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Fisheries and Wildlife Service
Victoria

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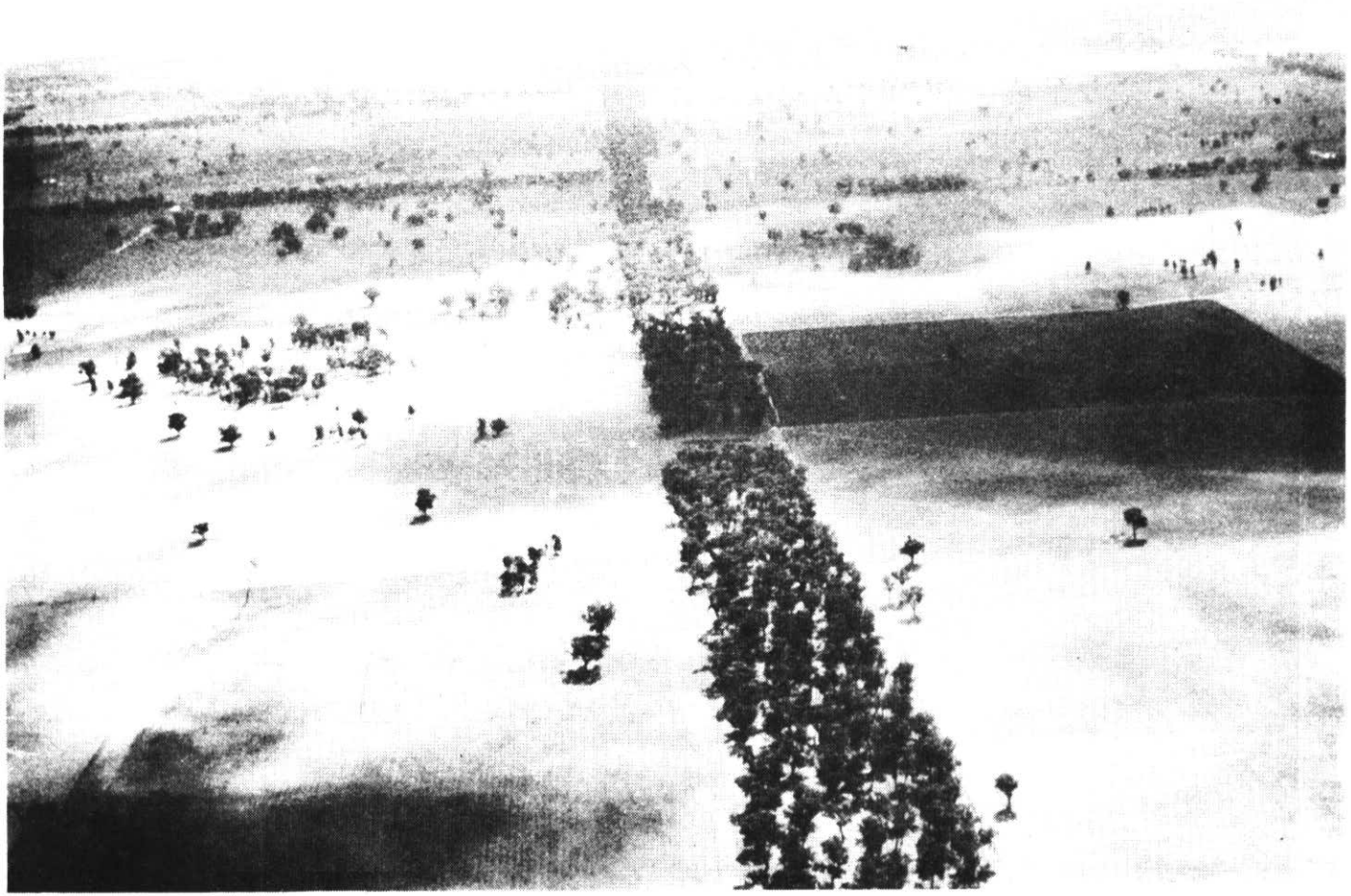
TECHNICAL REPORT SERIES No. 11

Conservation of roadsides and roadside vegetation

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**EDITORS: I. Thomas
A. Lindsay**

September 1984



Roadsides are often the only areas where clumps of indigenous vegetation remain.

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Editors: I. Thomas
A. Lindsay

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PREFACE

Apart from acting as a transport corridor for the movement of people, vehicles, stock and services, road reserves provide other functions. These relate principally to safety, comfort, landscape experience, wildlife habitat, fire protection and soil stability. The resource that provides the common linkage between these and the roadside, and which consequently contributes very substantially to the value of road reserves, is the roadside vegetation.

Appreciation of the significance of roadside vegetation in Victoria has been limited by lack of knowledge. Information that has been available has seldom been incorporated into the decision-making process by local and State authorities. This is because there has not usually been any clear or systematic concept of how such information could be used. To enable a systematic approach to the conservation of roadside vegetation a rational procedure to assess conservation value has been needed.

The Ecological Inventory and Evaluation Section of Fisheries and Wildlife Service recognized the need for such an approach and commissioned the Graduate School of Environmental Science at Monash University to develop a method for assessing conservation value of roadsides. To ensure the general applicability of this project and the resulting report, the Roadside Conservation Committee was invited to participate in the development of the brief and in guiding the progress of the task.

This report presents the development of the assessment method together with guidelines for managing roadsides to protect conservation values, and suggestions for the management of responsible authorities. The authors were candidates for the Master of Environmental Science Degree of which research constitutes about half of the two year course. This research project is expected to lead to the production of a thesis by each of the authors, related to public policy analysis and visual assessment techniques, which would then be lodged in the Hargrave Library at Monash University. Supervision of the project was undertaken by Dr. D. Mercer, Dr. E. Vaughan and the Editors.

'Conservation of Roadsides and Roadside Vegetation' is a synthesis of the integrated research by the authors. It is an information source in itself and is intended to be understood by non-specialists.

Editors.

SUMMARY

Roads serve principally as transport links. Roadsides, however, provide a range of functions including wild life habitat, landscape experience, easements for utility services and features of cultural or historical interest. The contribution that roadsides make to the physical and social environment has frequently been recognised, but unfortunately has not been documented in a systematic way. This report aims to redress this situation by developing a procedure for the assessment of conservation value of roadsides that is capable of application on a state-wide basis. Objectives for roadside conservation and guidelines, for roadworks, to achieve these objectives are also developed.

The conservation value of roadsides relates primarily to the value of the vegetation present on the roadside. Cultural or historical features are the other major factor which contribute to conservation value.

The values of roadside vegetation can be discussed in terms of ecological, social and economic considerations. Ecological factors relate mainly to roadsides being areas where indigenous vegetation can be found, as distinct from cleared or otherwise modified areas, and where management can be used to preserve this situation. The presence of this indigenous vegetation is important for the survival of floral communities and some fauna. Roadside vegetation also contributes to appreciation of landscapes, recreational opportunities and education, and therefore to social factors. Further, economic benefits are derived from roadside vegetation where it helps to control erosion, climate, fire, weeds and salt intrusion, while contributing to road safety and tourism.

Conservation value of a given section of roadside involves consideration of all these aspects. Recognising that resources available to responsible authorities for assessment of conservation value are limited, the difficulty arises in designing an assessment procedure that is sufficiently accurate to be useful, but straight forward to apply. The assessment which has been developed uses a number of easily identified roadside features as surrogates for values, so that staff with limited botanical knowledge can readily apply the technique. A handbook, with detailed explanations and field recording sheets, has also been produced for use in the field. Use of this handbook, and the assessment procedure generally, enables the roadsides to be classified into categories of low, moderate and high conservation value. These categories allow comparison between sections of roadside. More importantly, however, classifications of moderate or high indicate that important features exist on the roadside. In these cases, if changes to the roadside are planned more detailed botanical information may be needed and careful design, to protect conservation values, would be expected.

Management of roadsides is complicated due to the number of authorities which have responsibility for some aspect of the roadsides, and the number of government departments and private groups which have an interest in roadsides. A number of these organisations have developed codes of practice for works on roadsides, but have seldom included conservation objectives in these codes. To overcome this deficiency, conservation objectives have been outlined as:

- (i) preservation of existing indigenous or valuable exotic vegetation,
- (ii) encouragement of growth of vegetation indigenous to the area,
- (iii) avoidance of soil erosion and salt intrusion,
- (iv) recognition and protection of aesthetic, recreational, educational and heritage values of roadsides.

Methods to bring these into the decision making process are discussed, and in the light of these objectives, suggestions are presented for modifications to some codes of practice.

Again following from the objectives for roadside conservation, a number of guidelines has been formulated to cover most aspects of roadside management. It is envisaged that these guidelines would be generally applicable to all roadsides, but their use would become more important on roadsides assessed by the procedure as being of moderate or high value.

Finally, the mechanisms for the wide and consistent adoption of the assessment procedure and guidelines in Victoria are discussed. The setting up of a new "Roadside Section" within the Department of Conservation, Forests and Lands, to pursue roadside conservation, is considered to have merit, but initially it is felt that the existing structure of the Roadside Conservation Committee is sufficient to undertake the task; a Roadside Section could be considered in the future, if necessary. Accepting that management of roadsides would remain within the existing legislation and with existing authorities, some comments on this legislation are offered to better pursue conservation objectives.

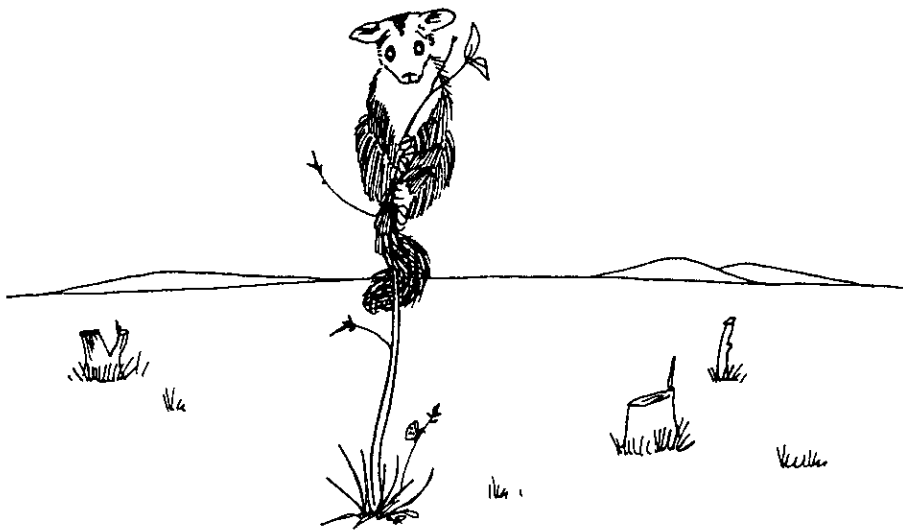


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Road Construction Authority
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Finally, the team wish to thank all those individuals who provided information and assistance, but to whom we have not specifically referred.

GLOSSARY

- exotic (vegetation) - species of vegetation which has been introduced to the area from another region, state or country.
- fauna - all larger animals (i.e. mammals and birds), reptiles and invertebrates in the area, but not necessarily micro-fauna.
- flora - all plants in the area, including grasses, ground covers, shrubs/bushes and trees, but not necessarily micro-flora.
- habitat - a local environment that provides food, water and shelter for organisms.
- indigenous - flora, or fauna, which originates from the immediate local area.
- native - flora, or fauna, which originates from the region.
- noxious weeds - these are plants which are either highly adapted to situations of soil disturbance or are able to take advantage of conditions of high fertility and are declared 'noxious weeds' under the Vermin and Noxious Weeds Act (1958) to be suppressed and destroyed.
- pest species - species of plants or animals which cause adverse economic effects on adjoining farmland, or compete with indigenous species on the roadside or in forests to such an extent that they prevent the development of a self-sustaining association of indigenous species.
- regeneration - growth of vegetation from usually nearby parent stock, without cultivation and then planting by man; usually refers to growth of indigenous species from vegetative parts or seeds.
- vegetation - the community of plant species growing in an area, comprising any combination of ground covers, shrubs, and trees.

FOREWORD

The purpose of this report is to establish the basis of a practical approach to the conservation of roadside vegetation. At the same time it is acknowledged that preservation needs to be balanced against a variety of purposes which are not always complementary with conservation.

It was seen that the study should feature a two-step approach:

(i) development of a procedure for assessing the conservation value of roadside vegetation. This should be designed in such a way that it could be used by people without specialist knowledge of vegetation, and

(ii) design of appropriate techniques for managing roadside vegetation to maintain and enhance its conservation value.

With this information available to the authorities responsible for roadside management, it should then be possible for particularly valuable roadsides to be highlighted and protected, while poorer roadsides could receive attention to improve their conservation value.

Available information on roadside vegetation does not, as a rule, reflect a balanced view of the values of this vegetation. It was thought desirable, therefore, to provide an integrated overview of these values. Chapter 1 presents the important values of roadsides, including some which have not previously been reported. These values have been considered when defining the term "conservation value".

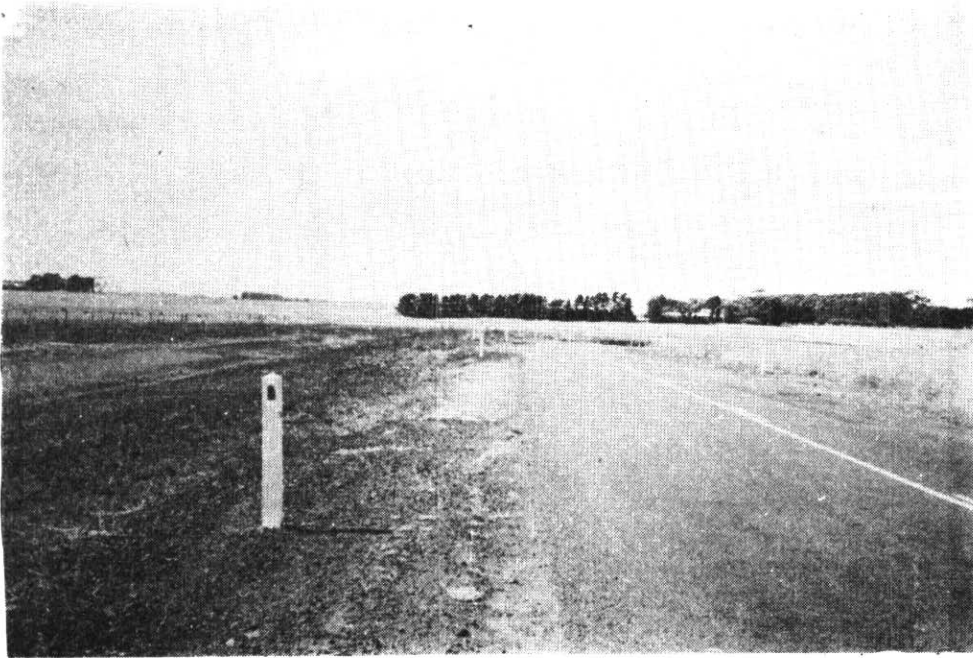
The problems of assessing various aspects of this conservation value for a particular road are discussed and a procedure for assessing the value is developed in Chapter 2.

There are various groups and organizations with an interest in roadside use. The types of interests each organization has in the roadside varies. Discussion of these interests, and the legislation related to the various bodies, with regard to roadsides, is covered

in Chapter 3. The bodies which have an interest in the management of roadside vegetation use a variety of management principles and practices. A survey of these principles and practices is undertaken in Chapter 4, together with a discussion of objectives for roadside management.

To manage roadside areas in a desirable way requires specific knowledge of the areas in question. General guidelines to cover most cases are proposed in Chapter 5.

The general condition of roadside vegetation could possibly deteriorate sharply in the future, unless some protective action is taken. The types of problems that have occurred, and will continue to occur, are considered in Chapter 6, with further discussion on how to overcome these problems, and reach a situation where roadsides can be managed with due regard for their conservation value.



Roadside vegetation makes a road more attractive and more pleasant to drive along, as well as conferring many other benefits.



1. THE VALUES OF ROADSIDE VEGETATION

1.1 INTRODUCTION

Roadsides are taken to be the land on the road reserve which is not occupied by the road itself; that is, the strip of land between the road and fence line. The conservation value of roadsides is related to ecological and sociological factors, and economic benefits. However, the vast majority of these factors and benefits are dependent upon the state of the roadside vegetation. Hence, roadside vegetation makes the major contribution to overall conservation value of roadsides.

This report concentrates on evaluation of roadside vegetation to assess overall conservation value. The only other aspect included in the study is the contribution made by cultural and historic features.

A majority of roads outside the metropolitan area of Victoria passes through land cleared for agriculture. In these cases the roadsides often carry the last remaining vegetation in something approaching an original state. At the same time roadsides, being Crown Land, are public property. They belong to no individual but are set aside for the benefit of society at large. This both enhances their value and results in a variety of pressures being placed on them. For example, they are used for road widening, stock routes, gravel pits, wayside stops and easements for utility services.

Multiple use of roadsides inevitably leads to some conflict over the use of the available space but more particularly with conservation of the roadside vegetation. Where one or more of the uses of roadsides puts pressure on the vegetation it is important, for a balanced management of this land, that the value of the vegetation itself be appreciated. The values of roadside vegetation discussed in this chapter involve preservation of ecological features and maintenance of socially valuable attributes. Economic benefits, which generally flow from ecological interactions, are also documented.

1.2 ECOLOGICAL CONSIDERATIONS

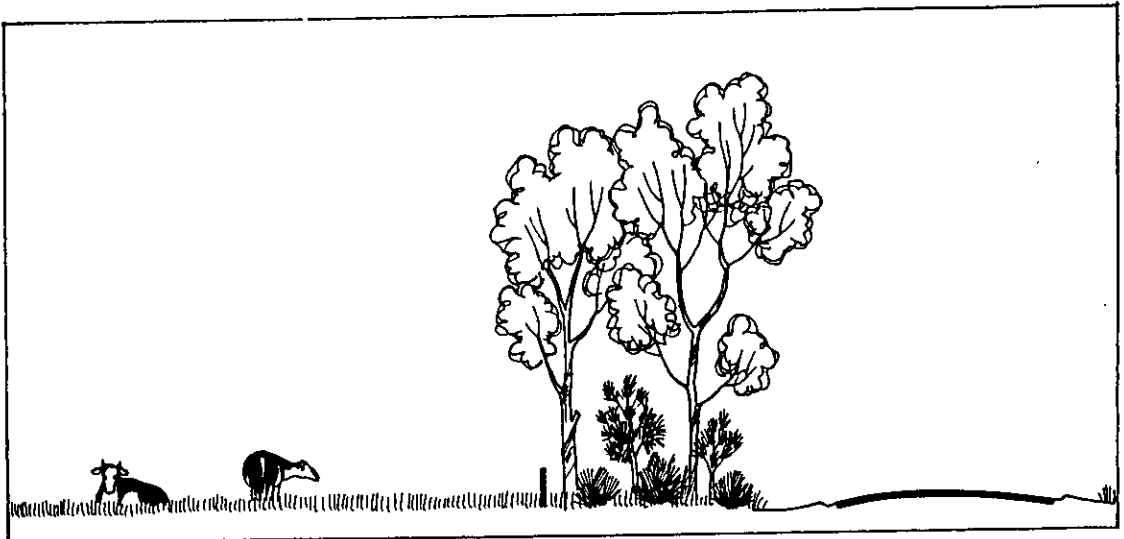
If roadsides carry indigenous vegetation, even where this is considerably disturbed, they have inherent ecological value. Preserving vegetation on roadsides in a totally natural state is virtually impossible. Such a state would imply that humans have effectively no impact on the area. On roadsides vegetation is subject to invasions from adjacent land and modified conditions of climate and drainage. However, reducing interference to a minimum can keep the vegetation in a semi-natural state where the ecological features of the original vegetation of the area are substantially preserved. Important aspects of such ecological preservation are discussed in the following sections.



Vegetation on roadsides provides shelter and food for wildlife.

1.2.1 Relict Species

Because much of Victoria's original vegetation has been removed, roadsides at times afford a refuge for species which can no longer be found on the cleared land. Outside the state's diminished forest areas, the process of settlement has largely restricted remaining indigenous community types and species to remnant islands of native vegetation on road and rail reserves, stream and swamp frontages, small reserves of various kinds and isolated areas on private property.



In some instances the roadside offers the only possible chance for survival for some rare and endangered plant species. Ritchie (1980) has stated that, in many parts of Victoria, particularly in the north and west of the state, roadsides are the last remaining locations on which certain types of indigenous vegetation are found. In addition, it is important to be aware that it is not only on the size of these "natural" areas that survival of relic species depend; the configuration of these areas is also important. Roadsides can play an important part in linking other areas of "natural vegetation".

1.2.2 Habitat

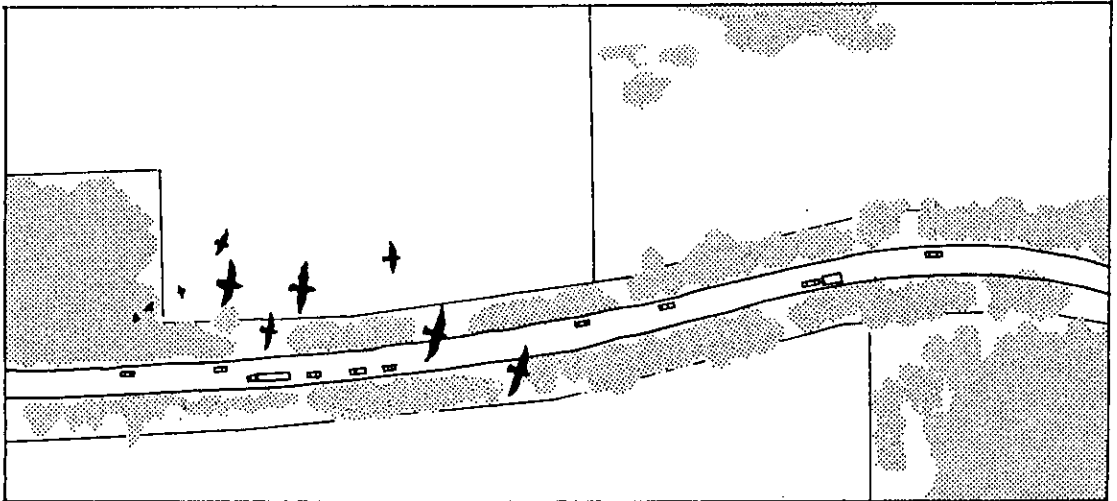
Vegetation provides food, shelter and breeding sites for all types of animals. With the great reduction in area of native habitat that has occurred due to land development and settlement, most wildlife populations have been reduced considerably; some species have disappeared completely from many localities, while many others have suffered a dramatic decline in numbers. Only a few have adapted to or been favoured by the alterations and have increased their numbers.

Much of Victoria's remaining, fragmented, original vegetation occurs on roadsides. These fragments are scattered over a large area of the state. Although the small strips and patches of vegetation may not provide a viable habitat for some animal species, they are appropriate, viable and very valuable for a great many other species. Many small marsupials, rodents, bats, reptiles, amphibians and insects are found in these remnant stands of vegetation (Middleton, 1980). Even the habitat value of isolated trees on the roadside should not be underestimated. Lack of floristic diversity on many roadsides reduces their value as habitats. This is particularly so where the shrub and ground layers have been removed. Where diversity has been encouraged the habitat value of the area has been significantly enhanced.



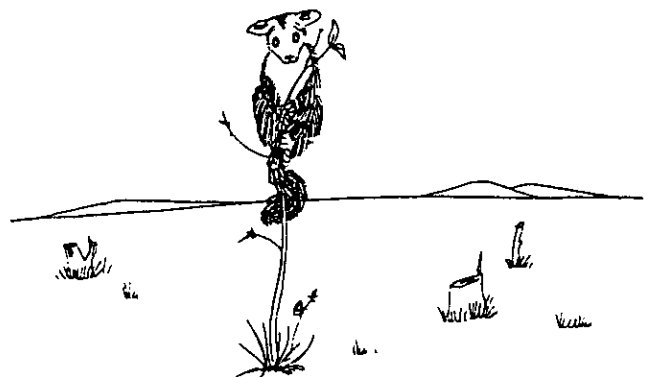
1.2.3 Migration and Dispersal

Because they link larger areas of natural vegetation (both forests and scattered remnant stands), roadsides function as major biological corridors. This permits movement of both flora and fauna between these areas.



Although many people are aware that birds migrate, it is not usually appreciated that there is a movement of many other animals. Bennett (pers. comm.) in his study of the Cobden to Warrnambool Road found both transient and resident population of various small mammals.

Dispersal is not solely an animal trait either. Plants disperse as well, but do so rather slowly. The actual method of dispersal of seeds or spore will affect a plant's distribution, but, by whatever means, dispersal is important for maintenance of genetic diversity and vigour.

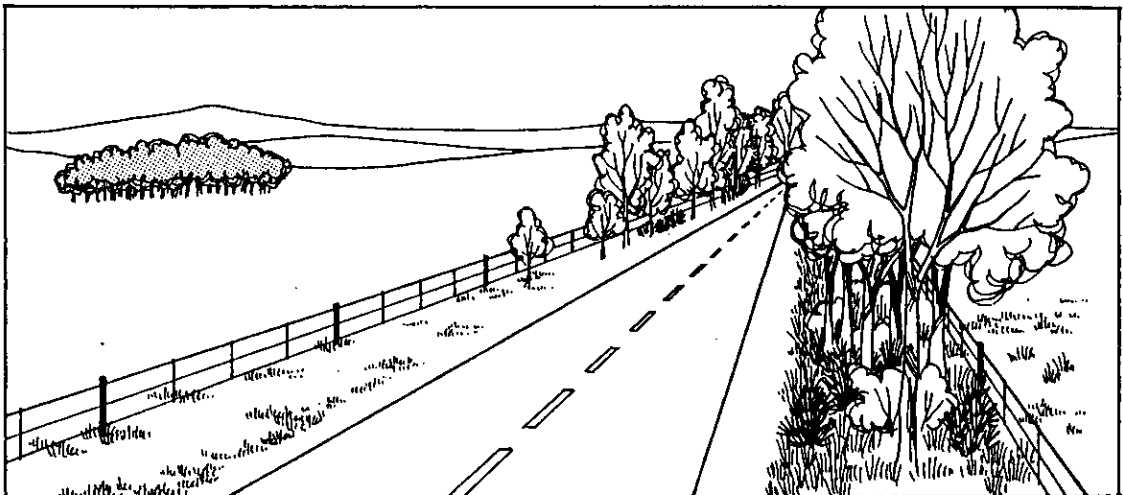


1.2.4 Roadsides as Islands

Any area of indigenous vegetation surrounded by other plant associations is an ecological island. Wherever there is heterogeneity in the landscape and amongst plant communities boundaries and zones will occur. These zones or "islands" will provide suitable locations for survival of some organisms, but for others they will be too small. Factors which alter the diversity and types of species which can be supported by an ecological island include the island's size and shape, whether or not it is linked to other similar areas and the nearness of species rich areas from which it can be re-colonized.

The edge or boundary of the "island" often supports species which do not occur elsewhere in the zone. These boundaries between plant communities provide the resources of two types of habitats to species which can take advantage of them. Generally "islands" which are large and have short edges in relation to their overall area can support more diverse populations than small elongated areas. However, with roadside vegetation, the "edge" effect may be of sufficient importance for it to carry a great diversity of species.

In addition, as has been mentioned above, a roadside frequently links larger areas of indigenous vegetation. By doing so it increases their effective area and provides corridors for migration and dispersal of both plants and animals.



1.2.5 Diversity in Monocultures

Monocultures (such as single species agricultural crops) are inherently unstable. In a natural ecosystem there is a diverse array of organisms. The complex relationships between these tend to maintain a stable balance. In a monoculture these complex, stabilizing relationships are absent. Consequently monocultures are vulnerable to stress. This instability can be reduced where diverse and stable ecosystems, such as may be found on roadsides, surround the agricultural land.¹

1.2.6 Fire

When a fire burns an area of vegetation the effects on both flora and fauna will vary, depending on many factors. These include length of time since the last burn, type of vegetation, intensity and type of fire, fuel load, time of year, soil type, length of time before it rains over the burnt area, intensity of precipitation, composition of flora and fauna available to recolonize the burnt area, and the number of individuals of a species available to recolonize. Consequently generalizations about the effect of fire are very difficult.

Bushfires are too often thought of entirely as environmental disasters. This oversimplification may lead to misconceptions and inappropriate planning. In many cases fires are considered as either "good" or "bad" while they can be both at the same time. For example, a fire that starts in a sclerophyll forest and burns into a rainforest may have a beneficial effect in the former and be most harmful in the latter. This is because, in the majority of cases, plant species in the sclerophyll forest are fire adapted while those in the rain forest are not.

1 A much more extensive discussion of this aspect of roadside vegetation will be available in the forthcoming booklet - Trees on Victorian Farms shortly to be published jointly by the Forests Commission of Victoria and the Graduate School of Environmental Science, Monash University.

Species of native animals whose habitat is in fire-adapted vegetation may either gain or lose from a fire. For example, the native Heath rat (*Pseudomys shortridgei*) requires a range of plants which will be present if patches of vegetation are burnt at different times on nearby areas. However common burning regimes now increase the probability that large areas will be burnt at the same time. This provides an inadequate habitat both for this and some other species. A fire regime, like any other form of management which tends to reduce habitat diversity, is likely to reduce species diversity as well.

The value of roadsides as ecological corridors may also be lost if the roadside vegetation has been burnt and nearby bushland is burnt soon afterwards. Further, many smaller mammals and marsupials will not cross denuded areas to recolonize burnt areas since they need a continuous cover of vegetation to shelter their movements. Consequently, the ground layer vegetation is crucial to promote a viable habitat for native terrestrial fauna. Finally, fire on a too regular and frequent basis will tend to alter the species composition of remnant vegetation to favour grass (native and exotic) and reduce the habitat value of the vegetation by decreasing its original diversity.

Specific conclusions are not easy to draw. It is clear that fire plays an important part in maintaining species diversity on roadsides. However, fire break burning of roadsides is unlikely to provide the right frequency, intensity or distribution of fires unless the managers are aware of these considerations and apply appropriate management principles.

1.3 SOCIAL CONSIDERATIONS

Most social benefits of roadsides, such as their aesthetic value, are related to ecological aspects of the vegetation. However most people tend to consider them separately. In the following sections, where these social aspects are discussed, it will be clear that there are often links with the preceding discussion of preservation of indigenous vegetation.

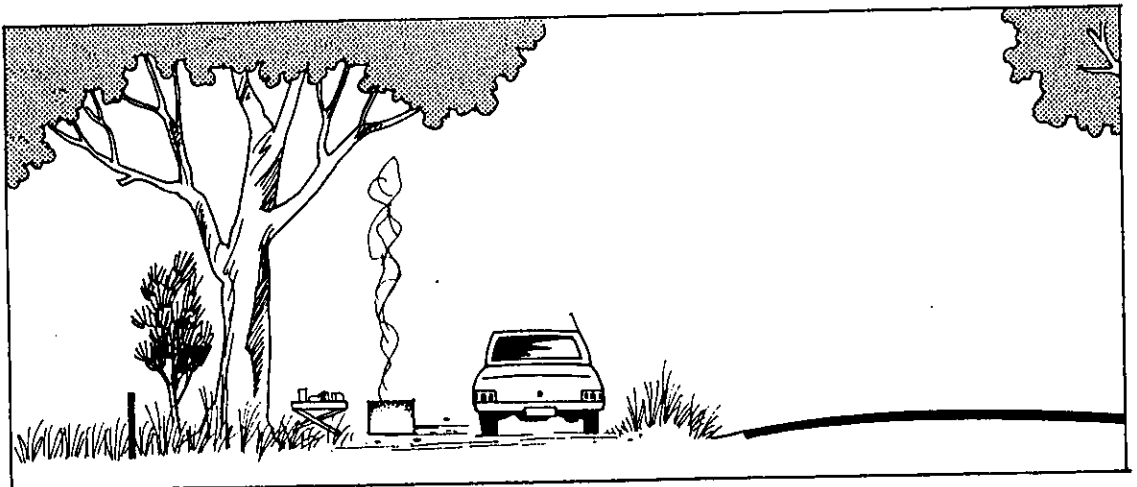
1.3.1 Aesthetics

The pleasure experienced when driving along many roads depends on the vegetation on the roadsides. Roadside bushland is beautiful, adds interest and variety to the scenery and helps to alleviate driver fatigue. Cleared roadsides and treeless agricultural land, on the other hand, tend to produce a monotonous landscape. Providing a visually harmonious roadside is an objective of many road construction bodies, yet all too frequently the aesthetics of an area depend more on chance than appropriate management.

The type of vegetation appreciated by an observer depends on many factors, including the person's previous exposure to similar types of vegetation, and values placed on that vegetation by the community. Many people, while appreciating indigenous trees, place little value on the shrub or ground cover. However these, as well as the visually more dominant trees, can play a major role in providing new floristic experiences for road users.

1.3.2 Recreation

Pleasure driving and picnicking are common leisure pastimes for Australians. The contribution that attractive roadsides make to driving enjoyment has already been considered, but roadsides may also be a destination for recreation. This is particularly likely when picnic facilities are provided. In this case a more leisurely and close enjoyment of the roadside vegetation is possible.

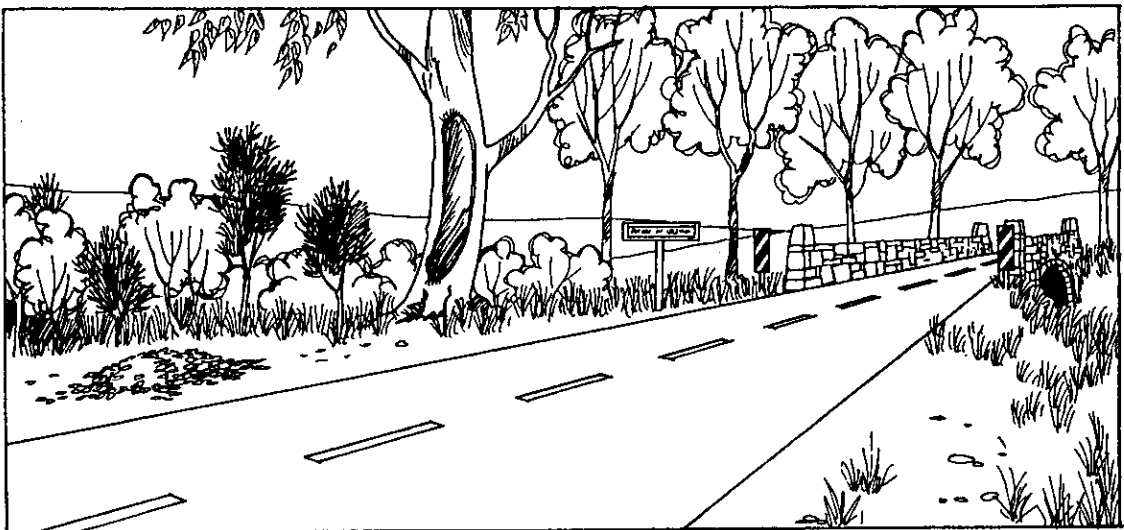


1.3.3 Education

Because they carry remnants of vegetation which may be of ecological, historical or cultural significance, roadsides have a potential educational value which is seldom recognised. In South Australia this potential has been acknowledged. Signs are being erected to direct the attention of road users to areas of native vegetation which are of particular interest and importance.

1.3.4 Heritage

Roadsides carrying undisturbed remnant vegetation may also contain archaeologically significant sites. Because, in much of the state, there remains little other undisturbed land, these areas become of particular importance. Trees scarred by Aborigines have been discovered amongst such vegetation; for example the Aboriginal Maternity Tree on Pollocks Road in the Shire of Talbot and Clunes - a Eucalypt large enough to allow a person to rest in it. In coastal areas or near water bodies Aboriginal middens may be present. As many parts of the state have not yet been surveyed for such Aboriginal relics, undisturbed roadside verges are valuable as potential sites for archaeological investigations.



1 See publications of Department of Environment and Planning, S.A.

European culture may also be represented on roadsides. Cairns, stream crossings and landmark trees frequently pay tribute to local history. Features which are part of European man's heritage are usually more easily identified than those of Aborigines. However, wherever features of historical value are noted their importance should be determined and this taken into account in management plans.

1.3.5 Scientific Value

Within any species there may be considerable difference between local strains. Within these strains there is further genetic variation. Consequently remnant vegetation may contain strains with specific adaptations to particular site conditions. This, with the overall genetic diversity, means that the roadside vegetation is likely to contain many species or strains which are of considerable scientific interest and potential practical use. The protection of this potential may require preparation of special management plans.

