Draft Guidelines for Understanding the Promotion of Ecological Sustainability in Tenure Review

Allan Hewitt and Grant Hunter

Landcare Research
PO Box 69, Lincoln 8152
New Zealand

Landcare Research Contract Report: LC0304/145

PREPARED FOR:
Land Information New Zealand

DATE: June 2004

Reviewed by:	*Approved for release by:*
Colin Meurk Landcare Research	Bob Lee for the Science Manager Rural Land Use

Contents

Summary

Project and Client

Guidelines to help those making tenure decisions under the Crown Pastoral Land Act 1998 to properly consider ecological sustainability were provided to LINZ by Landcare Research in June 2004.

Objective

- Define principles for the application of the term 'ecologically sustainable management' as per Part 2 of the Crown Pastoral Land Act 1998 to develop a definition applicable to tenure review.

Methods

- This final draft incorporates feedback from LINZ to a preliminary draft prepared by an inter-agency working party representing LINZ, the Department of Conservation, and the Ministry of Agriculture and Forestry.

Main Findings

- The concept and definition of ecological sustainability outlined in this report is not intended to be a general definition, but rather to provide an agreed understanding of ecological sustainability for the purposes of tenure review.

- Ecological sustainability comprises several elements:
    a. It is applied to a defined tract of land
    b. The ecological attributes to be sustained are specified
    c. It has a goal
    d. It has a time scale
    e. It considers off-site effects.

- Stringing these elements together provides the definition:
    Ecological sustainability is the maintenance or enhancement, in the long term, of present ecosystem attributes, for a defined tract of land, while avoiding effects that compromise off-site ecosystems.

- It is proposed that the concept of ecological sustainability be applied in tenure review by undertaking a basic analysis of risks to sustainability.

- The risk analysis considers the vulnerability of ecosystem attributes and the pressures likely to be applied under proposed tenure and protective mechanisms. A significant risk results from a combination of both high vulnerability and high pressure.

- The relevance of 'indigenous biodiversity' as one of the ecological attributes to be sustained is discussed.

1. Introduction

Guidelines to help those making tenure decisions under the Crown Pastoral Land Act 1998 to properly consider ecological sustainability were provided to LINZ by Landcare Research in June 2004.

2. Background

2.1 Decision-making context of the guidelines

In tenure review a decision is made to designate blocks of land to either public or private ownership. The focus of the decision is on tenure. However, there are protective mechanisms[1] that can be applied, though any associated cost may be a barrier to approval. Proposed designations need to be tested against the objects of tenure review, as stated in the Crown Pastoral Land Act 1998 (CPLA), the first of which is to 'promote the management of reviewable land in a way that is ecologically sustainable: …' (CPLA, section 24, p. 17).

One professional involved in the tenure review process described the decision making process undertaken when considering ecological sustainability as seeking answers to the question:

> 'What values does this land have and what tenure, and protective mechanisms, are needed to protect these?' or
> 'In designating land, how am I promoting the management in a way that is ecologically sustainable?'

Consideration of ecological sustainability assumes that good appropriate management would be applied. It also assumes that, if relevant, prospective uses would be economic. Therefore, these guidelines do not consider economic sustainability or prescribe particular uses or management practices. It is recognised that the ultimate tenure decision will give regard to the whole property and consider balancing factors other than ecological sustainability.

Our goal, therefore, is to provide guidelines that will support those making tenure decisions to properly consider the ecological sustainability component as intended by the CPLA.

[1] The main protective mechanism options include:
- Crown ownership with concession, special lease, or grazing permit
- Freehold with covenant under Conservation Act, Reserves Act, QE II Trust Act, or Historic Places Act.
- Freeholding with sustainable management covenant.
- Easements

To achieve our goal of producing decision-making guidelines, we need to start with some clarity about what ecological sustainability is.

In these guidelines we define ecological sustainability and then outline a way in which this concept may be applied in support of tenure decisions.

It should be noted that the CPLA (see Appendix 1) requires promotion of ecological sustainability in all reviewable land. The land under consideration may or may not have recognised significant inherent values (SIVs).

