

MANAGING HIGH COUNTRY LANDSCAPES INTO THE FUTURE

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This paper covers three topics: What are our goals for high country landscapes? What are the drivers of change in the high country? How can we manage for resilient high country landscapes?

Goals

When we talk about the future of the high country, we need to be very clear about what our goals are for this environment. Goals are essential to guide management and without goals it is not possible to say if management has been successful. It is very important to distinguish between visions and goals. Visions are long-term objectives, usually outside the lifespan of most management projects or even a particular person. Goals are measurable targets over defined time intervals, usually short-term. In a sense, they are the stepping-stones towards reaching the vision. Goal setting is a fundamental but often overlooked component of management, especially for indigenous biodiversity conservation, and particularly at the scale of high country properties.

For goals to work they need to be realistic; goals that are unachievable are a waste of time. Goals need to reflect the realities of the modern high country landscapes. They need to be challenging but achievable: there is no point in setting a goal that cannot be achieved. In conservation, a common goal is to recreate some previous ecosystems state, but this is problematic, as the previous state would have changed irrespective of other impacts.

So what are the realities of high country landscapes? We have discussed some of these

already at this forum. These are ecosystems that have resulted from nearly 1000 years of human influence. Several species are now extinct (e.g. moa). Seed sources are either absent or very sparse for many plant species including most of the dominant species in the pre-human landscape, the woody species (e.g. Halls totara, bog pine, celery pine). There is a new suite of species now dominant (such as Hawkweeds) and 'better' adapted to high country environments. Many of these high country systems have almost certainly crossed thresholds of change that will be very difficult to reverse: simply removing degrading factors alone will not lead to most of the high country regenerating back towards Halls totara forest for example - this is not going to happen. Finally, people are an integral part of high country landscapes.

Figure 1 summarises the changes that have taken place since human settlement of the high country: the shift from woody to tall tussock, then to short tussock vegetation, then across some quite fundamental ecological thresholds into systems dominated by exotic species - either herbaceous or woody. It is quite easy to move the systems in the directions of the red arrows in Figure 1, but moving them back in the directions of the blue arrows is going to require substantial management input and in some cases may not be possible. The high country has changed from predominately woody ecosystems through different types of grassland and on to exotic herbaceous dominated ecosystems with an increasing component of mainly exotic woody species. It is fundamentally important when we set a goal for management

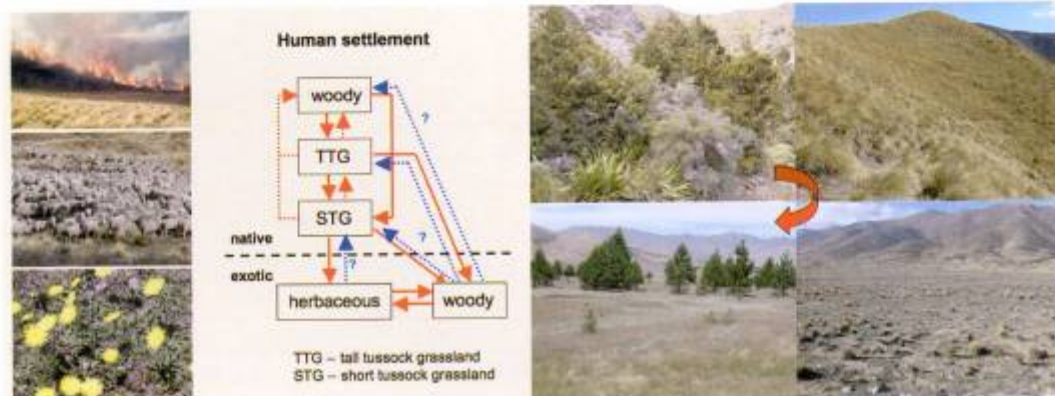


Figure 1: Ecosystem change in the high country since human settlement

that we also link it to a measure for success, for two reasons. First, the measure provides an auditable assessment of how well the management has been implemented: has the manager actually done what they said they were going to do? But also, perhaps more important ecologically, it enables the success of the methods used to be assessed and modified if necessary to adapt management to better meet the goal that has been set.

There are therefore three components to goal setting: the long-term vision, having clearly defined goals that are stepping stones towards reaching that vision, and then having performance indicators against which to assess success.

