protecting natural areas *design guide*

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protecting natural areas – a design guide

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introduction

Most of our "lived in landscapes" comprise a mix of productive and remnant natural areas but it is the **natural areas** that characterise our unique New Zealand landscape identity and ecological diversity.

Each natural area is important in contributing to this landscape identity and ecological diversity even though the extent and quality of natural areas varies enormously throughout the country. While many are viable for the longer term, others are not. Frequently, all it takes to ensure their continuing existence and viability in the longer term is a better understanding of the area's functional requirements in the larger system and, sometimes, some adaptation of management practices.

This guide aims to assist the effective establishment and long term viability in protecting natural areas. It recognizes that many natural areas are fundamental to maintaining (larger) functioning natural ecosystems, whether or not they are formally protected. The aim is to provide guidance to assist in achieving self-sustaining natural areas:

- **regardless of their status** (e.g informal protection, covenant, reserve), and,
- **regardless of who has management responsibility** (e.g. a private land-owner, a conservation trust, a council, or the Department of Conservation).

The guide identifies a number of issues. It looks at the need to understand the significance of each area's wider context and looks at particular design issues to be considered in protecting an area.

A key issue is identifying where a protected area's boundaries should be extended to. The issues are noted alongside illustrated examples and include recommendations for long term sustainable management.

In promoting recommendations, it is recognized that other management considerations, such as those relating to other uses, ownership, costs etc, will affect decisions relating to the design and management of a natural area and that not all the recommendations may be achievable in every situation. However, in using this guide, it is advised that each issue and recommendation be carefully considered - and that longer term goals are well identified. This is necessary to ensure the benefits and rewards are maximized for the time and effort invested.

A summary checklist is provided as a ready reference at the end of the guide, with page references back to the issues and recommendations discussed.

identifying natural values & their significance

Natural areas are frequently identified for their iconic features (e.g. a particular landform or water body, a wetland, stand of podocarp forest, feeding or nesting of a particular bird species, etc). These features may be important as uncommon or isolated remnant or they may be important in characterising a district or region. However, while they may be immediately obvious as features, their value for future generations will depend on how sustainable they are and how well the natural systems supporting them will endure.

Each natural area (including any proposed additions) will have its own unique set of values, and some areas may be more highly regarded than others for determining their nature heritage value.

The following four criteria are recognized in determining nature heritage value[1]:

- **Representativeness** – how representative and/or rare the area is in terms of its natural values (original indigenous vegetation, habitat, ecological processes etc)

- **Sustainability** – how sustainable the area will be over time

- **Landscape integrity** – the extent to which the area contributes to and maintains the original integrity of the landscape

- **Amenity/utility** – the extent to which the area contributes to the enjoyment and welfare of the (local) people.

Representativeness is referenced to New Zealand's Ecological Regions and Districts[2]. The following issues and recommendations relate largely to the remaining three criteria.

1 More detail on these criteria is available in the Nature Heritage Fund's Assessment Criteria - see reference list page 27

2 McEwen, Mary 1987

design factors & recommendations

1. natural areas cue to original landscape character

Each natural area provides a “window” for understanding and better enjoying original New Zealand. A natural area, on its own or in combination with other natural areas, may be recognised as contributing to the landscape character of the wider area or as part of a locally, regionally or nationally important landscape. Seek to protect as many of the values as possible, including such values as landform, vegetation, wildlife and their habitat, scenic, cultural/historic values.

don’t detract from important geological features, with unrelated fencelines and shelter planting

Where possible protect areas that maintain the integrity of an area and the full range of vegetation cover originally present in a natural landscape. This might include rare indigenous species, habitats and communities as well as the ecological processes that link them together.

The location of boundaries will be especially important, not only for the landscape’s ecological processes but also for its amenity/aesthetic and heritage landscape values. A special landscape feature, even with little remaining biodiversity value for example, may be particularly dramatic or noteworthy in an area and worth protecting as a total feature.

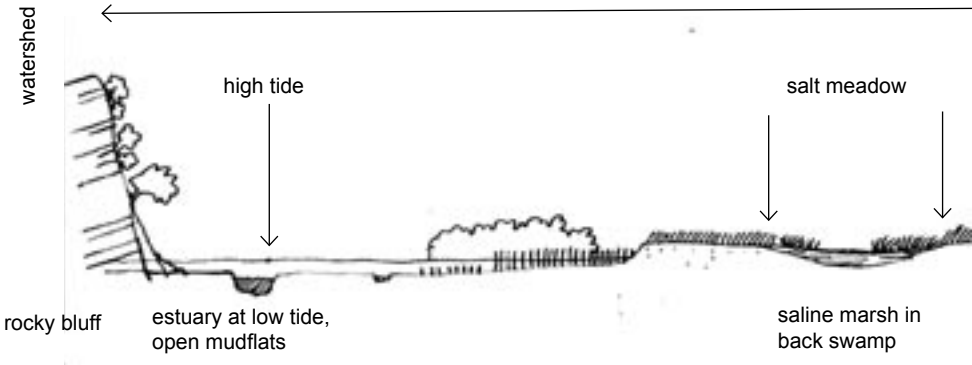
respect integrity of headland landform, treat as one unit

2. remnants of original functioning ecosystems

Each natural area is a remnant of a wider functioning ecosystem. Protect areas that reflect as fully as possible the plant and animal communities that were originally present, especially those communities that have now been reduced elsewhere throughout the ecological district. The more highly "intact", "rare", and/or "representative" they are, the more highly valued they are likely to be.

If your natural area contains rare or endangered species, determine their needs and threats[3] to ensure that the area can support minimum viable populations of these species.