3. Objectives

- Define principles for the application of the term 'ecologically sustainable management' as per Part 2 Crown Pastoral Land Act 1998 to develop a definition applicable to tenure review.

4. Method

A one-day workshop was held on 27 May 2004. It included, in addition to Landcare Research staff, two external agronomic advisors and specialists (Dr B. Allan and Dr A. Metherell), and the Commissioner of Crown Lands and his staff, who agreed to brief Landcare Research on the background to and intent of the Part 2 CPLA object of management of reviewable land in a way that is ecologically sustainable.

Follow-up discussions where held with the external advisors and LINZ to develop draft principles for evaluation of ecologically sustainable management in the context of tenure review decision-making. The working draft was provided to LINZ tenure review decision-makers and was then presented to an inter-agency working party comprising a representative each from LINZ, the Department of Conservation (DOC), and the Ministry of Agriculture and Forestry (MAF) for discussion and feedback.

Feedback was considered and incorporated into a 'final draft report' to LINZ where a consensus exists. Any differing views on interpretation of the CPLA or application within tenure review were identified and reported in the discussion section of the report. This report represents a consensus of a group of experts but it does not include a thorough review of the literature relating to ecological sustainability.

5. Main Findings

5.1 The concept of ecological sustainability

The concept and definition of ecological sustainability outlined in this section is not intended for general purpose, but rather to provide an agreed understanding of ecological sustainability for the purposes of tenure review.

Because sustainability means different things to different people, there is need to clearly describe, for any application, how it is being used. This can be done by specifying a number of elements. For the application of ecological sustainability in tenure review the elements are:

1. It is applied to a defined tract of land

The extent of the relevant land must be stated. Where there is significant variation in space and time in cover and microhabitats the extent would encompass an overall association of contrasting areas. The extent should also be one that can be managed as a unit. In grazed land, tracts may need to be large enough to integrate stock nutrient transfers.

2. The ecological attributes to be sustained are specified

'Ecosystem' is defined in the CPLA as 'a system of interacting living organisms and their environment', so we may interpret 'ecological sustainability' to mean 'sustaining a system of interacting living organisms and their environment'. This suggests that ecosystems comprise three parts; organisms, environments and interlinking processes. Alternative terms for these three components are biota, life supporting capacity and functions **(**Blum and Santelises 1994).

These components cannot be measured and monitored in the entirety because of their complexity. Indicator attributes therefore need to be chosen that can be measured and interpreted (Doran et al. 1994) to estimate ecosystem state and trend. Indicator attributes are needed for each of the biotic, life-supporting capacity and process components. If these ecological attributes are maintained it is likely that the ecosystem will be sustained.

Examples of attributes that will indicate ecosystem status:

Biotic attributes
Diversity
Composition
Indigenousness
Ground cover
Biomass
Structure

Life-supporting capacity attributes
(Where "life" primarily includes either indigenous organisms or productive species)
Soil–plant nutrient pool
Topsoil intactness
Soil structure (porosity/density)
Soil organic matter
Acidity

Process attributes
Plant and animal community dynamics
Nitrogen mineralisation
Regulation and storage of water
Adsorption and degradation of toxins

3. It has a goal

A goal is necessary if the system is to be managed.
Two general goals are proposed:

- *Enhancement*. An ecosystem (in some defined tract of land) may be in such a depleted condition or unstable state that it may be impossible to maintain ecological attributes in their existing state. A goal would be stated that defines the desirable status for attributes of a more stable ecosystem.
- *Maintenance* Another ecosystem may be stable and the goal would be maintenance of existing attributes. A goal to maintain ecological attributes might include allowing the biota to advance through a succession from tussock to shrub-land and to forest. In that case the biotic attributes of structure and biomass would no longer apply.

Critical management inputs may need to be stated (e.g. of fertiliser and seed, weed and pest control). The economics of delivery are not specified, but it would be pointless specifying inputs that were never likely to be economically justified or supported.

