spinifex-clad foredunes, wetlands behind and older, forest-clad dunes and swamps further inland. Networks of wetland linked interdunal lakes.

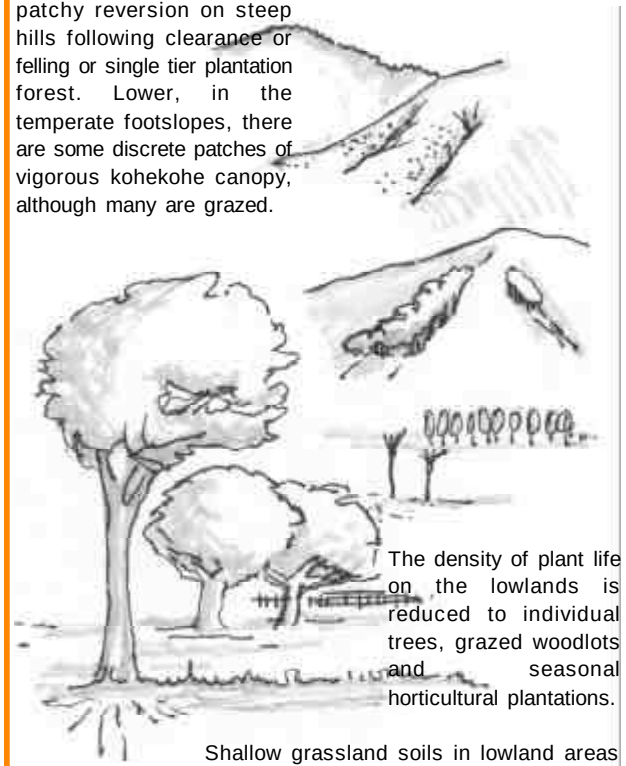
G. Leslie Adkin collection, MONZ PT 8.029138

Forest had been cleared from the lowlands by 1900, although areas of swamp still remained. The advent of refrigeration in 1882 and the subsequent increase in meat exports gave impetus to also clearing the hill country , for grazing. During the depression years mills continued to supply timber from the more remote forested hill country. After World War II marginal farmland was broken in by returned servicemen but much of this land has since reverted to bush.

Drainage prevented the periodic flooding of wetlands that kept flax healthy. This contributed to the demise of the flax industry when disease ravaged the flaxlands of the Manawatu in 1920. Since then there has been little to prevent the conversion of all swampy land to pasture.

and now . . .

Life on the hills now comprises patchy reversion on steep hills following clearance or felling or single tier plantation forest. Lower, in the temperate footslopes, there are some discrete patches of vigorous kohekohe canopy, although many are grazed.



The density of plant life on the lowlands is reduced to individual trees, grazed woodlots and seasonal horticultural plantations.

Shallow grassland soils in lowland areas but much of the original topsoil is now in the Tasman Sea.

Steep marram grass-clad foredunes, wetlands drained and peat shrinking, older dunes beyond stripped of vegetation and their soils leached away.

It costs a lot to fight nature. It costs a lot to fix problems and mend mistakes. Understanding environmental tolerances, seasonal fluctuations and natural diversity is the key to preparing for the future in a cost-effective way.

At the simplest level of design, any property can be improved with carefully planned planting. But even this requires a knowledge of the area and a knowledge of the plants best suited to fulfil the required function. To assist, we have prepared a map of ecological 'domains' which are the distinctive environments within a region which share similar climate, seasonal extremes, substrates and natural processes. Within each domain the patterns of life are responding to this unique set of factors, even though there will be variations between the hills and gullies within the domain.

Each domain tends to have particular ecological factors which may override other factors. There is a distinct difference, for example, between the influence of a sandy substrate on ecosystem processes compared to flood plain silts, even under the same climatic regime.

Similarly, the lack of frost where air flows out of gorges and along riverbeds can be more influential on growth than whether the ground is either stony or silty.

By assessing these kinds of ecological factors we can map the domains (see Figure 1) which gives you a starting point to understanding how to sustainably develop your site.

Setting the Scene

Severe salt belt This domain experiences salt burn, year-round rainshadow, strong but steady prevailing N-NW winds and sea breezes, and light frosts. It is an area of low nutrient sand and mobile, young dunes and deep meandering streams; estuaries at larger stream-mouths. Behind the foredune there are often hard flat pans, or swamps, where wind has exposed the water table. Natural vegetation is adapted to salt, wind infertility and drought.

Inland dunes Same climate as (1) but salt is not a dominant factor. This is an area of stable dunes, sand flats (with perched, rain-dependant wetlands); peaty, water-table dependant backswamps (many now drained and filled); deep meandering streams; low nutrient sands with thin, readily leached topsoils. Connectivity of wetlands via the water-table is an important feature. Natural vegetation is tolerant of wind, drought, infertility and frost. Aspect (and protection from drying winds) is important. Around the Manawatu River floodplain, the land is dominated by peaty wet soils.

Lowland terraces This domain experiences seasonal rainfall, light frosts, is less windy than towards the coast but vulnerable to damaging SE storms. Soils are stony or silt and clay rich and are relatively fertile, but all are prone to summer drought. Landforms are shaped by flood processes and wind-derived silt (loess). Natural vegetation is tolerant of drought and frost. **Volcanic lowland terraces** is a subset with soils that are rich in volcanic ashes.

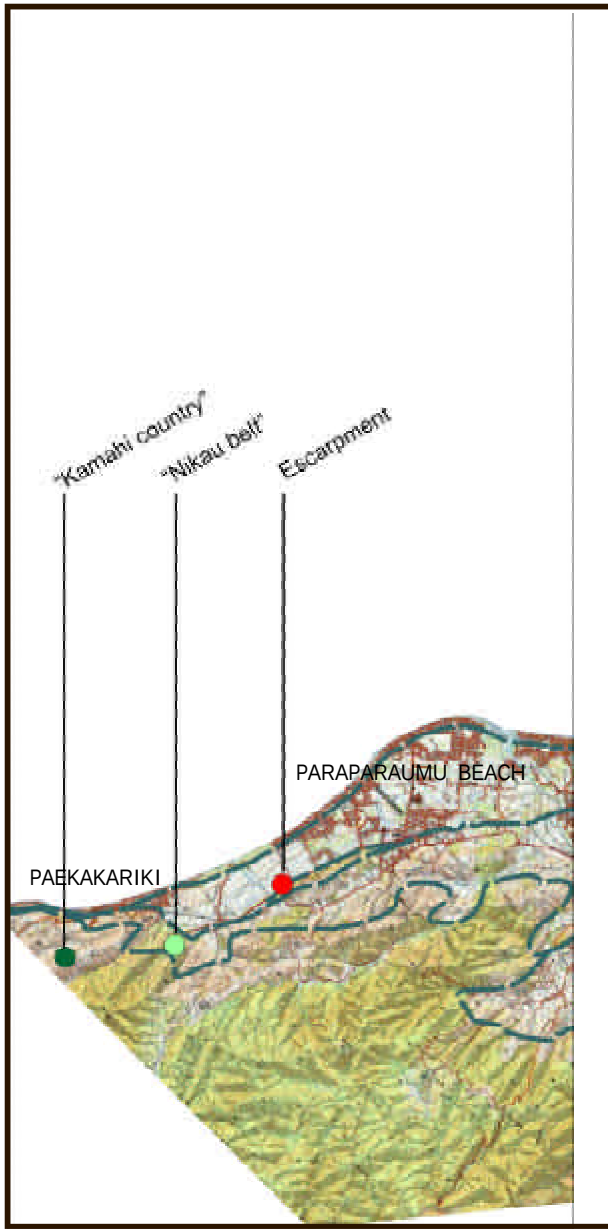
Flax terraces is an area with a similar climate to *lowland terraces* but because the landscape was created by flooding of the Manawatu River, it is dominated by peaty, wet soils.

'Nikau Belt' Includes some lowland terrace areas as well as foothills and valley mouths. Experiences year-round humidity; generally frost-free due to air drainage at night; cloud cover is significant. Landforms are 'softened' by loess mantling and weathering. Natural vegetation is dominated by vigorous, high nutrient-cycling species.

Escarpment The old marine escarpment, where it is closest to the present coast, is a blend of droughty scree conditions and frost-free coastal conditions.

Cool Basin Cold air pools at night here and frosts are heavy. There is high rainfall year-round. Soils are deep and well drained but relatively infertile on the hills. Natural vegetation is tolerant of frost, infertility and high rainfall.

