NATURE CONSERVATION - THE ROLE OF CORRIDORS

CONFERENCE/WORKSHOP TO BE HELD AT BUSSELTON, WESTERN AUSTRALIA 11-15 September 1989

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ORGANISING COMMITTEE

Mr J Blyth	Department of Conservation and Land Management
Dr G R Friend	Department of Conservation and Land Management
Dr R J Hobbs	Commonwealth Scientific and Industrial Research Organisation
Mr A J M Hopkins	Department of Conservation and Land Management
Miss B M J Hussey	Roadside Conservation Committee
Mr B Loney	Main Roads Department
Dr D A Saunders	Commonwealth Scientific and Industrial Research Organisation

ACKNOWLEDGEMENTS

The organising Committee would like to thank the following for their support of this Workshop:

ALCOA
ANSETT
CALM
CSIRO
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MRD
WESTRALIAN SANDS

PROGRAMME

Monday 11 September 1989

0830-0900	Opening Speech Joe North President Elect Country Shire Councils' Association of WA

INVENTORY & ASSESSMENT OF CORRIDORS

CHAIRMAN:	J BLYTH
0900-0945	REVIEW: M Soulé, M E Gilpin & L D Harris. "Toward a theory of corridor capability".
0945-1005	1. S G Taylor. "Patches, strips and gaps: measuring the biogeographic attributes of habitat networks for native species in human-dominated landscapes".
1005-1025	2. H Gulinck, P Janssens & O Walpot. "The simulation of migration patterns in the landscape, using SPOT data".
1025-1100	MORNING TEA
1100-1120	3. T W Norton & H A Nix. "Computer-based methodologies for the management of wildlife corridors".
1120-1140	4. J Baranga. "Kibale forest game corridor: man or wildlife".
1140-1200	5. A B Low, C R McDowell & B McKenzie. "Natural remnants and corridors in greater Cape Town: reconciling conservation and community needs".
1200-1220	6. C R McDowell, A B Low, B McKenzie & L Brown. "Natural remnants and corridors in greater Cape Town - their role in threatened plant conservation".
1220-1330	LUNCH
1330-1350	7. B M J Hussey. "The Flora Roads Survey - volunteer recording of roadside vegetation in Western Australia".
1350-1410	8. A O Nicholls & C R Margules. "The design of studies to demonstrate the importance of corridors".
1415-1530	WORKSHOP
1530-1600	AFTERNOON TEA
1600-1700	Plenary Session
	DINNER
2000-2030	J Watson. "River Foreshore Corridors in the South Coast Region of Western Australia".

Tuesday 12 September 1989

VALUES OF CORRIDORS

CHAIRMAN:	D A SAUNDERS
0900-0930	REVIEW: 1. R T T Forman. "Landscape corridor theory, function, vegetation, scale and policy".
0930-0950	1. C F J O'Donnell. "Application of the Wildlife Corridors concept to temperate rainforest sites in north Westland, New Zealand".
0950-1010	2. A F Bennett. "Roads, Roadsides and Wildlife Conservation".
1010-1030	3. B L Dawson. "South African road reserves - valuable conservation corridors?"
1030-1100	MORNING TEA
1100-1130	REVIEW: 2. H G Merriam. "Corridors for animal populations in heterogenous environments".
1130-1150	4. J F Lynch & D A Saunders. "Responses of bird species to habitat fragmentation in the Wheatbelt of Western Australia".
1150-1210	5. H Cross. "Corridors for wetland conservation and management - room for conjecture?"
1210-1230	6. G Wardell-Johnson & J D Roberts. "Riparian zones on agricultural land as habitat for the Geocrinia rosea complex. Is conservation possible?"
1230-1330	LUNCH
1330-1350	7. N Marr. "The importance of road verges to amateur birders".
1350-1410	8. J K Hibberd. "Roadside reserve condition and modification 1978-89 in the Southern Tablelands of New South Wales."
1415-1530	WORKSHOP
1530-1600	AFTERNOON TEA
1600-1700	Plenary Session
1930-	CONFERENCE DINNER
	After Dinner Address: M Soulé

Wednesday 13 September 1989

MID - CONFERENCE TOUR

There are two options:

A	Bus tour "The Leeuwin-Naturaliste Ridge - a linear feature".
B	Canoeing, Blackwood River. (Limit of 20 places, register at reception).

Depart: 0900

Return: 1630

EVENING FREE

Thursday 14 September 1989

MOVEMENT OF BIOTA

CHAIRMAN:	E M MATTISKE
0900-0945	REVIEW: L D Harris. "The need for, and implementation of, animal-movement corridors in human-dominated landscapes".
0945-1004	1. W A Rodgers & H S Panwar. "Corridors in Indian wildlife management".
1005-1025	2. D A Saunders & C P de Rebeira. "Values of corridors to avian populations in a fragmented landscape".
1025-1100	MORNING TEA
1100-1120	3. E M Date & H F Recher. "Use of Rainforest corridors by frugiverous pigeons in northern NSW".
1120-1140	4. C P Caterall. "Habitat use by birds in relation to the interface between a forest island and surrounding suburbs in Brisbane".
1140-1200	5. P Prevett. "Role of corridors for koala movements in the urban-rural fringe of Ballarat in Victoria and implications for management".
1200-1220	6. G W Arnold & J Weeldenburg. "The use of road verges and fencelines as corridors by kangaroos in the central Wheatbelt of WA".
1220-1330	LUNCH
1330-1350	7. A J M Hopkins & R J Hobbs. "The role of conservation corridors in a changing climate".
1350-1410	8. A Danks. "Corridors and the management of an endangered passerine".
1415-1530	WORKSHOP
1530-1600	AFTERNOON TEA
1600-1700	Plenary Session
	EVENING FREE