4. It has a time scale

Ecological attributes need to be maintained in the long term. Over a period of time there should be no net loss of stated ecological attributes (Pickup and Morton 1995). This time period needs to be stated as a guide for realistic management and monitoring. The length of time needs to be based on an understanding of how the ecosystem attributes (e.g. vegetation biomass, soil acidity) vary in time naturally or in response to management. There will be short-term fluctuations, and a long-term trend that is the aggregate of the short-term fluctuations. The short-term fluctuations are managed adaptively in order to achieve the sustained desirable long-term trend. Such adaptive management and tracking of long-term trends requires well- designed monitoring and analysis of results against preset goals.

Consideration of intergenerational equity suggests that soil quality should be managed so there is no net loss of quality over 25 years (a standard period for one human generation) (Sparling et al. 2003). For vegetation, the time period needs to be related to the estimated time needed for vegetation attributes to recover from pressure applied by management (resilience). The minimum time scale must be sufficiently long that a trend can be detected.

Although fluctuation is expected, management must avoid taking the system through any known irreversible (or difficult to reverse) thresholds.

5. It considers off-site effects

Ecologically sustainable management considers possible effects on ecosystems beyond the immediate tract of land. For example, leakage of applied nutrients may affect water quality.

Definition of ecological sustainability

A generic definition of ecological sustainability is assembled from the elements. A specific definition will specify each of the elements.

> ***Ecological sustainability is the maintenance or enhancement, in the long term, of ecosystem attributes, for a defined tract of land, while avoiding effects that compromise off-site ecosystems.***

5.2 Application of ecological sustainability in tenure review decision-making

The method of application proposed here is that, for a given tract of land, the tenure and protective mechanism options are listed and the relative risks to achieving the stated goal within the nominated time scale are evaluated. Consideration is then given to the level of risk when tenure options are determined. It is envisioned that this process would not be applied routinely but only where support is needed in difficult decisions.

Step 1.

Delineate the tract of land

- Normally a management block but might ranging in extent from a small area to a landscape.

Evaluate the ecological attributes that are to be sustained

- For practical field application the list of ecosystem attributes is reduced to attributes that may be readily evaluated.
- It is likely that ecological attributes will be in a favourable state if the following are true:
  - Healthy vegetation cover is maintained
  - Indigenous biodiversity, if present, is maintained
  - Loss of soil through erosion is minimised
  - Losses to nutrient pools by nutrient off-take or redistribution are replaced
  - The potential for contamination of water bodies is limited

State the goal

- Is the goal maintenance or is restoration of some ecological attributes required?

Specify the minimum time period for detecting a trend

- This presupposes that a monitoring system is planned, in which case a time scale is needed to interpret results

Consider possible off-site management effects

- Possible off-site effects include:
  - Nutrient leakage to water bodies
  - Weed or pest invasion
  - Sedimentation.

Step 2.

List the alternative tenure and protective-mechanism options.

Step 3.

Estimate the relative risks (see below) for each option and choose the option(s) for which risks are not significant.

5.3 Evaluating risks to ecological sustainability

Potential risk may be evaluated by examining the imposition of pressure on the vulnerability of the ecosystem to that pressure, where 'pressure' is a measure of impact intensity, stress or disturbance due to management, as used in the pressure-state-response model (Ministry for the Environment 1997).

Potential risk = vulnerability + pressure

		Pressure	
		Significant	No significant risk
Vulnerability	Significant	**Significant risk**	No significant risk
	No significant risk	No significant risk	No significant risk

Risk analysis steps:
For the delineated area:
(1) Assess the vulnerability of each ecosystem attribute
(2) Assess the pressures likely to be applied (see checklist below)
(3) Assess the risk where there are combinations of significant pressure on significant vulnerability.

Checklist of pressures

Natural pressures
Drought
Wind
Snow
Rain
Frost
Climate change

Management pressures
The pressures proposed by Stephens et al. (2002) relevant in the measurement of conservation achievement are given in parentheses.