'Kamahi Country' Experiences high rainfall year-round, cool temperatures so slower growth, turbulence and frequent cloud cover and mist. Soils are leached and often very thin, especially as gradients steepen. Streams are generally rocky, fast-flowing and incised, with steep banks.



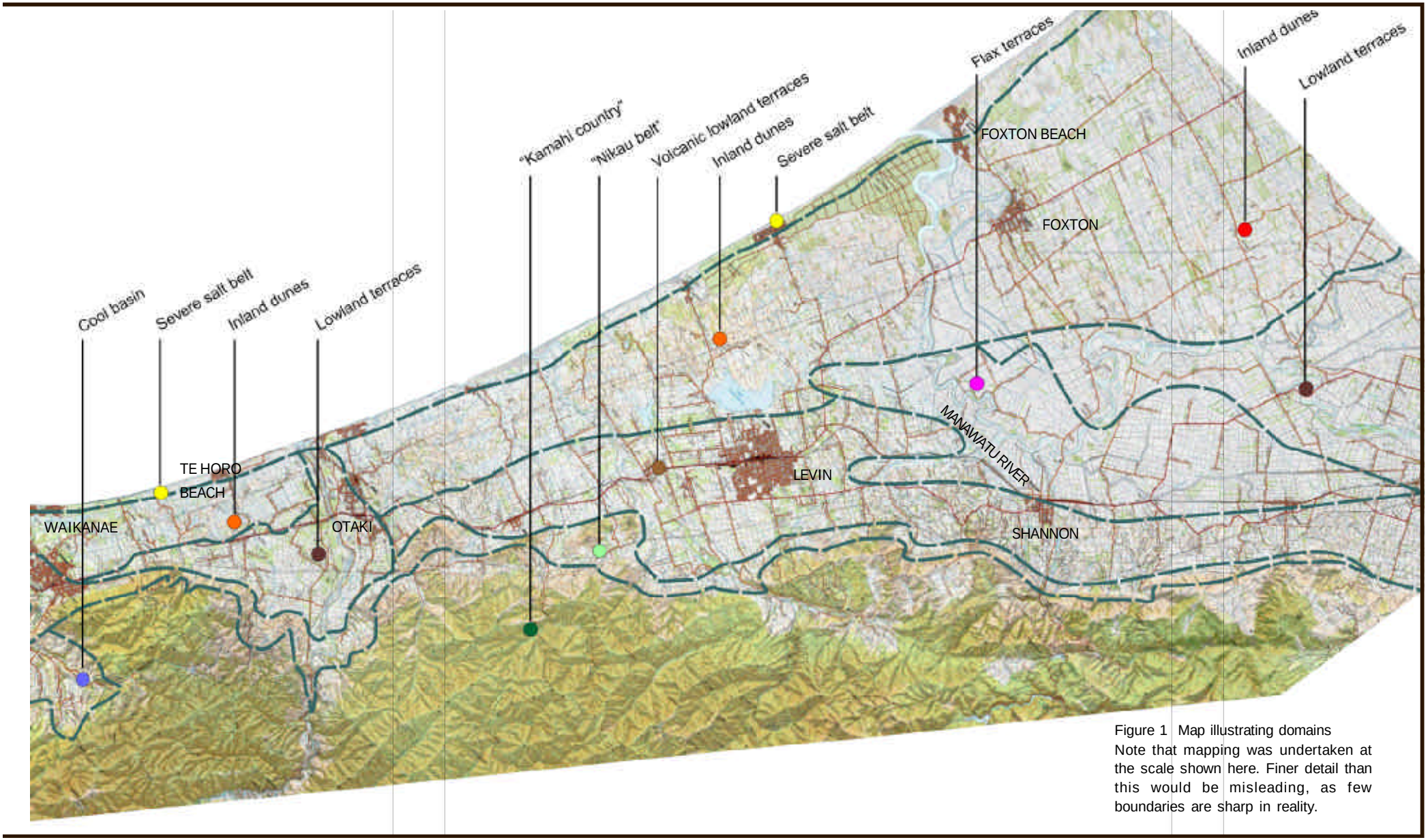


Figure 1 Map illustrating domains
Note that mapping was undertaken at the scale shown here. Finer detail than this would be misleading, as few boundaries are sharp in reality.

Fitting In

What are the key aspects of rural landscape design? Mostly the aim is to satisfy your own needs while at the same time minimising land modification, minimising the visual impact of built environments, getting the scale right and maximising the sense of space. Ways of achieving this include:

- **maintaining the natural landform patterns**. Bear this is mind when planning the placement of access roads and tracks, fence lines and shelter belts and plantation or amenity plantings. Try to follow natural 'edges' rather than creating arbitrary, new ones.
- **protecting natural drainage patterns** - this should be considered with grazing regimes and management of runoff as well as for aesthetic values
- **using a rural vernacular** (see page 11) in buildings and materials rather than a suburban vernacular, and exploring ways to visually 'connect' buildings with the land
- **managing earthworks** and locating buildings, utilities and services in ways that mean they do not dominate or create discord
- **maintaining air movement**. Trapping cold air in the open, flat country intensifies frost damage. Disrupting onshore winds exacerbates dune erosion. Tall trees in dunelands need protection from infrequent easterly storms.

We can summarise some specific landscape design issues that relate to each domain.

(left) These rural properties illustrate how site design can maintain the dunelands context. Property boundaries are blurred, areas of grass blend into the contours; driveways curve sinuously. Plantings, which have been based on existing native vegetation, achieve shelter by using both individual trees, which will minimise frost trapping, and groves in hollows which will allow the wind to lift over the top.

(right) In contrast, these properties disregard the natural character of the duneland. Straight boundaries are over-emphasised by hedging that will soon dominate andl diminish views; dunes have been levelled and potential for wetland restoration ignored.

Severe salt belt and inland dunes

It is a **highly diverse** landscape, with the extremes of dry dunes and wet hollows reflected in the natural vegetation, so retain this diversity in new developments too.

It is a dimpled, rather **formless** landscape, with much of the large vegetation (except plantation forest) confined to the damper hollows and the lee of dunes. Continue this pattern of **clump-planting**; it is self-sheltering and practical. Small, multi-crowned trees and shrubs are the natural ecological response.

On dunes, strong, steady drying onshore **salty winds**, summer **drought** and winter **frosts** dictate planting programmes. There are relatively few species adapted to these conditions (generally speaking small-leaved species, trees with shiny, thick leaves, and grasses - not sedges - will be most successful). Trees need protection from wind rocking by both westerlies and easterlies.

Damp, swampy ground, **salty winds**, **frosts** and poorly drained **acidic** soils are best planted with shallow rooting species such as sedges, flaxes, toetoe or species that can store oxygen in their roots, such as cabbage trees.

The bare hilltops create a sense of **open country**. Avoid creating solid screens or geometric patterns with trees. Don t build on hilltops or disrupt the hills and dales 'with constructed landscapes. Creating flat areas is only appropriate on the old sand plains.

Water is an essential ingredient in the duneland, whether sea, lake, stream or swamp. Emphasise and restore these features as naturally as possible within your manageable viewlines.

In this **dynamic** environment, infilling of swamps, sand blowouts shifting dunes and changing contours and soil loss through leaching are greatly exacerbated by human activities. Earthworks must be minimised and remedial action swift. Nevertheless, avoid running drives straight up dune faces as runoff is accelerated and concentrated and a straight drive would be visually obtrusive.

To fast-track revegetation, both organic material and fertiliser need to be added to help reconstitute a soil.

aerial photos: KCDC

Lowland terraces, volcanic lowland terraces

This environment is dominated by either flat, **well-defined terraces** or downland **dissected** by downcutting streams. Intense land use has resulted in a 'clean slate' replanted with large, scattered exotic conifers or shelter belts of deciduous trees. Larger streams are bordered with willows.

Open vistas such as that in the photograph (top right) are most common around Levin. In these instances, enhancing any natural features, for example by revegetating terrace faces and stream banks, is desirable. This also helps to create backdrops or edges against which buildings and tracks look less obstrusive.

Mostly, however, views are close, with a strong sense of **enclosure** created by tall shelter trees, and **privacy** plays a big part in life-style options. Privacy can be maintained by locating buildings away from roads, behind screen trees, but too much enclosure is counter-productive to the open space values of living in the countryside.

Although soils are fertile, whether alluvial or clay-rich, summer **drought** accompanied by light **frosts** determine planting programmes.

Leaching of nitrates into ground water is a problem, and soak pits and farm management practices must aim to **minimise contamination** by controlling effluent disposal and avoiding soil damage such as winter pugging.