1.4 ECONOMICS

Benefits which flow from having a stable indigenous community of plants on roadsides are appreciated more than they once were. In the past questionable management of roadsides resulted in costs which were commonly not recognised. The costs of repairing one organization's or person's damage is frequently borne by another body. In the long run though, it is the wider community which is faced with a loss of value (aesthetic, for example) or direct cost for repair of damage (soil erosion, for instance).

The following discussion emphasises the economic benefits of retaining the roadside in an undisturbed state. Costs of redressing incorrect practices are also highlighted. These costs must eventually be borne by the whole community. Therefore, stabilizing the vegetation on the roadside will maximize community benefits.

1.4.1 Soil Erosion

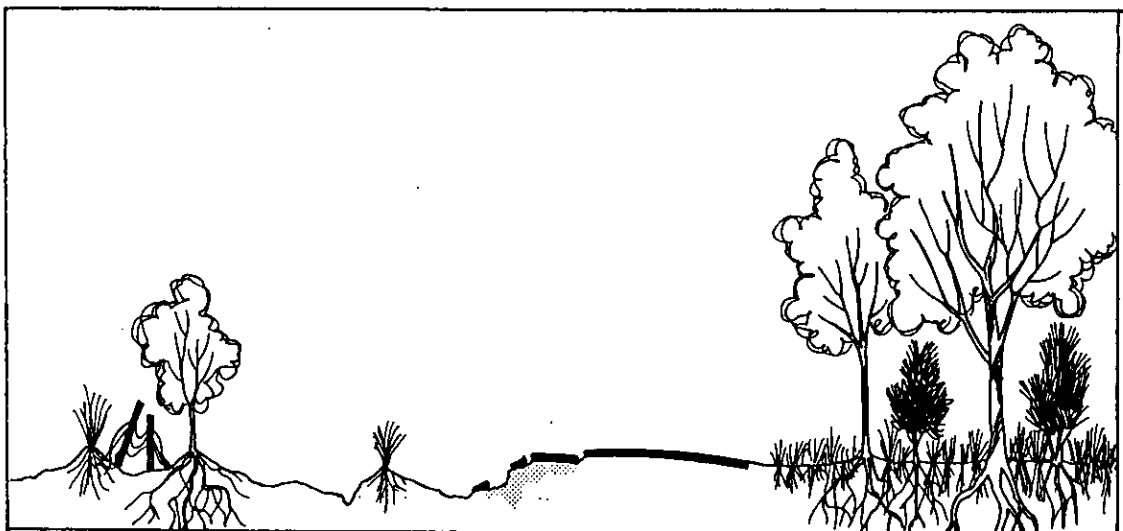
Road verge mismanagement may expose not only large areas of top soil but also the often very unstable sub-soil too. Increased run-off from the road reserve may also increase erosion of adjacent agricultural land. Thus, erosion associated with road reserves can cause both 'on-site' problems for the organization responsible for the road works and 'off-site' problems for nearby land-owners and in waterways downstream.

On-site problems include:

- (i) silting or clogging of culverts or drains, causing flooding or saturation and breakdown of the road pavement;
- (ii) contamination of base-course materials and filter material around subsoil drains during construction; and
- (iii) undermining of structures on or near the road.

Off-site problems include:

- (i) reduced productivity of agricultural land by either loss of topsoil or deposition of infertile sediment;
- (ii) increased turbidity of water causing reduced water quality and higher water treatment costs;
- (iii) increased sedimentation in streams, dams and reservoirs causing loss of capacity and increased flooding; and
- (iv) poor aesthetics.



Minimising the disturbance of vegetation during construction and restoring a cover of vegetation as quickly as possible afterwards will reduce soil loss. Retention of existing vegetation where possible is much more effective and a cheaper form of erosion control than restoration. Roadside vegetation also increases infiltration and use of water, thus reducing runoff from roads and traps soil washed from soil exposed near the road edges.

The impact of erosion and costs of control can be minimised during roadworks by reducing the area of soil exposed and time of exposure. Refer to section 5.8 for further discussion of erosion control and Appendix VI for techniques to prevent erosion.

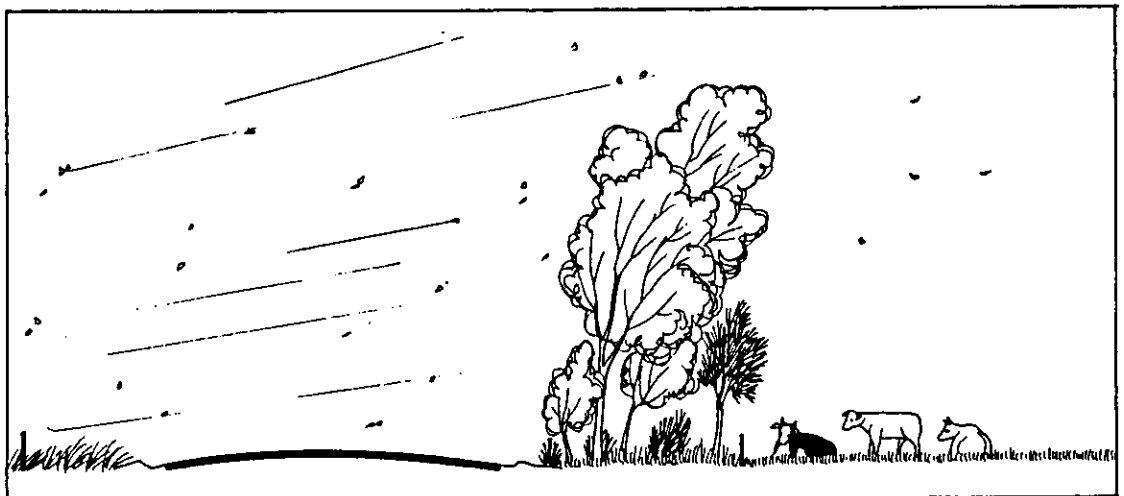
1.4.2 Windbreaks: Shade and Shelter

Vegetation on roadsides can provide a windbreak for both stock and crops.

This (windbreak) vegetation may add to farm productivity by providing shelter which

- (i) reduces evaporative losses from crops,
- (ii) stabilizes soil and air temperature and humidity for crops,
- (iii) reduces sand blasting of plants,
- (iv) reduces cold stress on stock (especially lambs),
- (v) reduces heat stress on stock.

Thus shelter and shade allow increases in stock yield.



Although the value of shelter and shade in terms of increased farm production is hard to measure, it has been suggested that farm productivity may be increased by one third by locating shelter belts on paddock boundaries in a rectangular grid or as perimeter plantings.

1.4.3 Fire Barrier and Suppression

Bush and grass fires can cause great loss of both life and property. Any practices which reduce either frequency or intensity of such fires will contribute to reducing these losses.

Firebreaks are frequently located on roadsides in an attempt to localize any fire which may be started by road users and to increase the effectiveness of the road itself as a break to fires spreading across the adjacent land. These breaks may be ploughed, slashed or burnt. Provided they are wide, they can prove an effective barrier to moderate intensive fires which are not driven by high winds. However, without constant and expensive upkeep these clear breaks soon become covered by a dense growth of exotic annual grasses. These may prove to be a much greater fire hazard than the indigenous perennials which would have been removed to establish the fire break.

Indigenous vegetation often has a higher ignition temperature than fully cured exotic grasses. Many native grasses have their growing season in summer and so have a higher water content and are less flammable than dry exotic grasses. Consequently, unless the fire break can be constantly maintained, it may be better to retain the indigenous vegetation.

In addition, windspeed at a level of the flames is a major determinant of the rate of fire spread. Roadside vegetation which includes trees act as a windbreak and so, by reducing windspeed, tends to reduce the speed of fires.

The presence of trees also reduces the likelihood that a fire will start under the tree because the ground layer is shaded; removing trees increases direct sunlight on the ground-layer and makes it easier to ignite by reducing its differential ignition temperature. However, the build-up of litter under trees, due to leaf and twig fall, can represent a fire hazard that may be ignited by a local ignition source, or by 'spotting' ahead of a major fire.

The Country Fire Authority¹ recognises the beneficial effects of trees and says that trees need not be removed, but recommends removal of ground litter. Mid level vegetation (shrubs) may need to be thinned if it is likely to contribute to the spread of a fire.

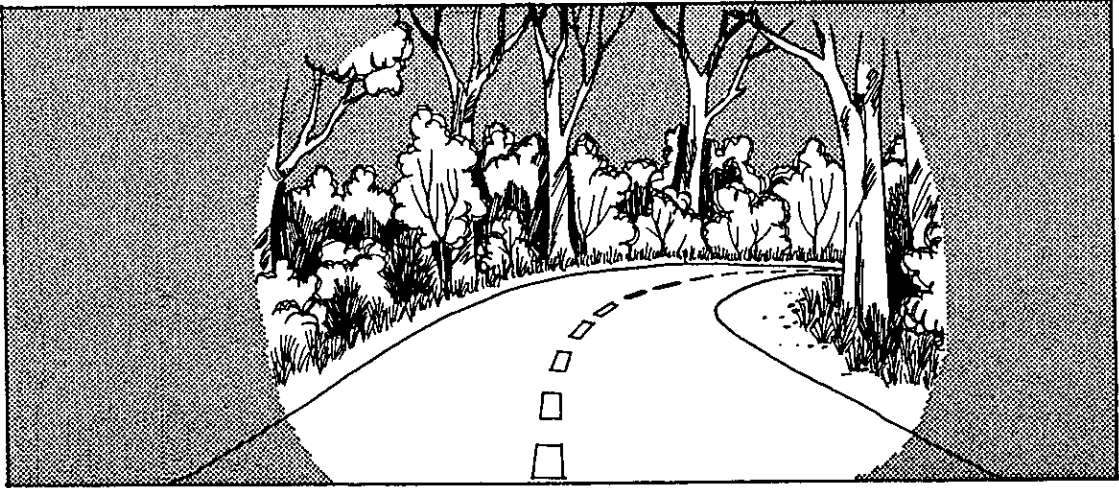
1.4.4 Road Safety

Road accidents claim a heavy price in deaths, injury and property loss each year. Roadside vegetation can contribute to reducing accidents in several ways (Richie, 1980, Goode, 1974):

- (i) vegetation reduces headlight glare and eye strain.
- (ii) shrubs can cushion the impact of an uncontrolled vehicle.
- (iii) vegetation reduces the effects of cross winds and the amount of dust blown across the road. This is particularly the case where the shrub layer as well as trees are retained.
- (iv) vegetation helps to stabilize the soil around the road formation. Uncontrolled vehicles leaving the road are consequently less likely to hit deep ruts and overturn as a result.
- (v) as mentioned in section 1.3.1, roadside vegetation helps to reduce the monotony of driving and so keeps drivers alert.

1 J. Barber, pers. comm.

- (vi) vegetation helps delineate the road alignment (especially at night).



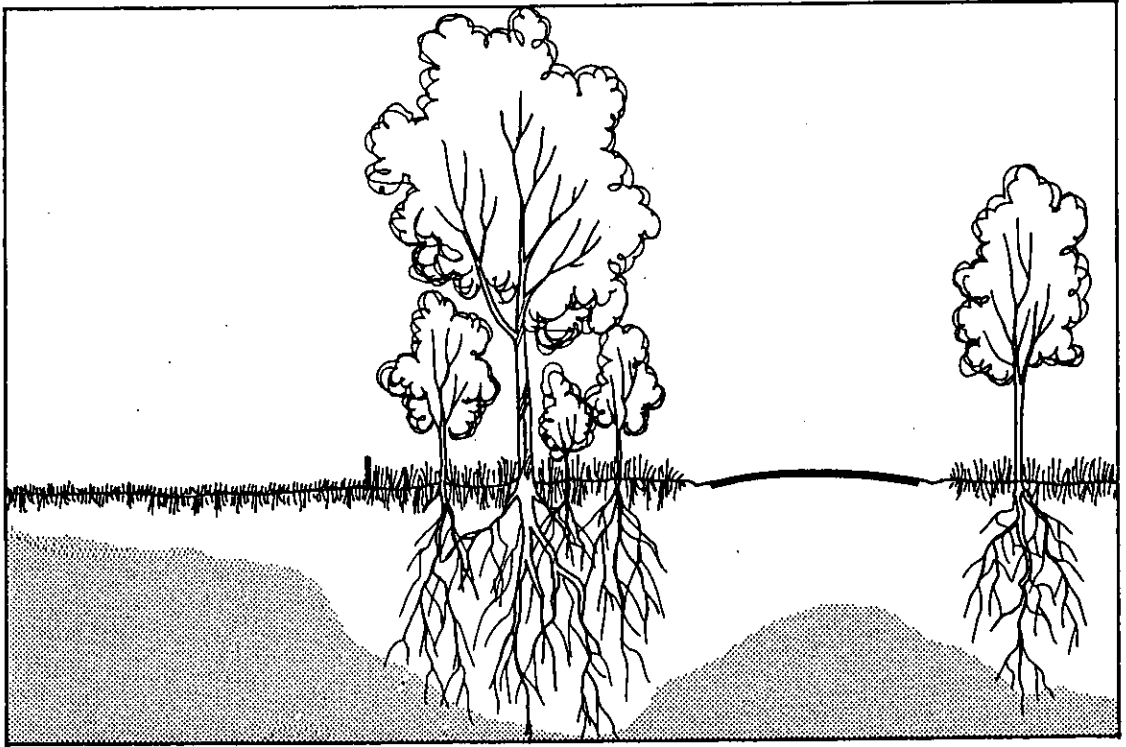
1.4.5 Tourism

A diversity of local vegetation types can provide a unique aesthetic appeal to motorists. Many people travel to specific areas for the sake of the vegetation (and sometimes the associated animals) which they can see while driving. Overseas visitors in particular are drawn to areas of locally indigenous vegetation which they can see nowhere else in the world.

1.4.6 Salt Reduction

In many areas of Victoria increased levels of salt in the soil have resulted from both large scale clearing of forests and irrigation. Rehabilitation of salt affected land requires a multi-pronged attack aimed at lowering ground water tables. One important step is to partially restore the tree cover. Trees and native perennials are deep rooted and use water throughout the year. Consequently they are effective at lowering water tables. Replanting of roadsides denuded of trees would make a contribution to reducing the salinity problem. This planting would be most effective where trees, shrubs and

ground layer are encouraged. Total evapo-transpiration rate would then be maximised while the lower shrubs and ground layer would encourage deep rooting of trees.



1.4.7 Weed Suppression

Disturbed areas provide a habitat for invading species, including weeds which may cause serious agricultural problems. On cleared easements pasture grasses tend to dominate. Both broad leaved annual weed species and others (such as wild oats) which may be a problem in crops can invade these as well as newly disturbed areas. These weeds, once established on the roadsides, become a source of continual reinfestation of surrounding agricultural land. They incur costs both by reducing production and as costs of control.

Stable indigenous vegetation is not readily invaded by weeds. By simply retaining roadside vegetation with as little disturbance as possible a barrier to the spread of weeds is provided and the requirement for regular weed control is greatly reduced.

1.4.8 Regeneration of Indigenous Species

Many farmers are interested in restoring some tree cover on their properties. Species indigenous to the area are likely to be those best adapted to the soils and climate and able to develop a self sustaining plant association. Remnant roadside vegetation can provide information on which species are indigenous to the area and a source of seed for planting.

On roadsides themselves, where recent clearing has occurred, a reservoir of seed may still remain in the soil. With suitable management (see Section 5.9) natural regeneration will restore a cover of indigenous vegetation. Where the roadside is essentially an extension of the agricultural land, natural regeneration will not usually occur because a viable seed stock no longer exists in the soil. In this case, too, remnants of indigenous vegetation on nearby roadsides can provide a source of seed.

Once the indigenous species are established, natural regeneration should ensure that the roadside vegetation is self-perpetuating. Where indigenous vegetation is not cleared from the roadsides it is able to retain all the values already discussed with little or no maintenance costs to the community.



2. ROADSIDE CONSERVATION ASSESSMENT PROCEDURE

2.1 INTRODUCTION

The values of roadside vegetation have been discussed in Chapter 1. From this discussion it is apparent that these values are worth protecting. However, to date, management bodies have seldom had sufficient information to take account of these values in conjunction with the other (engineering) values of roadsides, when construction or maintenance proposals have been considered. The need for access to this information arises from the dramatic and continuing decline of native vegetation in Victoria since the introduction of European agricultural practices.

To provide management bodies with information on the conservation values of roadsides, it is first necessary to develop a procedure for collecting data about roadsides, and for evaluating that data. This chapter concentrates on the development of such a methodology.

The primary purpose of such a methodology is to highlight those roadsides where careful management will be required to maintain their conservation value. It is not intended to dictate the management of roadsides. Rather the procedure is designed to provide local decision makers with sufficient information to make decisions about roadsides which take account of conservation values alongside the other values of roadsides (as an easement, for example). However, an indirect outcome of use of the methodology will almost inevitably be a greater awareness of local roadsides, and perhaps a greater appreciation of the need for considerate management.

Use of the assessment procedure in a consistent manner will not only highlight areas of special interest, but will enable comparison of roadsides within a local area (a shire, for example) or between areas. The assessment procedure cannot provide the managers of roadsides with instant management prescriptions, but it can form a basis for management. In later chapters some management guidelines

that can help to protect and enhance conservation values of roadsides will be discussed.

2.2 THE CURRENT SITUATION

For some roadsides there is some information relating to aspects of flora, fauna, landscape and cultural features available in government reports e.g. the Land Conservation Council Study Area reports, municipal planning study reports, and studies undertaken by private organisations, such as Field Naturalist groups and the National Trust (Vic.). However, in Victoria there has been no organised attempt to assemble data about these aspects of roadsides, nor has there been a systematic approach developed to collect information on a statewide basis.

In South Australia and Western Australia a similar situation has been recognised and procedures have been developed to provide an assessment of roadside vegetation (Mollenmans, 1982 and Scott, 1980). These procedures were not considered to be entirely appropriate for use with Victorian roadsides because of the different vegetation encountered in Victoria and the extent of data to be collected in the field. None the less, they provide a useful basis for developing a methodology for Victoria.

2.3 CONSTRAINTS ON THE METHOD

It was proposed that:

"The task should provide an assessment procedure that can be applied by non-specialist groups and which provides a framework which can be refined by more intensive investigation if required. The methodology should be applicable in any area of Victoria". (see Appendix 1, Study Brief)

This leads to the two main features which have governed the design of the procedure, i.e.

- a) the procedure can be used by people with little or no prior biological knowledge; although it is expected

that the more common local weeds can be recognised, and

- b) use of the procedure is simple and fast, in recognition of the fact that only limited financial and physical resources may be available.

It was further considered that the procedure should make use of as much existing information on roadsides as possible.

In view of these constraints it must be realised that the procedure cannot give the user a comprehensive listing of plants and animals along a given roadside. What it does give is a fairly precise and objective indication of the overall conservation value of a roadside (as discussed in Chapter 1); an indication which can guide further, more detailed biological surveys where necessary, and guide the development of management plans.

2.4 APPROACH TO THE DEVELOPMENT OF THE METHOD

2.4.1 Basis of the Method

Having established the constraints under which the procedure is required to operate, its design was based on:

- a) determination of those factors which contribute to the conservation value of roadsides, and which are capable of identification and qualitative measurement by 'untrained' field staff
- b) definition and description of these factors to enable rapid collection of data
- c) the need for an uncomplicated assessment process to convert the field data to a measure of conservation value
- d) application to localities representing the range of physical situations encountered across Victoria
- e) the expectation that relevant detailed information about the roadside would be, at best, limited.

These considerations lead to firstly the production of

a "field sheet" to be filled in by those evaluating the roadside (Figure 2.11, p.59). The components of this field sheet are discussed in the following Sections.

A handbook was then produced to enable field staff to apply the assessment procedure without the need to refer to this longer report in the field. A copy of the handbook is to be found in Appendix IV.

2.4.2 What Makes Conservation Value

The procedure sought is one to measure conservation value of roadsides. In the context 'conservation value' is taken to be:

- a) a sum of the values of disparate factors
- b) a quality of the roadside which may change with changing community values.

The factors that contribute to conservation value have been discussed in Chapter 1. However, it is generally not possible to directly measure the individual factors. Hence, the adopted approach to the procedure has been to measure substitutes for:

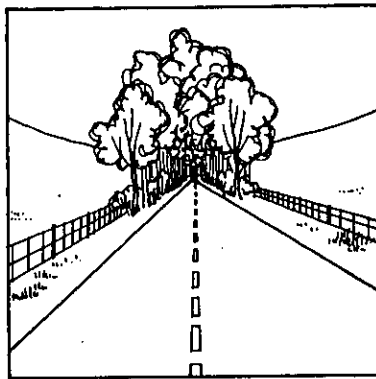
- a) habitat value for diverse animals
- b) habitats for a range of plants
- c) reasonably stable (self perpetuating) natural ecosystems
- d) reservoirs of rare/endangered species
- e) visually attractive areas
- f) area free of discordant or destabilising intrusions (weeds, utility services or agricultural pressure)
- g) culturally significant features.

Consequently, the attributes which contribute to conservation value are:

- . extensive presence of native plants and animals (both in area occupied and range of species)
- . extensive vegetative cover (natural or exotic)
- . presence of rare/endangered/historically significant species of plants or animals
- . evident regeneration of vegetation
- . opportunity for regeneration
- . attractive landscape
- . presence of culturally significant features



Presence of native plants and animals



Vegetative cover (native or exotic)



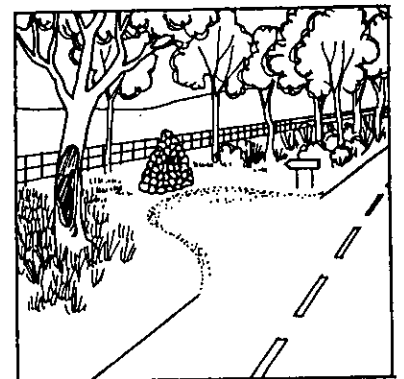
Rare, special or endangered species



Regeneration



Attractive landscape



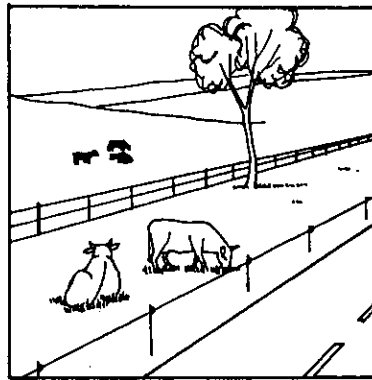
Historically or culturally significant features

Measures which detract from conservation value are:

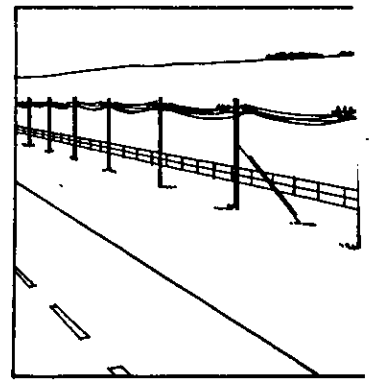
- . presence of weeds
- . evidence of farming pressure
- . use by utility services



Weeds



Farming pressure



Utility services

In general, most of the factors which contribute to conservation value of roadsides can be related to or are direct aspects of the roadside vegetation.

While faunal diversity contributes to conservation value its direct valuation would require training of staff and excessive time. Even then a useful level of accuracy would very likely not be achieved. However the potential abundance and diversity of animals in an area is dependant on the range of food sources and shelter available; that is on the floristic and structural diversity of the vegetation. Proximity of large stands of vegetation and water to the roadsides would also increase their value as habitats, and wildlife corridors. Consequently, these factors with the complexity of the vegetation structure were taken to be indirect measures of faunal richness. For the field assessment, habitat is represented by structural diversity and extent of vegetation, its stability, and the degree to which indigenous species are represented in the vegetation.

Vegetation also plays an important part in the aesthetic component of conservation value. Other factors, such as land form and contrast contribute as well. However, of a number of techniques available to score the landscape value of an area most involve some specific training of field staff and are time consuming. Furthermore, most techniques are applicable to broad landscapes and have not been developed to assess smaller scale areas like roadsides. Also, it has not been established that a complex, comprehensive landscape assessment technique produces results which are any more representative on community tastes than a more easily applied technique. Consequently, the straight forward approach developed by the National Trust of Australia (outlined in Appendix III) has been adopted for incorporation in the present method.

2.4.3 Assumptions

In the development of the procedure a number of assumptions have been made. Some have been alluded to in previous sections and are restated below explicitly, together with other principal assumptions:

- . conservation value of roadsides depends on a number of factors, the majority of which are related to the roadside vegetation. Conservation value can be assessed using knowledge of the vegetation and cultural/historical features found on the roadside, and the influences which are likely to adversely affect vegetation or these features.
- . locally indigenous (natural) vegetation is of greater value than exotic vegetation (i.e. not from that local region)
- . diverse exotic vegetation is of more value than pasture or crops extending onto the roadside
- . vegetation can be considered to be a proxy for faunal habitat and therefore for the range of fauna
- . the presence of rare or endangered species on a roadside gives the roadside a particularly high value

- . where indigenous vegetation on a roadside represents the majority of the original vegetation remaining in a locality (or region) it has a relative rarity or uniqueness, and the roadside consequently has a high value
- . a variety of species of vegetation and a range of strata are of greater value than dominance by a single species or stratum
- . evidence of vegetation regeneration on the roadside indicates a potentially high conservation value
- . a large expanse of vegetation is of greater value than a small expanse
- . proximity to areas of natural vegetation will encourage regeneration, and extend the effective area of the roadside vegetation; proximity to such areas is therefore of value
- . a wide road verge provides the potential to support a greater extent of vegetation and a greater range of species and strata than a narrow one and is therefore of more value
- . landscape value can be adequately assessed using a technique of direct observation with a score allocated from a narrow range of values (see Appendix III)
- . pest species and noxious weeds threaten the survival of communities of indigenous vegetation and the welfare of neighbouring landholders. They therefore reduce the roadside's value
- . the proximity of agricultural activity, particularly its encroachment onto the roadside, reduces the conservation value of the roadside
- . the presence of service utilities on the roadside causes the loss of vegetation and intermittent disturbance to that which remains. It therefore reduces the roadside's value
- . the conservation value of roadside vegetation can be rapidly assessed, using a qualitative approach concentrating on vegetative structure, to an acceptable level of accuracy without recourse to detailed botanical survey and evaluation.

2.5 STEPS TOWARDS A METHOD

From consideration of how the procedure was to be used and its required output, and the assumptions outlined above, it was considered that the most appropriate format for the method would be:

- a) a field sheet which could be used by staff without botanical training for a one-step assessment of the factors which have been previously identified as contributing to conservation value,
- b) a one-step procedure to take the field results and convert these into an evaluation of conservation significance,
- c) a simple means of transferring the evaluation results to tables or maps so that particular values could be highlighted or compared.

2.5.1 The Field Sheet

Figure 2.11, p.59, presents the final version of the Field Sheet that has been developed. The sheet provides information (explanations and definitions) for the user, and space for the assessor to record the appropriate assessment score.

For each factor, information is given to guide the user in choosing the score appropriate to the section of roadside under investigation. The range of scores that apply to the various situations of the identified factors are located adjacent to each guide. The scoring system which has been adopted is arbitrary, but is consistent with the assumptions stated in Section 2.4.3. In developing this system it was recognised that a number of 'nature conservation' scoring systems have been evolved in response to particular situations. Goldsmith (1975) points to difficulties in devising scoring systems "the interest of an area to a botanist is different from that of an entomologist, bryologist, ornithologist or mycologist"; these differences could be expected to become even wider when people from more diverse backgrounds and professions are considered. One scoring system devised by

Helliwell (1973) appears attractive since it is based on imputed monetary valuations which could then be compared with other uses of the roadside; such as for service easements. However, this system is based on the sale of timber, and since roadsides do not generally contain timber of a saleable standard the system would not be appropriate. The concept of imputing economic values to conservation values is nonetheless attractive. Unfortunately assigning monetary value to environmental factors is no less arbitrary than the scoring system that has been adopted for this method.

In summary, the basis of the scoring system is the allocation of weighted ordinal rankings for conservation factors to indicate the contribution made to overall conservation value for that section of roadside. Where a factor, such as 'regeneration' makes a large contribution it is allocated an accordingly high rank, where it is low the score is zero. Negative scores are given to detracting factors, such as 'weeds'; the greater this factor's importance, the higher the negative score. The exception is with special species or features, where the existence of these is recognised by a single high score.

The range of scores for each factor varies to represent the relative weight of the factors in their contribution to overall conservation value. The assessment procedure is flexible enough that the range of scores can be altered to increase/decrease the scoring options available to the user, and to change the relative weight of the factors. However, such alterations should be considered only for particular situations and only where the implications of changes are understood and have been validated.

2.5.2 Evaluation of Conservation Value

Once a field sheet has been completed for a section of roadside, evaluation of conservation significance is achieved by the addition of the scores chosen for each conservation factor.

The total score is then used to categorise the section of roadside as either:

HIGH	conservation value - total score greater than 25
MODERATE	conservation value - total score 25 to 11
LOW	conservation value - total score less than 11

2.5.3 Display of Evaluation Results

Evaluation sheets can be drawn up to show which sections of roadside fall into the three value categories; as illustrated, in Figure 2.12. This form of presentation makes it possible to see which conservation factors contributed to the total score, and which factor(s) are most important. Obviously the detail contained in this table could be summarised and the order changed to comply with the particular format of presentation required. The other main form of data presentation is to transcribe the categories determined from the evaluation sheet on to a map to give a direct visual impression of the situation of roadsides in an area. Maps 2.2 to 2.4 provide an example of this style of display.

2.5.4 Application and Refinement of the Method

The Shire of Heytesbury was selected to provide the first set of data. Information on flora and fauna were collected from existing sources such as Land Conservation Council reports, Field Naturalists studies, aerial photographs and shire maps. These data were collated and a photo mosaic map using black and white aerial photographs (1:50000) was constructed for the Shire to indicate the location and boundaries of vegetation community types. Ground 'truthing' was carried out in a number of areas to determine vegetation alliances (e.g. structures, dominant upper level species and upper storey species). The aerial photographs were re-examined in an attempt to see whether remote sensing techniques could be used to supply sufficient information to assess conservation significance. Unfortunately while the aerial photographs, if they were sufficiently recent, could provide a good indication of where

roadsides had been cleared, and where major stands of vegetation existed, they were not of high enough resolution for the identification of precise vegetation of type or strata distribution.

Representative sampling of several sections of roadsides was undertaken in an attempt to define the major features contributing to conservation significance.

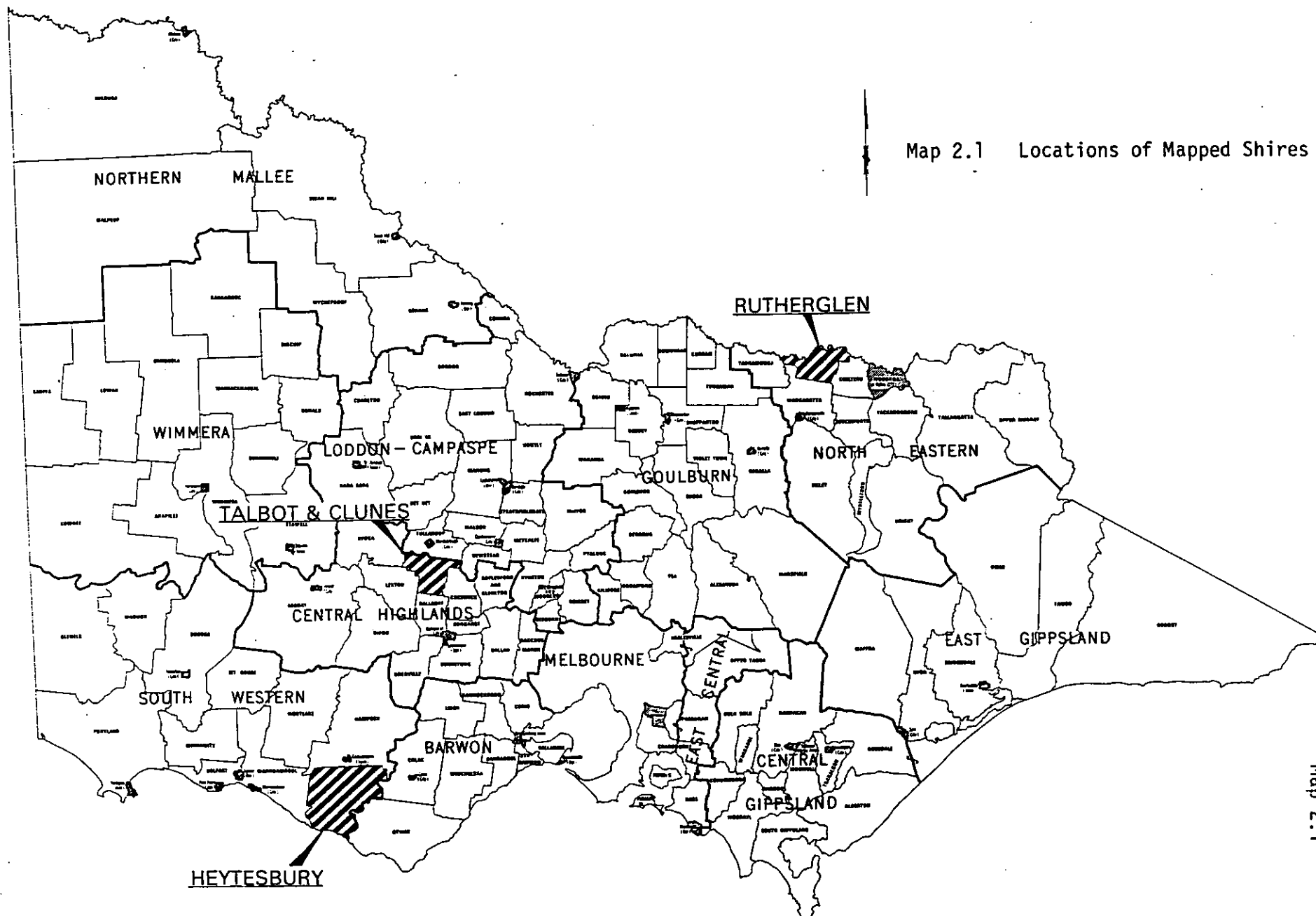
Refinement of the field sheet followed its use to map conservation value of roadsides in the Shire of Heytesbury. The factors which had been identified as representing conservation were retained with one change and some scores were modified and definitions/explanations were improved. The results of this mapping exercise are presented in Map 2.2.

Additional minor amendments followed use of the methodology to undertake a similar mapping exercise in the Shires of Rutherglen and Talbot and Clunes.