Friday 15 September 1989

MANAGEMENT - ESTABLISHMENT/MAINTENANCE/ REHABILITATION

CHAIRMAN:	A J M HOPKINS
0900-0945	REVIEW: B Loney & R J Hobbs. "Establishment, maintenance and rehabilitation of vegetation corridors".
0945-1005	1. S Lewis. "The conservation and management of roadside vegetation in South Australia".
1005-1025	2. G Stone. "Roadside management plans in the Road Construction Authority, Victoria".
1025-1100	MORNING TEA
1100-1120	3. B L Dawson & J P van der Breggan. "Re-establishment of indigenous vegetation in South African road reserves".
1120-1140	4. E J Jefferson, H S Lodder, A J Willis & R H Groves. "Establishment of native grass on roadside".
1140-1200	5. F D Panetta & A J M Hopkins. "Weeds in corridors: invasion and management".
1200-1220	6. R J Hobbs & P G Cale. "Condition of roadside vegetation in relation to nutrient status".
1220-1330	LUNCH
1330-1350	7. M A Cooper. "The tragedy of the commons in public corridors".
1350-1410	8. K Bradby. "Data are never enough - the local approach to land care".
1415-1530	WORKSHOP
1530-1600	AFTERNOON TEA
1600-1700	(Plenary Session (CONFERENCE ROUNDUP

REVIEWS

0900 Monday 11 September

TOWARD A THEORY OF CORRIDOR CAPABILITY

Michael Soulé, Michael E Gilpin, Larry D Harris

University of Michigan - School of Natural Resources
Dana Bldg, 430 E University, Ann Arbor, MI 48109-1115, USA

Any theory of corridor capability must be species - or taxon - specific. A useful theory will lead to insights about corridor dimension and shape. The categories intrinsic (species) and extrinsic (habitat) phenomena that must be considered in the construction of such a theory include (1) kinds of movement (eg random walk, density driven), (2) temporal use (eg daily, seasonal, periodic), (3) kinds of intraspecific interactions (eg positive and negative density dependence), (4) interspecific interactions (eg predation), (5) kinds, intensities, and penetration of edge effects (eg predation or temperature gradients), and (6) the strength of "viscosity" gradients perpendicular to corridor axis (eg the rate of movement along the edge vs the center). In addition, habitat in corridors may not be homogenous, giving rise to an index of patchiness. For some species, it may be possible to quantify the "roughness" of the edge using fractile dimensionality. All of these factors could vary from place to place in a corridor.

0900 Tuesday 12 September

LANDSCAPE CORRIDOR THEORY, FUNCTION, VEGETATION, SCALE AND POLICY

Richard T T Forman

Harvard University
Graduate School of Design, Cambridge, Mass 02138, USA

Landscape linkages or corridors have direct theoretical foundations in thermodynamics and molecular movement. Corridors exhibit five basic functions: conduits, barriers, sources, sinks and habitats.

Scales, from local hedgerows, roads and streams to continental/ national mountain ranges and major rivers, are distinct, but linked. Vegetation and other examples will be presented for these corridor concepts and principles in a fertile conceptual frontier.

A multi-scale corridor system integrates six major public policy issues: (1) water resources; (2) biodiversity; (3) agroforestry production; (4) recreation; (5) community cohesion and diversity; and (6) climatic change.

1100 Tuesday 12 September

CORRIDORS FOR ANIMAL POPULATIONS IN HETEROGENEOUS ENVIRONMENTS

H G Merriam

Ottawa-Carleton Institute of Biology, Carleton University,
Ottawa, Canada. K1S 5B6

Patchy habitats causes patch populations of animals in natural and developed landscapes. In heterogeneous landscapes, several patch populations may be connected into a metapopulation by corridors. At the landscape scale, the degree of linkage within and between metapopulations can be represented conceptually as connectivity. Landscape patterns can constrain connectivity; barriers can bound metapopulations and genetic breeding units. Habitat patches change successionally, by human impact, land use changes and crop rotation. Animals must move through the landscape to match their changing distribution of resources in the landscape. Effects of poor quality corridors can be simulated by computer models as can effects of poor quality patches and of patch and corridor arrangements. Frequency of extinctions in patches and in metapopulations and rates of recolonisation of these can be related to connectivity. In addition to the demographic effects, these interactions between connectivity and frequency of local extinctions can have important effects on the genetics of patchy populations. Understanding the dynamics of patchy populations at the landscape scale is basic to conservation planning for species and communities and connectivity in metapopulations will be a critical component of regional plans.

0900 Thursday 14 September

THE NEED FOR AND IMPLEMENTATION OF ANIMAL MOVEMENT CORRIDORS IN HUMAN-DOMINATED LANDSCAPES

Larry D Harris

University of Florida, Gainesville, Fl, USA

In order to warrant expensive conservation investments to facilitate animal movement, evidence must go beyond the observation that animals move; it must include evidence that they must move. This evidence does exist and derives first and foremost from basic biological traits that are evolutionary and genetically encoded.

Most amphibians and fish lay eggs in an aquaous environment and progress through an aquatic larval stage. As adults, many species of amphibians adopt a terrestrial life form while many species of fish are diadromous and alternate their life stages in freshwater and saltwater environments. Completion of the life cycle may require movement of thousands of kilometres between environments. The predominance of reptiles must lay their eggs in aerated environments, but then move into an aquatic environment as adults. Large numbers of bird and mammal species have adopted migration as a survival strategy that can not be muted simply because the avenues of migration may have been obstructed by human intrusion. These basic life history attributes that dictate the need for animals to move are triggered and accentuated by the asynchonous functioning of ecosystems at regional, continental, and hemispheric levels of organisation.

0900 Thursday 14 September (cont)

Obstructions to evolutionary, genetically encoded, or environmentally mandated movements by habitat fragmenting and isolation intrusions are documented to cause effects in at least five different biological diversity and ecological categories: (1) Loss of wide-ranging, area sensitive species that experience amplified rates of mortality due to movement through the fragmented environment; (2) Loss of interior species that require patches of unbroken habitat larger than remain in the fragmented landscape; (3) Loss of genetic and phenotypic diversity from within the species that are confined to live within isolated patches; (4) Proliferation of weedy species that are adapted to fragmented and disturbed environments; (5) Distorted levels of all major ecological processes including predation, competition, parasitism, and nutrient transfer.

Wildlife conservationists have implemented a large number of functioning movement corridors, landscape linkages and related technologies throughout the world in order to abate the consequences of disrupted movement. Tabulation of these examples with supporting rationale is included.