Grass-edged roads with no sign of utility services fulfil our expectations of rural character on the terraces. However, such a solid tunnel of trees diminishes the feeling of open countryside. See page 8 for ways to achieve both shelter and views.

Flax terraces

Drainage, flood management canal schemes and increased wind exposure are drying out the once kahikatea and flax-rich **peatlands.**

Any potential for native swamp vegetation to return relies on changing farm **management** practises and reducing the evaporative effects of wind on the peat soils. An opportunistic approach to integrating land-uses with subtle variations in the water-table or topography is required to retain or recreate wetland habitats.

Keeping vegetation low, and waterways fairly open, will at least optimise waterfowl habitat and help retain the nostalgia of broad **sweeping landscapes**.

Photo: Chris McLean

'Nikau Belt"

Vigorous kohekohe-dominated native forest regeneration with its **smooth**, **compact canopy** and the (often isolated) nikau palms, dominate the landscape. Due to the productive use of land in this temperate, humid zone, however, it is only compact pockets of native forest that remain.

As a result, **edges** are a significant design element and buildings should be located along bush edges where possible (though not so close that roots are damaged), to help lessen their visual impact.

These edges are **soft**, not severely geometric, and new plantings, such as plantation forest, should also follow contours and have 'soft edges.'

Earthworks, especially roads, are conspicuous on the hillslopes. Take particular care to **follow contours**, and minimise earth spills and excavation.

The **fresh greens** of kohekohe-mahoe-titoki forest are a strong colour influence (dark or strongly coloured exotic trees seem out of place in their vicinity).

Position buildings against bush edges

'Kamahi Country"

Thanks to Tararua Forest Park, and a number of regenerating cutover forests in the foothills, many of the skylines in the area bear the rough, tousled silhouette of tall native forest. Young forest is dominated by spires of rewarewa. Reverting farmland, cloaked in tauhinu, bracken, manuka and kamahi scrub, contributes to the **unruliness** of the landscape.

Massive trees, whether tall spires or spreading crowns, seem perfectly appropriate in this landscape. There is **a pervasive sense of chaos** rather than geometric order. Human interventions are soon softened by lichens, ferns and creepers, emphasising the **rustic** nature of this area.

Use **groves** rather than straight line plantings for screening or shelter. A buffer between pine forest and native gully vegetation is wise, as sudden exposure of bush species in this zone to wind and frost when plantation trees are harvested can be devastating. Severely pruned shelterbelts and hedges are out of character in this environment.

There is little privacy to properties due to the steeper terrain and care should be taken to design buildings sympathetically to the natural surrounding as they will be **focal points** in the view.

With steeper gradients and faster flowing runoff, riparian vegetation strips should be wider here than in the areas nearer the coast.

Photo: Chris McLean

Cool Basin

This is a curious landscape in which to consider design, as the enclosure by the **rough** kamahi country 'dominates views but the landforms and land uses of the flatter basin terraces create its own character: **gentle**, **placid**, **spacious** scenery.

Emphasis of those landforms, through scarp revegetation and riparian planting, will maintain the natural setting for properties in the basins.

Shelter should be planned to minimise trapping of air, as this area experiences heavy winter frosts. Shelter belts should meander around following contours rather than tracing abrupt boundary lines.

Although exotic conifers have traditionally been used for shelter there is no reason why local native trees should not be used, in particular wineberry, kamahi, five-finger or rewarewa, especially as they offer feeding opportunities for birds visiting from nearby forest.

Woodlots

Today woodlots are seen as multifunctional. If they are planned and located carefully, they can provide stock shelter (perhaps also food), riparian protection, wildlife corridors and protection plantings for native remnants.

Clusters of woodlots help to maintain the landscape diversity that would be lost under a monotonous mantle of plantation pine.

There are some fundamental principles to consider whenever a woodlot is planned:

- **plant in rows along a contour.** If, instead, you planted up and down a slope the rows would be visible for a long time and the whole planting will conflict with the lie of the land.
- **avoid geometric plot shapes**. Try to adjoin neighbour's woodlots if it allows you to follow landforms in a visually logical way. Reflect other landscape patterns in the shape of your woodlot (e.g. clumps in hollows in the dune country, or on the lee slopes; irregularly shaped pockets straddling gullies in the 'hikau belt'; in mosaics across slopes in kamahi country).
- **Avoid planting along ridgetops and hilltops**. The skyline is such a visible boundary that any disruptions along it are accentuated and will distract from the wider landscape appeal. Also, when stands are harvested, having permanent up-slope vegetation will help reduce run-off and siltation problems.
- **reduce pruning on the trees near the edges** so that a soft bushy 'look is achieved. Multi-tier cropping along the edges has the same effect.
- use a **diversity of species** in one woodlot, so not only does it look more interesting but also that it will be harvested incrementally. A mixture is also beneficial to soil health if nitrogen-fixing species such as alders, acacias and kowhai are included.
- **Some exotic trees are threats** to native vegetation, either by vigorous seeding or suckering. Certain alders, willows and poplars are a problem in wetlands. Some larches, pines and acacias invade pasture. Sycamore, pines and ash invade damp bush (sycamore is already a problem in kamahi country 'and cold basins) in the area. Contact your regional council or local nursery for advice.

Planning Shelter

The important thing to understand about shelter is that too much can undermine the reasons for having it in the first place.

We create shelter to reduce wind damage, to give stock shade or to create privacy and the temptation is to grow dense, tall, fast-growing hedges and shelter belts.

However, a *solid* barrier creates turbulence on both sides, and may create a zone where wind dumps 'after sailing over the barrier. A barrier that is *half solid, half void*, on the other hand, creates zones of lessened velocity on both sides. On the leeward side the benefit extends to a distance 20 times the height.

A tall windbreak may well block views, and in flat areas such as the terraced country, long distance view shafts are a critical landscape element. Perhaps 200m of shelter behind a 10m high shelter belt isn t really needed - clusters of shorter trees may create a better windflow through the property while preserving view shafts.

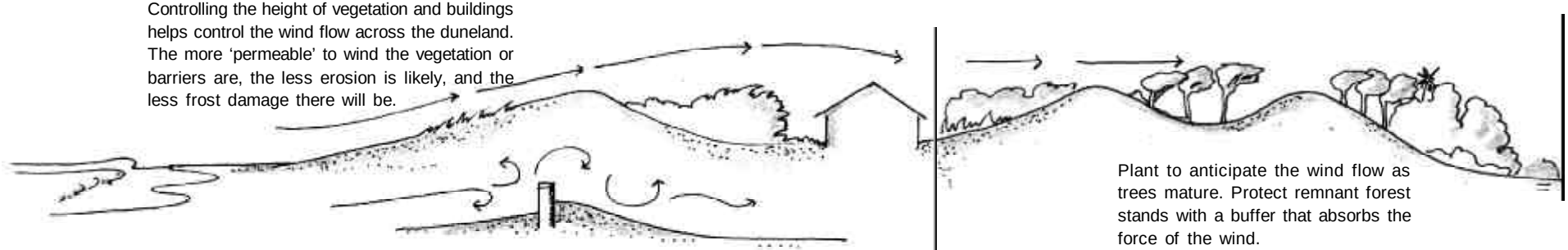
In the photograph below, the style of shelter belt is not only effective for lessening wind velocity and providing shade, but the 'see-through 'nature echoes the Te Horo landscape where scattered totara (often with grazed lower branches) create a 'see-through ' woodland scene.

In areas subject to frost (the inland dunes, terraces and cool basins), impervious hedging can cause pooling of cold air and increase the intensity of frost damage. Even though enclosed spaces may be warmer during winter days, at night the lack of air drainage attracts frost.

An impervious barrier can create turbulence which is more damaging than the wind it is trying to prevent.

Clusters of trees, or deliberately spaced trees can reduce wind velocity *and* wind turbulence.

Controlling the height of vegetation and buildings helps control the wind flow across the duneland. The more 'permeable' to wind the vegetation or barriers are, the less erosion is likely, and the less frost damage there will be.



Solid fences, walls and shelterbelts will increase turbulence and increase wind erosion in dune country

Plant to anticipate the wind flow as trees mature. Protect remnant forest stands with a buffer that absorbs the force of the wind.

The Rural Vernacular

When people move from the city to the country they often bring their notions of suburban architecture and lifestyle with them. In cities it is buildings which are the focus of attention. In the countryside, however, it is the land which dominates. Whereas the clutter of tiles, concrete and bricks are appropriate in streets full of buildings, they will often look out of place in the larger scale, simpler landscapes. Strong colour schemes, artificially flat land, kerb and channelling serve only to distract our attention away from the spaciousness and relaxed nature of the countryside.