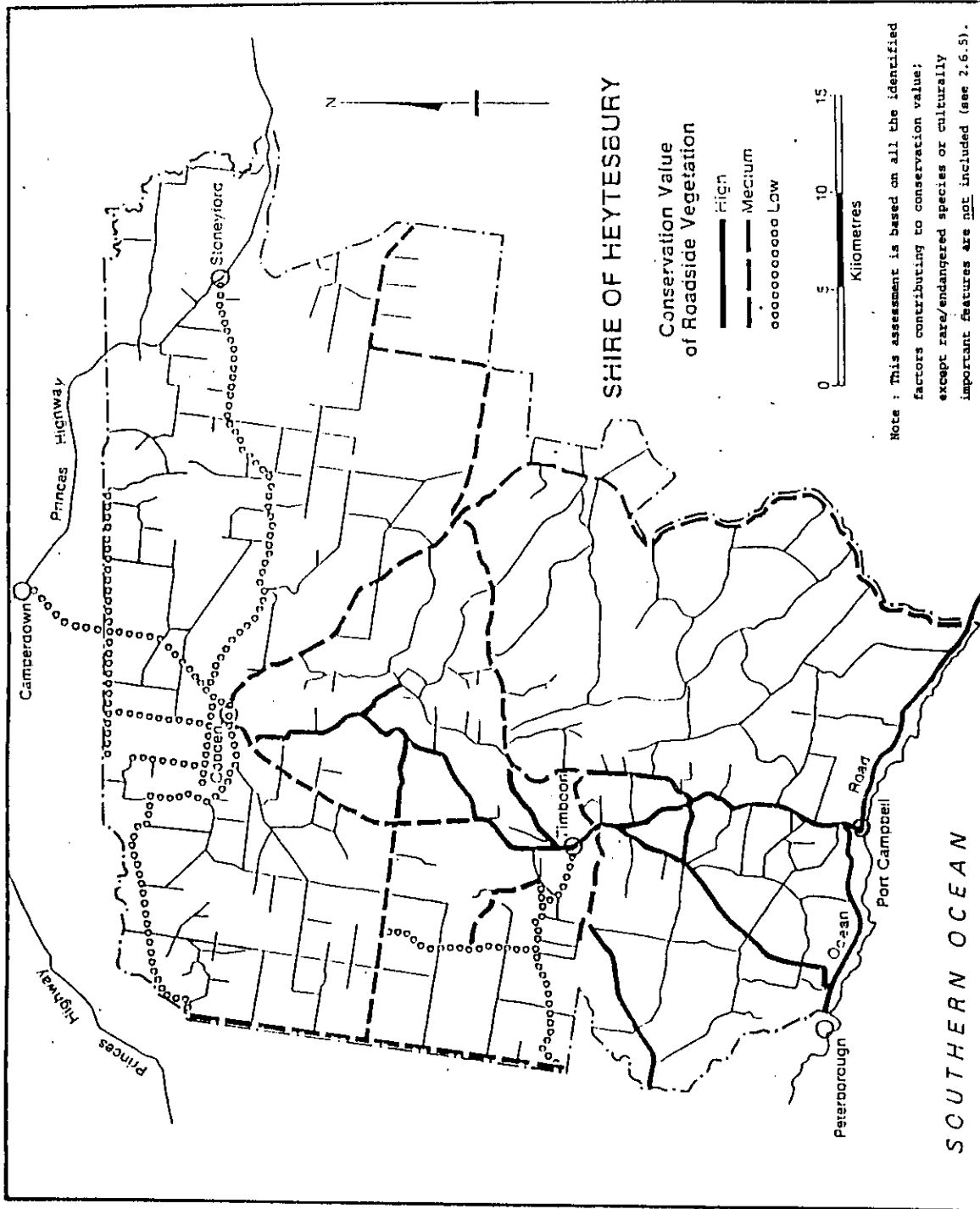
2.5.5 Shire Mapping Exercises

To ensure that the procedure would be applicable across Victoria the three shires in which the procedure was applied were chosen to represent as wide a range of vegetation types as possible. Map 2.1 indicates the locations of these shires.

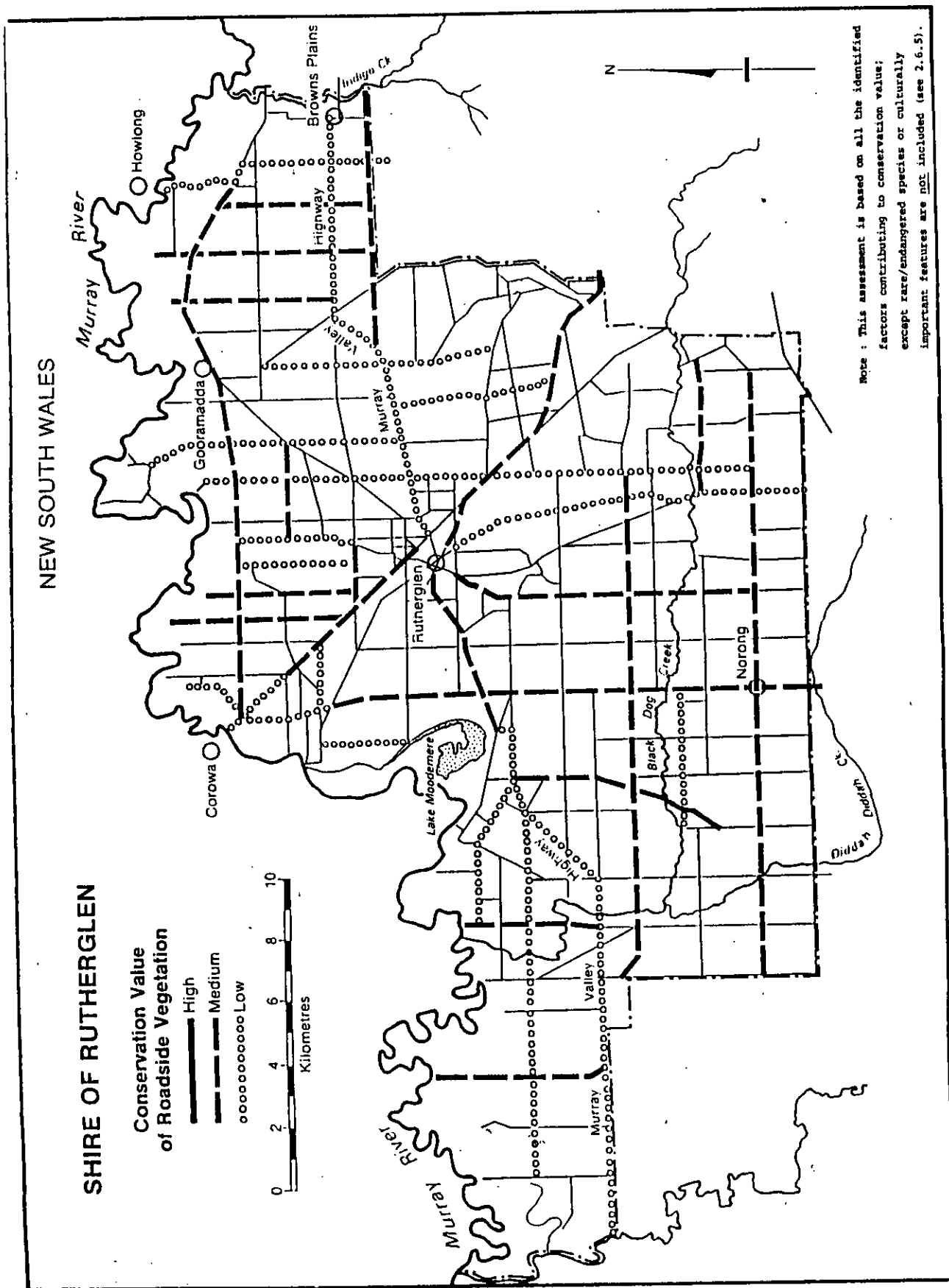
The Shire of Heytesbury carries a variety of vegetation types ranging from coastal heathland through open forest to grass lands in the north of the Shire. The Shire of Rutherglen was chosen as an area with few remaining blocks of natural vegetation, yet it provides a considerable degree of recreational driving. This Shire also hosts stands of river redgum and has examples of water features along the Murray River.



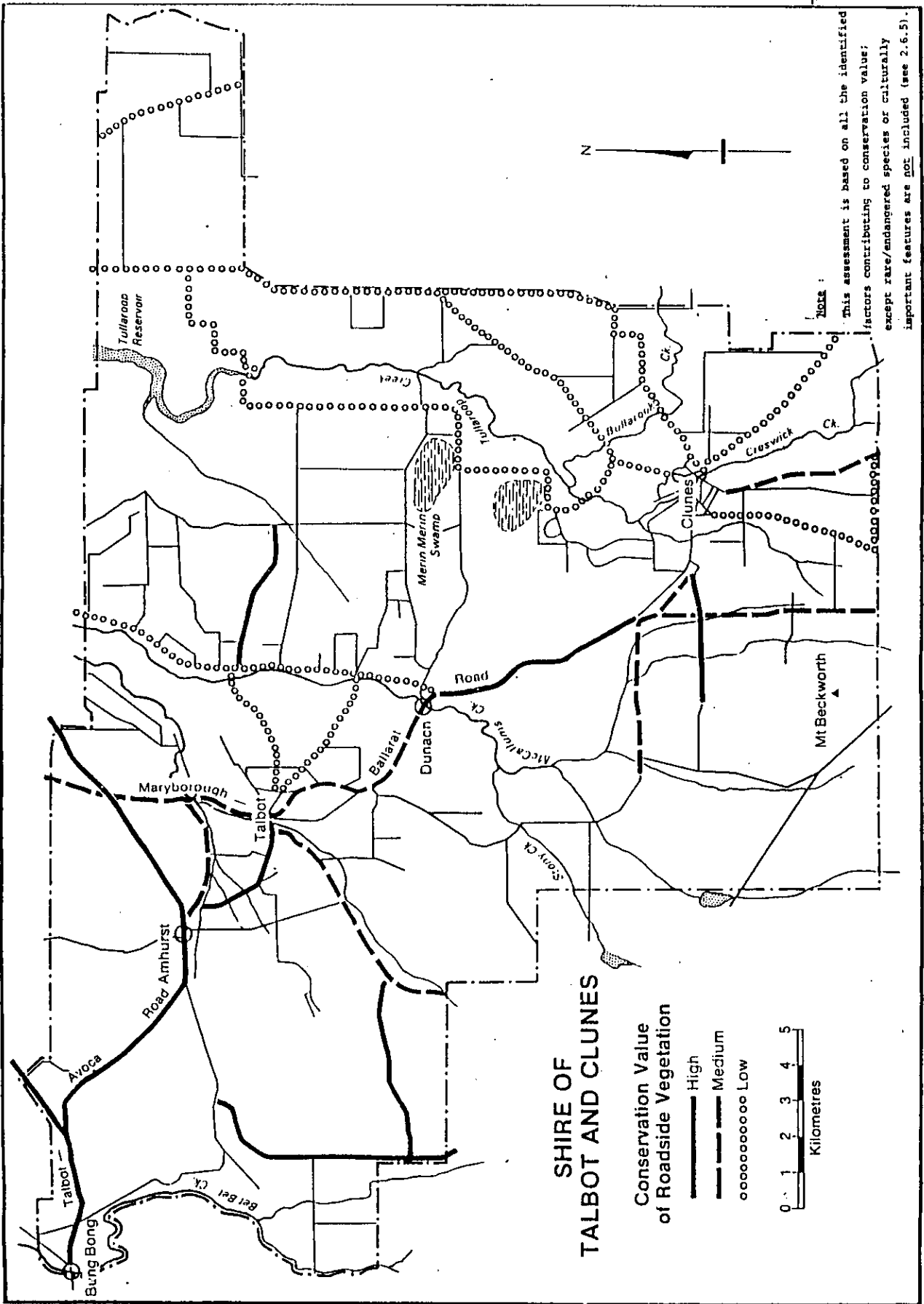
Map 2.2



Map 2.3



Map 2.4



Another area with little remaining natural vegetation in blocks is the Shire of Talbot and Clunes. The indigenous vegetation present is dominated by red/iron bark, yellow gum and grey box.

The results of applying the assessment procedure to these three shires are presented in Maps 2.2 to 2.4; the evaluation sheet for Shire of Rutherglen is included in Appendix V for information. Use of the procedure in the three shires confirmed its applicability to a range of roadsides and demonstrated the ease of its application.

It should be noted that information related to rare species or cultural features was not a prerequisite to assess the usefulness of the procedure. Also, collection of this information (discussed in Section 2.7) involves some time, which would have delayed completion of the project. As a result, the presence of rare species or cultural features was not included in the testing and refinement of the procedure, and is not represented in Maps 2.2, 2.3 or 2.4. To determine the absolute conservation value of roadsides in the three test shires, data on rare species and cultural features would have to be obtained and the roadsides reassessed.

However, the information which has been collected for the three shires provides some interesting insights into the state of vegetation across Victoria. The following section summarises results of the assessments of the data obtained under each of the field sheet headings. Maps 2.2 to 2.4 give a visual indication of the combination of all the factors. Roadsides were assessed between road junctions, not on a length basis, so it is possible to make only general comparisons between the surveyed shires.

(a) Vegetation and Habitat

Less than one third of the roadsides assessed (in the three shires) had no apparent native vegetation;

the majority had some native vegetation cover (between 20 - 100% cover). In (the shire of) Heytesbury a majority of the roadsides had a good cover of native vegetation, while in (the Shire of) Talbot and Clunes fewer roadsides had this cover. In direct contrast, none of the roadsides sampled in (the Shire of) Rutherglen had a good cover of native vegetation; a majority had a single dominant species, while the remainder had a cover of less than 20% of native plants.

(b) Extent of Vegetation

Of all roadsides assessed a significant minority had vegetation along less than 10% of their length; the situation for vegetation over a length of 60 to 80% was similar. In Heytesbury the majority of the roadsides assessed had a continuity in length greater than 60%. On the other hand in Talbot and Clunes nearly half the roadsides assessed had less than a 10% continuity of vegetation.

(c) Noxious Weeds

Either an abundant or a moderate amount of noxious weeds was observed on a majority of all roadsides assessed. In both Rutherglen and Heytesbury the majority of roadsides had either an abundant or a moderate amount of noxious weeds. Noxious weeds were slightly less of a problem in Talbot and Clunes. It should be noted that Cape Weed was particularly noticeable at the time of the assessment. Although this plant is not a designated noxious weed, it is a serious pest species and for the purpose of the trial assessment was included in this factor (see Section 2.7.2, B. for a discussion on the inclusion of pest species). This may have tended to influence the results.

(d) Regeneration of Native Vegetation

Of all the roadsides sampled in the three shires

only a very small proportion had extensive regeneration occurring. About a third had no regeneration at all, and the situation was similar for the categories of 'slight regeneration' and 'moderate regeneration'. In Heytesbury most roadsides had some regeneration, but in Talbot, Clunes and Rutherglen, regeneration was less obvious; in Talbot and Clunes about half the roadsides assessed exhibited no regeneration. On the roadsides assessed in Rutherglen there was very little evidence of extensive regeneration.

(e) Landscape

A low landscape value was accorded to roughly half of the total roadsides assessed. The remaining roadsides were reasonably equally divided between moderate and high classifications. However, in Heytesbury nearly half of the roadsides sampled had a high landscape value. This contrasts strongly with Rutherglen, where only a small proportion of the roadsides assessed had a high landscape value.

(f) Farming Pressure

The majority of roadsides assessed had no grazing present, and only a small proportion had noticeable grazing pressure. In Heytesbury a substantial minority of roadsides assessed did have grazing present, while only about half had no grazing. However, of the roadsides assessed in Rutherglen most had no grazing present, and in Talbot and Clunes almost all of the roadsides assessed had no grazing present.

(g) Width of Road Verge

Of all roadsides assessed just over half had a width of between four and ten metres, while about one third had a width greater than ten metres. Both Heytesbury and Rutherglen showed a similar distribution, but in Talbot and Clunes about a fifth had widths of less than four metres.

(h) Strata

The measurement of strata was only undertaken in the Shires of Rutherglen, and Talbot and Clunes. When the methodology was initially tested in the Shire of Heytesbury strata had not been specifically identified as being important. The need for its inclusion became apparent during the assessment in Heytesbury and this modification was made for the subsequent assessments. In Rutherglen almost all roadsides surveyed had one expected stratum absent, while about two thirds of the roadsides in Talbot and Clunes were in this category. None of the roadsides assessed in Rutherglen had all expected (original) strata present. On the other hand in Talbot and Clunes a substantial minority of roadsides had all expected strata present.

(i) Utility Services

The majority of all roadsides assessed had no discernible utility services, although the roadsides assessed in Rutherglen exhibited slightly more utility usage with a noticeable minority having a utility present over 70% of their length, and the utility taking up over 50% of the roadside's width. On the other hand, of the roadsides assessed in Talbot and Clunes, the substantial majority had no utility present.

(j) Proximity to Natural Vegetation

Of roadsides surveyed in the three Shires slightly over half were separated from areas of natural vegetation by over three hundred metres. Against this, a sizeable minority of roadsides assessed were connected by at least one point to an area of natural vegetation. The roadsides assessed in Heytesbury followed this trend. In Rutherglen, however, the proportion of roadsides connected by at least one point to an area of natural vegetation was somewhat less, while in Talbot and Clunes the proportion was slightly greater. Again in Rutherglen, only a very small

proportion of roadsides were connected at two points to areas of natural vegetation. This contrasts with the roadsides assessed in Talbot and Clunes where about a fifth were connected at two points to areas of natural vegetation.

2.6 CHECKS ON THE METHOD

Sensitivity of the procedure when used by different assessors is important for the replication of results. During the mapping of the three shires, two assessors always worked as a team and, on an informal basis, independently cross-checked the scores allocated for particular conservation factors. The results of these checks indicated that the scores allocated by each person differed only slightly. When this difference is translated into the effect on the categorisation of the roadside, it becomes important only if the total score falls on the border between two categories (for example if the total score were ten or eleven) and the variation of scores would change the category of the roadside. This tends to highlight the difficulty of adopting any form of categorisation system where there are discrete ranges of scores, and a difference of one point in the total score can lead to a change of category.

However, while such discrete categories are required by land use planners and administrators, the difficulty must be accepted. At the same time it is important that the basis for the divisions be made overt, as in the 'evaluation sheet' used in this procedure. This allows adjustment of categories should changes in community values indicate that this is desirable, and gives a basis for managing roadsides as well as giving them a rating.

Furthermore, a form of safeguard exists in the use of the evaluation sheet. Total scores which are on the borders of the categories, or within one or two points, can be examined to see if any particular features have caused this result (for instance a good cover of vegetation affected by heavy utility usage). Consideration can then be given to re-examining the roadside, if it is in a low category, when detailed surveys are

undertaken (see discussion in Section 2.8).

For the validity of the procedure described here to be fully assessed rigorous measurements of the factors which contribute to conservation value would have to be made over an extensive range of land types. Such measurements would include:

- (i) sampling for floral and faunal diversity,
- (ii) sampling over time to assess the stability and the amount of natural regeneration occurring, and
- (iii) application of quantifiable techniques for evaluating aesthetic value.

Detailed studies have been made of some of these variables on a few of the State's roads (for example by officers of The Forests Commission and National Herbarium). Other roadsides could be surveyed to produce the extra data needed to check the validity of the rapid assessment procedure developed here. The similarity of scores produced by this procedure and others based on rigorous assessment could then be measured using appropriate statistical techniques.

Such thorough testing would prove time consuming and expensive. An alternative would be to use experts in the appropriate fields of botany, zoology, weed invasion and aesthetics. Such experts could provide conservation value scores for roadsides where some quantitative information already exists and these scores would then be compared with those produced by the rapid assessment approach.

Either testing technique could also be used as a basis for developing more detailed assessment techniques for those roadsides identified as having moderate to high conservation value by the rapid approach.

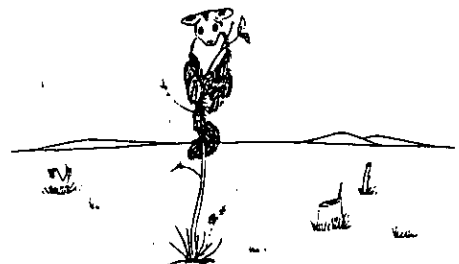
The practicability of using the procedure within the prescribed constraints (see Section 2.3) was checked during the surveys of the Shires of Rutherglen and Talbot and Clunes. Estimating the criteria used proved to be within the capabilities of an untrained person travelling in a slowly moving vehicle with only spasmodic stops.

Whether all the criteria estimated were needed to discriminate between roadsides having high, moderate or low conservation value, could not properly be determined on the basis of data from only three shires. There is undoubtedly some double counting in the criteria used. However, this serves to emphasise the contributions of some variables (for example vegetative cover) to several aspects of conservation value and to provide some internal checks on the consistency of the assessor.

Although the criteria used were assessed on ordinal rather than cardinal scales a parametric technique was used to test the appropriateness of the criteria used. This test, factor analysis, was applied to the data collected. This analysis suggested that fewer criteria could be used to discriminate adequately up to three categories of conservation value. However, data from other areas would be needed to determine if this is generally true. Furthermore, the saving in time from reducing the number of criteria would be slight and the opportunity for internal checks would be lost.

Additional tests may indicate the degree of double counting which is now suspected, but deletion of any factors would need to be carefully considered. While some 'overlap' of factors exists, each has been chosen, and defined, to assess different aspects of the roadside. Hence, whereas one factor's inclusion may be mathematically dubious it may still be important to the procedure overall.

Apart from rigorous testing of the rapid assessment approach (such as is suggested in the first part of this section) its use in the field should also be seen as a test. All such assessment systems should always be subject to review and updating as they are applied. It is recommended that those charged with the task of assessing roadside conservation value should be requested to comment on the method and recommend modifications after they have had opportunity to put it into practice.



2.7 USE OF THE METHOD FOR ASSESSMENT OF CONSERVATION VALUE OF ROADSIDES

Use of the assessment procedure by field staff should involve three steps:

1. Making an inventory of existing information on the roadsides concerned and becoming familiar with these roadsides.
2. Application of the 'field sheet' in the field.
3. Evaluation of the results collected during field work, and display of the findings.

These steps are described in detail in the sections following and summarised in the Handbook (refer to Appendix IV).

2.7.1 Collection of Existing Information and Familiarisation

It is suggested that an inventory and familiarisation should begin about four weeks before commencing the field work. The details of the procedure are as follows:

- (a) Send letters to the following Government Departments and Private Interest Groups for information on areas of biological, historical or landscape interest found in or near roadsides within the area (a map of the area, showing all roads, should be included with the request):
 - . National Herbarium
 - . Victoria Archaeological Survey
 - . National Trust of Australia (Vic.)
 - . Conservation Council of Victoria
 - . Field Naturalists Association (Local Branch)
 - . Bird Observers Club
 - . Department of Planning and the Environment
 - . Department of Conservation, Forests and Lands
 - . Local historical society
 - . Local conservation groups
 - . Victorian National Parks Association
 - . Society for Growing Australian Plants

- (b) Consult the Land Conservation Council reports, the National Estate register (both available in most libraries) or any other relevant references in order to identify known vegetation communities found within the area.
- (c) Prepare maps showing the distribution of biological and historical features based on the information obtained from (a) and (b). In particular, identify those roadsides with rare/endangered/significant species or cultural/historical features. These maps should be used to determine if the roadside vegetation represents the majority of the remaining original vegetation of the locality; i.e. to determine its relative rarity or uniqueness. (see K of the Field Sheet, Figure 2.11).
- (d) Obtain information from the local officers of the Department of Conservation, Forests and Lands regarding local weeds and their identification so an assessment of weed abundance can be undertaken.
- (e) Before using the procedure in the field it is important that the field staff become aware of local indigenous vegetation communities, the extent of roadside vegetation (often taken for granted) and areas of biological, historical or landscape interests in the area. It is suggested that the assessors drive around the area to simply observe the vegetation on particular roadsides and the differences between these. Visiting different roads should give an idea of the different types of vegetation types likely to be found in the area. However, inspection of LCC maps should have been carried out before setting off to discover the number and general location of the different vegetation communities likely to be found, and the range of strata that could be expected (contact with people knowledgeable in local vegetation is also advisable).

These visits will also help the assessors to attune themselves to the differences in vegetation, and the procedure itself. While the assessment procedure may be undertaken by one person, assessment by a driver and an observer is the fastest technique.

Further technical assistance may be available from the Department of Conservation, Forests and Lands through the local office of this Department.

2.7.2 Application: use of the "Field Sheet"

The Field Sheet (see Figure 2.11, p.59) is designed as a single sheet for each section of roadside being assessed. This is to be filled out as the assessor moves along the road. It is expected that the assessor would need to stop at some point along the section to reflect on the 'average conditions' encountered; if

more than one person is involved in the field the sheet can be filled in while travelling at a reasonably low speed depending on how much variation there is in the vegetation of the section.

The length of the section over which the assessment is undertaken is under the control of the assessors. Short sections will result in a lot of data to be evaluated, but provide fairly precise information on conservation value. Long sections will reduce the amount of data collected, but run the risk of overlooking fine detail or important observations. Suggestions for practical section lengths are as follows:

- (a) standardise on a section length of 0.5, 1 or 2 km.
- (b) adopt a variable length, for instance start the section at a road junction and end it at the next junction (this is the approach used to map the three test shires).
- (c) adopt a variable length based on the features of the roadside, i.e. start the section at some convenient point and end it at the place where one of the factors (e.g. Vegetation/Habitat) changes its score.
- (d) take a standardised distance, but begin the section where one of the factors changes its score.

The advantage of using a standard length is that roadsides can be compared; for example by computing the percentage of roadsides in a particular conservation category in different areas. However, there is also an advantage in ending a section where one of the factors changes its score since this encourages the assessor to be vigilant over the state of the factors. Consequently, approach (d) is recommended.

Whatever section length is adopted, it should be maintained throughout the study. If there is any doubt as to the choice of length, some 'dry runs' should be undertaken and the results discussed with a local representative of one of the organisations listed in Section 2.7.1.

Another decision to be made before filling in the first field sheet is whether each verge will be assessed separately, or whether the features of both verges will be averaged out by the assessor to give an overall assessment of the roadside. The procedure can handle either approach.

Once these decisions have been made a Field Sheet can be filled out for each section of roadside for the average or overall condition along that section of road for each factor on the Field Sheet.

The following sections will discuss scores for each factor. Refer to the figures cited in these groupings for aspects noted under each heading.

A. Vegetation and Habitat

In order to provide food and shelter for animals the extent and variety of vegetative cover is important. A gliding possum for example, will sleep in the hollow of a mature tree but feed on understorey trees; without both resources it would not survive. Likewise, birds such as honey eaters require nectar to feed; as plants of one species tend to flower at the same time, other species of plants are required to provide a year-round resource. Therefore, the amount of cover is important. In this case the term 'cover' refers only to shrubs/bushes and trees and is the extent of vegetation, on average, between the road edge and fence line. This is represented by the canopy of the vegetation as a percentage of the ground area. An estimate of this percentage is sufficient.

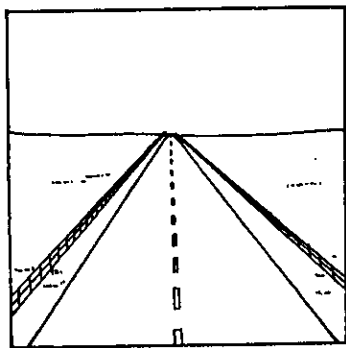
'Vegetation' in Figure 2.1 is taken to be represented by the shrub/bushes and trees on the roadside. However, not all vegetation contributes to conservation value to the same extent. Exotic species usually have considerably less value than indigenous species. Alternatively, where stands of indigenous vegetation are among the last remaining examples in the locality, they contribute a high value and an additional score is added to the score already obtained in this section to emphasise that special protection is required. An additional score is also involved where the presence of rare or endangered species is noted, as this presence gives a greater value to the vegetation since these species may prove irreplaceable (see K. Presence of Special Species or Features).

Presence of non-indigenous tree or shrub species along a roadside will have some value both aesthetically and physically. They provide some habitat and hold the soil together. Exotic trees, such as cypress, are acceptable in this category as the presence of any trees with understorey is generally of more value than a cleared roadside with exotic grasses.

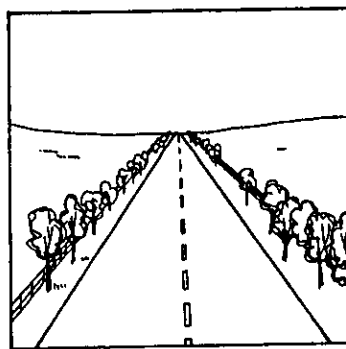
At the lower end of the spectrum, where the vegetation appears as an extension of the agricultural land, the vegetation has little conservation value. Likewise, where agricultural species appear in 'weeds' or 'tree regeneration' they are ignored in the cover calculation.

FIGURE 2.1 - SCORING SYSTEM FOR VEGETATION/HABITAT

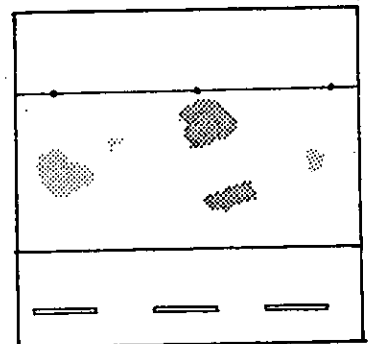
No apparent trees or shrubs roadside appears as an extension of agricultural land	0
Presence of <u>non-indigenous species</u> (plantation of exotic trees/shrubs or presence of species from outside region)	1
One or more species of native plants with a combined <u>cover of less than 20%</u>	3
One or more species of native plants providing <u>20-50% cover</u>	6
One or more species of native plants providing <u>50-100% cover</u>	8



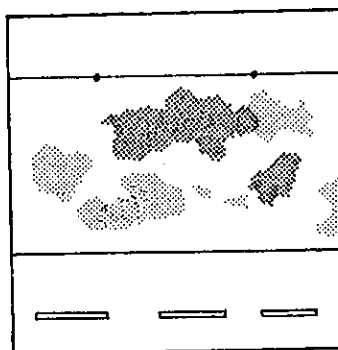
Extension of
agricultural land



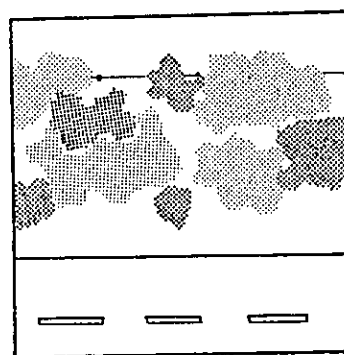
Probable presence
of non-indigenous
species



Native species
Less than 20% cover



Native species
20 - 50% cover

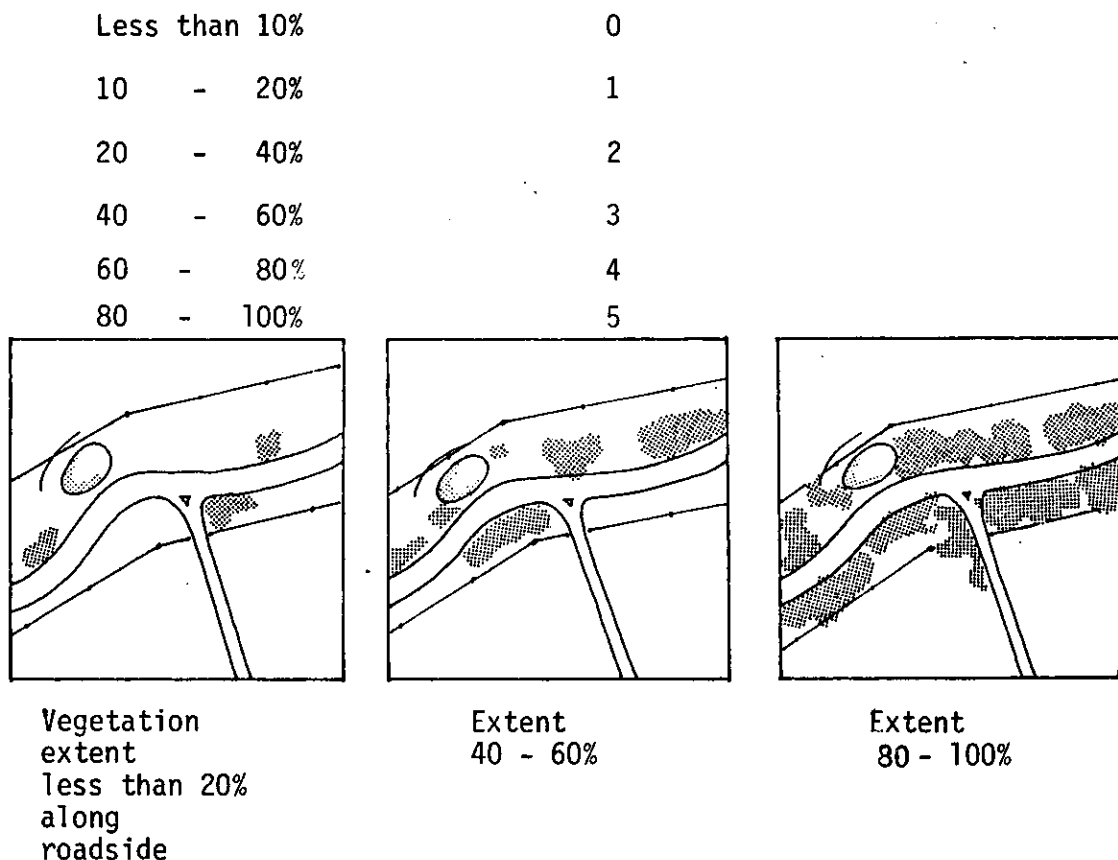


Native species
50 - 100% cover

B. Vegetation Extent over the Length of the Roadside

This section examines the extent of vegetation along a roadside with a high score given for a long continuous strip of natural vegetation; since continuity enables migration of flora and fauna, contributes to diversity and to aesthetics. Small water bodies and short breaks in the canopy, such as driveways, are not considered to break this continuity; e.g. a section of road of 100m. in length (of which driveways to farms form 20m.) has vegetation along 80m., therefore vegetation 'covers' 100% of the roadside. In all cases an approximate percentage is sufficient (see Figure 2.2).

FIGURE 2.2 - SCORING SYSTEM FOR EXTENT OF VEGETATION ALONG THE LENGTH OF ROADSIDE.
(Excluding pest species and agricultural plants)



C. Noxious Weeds.

Weeds are a problem for both regeneration on roadsides and for growing crops or pasture. Identification of weeds on a 'state-wide' basis is complicated because while a plant may be classed as a weed, or pest, in one area, it is not necessarily so in others. Consequently, this assessment technique uses that defined grouping of weeds, 'noxious weeds' (as outlined in the Vermin and Noxious Weeds Act, 1958) to indicate the presence of weeds in general. Discussion with local officers of the Lands Office (Department of Conservation, Forests and Lands) and Department of Agriculture may indicate that some pest species, other than the designated noxious weeds, should be included in the assessment. In this situation it is suggested that the assessment be undertaken twice; firstly incorporating only noxious weeds (so that the assessment is comparable with other roadsides) then including the pest species to see if this alters the conservation category.

The seasonality of some weeds (herbaceous or annual) needs to be noted and roadsides surveyed when expected weeds would be evident.

It is assumed that the users of this assessment technique will have some local knowledge and be able to recognise the more prominent weeds in the district. Officers of the local Lands Office should be able to assist with the identification of noxious weeds. As no specialist knowledge is assumed, the rating system for weeds is based on visual dominance only. To assess this the user should either slow the car or get out of it at frequent intervals to inspect the vegetation, usually when the vegetation appears to have changed.

Absence of weeds rates a (relatively) high score, whereas an abundance of weeds receives a negative score (see Figure 2.3).

FIGURE 2.3 - SCORING SYSTEM FOR NOXIOUS WEEDS

Abundant (visually <u>dominant</u> in understorey)	-4
Moderate (weeds <u>present</u> in understorey)	-2
Sparse (weeds inconspicuous)	0

D. Regeneration of Native Vegetation

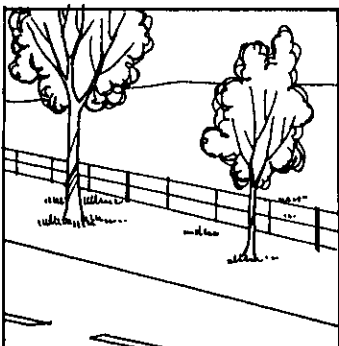
Evidence of seedlings or suckers may prove to be an indication of the 'health' of vegetation in an area. Pressure from grazing animals such as rabbits, cows and sheep may destroy an area's vegetative diversity by preventing the development of seedlings. Evidence of natural regeneration indicates that such deterioration is not likely and the quality of the vegetation may improve.

The scale to assess regeneration (see Figure 2.4) ranges from evidence of regeneration (nil), through the presence of a few scattered individuals (slight), to the presence of seedlings 'less than 3 meters apart' (extensive). In all situations presence of seedlings (or young shrubs or trees for that matter) refers to the presence of natural (indigenous) vegetation. Regeneration of weeds or trees such as introduced pine should be ignored.

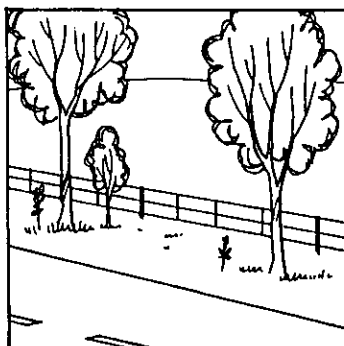
Regeneration may be most obvious in areas where the soil has been disturbed, and where there is also competition from weeds. A score for 'regeneration' will serve to counteract the negative influence of weeds.