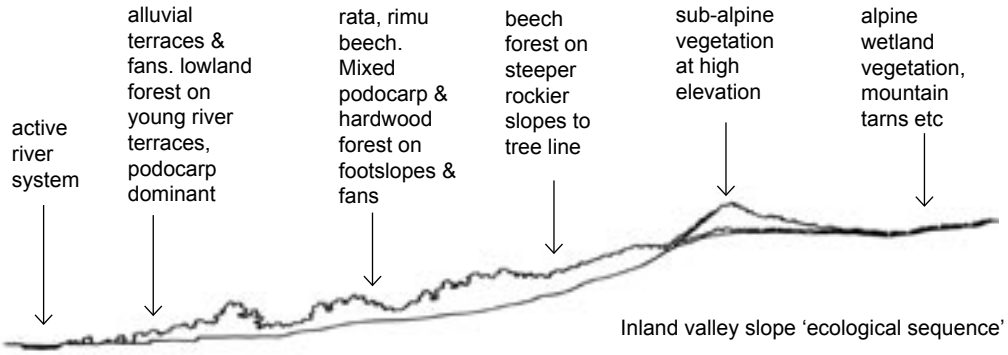
Even where whole ecosystems cannot be fully protected, recognise the importance some outlier areas may have for the survival of some species within the larger system. A remnant natural area may be still an essential part of that larger system. For example, small down valley areas may provide important nectar or berry food at critical times of the year and as other seasonal food reserves are diminished (e.g., riparian kowhai in late winter for the kereru which then moves higher up to ridgeline *Pseudopanax* fruits during the breeding season). Similarly, undisturbed coastal cliff areas are frequently important nesting sites for coastal bird species.



3 Assistance can be gained from the local Department of Conservation office

3. extend across ecological sequences

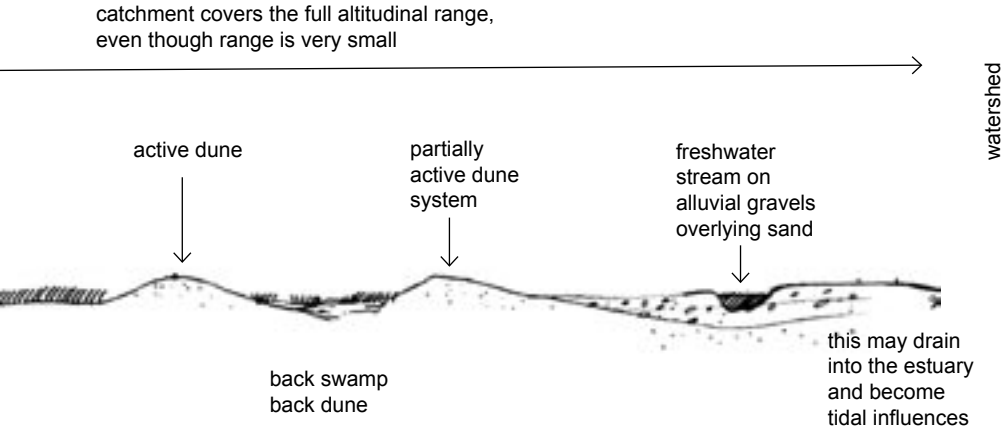
A habitat-rich protected area will include uninterrupted ecological sequences across altitudes and aspects. These sequences will be associated with changes in other attributes e.g., soil type, moisture, temperature. Even when located in very subtle terrain, it is desirable to ensure a protected area extends onto different levels. Each change in level involves habitat change.



Inland valley slope 'ecological sequence'

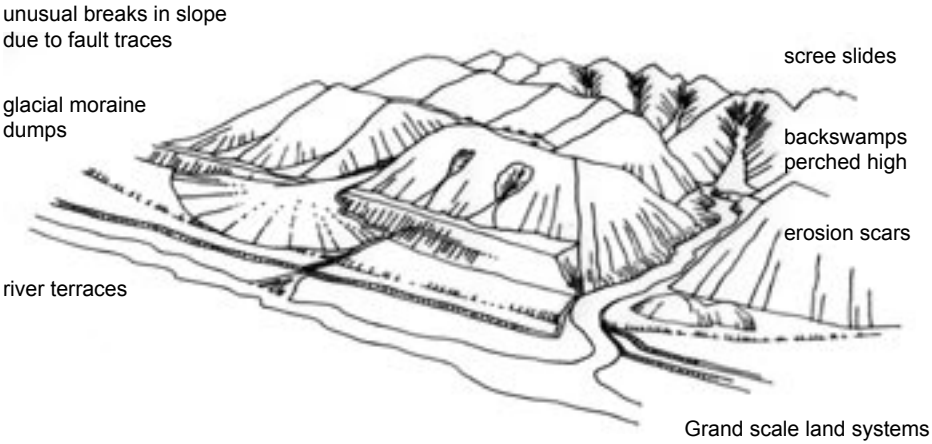
Altitudinal continuity not only assists habitat diversity and the seasonal migration of key species but it also allows species and communities to migrate in response to variations in seasonal changes, to changes in water table, inundation, nutrient or seed supply, or, with climate and sea level change.

Where natural values have been lost in the linking of different elevations, assess the potential to re-instate the nature of the linkages such as through providing seasonal habitat for feeding or breeding needs, preferably through natural regeneration or through active restoration work.



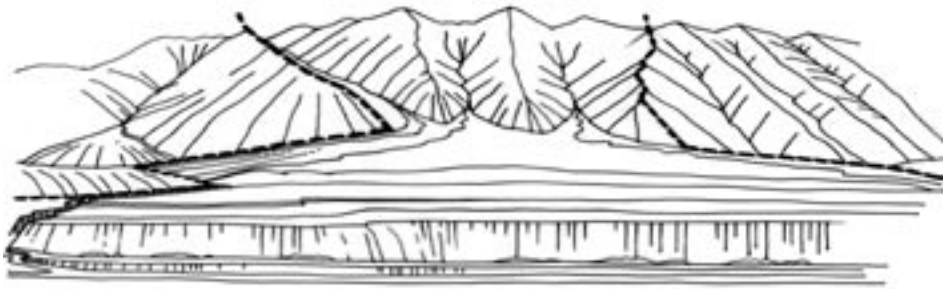
4. underlying land systems analysis

Through understanding the underlying land systems and basic processes a clearer picture of the composite ecosystems will emerge. This should include the full range of biological diversity (biodiversity) and habitats belonging naturally in the area.