So what are the goals for the high country? Existing high country goals (e.g. in the Biodiversity Strategy, Crown Pastoral Land Act 1998 and Conservation Management Strategies) do not identify specific management outcomes for indigenous biodiversity beyond general statements about 'protecting and enhancing'. We have to ask ourselves what are we trying to achieve in the high country?

Are we trying to maintain or enhance the full range of indigenous biodiversity: of species and/or ecosystems?

- Of ecosystems that are present today or those that were present 500 years or 1000 years ago?
- Are we trying to sustain tussock grasslands, or are we trying to restore woody vegetation?
- And where in the landscape are we trying to do these things?
- We talk about restoring threatened species, are we talking about nationally threatened species, regionally threatened species, locally threatened species?

We need to be very clear about the answers to these questions before we can identify specific management goals for any particular place in the high country.

Drivers of change in the high country

We cannot achieve goals in the high country unless we understand what is causing change, especially what is causing change now and will cause change in the future. Some of the drivers of change are positive but many have unwanted outcomes. In a sense, these are threats to the

achievement of goals for the high country. We need to consider both the realities of the high country today and the influence of these drivers of change on the future composition and structure of ecosystems in the high country.

Drivers of change have a number of underlying causes. For simplicity, these can be grouped into four broad groups:

- Global climate change.
- International economic factors.
- Domestic policy.
- Historical legacies - things from the past that are still influencing these landscapes and ecosystems today.

Global climate change and international economic factors are largely outside the control of high country land managers. Some of the initial consequences of global climate change are shifts in average rainfall and average temperature, and increases in the incidence of extreme events such as droughts or snowfalls.

Global climate change may affect biodiversity through intensification of farm management, as farmers seek to deal with changing conditions, and by altering species interactions (e.g. RHD and rabbits, hawkweeds in tussock grasslands, or trout and *Galaxias*). Species ranges will change, perhaps with contractions in drought intolerant species and warmth intolerant species, and some of the high altitude species will eventually disappear as temperatures rise. We will see the invasion of new species and, potentially, extinctions as well.

International economic factors, such as oil price increases, global recession, changing consumer preferences/demands and availability of substitutes, either for products or for producers, all influence what happens in the high country. They may have a whole range of initial consequences, such as reduced profitability from farming or tourism, which have direct impacts on high country land use. Any consequent reduction in the tax take may reduce the funds for conservation work on the public conservation estate. International animal welfare issues may require management changes associated with the use of chemicals such as 1080 for pest control.

Demand for natural fibres in preference to synthetic fibres could increase and 'green' certification, already important in the forestry

industry, may become an increasing requirement in agriculture and industry.

All of these factors affect biodiversity by changing the focus of agriculture (e.g. intensification) and they can reduce resource availability for 'low priority' activities by landowners, local authorities and central government. Changing attitudes towards indigenous biodiversity may increase or decrease interest in non-economic values: certification is going to lead to some positive changes in attitude; if farm profits decline, that will also cause changes in attitudes.

Domestic policy - regulatory requirements, land tenure review and land ownership, public access rights and national priorities – may increase the cost of doing business, change the focus of land use at the landscape scale and result in less community ownership or interest in non-economic values. These things have biodiversity effects to the other drivers of change: changing agricultural focus, especially intensification; reduced resource availability for 'low priority' activities; and changing attitudes towards indigenous biodiversity.

Historical legacies - there have been many changes in the high country over the last thousand years. There has been a loss of seed sources (e.g. for woody species such as Halls totara and bog pine) and quite large areas of the high country are so different that many of the original species would not regenerate even if seed sources were available. Much of the native plant and animal biodiversity is in very small remnant populations and this limits the potential for recovery to large viable populations. Changes to soils have resulted

from past management, especially soil loss through wind erosion exacerbated by high rabbit numbers in the past. Those influences will affect many generations to come of the plants and animals that live in the high country. These historical legacies, again, affect biodiversity: local extinction of remnant populations (remnant populations are very vulnerable); failure of native species to re-establish; and the crossing of abiotic thresholds, such as soil conditions, which are quite difficult to reverse.