FIGURE 2.4 - SCORING SYSTEM FOR REGENERATION.
(Presence of seedlings or young native vegetation)

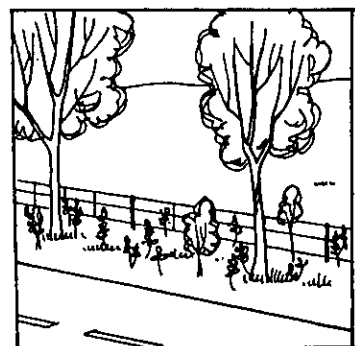
Nil	0
Slight (Scattered individuals)	1
Moderate	3
Extensive (individuals less than 3m. apart)	4



Nil



Moderate



Extensive

E. Landscape Value of Roadside Vegetation.

The presence or absence of roadside vegetation can either enhance or detract from the driving experience. All techniques used to assess landscape quality are subjective, but there is considerable agreement as to what constitutes high and low quality. Three levels of quality are identified (see Figure 2.5) and the assessor chooses the appropriate level based on the description given.

FIGURE 2.5 - SCORING SYSTEM FOR LANDSCAPE VALUE.

Low:

Long straight segments of roadside with sparse vegetation of little visual interest. Rubbish dumps, quarries or similar activities may be present.

0

Moderate:

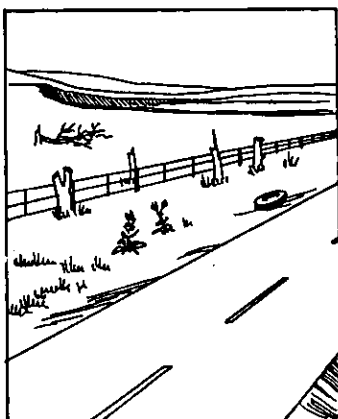
Expanses of roadside vegetation similar in spacing, form colour and texture to that commonly found in the character type which provide moderate visual interest but which seldom become a distinctive focus of view.

1

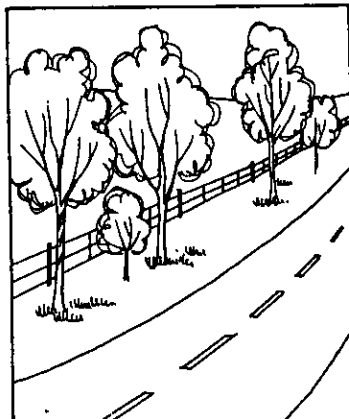
High:

Unique feature trees, or tree rows which become a positive focus of view due to position, colour, form or texture in contrast to those found commonly in the surrounding landscape. Water features such as ponds, swamps or creeks may be present.

3



Low landscape Value



Moderate



High

F. Farming Pressure.

As stated in the section on regeneration, grazing can have deleterious effects on both young and mature vegetation. Cultivation and cropping can have similar effects.

A rating of 'nil' would be given to a healthy stand of vegetation where there are no signs of droppings, hoof prints, or cropping (see Figure 2.6). If animals have been sighted on the roadside singly, or in large numbers en route between farms or paddocks, then it is recorded as 'occasional' farming pressure. The presence of electric fences along the roadside, use as a stock route or for crops demonstrates that grazing is present and farming pressure is 'present'.

The seasonality of grazing and cropping needs to be noted and roadsides surveyed when such activities are expected.

FIGURE 2.6 - SCORING SYSTEM FOR FARMING PRESSURE.

Present (electric fences on roadside or stock route; indications of cultivation or cropping)

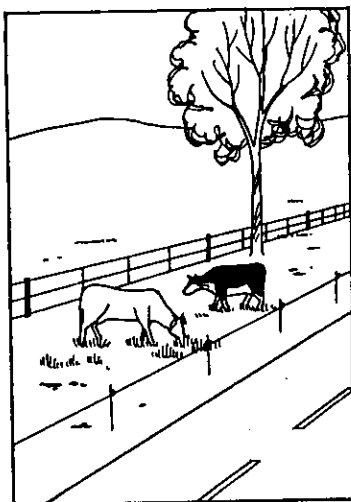
-5

Occasional (poor fencing or animals sighted on roadside).

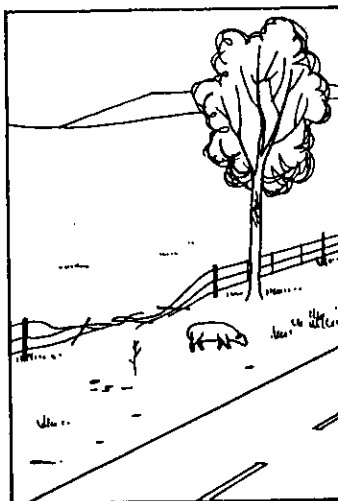
-2

Nil (no signs of droppings or hoof prints).

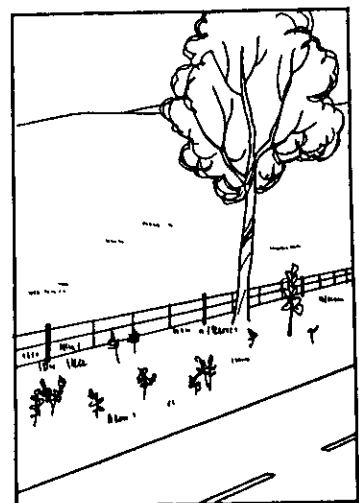
1



Farming pressure
present



Occasional



Nil

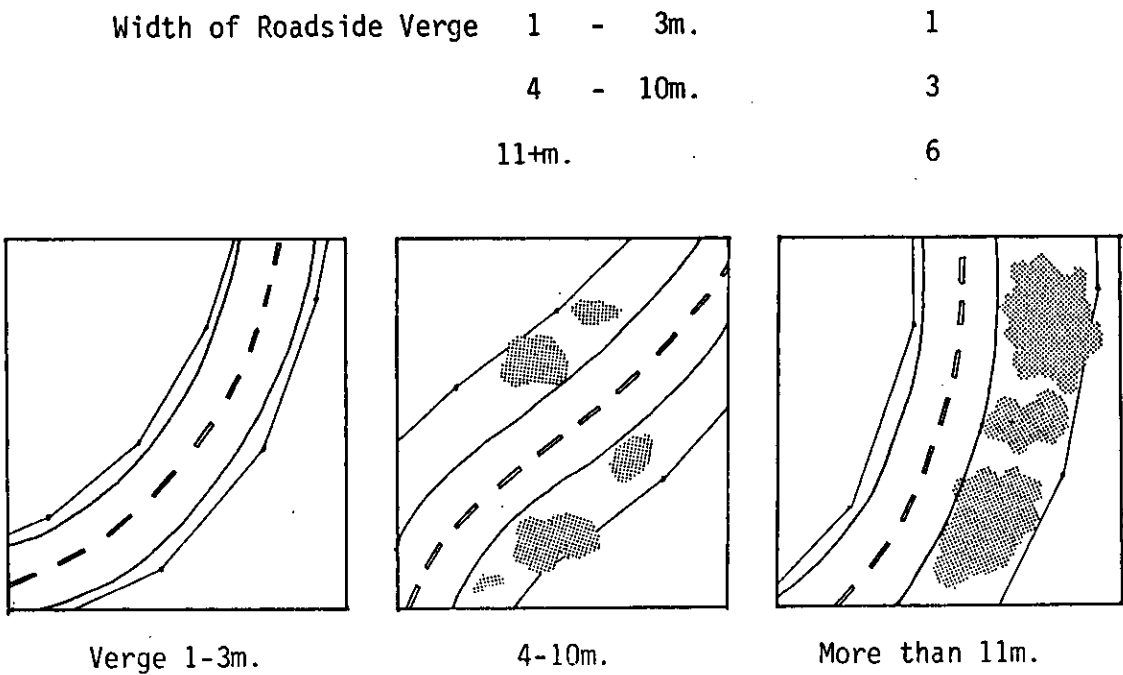
G. Width of the Roadside Verge.

Invasion of roadside vegetation by exotic species from neighbouring (often agricultural) land reduces its value for conservation. On the edge abutting the road itself the vegetation may be influenced by light and wind and possibly seeds introduced by traffic. A wide verge under native vegetation provides opportunity for the vegetation towards the middle to be reasonably undisturbed and stable.

Narrow verges present little chance for indigenous vegetation to be maintained, and are less likely to provide worthwhile habitat.

The width of the verge is measured from the edge of the road to the fenceline. If both sides of the road are to be assessed as one then the average of the two sides is the figure considered. In some areas the road has been developed to one side of the road reserve; in this case only the widest verge is considered (see Figure 2.7).

FIGURE 2.7 - SCORING SYSTEM FOR WIDTH OF ROADSIDE VERGE.



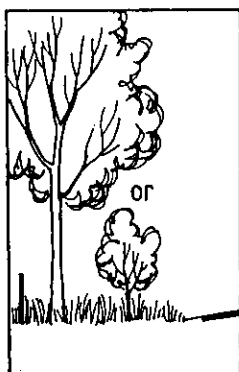
H. Strata of Vegetation.

'Strata' is taken to mean the number of canopy heights present in the grouping of vegetation. For example, there would be three strata if the roadside contained bushes of wattles, perhaps taller wattles above these and tall growing eucalypts above these. Generally the greater the number of strata, the more habitat available and the greater the potential carrying capacity of the roadside for birds and mammals. However, vegetation with many strata may not be a feature of every district; one or two strata only may be associated with some types of undisturbed vegetation (red gum forests for example). Hence, 'strata' requires an assessment of the change in the number of strata from that which would have been expected (prior to European settlement) and that which currently exists.

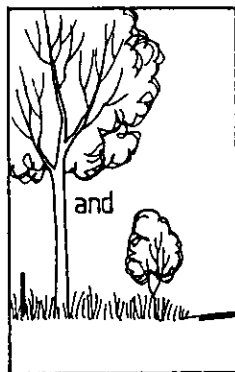
Local Groups and government representatives with botanical knowledge (for example Field Naturalist groups and Department of Conservation Forests and Lands) should be able to assist in determining 'original' conditions. Users of the method will have to familiarise themselves with the general appearance of different samples of the region's vegetation in order to assess the change of strata. Figure 2.8 presents the scoring system for the change of strata and indicates the appearance of a variety of strata.

FIGURE 2.8 - SCORING SYSTEM FOR STRATA OF VEGETATION

Roadside <u>lacks</u> 2 or more (natural) expected strata <u>or</u> natural tree cover absent <u>or</u> number of natural strata present but consisting only of exotic species	0
One (natural) expected stratum <u>absent</u> <u>or</u> represented only by scattered individuals	2
All (natural) expected strata <u>present</u>	4



One stratum



Two strata



Three strata
or more

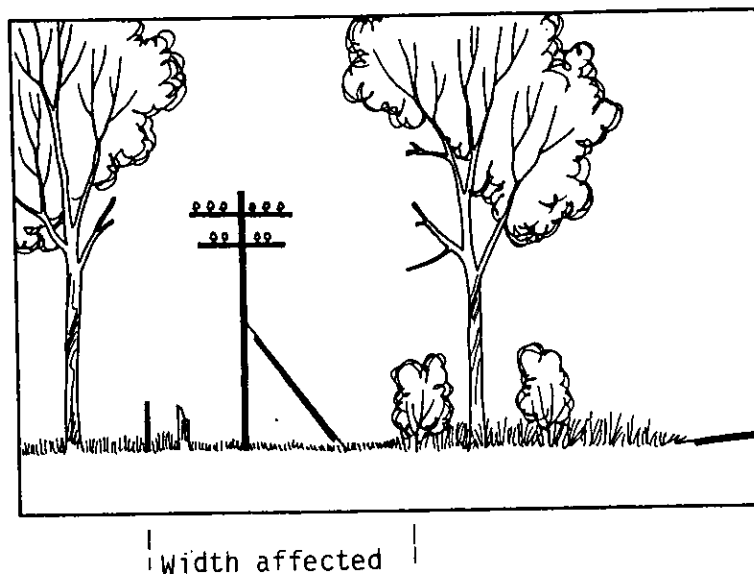
I. Utility Services.

Utility services represent the variety of services which use the roadside and consequently affect its conservation value. Width represents not only the physical space taken up by the utility (e.g. powerlines) but also the area affected in protecting and servicing the utility (e.g. firebreaks and access tracks).

Installation of utility services disturbs vegetation which then tends to be disrupted regularly as maintenance works are carried out. Hence the existence of utility services has a negative effect on vegetation and a negative score in this methodology (see Figure 2.9).

FIGURE 2.9 - SCORING SYSTEM FOR UTILITY SERVICES.

Utility extends for	>70% length of	&	>50% width	-6
	roadside			
"	"	"	>70% " " " & <50% "	-4
"	"	"	10-70% " " " & >50% "	-3
"	"	"	10-70% " " " & <50% "	-2
Present singly, e.g. gravel dump				-2
No utility service present (visible or underground)				2



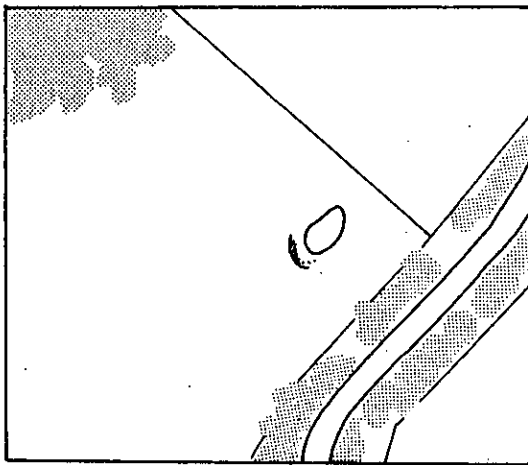
J. Proximity to Areas of Natural Vegetation.

The proximity of roadsides to areas of natural vegetation increases the amount of genetic material which may enter and disperse along the roadside verge. Adjoining natural vegetation also effectively widens the verge so that it becomes much less subject to invasion by exotics. There is an advantage in carrying out an assessment of roadside vegetation as part of an overall assessment of vegetation within the area. Blocks of natural (indigenous) vegetation will already be mapped, or the information readily available. Without the complete mapping of vegetation it is still possible to easily complete this section by noting where river reserves, State Forest, National Parks or vegetation on private lands join the vegetation on the roadside.

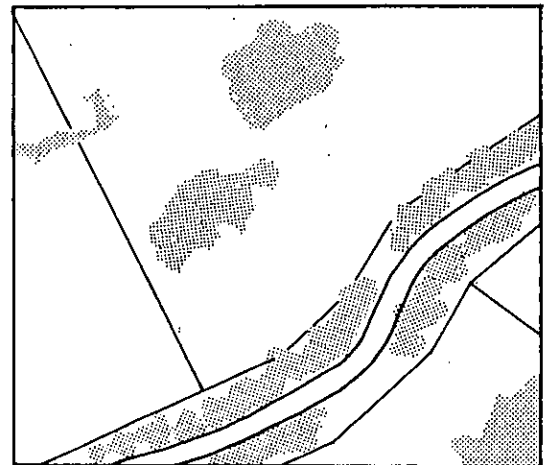
The scoring system outlined in Figure 2.10 gives the highest score for a block of natural (indigenous) vegetation being within 0 - 100m. of the road reserve fenceline at two points along the section of roadside being assessed. The lowest score is given for a block of natural vegetation being between 100-300m. from the fenceline. A zero score is given for blocks of vegetation further than 300m. from the fenceline.

FIGURE 2.10 - SCORING SYSTEM FOR PROXIMITY TO AREAS OF
NATURAL VEGETATION.

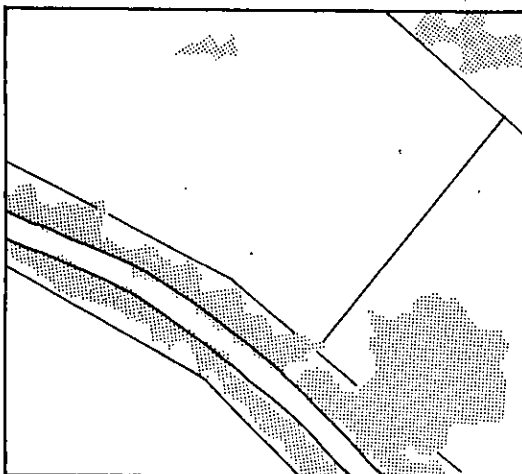
Block(s) of vegetation greater than 300m. from fenceline	0
Block(s) of vegetation 100-300m. from the fenceline	1
Block of vegetation 0-100m. from the fenceline at one point along the section	2
Blocks of vegetation 0-100m. from the fenceline at two or more points along the section	3



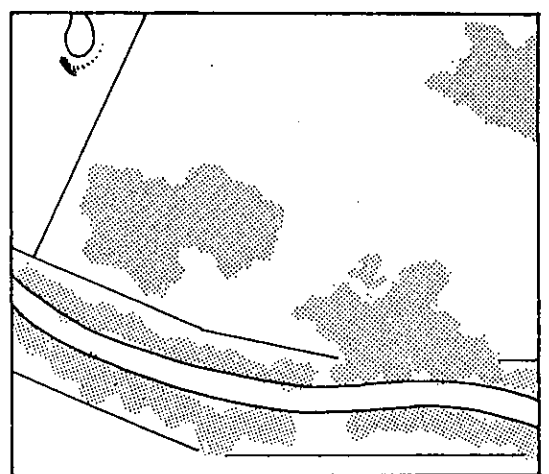
Vegetation more than 300m.
from fenceline



Vegetation within 100-300m.



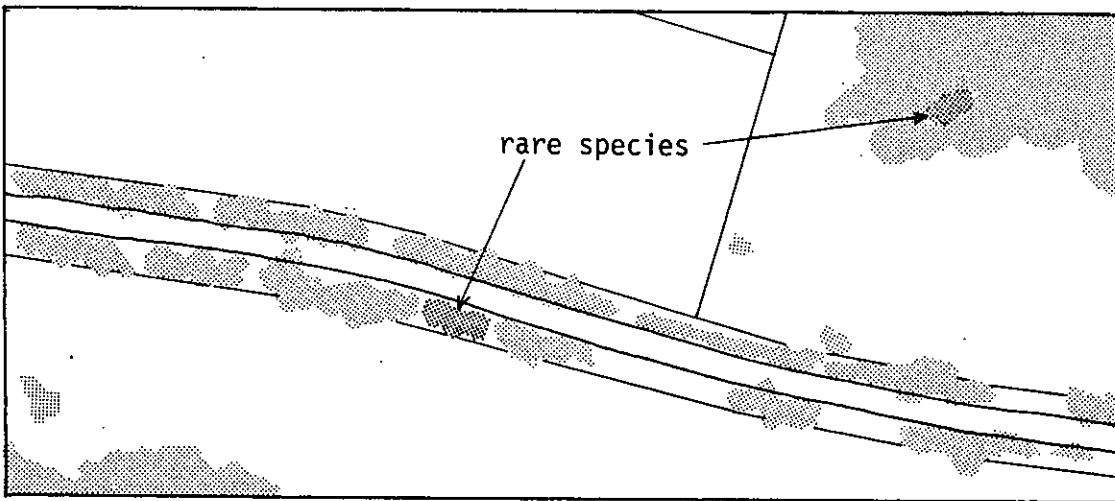
Vegetation less than 100m.



More than one block of
vegetation within 100m.

K. Presence of Special Species or Features.

Users of this procedure are not expected to have the expertise to be able to identify these species or features in the field. This information would come from the Inventory exercise described in Section 2.7.1. The presence of such species/features should be entered on the appropriate field sheet(s) as soon as they are returned to the office, if the data is available at that date; alternatively, the presence of these species/features may be recorded at any time, in which case the score for that section of roadside would have to be reviewed.



Presence of any rare/endangered/significant species, cultural/historical feature or relatively rare vegetation immediately attracts a score of 30 (see Figure 2.11. Section K), which immediately gives the section of roadside a HIGH, or at least MODERATE, conservation classification.

FIGURE 2.11 - EXAMPLE FIELD SHEET.

AREA/SHIRE.....DATE / / .

ROAD.....

SECTION FROM.....TO.....

BOTH VERGES/ONE VERGE (SPECIFY.....)

INSTRUCTIONS: For each conservation factor (A to J) circle the score appropriate to the average conditions along the section.

For K (Rare species) circle the score if special features/species are known to be present.

<p>A <u>VEGETATION/HABITAT</u></p> <p>No apparent trees or shrubs roadside appears as an extension of agricultural land</p> <p>Presence of non-indigenous species (plantation of exotic trees/shrubs or presence of species from outside region)</p> <p>One or more species of native plants with a combined <u>cover of less than 20%</u></p> <p>One or more species of native plants providing <u>20-50% cover</u></p> <p>One or more species of native plants providing <u>50-100% cover</u></p> <p>LIST DOMINANT SPECIES IF KNOWN</p> <p>.....</p>	<p>B <u>VEGETATION LENGTH OF ROADSIDE</u> (Excludes noxious weeds and agricultural plants)</p> <table border="0"> <tr> <td>0</td> <td>Less than 10%</td> <td>0</td> </tr> <tr> <td>1</td> <td>10 - 20%</td> <td>1</td> </tr> <tr> <td>3</td> <td>20 - 40%</td> <td>2</td> </tr> <tr> <td>6</td> <td>40 - 60%</td> <td>3</td> </tr> <tr> <td>8</td> <td>60 - 80%</td> <td>4</td> </tr> <tr> <td></td> <td>80 - 100%</td> <td>5</td> </tr> </table>	0	Less than 10%	0	1	10 - 20%	1	3	20 - 40%	2	6	40 - 60%	3	8	60 - 80%	4		80 - 100%	5
0	Less than 10%	0																	
1	10 - 20%	1																	
3	20 - 40%	2																	
6	40 - 60%	3																	
8	60 - 80%	4																	
	80 - 100%	5																	

<p>C <u>NOXIOUS WEEDS</u></p> <p>Abundant (visually dominant in understorey) -4</p> <p>Moderate (present in understorey) -2</p> <p>Sparse (weeds inconspicuous) -0</p>	<p>D <u>REGENERATION OF VEGETATION</u> (presence of seedlings or young shrubs/trees)</p> <p>Nil 0</p> <p>Slight (scattered individuals) 1</p> <p>Moderate 3</p> <p>Extensive (individuals less than 3m. apart) 4</p>
---	---

E LANDSCAPE VALUE OF ROADSIDE VEGETATION

Low	0	● Long straight segments of roadside with sparse vegetation of little visual interest.
Moderate	1	● Expanses of roadside vegetation similar in spacing, form, colour and texture to that commonly found in the character type which provide moderate visual interest but which seldom become a distinctive focus of view.
High	3	● Unique feature trees or tree rows which become a positive focus of view due to position, colour, form or texture in contrast to those found

F FARMING PRESSURE

Present (electric fences on roadside or other evidence)	-5
Occasional (poor fencing or individual animals on roadside)	-2
Nil (no signs of droppings or hoof prints)	1

G WIDTH OF ROADSIDE VERGE

Width of 1 - 3m.	1
Width of 4 - 10m.	3
Width of 11+m.	6

H STRATA OF VEGETATION

Roadside <u>lacks</u> 2 or more (natural) expected strata <u>or</u> natural tree cover absent <u>or</u> number of natural strata present but consisting only of exotic species	0
One (natural) expected stratum <u>absent</u> <u>or</u> represented only by scattered individuals	2
All (natural) expected strata <u>present</u>	4

I UTILITY SERVICES

Utility Extends for >70% length of the roadside >50% width	-6
Utility Extends for >70% length of the roadside <50% width	-4
Utility Extends for 10 - 70% length of the roadside >50% width	-3
Utility Extends for 10 - 70% length of the roadside <50% width	-2
Utility Present singly e.g. gravel dump	-2
No utility service present (visible or underground)	2

J PROXIMITY TO AREAS OF NATURAL VEGETATION

Block(s) of vegetation from fenceline a distance of 300m. or greater	0
Block(s) of vegetation from fenceline a distance of 100m. - 300m.	1
Block of vegetation from fenceline a distance of 0 - 100m. at <u>one</u> point on roadway	2
Block of vegetation from fenceline a distance of 0 - 100m. at <u>two</u> or more points on roadway	3

K PRESENCE OF SPECIAL SPECIES OR FEATURES

Prior (or later) investigation shows the presence of either:	
- rare/endangered/significant species (flora or fauna)	
- vegetation of relative rarity/uniqueness in the locality.	
- cultural/historical features	30

COMMENTS

.
.
.

TOTAL SCORE: ADD A+B+C+D+E+F+G+H+I+J+K =

2.7.3 Evaluation

The field sheet has been designed so that the scores allocated for each conservation factor can be added together on the field sheet to give the total for the section of roadside being assessed. However, rather than taking only the total from the field sheet, it is suggested that all scores are transcribed to an evaluation sheet (an example is shown in Figure 2.12) so that the factors that score high or low can be readily seen. The addition of scores for the final total can then be undertaken on the evaluation sheet, and the category of conservation significance determined (see Chapter 2.6.2.) i.e.

HIGH	conservation value - total score greater than 25
MODERATE	conservation value - total score 25 to 11
LOW	conservation value - total score less than 11

As discussed in Chapter 2.6.3 these categories can then be displayed in tabular form, or plotted on maps using a suitable legend.

2.8 USE OF THE ASSESSMENTS

Once roadsides have been assessed for conservation value and this data is plotted, it will be possible to gain a picture of the distribution of roadsides in each category. This will help to identify particular locations that deserve special protection measures, those locations that require help with regeneration and some which warrant more thorough evaluation.

The data will also show at a glance the broad conservation significance of a particular roadside that may be under consideration for uses which may threaten its conservation value - for example, as a fire break, for a utility easement or for road reconstruction. If the category is higher than LOW, consideration should be given to making more detailed study of the roadside vegetation as a basis for careful design of the intended activity to minimise reduction in the conservation value.

In some cases further study may identify vegetation of sufficient value to justify re-location of the intended development, and re-evaluation of the category of conservation value.



Plantations can contribute to the conservation value of roadsides.

3. MANAGEMENT OF ROADSIDES

3.1 INTRODUCTION

Approximately forty groups and organizations are actively or passively interested in roadsides. These include government and semi-government authorities, conservation groups and organizations with varying uses for roadsides. Groups range from those who have legislative powers, to those who have no power but are concerned about the status of vegetation on the roadsides.

The practices, policies and control of each body vary enormously. In general, the groups involved have either an extremely vague management strategy for roadsides, or none at all.

Legislative controls for the utility services and other government authorities relate to the main function of each body. These controls seldom consider management of roadside vegetation and where they do, may be completely inappropriate for state-wide management policies. Consequently, mismanagement of roadsides is widespread.

Each of the groups with some legislative control over roadsides has different responsibilities, powers and interests. Most would concede that the road reserve's prime reason for existence is as a corridor for transport. However their perceptions of the value of the roadsides differ greatly - from an area for the allocation of specific assets to a place for representation of habitat and floristic diversity.

3.2 CONTROLLING BODIES

3.2.1 Utility Involvement

Existing legislation permits a number of authorities to use the road reserves as easements for their services and to locate their assets on the road verge. A list of these organizations is presented in Appendix II. For some organizations this may involve a one-off or very infrequent disturbance of the roadside vegetation. Others require access to their assets at all times and need to carry out works on the roadside on a regular basis. This is more likely to have a severe effect on the roadside vegetation.

With the placement of utility assets on the road reserve, the area takes on a new economic significance. The capital investment involved in utility assets is substantial, and unwitting damage to the assets will involve large repair costs. To reduce the risk of damage to its assets, it is often necessary for a utility organization to modify the vegetation. Vegetation may be removed altogether or managed so that it does not interfere with the asset. This management is not always based on a good understanding of vegetation and its response to disturbance and may be influenced by public pressure on the organization to be seen to perform in a certain way. Consequently placing utility assets on roadsides often results in the destruction of vegetation. This destruction may produce such costly after-effects as have been discussed earlier in section 1.4.

The alternative of locating utility easements on private property, particularly where roadsides are well vegetated, has not often been adopted in the past. This is partly because of low values placed on roadside vegetation in the past and partly because of the inconvenience of negotiating with private landholders. However there are now instances where, rather than disturbing roadside vegetation, alternative easements have been used.

3.2.2 Utility Codes of Practice

Most utilities have some form of guidelines to aid their field staff when they are dealing with roadside vegetation. In many instances these guidelines are not adequate to cover many of the problems encountered. They may be supplemented by training of field staff. However, how well the guidelines are followed varies with the organization involved and the particular people carrying out the work.

The adoption of a course of action often involves consultation with other organizations which have an interest in the particular roadside verge(s). Codes for these circumstances have been written with consideration for each other's needs. These are examined in Section 4.2.

3.2.3 Other Interested Bodies

A great number of groups have an interest in roadsides other than as simply service corridors. They range from bodies with legislative control through to local action groups. In Appendix II a list of all groups with current or possible interest in some form in roadsides has been compiled. This does not include any localised "action groups" because they are difficult to discover and tend to disband once an issue is resolved.

The more prominent of these groups are represented on the Roadside Conservation Committee (R.C.C.) along with the utility organizations.

3.3 LEGISLATION

There are at least nineteen Acts of Victorian State Parliament which deal directly with road reserves to varying extents. These are dealt with in detail in the "Draft Report of the Roadside Flora Legislation Committee". The following discussion gives a brief outline of the main Acts.

The Forests Act (1958) is an extensive Act, which gives control of vegetation on most roadsides to municipalities and encompasses many other aspects of roadside vegetation. Under the Act "unused roads" become "Protected Forest". "Forest produce" is defined to include nearly every form of vegetation that has commercial value. Removal of this "produce" is licensed and penalties exist for non-compliance with the licensing procedure.

Municipalities obtain a wide range of powers from the Local Government Act (1958). The power to make by-laws related to roadsides is considerable and these by-laws are often municipality specific. An unappreciated aspect of these powers flows from the ability to grant licences to clear roadsides (of vegetation other than saleable timber) crop or graze unused road reserves (which are unlicensed by the Department of Conservation, Forests and Land), and graze cattle on roadsides.

The Road Construction Authority (R.C.A.) operates under the Country Roads Act (1958) and has control over 'declared' roads (such as Freeways, State Highways and Main Roads) within Victoria. Practical application of this control is not area specific. Basically, it has responsibility for everything that occurs in road reserve area of declared roads. This has meant the R.C.A. controls the timber, all road works and, to a large extent, fire prevention measures on these roads.

Through the Wildflowers and Native Plants Protection Act (1958) the Department of Conservation, Forests and Lands controls the removal of all listed protected flora. This also means the Department has the power to prosecute for illegal removal.

Erosion control legislation is incorporated in the Soil Conservation and Land Utilization Act (1958). The Department for Conservation, Forests and Lands has some power to prosecute for practices conducive to erosion.

The Ministry for Planning and Environment also has protective legislative powers under the Environment Effects Act (1978). The

object of this Act is to ensure that projects which could result in significant environmental effects are investigated and reported for public comment before decisions are made about approvals for the project.

Intervention to prevent the spread of vermin and noxious weeds is covered in the Vermin and Noxious Weeds Act (1958). Actual implementation is carried out by the Department of Conservation, Forests and Lands, local municipalities, R.C.A. and adjoining landholders.

State Rivers and Water Supply Commission operate under the Water Act (1958), the Sewerage District Act (1958) and the Pipeline Act (1967). Their works relate to pipeline laying and they are legally required to consult with the Ministry for Planning and Environment on major works. Water and sewerage mains are frequently within the road reserve. Intention to construct pipelines for sewage are advertised 30 days prior to commencement.

Under the State Electricity Commission Act (1958) the S.E.C. is provided with powers which allow it to allocate and service assets it places on the road verge. It also has powers to stop anything from interfering with its assets. In practice this results in an annual tree pruning and clearing campaign, to prevent vegetation interfering with power lines.

Two sections of the Gas and Fuel Corporation Act (1958) allow the Corporation to construct pipelines and work on the road reserve. In general, the Corporation's legislative powers are fairly limited because it carries out only minor repairs and maintenance in rural areas compared with the other authorities involved.

The Telecommunications Act (1975) deals in certain sections with Telecom's legal obligation to reinstate the surface of the land; this encompasses both soil and vegetation on roadsides.



The 'long paddock': use of the roadside for grazing after the drought has finished.

Fire control and specific legal obligations are set out in sections of some utility Acts. The main controlling Act though is the Country Fire Authority Act (1958). The powers in this Act range from sections requiring fire prevention work through to practices to be implemented in emergency situations.

3.4 INTERGROUP CONFLICT

It has been pointed out that there are numerous organizations in Victoria which have an interest in the roadside. It is not uncommon to find conflicts between their practices and policies. In some respects these conflicts reflect a tension between insular economic considerations on the one side and conservation values on the other. For example, removal of indigenous vegetation might be sensible from the point of view of reducing maintenance costs on the facilities installed by utility organizations but the result is seriously damaging to the ecological value of the area and result in unforeseen costs.

Figure 3.1 presents a Conflict Matrix for roadsides. Categories have been adopted to represent the organizations involved with the Roadside Conservation Committee (see Appendix II) and broad conflict areas have been identified. The aim of this matrix is not to present a definitive picture of all possible situations where conflicts can occur with regard to roadsides, rather it demonstrates that conflicts occur, and gives an indication as to the types of conflicts. Conflicts occur through the pursuit by each organization of its goals legitimised by its particular piece of legislation, or by the particular interests of the group. An analysis of this type assists in identifying the nature and cause of conflicts and where consultation and compromise will be needed. It is worth noting here that the legislation protecting roadside vegetation is much more easily enforced on individuals than on organizations, even though the scale of disturbance caused by each would suggest that organizations pose the greater threat to the conservation of indigenous roadside vegetation.

FIGURE 3.1- CONFLICT MATRIX FOR ROADSIDES
(see text for comments on this matrix)

	Service Utilities	Road Authorities	Land Managers/Planners	Special interest groups	
				Flora/Fauna Preservation	Others
Service Utilities e.g. State Electricity Commission of Victoria.	-	1,2	1,3,4,7	4,5,6,7	3
Road Authorities e.g. Road Construction Authority	-	-	2,6,7	4,5,6	4
Land Managers/Planners e.g. Dept. of Environment and Planning.	-	-	-	4,7	4
Flora/Fauna Preservation e.g. National Parks Service.	-	-	-	-	4,5,6
Other Interest Groups e.g. Country Fire Authority, Victorian Field and Game Assoc.	-	-	-	-	-

'Conflict Categories':

- | | | |
|-------------------------|--------------------------------------|--|
| 1. Space for easements | 4. Control of Vegetation | 6. Appearance of roadside. |
| 2. Space for roadworks | 5. Non-interference with vegetation. | 7. Maintenance of options for multi-use. |
| 3. Protection of assets | | |

Conflicts arise even though each organization may be acting in accordance with its legal charter. Consequently the most logical approach to resolving these conflicts is to bring the parties involved together so that, by discussion, they may arrive at a reasonable compromise between narrowly defined development, and conservation. In such a discussion the values of roadside vegetation and its need for protection would have to be clearly outlined. At the same time the value of the road reserve for other uses would be appreciated.

Some disturbance of the roadside vegetation would have to be accepted. Use should be made of all available information on responses of vegetation to disturbance and on techniques for minimising the effects of disturbance. A compromise which is acceptable to all parties may then be achieved.

However, the conflicts which occur between organizations are essentially between the organizations' goals. Since, in each case the goals are accepted as legitimate and the organizations' practice within the law, compromises are likely to represent a precarious balance. Compromise necessarily involves elements of bargaining, political influence and concession which are extremely difficult to control. There can be no guarantee that a reasonable compromise can be struck in all cases.

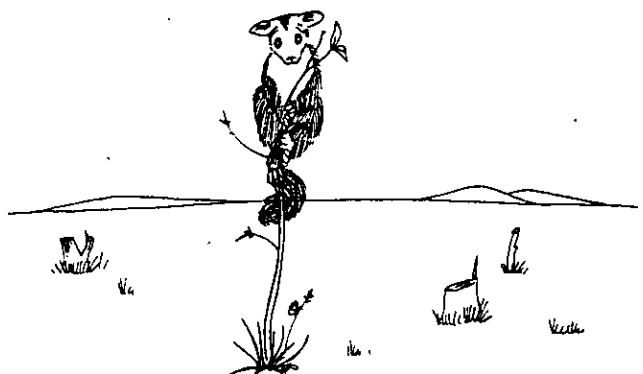
Since compromise cannot always be relied upon as a solution to intergroup conflict, a second alternative would be to establish some over-riding authority which could determine policy and practice on roadside vegetation throughout Victoria (see Section 6.1.3). This might be thought to constitute a further example of centralized bureaucracy, since it would certainly affect the autonomy of many organizations to determine their own policies and practices. Even so, there are reasons for thinking that a centralized authority is more likely to act in the community's broader interests, especially if it were closely associated with the State Government.