Grand scale land systems

Analyse the underlying land systems and the different geomorphological processes occurring in that system (ie what is being worn down, what is being transported, what is being built up). Identify the different landform components, the base-rock and soils. The diversity of landform and land systems, and of soil type and fertility, is important and beneficial to supporting more complex ecosystems and greater biodiversity at a range of scales. Compare the existing biodiversity with the original to ascertain the integrity and potential sustainability

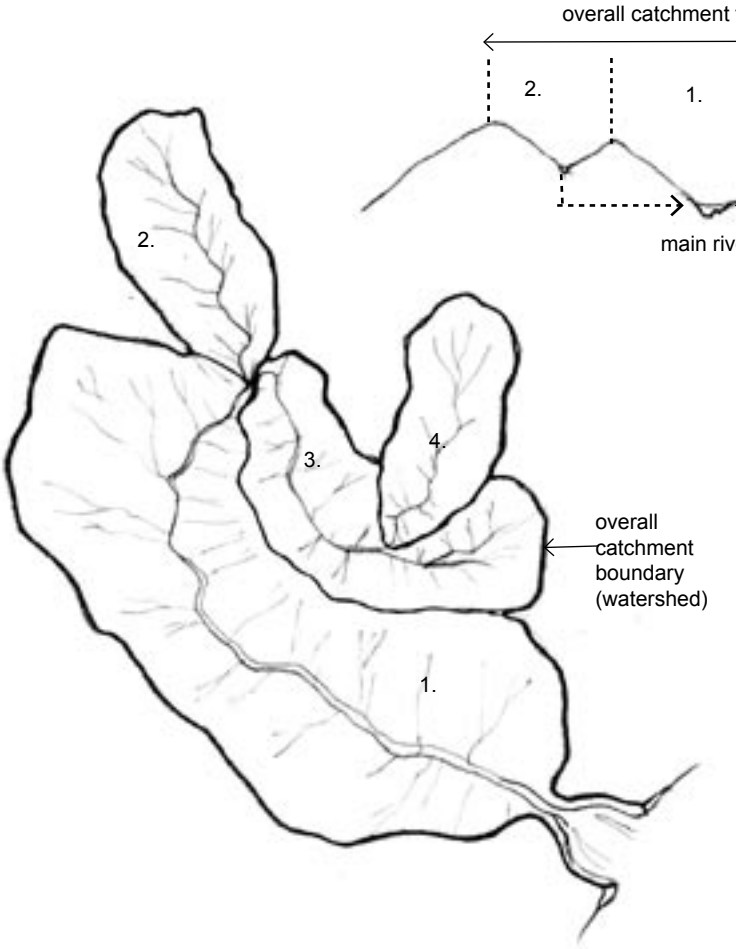


Finer scale land systems focussing on fan

5. catchment-based design

The water catchment area will provide contiguous diversity of altitude, aspect and hydrological regimes and associated vegetation and habitat diversity. Water born nutrients, seeds, spore and the movement of some micro fauna and bird species will be contained within the catchment area, as the drier ridges will form a natural boundary.

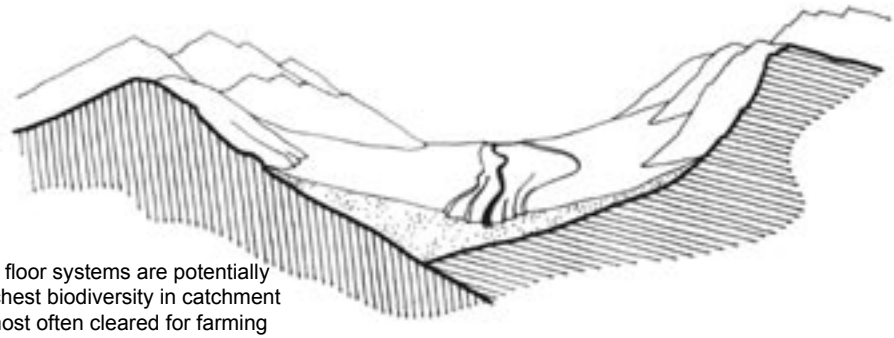
Ideally, a natural area will cover a full catchment or as many sequences within a full catchment as possible. This may be only a tributary or a sub-catchment.



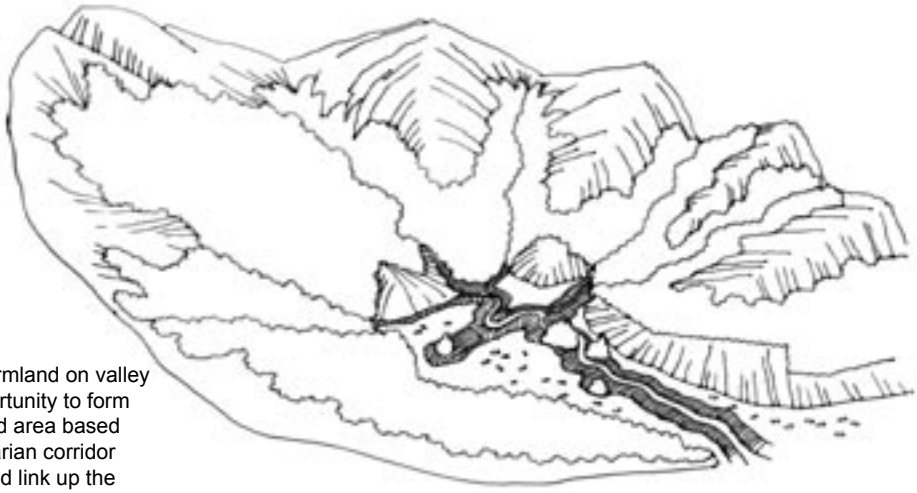
2,3,4 = smaller catchments that could be considered as individual and protected, or seen as part of the contribution to the overall. The catchment scale can be interpreted at different levels. Focus on a particular waterway you wish to have a positive influence on and work back up through all the tributaries that will then define the overall catchment..

Think beyond protecting only the steep inaccessible gullies and side slopes or eroded/eroding lands. Through protecting as much of the whole catchment as possible, it is more achievable to protect and maintain the natural nutrient cycles, energy flows and hydrological regimes that influence the biodiversity. A fuller range of habitat types is more likely to be protected with more of the catchment protected.

