6. Soil Conservation

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Land degradation

Pre Settlement

Prior to European settlement, the land of the Goulburn River Catchment was relatively stable with a protective woodland or forest cover with an understorey of grasses or scrub.

Settlement

Pastoral settlement began around 1840 with the occupation of the plains and foothills. Population increased dramatically with the discovery of gold in the 1850's and 60's. The mining activity was accompanied by widescale utilisation of hardwood forests.

Towards the end of the 19th century the squatting era and the gold boom ended, and closer settlement of land soon followed. Settlers regarded trees as a hinderance to agricultural development and removed vast numbers by ringbarking, felling and burning.

Agricultural activity was concentrated on wool production with the exception of the more fertile creek and river flats, where dairying flourished. The introduced animals had the effect of reducing the vegetative cover and compacting the soil surface – both leading to increased runoff.

Rabbits had reached pest proportions by the turn of the century. Numbers grew unabated until the early 1950's when myxomatosis was introduced. The rabbit exacerbated the overgrazing problem and its burrowing habits often initiated erosion.

The combination of these factors (ie. Removal of trees, over-grazing of the native vegetation, compaction of soil surface and soil disruption through mining and rabbit activity), led to wide scale land degradation by sheet and gully erosion, often resulting in siltation of streams and storages (Plate 6.1).

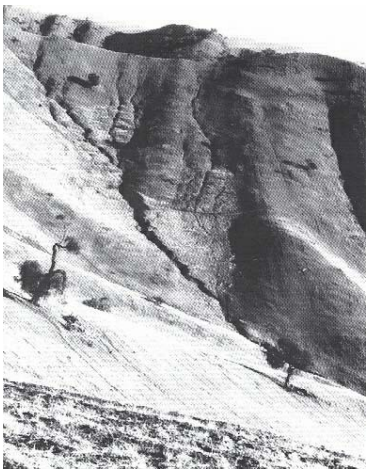


Plate 6.1 Typical hill country scene within the study area. Note the almost total removal of trees and the rill and gully erosion that has occurred.

The control of rabbits and the introduction of superphosphate and subterranean clover in the 1950's reduced the severity of the degradation as ground cover was restored. However, the increased fertility and higher stocking rates created new problems such as the spread and dominance of annual weeds (Plate 6.2) and increased incidence and severity of grass fires. Annual weeds provide very poor ground cover over the summer/ autumn period and grass fires have the effect of rapidly devastating large areas of ground cover in the same period.

Plate 6.2 Increased fertility has caused the spread and dominance of capeweed. When capeweed dies off in late spring the hills are left bare.

Loss of ground cover becomes disastrous when followed by high intensity thunderstorms. Such storms are frequent throughout summer, but are usually confined to smaller areas. Soil loss in such instances has been estimated at over 5 tonne/hectare. Occasionally the storms are more widespread as in 1983 when several thousand hectares were severely sheet eroded by 40 mm of rain falling in less than 30 minutes in the vicinity of Bonnie Doon (Plates 6.3 and 6.4).

Plate 6.3 Tonnes of organic matter, silt and gravel stripped from the hillside have flattened this fence and blocked a road culvert to the left of the photograph.

Recent Land Use

Since 1970, land use in the study area has changed significantly. The main changes have been:

(1) Subdivision of Land

Farming land has been subdivided into numerous small allotments – the large majority of which have been purchased by absentee landlords.

The change in land ownership patterns has frequently led to a reduction in the standard of land management. Firstly, the subdivision and associated development has often been poorly designed and badly constructed, resulting in steep access roads, large areas of hard surfacing, unsatisfactory effluent disposal and eroding dams. Secondly, absentee owners commonly neglect vermin and noxious weed control and fire prevention works. Thirdly, many of the owners are unskilled, inexperienced in land management and stock husbandry, resulting in generally poor land use practices.

Overall the land has become more neglected and less productive as a result of subdivision.

Plate 6.4 A heavy thunderstorm on an overgrazed hillside resulted in severe sheet erosion in the vicinity of Boonie Doon.

(2) The Rural Crisis

Full time farmers are caught in a cost-price squeeze. Their major asset, the land, is valued far in excess of its true productive worth because of its subdivision potential. Increasingly the full time farmer is being forced to reduce high cost inputs such as fertiliser, while still striving to increase production. In the short term such as philosophy keeps the farmer viable and does little harm. However, if the farmer pursues such a course indefinitely, the property deteriorates, production drops and income is further reduced. Faced with the dilemma of borrowing heavily or subdividing and selling the farm, many farmers are choosing the latter course.

In addition, fewer young people from farms are following in their parents footsteps and the ageing farmer population is gradually losing its complement of fit, able and skilled managers.

Overall the future for fulltime farming in the study area looks bleak and increased land degradation is to be expected on such farms.