0900 Friday 15 September

ESTABLISHMENT, MAINTENANCE AND REHABILITATION OF VEGETATION CORRIDORS

B Loney[1] and R J Hobbs[2]

[1] Main Roads Department, Waterloo Crescent, East Perth WA 6004
[2] CSIRO Division of Wildlife and Ecology, LMB No 4 PO, Midland WA 6056

We discuss the attributes and uses of natural, remnant and cultural vegetation corridors and examine the management required to provide the characteristics necessary for wildlife movement and other uses including windbreaks, landscaping and tourism.

This involves the management and rehabilitation of existing corridors and establishment of new corridors. We examine the problems associated with managing linear resources with large edges and the associated problems of regeneration, public safety and resource allocation. Practical solutions to corridor management include vegetation retention and re-establishment, increased community awareness and support and interactive management structures. Of primary importance for effective management is a better understanding of what constitutes a corridor for different species.

CONTRIBUTED PAPERS

0945 Monday 11 September

PATCHES, STRIPS AND GAPS: MEASURING THE BIOGEOGRAPHIC ATTRIBUTES OF HABITAT NETWORKS FOR NATIVE SPECIES IN HUMAN-DOMINATED LANDSCAPES

S G Taylor

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GPO Box 498, Adelaide SA 5001

In Australia's human-dominated landscapes, the process of European settlement has fragmented the native vegetation cover into patches and strips of remnant natural land set within a matrix of rural and urban land. These patches and strips of remnant natural land constitute habitat networks for native plant and animal species unable to colonise the surrounding rural and urban land. There is a need to quantify the biogeographic attributes of such habitat networks so that measurable variables can be correlated with ecological processes and then used as indices of conservation value.

The present paper reviews the measures of connectivity that have been applied to habitat networks in human-dominated landscapes. Based on this review, selected measures are examined for their sensitivity to differences in Australian landscape patterns, using test areas in South Australia having different biophysical characteristics and land use histories.

1005 Monday 11 September

THE SIMULATION OF MIGRATION PATTERNS IN THE LANDSCAPE, USING SPOT DATA

H Gulinck, P Janssens, O Walpot

Laboratorium for Landmanagement, Faculty of Agriculture
Katholieke Universiteit Leuven, Kard. Mercierlaan, 92 B-3030
Leuven, Belgium

In this paper we aim at the detection of potential migration patterns within landscapes, using remote sensing data. Landscape structure is the key controlling factor defining the resistance of the landscape movement (spatial analysis). The automated, digital processing of remote sensing data allows us to analyse spatial configurations of structural landscape elements. The use of satellite remote sensing data tends to emphasise the possibilities for a structural analysis. This structural approach is assumed to be complementary to a functional approach.

To describe patches and networks in the satellite images, we developed techniques to measure shape, orientation, area and to classify texture patterns. The matrix is described by measurements as heterogeneity, openness, complexity, connectivity etc. A special subtopic in this study is the detection of linear elements in the landscape.

We promised the structural parameters in the landscape are relevant attributes effecting several ecological characteristics of an area. To delimit landscape ecological units, these parameters (landscape attributes) can be calculated within a predefined area and repeatedly compared by multivariate analysis.

1100 Monday 11 September

COMPUTER-BASED METHODOLOGIES FOR THE MANAGEMENT OF WILDLIFE CORRIDORS

T W Norton and H A Nix

Centre for Resource and Environmental Studies
The Australian National University, GPO Box 4, Canberra ACT 2601

Planned and viable management of wildlife corridors involves three inter-related, key components: the identification of extant or potential corridors; a general understanding of the ecology of these corridors and their wildlife; and explicit objectives for management. Here two new technologies, a Bioclimate Prediction software package called BIOCLIM and aspects of an AEGIS (Australian Environmental Geographic Information System), are used to illustrate the utility of computer-based systems for management. Particularly, the flexibility of these systems, eg to highlight gaps in knowledge, to focus research efforts and to incorporate new information as it comes to hand.

Examples of populations of plant (eg woodland eucalypts) and animal (ie Superb Parrot Polytelis alexandrae, Squirrel Glider Petaurus norfolcensis) taxa reliant on fragmented habitats in the highly modified wheatbelt of south-east Australia are considered to demonstrate how wildlife corridors may be readily identified and, in turn, managed actively and efficiently through time for nature conservation and/or other purposes.

1120 Monday 11 September

KIBALE FOREST GAME CORRIDOR: MAN OR WILDLIFE

Jonathan Baranga

Uganda National Parks, PO Box 3530, Kampala, Uganda

Kibale forest game corridor is a 340km^2 game reserve in Western Uganda. It has previously served as a migration route for large mammals especially elephants between Queen Elizabeth National Park to the south and Kibale forest to the north. The encroachment in Kibale forest and game corridor constitute a single and homogeneous settlement unit and the data presented is treated accordingly.

Encroachers have been in the reserve under dubious circumstances for the last twenty years. The status of the corridor and the human question are presented in 5 figures and 3 tables. There is evidence that encroachment is related to breakdown of law and order.

Government efforts to remove encroachers have been inconsistent and largely half-hearted. The encroachers have responded by asking, "Does the government prefer animals to people?", to which there has been no easy answer. A USAID-funded international team carried out a very short study and recommended degazetting Kibale game corridor. My response is a criticism of the report and suggestions of my own to solve the problem of encroachment and thus save Kibale game corridor.

1140 Monday 11 September

NATURAL REMNANTS AND CORRIDORS IN GREATER CAPE TOWN: RECONCILING CONSERVATION AND COMMUNITY NEEDS

A B Low*, C R McDowell and B McKenzie

* Cape Flats Nature Reserve, University of the Western Cape, Bellville, South Africa

Two major vegetation types on the coastal lowlands around Cape Town, namely acid sand flats Fynbos and Strandveld, are threatened by socio-political factors. These include State-determined separate residential areas for different race groups, the Influx Control Act (recently repealed), burgeoning urban sprawl, widespread socio-economic deprivation, and the inadequate conservation of threatened habitats. Nature conservation versus urbanisation is discussed in the context of the local "Third World-First World" interface. Positive community attitudes of both groups, are essential for conservation initiatives to succeed. The improvement of attitudes is complicated by the complex and controversial socio-political fabric of South Africa. Surveys indicate that local communities favour "urban" nature conservation but are ill-informed of the potential benefits of natural remnants and corridors. Local authorities have also been largely ineffective in managing these areas for public use. The implementation of far-reaching environmental education programmes is essential for community-oriented nature conservation. Appropriate conservation strategies for protecting remaining vegetation are discussed in this light.