Frequently, the valley floor is excluded from protected area design due to previous modification, but this is often the location of the catchment's highest nutrient deposits and can potentially have the richest biodiversity. Some, if not all, of these low valley areas should therefore be included in a protected area to ensure the full sequence of ecosystem processes is included. Restoration may need to be allowed for.



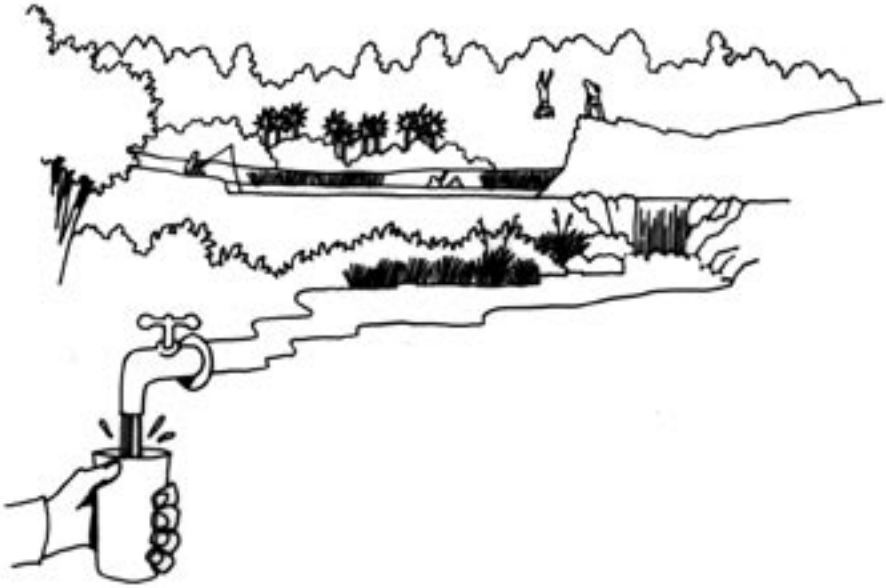
Valley floor systems are potentially the richest biodiversity in catchment and most often cleared for farming purposes.



Grazed farmland on valley floor.Opportunity to form a protected area based on the riparian corridor which could link up the other protected areas in the catchment or allow valley floor to regenerate.

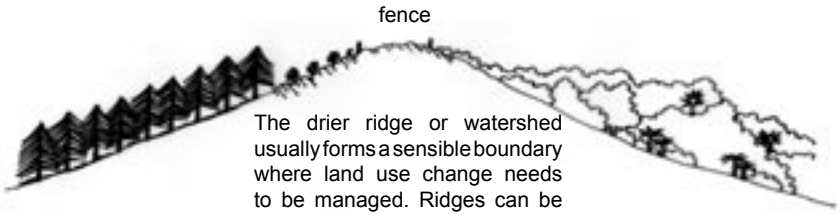
When it is possible to consider only part of a catchment for protection, ascertain if it is possible to protect key habitat and the range of processes that link the ecosystems present. Consider also the invertebrate fauna, not just the more obvious bird species.

Protecting natural areas can assist in protecting water quality, as well as assisting in sustaining the water yield. It may be beneficial to 'downstream' users if a protected area protects an upper catchment above important water intakes for domestic, urban, farming or industrial use.



6. natural boundaries the most effective

The drier ridge forming the catchment's boundary often naturally limits the movement of species within the catchment. It can therefore be used to assist in managing the protected area though "containing" the less mobile indigenous species within the ecosystem and assisting in limiting the invasion of unwanted plant and animal species from outside. Some bird and animal species will of course move from within to well outside a catchment on a daily or seasonal basis in response to breeding and feeding cycles.



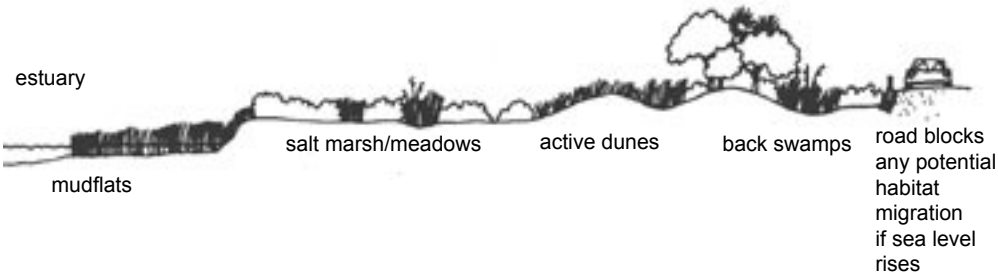
The drier ridge or watershed usually forms a sensible boundary where land use change needs to be managed. Ridges can be easily patrolled for management, provide firebreaks & access to fight fires/store water, and limit pests.

However, it may not be appropriate to have the protected area boundary right on the catchment's ridge-crest. In some circumstances greater ecological diversity and landscape integrity can be achieved through extending beyond the catchment boundary. Ensure that all of the habitat or land within the catchment is included, then as appropriate extend beyond the catchments to link and provide habitat and landscape continuity, and/or to buffer the protected catchment lands.

7. respect natural change

Allow for gradual changes in natural processes. A natural system cannot be protected like a museum piece, but must be allowed to evolve with time. Protecting natural areas will be more successful in the long term if their design recognises their ongoing natural processes. For example, recognise that wetlands gradually infill, that the canopy trees of evolving forest associations will eventually die and be replaced by not just new plants but often quite different species.

In a coastal location, if there is a gradual sustained rise in sea level, would the indigenous species and communities present have the space to migrate inland, up-slope?



If there is a major natural disturbance event, a protected area should be able to maintain its ecological integrity and allow for natural processes to continue. In trying to protect a floodplain forest, for example, recognise the natural flood cycle. Allow for not only physical damage from inundation, but the nutrients and silt deposits that are an essential input, and the vegetative responses to this cycle. Allow protection of an adequate area to ensure the forest system can be sustained.

8. seek self-sustaining areas

Seek to sustain the natural processes within or affecting the area as much as possible. Fencing off natural areas to prevent stock damage will protect the process of natural regeneration within the fenced area and will assist in ensuring the vegetation community survives beyond the current generation.

