

A land systems approach: Bay of Plenty

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LAND SYSTEMS HAVE BEEN AN IMPORTANT scientific concept in New Zealand landscape studies for many years (Swaffield and O'Connor 1986), but have only recently been incorporated fully into landscape assessments by landscape architects. This case study features the combination of land systems with related ecological and climatic concepts in the Bay of Plenty (BOP) region of New Zealand.

The BOP study was undertaken by Lucas Associates in association with Ian Lynn and Wildland Consultants, who provided specific scientific expertise. The aim of the study was to develop a framework for monitoring ecological integrity. It differs in focus from landscape assessments that address the specific requirements of s 6(b) of the Resource Management Act 1991 (RMA91) for the protection of outstanding natural features and landscapes. However, the difference is more than one of statutory focus – it is also one of philosophy as it illustrates the distinctive emphasis of Lucas Associates's approach, which Lucas Associates now applies to most landscape assessments.

The essential feature of the BOP assessment is that it is based on a systematic analysis of ecological integrity, measured in terms of the spatial configuration, processes and evolving condition of the biophysical environment, and that culminates in the development of management guidelines for the entire landscape of the region.

Concepts

KEY WORDS
Ecological integrity
Landscape assessment
Monitoring
New Zealand

The key concepts of the assessment are land systems, landform components, bioclimatic zones, ecological districts, and ecological units (eco units). In this study, land systems are interpreted as physiographic land types, reflecting both lithology and tectonic regimes. The BOP study uses broad land systems (eg igneous/volcanic country) as a large-scale classification, as well as specific systems (eg Rotoroa–Okataina). Within land systems, landform components are identified (eg scarps, low terraces and volcanic fan). These provide the basic spatial ordering framework for the analysis, evaluation and subsequent management of landscapes.

Overlaid on this land systems base are bioclimatic zones, based on the distribution of indicator plant species. Ecological districts are classifications of topography, geology, climate, soils and biota, each with a characteristic landscape and range of biological communities (McEwen 1987). The ecological districts are complemented by the reconstruction of indigenous vegetation cover at several historic periods: before human modification, 1840 (pre-European modification) and present day.

CASE STUDIES

The term 'eco unit' has been developed to refer to a landform component lying in a particular land system, ecosystem, bioclimatic zone and ecological

district. Eco units provide the means by which these other dimensions are spatially integrated for analysis and management. There are three parameters of ecological integrity at the eco unit level, all referring to indigenous vegetation cover. They are proportion remaining, fragmentation and condition.

Method

The BOP analysis combines geographic information systems (GIS) mapping with other databases (eg vegetation types) in a series of layers. For each land system, tables are prepared that link ecological district, bioclimatic zone, landform