This does not mean buildings must all be brown and green and 'disappear' into the background. But there are a number of techniques by which buildings can be made more sympathetic to their surroundings.

Every country tends to develop an architectural style suited to the particular climate, social history and economic constraints. In New Zealand the colonial forms left a unique legacy in country housing, so that now pitched roofs, verandahs and lean-to's are perceived as part of our rural heritage.

And then steeply pitched roofs that obviously echoed mountain backdrops added to the rural building language, and more recently again, the post-modernist simplicity of flat roofs, large panes of glass and unpainted timber cladding has found a home in some of the rural landscapes. Curved roofs and walls that mimic the curves of rolling hills and dunes are extending the rural vernacular.

What many of the successful rural buildings share is a sense of belonging to the land. This starts with good siting. It can be assisted by vines trailing up walls; through the use of natural colours and natural cladding (if rock is used, then using rock local to the area); through using gravels and grass to replace concrete and paving.

The use of 'honest down-to-earth' materials - timber, stone, iron - is an important ingredient. There is little logic to brick veneers and plastic planking in the rural vernacular.

Fencing in particular communicates the difference between town and country. In an area where wire fencing dominates, it is natural to use permeable fencing styles rather than solid concrete or plastered walls.

duneland shapes are echoed in the shape of these houses which are close to the beach, and which are themselves reminiscent of sun-bleached objects swept by wind and waves

vines and ramblers help to 'tie' the house to the land

open timber fences minimise the sense of enclosure

natural timbers and a neutral colour scheme ensure this large house has minimal visual impact

eaves and overhangs create a shadow line which seems to reduce the size of the building

low walls help buildings look as though they sit comfortably on the land

dark colours ensure the house receeds into the shadows of the forest.

fencelines and tracks follow the contours of the slope

Siting Buildings & Tracks

Buildings dramatically influence our perception of the neighbourhood's landscape. Their prominence and their architectural style can cause them to be focal points, whereas in rural areas it is desirable for the countryside to be the focus of attention. And, of course, the steeper the slope the more conspicuous the buildings and roads will be.

The positioning of buildings on the property will be determined by practical issues such as costs of services, location of sewage systems, aspect and so forth, but one of the factors taken into account should certainly be the visual impact.

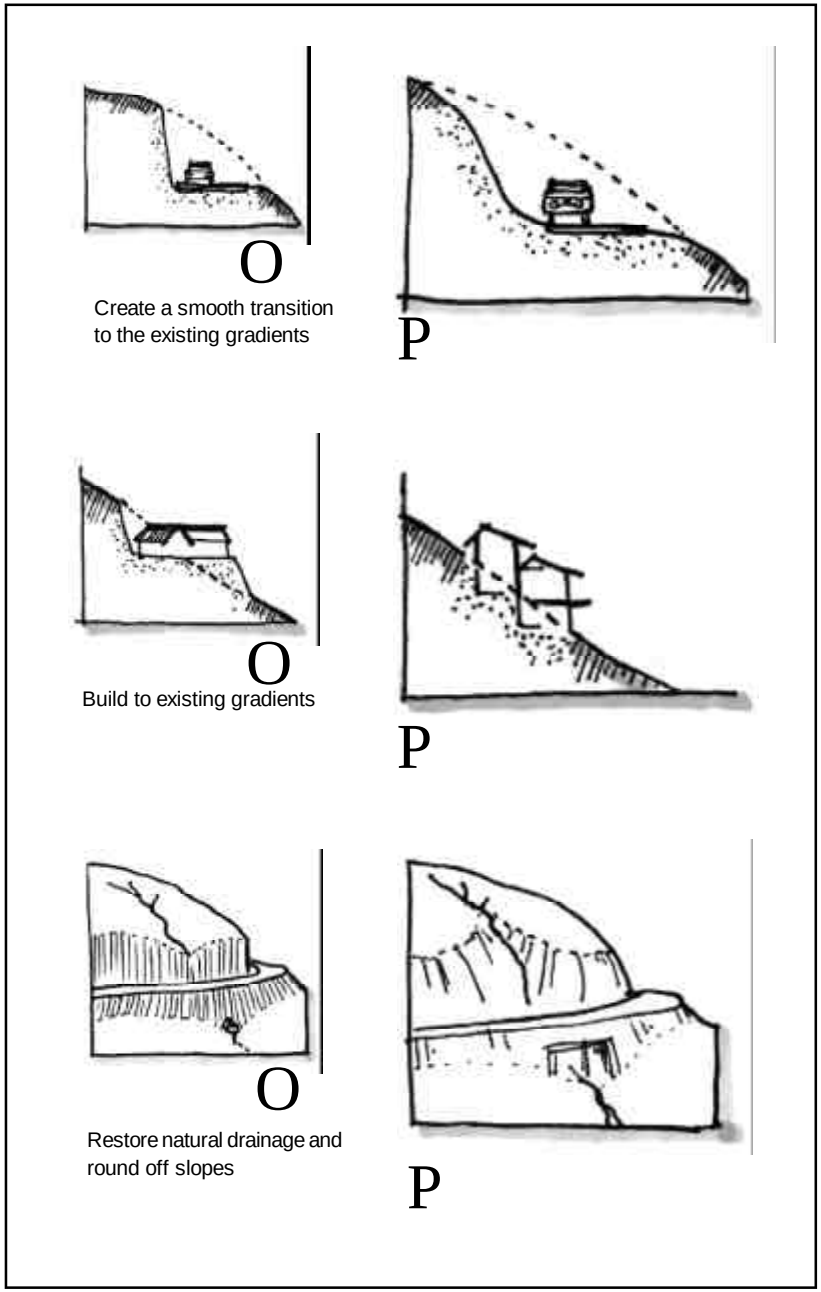
There are two main approaches to successful rural architecture. One respects the dominance of the land and treads lightly 'on it, perhaps by being raised off it. The other approach is for the house to become part of the land, echoing landforms and blending in to the surroundings.

For both approaches there are fundamental rules that help minimise the visual impact of buildings.

- avoid a backdrop of sky. Instead, position buildings (including sheds and watertanks) so that their backdrop is land or vegetation.
- minimise the excavation required and reshape the ground later so that the building does not appear to interrupt the natural shape of the land. This is particularly relevant in hillocky dunelands.
- cluster buildings together so that views of the countryside have minimal interference by built structures.
- use a similar design style for all buildings

- screening houses from the road with a shelter belt is not an effective technique - it simply introduces a new dominant visual element into an otherwise 'soft' landscape. A better way to screen buildings is to plan a winding approach from the road. Cluster trees and shrubs or create an avenue of trees to create the desired effect of privacy while maintaining natural lines.
- align buildings with the 'lie of the land' not the boundary fence.

Figure 2 ▸
Roading and housing is highly visible on hilly sites. In a natural setting engineered slopes look offensive. Consider techniques that respect the land forms and which make smooth transitions between natural and engineered slopes.



S.Drakeford

This property was redeveloped so that the driveway, which once ran directly from the photographer's position to the house, now swings elegantly around the trees. As the plantings mature, the house will become discreetly screened from the road and the vegetation will become the dominant feature. The driveway will remain soft-edged, with the garden absorbing the runoff.

After only three years the desired effect has been achieved.

The views from the house are just as important as the view onto the property. To disguise a distracting track, or to enhance a long distance view from the house, it may be possible to create a ha-ha (an elevated terrace with a vertical edge). The arrow in the photo (left) shows the position of the ha-ha. Ha-ha were traditionally used to prevent stock entering the garden, without the need for a fence or wall across the lawn.

Sewage Systems

On-site sewage disposal is pretty much a fact of rural life, as few rural areas are serviced by reticulated sewage systems. Many existing on-site sewage systems are old and inadequate and should be upgraded. Applicants for rural subdivisions must show, for resource consent, that there can be adequate on-site wastewater disposal (including sewage) on the proposed lot.

If there is a group of building lots proposed, consider a combined system to provide a more economic and better level of treatment.

Councils will stipulate the types of systems possible on new properties, based on soil and climate characteristics, and how far away from waterways the discharge must be.

The first part of the treatment process is common to all the systems and requires a tank where solids and liquids are separated. This is commonly called the septic tank. The solids break down and a sludge accumulates. *To maintain tanks, pump them out every three years.*

The liquid component still contains nitrogen compounds and pathogens which could contaminate groundwater, so it passes through a soil or sand-based soakage treatment before being released into the subsoil. The aim is to prevent effluent collecting on the ground surface or saturating the ground (and thus increasing the likelihood of contaminants being flushed into the groundwater, as is happening around Otaki, Manakau and Te Horo).