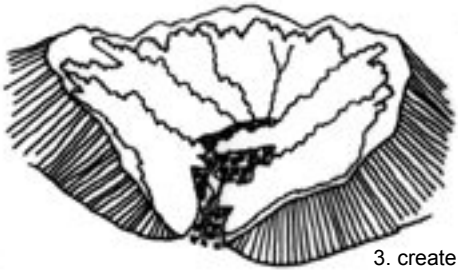
In riparian areas ensure that any existing or potential water extraction up stream (or controlled flooding) won't adversely affect the biodiversity levels present.

9. link isolated areas to enhance value

Many natural areas are small isolated remnants with limited long term viability if left unfenced. However, with adequate protection from, for example, grazing stock or animal pests, many of these may become self-sustaining in the longer term. Additionally, their value may be significantly enhanced through being linked to other natural areas (either physically or by ecological processes). Thus, small isolated remnants may be fenced to allow for gradual coalescing of the remnants and recovery of larger natural areas. These can be in a phased approach to longer term management if necessary.

1. fence out existing remnants and protect from weeds,stock,pests

2. expand & link up remnants creating some altitudinal sequences. Reduces farming operations



3. create protected area for entire valley. Remove all farming operations

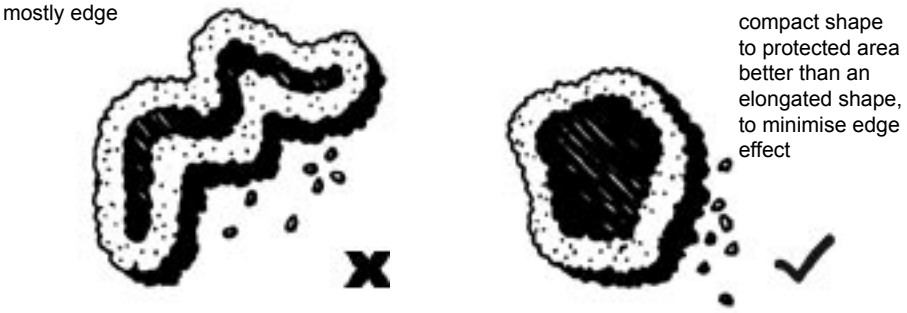
Linking existing natural areas through “corridors” can be valuable – for example to extend the range of certain types of habitat for feeding or breeding. However, first care should be taken to ensure pest plants and animals don’t acquire a convenient route to spread to other more intact areas. A pest plant and animal audit is essential to identify potential risks – what species are a problem and need cover to move? What level of commitment is needed to eliminate such threats?

Ideally, the aim will be to contribute to a greater landscape matrix adding positively to other existing protected areas through increased scale, buffering, linkages and restoration.

10. maximise the core and minimise the edge

It can be more ecologically valuable to have one large protected area than several smaller patches of the same total area. The core area should be large enough to adequately sustain the ecosystems present. A large core will enable continual self-generation and allow for the evolution of indigenous communities in the long term, including ecotones. If the protected area is too small, there will be no ‘critical mass’ to sustain complete ecosystems.

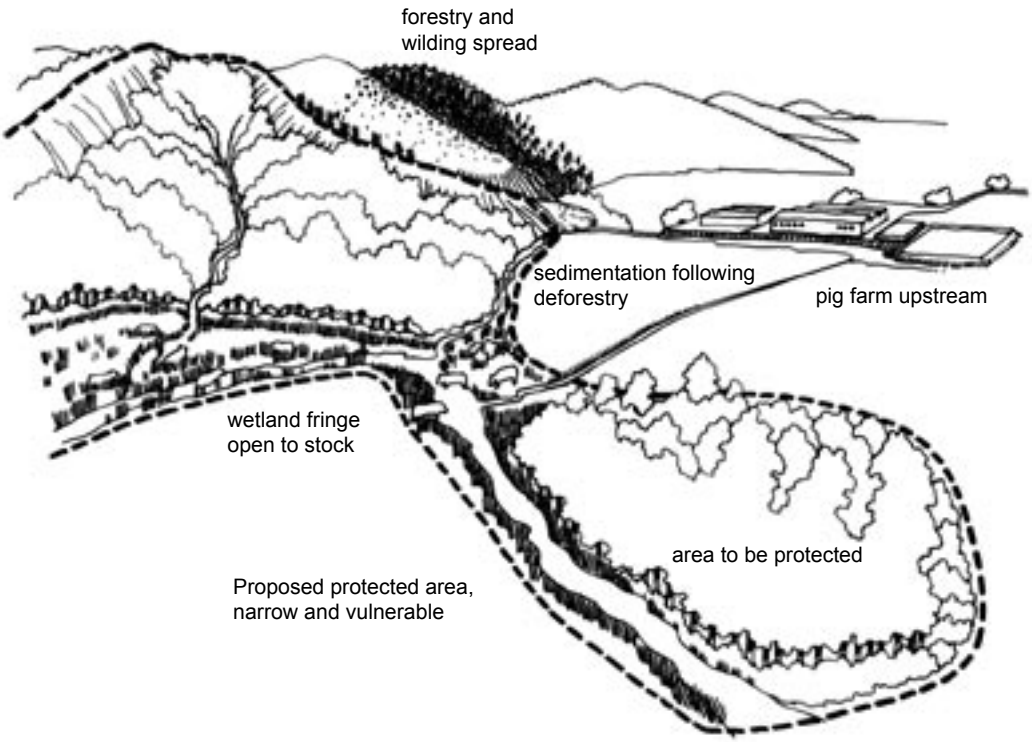
The size and shape of a protected area can have a large bearing on the ecological success of the protection. If the protected area is too small it could have a very limited opportunity to exchange genetic material. Edge effects may pervade so that the ecosystem will gradually change and lose its integrity. An abrupt and artificial change at the boundary to a protected area, such as between pasture and natural ecosystems, is the place of greatest stress on the natural system through climatic exposure, pressure from animal browse, and pest encroachment. Thus a minimal length of edge, or low perimeter to core area ratio, is usually desirable. A compact shape, with minimal unprotected enclaves, is better than an elongated one, to reduce the 'edge effect'.



In high fire risk areas however, it is worth noting that fire risk can be greater in one large protected area rather than several smaller protected areas with firebreaks between.