Cultivation
Mechanical harvesting
Traffic type and frequency
Earthworks
Tracking
Fertilising
Over-sowing
Herbicide/pesticide sprays
Vegetation clearance (Biota removal*)*
Weeds (Infestation) and pests
Burning
Crops (type)
Irrigation
Drainage
Grazing – domestic
Grazing – feral (Consumption)
Contamination
(Physio-chemical resource modification)
(Fragmentation)

Determining vulnerability

For each ecosystem attribute, determine its vulnerability to an applied pressure. It will be possible, for many ecological attributes, to develop guidelines for assessing vulnerability. There are interactions between ecological attributes, e.g. topsoil normally vulnerable to erosion will be less vulnerable under good vegetation cover. Thus vulnerability of vegetation cover is of prime importance.

6. Discussion

The LINZ, DOC, MAF working group considered a working draft of the above guidelines and provided feedback. The required changes were minor.

Debate at the meeting, and in following discussions, focused on two issues

The first issue was - should ecosystem attributes be qualified as 'present ecosystem attributes' or as 'desirable ecosystem attributes in the proposed ecological sustainability definition. Both qualifiers lead to ambiguity and neither of the words were retained.

The second issue was - should application of ecological sustainability in tenure review distinguish between indigenous and introduced organisms. Should 'indigenous biodiversity' or 'indigenousness' be included in the list of ecosystem attributes to be sustained, and how should it be defined. Although the other listed ecosystem attributes also require further scrutiny and definition, their inclusion was not controversial.

In the CPLA, ecosystem is defined as a 'system of interacting living organisms and their environment'. Therefore 'ecologically sustainable' means sustaining a system of interacting living organisms and their environment.

A DOC view is expressed in an unpublished report prepared by DOC (Department of Conservation 2004). It concludes that ecologically sustainable management means encouraging and supporting land management practices that, among other things, enable on-going interactions between indigenous organisms and their environments, and maintain the current numbers and extent of indigenous organisms and their environments. The report also concludes that this definition does not fit well with the intention under the Crown Pastoral Lands Act 1998 (CPLA) that lands freeholded unencumbered in a tenure review may be developed to their best economic use (if allowed under the Resource Management Act 1991). For such lands, the report suggests that it is reasonable to expect land management practices will maintain the ability of the chemical and physical properties of the soil and water resources to continue to provide a full range of products—i.e. sustainable soil and water management.

The DOC report recognises that officials, in consultation with stakeholders, need to do further work to clarify the concept of management that is ecologically sustainable. This work will need to recognise the context of (i) the major historical concerns about land degradation that resulted in the development of the CPLA (Martin 1994) and (ii) the existence of the Government's high country objectives and Part 2 objects of the CPLA (particularly to protect significant inherent values).

A LINZ view is that the phrase 'living organisms', in the CPLA definition of 'ecological' does not necessarily mean indigenous organisms, and should be neutral with regard to the indigenous or introduced status of species. Section 24 of the CPLA separates the promotion of

ecological sustainability and the protection of significant inherent values as distinct objects. It can be argued that it is the services that an ecosystem provides that are to be intrinsically valued and not the specific biota (Callicott and Mumford 1997).

The authors of this report conclude that there are fundamental differences in how agencies and individuals interpret the concept of ecological sustainability. Such differences may strongly influence land allocation and/or protective mechanisms. Arrival at an agreed definition for ecological sustainability requires a decision on the status of indigenous organisms. The concept of sustainability cannot be applied unless it is clear what it is that should be sustained. The decision on whether indigenous organisms should be specified will need to consider the following implications.

Implications of requiring consideration of indigenous organisms:

- Ecological sustainability will either (1) need to have two definitions, one for land with appreciable indigenous components and another for land without appreciable indigenous components, or (2) will apply only to land with appreciable indigenous components, and be replaced by another term for land without appreciable indigenous components. In the latter, the focus would be more on the life supporting capacity rather than the organisms and might be expressed as "sustaining quality ecosystem services"
- A threshold would need to be defined between land with and with out appreciable indigenous components.
- Covenants or some other protective mechanism would be required for freehold land with indigenous organisms. These would probably require the formulation of management plans.
- Development of freehold land with some defined indigenous component may be restricted.
- For all ecosystems, indigenous communities fill a number of roles. They provide benchmarks for assessing trends arising from land use, contribute to ecosystem resilience, demonstrate natural ecosystem functioning for education, help meet biodiversity goals (Hunter et al. 1996), protect water and soil values, and establish natural character of the landscape and sense of place.