To summarise, the key drivers that will directly effect indigenous biodiversity in the high country in the future are: invasive species, changing species interactions, recruitment failure, changing soil conditions, intensification, attitudinal changes and resource availability. Change is not bad in itself, in fact change is a normal feature of any ecosystem, and some of these changes can be quite positive, particularly changing farmer attitudes. But many of these drivers of change will also limit the outcomes that can be achieved for indigenous biodiversity in the high country, and these need to be acknowledged in management planning.

Managing for resilient high country landscapes

How can we manage for resilient high country landscapes? I don't believe that changing tenure in itself equals management; it is not actually a management action. For example, reservation of land (for conservation purposes) is not the end of the conservation effort; it is where conservation management begins. Most high country ecosystems are induced and all are strongly influenced by external drivers of change. For these reasons management is



Figure 2: Native brooms *C. crassicaule* (left) and *C. vexillata* (right) – vulnerable to grazing

essential to sustain indigenous biodiversity **across all land tenures**. The key is to be adaptive and flexible, and not tied into the 'one-model fits all' approach.

Two different groups of plants illustrate some of the challenges we face in managing biodiversity in the high country, and the role of different management tools. Native brooms (*Carmichaelia* - a group of plants with tremendous diversity) are unique to New Zealand and are very vulnerable to grazing whether by stock or animal pests.

Figure 2 shows two species: coral broom (*C. crassicaule*), normally a shrub up to 2 metres tall, severely browsed down to a few centimetres and in gradual decline; and *C. vexillata*, well browsed down, is in serious decline.

By contrast, *Lepidium sysimbrioides* (in gradual decline) and *Convolvulus verecundus* (sparse) are herbs found in dry areas such as the Waitaki Valley (Figure 3). These plants are not influenced so much by grazing animals but are very vulnerable to competition in the absence of grazing.

Where these two groups of plants are found together, conflicting issues arise in planning for their management. Excluding grazing will favour the native brooms but subject the vulnerable herbs to more competition, while using grazing as a management tool might result in the opposite outcome. These are some of the dilemmas we need to build into our management planning.

Whole property farm management plans

I believe whole property management plans are a key tool for positive biodiversity outcomes on high country farms irrespective of tenure (and similar plans should be implemented for public conservation land). They should cover **all** aspects of land management - biodiversity, farming and people, and there is a potential role for local community in plan development and annual review. These plans provide a unique opportunity for win-win economic, biodiversity and recreation outcomes.

Covenants can be part of the farm management planning approach, but are not in themselves the main way to manage indigenous biodiversity: they are an important tool that we can use to get there. The question then is why DOC and the environmental NGOs are not supporting this approach? Hopefully I can provide more insight into what's involved, and perhaps we can get some more support for it.

A farm management plan is a good way to formalise best management practice. It obviously will assist farmers in meeting their RMA requirements. It will underpin successful certification through green marketing schemes (e.g. eco-wool labelling) and I can't emphasise that enough - I think it's a very important tool. A farm management plan provides an alternative model to the current predominantly two-way tenure review split and reinforces the established ethic of stewardship that farmers have for their land. Importantly, it allows the feedback on the effects of management activities that is essential for adaptive management.



Figure 3: Native herbs *Lepidium sysimbrioides* (left) and *Convolvulus verecundus* (right) appear to suffer through competition in the absence of grazing

A farm management plan requires clearly defined goals for the property over different time frames and a good understanding of the environmental, social and farming attributes of the land itself. It will identify the key constraints to management for achieving these goals and subdivide the property into management units. It will formalise the tools that are to be used to meet those goals (stock management, weed control, recreation etc.). Targeted monitoring will be required to provide feedback on management actions.

The following examples of a vision and goals are from an evolving farm management plan for a particular high country property (with identifying details removed).

Vision: The economic potential of XXX is being fully utilized while maintaining and, where appropriate, enhancing other values present (especially native biodiversity and recreation), in a manner that is resilient, dynamic and flexible.