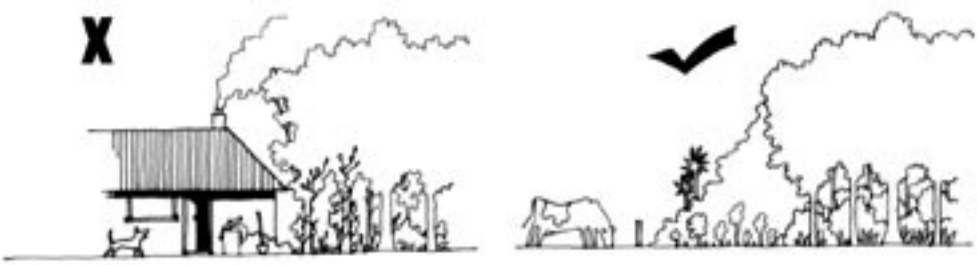
11. consider buffers at the same time as boundaries

In protecting a natural area it is important to consider what buffering may be necessary in establishing the boundary. Good buffering from adjacent land use activities may be essential - especially at the protected area's narrowest points, and, upstream and upwind.

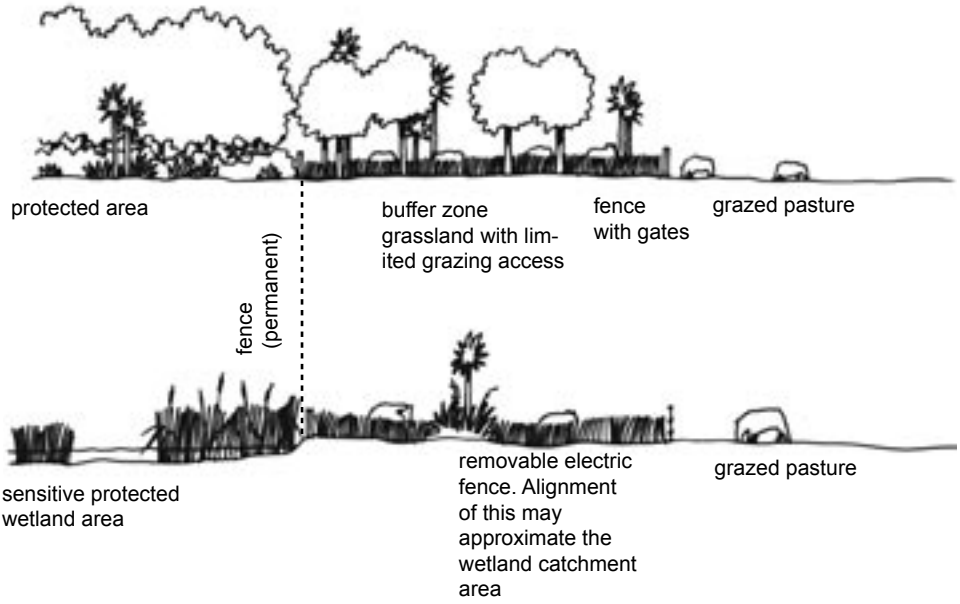


Boundaries are needed to adequately protect the area's values and to visually separate the area from other management activities. For example, stock will trample and compact the soil, causing damage to root systems, soil erosion and pugging. They can eat smaller or palatable plants and ring bark trees.

In some situations, such as in remnants where stock like to shelter and graze and there is no under-storey or natural regeneration occurring, it is essential to remove and keep stock out. Effective stock boundaries may comprise a physical stock-proof fence around a bush remnant or may be an extensive water management buffer regime around a sensitive wetland area. Particularly where the "core" of the remnant is small, fence far enough back to prevent stock from eating or damaging existing plants and if possible allow sufficient "buffer" space for outward regeneration (or restoration) into the open newly-fenced area. (However, in areas prone to vigorous weed growth consider the management commitment required for this to be feasible.)



In other situations, the buffer margin may involve a programmed level of management and monitoring grading from normal farming operations through to stock exclusion in the protected area. For example, stock may be allowed to graze in the buffer zone, but for limited periods and under strict supervision, and the class of stock may be defined. Grazing of buffers might avoid wet periods and seeding times, eg, in wetlands and tussock grasslands.



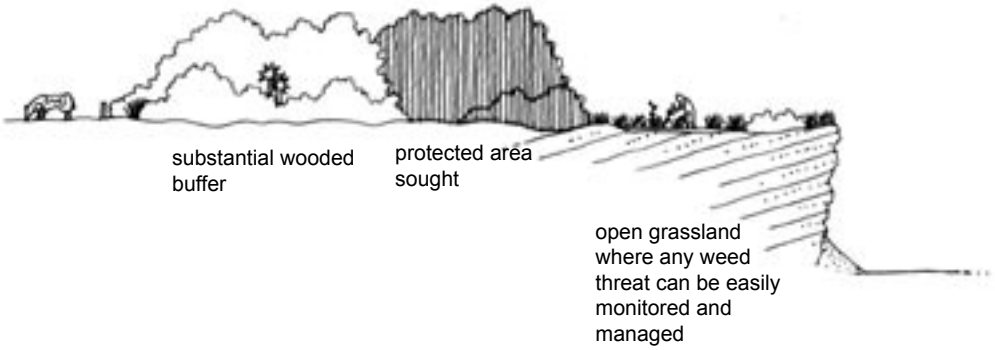
The buffer may involve a different level or more flexible management than exclusive fencing off. People and animals may be excluded at certain times (e.g. during nesting). It implies protection through agreement, and allows for some measure of flexible land use that may allow the farmer to maintain a certain level of operation.

Where a flexible buffer is defined, it needs to be determined to be mutually beneficial to both the farming and natural values being protected. An inflexible and ill-considered arbitrary buffer may serve no really meaningful purpose but may create management problems. In the case of a wetland for example, it may be better to look at its ecological context and protect the local catchment or water source e.g. spring, rather than merely remnant wetland vegetation.

12. access requirements for management and maintenance

All natural areas need to be checked routinely and the frequency will depend on the potential and degree of threat to the area's values (e.g., a rare plant species may need to be monitored for vigour and recovery or a bird nesting colony monitored for animal pest invasions). Access routes for carrying out routine management and maintenance tasks therefore need to be practical and suit the necessary tasks whilst minimising negative impacts on any values being protected.