1200 Monday 11 September

NATURAL REMNANTS AND CORRIDORS IN GREATER CAPE TOWN: THEIR ROLE IN THREATENED PLANT CONSERVATION

C R McDowell*, A B Low, B McKenzie and L Brown

* Department of Botany, University of Cape Town, Rondebosch, South Africa

Cape Town is situated in the Cape Floral Kingdom, one of the world's richest in plant diversity and endemism. The remaining lowland vegetation around Cape Town comprises mainly acid sand flats Fynbos and alkaline dune Strandveld. Remnants of the former have the greatest concentration of Red Data plant species in South Africa. Fynbos is more sensitive than Strandveld to human-related impacts. The status of selected Red Data species in the two systems is discussed with reference to housing, alien vegetation, "park-scaping", fire, stock-grazing, public ignorance and inappropriate planning decisions. The current and potential conservation role of researched remnants and corridors is evaluated by assessing known habitat requirements of Red Data species with their associated community types. Both official and unofficial protection categories for the latter areas are illustrated by using examples of specific nature reserves, "natural heritage sites", racecourses, high security areas, roadsides, powerline reserves and suburban buffer/green belt zones.

1330 Monday 11 September

THE FLORA ROADS SURVEY - VOLUNTEER RECORDING OF ROADSIDE VEGETATION IN WESTERN AUSTRALIA

B M J Hussey

Roadside Conservation Committee
PO Box 104, Como WA 6152

The South-West Agricultural Region of Western Australia has 107500 kilometres of roads, many of which retain native vegetation on the roadside. Public concern for the preservation of wildflower drives led to the reservation of wide road reserves (up to 200m) deliberately for flora conservation. Thus many roadsides retain a linear transect of the original vegetation and have important conservation value.

Degradation, however, is continually occurring, often due to lack of knowledge of the resource leading to inappropriate management. To obtain preliminary data, a survey was designed to use volunteers to assess the conservation value of road reserves.

This paper will outline the techniques used and compare the results with other surveys - professional and amateur - in Australia, with regard to accuracy, quality of data, cost, value as a management tool and public involvement. It will be shown that the use of volunteers to survey roadsides is a cost-effective way of obtaining data while at the same time raising community consciousness.

1350 Monday 11 September

THE DESIGN OF STUDIES TO DEMONSTRATE THE IMPORTANCE OF CORRIDORS

A O Nicholls and C R Margules

CSIRO Division of Wildlife and Ecology
PO Box 84, Lyneham ACT 2601

The paper reviews corridor studies emphasising study design. Design strengths and weaknesses are discussed and some consequences of the weaknesses illustrated using a fragmentation experiment in south eastern Australia.

Two major problems exist. The first is a lack of monitoring before and after the creation of the corridors. The second is the lack of control over the design and stratification of the sampling.

Suggestions will be made for the development of a design capable of testing the impact of corridors. This highlights the need for the design to be limited to one or two questions in view of the many variables that influence the role corridors play in conservation, reserve selection and management.

2000 Monday 11 September

RIVER FORESHORE CORRIDORS IN THE SOUTH COAST REGION OF WESTERN AUSTRALIA

John Watson

Department of Conservation and Land Management
South Coast Region, 44 Serpentine Road, Albany WA 6330

The CALM South Coast Region extends from near Albany in the west to the South Australian border in the east and inland to the southern margins of the WA Wheatbelt and the Southern Goldfields. Numerous national parks and nature reserves are located within the region but for the most part, particularly between Albany and Esperance, these are "islands" with surrounding lands being largely cleared for agriculture.

As part of a total review of conservation reserves in the region, attention has been focussed upon the potential for remnant vegetation, especially along river foreshores, to provide corridor links between major reserves located on the coast and other important reserves and uncleared vacant Crown land further inland.

Potential corridors were first identified from satellite photographs and aerial photographs and then checked by field inspection. Quality or condition of the corridors was assessed with regard to width, vegetation condition, weed and pest invasion, dieback disease, stock damage, recreational use and potential for widening through purchase of adjoining uncleared land or co-operative arrangements with landowners. Detailed flora or fauna surveys were not undertaken, however opportunistic sightings and any unusual landforms and species were noted.

As a result of the preliminary inspections it is anticipated that some corridors will have high conservation value in their own right despite the management difficulties and costs traditionally imposed by areas with a high boundary to area ratio.

0930 Tuesday 12 September

APPLICATION OF THE WILDLIFE CORRIDORS CONCEPT TO TEMPERATE RAINFOREST SITES IN NORTH WESTLAND, NEW ZEALAND

Colin F J O'Donnell

Science & Research Directorate, Department of Conservation
Private Bag, Christchurch, New Zealand

The wildlife corridor concept was used to justify conservation of extensive areas of temperate rainforest zoned for logging in 1986. The Paparoa Range (150 000ha) is joined by lowland forest to the Southern Alps via a 50 000ha corridor. The Range is otherwise isolated by agricultural land. Application of the corridor concept was justified by arguing its necessity for aiding long term gene flow and maintaining genetic heterogeneity and demographic characteristics in forests which would otherwise become isolated patches.

A review of this corridor is now addressing the questions: Do the objectives of the corridor, predicted by theory, function in reality and how? If so, is the design adequate, and what level of modification (logging) could be permitted? Methods being used include sampling and genetic variability of selected species along the corridor and comparing them with the degree of genetic differentiation of populations already isolated.