There are a range of soakage treatment options available: perforated aggregate-filled pipes laid in trenches which work in well drained soils; sand mounds above ground level; evapo-transpiration beds that use evaporation and plant transpiration to absorb the nutrient-rich liquids. Evapo-transpiration beds are ideal for the *sandy salt belt* and the *inland dunes* with their low rainfall and high sunshine hours. Here plant roots will actively seek damp soils, and the evaporation rate is high. Refer to Figure 4 for suitable plants for this role.

Treatment areas should all be shallow, so that oxygen and microbes work effectively, and the amount of effluent being treated should match the capacity of the soil to absorb it.

The soakage area is going to be large and occasionally damp. Pumping effluent through it (rather than using gravity feed) will avoid clogging. Keep it clear of vehicles and livestock which may compact the area. Don t grow deep-rooting trees too close to pipes. Ensure rainwater from roofs, driveways or uphill areas isn t going to flow into the soakage area. Watch for any surface effluent ponding - that means it s time for maintenance!

A substantial amount of land and equipment is required to adequately treat wastewater. Consider carefully your outputs. Can they be reduced? For example, simply having an in-sink kitchen waste-disposal unit requires a septic tank to be 30% larger than normal. Composting toilet systems will substantially reduce system requirements.

Note that there are more wastewater disposal options available than covered here - you can refer to the Guides such as NZS 1547 (On-site Domestic Wastewater Management) and 1546 (Domestic Wastewater Set) or SNZHB 44 for further information (www.standards.co.nz) and talk with your Regional Council.

Figure 3 Useful filtration and evapo-transpiration system plants (tolerate periodic wet feet).

Shrubs should not be planted too close to distribution pipes or their roots might block the holes. Schoenoplectus californicus is sometimes suggested as a good filtration plant, but this exotic is invasive and not recommended.

Sand country

karamu (*Coprosma robusta*)
swamp coprosma (*C.tenuicaulis*)
sea rush (*Juncus maritimus*)
most *Carex* spp. (sedge)
common rush (*Juncus gregiflorus*)
manuka (*Leptospermum scoparium*)
marsh ribbonwood (*Plagianthus divaricatus*)

Terraces

most *Carex* spp. (sedge)
toetoe (*Cortaderia toetoe*)
karamu (*Coprosma robusta*)
swamp coprosma (*C. tenuicaulis*)
manuka (*Leptospermum scoparium*)

Nikau Belt

All tree ferns
most *Carex* spp. (sedge)
kiokio fern (*Blechnum capense*)
karamu (*Coprosma robusta*)
toetoe (*Cortaderia toetoe*)
giant umbrella sedge (*Cyperus ustulatus*)
hounds tongue fern (*Phymatosorus pustulatus*)

Cool basins

most *Carex* spp. (sedge)
kiokio fern (*Blechnum capense*)
karamu (*Coprosma robusta*)
giant umbrella sedge (*Cyperus ustulatus*)
hounds tongue fern (*Phymatosorus pustulatus*)

Kamahi Country

All tree ferns
most *Carex* spp. (sedge)
kiokio fern (*Blechnum capense*)
karamu (*Coprosma robusta*)
giant umbrella sedge (*Cyperus ustulatus*)
hounds tongue fern (*Phymatosorus pustulatus*)
mountain toetoe (*Cortaderia fulvida*)
rangiora (*Brachyglottis repanda*)

Note that swamp flax (*Phormium tenax)* may be tried in all these situations, although its natural preference is for poor ground where water is able to flow, rather than rich, stagnant water.

Driveway Runoff

A concentrated source of groundwater pollution is the vehicle exhaust, oil and cleaning chemicals that wash off hard surfaced drives, yards and carparks.

This is one area where practicalities and rural aesthetics marry. Permeable substrates

such as thick gravel, plastic matting or cobbles that allow grass growth, are useful surfaces, letting polluted water drain through vegetative filters. Alternatively, hard surfaces can be left to drain into a soakage pit.

Swales, the grassed roadside ditches we associate with 'the country,' are far cheaper, and more efficient at dispersing floodwaters and pollutant-bearing runoff than kerb and channelling, and the soft-edged look is appropriate in the rural setting.

When constructing new roads on hill slopes it is important to design silt traps to capture the construction run-off. If these are incorporated into natural drainage patterns they will continue to do their work into the future. It is advisable to seek local knowledge about the expected scale of floods before determining the capacity of the silt trap.

Pasture Runoff

Ammonia (from effluent) is converted to nitrates fairly rapidly in most New Zealand soils and will be taken up by plants. Nitrate makes water unsafe to drink, and there are areas (particularly around Te Horo and Manukau) where the nitrogen input is greater than plants can take up, or is being supplied from sewage systems too deep for plants to use it. The nitrate levels in the groundwater are getting too high for bore water consumption.

Nitrates (and phosphates) also cause prolific weed growth in lakes and streams, depriving aquatic life of oxygen and reducing habitat opportunities for invertebrates.

Stock urine patches create problems because vegetation can't absorb all the nitrogen (and it leaches into groundwater). It may also drain into waterways. Telltale clues of enrichment (beyond the obvious evidence illustrated here) include increased raupo growth where farm runoff enters wetlands; seasonal algal blooms on lakes in warm weather; abundant stinging nettle.

Increase the amount of filtering vegetation intercepting runoff *before* it reaches waterways. Factor in the permeability of the soils when you assess the carrying capacity of your property. Fence off waterways and use alternative water sources for stock. Many farmers believe livestock drink more water when it is of high quality, and when they drink more they eat more.

Being Water-Wise

Seasonal water shortages are common throughout Kapiti-Horowhenua. Kapiti Coast District does not store water and relies on rainfall maintaining the river levels and bore water.

Irrigation is a major drain on water resources. Whether you intend watering gardens or commercial crops, forward planning may save not only water but money.

Putting a bore down means high development costs and high ongoing maintenance costs. You will need to know whether the pressure you require is actually available. What happens to the water table if all the neighbours are drawing off water? What is the water quality like - especially if you are in an area where groundwater is contaminated with nitrates.

In the dune lands and the alluvial terraces there will always be doubt over ground-water use being sustainable in the long term. The best approach is to plant or manage your property so that irrigation is not required.

This means seeking good advice about the best plants for the location; planting in autumn using hardened-off plants; mulching well; perhaps interplanting within 'nurse crops' such as manuka or tree lucerne; and planting densely.

If you do intend to irrigate a garden area, use timers, moisture meters and directional sprinklers, and water late in the evening to minimise evaporation.

It would be ideal to re-use the waste water produced on your property. Diverting driveway runoff, wastewater treatment systems or grey water from household appliances provides a regular drip-feed.

Composting toilets should be seriously considered as another way to conserve precious water.

Riparian Protection

All the rural issues of sustainability come into sharp focus when we assess effects on stream health. A stream stripped of tall riparian vegetation is:

- prone to decreased water quality (high nitrogen levels, contaminants, sedimentation);
- a poorer ecosystem (water enrichment and weed infestation depleting the oxygen fish require; loss of shading causing temperature fluctuations; loss of terrestrial insect habitat reducing the food supplies for aquatic life);
- more prone to erosion during flood events;
- unable to provide safe habitat or food for birds.

Many streams in the dune country run through peat and become 'naturally' discoloured by tannins. There are also shallow lakes that are naturally predisposed to becoming choked with organic matter and nutrient-enriched. Nevertheless, in both cases, loss of riparian vegetation accelerates and intensifies these natural processes.

How much vegetation is required alongside streams to counteract all these negatives? Generally speaking, 10 metres each side is recommended, but the steeper the land, the faster the runoff and the wider the riparian filter should be. The height of the vegetation need not exceed the formula illustrated on this page to create optimal fish habitat.

Planting programmes should involve rabbit and hare control, and weed control (riparian areas are particularly prone to blackberry, convulvulus and pampas infestation). Continuous bush will provide suitable habitat for possums and mustelids, but the benefits to water quality and biota outweigh their impact, and the pests can also be controlled.

The greatest returns for your effort will be at headwaters and smaller wetlands that drain into larger waterways as these are the sites most susceptible to degradation by agriculture or forestry practices. Riparian vegetation has been shown to decrease the nitrogen run-off from pasture by 90%.

With careful planning, riparian planting can be multi-functional: it can provide shade for stock and wind breaks or woodlot timber. It will also contribute to the overall landscape of the area by emphasising the paths of the waterways across the land.