Examples of 30-year goals (of the farming family):

- The property has been 'future proofed' as evidenced by not having to buy in feed and not having to sell capital stock during droughts.
- Average weaning percentage has increased to over 100% (given suitable weather conditions)
- Soil fertility is the same or exceeds levels present in 2005, at least within the areas used for economic production.
- The indigenous biodiversity values of representative examples of the full range of natural ecosystems on the property are being sustained.
- Animal and plant pest species have been managed to a level that does not threaten either economic or biodiversity values
- Stream health is the same or exceeds levels present in 2005.
- At least two wetland restoration projects have been implemented
- At least one new recreational opportunity has been developed

Examples of 5-year goals with performance indicators (PI):

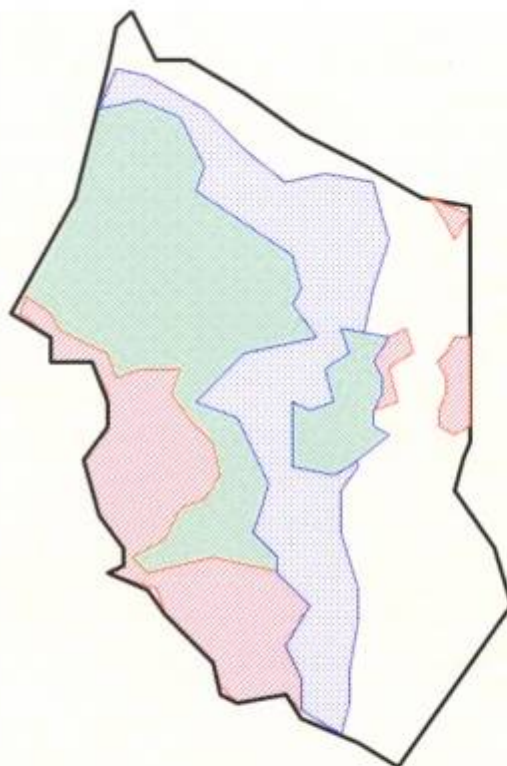
- Identify and map representative examples of the full range of natural ecosystems on the property as a basis for subsequent management
- PI - Ecosystem pattern has been mapped for the property at the scale of 1:50,000
- Establish tall tussock grassland monitoring plots
- PI - At least 20 vegetation monitoring plots have been established in tall tussock grassland with at least one re-measurement undertaken

- Complete an assessment of the wilding spread potential and removal options for the established conifers around YYY huts.
- PI - The assessment has been completed and includes a staged proposal, with costings, to remove conifers from around these huts.
- Establish an aquatic monitoring system.
- PI - A survey of aquatic systems on the property has been completed and a monitoring system established covering the range of aquatic systems present, with at least one re-measurement having been undertaken.

The five year goals above are 'steps along the way'; you can't achieve everything overnight, it can take thirty years to get some of these things in place and up and going. They provide a practical way to move forwards within realistic economic and ecological time frames. The performance indicators are fundamentally important to measuring how successfully the goals have been met.

We need to know the environmental, the economic and the social context of the property for farm management planning: geology, landforms, soils and climate; vegetation, fauna (birds, lizards, aquatic etc.); farming history and farming opportunities; local economy (including location of main service centres used etc.); recreational uses and opportunities; and other uses of the property (e.g. forestry). This overview can be based on existing information and an initial property assessment.

Then the management constraints must be identified. These can be abiotic, biotic and socio-economic factors that limit our ability to reach our goals. The likely consequences of each factor should be identified and possible management actions for addressing them considered (economic, environmental and social). For example a constraint might be that unforeseen extreme weather such as a drought will impact on biodiversity conservation, maybe through killing some restoration plantings; it will also impact on farm production. The management response for biodiversity might be to make sure that all plantings are sourced from local material (because it will be better adapted), making sure that plantings are timed to minimise the impacts of drought, and reducing competition (e.g. with herbicide). For farming, the management response might be to invest in additional irrigation to enable more feed to be carried on property (future-proofing the property).



Property with four management zones reflecting different goals and hence different types of management activity

- Red – no stock, but other uses possible (e.g., recreation & tourism)
- Green – summer grazing, no AOSTD and other uses
- Blue – subdivision, AOSTD, etc (but no cultivation) and other uses
- White – intensive management

But all management zones would include goals relating to native biodiversity, but these would reflect the nature of farm management activities in each zone.

Figure 4: Subdivision of a property into management units

The core section of a management plan covers management tools and it will probably be divided into several subsections. It discusses in detail the range of tools available to meet the goals for the property. It includes approaches to stock management, pasture improvement, recreational use and biodiversity conservation. It is not possible to foresee all management approaches that might be used and it is therefore important to allow for regular revision and updating of these tools. They should be spelled out to a detail sufficient to guide management.