It is worth pointing out that a similar move was thought necessary after the 1983 bushfires in Victoria, when problems occurred in the implementation of the Disaster Plan. Emergency Services were found to be affected in their operations by intergroup rivalries, and it was subsequently decided to have a central authority (the Minister for Police and Services) to command the deployment and operations of emergency services in future disaster situations. Few would question that this is more sensible and effective than relying wholly on the different organizations to co-operate with each other. Nor need the existence of such an over-riding authority preclude discussion between groups aimed at resolving their differences.

Although emergency services might appear to have little resemblance to the organizations using the roadside, the reasons for advocating a central authority to govern both is essentially the same (for further discussion see Chapter 6).

A third alternative, and possibly the most desirable one is to alter the legislation under which all the organizations with control over roadsides act, to include the objective of preserving roadside vegetation at all reasonable cost. Guidelines to implement the amendments could be formally produced, or endorsed, by the Roadside Conservation Committee and sanctioned by the Minister for Conservation, Forest and Lands.

Such an approach would avoid the need for an additional government body and place responsibility for vegetation protection in the hands of the management organizations. These would be provided with guidance by existing groups and use existing resources.



4. PRINCIPLES AND PRACTICES OF ROADSIDE MANAGEMENT

4.1 BACKGROUND

Public criticism has been a major instigator of change for some roadside practices. Changes in social values have promoted many organizations involved with roadsides to alter their practices. For example, a growing awareness of the value of trees in the rural landscape has influenced the S.E.C. to trim many trees near power lines rather than cut them down.

The values of roadside vegetation have been examined in Chapter 1; however land use practices consistent with conservation of roadside vegetation in its indigenous state are needed if these values are to be realized. Planning with conservation in mind should precede any interference with the roadside. This will significantly reduce both the severity of the disturbance and overall costs of restoration.

An important part of this planning should be to contact other organizations with an interest in the roadside and obtain their views and suggestions on the proposed action. It is important that each body concerned with roadsides should be aware not only of its own impact on the state of the roadside, but of the influence and interests of other groups. This should allow an integrated approach to roadside management to be developed and prevent incongruous practices from occurring.

Continuous assessment of changes in community values and methods of conducting field practices should be undertaken. However, for a variety of reason, including pressures to reduce costs, it is unlikely that updating and integration of programs for roadside management have been carried out by all organizations involved. This report seeks to update many ideas and point out inconsistent or detrimental practices.

Sections in this chapter deal with development of management

objectives and policy, making decisions with regards to management plans, and an evaluation of present roadside management.

4.2 PLANNING AND AIMS.

Adequate planning requires first that appropriate aims be defined. Aims for the conservation of roadside vegetation can be stated in general terms as:

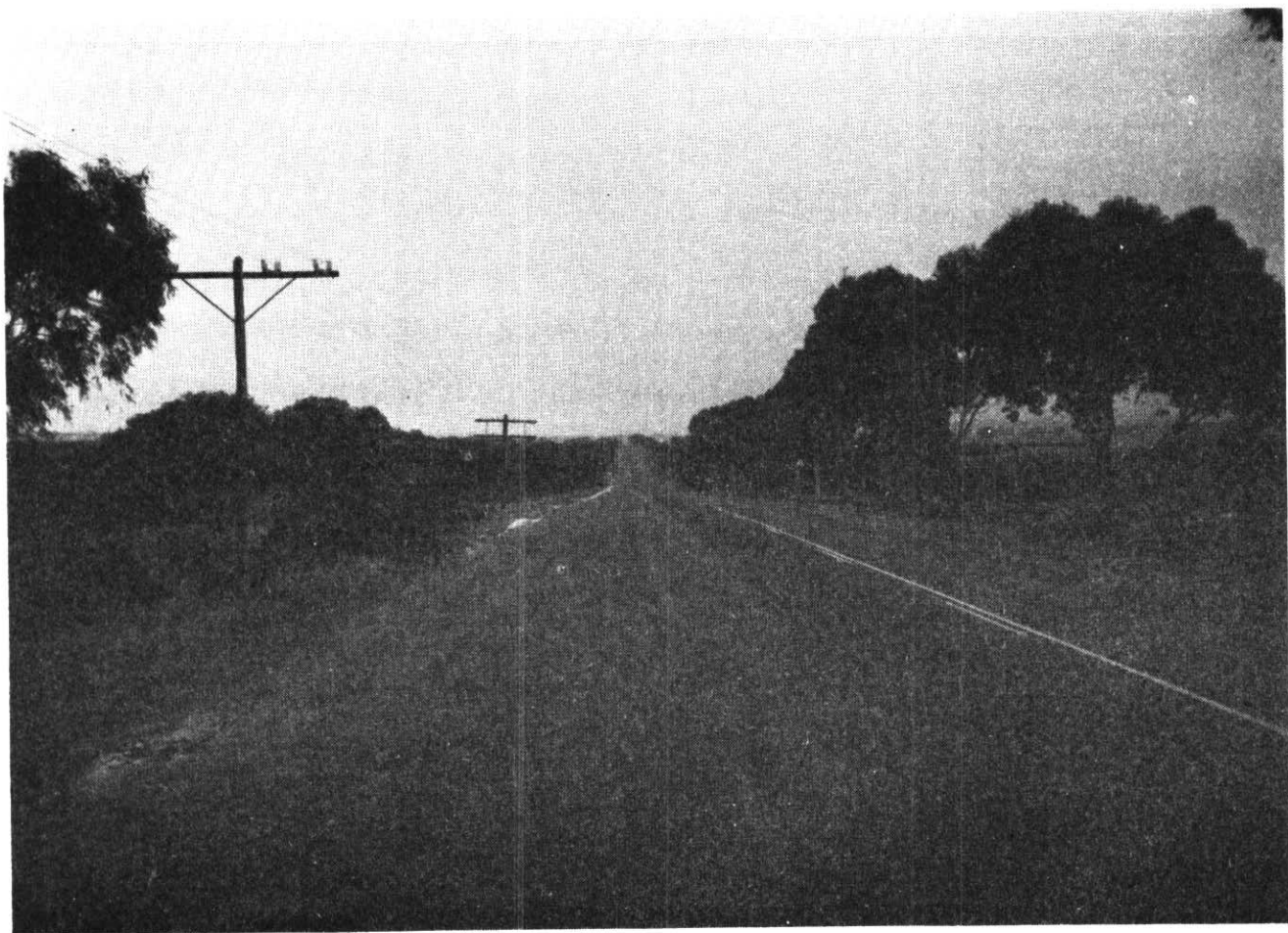
- (i) preservation of existing indigenous or valuable exotic vegetation,
- (ii) encouragement of growth of vegetation indigenous to the area,
- (iii) avoidance of soil erosion and salt intrusion,
- (iv) recognition and protection of aesthetic recreational educational and heritage values of roadsides.

The planning process then involves four steps:

- (i) evaluation of present conditions,
- (ii) establishment of what are the desirable conditions,
- (iii) consideration of alternative methods of attaining the desired condition,
- (iv) deciding which courses of action should be pursued to reach the desired condition.

The final decision would of necessity take account of other aims than conservation - improvement of road safety for example. The management plan adopted would be that which rates highest overall. However, the conservation aims stated above have often been given rather low priority. Considering the values of roadside vegetation, a relatively high rating should be given to these aims.

Ideally all bodies involved with roadsides should consult to develop a set of objectives for overall management of roadsides towards



Management can be passive or active: the planting of trees has markedly improved this roadside's conservation value.

which each can work. In the interim it is expected that each body will continue to pursue its separate objectives with respect to its field operations. However, it is strongly recommended that the general objectives stated above be adopted for conservation of roadside vegetation by all bodies. This would give a common focus to the managing of roadside vegetation and a start towards a more comprehensive set of objectives for overall management.

4.3 DECISION MAKING

There is a need for a policy for the State of Victoria on roadside management which recognises all the benefits which roadsides offer the community. Consultation between interested organizations could produce an appropriate set of objectives for roadside management. These should include aims such as those set out in the preceding section.

The main problem when making decisions is to predict the changes on the values of each decision. The use of economic models can be misleading. There are benefits (and costs) of roadside management which do not have identifiable monetary values and for which there is no adequate way of attributing such a value. These include aesthetics, species potential, wildlife habitat and safety considerations. These are commonly ignored or, at best, given surrogate monetary values of doubtful meaning. Consequently using such quantitative techniques for making decisions on roadside management is likely to produce inappropriate results.

The alternative and more appropriate approach is to base decisions on a descriptive technique. A set of descriptive models or scenarios which seek to simulate the outcomes of various decisions can be produced. The major variables which need to be considered on the benefit side of such scenarios have been discussed in Chapter 1 - that is, those derived from ecological, social and economic values. The costs and

feasibility of obtaining these values could be enumerated by the organizations involved.

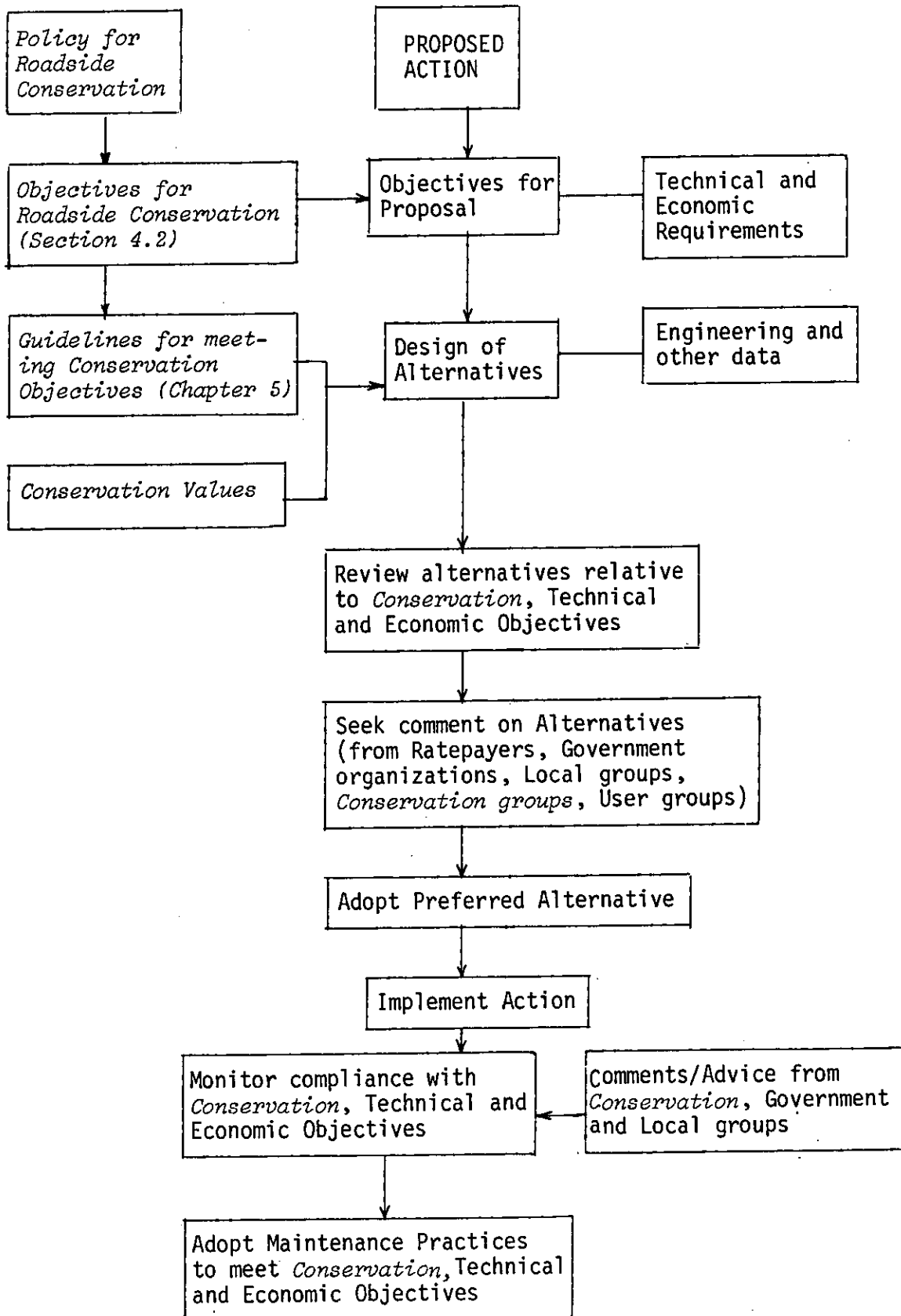
The organizations concerned with roadsides are diverse and ecological systems are complex. Consequently producing even a fairly small number of realistic models is a demanding task. Provided they are realistic however, they will permit decision makers to choose a management system which most adequately meets community values.

A theoretical decision making model such as that outlined in Figure 4.1, could be applied to roadsides to help define the outcome of actions. Unfortunately this type of procedure is obviously demanding of resources and therefore is likely to be used only in particularly sensitive situations. For the vast majority of cases a simpler approach is required.

The technique proposed for general application to roadside management is the adoption of guidelines; designed to take into account most aspects of the theoretical model, while being straight forward enough to be relevant to the majority of projects which affect roadsides. These guidelines are presented in Chapter 5. It must be appreciated that these guidelines will not cover every roadside situation. In these infrequent cases not covered by the guidelines, it is recommended that there be recourse to the theoretical model.



FIGURE 4.1 - A DESCRIPTIVE MODEL OF DECISION MAKING FOR ROADSIDES



Monitoring is one area which the guidelines do not specifically address. It is assumed that the authority responsible for roadside management would, as a part of overall management plans, review the effects of changes to the roadside, including restoration works, and take remedial action where necessary in line with the guidelines.

Management plans for roadsides would need to be attainable and would therefore need to allow for some flexibility. The main danger in allowing this flexibility would be continuous claims for exceptions. If an exception to the management plan is to be considered, its acceptability should be looked at in terms of the overall policy and objectives rather than the benefit of one body.

4.4 EVALUATION OF PRESENT ROADSIDE MANAGEMENT

This section aims to guide future philosophies on how roads should be managed rather than criticise in a negative way. It evaluates current practices to highlight where major conflicts with the conservation of local indigenous vegetation occur. As with the rest of the report only rural areas are discussed.

Assessment of each organization's practices was undertaken using literature provided by that organization. The co-operation of these organizations was most appreciated. Further, the enthusiasm shown by some members of these organizations for the project suggests a willingness to pursue the objectives of roadside conservation. Some of the literature does not relate directly to roadsides but incorporates roadsides indirectly into its discussion.

In some cases an organization acts wholly as a single authority. In others, where areas of responsibility are seen to be shared by more than one organization, two or more authorities have joined to produce documents of agreement. In the following discussion sections (a) to (g) deal with organizations which have both individual and joint policies and programs. Where there is overlap, documents will be discussed in

the context of one authority but will also be referred to when the other body's literature is discussed. The remaining sections look at policies, programs and guidelines of bodies which have not produced such agreements with other organizations.

(a) Road Construction Authority

The Road Construction Authority (R.C.A.), formerly the Country Roads Board of Victoria, has three documents related to roadside vegetation:

- . a policy on fire prevention measures on declared roads;
- . a circular which sets out conditions for permits for the grazing of stock on R.C.A. declared main roads;
- . a joint code of practice with the State Electricity Commission of Victoria.

In the policy paper on fire prevention there seems to be an effort to 'please everyone' which has resulted in inconsistencies in approach. The policy of slashing behind guide posts, for example, may not greatly disturb indigenous vegetation where the verge is wide, but as a general policy for all roadsides it could greatly affect the many narrow verges (see Section 2.5.5).

The undesirability of fuel reduction burning of indigenous vegetation on roadside has already been discussed (Section 1.2.6). It is commendable that the R.C.A. does not favour this method. However, the methods they do adopt to establish fire breaks (slashing, cutting and ploughing) promote grassland. Consequently fire breaks have to be established every year. If regeneration of indigenous vegetation could be encouraged instead, the ground fuel load would be considerably reduced and annual maintenance of a fire break may not be required.

The R.C.A. policy of encouraging the making of fire breaks on land adjacent to the road is most likely to prevent fires from spreading and also avoids disturbance of the roadside vegetation. However, landholders are also allowed to make fire breaks on cleared road reserves. In this case there will be little opportunity for regeneration to occur.

While mention is made of fallen timber and logs there appears to be no appreciation of their value as shelter for animals. As roadsides are usually small areas, removal of this shelter may not leave adequate alternatives for small terrestrial animals. They may either abandon the area or die out.

Many authorities continually use weedicides to control growth on roadsides. The R.C.A. policy of not favouring their use is commended. A policy of precluding practices which promote weed growth is always desirable and much less costly than continual control.

With regard to grazing, as a body charged with the care and maintenance of road reserves for all Victorians, the R.C.A. needs to carefully consider a situation where a few individuals are allowed to use a public asset for private gain. Apart from this philosophical issue, where grazing is allowed, individuals tend to gain a sense of quasi-ownership of the land; withdrawal of the right to graze is a problem. Future revegetation of roadsides becomes difficult and guidelines for grazing are not likely to be followed unless they are enforced. The consideration that landholders tend to graze their stock on roadsides in summer when traffic in many rural areas may be at its highest should also be appreciated and, perhaps, issue of grazing licences based on average traffic conditions could be reviewed.

In its joint code of practice with the S.E.C. the R.C.A.'s position differs from its policy on use of its road reserves as fire breaks. The current policy of the R.C.A. is to allow the S.E.C. to place its assets on the road reserve. In this case

selective revegetation in the vicinity of the power lines should be undertaken. Information on plants indigenous to the area could be sought from local Field Naturalist Clubs or the Department of Conservation, Forests and Lands. Species could be chosen so that the height of the mature plants would not necessitate the regular trimming of trees. Frequently natural regeneration could be used with selective removal of taller species. Eventually a dense growth of shrubby species may prevent regrowth of the tall species while the random location of plants would produce an attractive, informal landscape.

(b) Telecom Australia

Telecom Australia has two engineering instruction papers which represent its policies and practices on roadsides. The first paper entitled 'Cutting and Lopping of Trees', and was issued in February, 1958. The second paper, entitled 'Clearing of Timber along Roads under Country Roads Board (R.C.A.) Control', was issued in June, 1974. This second paper is an extension of the first and deals specifically with R.C.A. controlled roads.

Both these papers show a deep concern for preserving trees on the roadside; Wilson (1983) infers that this means trees, shrubs and the ground layer. The second paper lists a number of methods for disposal of timber. Various advantages of retaining or pruning trees are discussed at length in the papers. Where revegetation is undertaken simply removing specific trees could prove to be a useful approach.

It is commendable that the placing of Telecom's assets on private land is discussed, although the emphasis is mainly on economic benefits.

In the future, guidelines could be given on how revegetation of disturbed areas should be achieved. Consideration should be given to the likely establishment of exotic grasses and weeds on such areas. These may prevent the re-establishment of the original



Fortunately, there are many roadsides that provide habitat, shade and beauty.



vegetation communities. A second matter for consideration is the disturbance of faunal habitats while works are being carried out. This could leave a sensitive species with no refuge so that it may disappear from the area.

(c) State Electricity Commission (Victoria)

Both above ground power lines and cutting and lopping of trees to avoid their interfering with power lines make the impact of the State Electricity Commission very visible. This has raised a good deal of public criticism. The S.E.C. has sought to answer this by producing a wide range of policies, practices and guidelines to deal with most of the issues raised.

The joint R.C.A. and S.E.C. code of practice has already been discussed. This gives reasons for allocating assets on the road reserve and implications of this approach. However there is little indication that values of roadsides beyond that of an inexpensive easement with good access have been considered. Little value seems to be accorded to trees. Instead, considerable emphasis is placed on clearing or pruning them near power lines. Unfortunately this emphasis is to the exclusion of proposing that vegetation which does not grow beyond an appropriate height might be used to replace trees which must be removed or regularly pruned. There is evidence (some collected by S.E.C. staff) that, in some situations, regeneration of indigenous shrubs and ground cover can suppress growth of taller species if the latter are selectively removed during the early years of regrowth. Certainly retaining all but the taller species would increase floristic diversity and reduce invasion of the roadside by exotic grasses and weeds.

The S.E.C. publication "Guide to Tree Planting Near Power Lines" provides information which can assist other groups and individuals to plant trees or shrubs which will not interfere with the lines. Although the use of many Australian native small trees and shrubs is recommended in this publication, it does not commit the S.E.C. itself to any planting program. Nor does it discuss the value of

using locally indigenous species. It may be appropriate for the S.E.C. to channel enquiries about such planting under power lines through the Department of Conservation, Forests and Lands which has more resources available to give details on suitable locally indigenous vegetation.

The S.E.C. has a joint code of practice with the Municipal Association of Victoria (M.A.V.). This deals with the type of procedures the S.E.C. will follow when carrying out works on land controlled by municipalities. The issues examined earlier relating to both the R.C.A. policy paper and the guide to tree planting, apply to this document as well. Another point which is discussed involves the disposal of debris. This debris is essential on the roadside and should be spread out over the road reserve, thus creating habitat for wildlife and returning seed and nutrients to the soil. It is also possible for the chemical inhibitors in many native plant leaves to retard the growth of weeds. So long as the debris is spread out it is not a great fire hazard; nor is vermin able to find shelter in there. The spreading of seeds and nutrients is also encouraged.

In the main the S.E.C. is conscious of community appreciation of trees. However trees are not the only component of vegetative communities. Not only the S.E.C. but all the authorities involved in using the roadsides need to appreciate the value of roadside vegetation in terms of the whole plant community.

The latest document issued by the S.E.C. is entitled, 'S.E.C.' "Lines on Private Land". This raises several considerations. Compensation costs and relations with private land holders are issues involved. When planning to allocate assets on private land, the S.E.C. might consider providing land owners with a substantial economic incentive to make this desirable placement of lines easier to achieve; e.g. a discounted electricity rate.

(d) Ministry for Planning and Environment

A procedure for assessing the degree of fire hazard in rural areas of Victoria in relation to the planning of new development has recently been produced jointly by the Town and Country Planning Board (now part of the Ministry for Planning and Environment), and the Country Fire Authority (Morris & Barber, 1981). The procedure seeks to establish relative fire hazard ratings, on a consistent basis, across the whole State. It recognises that development in high or very high fire hazard areas may be exposed to the full potential of bush fires, placing residents at considerable risk. Where areas of extreme fire hazard are to contain residential developments, constraints and conditions, including clearing of large areas of vegetation to create buffer zones would have a large effect on roadside vegetation. The alternative is to discourage or prohibit development in areas of extreme fire hazard.

Another joint publication with the Country Fire Authority is entitled "Design and Siting Guidelines" (Morris & Barber, 1983). This booklet presents information on siting, design and landscaping of rural properties for maximum protection from bushfires. In several instances slashing the roadside vegetation is suggested. This approach fails to consider any other roadside values; for example, the possible presence of rare species or whether the roadside vegetation contains the less flammable species. It also ignores the need for very frequent maintenance of slashed fire breaks and the value of roadside vegetation as a wind break in grass fires (see Section 1.4.3).

(e) Municipal Association of Victoria

The Municipal Association of Victoria has a joint code of practices with the S.E.C. which is discussed above.

The 'Co-ordination of Streetworks; Code of Practice' has been produced in conjunction with most utility organizations

and relates mainly to urban areas, confining discussion to engineering considerations. The various benefits of vegetation on the roadside are not considered although vegetation gains a brief mention in connection with tree planting along the alignment of electricity poles (for previous discussion on this point see (a) above).

(f) Country Fire Authority

In addition to the two documents previously discussed in section (d), a further document entitled 'Survive The Summer Peril' was produced in 1983. It raises many points which affect roadside vegetation. Construction of roadside fire breaks raises a number of issues (some of which have been discussed earlier). In the context of 'Survive The Summer Peril' the following points should be noted:

- (i) While cleared areas may reduce the fuel load this will not be effective in slowing the rate of spread of grass fires; whereas shrubs will act as a barrier to reduce the rate of spread and will decrease the angle of flames. However, the chance of fire rising from shrubs to tree crowns must be realized.
- (ii) Control burns on roadsides that are vulnerable to erosion will produce many problems including the break-up of the road's foundations, and this is not recommended by the Department of Conservation, Forests and Lands.
- (iii) Grazing along roadsides will increase weeds, cause soil compaction and may lead to soil erosion.
- (iv) If a constructed fire break is unlikely to stop a major fire under extreme conditions then the emphasis on roadside fire breaks may need to be reassessed; a narrow break adjacent to the road edge may be sufficient to inhibit fires started from vehicles but not a well established fire.
- (v) Fuel reduction burning may not be the best alternative. It has been estimated that 25% of wild fires are caused by burning off (Country Fire Authority, 1983) so that fuel reduction burns on roadsides may constitute a considerable fire hazard in themselves.

In general, a more rational and systematic appraisal based on a similar format to that discussed in fire hazard mapping (Barber and Morris, 1981) needs to be used when planning and selecting ways to reduce the hazard of bushfires. and grass-fires.

There appears to be widespread acceptance that farm and garden layout, and building design are important factors in protecting lives and property. There seems little justification for denuding roadsides when the likelihood of this stopping fires is in doubt unless the roadsides are part of a wider buffer zone being used for community protection.

(g) Forest Commission of Victoria

Three Standing Instructions issued by the Forest Commission of Victoria (F.C.V.) (Department of Conservation, Forests and Lands) apply to roadsides.

Firstly, Instruction 0-711 deals with implementation of *Phytophthora cinnamomi* restrictions. The main object of these instructions is the prevention of fungal infection of unaffected forest areas. It deals with gravel pits and the procedures to follow when entering non-affected areas. Part of the discussion revolves around sampling sites which include gravel pits on roadsides. Overall the 'Instruction' can aid the protection of roadside vegetation.

Secondly, the F.C.V. has a joint agreement with the R.C.A. relating to disposal of marketable timber from contract roadworks. This deals with those who receive income from the work. Vegetation becomes the property of the contractor who carries out the removal of timber. This approach does not cater well for good disposal of the debris. An alternative approach could be for the shrub layer and debris to be retained by the F.C.V. and used as a source of seed on the roadside. Disposal of excess could then follow the same practices as are accepted by other authorities,

where the excess is ordinarily not burnt.

The third Standing Instruction discusses the legal obligations and position of the F.C.V. relating to timber on road reserves. It points out that unless municipalities are undertaking construction or repair works, they cannot legally remove saleable timber from the roadsides. It also makes reference to Sections 106 and 107 of the Crimes Act, which are no longer in force.

(h) State Rivers and Water Supply Commission of Victoria

The State Rivers and Water Supply Commission (S.R.W.C.) offers its customers two methods for installation of reticulated water pipelines. One involves hand digging trenches and the other excavation by tractor. There is no indication that the charges for these works take account of the costs of damage to vegetation and control of weeds which invade disturbed sites.

The S.R.W.C. has all its major works assessed by the Ministry for Planning and Environment. Where minor works are undertaken an on-site assessment is made. This is especially important when the roadside is heavily timbered, or a road must be constructed over a watercourse. Such procedures help relieve the unreasonable burden of judgment placed on field staff who are unlikely to be aware of all the values of roadsides, the complexities of ecological interactions or whether rare or endangered species are present.

(i) Soil Conservation Authority

Control of soil erosion is the concern of the Soil Conservation Authority of Victoria (S.C.A.), (Department of Conservation, Forests and Lands). The S.C.A.'s "Soil Aid No. 34" deals with preventing erosion at construction sites. Concern centres on stabilizing areas by planting, and much of the discussion relates to the benefits of using existing

indigenous vegetation (since this vegetation has adapted to the local soil and climate).

The S.C.A.'s 'Guidelines for Minimising Soil Erosion and Sedimentation from Construction Sites in Victoria' generally covers the topic well. However, the discussion on stockpiling does not promote plants which are adapted to nutrient-poor soils and do not need fertilizers. Where weed invasion is a hazard it is useful to avoid use of fertilizers to establish plants. Trees are discussed but the benefits of retaining shrubs and ground cover are omitted. It is also surprising that the use of thatching to encourage regeneration of native plants after topsoil is replaced has not been promoted for erosion control in the S.C.A.'s 'Guidelines'.

However, both the S.C.A.'s literature and practice of providing site specific advice is commendable. Procedures promoted enable fast stabilization of disturbed areas with long lasting results.

(j) Local Government Engineer Association

Although the Local Government Engineers Association does not have a written policy on roadsides, possible policy and practices have been presented in a submission to the Roadside Conservation Committee (McArthur, 1983).

This document discusses trees only, and fails to consider roadside vegetation as an ecological entity. However, it does include a discussion of the possibility of placing service utilities elsewhere on the roadside, which is seen as normal policy interstate (Graham, 1980; Hewitt, 1980).

(k) State Transport Authority

The State Transport Authority (S.T.A.) has no stated policy or code of practices to deal with roadsides. Obviously it has an interest in rail reserves which, like roadsides, are linear vegetation corridors. The Authority does, however, have beautification proposals which apply to urban areas. No reference is made to the difficulties that may occur on revegetating disturbed areas with indigenous species.

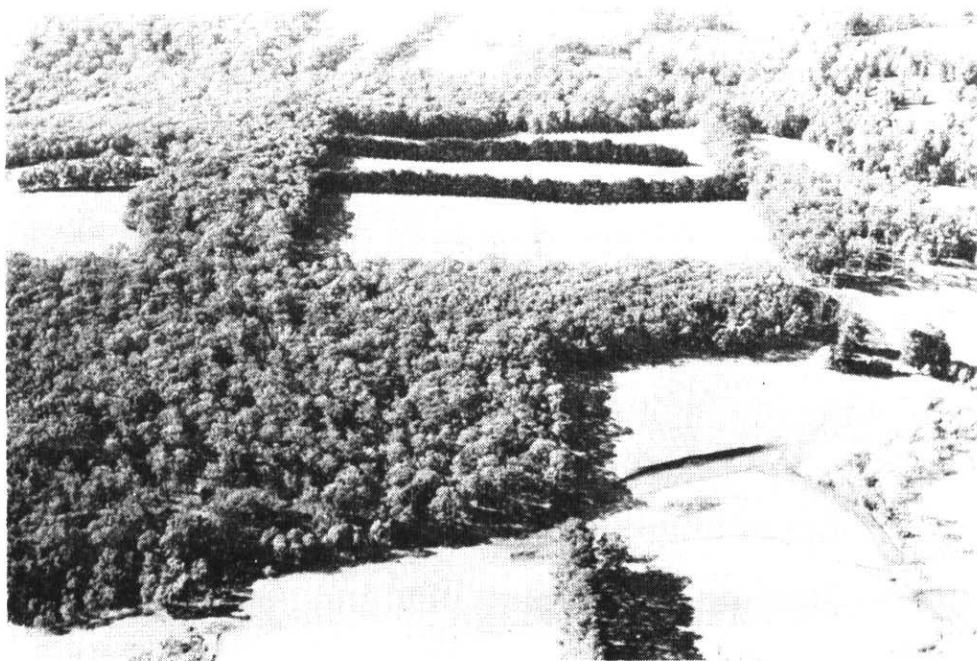
(i) Gas and Fuel Corporation

In general, the Gas and Fuel Corporation of Victoria has no guidelines for dealing with vegetation on roadsides. Largely this will be because, in rural areas gas pipelines are frequently in easements away from road reserves. In urban areas the Corporation follows the guidelines set out in the 'Co-ordination of Streetwork; Code of Practice' which is discussed in (e) above.

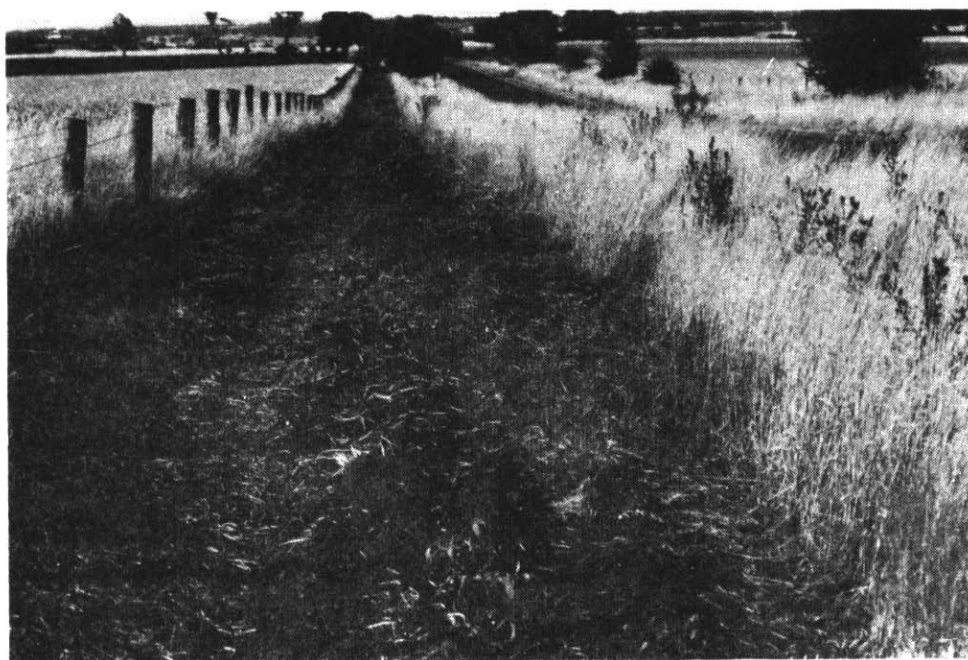
The Corporation's engineering manual discusses the removal of stock-piled soil and the replacement after backfill, which is in line with usual conservation techniques. Major works are discussed with the Ministry for Planning and Environment each year.

(m) Roadside Conservation Committee

The Roadside Conservation Committee (R.C.C.) has one document which deals with conservation and fire prevention. The many reasons why firebreaks should not be constructed on roadsides are discussed, but it is also accepted that the current practice of using road verges for firebreaks will continue in many instances; the inadequacy of such firebreaks (width and location) and problems of exotic grasses and weeds invading the areas cleared as firebreaks deserves more emphasis. However,



Vegetation corridors provide links between areas of native vegetation and opportunities for flora and fauna to migrate.



A narrow ploughed fire break may only stop regeneration of the native vegetation.

the document generally provides good substantiation of the need to reduce the use of roadsides as firebreaks.

(n) Department of Crown Lands and Survey

Although the Department of Crown Lands and Survey (Department of Conservation, Forests and Lands) has no stated policy or guidelines on roadsides, a Committee was set up to look at management problems on Crown Land. In 1983 this Committee presented a final draft entitled "The Management of Crown Land". The Committee's recommendations may eventually play an important role in the management of roadsides as road reserves are, in most cases, Crown Land. One of the Committee's important recommendations, with reference to roadside management, deals with the issue of prosecutions. In the past, departmental officers have found themselves lacking opportunity to prosecute offenders under the Land Act (1958), or support when prosecutions have been launched. By enforcing this Act many problems of despoliation of roadsides could be avoided. Furthermore, the recommendations relating to servicing of litter bins, general maintenance and works project procedures would aid in the litter reduction on roadsides. The proposal to seek equity for royalties from gravel pits would make roadsides less attractive as sources of material and help to protect the vegetation.

As a public resource, Crown Land was not originally set aside to create an on-going revenue source for the Department. Once the Department has fully documented all roadsides occupied illegally (including unused roads) consideration should be given to reclaiming and revegetating the land where this is practical, as an alternative to allowing it to be used for agricultural production.

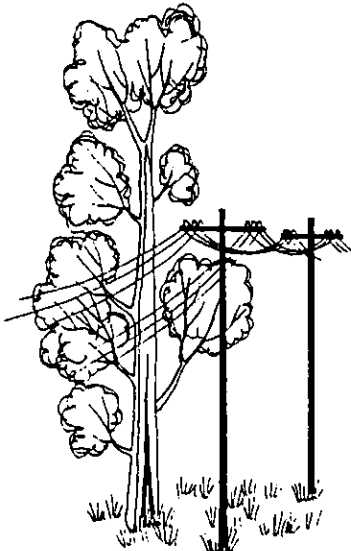
5. GENERAL GUIDELINES FOR MANAGEMENT

5.1 INTRODUCTION

As part of the management of roadsides by any organization or body it is assumed that the principal objective would be to maintain or enhance the value of the roadsides to the community. The main thrust of these guidelines then, is to achieve the objectives outlined in section 4.2 and promote the benefits of roadsides primarily through preservation of indigenous roadside vegetation.

As Victorian vegetation contains a diversity of community types it may be necessary at times to adjust certain specific practices to manage a particular roadside. The following sections provide general guidelines for Victorian roadsides and are written with the emphasis on minimizing disbenefits (costs) to the community. These "Guidelines" may be applied to all roadsides. However, where the procedure given in section 2 identifies a roadside as having moderate to high conservation value, the "Guidelines" should be adhered to closely, and opportunity for other factors (such as use of roadsides to reduce easement costs) to dominate management plans should be reduced.