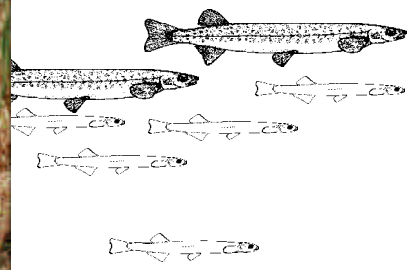
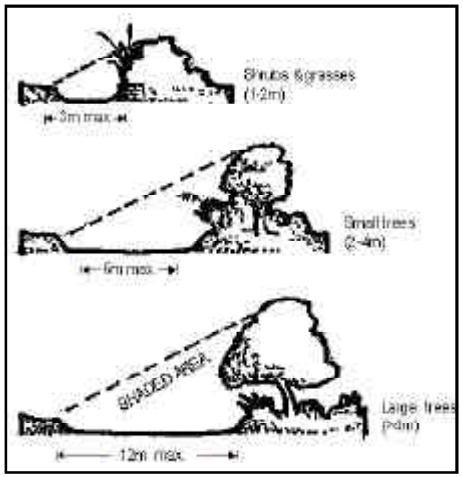


Figure 3
Ideal heights for streamside planting.

In some parts of the country allowing riparian grassland to become rank in winter to absorb heavy runoff, then grazing it over summer, provides an effective buffer. In most of the Kapiti-Horowhenua area, though, seasonal differences are not great enough to warrant a seasonal management approach such as this, and permanent vegetation is advisable.

There are several reasons for encouraging the use of native species. Many native insects are dependent upon certain native species for part of their life cycles and by maintaining the host we maintain a natural food chain. Some native bird species have a preference for native foliage and fruits as part of their seasonal diet so we are supporting their populations also.

Traditional exotic riparian species, willows and poplars, allow too much surface runoff because they suppress undergrowth either by summer shading or winter leaf-drop.



Dune country Generally deeply incised streams which meander slowly, and have steep, readily erodable banks. The sandy soils are excessively well drained. Frost is likely along the banks of smaller, sluggish streams. These conditions make grasses, sedges and flax a good choice. If aquatic growth becomes excessive plant shade trees. The salt wedge (where whitebait spawn) may reach hundreds of metres inland and every effort should be made to protect grassy edges from stock damage in this zone.

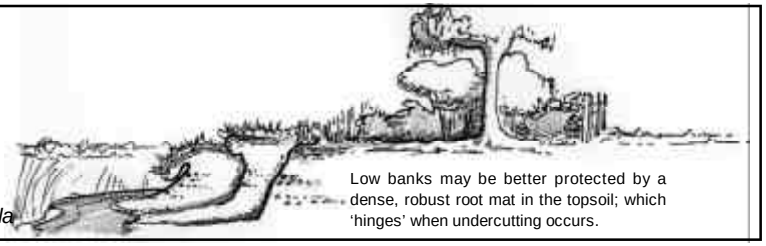
examples of suitable native species for these sites

toetoe *Cortaderia toetoe*
pukio *Carex secta*
swamp flax *Phormium tenax*
kanuka *Kunzia ericoides*
ngaio *Myoporum laetum* (poisonous to stock)
tree tutu *Coriaria arborea* (poisonous to stock)
tauhinu *Cassinia leptophylla*
taupata *Coprosma repens*

Terrace country Streams and rivers are generally shallower, straighter and faster, so banks are 'cleaner' and more difficult to keep vegetated long term. Banks are generally frost-free so planting can comprise a wider variety of species, although they need to be drought tolerant. Root strength and depth is important for stabilising deep banks. Kowhai, mahoe, manuka, tree ferns and hebe are helpful.

karamu *Coprosma robusta*
koromiko *Hebe stricta*
muakoro, scented broom *Carmichaelia odorata*
manuka *Leptospermum scoparium*
mahoe *Melicytus ramiflorus*
kowhai *Sophora microphylla*
totara *Podocarpus totara*
kaikomako *Pennantia corymbosa*

Melicope simplex
small leaved coprosmas
tauhinu *Cassinia leptophylla*



Low banks may be better protected by a dense, robust root mat in the topsoil; which 'hinges' when undercutting occurs.

'Nikau belt' There is often a deep loess or clay-rich soil in this zone which is prone to slumping into stream beds when protective vegetation is removed. This will create wetlands and gentle banks. Conditions in this temperate belt are conducive to tree growth and it is feasible to plant large species such as pukatea and kahikatea, tree ferns etc, but on flat, wet valley floors flax will be a useful dominant species.

manuka *Leptospermum scoparium*
karamu *Coprosma robusta*
rangiora *Brachyglottis repanda* (poisonous to stock)
lemonwood *Pittosporum eugenioides*
mahoe *Melicytus ramiflorus*
wharangi *Melicope ternata*
poroporo *Solanum aviculare*
swamp flax *Phormium tenax*

cabbage tree *Cordyline australis*
ponga *Cyathea dealbata*
kawakawa *Macropiper excelsum*

'Kamahi country', Cool basins Steeper gullies, higher rainfall and flash flooding are common so stream beds are often rocky and stripped of soils. Plants suited to wet, low nutrient conditions do well in these sites.

wineberry *Aristotelia serrata*
pigeonwood *Hedycarya arborea*
five finger *Pseudopanax arboreus*
kanono *Coprosma grandifolia*
putaputaweta *Carpodetus serratus*
mamaku *Cyathea medullaris*
small leaved rata *Metrosideros perforata*

Dune Lakes

Lakes have always been a major feature of the dune country and since there are fewer now due to drainage, there should be a deliberate effort to return boggy hollows to wetland.

Most interdunal lakes are shallow and occur where wind has eroded sand down to the level of the water-table. Their levels fluctuate seasonally with the water-table and their edges have a shallow gradient. They would naturally progressively infill and become swamps with time. These lakes will respond to the neighbourhood's bore water take and the ground water that recharges them.

Other small lakes are perched on hard pans created by previous dune erosion and because they are fed primarily by rainwater, their levels fluctuate greatly. The zone of inundation-tolerant plants around their edges is correspondingly wider.

Shallow lakes are particularly vulnerable to excessive aquatic weed growth if nutrient levels become elevated, because they are warm, and more light reaches the lake bottom than in deeper lakes. Thus, a filter of riparian planting to absorb excess runoff is crucial to their health.

Although there is a constant slow movement of groundwater through these shallow lakes, there is not the flushing of stream-fed lakes, so pH levels can rise as organic material builds up. This will encourage the growth of raupo in preference to flax and a more rapid succession from open water to swamp as a result. The growth of raupo is accelerated by effluent runoff. Raupo can grow in depths up to one metre, so you may find that improving water quality rather than trying to deepen lakes will best manage its growth in the long term.

Digging a deeper pond is only a temporary solution to weed growth generally anyway, as drifting sand will be constantly infilling the pond.

When creating a new lake from an old swamp bed or in a dune hollow, it will be important to know how much the water table fluctuates, as this will determine the plants best suited to grow around the edges (see box). You can also design the gradient of the bank to manage the effect of water level fluctuations (the steeper the bank the less the effective change in water-level).

When creating dune ponds the most important and immediate planting required is to sow grass, preferably *within hours* of completing earthworks, to stabilise the sand quickly. This inevitably means planting will involve a programme of releasing young plants each year.

Remember that prior to farm drainage there was a network of lakes and swamps and creeks through the duneland which created an extraordinarily rich habitat for fish, birds, shellfish, snails and insects. Recreating some of those linkages may help restore some of that diversity.

Useful plants for:

constant inundation: *Carex secta* (pukio, niggerhead), *Typha orientalis* (raupo), *Eleocharis acuta* (sharp spike-sedge)

intermittant inundation (i.e.water levels fluctuate with rainfall): *Cortaderia toetoe* (toetoe), *Phormium tenax* (swamp flax), *Carex secta* (pukio, niggerhead), *Cyperus ustulatus* (giant umbrella sedge), *Cordyline australis* (cabbage tree)

seasonal inundation (i.e. long periods with 'wet feet'): *Cortaderia toetoe* (toetoe), *Dacrydium dacrycarpus* (kahikatea), *Coprosma propinqua*, *Coprosma tenuicaulis*, *Olearia virgata, Phormium tenax* (swamp flax), *Syzygium maire* (swamp maire), *Leptospermum scoparium* (manuka)

Lakes from Creeks & Springs

Wetlands are being created in other environments, usually by the damming of seepages and creeks. A constant supply of freshwater may by augmented by an artesian bore. Seek the advice of a professional engineer over dam construction to avoid potential problems of washouts or collapse.