0950 Tuesday 12 September

ROADS, ROADSIDES AND WILDLIFE CONSERVATION

A F Bennett

National Parks and Wildlife Division
Department of Conservation, Forests and Lands
123 Brown Street, Heidelberg VIC 3084

Roads are transport corridors imposed on the environment by humans for the movement of people and materials. Road systems are extensive in both their length and area occupied (eg in Victoria 159 500km occupy some 3% of the State), and they occur through most terrestrial habitats. They have a large, but poorly documented, influence on wildlife populations. A review of literature reveals four major impacts of road systems: (i) habitat change, including loss and transformation of habitat, or retention of remnant habitat; (ii) isolation, creating a barrier or filter to movements, and a source of mortality; (iii) connectivity, where roadside habitats serve as a corridor; and (iv) a source of disturbance and emission affecting the biota of the surrounding matrix. In disturbed and severely modified environments, management of habitats on road reserves offers great potential for restoring or enhancing continuity to natural elements in the landscape. The reserved status of roads, their geographical extent and continuity, and their network structure, provide opportunities for linking insular habitats and facilitating interchange between wildlife populations.

1010 Tuesday 12 September

SOUTH AFRICAN ROAD-RESERVES - VALUABLE CONSERVATION CORRIDORS?

B L Dawson

PU-NTC Research Institute for Reclamation Ecology (Cape)
PO Box 352, Brackenfell, 7560 Republic of South Africa

The nature and extent of the South African road network is briefly described, with particular reference to servitude widths and the extent of the road-reserve. The policies of the various road authorities, with regard to road-reserve revegetation and maintenance, are also presented.

The results of a road-reserve survey undertaken through a number of different biomes and vegetation types are discussed. It was found that some South African road-reserves do, in certain vegetation types, constitute valuable conservation corridors, but that this is more fortuitous than the result of any deliberate policy.

The vegetation types where this is the case are generally those which have been largely transfomed by agricultural or other human activities. These areas tend to be categorised by having a flat to undulating topography, better quality soils, and moderate to good rainfall.

1130 Tuesday 12 September

RESPONSES OF BIRD SPECIES TO HABITAT FRAGMENTATION IN THE WHEATBELT OF WESTERN AUSTRALIA

J F Lynch[1] and D A Saunders[2]

[1] Smithsonian Environmental Research Center
PO Box 28, Edgewater, Maryland 21037, USA
[2] CSIRO Division of Wildlife and Ecology, LMB No 4 PO,
Midland WA 6056

The species of landbirds that inhabit the wheatbelt of Western Australia differ markedly in their tolerance to the reduction and fragmentation of native vegetation that have accompanied agricultural development. Data from strip censuses and other sources are used to define 6 general classes of avian responses to habitat disruption, and examples of each class are presented.

Use of vegetaed corridors by birds varies with species, season, and corridor configuration. Existing corridors of native vegetation in the wheatbelt are used by different species as breeding sites, seasonal or year-round feeding areas, shelters, or dispersal routes. However, some bird species appear to avoid corridors altogether.

1150 Tuesday 12 September

CORRIDORS FOR WETLAND CONSERVATION AND MANAGEMENT? - ROOM FOR CONJECTURE

H C Cross, P D Wettin and F M Keenan

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The wetlands of the Lachlan/Murrumbidgee Rivers confluence in south-west NSW form one of the largest and most diverse wetland assemblages in south-east Australia. In the past decade, some areas structurally dominated by lignum (Muehlenbeckia cunninghamii) have come under increasing pressure for agricultural development. These areas contain the most important known sites for the regular breeding of straw-necked ibis in SE Australia. They are also used for feeding and breeding by many other waterbirds, including migratory species. The Department of Water Resources, as the responsible water authority for the region, is co-ordinating the development of land and water management plans based on wetland vegetation corridors along major floodways. Various agricultural and environmental needs, including maintenance of habitat diversity, water and stock management and feral pig control, mitigate both for and against the corridor concept.

1210 Tuesday 12 September

RIPARIAN ZONES ON AGRICULTURAL LAND AS HABITAT FOR THE GEOCRINIA ROSEA COMPLEX. IS CONSERVATION POSSIBLE?

G Wardell-Johnson[1] and J D Roberts[2]

[1] Department of Conservation and Land Management, Research Centre
Brain Street, Manjimup WA 6258
[2] Department of Zoology, University of Western Australia
Nedlands WA 6009

The Geocrinia rosea complex includes four species exhibiting direct development and restricted to continuously damp sites in the lower south west of Western Australia. This paper describes the distribution, abundance and habitat of two recently described rare and endangered species occurring in restricted habitat east of the Leeuwin Naturalist Ridge. G.vitellina is known from small areas of suitable habitat in two creek systems, both on publicly managed land. Its total distribution is less than 30ha. G.alba occurs in restricted habitat over a total distribution of 92km^2. However all but 29% of this is cleared private property. The rarity of suitable habitat and the vulnerable breeding biology of these species urge the adoption of conservative management practices in riparian strips on private and public land alike.

1330 Tuesday 12 September

THE IMPORTANCE OF ROAD VERGES TO AMATEUR BIRDERS

Noela Marr

Lot 3 Bunneys Lane, Kin Kin QLD 4571

As an introduction, my own experiences as a newly arrived birder in Western Australia are described. My use of road verges is related.

The terms Amateur and Professional Birder are defined.

Types of Amateur Birders are enumerated and explained. Special mention is made of the Twitcher.

Some explanations for the popularity of birding in verges are put forth.

A small number of slides showing verges suitable for birding will be shown.

It will be concluded that Road Verges may be responsible for many people's taking an interest in birds in general, leading to a greater awareness of the environment in general.

1350 Tuesday 12 September

ROADSIDE RESERVE CONDITION AND MODIFICATION 1978-89 IN THE SOUTHERN TABLELANDS OF NEW SOUTH WALES

J K Hibberd

Kestel Research, PO Box 2546, Canberra ACT 2601

A detailed field-based survey of travelling stock routes, reserves and other Crown lands was carried out in 1978 in the Southern Tablelands. The survey located and described 129 reserves and 687km of roadside vegetation in the 7 500km^2 study area and evaluated their relative values for wildlife protection, grazing, landscape retention and tourism. 45% of the remnant forested lands in the study area occurred on Crown lands; half of this being found on roadsides and other Crown lands.