If the protected area's ecological values can be threatened by nearby landuse activities (e.g., spread of plant pests along the track edges), or if some parts/ boundaries are naturally inaccessible, additional care needs to be taken in planning track use and maintenance, and track alignments.



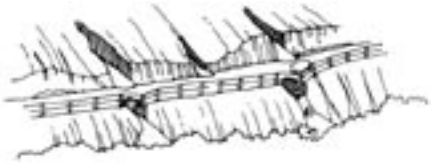
Stock-routes and fire control access routes through protected areas may be desirable for the landowner. If unavoidable, incorporate in a way that will minimise any risks and negative impacts on the area's natural values (e.g., located to minimise erosional rates and pugging, to avoid stock effluent finding its way directly into nearby waterways). Any access route should be kept to the minimum width necessary and sturdily fenced off or, where only for short distances, planted with appropriate unpalatable species (e.g. flax).

In native grassland areas it may be necessary to allow stock access from time to time to control exotic pasture grasses and other non-woody and woody weed species. Responsible stock management is essential in this case.

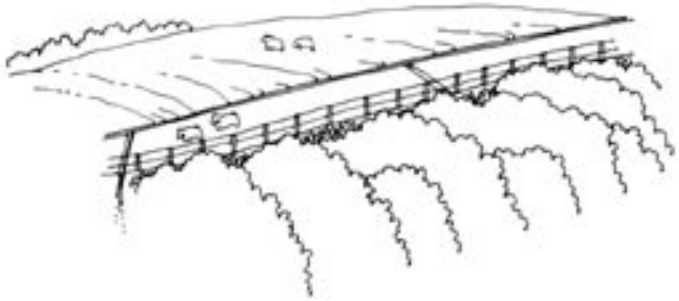
13. site fence-lines according to landform

Use the landform to assist in maintaining the integrity of the area being protected and to enhance its management. Site fences according to natural landform patterns such as close to ridge lines and crests of catchment boundaries, at sharp changes in topography – (e.g. terrace edges, base of slope). Don't fence off in a way that is unrelated to the landform.

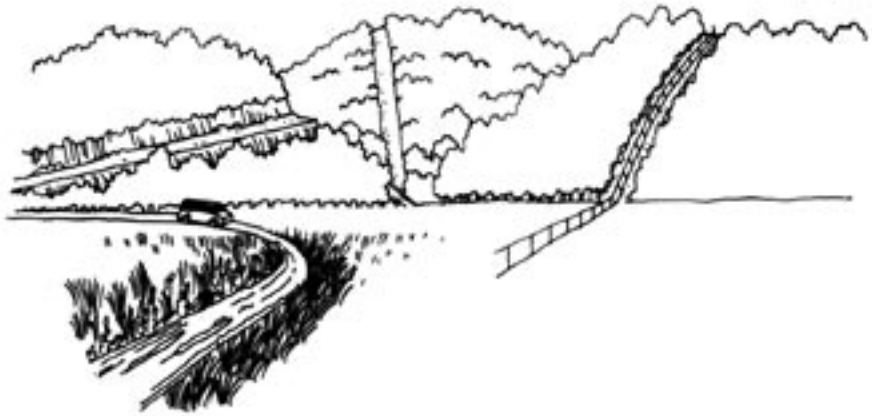
Site fence-lines where it will be easy for fence checks. In some instances fencing may be unnecessary or impractical e.g. at high altitudes.
Try to avoid having gates into a protected area – it is too easy to forget and leave open allowing stock to enter, causing large scale damage of several year's growth in one event. Use stiles instead, if need be.



Some stock will follow fence-lines more than others, so avoid siting fences on obviously unstable land where erosion (e.g. tunnel gully) may allow stock to squeeze underneath into the protected area.

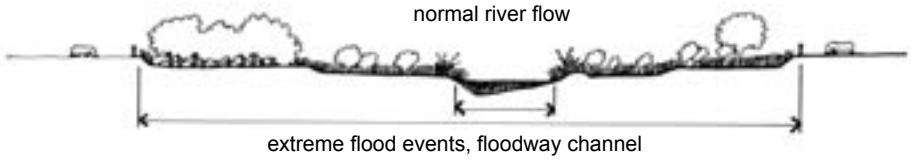


Avoid bulldozing fence-lines – the scars left on the land can be very unsightly. Cutting swathes through the bush, shrubland or tall grassland to provide for a fenceline provides an invitation to pests. A cut fence corridor can quickly become an animal pest or predator corridor and a plant pest or weed corridor for invasion.



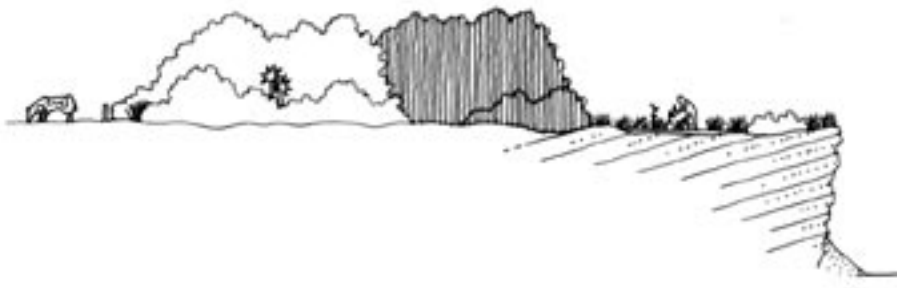
For protecting riparian waterway areas, locate fences on the edges of the floodway channel to protect the entire river system. Restricting waterway access during the breeding season may be necessary. Artificial structures such as bridges can be used to define the upstream and downstream extremities of protected natural areas where fencing is not feasible.

Protect entire river system



14. consider carefully plant pests….

The majority of plant pests are borne by air (wind), water, animals and birds, and they will tend to colonize the open areas within and adjoining natural areas. Time taken to carefully assess the risks plant pests pose to protecting a natural area can save significant time and money in later pest eradication and management programmes. For example, eliminating a small up-wind or upstream threat may be the most cost effective long-term measure. Or, containing a buffer area of dense vegetation or dense mulch around the natural area may reduce the ability of new plant pests to invade the area. This vegetation could be composed of existing gorse (contained on the unprotected edge) which will allow native seedlings to eventually emerge and naturally suppress the gorse over time.