As a first stage in implementing these Guidelines, it would be expected that the method for assessing conservation value of roadsides would be applied to all roadsides in the area of responsibility.



Consideration and appreciation of roadside vegetation will ensure that management practices could never lead to such extreme treatments as this.

5.2 PROMOTION OF ROADSIDE VEGETATION

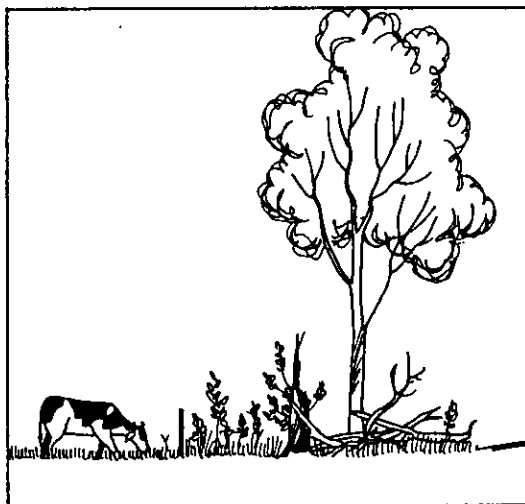
(i) Use a Total Ecosystem Approach

Emphasis should not be confined to trees but be equally given to shrubs and groundcover. The interactiveness of natural systems should be considered when planning roadside management.



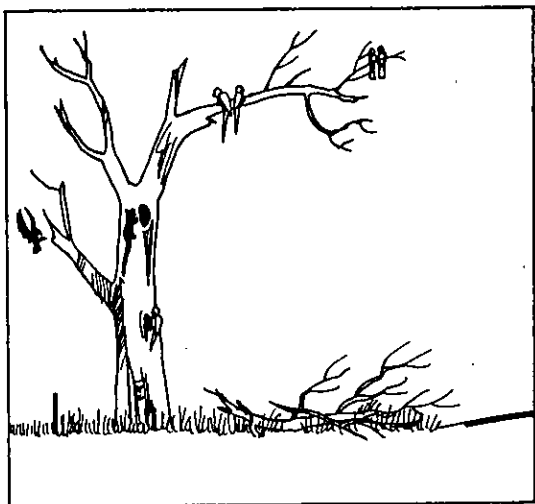
(ii) Encourage Regrowth of Indigenous Vegetation

Natural or managed regeneration of indigenous vegetation should be encouraged, especially where regrowth cannot occur on neighbouring land because of regular grazing or tillage. Indigenous species are usually easiest and cheapest to establish and perpetuate; they also provide appropriate habitats for wildlife and maintain local gene pools and landscape character.



(iii) Retain Dead Trees

Very mature trees and standing dead trees often contain hollows and are of particular value for native animals; they should be retained where possible. Fallen limbs also provide habitat for small terrestrial species.



(iv) Design Roadworks to Leave the Widest Possible Verge

Where a new road is being constructed along a previously undeveloped road reserve, it is preferable that the carriage-way be offset to one side of the reserve. Similarly road widening should be undertaken on one side only. This will enable a broad strip of vegetation to be retained on one side of the road rather than a narrow strip on each side.

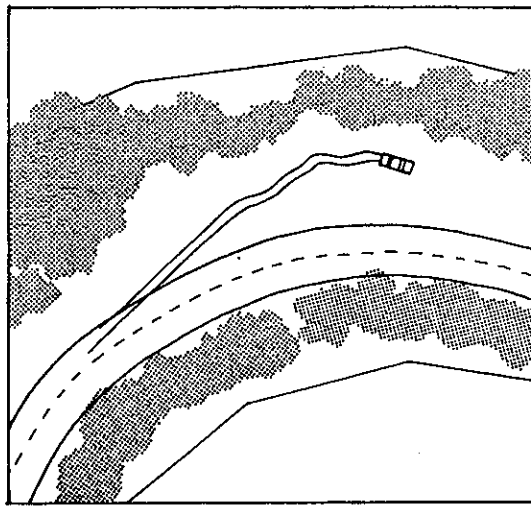
(v) Where Road Widening Would Seriously Affect Roadside Vegetation Consider Acquiring Alternative Land.

Where a road is to be widened consideration should be given to purchasing a strip of adjacent cleared land to re-establish a verge as wide as (or wider than) the one which will be lost. Alternatively, negotiation with the neighbouring landowner may allow for a revegetated strip adjoining the road to be established on private land and protected through lease and covenant arrangement.

5.3 ROAD SAFETY

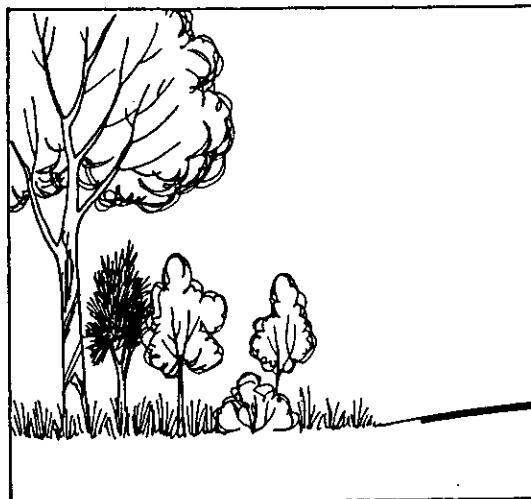
(i) Keep Trees Back from the Road

Trees or shrubs with trunks greater than 75 mm. in diameter should not be retained or planted too close to the traffic lane. The safe distance will depend on the design of the road and likelihood of vehicles leaving the carriage-way.



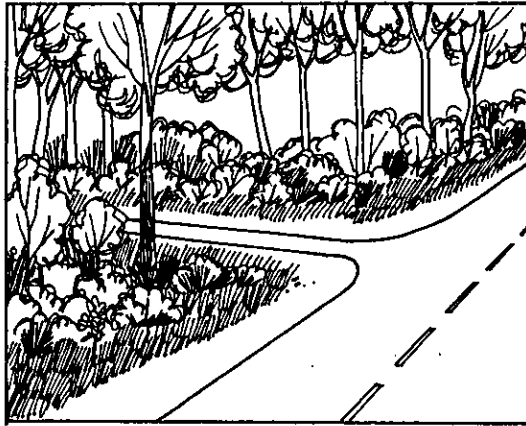
(ii) Use Shrubs to Cushion Impacts

Shrubs without thick trunks should be encouraged between the traffic lane and large trees, particularly where there is a high risk of vehicles leaving the road. These will absorb much of the impact of the vehicles and reduce the risk of serious accidents.



(iii) Consider the Effect of Vegetation on Visibility

The height (and density) of vegetation should be taken into account where visibility is crucial, such at a road junctions, school bus stops and rest areas. In these areas groundlayer species and low shrubs should be used in conjunction with trees with clean trunks (no low branches).



(iv) Use Vegetation to Stabilize the Road Shoulder

Ground cover species and low shrubs should be encouraged on the shoulder behind the line of guide posts to maintain a stable formation. They should, however, be kept out of drains where low grasses would be more suitable.

(v) Use Vegetation to Reduce Glare and Delineate the Roadway

Strategically placed vegetation can greatly reduce the problem of glare from oncoming headlights and provide guidance for the motorist as to the road's alignment.

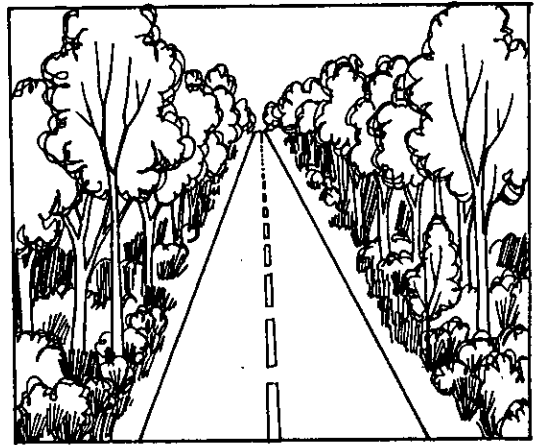
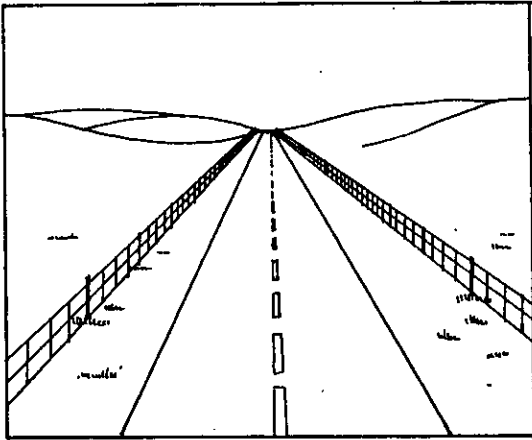
(vi) Use Trees for Shade and Shelter

Trees and bushes, by providing shade, reducing glare and varying the landscape, helps to lessen driver fatigue. They also reduce crosswinds giving drivers better control over vehicles.

5.4 LANDSCAPE

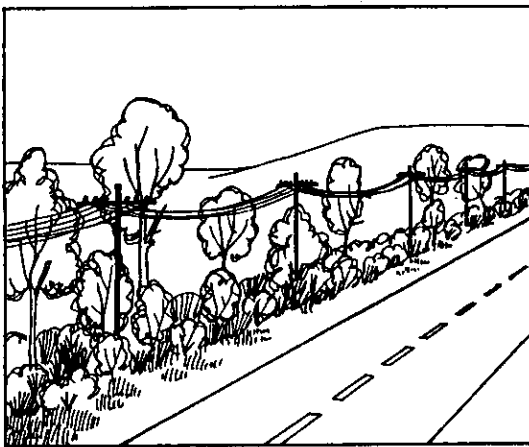
(i) Use Vegetation to Add Interest to Landscapes

Indigenous vegetation should be substantially retained or restored to enhance the individual and scenic value of roads.

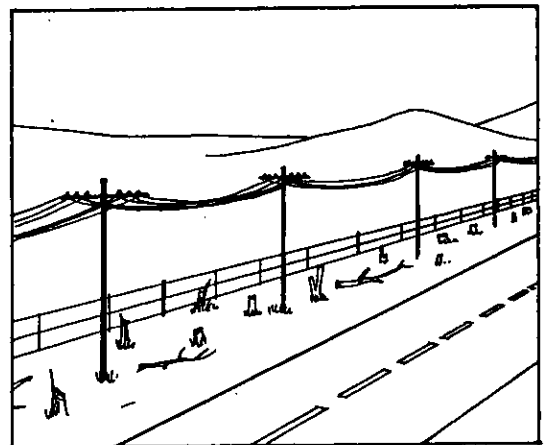


(ii) Prune or Replace Trees

Trees overhanging roads provide an attractive canopy effect and can contribute to the pleasure of driving. However where limbs over roads or powerlines are dangerous they should be removed. Correct pruning is usually preferable to removing the tree altogether. However, where continual pruning would be required, removal of problem trees and their replacement by smaller species or ones which do not shed limbs may be desirable.



Consider this



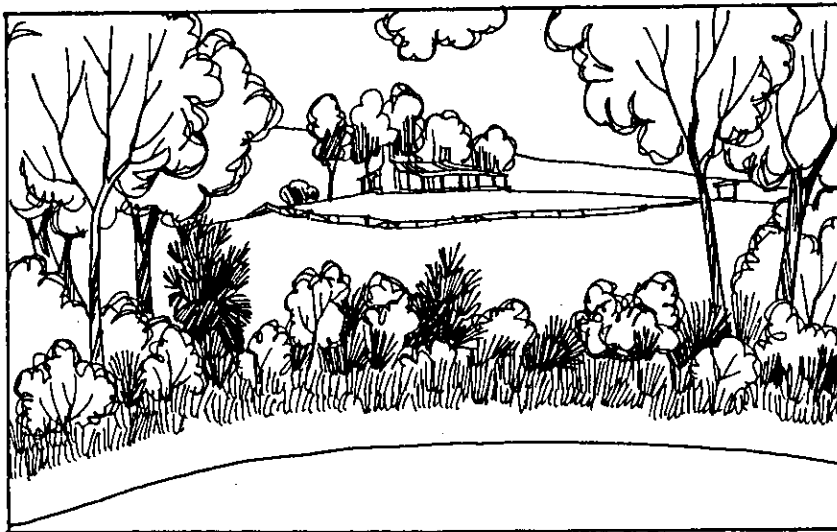
rather than this.

(iii) Use Vegetation to Enhance Parking Bays and Rest Areas

When facilities such as parking bays, wayside stops, scenic lookouts and information bays are being constructed, care should be taken to remove only vegetation as is necessary for the safe and efficient use of the facility. It is important to retain shade trees and, in some cases, supplementary planting may be undertaken. Natural regeneration may be encouraged by excluding access to disturbed areas for a period of time. Planting of non-local species may detract from the landscape of the area.

(iv) Create Vistas with a Minimum of Clearing

Extensive clearing to create vistas produces ugly foregrounds (often weed infested) which detract from the view. Where new roads are being constructed advantage can be taken of land cleared adjacent to the reserve. Long radii curves can bring the road close to the boundary at appropriate points. Alternatively, careful thinning of shrubs or bushy trees can be used to provide glimpses of distant landscapes and features.



5.5 CONTROL OF PLANT AND ANIMAL PESTS

(i) Avoid Disturbance of Established Vegetation

Road verges with a good cover of indigenous vegetation are usually reasonably stable and need little management. In direct contrast extensive soil disturbance for weed or rabbit control will normally lead to ongoing management problems.

(ii) Avoid Damage to Indigenous Flora and Fauna When Controlling Weeds and Pests

Active control of noxious weeds and vermin will sometimes be required on roadside. Methods on control should be chosen which minimise detrimental effects on the total ecosystem including native fauna. Weedicides to which the indigenous vegetation is tolerant should be investigated and applied by spot spraying the weeds.

Control of vermin should be carried out with a minimum disturbance of existing vegetation. A combination of ripping and fumigating of burrows (and poisoning with 1080) is usually most effective in controlling rabbits. However, it is most important that any poisoned bait is placed well away from indigenous vegetation and both bait and carcasses collected shortly after the poisoning program; otherwise native fauna may be poisoned as well. Vermin control should always be carried out on the adjacent land at the same time.

If areas disturbed by either weed control or ripping are at all extensive, positive efforts should be made to encourage regrowth of indigenous species on these areas. The results of control efforts should then enhance the conservation value of the roadsides.

(iii) Invading Species may need to be controlled

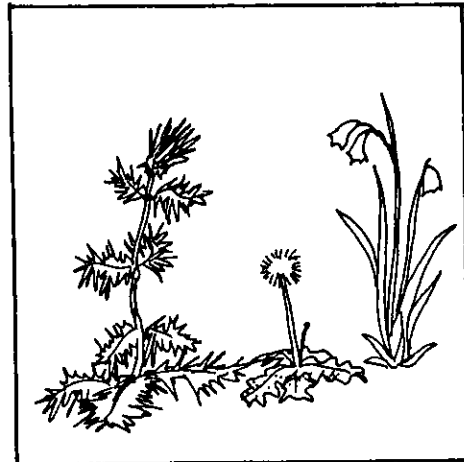
There is a tendency for some species to invade and take over areas of indigenous flora. Although these species have not been declared noxious weeds they should be treated as such if they show signs of dominating very large areas of indigenous flora.

(iv) Control Weeds by Encouraging Regeneration of Indigenous Species

The best method of preventing weeds from invading an area which has been disturbed is to replace topsoil to encourage natural regeneration. To do this it is usual to recommend replacement of topsoil shortly after disturbance. However, where weeds are a problem, these will be carried in the soil and removal of the topsoil may be a way of controlling the weeds. The exposed, nutrient deficient soil can usually be revegetated by indigenous species if seed is introduced from a weed free area. If topsoil removal is felt to be necessary, it should be strictly monitored. Covering the bare ground with a mulch of litter from a nearby forested area will both provide seed and inhibit soil erosion. However, the mulch should be collected in such a way that it does not unduly disturb another area.



Regeneration



rather than weeds

5.6 FIRE BREAKS

The benefits of using the roadside as a firebreak are questionable (Stevens, 1983), and other States are changing their practices (Walden, 1982), although many Victorian roadsides continue to be used for fire-break construction.

Fuel reduction burns have received attention in recent years as a means of reducing fire risk and the technique has been applied to roadsides. However, Stevens (1983) states that the application of fuel reduction burns as a management program for roadside vegetation is counter productive as follows: (a) high capital risk, (b) risk of increase in annual plant component of vegetation understorey (weeds and exotic grasses), (c) large drain on human resources, (d) uncertainty of obtaining fuel reduction levels similar to those obtained in extensive tracts of vegetation, and (e) risk of deterioration in quality of the vegetation's conservation value.

Other, perhaps more traditional, methods of reducing the fire hazard by establishing fire breaks along roadside include ripping, ploughing, slashing/mowing and grazing. All these practices produce attendant fire hazards because they promote the growth of weeds and exotic grasses, which are fully cured in early summer, and which must be removed each year to contain the fire hazard. Indigenous vegetation, however, tends to retain moisture longer and is less flammable. Also, if indigenous vegetation can remain undisturbed, there is likely to be a range of plant heights, which helps to reduce wind speed and the chance of fire spreading.

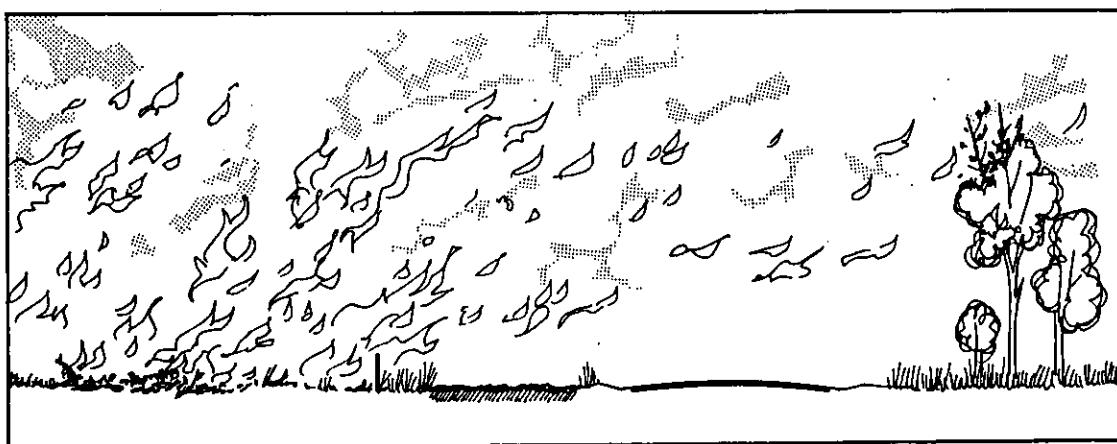
If creation of fire break on a roadside is being considered, the following guidelines are offered:

- (i) Determine if a Fire Break is Needed (Will it Stop a Fire?)

Generally it is possible to construct only narrow fire breaks which are unlikely to prevent fire driven by strong winds from spreading past the break. In this case the break would

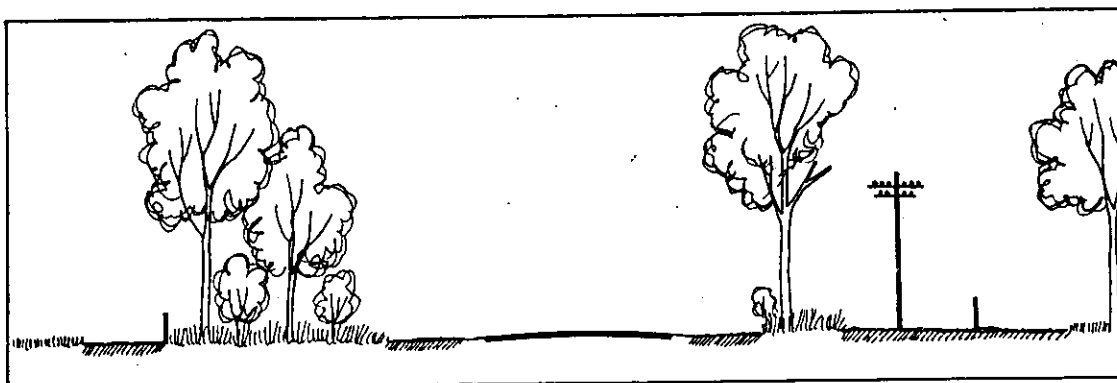
not be effective. However, if the break is intended solely to contain fires which may be caused by road traffic (cigarettes or hot metal), then removal of most of the flammable material over a narrow strip adjacent to the road edge may be effective.

This fire break may also be used to control flanks of major fires, to enhance safety for fire fighters using the road for access, and as a control line for fire suppression purposes (back-burns for example).



(ii) Locate Fire Breaks Adjacent to the Road Edge, or on Private Property

If it is considered that the combination of particular road type (e.g. heavily trafficked highway) with local terrain and vegetation conditions result in the need for fire breaks to protect private property, encouragement should be given to landowners to establish breaks on their own land; the breaks can then be made wide enough to stop some fires and the problems of invasion of exotic grasses will not occur on the roadside. To reduce the chances of fires starting along the roadside from passing vehicles, construction of a 2m. max. break adjacent to the road edge could be undertaken as well.



(iii) Construct Roadside Fire Breaks by Slashing

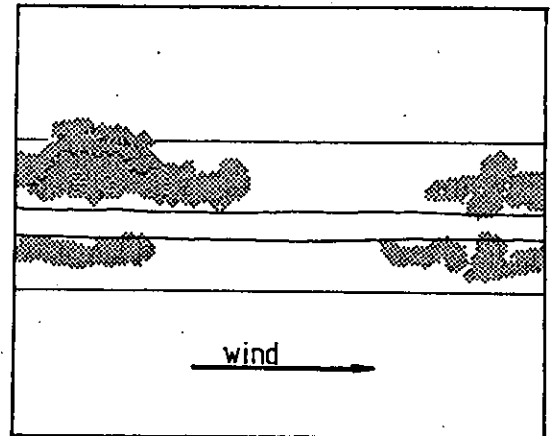
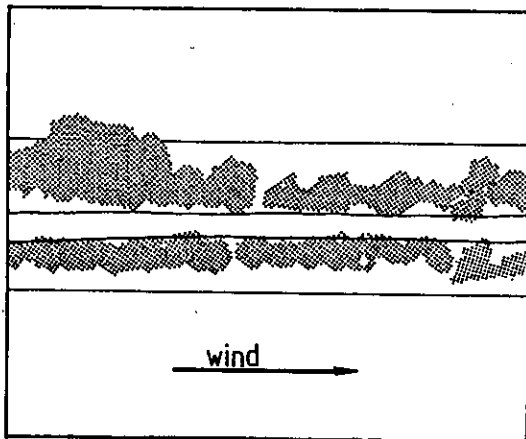
Slashing has less effect on roadside flora and fauna, landscape and soil erosion than other fire break methods.

(iv) Construct Fuse Brakes Rather Than Continuous Fire Breaks

Where fire is likely to spread along the roadside (rather than jump the road, under a crosswind) removal of *sections* of vegetation can be undertaken to break the fire. Thinning of shrubs and slashing would be preferable to cultivation, although *well controlled* fuel reduction burns over *small areas* may be considered in this case.

Convert this....

to this.



5.7 TIMBER

(i) Permits for Removal of Vegetation Should Not Automatically be Granted

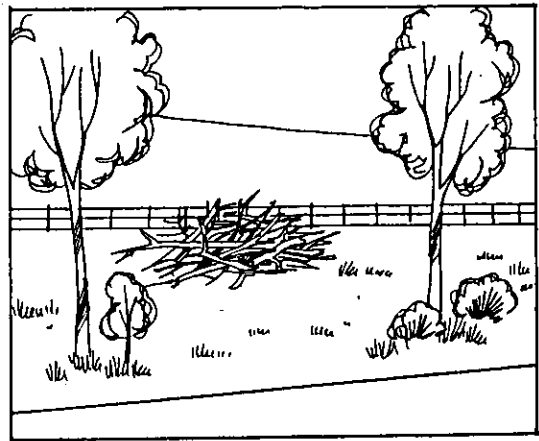
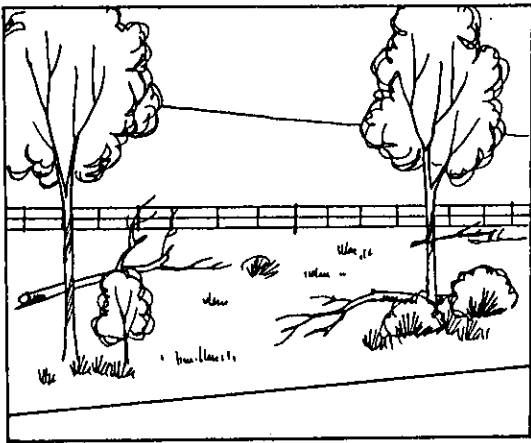
Although controlling bodies have power to remove some timber, such removal will ordinarily cause serious management problems. The removal of the top canopy (trees) will allow an increase in light penetration and provide a more suitable environment for exotic grasses and weeds. Furthermore removal of certain plants may be illegal under the Wildflower and Native Plant Protection

Act. Therefore, issuing any blanket approval could lead to a situation where the permit holder inadvertantly commits an offence.

(ii) Allow Fallen Timber to Remain

Fallen dead timber should not be removed unless it constitutes a road hazard, as it provides habitat for fauna. Removal of timber may also constitute an offence under Section 59 of the Forests Act.

Aim for this rather than.....



(iii) Check That Timber May Be Removed During Roadworks

Although controlling bodies are empowered to sell timber cut during the course of roadmaking operations, timber cut otherwise remains the property of the Crown and its disposal is illegal. The local Forest Officer should be consulted before any millable timber is removed, even when the work is for construction or repair of a road, culvert or bridge.

5.8 EROSION
(see Appendix VI also)

(i) Avoid Wind Erosion By Maintaining a Cover of Vegetation

Wind erosion is most effectively avoided by leaving vegetation undisturbed. If this is not possible the area should be revegetated as quickly as possible.

In areas of sandy soils wind blasting may make establishment of plants difficult. It may then be necessary to consider planting a "nurse crop" - a fast growing cover of an exotic species which can withstand the sand blasting and protect young plants of indigenous species become established. Several annual crop plants have been used for this purpose but advice should be obtained on this technique if it is thought to be needed.

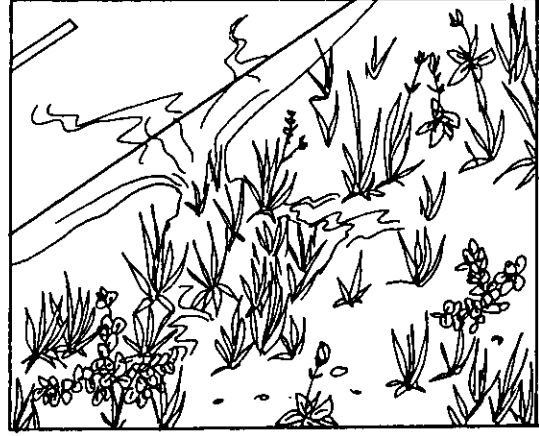
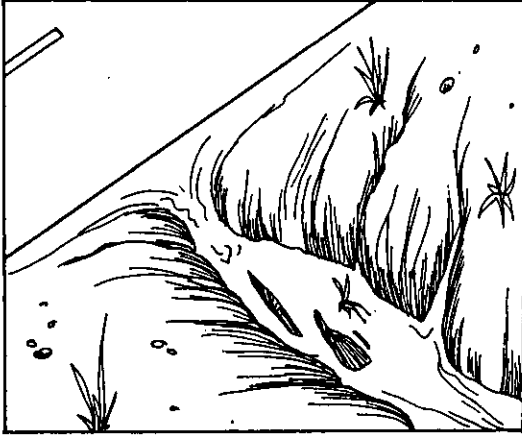
(ii) Avoid Water Erosion By Maintaining Vegetative Cover

Again undisturbed roadside vegetation provides the best protection against erosion and disturbed surfaces should be revegetated without delay. Timing of works so that soil disturbance does not occur at a time when it is likely to be followed by heavy rain and weather unsuitable for establishing plants is important.

Where there may be initial difficulty in establishing indigenous vegetation, consideration should be given to planting a "nurse crop" (as discussed in (i) above), to protect the exposed soil and growing indigenous species.

All clearing operations are best carried out using either a tracked or rubber-tyred bulldozer fitted with a root rake or a tracked loader fitted with teeth on the bucket. This will ensure that when the cleared material is stockpiled, it is free of soil.

Earthworks should be designed so that drainage flows which have been concentrated are subsequently dispersed as sheet flow over well vegetated areas.



(iii) Always Leave Some of the Cleared Material

Not all the material resulting from clearing work should be burnt or removed from the roadside. Before clearing starts, steps should be taken to ensure that all millable timber is first removed. As much timber unsuited for milling as possible should be heaped and then spread over the site after the works are completed. The understorey scrub will provide seed and mulch to assist regeneration while logs will provide shelter for animals. However, clumps of dead vegetation should not be left where vermin may be a problem, or where the size of the clumps could add to the bushfire hazard.

(iv) Choose Cleared Areas for Quarry Sites

Where possible, roadmaking materials should only be taken from cleared sites. Eventually these should be revegetated by the methods described above. Tests for pathogens should be made so that materials removed will not spread fungal diseases into new vegetation communities.

5.9 REGENERATION OF ROADSIDES

- (i) Revegetation of Disturbed Areas Should Be Encouraged As Soon As Works Are Complete

Initially care should be taken to minimize the disturbance of trees, shrubs, groundcover, plants and soil on the road verge. Where indigenous vegetation must be removed, soil should be disturbed as little as possible to avoid erosion and to minimize the spread of weeds and other exotic plants. This will aid the regrowth of the native vegetation.

The most effective procedures to encourage regeneration vary with site and locality. In all cases, however, planning for revegetation before the area is disturbed at all is most important. The following procedures will then usually be effective:

- (a) Stockpile topsoil
- (b) Where subsoil is removed, stockpile this separately
- (c) On completion of works, form any excessively steep surfaces so that plants can become established before erosion occurs. Advice on appropriate slopes for different types of soils can be obtained from the Soil Conservation Authority of Victoria.
- (d) Rip any soils which have become compacted during the operation.
- (e) If the surface is near level, first spread sub soil then topsoil. Where steeper batters are involved a top dressing of only a few centimetres of top soil will encourage roots to penetrate quickly into the formerly exposed surface and prevent soil erosion. In this case mulching may also be needed and again advice should be sought from the S.C.A.
- (f) If works are to take place over more than a few months, disturbed areas should be treated progressively. Topsoil should not be stockpiled for more than six to eight months. Where new sites are being cleared, soil from these can be spread on other areas where work is completed.

For a further discussion of regeneration techniques see Appendix VI.

5.10 GRAZING

- (i) Grazing Permits Should Not Be Granted Except Where Exotic Grasses Are The Only Roadside Vegetation.

Grazing of roadsides, especially if it is prolonged, can cause serious damage to the natural ecosystem. This results from prevention of natural regeneration, damage to mature plants, introduction of weeds, soil compaction and alteration of soil microflora. Weeds and exotic grasses tend to be favoured.

During drought there are many requests from landholders that grazing of road reserves be permitted. Unfortunately even infrequent heavy grazing of indigenous vegetation can do a great deal of damage. Furthermore, if a grazing permit is given it tends to encourage farmers to use the area even when grass supplies are adequate for their stock.

- (ii) Use Legislative Provisions to Prevent Damage to Vegetation by Stock

Any cattle found wandering on roadsides, where the owner does not have a permit, can be impounded under Section 546 of the Local Government Act. Cattle driving can be prohibited using Section 197 (1) (XXVI) of the Local Government Act. These two sections should be used by local governments to stop stock grazing on roadsides with stands of indigenous vegetation.

Where stock must be moved for agistment during drought they should be trucked, if necessary at the community's expense, and not droved on roadways.

5.11 BEES

- (i) Apiarists should not normally be permitted to locate hives on the roadside

Exotic bees can outcompete native bees and alter the local ecosystem. The predators of native bees aid in controlling crop and pasture pests as well so there is an economic gain in retaining their host, the native bee: when exotic bees are moved to another area this potential food source becomes unavailable to predators. Furthermore, depletion of the native bee population by competition from introduced bees will leave the roadside vegetation and nearby crops with inadequate vectors for pollination when the exotic bees are withdrawn.

5.12 RESOURCE ORGANIZATIONS

It is inevitable that the majority of organizations will not have sufficient 'in house' expertise to fully implement the guidelines given above. However, there is a number of specialist government and private bodies which would be able to provide expert advice and assistance on particular aspects of roadside management. The following list documents those bodies which would be most usually contacted:

Department of Conversation, Forests and Lands:

National Parks Service - advice on flora and fauna
Fisheries and Wildlife Division - fauna
Soil Conservation Authority - soil erosion control
Royal Botanic Gardens and Herbarium - flora
Vermin and Noxious Weeds Destruction Board - control of
noxious weeds and vermin
Forests Commission - flora (nursery service available),
some aspects of fauna and landscape

Ministry for Planning and Environment:

Victoria Archaeological Survey - aboriginal relics and heritage
Department of Planning - general planning matters, environmental assessment and landscape

Department of Agriculture:

Local offices - pest species
Burnley Horticultural College - indigenous and exotic
flora

Conservation Council of Victoria:

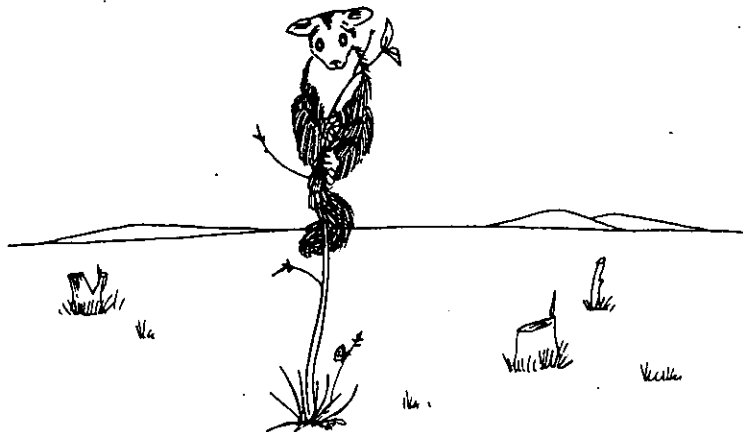
Bird Observers Club - distribution and habitat needs of birds
Native Plants Preservation Society - indigenous vegetation
Natural Resources Conservation League - flora (nursery service
available)
Field Naturalists - specific information on indigenous flora
and fauna from local groups
National Trust of Australia (Vic.) - landscape and heritage

Royal Automobile Club of Victoria - recreation, comments on road
safety and landscape

Country Fire Authority - fire hazard mapping and reduction of
hazards

Road Construction Authority - road safety and landscape

Local Historical Society - cultural and historic features



6. THE FUTURE OF ROADSIDES

6.1 ACCOMPLISHMENT OF OBJECTIVES FOR ROADSIDES

6.1.1 Introduction

Achievement of the objectives outlined in section 4.2, i.e. maintenance of the conservation values of roadsides, relies on two issues:

- (a) acceptance and implementation of the guidelines suggested in Chapter 5 by all organizations, and
- (b) provision of legal and governmental mechanisms to support the objectives.

6.1.2 Integration of Guidelines

Organizations are constituted to undertake specific tasks and, for the vast majority of Victorian bodies, preservation of roadside vegetation has not been in the task specification. This, however, should not be a barrier to the acceptance of the 'Guidelines' in this report.

The Guidelines have been written to promote an awareness of the value of roadside vegetation and to illustrate how these values can be maintained while the tasks of organizations are undertaken. It will not always be possible to adhere to each guideline. The important point is that a serious attempt be made to follow them whenever work on a roadside is planned. Because the Guidelines allow for flexibility of management, and are not to be imposed by one organization upon others, it is expected that there should be little difficulty in any body accepting the Guidelines and integrating them into their operations.

Implementation of the Guidelines, however, will require positive action by each organization. This action will encompass telling staff, and other bodies, that the Guidelines have been accepted, then training staff in their use.

6.1.3. Providing Mechanisms

Attainment of any objective involves designing a way of feeding back information on performance and determining modifications (refer to section 4.3). As vegetation communities are in dynamic states, implementation of goals to ensure survival involves many considerations beyond the expertise available within more organizations, such issues include knowledge of succession stages, recolonization of areas by pest species and manipulation of vegetation to favour certain species. Hence, relevant expertise should be available to those organizations which need assistance.