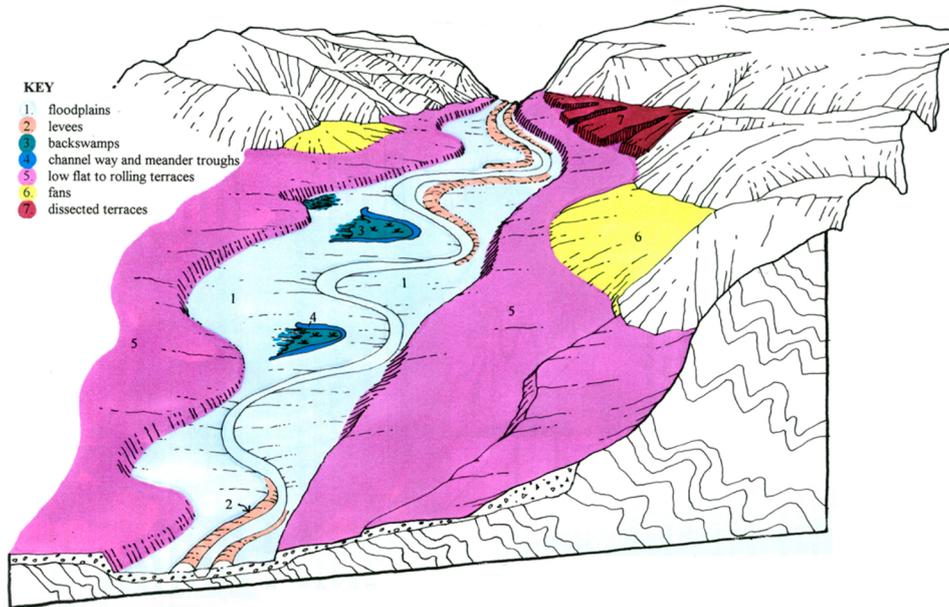


Figure 1: Example of land system/ecosystem framework (free-draining valley floor)

component, geological formation, elevation, historic vegetation, present land use and measures of current ecological integrity. These lead to the formation of summary issues and management guidelines. In the BOP study, the use of GIS layers, combined with extensive graphic illustrations, suggests some parallels with the McHarg (1969) case study approach. However, there are two major differences: the BOP study focuses on monitoring ecological integrity rather than the comprehensive development plans used by McHarg, and the use in BOP of landform or 'eco units' as the focus for analysis provide local-scale management units. Management is based on 'best practice' guidelines. An important feature of the BOP approach is its hierarchical structure, with small-scale units of analysis within larger units. This ensures the integration of detailed management with broader policy frameworks.

Using the indicators of integrity listed above, 'red light' areas requiring urgent action and buffering opportunities are identified. Information and measures can also be aggregated for use at regional and national levels and there is also scope to update regularly the database using remote sensing data.

Landform component	Geological formation	Elevation (metres)	Historical vegetation	Present land use	Indigenous vegetation/habitats				Ecological issues management
					Present	Proportion	Fragmentation	Condition	
Flats	Variable tephra mantle over alluvium	< 300	Podocarp forest, podocarp/hardwood forest	Exotic forestry, conservation land	Secondary scrub and shrubland	Low	Very	Poor	Protection of remnant vegetation, 14% remains (4% protected)
Wetlands	N/A	< 30	Swamp forest, raupo, Baumea, Schoenoplectus, Bolboschoenus, manuka	Industrial site(s), grazing, informal protection	Varies, includes raupo, Eleocharis, Baumea, Schoenoplectus, Bolboschoenus, manuka	Not known	N/A	Poor	Generally degraded, potential for better protection and restoration
Geothermal areas	Undifferentiated alluvium, terrace deposits	< 300	Geothermal vegetation	Conservation land	Geothermal vegetation, mainly prostrate kanuka	High	Relatively intact	Good	Monitoring recently instigated by DoC in Parimahana SR
Low terraces	Recent terrace fan and uplifted or remnant lake floor deposits with variable tephra mantle	< 300	Originally podocarp/tawa forest, probably kanuka forest by c 1840	Conservation land	Secondary shrubland	High	Relatively intact	Good	Animal pests

Figure 2: Example of management framework – Rotorua–Okataina volcanics land system/ecosystem (semi-coastal bioclimatic zone)

Extension into other dimensions of landscape

The BOP study focuses on ecological integrity. However, the land systems base lends itself to, and has been used for, the development of landscape assessments that extend from the biophysical to incorporate cultural and human experiential dimensions. The key feature is the use of land systems as a scientifically validated base for subsequently adding and interpreting landscape values. A second important link to conventional landscape assessments is using oblique 3-D model sketches of land systems to illustrate key interrelationships. This provides a useful base for community consultation.

Conclusion

The essential contribution of this case study to the consideration of landscape assessment procedures is that it offers a set of concepts and methods for analysing the biophysical environment that can be used to underpin all landscape assessments. There are two potential advantages in this. First, adoption of land systems provides a shared conceptual language for the descriptive phase of assessment, which also connects with other disciplinary contributions. Secondly, it provides a credible biophysical base for interpreting landscape character, on which experiential and cultural interpretations can be overlaid.

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