15. … and the risks of animal pests

Assess the risk of animal pests on an area's natural values. Browsing animals such as deer, goats, rabbits, hares and possums can devastate regenerating vegetation – and even mature vegetation if under pressure. Rodents, mustelids, feral cats and stray dogs can decimate populations of bird-life, especially ground dwelling and nesting birds and their fledglings. Hedgehogs can also pose a threat.

As an existing habitat starts to regenerate, this may result in an influx of hitherto unrecognized pests. For example, the new young shoots of regenerating seedlings may attract browsing rabbits or hares (in turn attracting an increase in mustelid pests). Also, an increase in seed-bearing saplings may attract a range of pests including rodents.

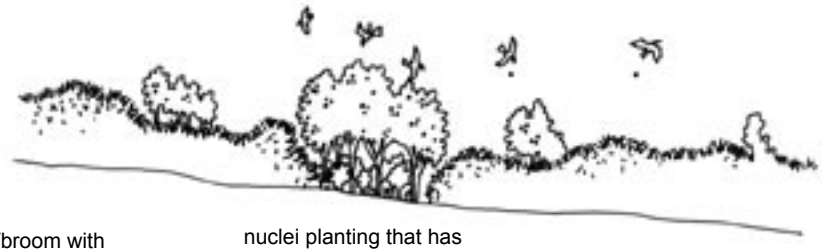
Generally, animal pests can be managed (through trapping, shooting, and poisoning by licensed operators) for most areas being protected for their vegetation communities. However, where rare and endangered species are involved it is essential that more professional assistance[4] is sought for the pest management to be undertaken. This is also the case for protecting the habitat of important invertebrate or bird species and may involve predator proof fencing.

If the area being considered for protection is in close proximity to other indigenous areas, consider carefully the advantages and disadvantages. Will the new protected area pose any new threats to these areas and their values already under protection?

16. natural regeneration or vegetation restoration?

In many cases, nature may be able to do most of the work. Simply fence, protect from fire, and control exotic weeds and pests.

You can help this process by hand releasing emerging native trees or planting native food bearing plants in small nuclei where birds will come and feed and disperse seed into the area. This may be effective in areas where there is a good nurse-cover of broom, gorse, or native shrubland that the native seedlings would come up through following germination.



gorse/broom with native self seeded/ bird distributed seedlings beginning to emerge

nuclei planting that has established suppressing the nurse crop cover. Birds use as reliable food source.

4 Contact your local Department of Conservation office

Where an area has a plant pest or weed problem requiring ongoing maintenance, determine whether this can be turned to advantage (e.g., a contained area of gorse determine if it may be a valuable nursery for natural regeneration) or, if it needs to be eradicated, this may be an area to initially revegetate to reduce ongoing weed spread, or containment and control costs. However, carefully check the nature of the weed problem first. Importantly, some weeds have seeds with very long viability and do not require much light to establish while others do not and are quickly out-competed.

Where carrying out revegetation to restore parts of an area, consider carefully where best to start and work with nature, establishing areas that will recover easily. This will not only provide greater satisfaction but will assist by establishing seed-rich areas for nature to give a helping hand. Consider soil moisture and aspect. In cooler climates a warm northerly aspect may be an advantage or, in hot dry prevailing conditions, a cooler, wetter southerly aspect may be more viable for ensuring planting success and establishment with minimal ongoing after-care (e.g. watering).

If the area has already undergone some human-induced or natural modification and restoration is needed, a commitment must be adhered to that will be maintained for the length of time that it will take until the protected area becomes largely self sustaining.

17. be aware of cultural needs

Respect any recognised historical or archaeological sites that may be present. There may also be features or values that are important to tangata whenua. You may need to consult with the local tangata whenua or the NZ Historic Places Trust. Seek that the local community support and appreciate the area becoming protected. A protected area might provide for physical, social and spiritual renewal.

18. public access to protected natural areas can have advantages

Public access should generally be permitted and, when well managed, can greatly assist the monitoring of problem pests. A stile best provides for access, with any gates left locked. A simple informative sign will generally be respected and additional signs should indicate any closed periods (e.g., for bird nesting, maintenance poisoning operations, lambing etc). People should not have to ask for permission to access the protected area, particularly if involving any area of public land or funding.

Protecting natural areas - summary and check

Use the table to check the factors to address in protecting natural areas

		Factors	page	yes/ no	comment
ecological	1	How significant is the natural area to the wider landscape character?	7		
	2	How important is the natural area to enhancing the wider eco-system (e.g., as food or nesting habitat? a natural buffer area?)	8		
	3	To what extent can the area extend across continuous ecological sequences?	9		
	4	How well does the natural area relate to the under-lying land systems?	10		
	5	How much of the natural catchment area is it possible to protect? Can this be added to in future?	11		
	9	Can isolated areas be linked up to enhance their value?	15		
site management	6	Can natural boundaries be used to their best effect?	13		
	7	Can the natural area cope with some natural change?	14		
	8	Is the natural area designed to be self-sustaining?	15		
	9	Can isolated areas be linked up to enhance their value?	15		
	10	How well has the core been maximised? - and the edge minimised	16		
	11	Have adequate buffer areas been considered in determining the boundaries?	17		
	12	Have management and maintenance requirements been fully incorporated?	20		
	13	How well do fence-lines relate to landform?	21		
	14	Have plant pests been fully considered? Which ones and how will they be managed?	23		
	15	Have animal pests been fully assessed? What are they and how will they be managed?	23		
	16	Is natural regeneration possible? Or is some restoration necessary?	24		
	9	Can isolated areas be linked up to enhance their value?	15		
cultural values	17	Have cultural needs been considered?	25		
access	18	Is public access possible?	25		

References

Nature Heritage Fund's Assessment Criteria www.nhf.govt.nz

McEwen, Mary. 1987. *Ecological Regions and Districts of New Zealand.* 3rd rev. ed. Department of Conservation, Wellington.

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