7 LAND SYSTEMS

Definitions of mapping units require progressive change because of changes in technology and in attitudes towards the use of land. The land types recognised within the Avoca catchment accord with the following concepts and definitions currently used by the Soil Conservation Authority.

Concept

Definition of mapping units is based on the ecosystem concept, in which several land characteristics are integrated. Climate, geological material, land form, soil and native vegetation are considered because they affect the inherent properties and processes of the land and its response to management.

The mapping units and their interrelations are recognised by examining covariance between classes of these characteristics in local and regional sequences. Local sequences are repetitive - usually slope sequences of particular soils and vegetation within particular land form associations. Superimposed at the regional scale are the effects of climatic trends.

The inherent nature of the land is taken to be the condition before intensive modification, which began in the mid 19th Century and has subsequently extended to a large proportion of the State. Observations on relatively undisturbed sites are required, and this leads to a lack of data in some intensively used districts. Knowledge of the inherent condition provides a standard against which to compare the effects of uses on the land and *vice versa.*

In general concept, the mapping unit can be considered as an area of land with specified variation in inherent characteristics - climate, geological material, land form, soil and native vegetation - and therefore having a specific inherent range of properties and processes significant for a variety of uses in terms of production, land deterioration hazard and management.

Mapping is required at various scales to meet planning needs ranging from a few hectares to the whole State. Three categories of mapping unit are used within the Avoca catchment - land component, land system and land zone. Their common limits of variation are shown in Table 10. Variability of landscapes precludes the setting of rigid scales for the categories. For example, land systems are commonly mapped at scales of 1:100000 to 1:250000, but occasionally at 1:50 000 or 1:500 000.

Definitions

A land component is an area of land, distinct from the surrounding terrain, having an integrated assemblage of particular classes of geological material, land form, soil and native vegetation.

A land system is an area of land, distinct from the surrounding terrain, that contains particular classes of land characteristics with maximal covariance between them, expressed as a recurring sequence of particular land components. The land components generally occur in similar proportions, and have similar interrelations, in each occurrence of a particular land system.

A land zone is a broad area of land consisting of land systems that are related in terms of one or more of the independent land characteristics - land form, geological material and climate. Soils and native vegetation are listed in broad terms, but these are not taken into account when differentiating land zones.

Presentation of data

Twenty-eight land systems have been mapped (see the map inside the back cover), grouped into nine land zones according to geomorphic changes (as shown in Figure 8). Patterns were delineated by interpretation of aerial photographs at a scale of approximately 1:80000. Land systems and components were recognised within the geomorphic units through field traverses and studies of the relations between soils, vegetation and the independent variables climate, geological material and land form.

The description of each land system includes a general description, a block diagram showing the topographic situation of each land component, photographs, a table of land features and a table of land deterioration hazards. Cross-sections are included in areas of low relief.

Table 10 -- Common limits of variation in classes of land characteristics for the mapping units

Mapping unit	Land form	Geological material	Soil	Native vegetation
Land component	Land form or slope segment	Uniform texture, structure, genesis	Series	Association
Land system	Land form(s)	Varied texture, structure, genesis	Series, association	Alliance(s)
Land zone	Land forms	Dominant texture, structure, genesis	Principal profile forms	Formation(s)

Authorities are as follows:

Land form	- Alley and Jenkin (personal communication, 1980)
Geological material	- Texture, Wentworth (1922)
Soil	- Series, series complex, series association - United States Department of Agriculture, 1951 Principal profile form - Northcote, 1979 (Series is regarded as analogous to extended principal profile form, PPF+' of Northcote, 1979)
Native vegetation	- Association, alliance, - Beadle and Costin, 1952 Formation - Specht, 1970

The table of land features provides detailed data relevant to productivity, hazards and many aspects of management. The methodology is given in Appendix VI.

Table of land deterioration hazards

The methodology for the table of land deterioration hazards has been developed for general-purpose land inventories, based on land features and processes (J. N. Rowan and J. M. Aldrick, unpublished data). It involves the concepts discussed below. ***A standard condition of the land,*** as a frame of reference, is the relatively undisturbed condition, which can be observed inmost districts -for example, on roadside or other Crown land reserves. It is the reference point for land characteristics and for the original magnitude of relevant land processes. The inquiry is into the changed magnitude of processes of deterioration following land disturbance. ***Broad categories of disturbance*** can be related to use and management practices. Forms of disturbance are easier to classify than forms of use because the management variable is eliminated, and the result can be related more easily to processes that occur in the land. The four basic categories of disturbance, and examples of practices that can cause them, are shown in Table 11. These may induce secondary categories, including raised water table, increased run-on and deposition.

Table 11 - Categories of disturbance and possible causes

Category	Possible cause
Altered vegetation – decreased leaf area, perenniality or rooting depth	Clearing, cultivation, selective logging, ring-barking, grazing, fire
Reduced soil surface cover	Fire, grazing, cultivation, bulldozing
Increased trafficking, trampling	Livestock, humans, vehicles
Increased soil disruption	Clearing, logging, cultivation, roading, burrowing

Affected process and trend. The designated processes resulting from disturbance are first- and second-order responses relevant to forms of deterioration. They are assessed empirically - for example, by observing increased run-off - and rationally through known relations between land characteristics and processes. This knowledge is increasing rapidly through investigations into land deterioration. Particularly relevant to the Avoca catchment are investigations of land deterioration in northern Victoria (Jenkin 198 1).

Primary resultant deterioration, form, is assessed rationally according to the land characteristics and empirically by observing the results of management practices. A wide range of forms is considered -various forms of erosion by water and wind, mass movement, soil physical and chemical decline, and deterioration of water quality and regulation.

Primary resultant deterioration, susceptibility. Ideally, susceptibility will be based on rational methods derived from experimental correlation of land characteristics such as slope, vegetative cover and soil erodibility with the amount of deterioration. Such data are lacking for all forms of deterioration in northern Victoria, so a subjective, rational estimate of susceptibility has been made through observing incidence under poor management. The least reliable of these estimates is that of nutrient decline, which is not directly visible. Jenkin (198 1) has shown that nutrient decline can be considerable on permeable soils used for agriculture in northern Victoria. Indirect evidence is also provided by the widespread increase in salinity of soils

and waters; salts in general are leached from the soils, not just sodium chloride. In the table of hazards, the estimate of susceptibility is based on permeability of the soil and its nutrient status.

Primary resultant off-site process. Changed magnitude of a process at a site may cause deterioration elsewhere. For example, increased soil compaction on a hillslope will increase run-on at lower sites, and this may lead to gullying of drainage floors.

Aerial photo showing land system boundaries, south of Amphitheatre.
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