Water levels are generally stable, so a planting programme can proceed with relative certainty. The photograph above shows the first step: fencing off from stock. The true right bank is being kept clear of vegetation so that waterfowl can land with ease and the true left has been planted with native broadleaf species.

Mass Planting

Many people dread the expense of mass planting programmes, but in reality it is the most cost effective way to alter and improve a landscape.

To manage the risks and their associated costs it is vital that before you start you understand local conditions and choose appropriate plants, you appreciate the long-term commitment to maintenance you are undertaking and you assess how long it will take to fulfill your vision.

Achieving the vision

Ground preparation

If the ground has just been cleared of weeds such as blackberry or vines, it really does pay to be patient and wait until the next spring to catch the resprouting roots you missed and the first crop of seeds germinating in the disturbed ground. Tackle these, and the prospect of weeds taking over your new plantings reduces substantially.

On sand country, if the ground is disturbed then sowing grass quickly is essential to minimise a disturbance turning into a full-scale blowout.

Ground that has been compacted by heavy stock trampling or vehicles can be ripped for aeration and release of nutrients.

Using nurse crops

Native woody colonising plants have adaptations (such as soil fungal associations and frost tolerance) which allow them to grow rapidly with minimal soil fertility, and withstand heat, cold and dessication when they are young. Depending on the circumstances, they are deemed to be either annoying weeds, or a landowner's best friend.

If used as a nursery crop to fast-track the establishment of broadleaved species you should only need to wait two or three years before they provide adequate shelter for interplanting with the more tender species.

Useful native species are: manuka, toetoe, tauhinu, and in frost-free areas *Hebe stricta* and native broom *(Carmichaelia odorata)*, and in wetter areas karamu (*Coprosma robusta*). These species do not require fertiliser. In five years time you will be able to thin out the nurse crop so that the growth of the interplanted species is not overly 'forced,' making them spindly.

Clean slate 'planting

Without a nurse crop you must be sure to plant species that cope with heat, frost and dessication when they are young. Heavy mulching may help with soil moisture retention and wind breaks may cut down the dessication, but losses of up to 20% must be expected (more than this and it would be worth seeking specialist advice). The more tender species can be planted in five years time between the established shrubs.

Planting times

Autumn in frost-free areas; elsewhere late winter after the threat of successive frosts has disappeared.

Hardening off is essential for nursery-raised plants and this may have to be done over several months in progressively harsher environments to prepare plants adequately for planting. Factor this into your timetable.

Spacing of plants

For a large mass planting, a one metre spacing between large-growing plants is desirable.

Is it really achievable?

Tempted to plant the entire 2 hectares in one go? Be realistic. Will there be the time and energy or money to release that many plants from aggressive competing weeds over the next three years, replenish mulch and fight off the rabbits and pukeko? Start small and achieve success. Staging planting over several seasons also spreads the risk, and gives you the chance to assess what works and what doesn't.

Getting it right

Pot sizes

Small plants will establish better than big ones. Use plants approximately 20cm in height. This usually equates to a pot size of PB2. An added benefit is that losses are relatively cheap to replace at this pot size.

Mulch

Mulching is for soil moisture retention, and works both by preventing evaporation and by preventing competition for moisture from weeds. It needs to be fibrous to 'knit' together so it doesn't blow or roll away.

On heavier soils, newspaper or peastraw mulch is adequate but on the wind-derived sands you may need a heavier mulch such as woollen blanket fabric, or even a crop of nitrogen-fixing lucerne that can be mulched *in situ.*

This five year old nurse crop of toetoe and manuka has been interplanted with broadleaved species which, after four years of growth, are almost visible. When they reach the same height as the manuka the nurse crop should be thinned.

Irrigation

There are many costs associated with irrigation. You need to ascertain the effects of a bore on the water table as a bore requires a resource consent from the Regional Council. There is the cost of a bore, and then ongoing costs of maintaining pumps and feed lines. You need to know that the pressures available are going to be adequate to get water to the sites that require it.

Satisfy youself first that:

(a) it is a sustainable water supply (or are all the neighbours going to be drawing off the same water source);

(b) it is the best practise. Could planting the best plants for the site, rather than thirsty ones, be more effective in the long term; will good ground preparation and mulching achieve the same effect;

(c) that water quality will be adequate. Will it contain undesirable minerals and elements?

Additives

Compost? Fertiliser? Are they necessary? The main role of organic material in sandy soils is water retention rather then plant food. However, it breaks down and leaches away far more quickly in sand than in other soils, so replenish organic matter regularly in the dune country. It is not essential in other areas.

Slow release ground fertiliser is beneficial for most shrubs and trees, but do not waste it on the colonising plants such as manuka and kanuka.

Sustaining the vision

Maintenance is the most neglected part of planting programmes. Each year, for up to three years, individual plants will need releasing from the grasses and weeds that threaten to overwhelm them. (For this reason alone many people plant even the most naturalistic plantings in rows - so that they can readily find the young plants again!)

Mulch that has blown or washed away will need replacing. Pest fences and wind-breaks will require patching. Pest control should be on-going.

Protecting Bush Remnants

Three types of native bush remnants are common in rural areas and each require particular protection techniques.

1. **Grazed blocks** which have only canopy species remaining, and perhaps some unpalatable undergrowth of coprosmas and nettles. Returning these to their full potential requires:

(i) fencing. If surrounding land is to be grazed some of the edge trees could be excluded, to provide shelter for stock. Ideally, however, a fence should be several metres away from the stand edge to allow for some buffering shrub growth. Remember too that cattle can browse up to 700mm over fences.

(ii) weed management. Don t be tempted to run stock through for a few days to reduce weed growth. This will set regeneration, fern and native grass growth back at least five years. Concentrate weed removal efforts on the smothering weeds such as exotic vines, blackberry, wandering willy, etc, rather than annuals.

(iii) sealing edges from wind using shrubs and small trees so that regeneration of forest interior species is possible, and to minimise evaporation of soil moisture.

(iv) animal pest management. With little dietry scope for possums in these stands they will do relatively more damage, and concentrated damage, to seedlings and kohekohe flowers, unless managed.

(vi) shelter. Grazed blocks, especially in the soft substrates of the dunelands, can sustain serious damage during storms from toppling or breaking of trees on the exposed sides. It is not just shelter from the prevailing winds that is required: easterly storms do great damage because they are so infrequent (but turbulent when they happen). If a shelter belt of protective trees is planted, use species which grow no taller than the current canopy trees. Tall trees such as macrocarpa and pine, unless carefully pruned and maintained for their entire lifespan, can end up being detrimental, not protective.

2. **Fenced stands** or ungrazed multi-tier stands. They will require less intervention, but will benefit from:

(i) edge management. Damaged bush edges are naturally ‘sealed ’by shrubs and vines but most exotic vines are too aggressive and must be eradicated. Fill the gaps left with fast-growing small trees like manuka, karamu, mahoe and with native vines such as NZ passionvine and NZ jasmine.

(ii) access management. Create well-defined paths, and if they traverse the boundaries, set them back several metres, allowing a buffer of shrub growth between the path and the fence. Sharing a bush remnant amongst multiple property subdivisions may sell properties faster but it is generally detrimental to the health of the stand, as everyone wants their own access and pathway through the stand. Co-ordinate with neighbours to minimise damage wrought by trampling.

3. **Gardened ’stands**. Perhaps these have been manipulated (selected species encouraged at the expense of others) or they may be the result of a large planting exercise. There are hazards in introducing non-local native species as they may hybridise with the locals, or may have bird-distributed fruits and begin to dominate (puriri and karo are common examples). Keep stands as ‘pure ’as possible. There are so few bush remnants of naturally established bush that we must not undermine their value.

Contact your district council or QEII National Trust for information about covenants for long term legal protection of natural habitats.

Pest Animals

RABBITS are particularly common in the dune country and along riverbeds; **HARES** are more common in inland areas. It is a landowner's responsibility to manage rabbit numbers to low levels, so that neighbouring properties are not adversely affected. Overgrazing will encourage rabbits, as they prefer patchy, sparsely grassed areas.

Control methods include:

- Magtoxin tablets for fumigating burrows.
- Pindone cereal rabbit pellets (an anticoagulant poison). Possums will compete with rabbits for Pindone, so either undertake possum control first, or hide the pellets in short lengths of plastic pipe. Use in dry weather.
- Shooting (this is the best option for hares as they do not take poison). You must have a firearms license. Remember it is an offence to carry a loaded firearm on any vehicle. It is also an offence to discharge a firearm so as to annoy or frighten anyone, so warn your neighbours before you shoot near dwellings.