Apart from this, there is the problem of controlling individuals and bodies showing little regard for roadside values. Grazing is an example where the actions of individuals could destroy the management plan of an organization. In this case there is existing legislation to control grazing through the issue of grazing permits; although, to be effective these controls must be policed. However, local pressure can be exerted to issue permits in spite of a commitment to conserving roadside vegetation and there may need to be avenues of appeal to another body to protect the community resource of the roadside. These considerations suggest that a government organization should be established to provide resources for management bodies and to act in a co-ordinating/overseeing role. The management necessary for roadsides requires a diversity of knowledge. This type of expertise exists in the Department of Conservation, Forests and Lands. This Department also has field staff who could act as advisors to provide on-site consultation and advice. However, at present there is no section within the Department which focuses on the management of roadsides; this could be achieved by the formation of a new 'Roadside Conservation Section' or by allocation of such a role to an existing group within the Department.

Another reason why this Department is suitable is that the legislative powers needed to manage roadsides already exist to a large extent and are vested in the Forests Act (1958), Lands Act (1958), Soil Conservation and Land Utilization Act (1958) and Wild Flowers and Native Plants Protection Act (1958). These Acts

encompass many of the necessary areas of legislation but some legislative changes may need to be made for points of detail.

The main problem facing a Roadside Conservation Section would involve persuading organizations to follow set guidelines. In South Australia, where municipalities have been asked to comply with directives on managing vegetation, compliance has been mixed. Suggestions of taking power from the municipalities have been put forward as a possibility, if local government does not follow directives set by government departments.

Establishment of a specific and clear government policy relating to roadsides would help. Observance of the policy and guidelines then becomes a matter for the government (through a nominated agency) rather than being only a departmental issue.

Even though a case has been made to establish a Roadside Conservation Section, considerations of increasing the number of government bodies (when the trend is towards reduction) and the implications for the legislative power of existing bodies (municipalities for example) suggest that this may not be appropriate at present.

The alternative is to promote the conservation of roadside vegetation through the existing Roadside Conservation Committee, using the material of this report. This has the advantage of ensuring that each organization is still responsible for its own actions and helps to involve staff of these bodies to the greatest degree in roadside conservation issues; they can then become aware of the factors involved and have the opportunity to become directly associated with conservation plans.

The Roadside Conservation Committee would have to monitor the effectiveness of this approach. If it were found to be working unsatisfactorily, consideration could then be given to formation of the Roadside Conservation Section.

6.1.4 Comments on Existing Legislation

Coupled with implementation of legislation should be an education program to explain the value of roadsides, particularly vegetation, and to make the public aware of laws which affect the roadside. The principle that 'ignorance of the law is no excuse', does not provide a situation where harmonious implementation of guidelines can proceed.

If a Roadside Conservation Section were to be established in the future, associated legislation may be required to ensure its success. However, in the proposed situation of promoting the Guidelines via existing arrangements, the comments offered about legislation can be relatively straight forward. In addition to the revisions being investigated by the Roadside Flora Legislation Committee, to provide a situation where disturbance and destruction of roadside vegetation is minimized, it is suggested that:

- (a) Schedule II of the Wild Flowers and Native Plants Protection Act be implemented.
- (b) A third schedule of the Wild Flowers and Native Plants Protection Act (1958), to cover genera which are threatened, be created.
- (c) Section 190 of Land Act (1958), relating to prosecutions for removal of timber, be implemented.

These steps could be used to reduce interference with natural features, particularly the clearing of roadsides, removal of timber for firewood and grazing on roadsides; activities which constitute a significant threat to roadside vegetation and features.

An alternative to pursuing the enforcement of these Acts by State government departments could be the formulation of regulations, under the various Acts, to pass authority onto the local government authorities. This approach has the advantage of delegating authority to officers who are usually the most familiar with an area and who are most frequently

in a position to know what activities are taking place. Also, as was mentioned in section 6.1.3, involvement on issues related to roadsides would help local people to become aware of the situation in their locality, and promote their interest.

6.2 SOME CONCLUDING COMMENTS

The roadside is a complex ecosystem where any disturbance will produce a complexity of interactions. Small changes may radically alter the state of the ecosystem. This ecological complexity serves to add to the inherent difficulty in reaching the aims stated in section 4.3.

Presence of rare species can raise further difficulties, since these species will most likely require special management techniques. Expert advice is needed in these situations. The concept of plant communities also raises issues of complexity. Although there may not be a rare plant on a roadside, the plant community may be rare. Plants often coevolve and as a result, can become dependent on each other for survival. Disturbing the roadside may alter the environment so that a particular species cannot grow on the roadside. This species may also be instrumental in allowing other species at the site to survive. The roadside vegetation must always be considered as a community of plants and not a conglomerate of individual plants.

The effects of disturbance on the roadside are cumulative. Intervention by one organization on the roadside will alter the vegetation. However, further intervention may lead to a complete degradation of the vegetation.

Roadsides will continue to be used as locations for community services (roads and utilities). However, there is no reason why these services should needlessly destroy the conservation value of roadsides. A methodology to assess conservation value is presented in this report, along with guidelines to achieve conservation objectives. Both have

been designed to be easily used by management bodies and easily integrated into their operations. Use of the methodology and guidelines will help management bodies to be aware of roadsides where interference must carefully be considered and to minimize the adverse effects of this interference.



Some landowners have encouraged the growth of vegetation on roadsides. With this type of co-operation with management bodies the maintenance of high conservation value of roadsides is ensured.

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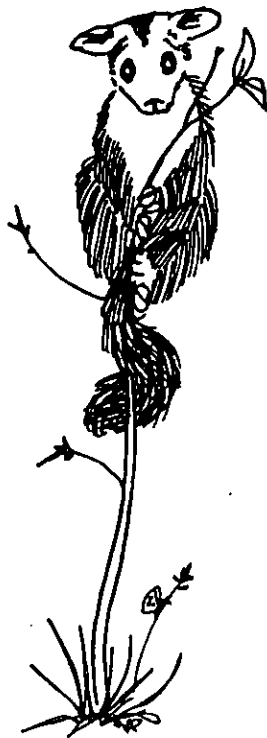
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APPENDIX I - STUDY BRIEF

1.1 Background

This issue is primarily concerned with the development of a practical approach to the conservation of roadside vegetation. In this context conservation must be integrated with the continued utilization and management of roadsides for a range of uses. It is generally recognized that road reserves provide for several functions, including safety, comfort, landscape experience, wildlife habitat, fire protection and utility easements. The resource that contributes most to road reserve functions and/or is likely to be disturbed as a result of a particular function is the vegetation. Present knowledge of the significance of roadside vegetation in Victoria is limited and what little data are available are not systematically included in decision-making processes by local and State authorities. It is intended that this task will provide a rational and systematic procedure to enable local and State authorities to assess the values of and to make decisions about the vegetation on road reserves so that subsequent management can have regard to the particular values identified. The task should provide an assessment procedure that can be applied by non-specialist groups and which provides a framework which can be refined by more intensive investigation if required. The methodology should be applicable in any area of Victoria.

1.2 Definitions

For the purposes of this task the Roadsides Conservation Committee (R.C.C.) has suggested the following road classification categories be included.

- State Highways
- Main Roads
- Declared Roads
- Unclassified Roads
- Unmade Road Reserves - where they are subjected to public movement.

Road reserves are to be taken to mean all the land, whether grassed or planted, between the road itself and the boundary fences.

Freeways, Tourist Roads and Forest Roads should be excluded. The study should also exclude urban areas and be confined to road reserves through private land areas. The R.C.C. suggested the road reserves in parks and Forests Commission plantations are indistinguishable from the adjoining vegetation (except perhaps during harvesting) and are subjected to the same management as the adjoining vegetation. It would not be realistic to expect separate management treatment of road reserves in these areas.

1.3 Aim

To contribute to the conservation of vegetation on road reserves in Victoria by providing a procedure which responsible authorities may use to identify vegetation areas of value so that planning and subsequent management can take account of the values identified.

1.4 Objectives

- (1) To characterize the issue of conservation of roadside vegetation in the following way:
 - (a) Identify all users of road reserves, present and potential, in Victoria. Conservation interests should be included.
 - (b) Define the needs of these users, given their current practices (e.g. farmer groups, C.R.B., F. & W.D., etc.)
 - (c) Identify important management issues and problems of users of road reserves. Include issues concerned with the dynamic-changing character of vegetation.
 - (d) Identify the apparent incompatibility of management practices amongst users of road reserves.
- (2) To identify and record the advantages/values of vegetation on road reserves.
- (3) To develop a procedure which can be applied by land-use planners and land managers for identification of the various values of roadside vegetation and for ranking those values. In this context the values of vegetation to be considered include the value for landscape character, wildlife habitat, protection from soil erosion,

protection of water quality, windbreaks and farm shelter, and intrinsic botanical values such as rarity or uniqueness. Other values may become apparent as the study progresses and may also be included.

- (4) To develop a procedure to assist responsible authorities in making systematic and rational decisions among competing users of road reserves to provide for necessary services whilst maximising the various relevant conservation values.
- (5) (a) To develop a procedure to identify the desirability of re-establishment of native plant species on road reserves which currently lack natural vegetation.
(b) To identify sources of technical and financial assistance for re-establishment of native plant species on road reserves.

This objective is not expected to be a major task. It is required to enable an assessment to be made of the desirability of revegetating some roadsides in order that the needs for one or other vegetation values be met.

- (6) To test the methodologies in at least 3 municipalities within Victoria, distinguished from each other by differences in climate, topography and vegetation cover over a range of road easement sizes and road surfaces, and to refine the methodologies by an iterative procedure of modification and retesting.
- (7) For those activities or uses likely to be accorded priority for use of roadsides, identify possible alternative management procedures which would minimize adverse effects on the vegetation.
- (8) In the light of the studies to meet the previous objectives to identify the need for changes to the laws relating to management of road reserves to enable conservation of roadside vegetation to be effected. The draft report of the Roadsides Flora Legislation Committee should form the basic background document.

1.5 Scope

The procedures developed must be appropriate for use within local government and other relevant management bodies recognizing the levels of relevant technical skill likely to be available, the general lack of a detailed vegetation data base and the level of information which is likely to be considered appropriate and usable in the local government planning situation.

The procedures developed should make maximum use of existing information about the vegetation including where appropriate local knowledge derived from Field Naturalist Clubs, other conservation groups and individuals with specialist knowledge.

The procedures should be applicable state-wide. However, because of the range in environments and in the extent of clearance of native vegetation across the state it may be necessary to allow for modifications to be made when the procedures are being applied to meet local needs.

Liaison with people involved professionally in planning at local government level will be required to ensure that the objectives of the task are met.

In testing the procedures (Objective 6) the prime requirement is that a range of different conditions is covered to ensure that within practical limits the procedures finally recommended are seen to be capable of meeting the general requirements stated in this Section.

APPENDIX II - ORGANIZATIONS AND AUTHORITIES WITH AN INTEREST IN ROAD RESERVES

Users of Road Reserves	Legislat- ive Control	Practical Use	Code of Practice	Interest Status
<u>RCC MEMBERS</u>				
Bird Observers Club (1)				*
Conservation Council of Victoria				*
Department of Agriculture				
Department of Crown Lands & Survey	L			#
Department of Planning	P			#
Fisheries and Wildlife Division				
Forest Commission	V	*	+	
Local Government Engineers Association		#		
Ministry of Conservation	P			#
Municipal Association of Victoria	U	#	+	#
Native Plants Preservation Society (1)				*
National Parks Service	L			#
Natural Resources Conservation League (1)				*
R.A.C.V.				#
School of Environmental Planning				#
Soil Conservation Authority	P			@
Town and Country Planning Association				#
Victorian Farmers and Graziers Association		#		#
Victorian National Parks Association (1)				#
Victorian Railways	U	@		
<u>RCC OBSERVERS</u>				
Country Fire Authority	V	*		
Country Roads Board	U	#	+	
Gas & Fuel Corporation	U	@		
National Trust (Landscape Committee)				*
State Electricity Commission	U	@	+	
Telecom Australia	U	@	+	
State Rivers & Water Supply Commission	U	@	+	

.....cont'd.

APPENDIX II (continued)

Users of Road Reserves	Legislative Control	Practical Use	Code of Practice	Interest Status
<u>NON-RCC GROUPS</u>				
Bicycle Institute of Victoria (1)				#
Federation of Victorian Walking Clubs (1)				*
Victorian Field and Game Association (1)				#
Australian Road Research Board (2)				#
Keith Turnbull Institute (V & N Weeds) (3)	P			*
National Herbarium (3)				*
Aboriginal Groups				#
Local Field Naturalist Groups (1)				#
University Botany Departments				*
Environmental Law Section (Law Institute)				#
Health Department	P			@
Graduate School of Environmental Science				#
Victoria Archaeological Survey (4)	L			#
Royal Australian Institute of Parks and Recreation (2)				#

Legend : P - passive legal control (status)

L - limited control

V - legal floristic intervention

U - utility use

- total

@ - land

* - vegetation

(1) - Member of Conservation Council of Victoria

(2) - regular liaison takes place

(3) - included in Department of Conservation, Forests and Lands

(4) - represented through the Ministry for Planning and Environment

APPENDIX III - LANDSCAPE ASSESSMENT

The landscape assessment section of the overall methodology for determining conservation value of roadsides (Section 2.7.1, E) is based on the procedure proposed by the Landscape Committee of the National Trust of Australia (Vic.). This procedure is outlined in the Committee's 'Procedure Manual, Vol.2, Landscape Assessment Field Guide', the relevant parts of which are reproduced in this Appendix.

Classifying Agricultural Landscapes

A supplemental frame of reference has been formulated to assess agricultural landscapes within and adjacent to forested landscapes. To be utilised in conjunction with the frame of reference for the applicable Landscape Character Type, these criteria give additional attention to such visual factors as scale, contrast, form, line, colour and texture. The supplementary description was considered necessary as scenic quality within totally altered landscapes could not effectively be compared to that of naturally established landscapes.

The frame of reference for agricultural landscapes has potential application to vast areas of rural land in Victoria and could provide a significant supplement to landscape management outside forest land.

Little research has been completed in Victoria which may support or contradict agricultural landscape criteria stated in the frame of reference. The assumed criteria is based mainly upon professional judgement and should be fully tested should a wider application be specific to cleared or partially cleared landscape.

AGRICULTURAL LANDSCAPES - Scenic Quality Classification (Supplemental Frame of Reference*)

	HIGH SCENIC QUALITY	MODERATE SCENIC QUALITY	LOW SCENIC QUALITY
PATTERN	<ul style="list-style-type: none"> ● Distinctive variation in vegetative pattern created by contrasting land uses as woodland, pasture, orchard, plantation and cropland. Patchwork effects of colour, texture and form are visually dominant over relatively small acreages. 	<ul style="list-style-type: none"> ● Variation in vegetative pattern created by adjacent land uses evident but not distinctive in the landscape. Patchwork effects of colour, texture and form are evident over moderate to broadscale acreages. 	<ul style="list-style-type: none"> ● Expanses of similar vegetative pattern, texture and form. Few pattern or textural changes over relatively large to extensive acreages.
TRANSITION	<ul style="list-style-type: none"> ● Gradual naturally appearing transitions between agricultural land use and adjacent forested land, line edges generally inevent. 	<ul style="list-style-type: none"> ● Transition between agricultural land use and adjacent land use combining both gradual and sharp edge contrast, but seldom appearing an unbroken straight line. 	<ul style="list-style-type: none"> ● Transition between agricultural land and adjacent forest land sharp and geometric, generally appearing as a line.
STRUCTURE	<ul style="list-style-type: none"> ● Unique farm buildings complementing traditional rural architectural styles which borrow from form, line and colour found frequently in the surrounding landscape. 	<ul style="list-style-type: none"> ● Farm buildings which partially borrow from landscape features and traditional architectural styles found commonly throughout the character type. 	<ul style="list-style-type: none"> ● Farm buildings which contrast sharply from landscape characteristics of form, line, colour and texture and are alien to traditional rural architectural styles.
ROADSIDE	<ul style="list-style-type: none"> ● Unique feature trees or tree rows which become a positive focus of view due to position, colour, form or texture in contrast to those found commonly in the surrounding landscape. 	<ul style="list-style-type: none"> ● Expanses of roadside vegetation similar in spacing, form, colour and texture to that commonly found in the character type which provide moderate visual interest but which seldom become a distinctive focus of view. 	<ul style="list-style-type: none"> ● Long straight segments of roadside with sparse vegetation of little visual interest.

* When classifying agricultural landscapes this frame of reference should supplement, not replace, the scenic quality classification criteria written for the appropriate landscape character type. This criteria was written specifically for relatively small agricultural areas and has not been fully tested in all agrarian landscapes.

Measuring Scenic Quality

Landscape Character Types and Sub-types are areas of relatively homogeneous landscape in which comparisons of Scenic Quality are possible. The frames of reference define a range of scenic quality components which exist within each Character Type. While all landscapes have some value, some are of greater scenic value and importance than others. Three classes of relative scenic quality are used - High, Moderate and Low. The Forests Commission's descriptions are written for each type and sub-type in terms of diversity of primary landscape components - land form, vegetation and water form.

It was initially assumed and later supported by research studies that scenic quality, as generally perceived, increases with:

- greater degree of uniqueness in land form, rock out-cropping and land cover;
- greater degrees of naturalness and lesser degrees of man-made alteration;
- greater degrees of vegetative diversity and tree cover;
- greater degrees of relative topographic relief and ruggedness;
- greater degrees of vegetative structure and edge diversity in coniferous plantations;
- greater degrees of vegetative diversity and agricultural landscapes.

Mapping Scenic Quality (Forests Commission Victoria)

Following establishment of descriptive frames of reference for each Character Type and Sub-type, the Forests Commission, using the following steps, has prepared maps of landscape scenic quality for the areas that they manage.

Step 1

Features are rated for scenic quality by interpreting the appropriate frame of reference and delineating classes on aerial photos. Vertical photos, particularly

in stereo pairs and oblique photos are effective tools in judging and Classifying land zones. Aerial observation and on-site inspection may also prove valuable. Each frame of reference is presented in chart form for easy interpretation.

Areas exhibiting the features and diversity normally present in the Character Type, are assessed as a moderate scenic quality class, those areas with more outstanding, unusual or diverse features are classified as high scenic quality and those areas limited or lacking in features and diversity are assigned to a low scenic quality.

Step 2

Scenic quality class determinations are transferred to a contour base map of a scale appropriate to planning needs.

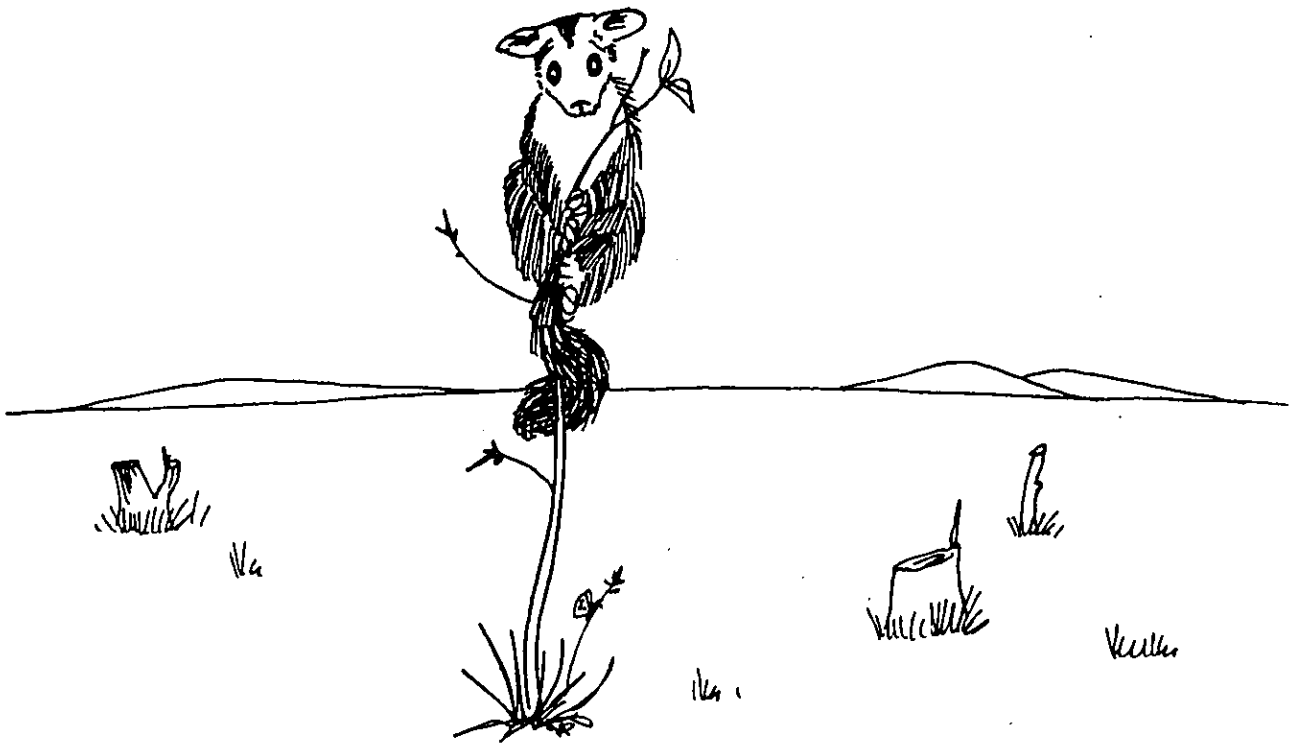
National Trust and Scenic Quality

When considering scenic quality, the Landscape Committee of the National Trust is most concerned with those areas that have more outstanding, unusual or diverse features than are normally present within a particular Landscape Character Type, i.e. those areas for which the frames of reference used by the Forests Commission define high scenic quality.

By using the same frames of reference, and any aerial photographs available, the Landscape Committee and its working groups are able to define areas of high scenic quality in rural areas. To be most effective, people using the frames of reference should have as good a visual knowledge as possible of the Landscape Character Type in which they are working. To this end, field trips and site visits should be as comprehensive as is possible.

APPENDIX IV.

HANDBOOK: FIELD ASSESSMENT OF ROADSIDE VALUE



HANDBOOK: FIELD ASSESSMENT OF ROADSIDE VALUE

1. BEFORE STARTING

It is suggested that an inventory and familiarisation should begin about four weeks before commencing the field work.

The details of the procedure are as follows:

- (a) Send letters to the following Government Departments and Private Interest Groups for information on areas of biological, historical or landscape interest found in or near roadsides within the area. (a map of the area, showing all roads, should be included with the request):
 - . National Herbarium
 - . Victoria Archaeological Survey
 - . National Trust of Australia (Vic.)
 - . Conservation Council of Victoria
 - . Field Naturalists Association (Local Branch)
 - . Bird Observers Club
 - . Department of Planning and the Environment
 - . Department of Conservation, Forests and Lands
 - . Local historical society
 - . Local conservation groups
 - . Victorian National Parks Association
 - . Society for Growing Australian Plants
- (b) Consult the Land Conservation Council reports, the National Estate register (both available in most libraries) or any other relevant references in order to identify known vegetation communities found within the area.
- (c) Prepare maps showing the distribution of biological and historical features based on the information obtained from (a) and (b). In particular, identify those roadsides with rare/endangered/significant species or cultural/historical features. These maps should be used to determine if the roadside vegetation represents the majority of the remaining original vegetation of the locality; i.e. to determine its relative rarity or uniqueness. (see K of the Field Sheet, Figure 2.11).
- (d) Obtain information from the local officers of the Department of Conservation, Forests and Lands regarding local weeds and their identification so an assessment of weed abundance can be undertaken.
- (e) Before using the procedure in the field it is important that the field staff become aware of local indigenous vegetation communities, the extent of roadside vegetation (often taken for granted) and areas of biological, historical or landscape interests in the area. It is suggested that the assessors drive around the area to simply observe the vegetation on particular roadsides and the differences between these. Visiting different roads should give an idea of the different types of vegetation types likely to be found in the area. However, inspection of LCC maps should have been carried out before setting off to discover the number and general location of the different vegetation communities likely to be found, and the range of strata that could be expected (contact with people knowledgeable in local vegetation is also advisable).

These visits will also help the assessors to attune themselves to the differences in vegetation, and the procedure itself. While the assessment procedure may be undertaken by one person, assessment by a driver and an observer is the fastest technique.

Further technical assistance may be available from the Department of Conservation, Forests and Lands through the local office of this Department.

II. DETERMINE SECTION LENGTH AND WHICH VERGE(S) TO BE SURVEYED

The Field Sheet (see attached) is designed as a single sheet for each section of roadside being assessed. This is to be filled out as the assessor moves along the road. It is expected that the assessor would need to stop at some point along the section to reflect on the 'average conditions' encountered; if more than one person is involved in the field the sheet can be filled in while travelling at a reasonably low speed depending on how much variation there is in the vegetation of the section.

The length of the section over which the assessment is undertaken is under the control of the assessors. Short sections will result in a lot of data to be evaluated, but provide fairly precise information on conservation value. Long sections will reduce the amount of data collected, but run the risk of overlooking fine detail or important observations. Suggestions for practical section lengths are as follows:

- (a) standardise on a section length of 0.5, 1 or 2 km.
- (b) adopt a variable length, for instance start the section at a road junction and end it at the next junction (this is the approach used to map the three test shires).
- (c) adopt a variable length based on the features of the roadside, i.e. start the section at some convenient point and end it at the place where one of the factors (e.g. Vegetation/Habitat) changes its score.
- (d) take a standardised distance, but begin the section where one of the factors changes its score.

The advantage of using a standard length is that roadsides can be compared; for example by computing the percentage of roadsides in a particular conservation category in different areas. However, there is also an advantage in ending a section where one of the

factors changes its score since this encourages the assessor to be vigilant over the state of the factors. Consequently, approach (d) is recommended.

Whatever section length is adopted, it should be maintained throughout the study. If there is any doubt as to the choice of length, some 'dry runs' should be undertaken and the results discussed with a local representative of one of the organisations listed.

Another decision to be made before filling in the first field sheet is whether each verge will be assessed separately, or whether the features of both verges will be averaged out by the assessor to give an overall assessment of the roadside. The procedure can handle either approach.

Once these decisions have been made a Field Sheet can be filled out for each section of roadside for the average or overall condition along that section of road for each factor on the Field Sheet.

III. EXPLANATION OF FACTORS OF THE FIELD SHEET

A. Vegetation and Habitat

In order to provide food and shelter for animals the extent and variety of vegetative cover is important. A gliding possum for example, will sleep in the hollow of a mature tree but feed on understorey trees; without both resources it would not survive. Likewise, birds such as honey eaters require nectar to feed; as plants of one species tend to flower at the same time, other species of plants are required to provide a year-round resource. Therefore, the amount of cover is important. In this case the term 'cover' refers only to shrubs/bushes and trees and is the extent of vegetation, on average, between the road edge and fence line. This is represented by the canopy of the vegetation as a percentage of the ground area. An estimate of this percentage is sufficient.

'Vegetation' in Figure 1 is taken to be represented by the shrub/bushes and trees on the roadside. However, not

all vegetation contributes to conservation value to the same extent. Exotic species usually have considerably less value than indigenous species. Alternatively, where stands of indigenous vegetation are among the last remaining examples in the locality, they contribute a high value and an additional score is added to the score already obtained in this section to emphasise that special protection is required. An additional score is also involved where the presence of rare or endangered species is noted, as this presence gives a greater value to the vegetation since these species may prove irreplaceable (see K. Presence of Special Species or Features).

Presence of non-indigenous tree or shrub species along a roadside will have some value both aesthetically and physically. They provide some habitat and hold the soil together. Exotic trees, such as cypress, are acceptable in this category as the presence of any trees with understory is generally of more value than a cleared roadside with exotic grasses.

At the lower end of the spectrum, where the vegetation appears as an extension of the agricultural land, the vegetation has little conservation value. Likewise, where agricultural species appear in 'weeds' or 'tree regeneration' they are ignored in the cover calculation.

FIGURE 1

VEGETATION/HABITAT

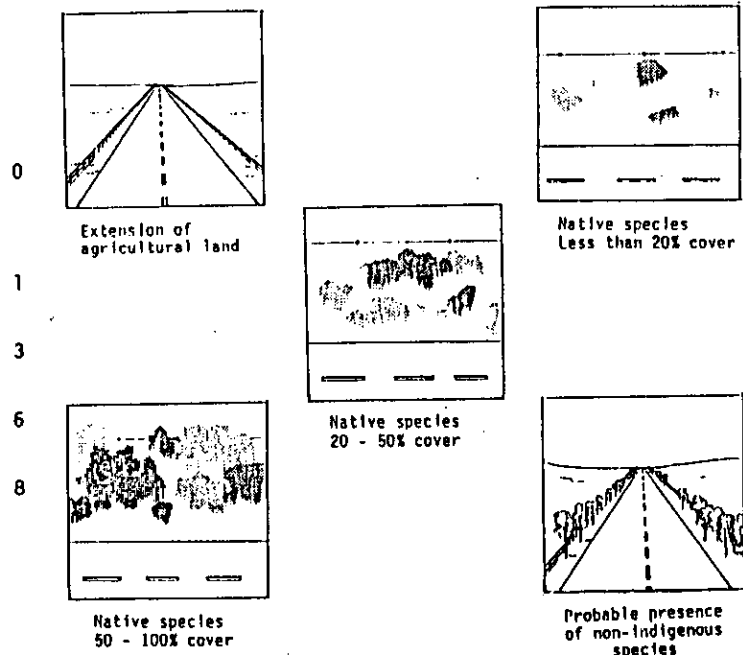
No apparent trees or shrubs
roadside appears as an extension of
agricultural land

Presence of non-indigenous species
(plantation of exotic trees/shrubs
or presence of species from outside
region)

One or more species of native plants
with a combined cover of less than 20%

One or more species of native plants
providing 20-50% cover

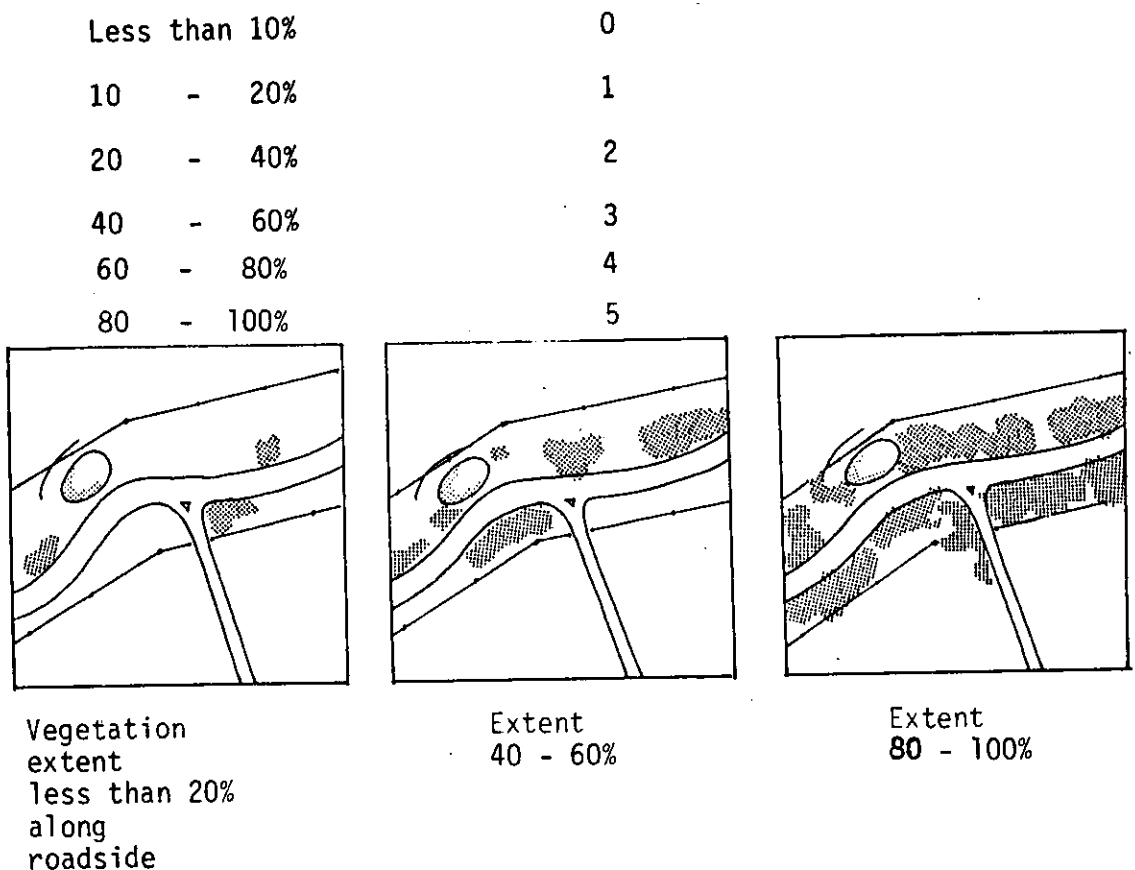
One or more species of native plants
providing 50-100% cover



B. Vegetation Continuity for the Length of the Roadside

This section examines the continuity of vegetation along a roadside with a high score given for a long continuous strip of natural vegetation; since continuity enables migration of flora and fauna, contributes to diversity and to aesthetics. Small water bodies and short breaks in the canopy, such as driveways, are not considered to break this continuity; e.g. a section of road of 100m. in length (of which driveways to farms form 20m.) has vegetation along 85m., therefore vegetation covers 85% of the roadside. In all cases an approximate percentage is sufficient (see Figure 2).

FIGURE 2 - SCORING SYSTEM FOR VEGETATION CONTINUITY ALONG THE LENGTH OF ROADSIDE.
(Excluding pest species and agricultural plants)



C. Noxious Weeds.

Weeds are a problem for both regeneration on roadsides and for growing crops or pasture. Identification of weeds on a 'state-wide' basis is complicated because while a plant may be classed as a weed, or pest, in one area, it is not necessarily so in others. Consequently, this assessment technique uses that defined grouping of weeds, 'noxious weeds' (as outlined in the Vermin and Noxious Weeds Act, 1958) to indicate the presence of weeds in general. Discussion with local officers of the Lands Office (Department of Conservation, Forests and Lands) and Department of Agriculture may indicate that some pest species, other than the designated noxious weeds, should be included in the assessment. In this situation it is suggested that the assessment be undertaken twice; firstly incorporating only noxious weeds (so that the assessment is comparable with other roadsides) then including the pest species to see if this alters the conservation category.

The seasonality of some weeds (herbaceous or annual) needs to be noted and roadsides surveyed when expected weeds would be evident.

It is assumed that the users of this assessment technique will have some local knowledge and be able to recognise the more prominent weeds in the district. Officers of the local Lands Office should be able to assist with the identification of noxious weeds. As no specialist knowledge is assumed, the rating system for weeds is based on visual dominance only. To assess this the user should either slow the car or get out of it at frequent intervals to inspect the vegetation, usually when the vegetation appears to have changed.

Absence of weeds rates a (relatively) high score, whereas an abundance of weeds receives a negative score (see Figure 2.3).

FIGURE 3 - SCORING SYSTEM FOR NOXIOUS WEEDS

Abundant (visually <u>dominant</u> in understorey)	-4
Moderate (weeds <u>present</u> in understorey)	-2
Sparse (weeds inconspicuous)	0

D. Regeneration of Native Vegetation

Evidence of seedlings or suckers may prove to be an indication of the 'health' of vegetation in an area. Pressure from grazing animals such as rabbits, cows and sheep may destroy an area's vegetative diversity by preventing the development of seedlings. Evidence of natural regeneration indicates that such deterioration is not likely and the quality of the vegetation may improve.

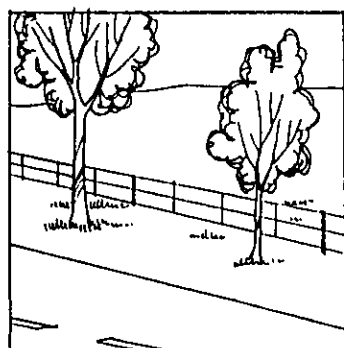
The scale to assess regeneration (see Figure 2.4) ranges from evidence of regeneration (nil), through the presence of a few scattered individuals (slight), to the presence of seedlings 'less than 3 meters apart' (extensive). In all situations presence of seedlings (or young shrubs or trees for that matter) refers to the presence of natural (indigenous) vegetation. Regeneration of weeds or trees such as introduced pine should be ignored.