(3) 'Collins Street Farmers'

Many of the larger rural holdings offered for sale over the last 15 years, have been purchased by businessmen farmers – the so called 'Collins Street Cockies'. These farmers by virtue of their off-farm incomes and generally high levels of education, have been quick to undertake improvement programs. They have also provided employment for many non-viable fulltime farmers.

Overall the effect of this land use change has been beneficial and land degradation decreased.

(4) Recreational Land Use

Within the study area, tourism has increased enormously and many new facilities have been established on both private and public land to meet the demand for increased recreational activities. Often sensitive areas receive the highest pressure eg. Eildon foreshore and stream frontages. The overall effect is increasing land degradation from trafficking and land disturbance.

Soil Conservation Problems

Water Erosion – Pastoral (Figure 6.1)

The clearing of native timber and heavy grazing of freehold land led to a decline in vegetative cover, particularly on steep non-arable land. Rainfall on these areas has removed the topsoil which has resulted in the degradation of drainage lines and streams, and discolouration and siltation of waters in major creeks and rivers. An estimated 40% of the study area is effected by varying degrees of sheet and gully erosion, plus siltation leading to reduced productivity of land and increased management problems (Plate 6.5).

Control of erosion on these areas has involved an integrated approach using deep rooted perennial grasses, treeplanting, earthworks and structures (Plates 6.6, 6.7 and 6.8). However the major emphasis is placed on presentative measures by providing advice for improved farm management (Plate 6.9).

Water Erosion – Non Agricultural (Figure 6.1)

The demands placed on both private and public lands cause considerable soil disturbance with potential for severe erosion from runoff.

Soil disturbance can be initiated in many ways including construction of highways, roads and access tracks, benching of house sites, installation of pipelines, clearing under high voltage power lines, logging activities, extraction of sand, soil, stone and gravel, off-road vehicle damage and soil erosion along streams. Approximately 3% of the study area is affected.

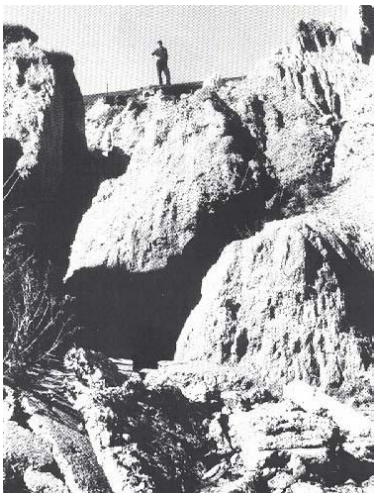


Plate 6.5 Severe gully erosion affects many drainage lines throughout the study area.

Plate 6.6, 6.7 Deep gullies often develop in drainage lines on overgrazed hillsides. However with reduced grazing, a series of diversion banks and treeplanting this gully has been stabilised.

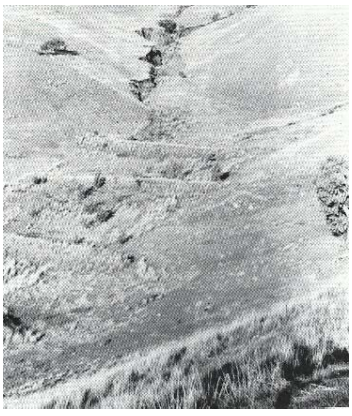


Plate 6.8 The sowing of deep rooted perennial pastures is an important means of controlling and preventing erosion. Traditionally a chisel seeder like the one above has been used but many other methods including aircraft are also successful.

Plate 6.9 Improved grazing management is the key to preventing soil erosion. The photo illustrates how excessive stocking rates can severely reduce ground cover and predispose the hill country to sheet erosion.

Control of erosion on non-agricultural land is primarily achieved by input to management through guidelines and prescriptions. Because of the nature of works many structured devices are required to control erosion, but the emphasis is on prevention rather than repair.

Water erosion – Alpine (Figure 6.1)

The alpine areas in the south-east of the study area are important water catchments even though they represent less than 1% of the study area.

Under natural conditions erosion hazard in these areas is low. However, once soil and vegetation are disturbed, erosion hazard increases with consequent risk to water quality and supply further down in the catchment.

Soil and vegetation disturbance, notably by grazing, ski-field and ski village development, logging road and track construction and mining is increasing as greater use, particularly for recreation, is made of alpine areas.

Control of erosion in the alpine zone is achieved by input to management of the area at all stages of development – planning, implementation and maintenance. A directive from the State Premier which requires approval be sought from the Department of Conservation, Forest and Lands for the earth-works above 1,220 metres ensures that consultation occurs (Vic. Act 1958).