Repel rabbits and hares from young plants with:

- Oxblood, in liquid form, painted onto foliage (this seems to be absorbed by the plant so is not rained off).
- Acrylic paint + egg powder mixture painted onto foliage. Remember that unprotected new growth will soon emerge.
- Netting or plastic sleeves placed around young plants will need to extend higher than growing tips to prevent hares lopping the tops off.

Control of possums, goats, ferrets, stoats and weasels are also landowner responsibilities.

Regional Councils will assist with **POSSUM** control on properties with Key Native Ecosystems / High Value Conservation Areas. DOC and Regional Councils are also active with possum Bovine Tuberculosis management programmes.

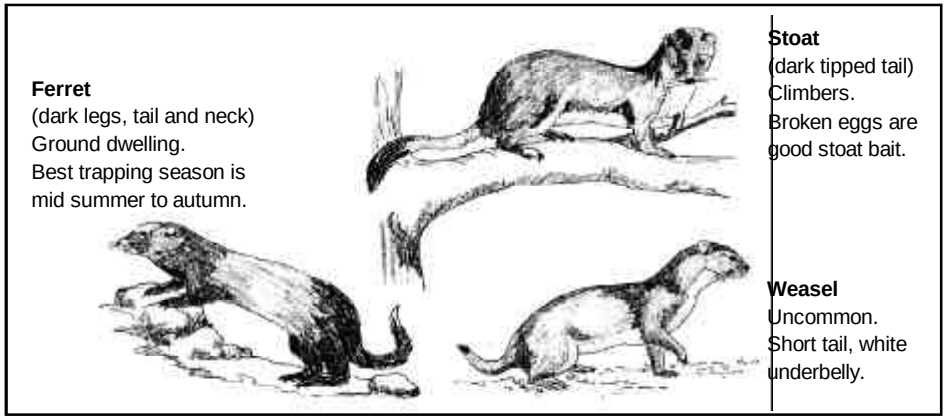
Landowner control methods include:

- Bait stations: brodifacoum or cholecalciferol pellet baits are recommended. These do not require a poison licence and are available from Regional Council or farm produce stores. Brodifacoum will also target rats. Dogs are particularly vulnerable to this poison so do take care.
- Shooting (see previous comments about firearm use).
- Timms traps (bait with apple; raise above ground level if you want to avoid trapping hedgehogs).

MUSTELIDS (ferrets, stoats, weasels) are serious threats to other wildlife. It is likely that poultry losses over summer are due to ferrets, which are also carriers of Bovine Tuberculosis. Useful locations for setting traps include hay barns, cattle stops, culverts, near creeks or rabbit warrens. Mustelid populations recover quickly after control, so you must persist with your trapping for any long term benefit.

Control methods include:

- "Fenn" traps set inside wooden or plastic tunnels.They are baited with fresh meat and must be cleared the next day.
- Diphacinone anticoagulant poison (must be used in tunnel bait stations).



MAGPIES are not protected birds and can be controlled. Regional Council officers can assist with magpie control where they pose a threat to people. They can also loan Larsen live capture traps for landowners to tackle the problem themselves (or supply plans for building your own). To assist with shooting magpies painted decoys or distress tapes will lure birds. Both can be purchased from sporting goods stores.

A further method of capture is using the narcotic Alphachloralose to drug the birds. This does not require a poison license if used in low concentrations.

PUKEKO are not regarded as a pest - just a nuisance - and they are protected outside the duck shooting season. It is up to you to determine how best to protect young plants and vegetables!

For detailed advice do not hesitate to contact your local Regional Council.

Wellington Regional Council
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Pest Plants

Illustrated here are some of the pest plants which are prevalent on rural farmland in the Kapiti and Horowhenua - or which are at low enough levels to be caught early before they spread.

Regional Councils publish Pest Plant Guidelines which will inform you which plants are your legal responsibility to destroy, and which are the council's responsibility. Updated guidelines are released every few years, so contact your Council for the latest advice.

Water weeds

Water weeds pose particular problems due to the difficulty of eradicating them and in their rapid dispersal, both by water and by the waterfowl.

Removal operations should try to minimise the release of small plant pieces downstream. Contact the Regional Council for advice.

Hornwort

Marshwort

Climbers

Native climbers such as *Muehlenbeckia australis* or NZ Passionvine *Tetrapathea tetrandra* find a niche on bush edges or where windfalls have allowed sunlight to penetrate the bush. They are a natural element in the native ecosystem, and help to seal bush edges from destructive winds as it recovers from disturbance. Many exotic climbers are far more vigorous, have wind or bird-dispersed seeds and are shade tolerant, so are far more suppressive in their growth.

To control exotic vines find the root system. Cut the vines at waist height and leave to die in the trees. Cut back the stumps to ground level and paint or spray immediately with a recommended herbicide in accordance with manufacturer's instructions.

Wait for any regrowth to reach one metre (so it has reached full leaf stage) and respray.

Bindweed

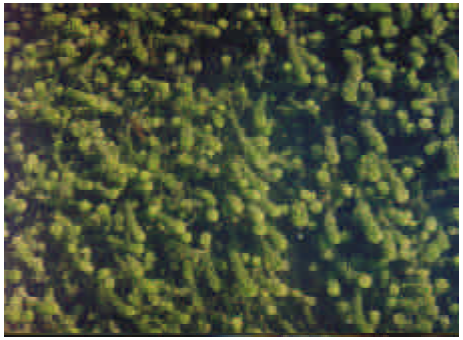
Mile-A-Minute

Old Man's Beard

Cape Ivy

German Ivy

Lagarosiphon



Parrots Feather

Blue Morning Glory

Cathedral Bells

Climbing Asparagus (Snake Feather)

Banana Passionfruit

Other plant types

There is no legal requirement to control blackberry, but Regional Council officers can assist with advice.

Gorse, ragwort and variegated thistle are species which should be controlled close to adjoining properties (the rules for how close vary between Councils - check what they are in your area). Broom must be removed anywhere within the Horowhenua District.

In the dune country particular problem plants include boxthorn, boneseed and pampas. Ways to tell the differrence between pampas and native toetoe include the flowering times (toetoe in summer, pampas in autumn) and the leaves (toetoe has many ribs, pampas a single midrib and its dead leaves look like giant pencil shavings).

Evergreen buckthorn can be found on the terrace country - even used as shelter belts around Te Horo.

Some trees become problems when their original circumstances change, for example macrocarpa and pine are likely to self-seed in reverting pasture when grazing pressure is removed. In the cooler, wetter hill country sycamore is self-seeding freely through bush edges.

Using Herbicides

At all times be as specific with their use as possible, targetting only the problem plants. Do not use herbicides where there is a risk of seepage into waterways. Ensure that label directions are followed.

Japanese Honeysuckle

Boneseed

Evergreen Buckthorn

Pampas

Broom

Wild Ginger

Contacts

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Horowhenua District Council

13 Bath Street

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NZ Historic Places Trust

For enquiries about archaeological sites contact your Regional Trust Office (see your local ohonebook) or contact:

The Senior Archaeologist

NZ Historic Places Trust

P.O.Box 2629

Wellington

Ph: 04 472 4341

e-mail: archaeologist@historic.org.nz

www.historic.org.nz

Department of Conservation

Wellington Conservancy

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Kapiti Area Office

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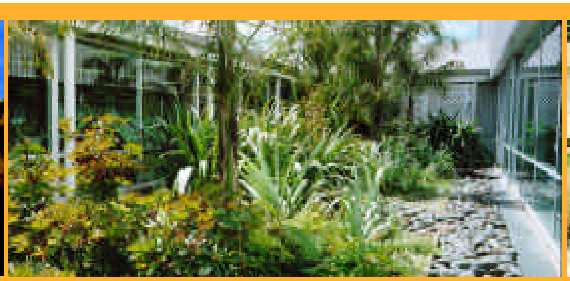
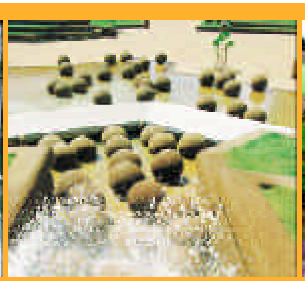


Boffa Miskell encourages design and restoration projects which reflect the spirit of our natural places.
We are pleased to support this guide and help Kapiti and Horowhenua put these principles into practice.