Regeneration may be most obvious in areas where the soil has been disturbed, and where there is also competition from weeds. A score for 'regeneration' will serve to counteract the negative influence of weeds.

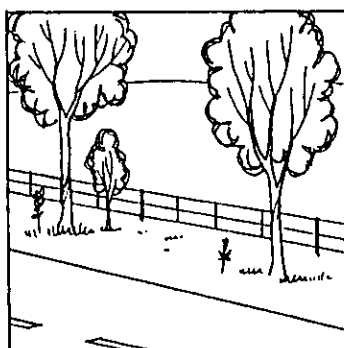
FIGURE 4 - SCORING SYSTEM FOR TREE REGENERATION.

(Presence of seedlings or young native vegetation)

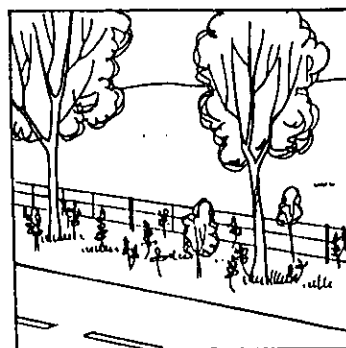
Nil	0
Slight (Scattered individuals)	1
Moderate	3
Extensive (individuals less than 3m. apart)	4



Nil



Moderate



Extensive

E. Landscape Value of Roadside Vegetation.

The presence or absence of roadside vegetation can either enhance or detract from the driving experience. All techniques used to assess landscape quality are subjective, but there is considerable agreement as to what constitutes high and low quality. Three levels of quality are identified (see Figure 5) and the assessor chooses the appropriate level based on the description given.

FIGURE 5 - SCORING SYSTEM FOR LANDSCAPE VALUE.

Low:

Long straight segments of roadside with sparse vegetation of little visual interest. Rubbish dumps, quarries or similar activities may be present.

0

Moderate:

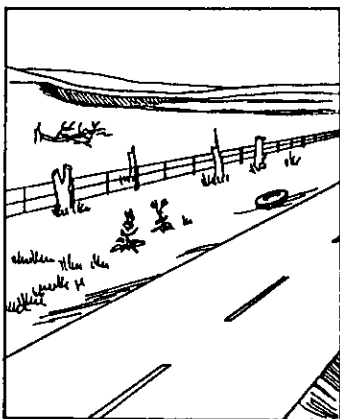
Expanses of roadside vegetation similar in spacing, form colour and texture to that commonly found in the character type which provide moderate visual interest but which seldom become a distinctive focus of view.

1

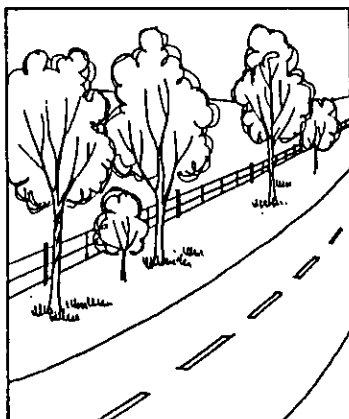
High:

Unique feature trees, or tree rows which become a positive focus of view due to position, colour, form or texture in contrast to those found commonly in the surrounding landscape. Water features such as ponds, swamps or creeks may be present.

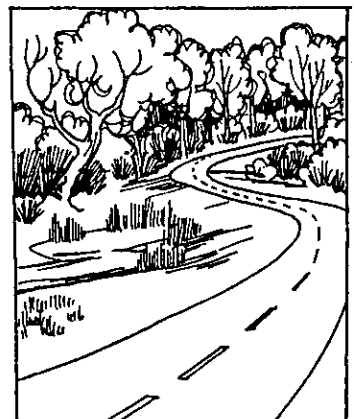
3



Low Landscape Value



Moderate



High

F. Farming Pressure.

As stated in the section on regeneration, grazing can have deleterious effects on both young and mature vegetation. Cultivation and cropping can have similar effects.

A rating of 'nil' would be given to a healthy stand of vegetation where there are no signs of droppings, hoof prints, or cropping (see Figure 6). If animals have been sighted on the roadside singly, or in large numbers en route between farms or paddocks, then it is recorded as 'occasional' farming pressure. The presence of electric fences along the roadside, use as a stock route or for crops demonstrates that grazing is present and farming pressure is 'present'.

The seasonality of grazing and cropping needs to be noted and roadsides surveyed when such activities are expected.

FIGURE 6 - SCORING SYSTEM FOR FARMING PRESSURE.

Present (electric fences on roadside or stock route; indications of cultivation or cropping)

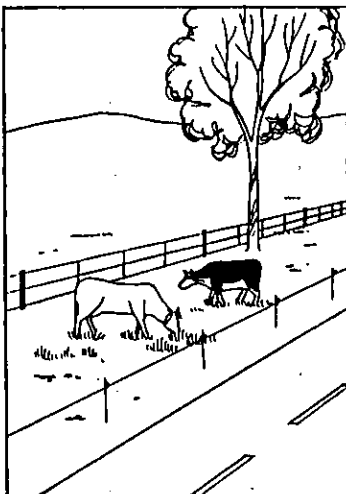
-5

Occasional (poor fencing or animals sighted on roadside).

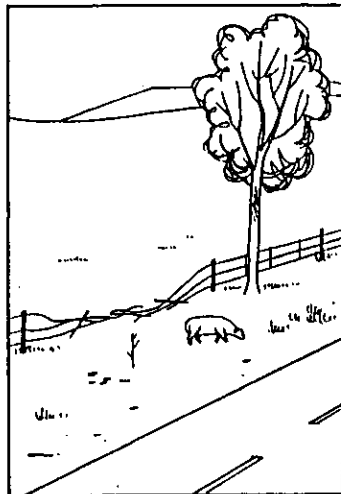
-2

Nil (no signs of droppings or hoof prints).

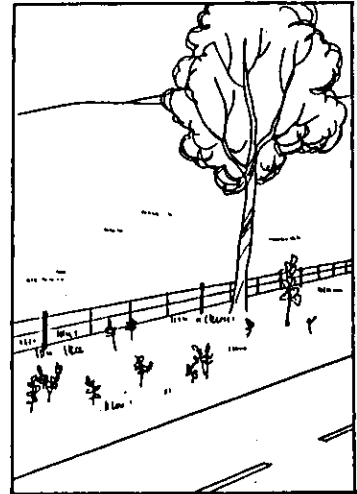
1



Farming pressure
present



Occasional



Nil

G. Width of the Roadside Verge.

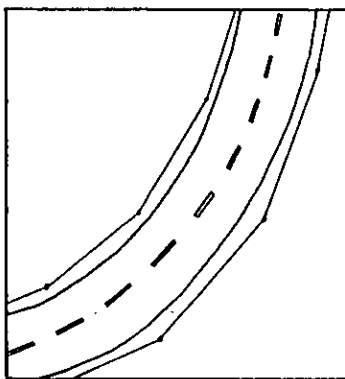
Invasion of roadside vegetation by exotic species from neighbouring (often agricultural) land reduces its value for conservation. On the edge abutting the road itself the vegetation may be influenced by light and wind and possibly seeds introduced by traffic. A wide verge under native vegetation provides opportunity for the vegetation towards the middle to be reasonably undisturbed and stable.

Narrow verges present little chance for indigenous vegetation to be maintained, and are less likely to provide worthwhile habitat.

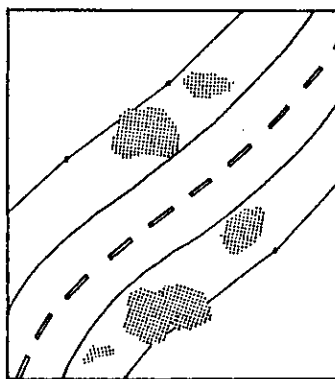
The width of the verge is measured from the edge of the road to the fenceline. If both sides of the road are to be assessed as one then the average of the two sides is the figure considered. In some areas the road has been developed to one side of the road reserve; in this case only the widest verge is considered (see Figure 7).

FIGURE 7 - SCORING SYSTEM FOR WIDTH OF ROADSIDE VERGE.

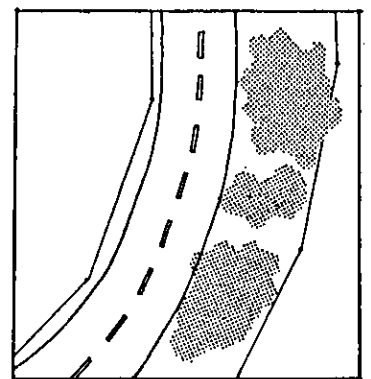
Width of Roadside Verge	1 - 3m.	1
	4 - 10m.	3
	11+m.	6



Verge 1-3m.



4-10m.



More than 11m.

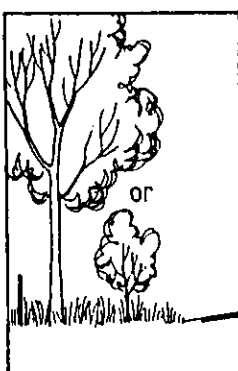
H. Strata of Vegetation.

'Strata' is taken to mean the number of canopy heights present in the grouping of vegetation. For example, there would be three strata if the roadside contained bushes of wattles, perhaps taller wattles above these and tall growing eucalypts above these. Generally the greater the number of strata, the more habitat available and the greater the potential carrying capacity of the roadside for birds and mammals. However, vegetation with many strata may not be a feature of every district; one or two strata only may be associated with some types of undisturbed vegetation (red gum forests for example). Hence, 'strata' requires an assessment of the change in the number of strata from that which would have been expected (prior to European settlement) and that which currently exists.

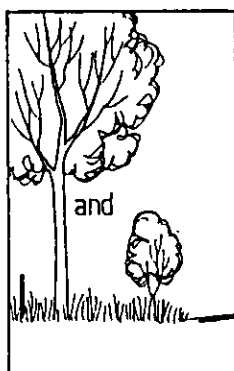
Local Groups and government representatives with botanical knowledge (for example Field Naturalist groups and Department of Conservation Forests and Lands) should be able to assist in determining 'original' conditions. Users of the method will have to familiarise themselves with the general appearance of different samples of the region's vegetation in order to assess the change of strata. Figure 2.8 presents the scoring system for the change of strata and indicates the appearance of a variety of strata.

FIGURE 8 - SCORING SYSTEM FOR STRATA OF VEGETATION

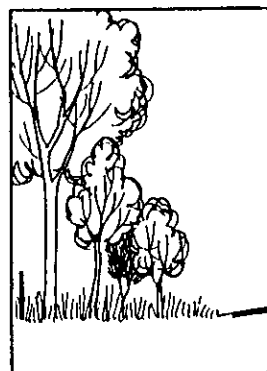
Roadside <u>lacks</u> 2 or more (natural) expected strata <u>or</u> natural tree cover <u>absent</u> <u>or</u> number of natural strata present but consisting only of exotic species	0
One (natural) expected stratum <u>absent</u> <u>or</u> represented only by scattered <u>individuals</u>	2
All (natural) expected strata <u>present</u>	4



One stratum



Two strata



Three strata
or more

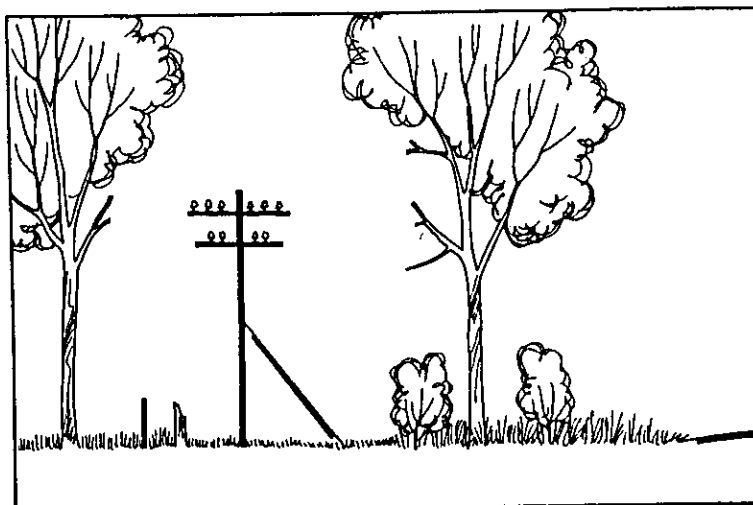
I. Utility Services.

Utility services represent the variety of services which use the roadside and consequently affect its conservation value. Width represents not only the physical space taken up by the utility (e.g. powerlines) but also the area affected in protecting and servicing the utility (e.g. firebreaks and access tracks).

Installation of utility services disturbs vegetation which then tends to be disrupted regularly as maintenance works are carried out. Hence the existence of utility services has a negative effect on vegetation and a negative score in this methodology (see Figure 9).

FIGURE 9 - SCORING SYSTEM FOR UTILITY SERVICES.

Utility extends for	>70% length of	&	>50% width	-6
	roadside			
"	"	"	>70% " " " & <50% "	-4
"	"	"	10-70% " " " & >50% "	-3
"	"	"	10-70% " " " & <50% "	-2
Present singly, e.g. gravel dump				-2
No utility service present (visible or underground)				2



| Width affected |

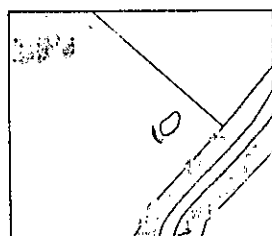
J. Proximity to Areas of Natural Vegetation.

The proximity of roadsides to areas of natural vegetation increases the amount of genetic material which may enter and disperse along the roadside verge. Adjoining natural vegetation also effectively widens the verge so that it becomes much less subject to invasion by exotics. There is an advantage in carrying out an assessment of roadside vegetation as part of an overall assessment of vegetation within the area. Blocks of natural (indigenous) vegetation will already be mapped, or the information readily available. Without the complete mapping of vegetation it is still possible to easily complete this section by noting where river reserves, State Forest, National Parks or vegetation on private lands join the vegetation on the roadside.

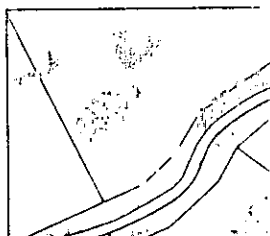
The scoring system outlined in Figure 10 gives the highest score for a block of natural (indigenous) vegetation being within 0 - 100m. of the road reserve fenceline at two points along the section of roadside being assessed. The lowest score is given for a block of natural vegetation being between 100-300m. from the fenceline. A zero score is given for blocks of vegetation further than 300m. from the fenceline.

FIGURE 10 - SCORING SYSTEM FOR PROXIMITY TO AREAS OF NATURAL VEGETATION.

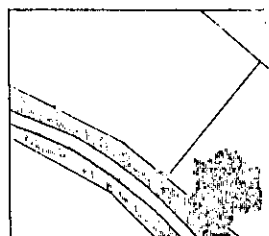
Block(s) of vegetation greater than 300m. from fenceline	0
Block(s) of vegetation 100-300m. from the fenceline	1
Block of vegetation 0-100m. from the fenceline at one point along the section	2
Blocks of vegetation 0-100m. from the fenceline at two or more points along the section	3



Vegetation more than 300m. from fenceline



Vegetation: 100-300m.



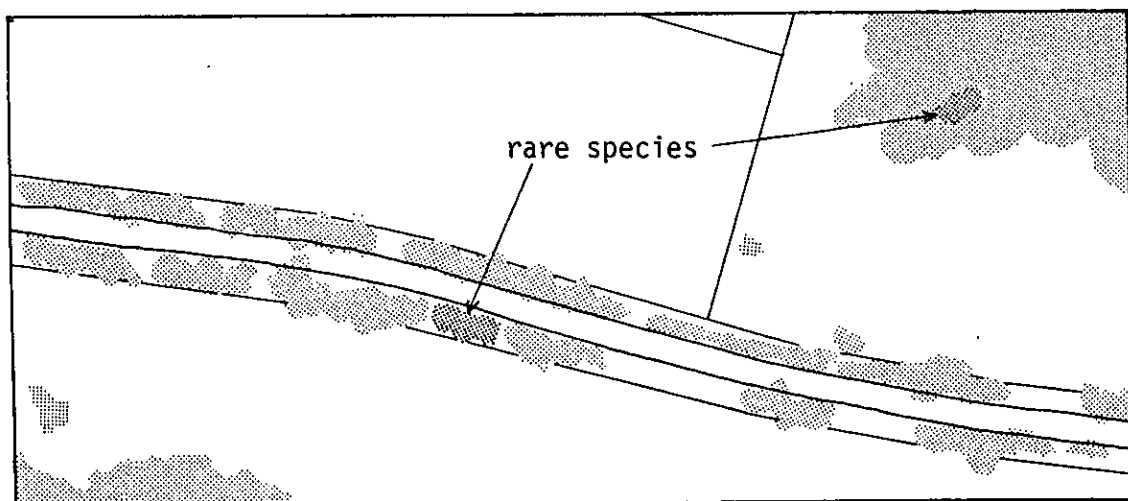
Vegetation less than 100m.



More than one block of vegetation within 100m.

K. Presence of Special Species or Features.

Users of this methodology are not expected to have the expertise to be able to identify these species or features in the field. This information would come from the Inventory exercise described in Section I. The presence of such species/features should be entered on the appropriate field sheet(s) as soon as they are returned to the office, if the data is available at that date; alternatively, the presence of these species/features may be recorded at any time, in which case the score for that section of roadside would have to be reviewed.



Presence of any rare/endangered/significant species, cultural/historical feature or relatively rare vegetation immediately attracts a score of 30 (see Field Sheet, Section K), which immediately gives the section of roadside a HIGH, or at least MODERATE, conservation classification.

IV. IN THE OFFICE

The field sheet has been designed so that the scores allocated for each conservation factor can be added together on the field sheet to give the total for the section of roadside being assessed. However, rather than taking only the total from the field sheet, it is suggested that all scores are transcribed to an evaluation sheet (an example sheet is attached) so that the factors that score high or low can be readily seen. The addition of scores for the final total can then be undertaken on the evaluation sheet, and the category of conservation significance determined, i.e.:

HIGH	conservation value - total score greater than 25
MODERATE	conservation value - total score 25 to 11
LOW	conservation value - total score less than 11.

These categories can then be displayed in tabular form, or plotted on maps using a suitable legend.



FIGURE 2.11 - EXAMPLE FIELD SHEET.

AREA/SHIRE.....DATE / / .

ROAD.....

SECTION FROM.....TO.....

BOTH VERGES/ONE VERGE (SPECIFY.....)

INSTRUCTIONS: For each conservation factor (A to J) circle the score appropriate to the average conditions along the section.

For K (Rare species) circle the score if special features/species are known to be present.

A

VEGETATION/HABITAT

- No apparent trees or shrubs
roadside appears as an extension of
agricultural land 0
- Presence of non-indigenous species
(plantation of exotic trees/shrubs
or presence of species from outside
region) 1
- One or more species of native plants
with a combined cover of less than 20% 3
- One or more species of native plants
providing 20-50% cover 6
- One or more species of native plants
providing 50-100% cover 8

LIST DOMINANT SPECIES IF KNOWN

.....

B

VEGETATION LENGTH OF
ROADSIDE

(Excludes noxious weeds and
agricultural plants)

- Less than 10% 0
- 10 - 20% 1
- 20 - 40% 2
- 40 - 60% 3
- 60 - 80% 4
- 80 - 100% 5

C

NOXIOUS WEEDS

- Abundant (visually
dominant in
understorey) -4
- Moderate (present
in understorey) -2
- Sparse (weeds
inconspicuous) 0

D

REGENERATION OF VEGETATION
(presence of seedlings
or young shrubs/trees)

- Nil 0
- Slight
(scattered
individuals) 1
- Moderate 3
- Extensive
(individuals less
than 3m. apart) 4

E

LANDSCAPE VALUE OF ROADSIDE
VEGETATION

- Low 0
- Moderate 1
- High 3

● Long straight segments of
roadside with sparse vegetation
of little visual interest.

● Expanses of roadside vegetation
similar in spacing, form, colour and
texture to that commonly found in the
character type which provide moderate
visual interest but which seldom become
a distinctive focus of view.

● Unique feature trees or tree rows
which become a positive focus of view
due to position, colour, form or
texture in contrast to those found
commonly in the surrounding landscape.

F FARMING PRESSURE

Present (electric fences on roadside or other evidence)	-5
Occasional (poor fencing or individual animals on roadside)	-2
Nil (no signs of droppings or hoof prints)	1

G WIDTH OF ROADSIDE VERGE

Width of 1 - 3m.	1
Width of 4 - 10m.	3
Width of 11+m.	6

H STRATA OF VEGETATION

Roadside <u>lacks</u> 2 or more (natural) expected strata <u>or</u> natural tree cover absent <u>or</u> number of natural strata present but consisting only of exotic species	0
One (natural) expected stratum <u>absent</u> <u>or</u> represented only by scattered individuals	2
All (natural) expected strata <u>present</u>	4

I UTILITY SERVICES

Utility Extends for >70% length of the roadside >50% width	-6
Utility Extends for >70% length of the roadside <50% width	-4
Utility Extends for 10 - 70% length of the roadside >50% width	-3
Utility Extends for 10 - 70% length of the roadside <50% width	-2
Utility Present singly e.g. gravel dump	-2
No utility service present (visible or underground)	2

J PROXIMITY TO AREAS OF NATURAL VEGETATION

Block(s) of vegetation from fenceline a distance of 300m. or greater	0
Block(s) of vegetation from fenceline a distance of 100m. - 300m.	1
Block of vegetation from fenceline a distance of 0 - 100m. at <u>one</u> point on roadway	2
Block of vegetation from fenceline a distance of 0 - 100m. at <u>two</u> or more points on roadway	3

K PRESENCE OF SPECIAL SPECIES OR FEATURES

Prior (or later) investigation shows the presence of either:	
- rare/endangered/significant species (flora or fauna)	
- vegetation of relative rarity/uniqueness in the locality.	
- cultural/historical features	30

COMMENTS

.
.
.

TOTAL SCORE: ADD A+B+C+D+E+F+G+H+I+J+K =

GLOSSARY

- exotic (vegetation) - species of vegetation which has been introduced to the area from another region, state or country.
- fauna - all larger animals (i.e. mammals and birds), reptiles and invertebrates in the area, but not necessarily micro-fauna.
- flora - all plants in the area, including grasses, ground covers, shrubs/bushes and trees, but not necessarily micro-flora.
- habitat - a local environment that provides food, water and shelter for fauna.
- indigenous - flora, or fauna, which originates from the immediate local area.
- native - flora, or fauna, which originates from the region.
- noxious weeds - these are plants which are either highly adapted to situations of soil disturbance or are able to take advantage of conditions of high fertility and are declared 'noxious weeds' under the Vermin and Noxious Weeds Act (1958) to be suppressed and destroyed.
- pest species - species of plants or animals which cause adverse economic effects on adjoining farmland, or compete with indigenous species on the roadside or in forests to such an extent that they prevent the development of a self-sustaining association of indigenous species.
- regeneration - growth of vegetation from usually nearby parent stock, without cultivation and then planting by man; usually refers to growth of indigenous species from vegetative parts or seeds.
- vegetation - the community of plant species growing in an area, comprising any combination of ground covers, shrubs, and trees.

APPENDIX V - RESULTS OF TEST ASSESSMENT IN THE SHIRE OF RUTHERGLEN

REF.	ROAD	REFERENCE POINTS		A	B	C	D	E	F	G	H	I	J	K	Total	Class
R1	Murray Valley Highway	Rutherglen	Moodemere	1	3	-2	0	1	1	6	1	2	0		13	M
R2	Murray Valley Highway	Moodemere	Ovens River	1	0	2	0	0	1	3	1	-2	3		9	M
R3	Bamin Road W..	Murray Valley Highway	Murray River	3	2	0	1	1	-5	3	1	2	3		11	H
R4	Dugay Bridge Road	Williams Road	Murray Valley Highway	1	1	0	0	0	-2	3	1	-2	2		4	L
R5	Rattye Road	Dugay Bridge Road	Murray Valley Highway	3	3	0	0	3	1	3	1	2	0		16	M
R6	Parris Road W..	Murray River	Dugay Bridge Road	1	2	2	0	0	1	3	1	2	2		14	M
R7	Buckingham Road	Murray Valley Highway	The end	1	1	0	0	0	1	3	1	2	0		9	M
R8	Escort Bridge Road	Murray Valley Highway	R.9	1	2	2	1	1	1	3	1	2	2		16	M
R9	Clohesseys	Escort Bridge Road	3 Chain Road	1	1	0	0	0	1	3	1	2	1		10	M
R10	3 Chain Road	Clohesseys Road	McPherson	3	4	0	1	1	1	3	1	2	0		16	M
R11	McPhersons Road W..	3 Chain Road	R.12	3	3	0	1	1	1	3	1	2	0		15	M
R12	Sherdons Bridge Road	McPherson Road	Rutherglen High School	3	3	0	1	1	1	3	1	2	2		17	M
R13	3 Chain Road	Murray Valley Highway	Railway Road	3	4	0	3	1	-2	6	1	2	0		18	M
R14	Distillery Road	3 Chain Road	Rutherglen/Wahgunyah Road	0	0	0	0	0	1	3	1	-6	2		1	L
R15	Rutherglen/Wahgunyah Road	3 Chain Road	All Saints Road	3	3	0	3	0	1	6	1	2	0		19	M
R16	All Saints Road W..	Rutherglen/Wahgunyah Road	Howlong	1	0	0	1	0	1	6	1	-2	0		8	L
R17	St.Leonards Road	Howlong	St.Leonards Winery	0	0	0	1	0	-2	3	1	-2	0		1	L
R18	Carlyle Road	Back Wahgunyah Road	St.Leonards Road	3	1	0	1	0	1	6	1	-4	0		9	M
R19	Back Wahgunyah Road	Carlyle	Outskirts Wahgunyah	3	1	0	1	0	1	6	1	2	0		15	M
R20	Carlyle Road	Back Wahgunyah Road	Outskirts Rutherglen	3	2	-2	3	1	1	6	2	-4	0		12	M
R21	Burrows Road	Carlyle	O'Keefes Road	1	2	2	0	1	1	1	1	-6	0		3	L
R22	Kilborn Road	Carlyle	Humphries Road	1	2	0	1	0	1	3	1	-6	0		3	L

Note: For this test, special features (k) were not included.

SHIRE OF RUTHERGLEN RESULTS SHEET (Contd.)

REF.	ROAD	REFERENCE POINTS		A	B	C	D	E	F	G	H	I	J	K	Total	Class
R23	Granthams Road	Kilborn Road	O'Keefes Road	1	2	2	0	0	1	3	1	-6	0		4	L
R24	Notts Road	Kilborn Road	O'Keefes Road	1	1	2	0	0	1	3	1	2	0		11	M
R25	Humphries Road	Kilborn Road	W.P. River Road	1	0	0	0	0	1	1	1	2	0		6	L
R26	Eaglestone Road	Humphries Road	Gooramadda Road	1	5	0	1	1	1	3	1	2	0		15	M
R27	W.P. River Road W..	Humphries Road	Police Paddocks Road	1	3	0	1	0	1	6	1	-4	0		9	M
R28	Gooramadda Road	W.P. River Road	Chiltern/Howlong	1	2	0	1	0	1	6	1	2	0		14	M
R29	Howlong Road W.	Gooramadda Road	Shire boundary	1	3	0	3	1	1	6	1	2	2		20	M
R30	Chiltern/Howlong Road	Gooramadda Road	Murray Valley Highway	1	1	0	1	0	-5	3	1	2	0		4	L
R31	Murray Valley Highway	Chiltern/Howlong Road	Great Southern Road	1	1	0	1	0	1	3	1	2	0		10	M
R32	Mia Mia	Murray Valley Highway	Gills Road	1	4	0	1	0	1	3	1	2	0		13	M
R33	Popes Road	Murray Valley Highway	Gills Road	1	4	0	3	3	1	3	1	2	0		18	M
R34	Webbs Road	Murray Valley Highway	Indigo/Gos Road	1	4	-2	3	3	-2	3	3	2	0		15	M
R35	Gillies Road	Murray Valley Highway	Indigo/Gooramadda	1	4	0	3	3	1	3	1	2	0		18	M
R36	Great Northern Road	Murray Valley Highway	Cornishtown Road	0	0	0	0	0	1	3	1	-6	2		1	L
R37	Breen Lane	Murray Valley Highway	Cornishtown Road	1	1	2	0	0	1	3	1	2	0		11	M
R38	Trimbles Lane	Murray Valley Highway	Cornishtown Road	1	4	0	3	3	1	3	1	2	0		18	M
R39	Great Southern Road	Murray Valley Highway	Chiltern Road	1	1	0	0	0	1	3	1	2	0		9	M
R40	Chiltern/Rutherglen Road	Great Southern Road	Rutherglen	3	4	0	4	0	1	6	1	2	0		21	M
R41	Rutherglen/Springhurst Main	Rutherglen	Shire boundary	1	1	1	-2	0	1	3	1	-6	0		-1	L
R42	Lilliput/Worong Road	Rutherglen/Springhurst Main	Shire boundary	1	5	0	1	1	1	3	1	2	0		15	M
R43	Withers Road	Rutherglen/Springhurst Main	Same as Popes	1	4	0	3	3	1	3	1	2	0		18	M
R 27a	Pol Pad Rd.	W.P. River Road	Gooramadda Road	0	0	0	0	0	1	3	1	-4	0		1	L
R 41a	Parkins Road	Rutherglen/Springhurst Main Road	Same as Distillery Road	0	0	0	0	1	1	3	1	-6	2		1	L

Note: For this test, special features (k) were not included.

APPENDIX VI - DETAILS OF REGENERATION AND EROSION TECHNIQUES.

AND APPROPRIATE MACHINERY

REGENERATION TECHNIQUES

Where areas have become denuded, and it is desirable to re-establish plant growth for conservation purposes and soil stabilisation, flora native to the area should be utilised for the following reasons:

- . it has proved capable of surviving the conditions which exist in the area;
- . it is representative of the area;
- . it is normally readily available from the local area.

This information is available but often hard to find. Usually information is available from local Field Naturalists' group (this group should be the first reference point). Other organizations such as the Department of Conservation, Forests and Lands and University Botany Departments, have access to information.

In its natural state indigenous flora receives protection from the wind and sun in the early stages of its growth; this protection is provided by surrounding plants. Therefore, it is advisable to cut brush of a bushy nature and cover seeded areas with this material to give some shade and wind protection.

Contour ripping of steep banks will assist regrowth by collecting seeds, dust, etc., and at the same time increasing water penetration, but should not be considered a substitute for resspreading topsoil.

Careful inspection must be made of soil type and existing flora to enable correct selection of plants to be made. If no indigenous

plants are present in the area then the nearest areas of natural vegetation with similar topography, micro climate and soil type, must be sought to provide the type of vegetation which is appropriate for the area.

Careful inspection will reveal that there is an association of plants, trees, shrubs and ground flora, the names of which will often not be known. Plant identification is quite complex and can only be done by specialists, such as the National Herbarium (Department of Conservation, Forests and Lands). While this identification is encouraged, it is not a necessary step for regeneration.

EROSION CONTROL TECHNIQUES

When construction work is completed it is necessary to consider protection against erosion which will result in loss of seed and soil. It is often desirable to protect the finished surface against the effects of the first rain to stop rills and gullies forming. The following four techniques can be used:

- (a) Bituminous emulsion
- (b) Hydro-mulching
- (c) Aqua-mulching
- (d) Brush thatching

Both (a) and (b) are expensive techniques for problem areas. Aqua-mulching involves spraying the ground with a mixture of water and paper mulch. Any seed which is to be added should be worked into the surface soil prior to aqua-mulching.

No matter which method is used, mulching should not be considered as an alternative to, or replacement of, the need to return the fertile topsoil to the site on completion of earthworks. Mulching is best suited as a method of preventing wind and water erosion prior to germination of seed. To gain the maximum benefits from mulching it should be carried out as soon as possible after the disturbance.

Brush thatching is a simple and effective technique. However, it is more labour intensive than the other three methods. Brush is laid vertically on the slope in such a way that a uniform cover is provided. This is then secured to the ground by strands of wire running at right angles to the brush and secured to the ground by stakes driven into the ground at intervals to prevent the brush from being blown away.

Indigenous material should be used in brush thatching because the seed from this brush is the most likely to germinate and colonize the area. However, some plants are better suited for this work than others as they retain their seed for long periods and do not release it until the plant cures.

APPROPRIATE MACHINERY

The successful rehabilitation of earthwork is greatly influenced by the efficiency of clearing timber and scrub, and the removal and stockpiling of topsoil for subsequent return to the worked area.

In the past the bulldozer with a conventional flat blade has been the stock-in-trade for clearing and stockpiling of timber, other debris and topsoil. It is an excellent machine for this purpose, but is very inefficient in pushing material long distances, and when used for clearing it pushes up large quantities of topsoil together with the timber and other material. If the timber is burnt, the topsoil mixed in with the timber hinders the burning process, while at the same time the benefits of organic material, micro fauna and seed are lost. This produces a sterile soil which encourages the growth of weeds, grows little native vegetation, which in turn increases the fire hazard of the area.

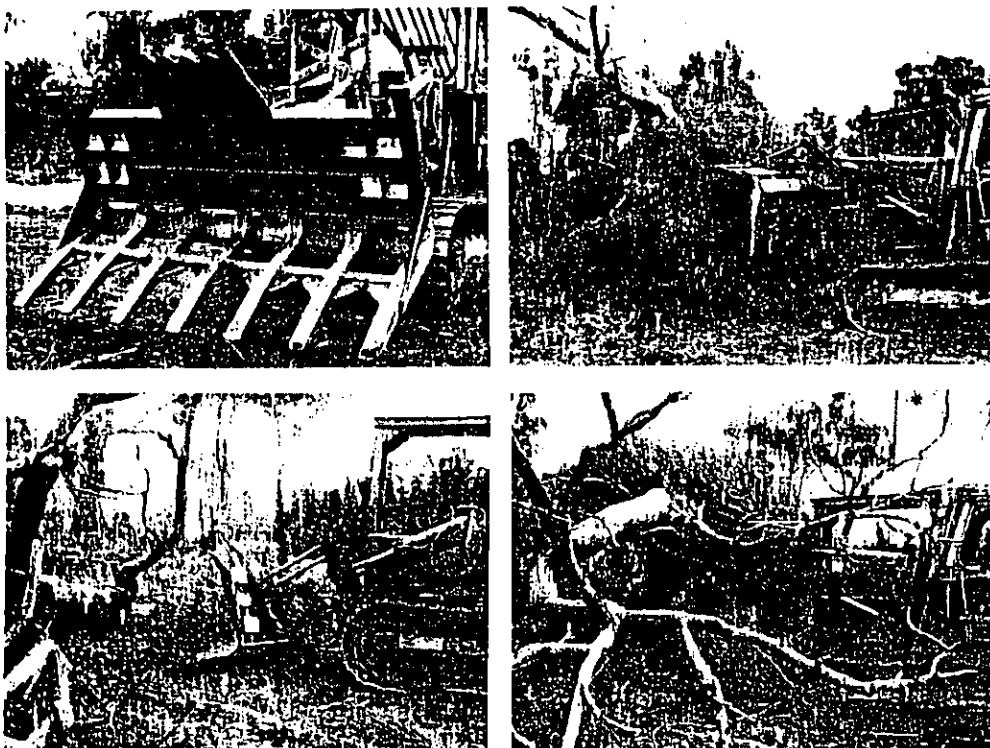
Other machines used include the disc plough for chopping up light scrub and the pin wheel side-winder rake. These are excellent machines for removing small roots and sticks but their use has now been largely dispensed with as it has been found that it is desirable to mix

light brush with the topsoil for return to the site on completion of operations.

The brush incorporated in the soil acts as a binder to prevent erosion. It provides organic material to aid plant growth and ensures that all seed is returned to the site for regeneration.

On completion of respreading the topsoil, it may be necessary to rip the roadside to aid water and root penetration and mix the top into the sub-soil to prevent it being blown or washed away before germination takes place; although this would not be the normal practice.

Over the last few years the spread of fungus diseases has been attributed to the lack of hygiene when moving machinery from one area to another. Therefore, once work has been completed at a site or if machinery is moved to another site the machinery involved should be hosed down properly before it is transferred. This practice cannot be stressed strongly enough. When driving even a car into a recognized fungus area the car should be hosed down before it is taken to another site.



Clearing using a tracked loader fitted with a fork bucket (Walden, 1983).