The follow-up study in 1989 examined changes in tree cover and utilisation for the same reserves. Grazing resulting in lack of regeneration was found to be the major factor in tree cover decline. In addition to field survey, remote sensing techniques were used to map reserves and information is presented on the cost effectiveness of such methodology for large area remnant survey.

0945 Thursday 14 September

CORRIDORS IN INDIAN WILDLIFE MANAGEMENT

W A Rodgers and H S Panwar

Wildlife Institute of India, Dehra Dun, India

India's forest cover has declined by 50% this century to the existing 19% of land surface. The resulting fragmented forest patches include over 450 separate national parks and sanctuaries averaging only 300 sq km in size. Such isolated small protected areas cannot maintain viable populations of such low density species as tiger, bear, elephant, etc; especially with increasing pressure from growing human populations dependent on forest resources. The Wildlife Institute has just completed a review of protected area needs in India and stresses the role corridors must play for successful conservation of wildlife resources.

Corridors are planned at several distinct scales ranging from multinational corridors for elephant to maintaining riverine forest continuity for squirrels. Corridors are planned for distinct migratory and transhumance routes, for dispersal of carnivores and for maintaining gene flow between fragmented sub populations. The paper describes several case studies in India stressing practical management issues including compensatory development for adjacent human communities.

1045 Thursday 14 September

VALUES OF CORRIDORS TO AVIAN POPULATIONS IN A FRAGMENTED LANDSCAPE

D A Saunders and C P de Rebeira

CSIRO Division of Wildlife and Ecology
LMB No 4 PO, Midland WA 6056

The Kellerberrin District, in the central wheatbelt of Western Australia, had about 95% of its native vegetation removed between 1880 and 1960. The remaining vegetation is distributed in hundreds of patches of varying sizes, shapes, degrees of isolation and vegetation types, and along the verges of roads. Of the 131 species of land bird that once occurred in the district, 15 have disappeared since clearing began and 24 additional species have declined in range and/or abundance. The conservation of the remaining species that depend on native vegetation will mainly depend on their ability to move among vegetation remnants. The role of corridors of native vegetation in fostering the movement of birds has been investigated by banding studies at a series of road verges and conservation reserves around a 625km^2 study area. The results are used to divide the birds into movement categories, and to assess their present and future conservation status in the district. The need for more work on the landscape scale is stressed, as is the need to document movements of individual birds in fragmented landscapes.

1100 Thursday 14 September

USE OF RAINFOREST CORRIDORS BY FRUGIVOROUS PIGEONS IN NORTHERN NEW SOUTH WALES

E M Date & H F Recher

Department of Ecosystem Management
University of New England, Armidale NSW 2351

Historically, subtropical rainforests in New South Wales formed almost continuous corridors between high and low elevation rainforests otherwise isolated by sclerophyllous forests. Rainforests contain fruit-bearing plant species that are food for frugivores, such as Wompoo, Superb and Rose-crowned Fruit-Doves, Topknot and White-headed Pigeons (Ptilinopus magnificus, P.superbus, P.regina, Lopholaimus antarcticus, Columba leucomela). Pigeons move from the coastal lowlands in late winter to the highlands by late spring as fruits ripen at higher altitudes. Most pigeons then return to the lowlands in autumn and winter or migrate north.

Major spring food sources in the lowlands and summer sources in the highlands are figs (Moraceae), laurels (Lauraceae) and lillypillies (Myrtaceae) whereas autumn palm crops (Palmaceae) are abundant in the lowlands. Except for the exotic camphor laurel (Cinnamomum camphora, Lauraceae), little fruit is available during the winter. Few plants fruit in the highlands during the winter and winter-fruiting species have become scarce at lower elevations with clearing and fragmentation of rainforest. Most Rose-crowned and Superb Fruit-Doves migrate north to abundant tropical winter crops. Of the overwintering species in the subtropics, Topknot and White-headed Pigeons fly great distances to forage in isolated remnants or along corridors. Wompoo Fruit-Doves rarely fly long distances outside the rainforest canopy, apparently requiring the shelter of corridors to move between remnants.

Few corridors remain that connect highland summer crops to diminishing lowland winter crops. Most are on private land and state forest where logging of rainforest still occurs. Existing corridors vary in width and continuity from over 20km wide in parts of the midlands (eg Orara West State Forest) to less than 50m along coastal creeks (eg Woolgoolga Creek). Mature rainforest forms only a small portion of these corridors whereas rainforest regrowth and invading weeds form larger portions.

Passage for altitudinal migrants can be maintained along unlogged or regrown corridors left along gullies, streams and roads. Management of corridors will require wide community participation including land owners, local and state authorities and community associations. In the short-term, protection of weed species such as camphor laurel may be necessary to provide winter food for frugivores pending the re-establishment of alternative native food sources necessitating changes in community attitudes towards exotic species.

1120 Thursday 14 September

HABITAT USE BY BIRDS IN RELATION TO THE INTERFACE BETWEEN A FOREST ISLAND AND SURROUNDING SUBURBS IN BRISBANE

C P Catterall, R J Green and D N Jones

Division of Australian Environmental Studies
Griffith University, Nathan QLD 4111

Toohey Forest (500ha) is an area of eucalypt forest which has been almost isolated within suburban Brisbane for at least 20 years. There is an abrupt boundary between the forest and adjacent suburban development. The abundance of birds and their patterns of habitat use during winter were assessed using a replicated point count method, at 132 sites, spanning habitat categories across this boundary.

A Discriminant Analysis of 80 sites from four categories (forest interior, forest edge adjacent to suburbs, suburb edge adjacent to forest, and well-vegetated suburbs 0.25-0.5km from the forest edge) showed that these were significantly distinct on the basis of their bird species compositions, with a misclassification rate of only 10%. The bird species composition within the forest was typical of eucalypt forest, and was both more diverse than, and distinctly different from, that in adjacent well-vegetated suburbs. The forest edge immediately adjacent to the surrounding suburbs was also characterised by a diverse bird assemblage distinct both from that of the forest interior and from suburban sites. In contrast, the bird diversity and species composition of well-vegetated suburban sites did not differ greatly with distance (0.25-0.5km vs 2-3km) from the forest, whereas variation in the vegetation within suburban sites at a uniform distance from the forest resulted in significant discrimination of the bird assemblages present.