Water Supply Catchment Protection (Figure 6.1)

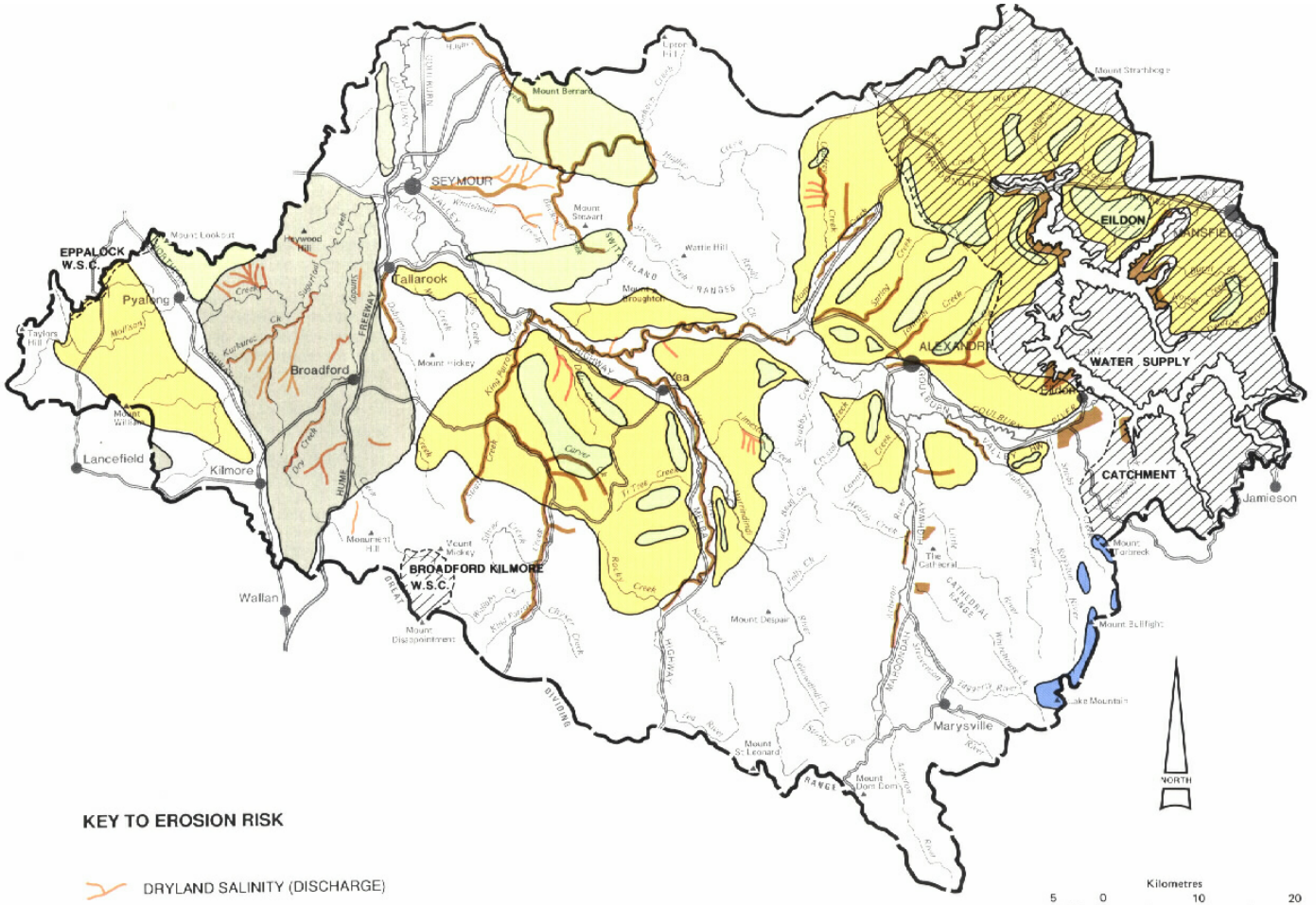
The study area contains significant water catchment areas. These areas are recognised by Proclamation or Land Use Determination and are as follows:

Catchment Name	Type	Area sq km
Upper Goulburn (Eildon)	Proclaimed	3807
Lake Eildon Environs	Land Use Determined	868
Kilmore	Land Use Determined	5
Sunday Creek (Broadford/Kilmore)	Proclaimed	20
Eppalock	Proclaimed	2124
Mollison Creek (Pyalong)	Proclaimed	166

Only part of the Eildon Catchment, approximately 8,000 sq km, is included in the study area.

Eppalock is only partially in the study area. (40 sq km approx.). A land Use Determination for Eppalock is almost completed.

As for other soil conservation components, emphasis for water supply catchment protection is put on prevention of problems. Close monitoring is kept on land use change, disturbance and management through close liaison with local government, advice to contractors and landholders and regular inspections. Where necessary conditions are applied to ensure land is managed so that water quality and supply is not adversely affected (Vic. Cir. 1979).