Implications of considering biota to be species neutral:

- If 'significant inherent values' is defined with a high requirement for significance, there will be land with an appreciable component of indigenous organisms for which neither SIV nor ecological sustainability objects apply. This includes land proposed as having SIVs but failing to receive full protection in the course of Tenure Review. The long-term result may be the elimination of indigenous ecosystems, organisms and natural character across extensive areas of the high country (just how significant this area might be is unknown).
- If it is intended that concepts of ecological sustainability do not provide directly for the retention of indigenous organisms that lie outside of defined SIVs (and associated landscape values), then wider use of protective mechanisms such as covenants may be required over freehold land.

7. Acknowledgements

Funding for this work was provided by Land Information New Zealand.

8. References

Blum, W.E.H. and Santelises, A.A. 1994. A concept of sustainability and resilience based on soil functions: the role of ISSS in promoting sustainable land use. p 538-542. In. Soil Resilience and Sustainable Land Use. Edited by Greenland, D.J. and Szabolcs, I. Symposium Proceedings, Budapest, 1992. CAB International, Wallingford UK. 561p.

Callicott, J. B. and Mumford, K. 1997. Ecological sustainability as a conservation concept. Conservation Biology. 11: 32-40.

Department of Conservation. 2004. Unpublished report on management that is ecologically sustainable. The report is an appendix to a joint Land Information New Zealand-Department of Conservation high country report back paper prepared for Cabinet Policy Committee (but not yet considered by the Committee).

Doran, J. W.; Coleman, D. C.; Bezdicek, D. F. and Stewart, B. A. 1994. Defining soil quality for a sustainable environment. Soil Science Society of America Special Publication 35. Soil Science Society of America, Madison, WI.

Hunter, G. G.; Partridge, M. J.; Kilvington, M. J.; Meurk, C. D. 1996: Options for an eco-system-based approach to regional soils and land use planning in Canterbury. Landcare Research Contract Report LC9697/058 (unpublished).

Martin G. 1994. South Island High Country Review: Final report of the Working Party on Sustainable Land Management. Chairman – G. Martin. 184p.

Ministry for the Environment. 1997. Environmental performance indicators. Proposals for air, fresh water and land. Ministry for the Environment, Wellington. 158p.

Pickup G. and Morton S. R.1995. Restoration of arid lands. p177- 192. In. Defining and measuring sustainability: the biogeographical foundations. Edited by Munasinghe, M and Shearer, W. The United Nations University and The World Bank. Washington DC. 440p .

Sparling, G.P.; Parfitt, R.L., Hewitt, A.E.; Schipper, L.A. 2003. Three approaches to define desired soil organic matter contents. J. of Environmental Quality 32: 760-766.

Stephens, T.; Brown, D.; Thornley, N. 2002. Measuring conservation achievement: concepts and their application over the Twizel area. *Science for Conservation 200*, Department of Conservation, Wellington.

Appendix 1

Objects of Tenure Review (Crown Pastoral Land Act 1998)

(a) To –

(i) Promote the management of reviewable land in a way that is ecologically sustainable:

(ii) Subject to subparagraph (i), enable reviewable land capable of economic use to be freed from the management constraints (direct and indirect) resulting from its tenure under reviewable instrument; and

(b) To enable the protection of the significant inherent values of reviewable land –

(i) By the creation of protective mechanisms; or (preferably)

(ii) By the restoration of the land concerned to full Crown ownership and control; and

(c) Subject to paragraphs (a) and (b), to make easier –

(i) The securing of public access to and enjoyment of reviewable land; and

(ii) The freehold disposal of reviewable land.

New complementary Government objectives for the South Island high country

- To ensure that conservation outcomes for the high country are consistent with the New Zealand Biodiversity Strategy. To progressively establish a network of high country parks and reserves.

- To foster sustainability of communities, infrastructure and economic growth and the contribution of the high country to the economy of New Zealand.

- To obtain a fair financial return to the Crown on its high country land assets.