The following conclusions are drawn: 1. Most forest birds do not make frequent daily movements even a few hundred metres across the habitat boundary into suburbs (and vice versa); 2. the forest/suburb edge supports a distinctive suite of bird species; and 3. therefore, forest remnants not linked by corridors are at risk of a reduced flux of bird movements and usage, and narrow corridors may support mainly edge species. There is insufficient knowledge of the roles of daily movements as opposed to periodic dispersal in relation to these processes.

1140 Thursday 14 September

ROLE OF CORRIDORS FOR KOALA MOVEMENTS IN THE URBAN-RURAL FRINGE OF BALLARAT IN VICTORIA AND IMPLICATIONS FOR MANAGEMENT

P Prevett Petrid.

School of Biological and Chemical Sciences
Ballarat College of Advanced Education
PO Box 663, Ballarat VIC 3350

In urban Ballarat the problem of koala road deaths and harassment by dogs is of particular concern.

One management solution has made use of translocation and radio-tracking to assess the effects of movement.

Results have shown that where the forest is highly fragmented by farmland, translocated koalas are extremely mobile and make use of vegetation remnants and corridors available to them. Koalas have also successfully crossed wide areas of alienated land in the urban-rural fringe. Currently there is concern where the new Ballarat Bypass will intercept a major vegetation corridor used extensively by koalas, and where the road toll is already high.

Successful management of Ballarat's urban koala population seeks solutions to these problems.

1200 Thursday 14 September

THE USE OF ROAD VERGES AND FENCE LINES AS CORRIDORS BY KANGAROOS IN THE CENTRAL WHEATBELT OF WA

rhume.

G W Arnold and J Weeldenburg

CSIRO Division of Wildlife and Ecology
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A study is being made in a 1689km^2 area of whether individual kangaroos use one or several of the 551 remnants, and the extent to which the 610km of road and 150km of fence lines with a strip of native vegetation act as corridors. With the assistance of Earthwatch volunteers, the use of remnants and road verges by kangaroos was assessed from faecal densities in the 900km^2 with the highest density of larger remnants. Road verges adjacent to remnants that had moderate (10 animals per km^2) or high densities (15/km^2) of kangaroos were generally used only if they were >10m wide and had a shrub layer. Usage usually extended only to 500m from the remnants, indicating that some individuals made use of the road verges as habitat. Road verges of 5m were rarely used, but some animals moved alongside the fence in the paddock. In 3 locations the road verges acted as major linkages between small remnants. These road verges represent <5% of the road verges. Another 10% of road verges and fence lines are used occasionally as routes for movement. It is concluded that verges in the area are only of minor significance in providing linkages between remnants of native vegetation.

1330 Thursday 14 September

THE ROLE OF CONSERVATION CORRIDORS IN A CHANGING CLIMATE

A J M Hopkins[1] and R J Hobbs[2]

[1] Department of Conservation and Land Management
Western Australian Wildlife Research Centre
PO Box 51, Wanneroo WA 6065
[2] CSIRO Division of Wildlife and Ecology
LMB No 4 PO, Midland WA 6056

Predicted global changes in climate have major implications for nature conservation. Present distributions of plants and animals can be broadly correlated with climatic variables; changes in climate will thus force changes in distribution patterns. Such climate-driven changes in distributions have been documented for post-glacial periods. However the present situation differs from this in that climatic change may be much more rapid and also landscapes are now considerably fragmented by human activity.

One proposal for positive action in the face of climate change is the development of migratory corridors through now-fragmented landscapes. In this paper we examine the likely value of this measure and develop some principles for design and management.

1350 Thursday 14 September

CORRIDORS AND THE MANAGEMENT OF AN ENDANGERED PASSERINE

Alan Danks

Department of Conservation and Land Management
Two Peoples Bay Nature Reserve
RMB 8609 via Albany WA 6330

The noisy scrub Bird, Atrichornis clamosus, an endangered near-flightless passerine, has been the subject of research and management at Two Peoples Bay Nature Reserve since the 1960's.

The scrub bird population has steadily increased and over the last ten years has colonised several areas away from the Mt Gardner headland to which it was once confined. A small colony has been established at nearby Mt Manypeaks by translocation. More recently small numbers have dispersed to new areas outside the reserve boundaries.

The species has shown an ability to disperse given suitable corridors. Such corridors could play an important role in allowing further dispersal, recolonisation and genetic contact between developing sub-populations. The possibility of disease affecting one of the sub-populations has raised the question of the role of corridors in transmitting infection between otherwise isolated groups. Management of the scrub bird over the enlarged area now occupied by the species will need to take management of the corridors into consideration.

0945 Friday 15 September

THE CONSERVATION AND MANAGEMENT OF ROADSIDE VEGETATION IN SOUTH AUSTRALIA

Simon Lewis

SA Department of Environment and Planning
GPO Box 667, Adelaide SA 5001

South Australia has an estimated 128 000km of road reserves generally ranging in width from 20 to 60 metres. The State Government places great value on remnant roadside vegetation, especially as more than 80% of native vegetation has been cleared from farmland. In some regions roadside vegetation is virtually all that remains.

Management of SA's roadside vegetation is the responsibility of the 80-odd local district councils while the overall conservation emphasis is provided through the Roadside Vegetation Committee. The Committee has mapped the State's roadside vegetation, has examined specific management problems and has issued management guidelines to district councils.

This paper discusses the status of SA's roadsides, the Committee's programs and the key management issues which still require attention. The State's legislative framework applying to this vegetation is also described.