KEY TO EROSION RISK

- DRYLAND SALINITY (DISCHARGE)
- MODERATE STEEP HILL MANAGEMENT PROBLEMS
- SEVERE STEEP HILL MANAGEMENT PROBLEMS
- WATER EROSION (NON-AGRICULTURAL)
- WATER EROSION (ALPINE)
- SEVERE GULLY EROSION
- WATER SUPPLY CATCHMENT

KEY TO BASE MAP

- Boundary of study area
- Major roads
- Major towns
- Other towns
- Major peaks

Dryland Salinity

The deterioration of valley grazing land by salinisation is a direct result of rising saline water tables. This is thought to have been caused by the removal of deep rooted native species from groundwater intake areas. Not only does salting cause land deterioration, but also has a marked effect on water quality in streams (Plate 6.11).

Plate 6.10 Eildon Reservoir in the east of the study area is one of Victoria's major water storages and the prevention of soil erosion in its catchment is vital for its long term usefulness.

Plate 6.11 Rising saline water tables have caused severe land degradation in drainage lines in the west of the study area.

At present, an area of at least 400 ha is severely affected by salinity and an equivalent area is affected by incipient salting. The full extent of the problem is not known and awaits a detailed survey.

So far dryland salinity has been identified in the catchments to Whiteheads Creek, Bylands Creek, Sugarloaf Creek and in the Ghin Ghin and Gobur areas (Figure 6.1).

Methods of Erosion Control

Farm Plans

Emphasis is placed on preventing erosion by preparing farm plans which specify features of farm management to minimise potential erosion problems.

Pasture Improvement

Expert advice and incentives are given to encourage the introduction of deep rooted perennial grasses on the most erosion prone grazing lands. Techniques used include aerial seeding and contour seeding by chisel seeders (Plate 6.8). Such pastures increase production while providing improved ground cover and reduced runoff.

Treeplanting

Trees are used in a wide range of soil types and situations to prevent or halt soil erosion. The main sites are gullies, hilltops and salt affected areas. The trees bind the soil while aiding water infiltration, and improving soil structure. Water is held within the root zone and is prevented from percolating into the deep ground water table, thereby reducing the incidence of salinity.

Earthworks

Earthmoving machinery is used to repair gullies and tunnels by deep ripping and filling and to construct dams and banks to impound or divert runoff water. The works either remove gullies entirely or control water movement so that further erosion is prevented. Earthworks must be followed by appropriate vegetative control to protect the new works.

Structures
Various types of structures using concrete, plastic, timber, sandbags or old tyres are constructed in gully heads or along gullies to control the extension or deepening of gullies. Because of their high cost and maintenance requirements, such methods are used infrequently.

Fencing
Fences are used in conjunction with other measures to control stock grazing or movement. Fences are essential to exclude stock from treeplanting sites, newly sown pasture, and erosion prone areas.

The Future
The management of catchment areas, streams and rivers requires an integrated and co-ordinated approach to achieve total soil and water protection. At present in Victoria, responsibility for catchment protection rests with the Department of Conservation, Forests and Lands, while stream protection is the responsibility of the Rural Water Commission. Discussion is taking place between the two departments to define their responsibilities and ensure a co-operative approach is taken to any works.

Land Protection
Within the study area two distinct land types particularly require protection:

(i) ***Prime Agricultural land*** – needs to be preserved so that it is available for future generations for agricultural purposes.
(ii) ***High Erosion Risk land*** – needs to be protected against severe degradation so that it remains productive and does not adversely affect other land or public facilities.

Methods and/or incentives for achieving protection of these land types are urgently required. This may involve land use restrictions, land retirement or land improvement schemes.

Salinisation
The dryland salinity problem has been identified, but no quantified. Before any extensive control measures are introduced, study of the cause, extent and methods of control is required.

Pasture Development
Developments in pasture technology are of prime importance to the study area. In particular, the following areas require greater study:

(i) Improved methods of establishment of pasture species by both ground and air.
(ii) Plants which give optimum production under low phosphate conditions.
(iii) Cost benefit analysis of introducing improved pastures.
(iv) Methods of establishment of native pastures for reclamation works.

Other Soil Studies
More information and data is also required in the following areas so that soil management can be improved:

(i) ***Incipient Soil Degradation*** – a system which can be used to assess soil physical and chemical conditions is needed. This could be used to determine the status and trends of factors such as soil structure and acidity.
(ii) ***Recreational Land Use*** – preparation of guidelines for land based recreation.
(iii) ***Universal Soil Loss Equation*** – data for the study area needs to be developed with particular emphasis on the cover factor.

Plate 6.11 Rising saline water tables have caused severe land degradation in drainage lines in the west of the study area