Possible subsections include stocking patterns (stock type, number and timing) subdivision; pasture improvement; weed control; animal pest control; retirement of areas from grazing; rehabilitation of particular ecosystems (e.g. forest or grassland); wetland management; covenants; and recreational management including public access, hut maintenance, recreation concessions etc.). Biodiversity management can involve a range of activities including plant and animal pest control, restoration plantings, waterway/wetland enhancement, reintroductions of locally extinct species, sympathetic grazing (stocking rate,

stock type, timing of grazing), fertiliser application to degraded short tussock grassland, grazing exclusion, fire exclusion, amenity and shelterbelt plantings, and monitoring. Grazing is often seen as a key threat for native biodiversity, yet its removal can also lead to a loss in native biodiversity, especially when invasive exotic species are dominant.

Subdivision into management units is important because it provides us with a framework from which we can then go and apply management. No property is uniform, there is great variation which means that the goals and management tools will differ across the property. The number of management units will reflect the environmental diversity of the property and will be determined by a combination of management practicality and ecological patterns. They form the basis for implementing farm management and for assessing how sustainable the overall farming operation is. Figure 4 shows a hypothetical example of a property with a range of different management units.

Monitoring is the key part of farm management plans. It is critical for the whole plan and links to

the performance indicators associated with goals. It provides direct feedback to the farmer on success of different management actions. It is also a powerful advocacy tool (e.g. to show how management can meet government goals of ecological sustainability and protecting significant inherent values). It should include economic indicators (e.g. average animal body weight), recreational indicators (e.g. track or hut usage) and environmental indicators (e.g. tussock density).

Monitoring can be expensive, both in time and funds, and our thinking needs to be very focused on the goals. Some monitoring requires technical input (e.g. stream invertebrates), but most should be of a nature that is easy to undertake (and some will already be part of farm management). Possible monitoring variables include climate, soil fertility, vegetation condition (e.g. photopoints – photo monitoring is a valuable tool), animal pests (e.g. rabbit counts), standing crop, stock condition (lambing and fleece weight) and recreational use.

How do farm management plans work? The process begins with an initial assessment of the property (with good mapping) covering environmental patterns, social values (e.g. recreation) and farm management practices. The management plan is then produced and 'buy-in' sought from outside interest groups such as local government. The plan is then implemented with regular review (5 yearly). Without review, these plans are really a waste of time, and there is room for outside groups to be involved in reviews – there is a lot of skill out there that can be utilised very effectively. Reviews can be used as the basis for formulating annual work plans and should match any certification audit cycle. The key is to keep compliance costs low.

Possible cost to the farmer include base-line surveys, ongoing monitoring and review, changes in stocking patterns, costs of restoration plantings, additional fencing and lost areas of grazing. But there are funding sources: local government, central government, carbon credits, enhanced market access (through green certification) and alternative income sources as well (through

intensification elsewhere on the property or ecotourism for example). There is a range of benefits to offset these costs. There is potential for a diverse range of economic uses, especially if the underlying tenure is freehold, and economic incentives for conservation management (e.g. weed control).

Whole property management planning can build on the established ethic of stewardship and capture a farmer's knowledge of the property. It ensures the presence of a 'manager' on the property all the time. Finally, there is potential to use sustainable management plans for 'environmental' marketing of products (e.g. an 'eco-wool' brand).

Conclusions

- I think we need to have clearly defined management goals in the high country, particularly for indigenous biodiversity. I don't believe we have those management goals here today. We have the high level goals and biodiversity strategies but not the management goals.
- We need to include performance measures with goals to enable the success of management interventions to be determined (essential feedback).
- The goals need to be realistic with regard to the factors that are causing change in high country landscapes.
- Management is essential; I don't believe biodiversity values will be sustained without some management. Changing tenure doesn't equal management.
- There is no one goal for high country and no one 'correct' management approach, even for biodiversity conservation.
- Whole property management plans provide a key tool to meet biodiversity conservation goals within an economic framework and at minimal cost to Government.
- It is time for Government and non-government land managers to work in partnership to ensure that we manage high country landscapes in a manner that results in resilient ecosystems within which indigenous biodiversity is sustained.