1005 Friday 15 September

ROADSIDE MANAGEMENT PLANS IN THE ROAD CONSTRUCTION AUTHORITY, VICTORIA

Graeme Stone

Road Construction Authority
60 Denmark Street, Kew VIC 3101

The Road Construction Authority, Victoria has commenced preparation of Roadside Management Plans on a trial basis in a number of the 10 RCA Regions in the State. The setting down of a suitable framework should allow roadsides to be fully assessed and management goals and tasks to be discussed with interested parties.

A format being trialled includes three basic documents:

(i) General Management Goals - an open statement of principles and objectives for a particular highway.

(ii) Local Management Tasks - primarily for field staff in tailoring regular roadside maintenance activities to suit agreed objectives for the particular road.

(iii) Specific Feature Listing - will record locations of significant plants and grasses and the locations of specified stockpiles, dump sites, etc.

Assessment of highway roadsides has included using a modified Grieves and Lloyd (1984) method.

1100 Friday 15 September

RE-ESTABLISHMENT OF INDIGENOUS VEGETATION IN SOUTH AFRICAN ROAD-RESERVES

B L Dawson and J P van der Breggen

PU-NTC Research Institute for Reclamation Ecology
PO Box 352, Brackenfell, 7650, Republic of South Africa

A deliberate effort is being made by the National Roads Department to re-establish indigenous vegetation in road-reserves.

Topsoil containing seed of local species is replaced in the road-reserve after construction. Indigenous grass species are preferred for inclusion in the basic hydroseeding mixture. In certain areas the hydroseeding operation is supplemented using seed of local shrub or heath vegetation which is harvested locally by hand, suction, or brushcutting methods. Predominantly indigenous trees and shrubs are planted.

Natural colonisation by indigenous species from outside the road-reserve is encouraged, where this does not conflict with traffic safety considerations. Invasive alien species are removed, and heavy encroachment by native woody species is controlled.

1120 Friday 15 September

ESTABLISHMENT OF A NATIVE GRASS ON ROADSIDES

E J Jefferson, M S Lodder, A J Willis and R H Groves

CSIRO Division of Plant Industry
GPO Box 1600, Canberra ACT 2601

Germination, establishment and survival of the native grass Danthonia richardsonii were compared with those of standard grass mixes used by two public authorities in eastern Australia, including the NSW Department of Main Roads, who fund this research. Seed mixes were sown in spring 1988 and autumn 1989. Initial results of monitoring of survival, cover and weed invasion will be presented.

A complementary research program on the regeneration biology of some colourful native herbs has begun. This new program is funded by the Landscape Section, National Capital Planning Authority. We intend to eventually include seed of these species in revegetation mixes for roadside plantings.

Some general principles concerning revegetation of roadsides using native species will be formulated.

1140 Friday 15 September

WEEDS IN CORRIDORS : INVASION AND MANAGEMENT

F D Panetta[1] and A J M Hopkins[2]

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PO Box 51, Wanneroo WA 6065

Corridors generally consist of narrow linear patches of one type of vegetation (usually native) which extend through large areas of a different type of vegetation (usually non-native). Because of their high edge:area ratios, corridors are highly vulnerable to invasion by weeds. Such invasion almost invariably results in a loss of nature conservation values.

In this paper we attempt to identify factors promoting the establishment of weeds and highlight the need for research into the impact of weeds on various community processes. The relevance of weed control thresholds is discused, and guidelines for maintaining nature conservation values of corridors are developed.

1200 Friday 15 September

CONDITION OF ROADSIDE VEGETATION IN RELATION TO NUTRIENT STATUS

P G Cale and R J Hobbs

CSIRO Division of Wildlife and Ecology
LMB No 4 PO, Midland WA 6056

Roadside vegetation is open to many forms of degradation. Two of the major problems encountered in SW Western Australia are invasion by non-native plant species and damage to trees and shrubs by insects. Soil nutrient status may play a key role in both these processes and hence in determining the condition and conservation value of roadside vegetation.

In this paper we examine the relationship between soil nutrient status and vegetation condition in two vegetation types along road verges in the Western Australian wheatbelt. We present data on the degree of invasion by non-native plant species and levels of insect damage on two common species (Eucalyptus erythronema and Santalum spicatum). We discuss these in relation to soil and foliar nutrient levels and examine the implications for management of roadside vegetation.

1330 Friday 15 September

THE TRAGEDY OF THE COMMONS IN PUBLIC CORRIDORS (TOO MANY USERS)

Maxine A Cooper

Road Traffic Authority
309 Castlereagh Street, Sydney NSW 2000

Public corridors are prime targets for the development of the Tragedy of the Commons. The Tragedy of the Commons was first presented in 1833 and is founded on the notion that lands which are readily available to everyone will be heavily used and this use will ultimately degradate them to the degree that they become unfit for any use. There are signs that the Tragedy of the Commons is already starting to occur along river, in road and rail corridors. This paper examines the causes of the Tragedy of the Commons which are people's attitudes. In doing this the public reserves along the Murray River, Travelling Stock Routes (TSRs) and rural roads are focused upon.

There is an urgent need for efforts to be taken to change people's attitudes and management strategies. This is starting to occur as will be illustrated in this paper, but present efforts need to be accelerated to avert the Tragedy of the Commons along river, in road and rail corridors.

1350 Friday 15 September

NATURE CONSERVATION - THE ROLE OF CORRIDORS "DATA IS NEVER ENOUGH - THE LOCAL APPROACH TO LAND CARE"

Keith Bradby

C/- Post Office, Hopetoun WA 6348

Within any human community there are a range of resources, viewpoints and pressures which affect the environment. This paper looks at the recent history of one community on the south coast of WA, and gives examples of the processes by which improved nature conservation is achieved. It is suggested that scientific data generally plays a secondary role, following in the vanguard of public opinion and emotion based responses.

Both the Fitzgerald River National Park and its recent northern extension were gazetted after public campaigns. These campaigns prompted the collection of the scientific data which oiled the political decision making process. This large National Park (326 000ha) is now a remnant and part of a corridor. It is surrounded by smaller remnants, some of which form corridors. All are ultimately dependent on public goodwill and political support for their survival. It is suggested in this paper that the scientific community has, in many ways, lagged behind the general community in the adoption of nature protection measures, and that innovative approaches are required. The example is given of the Fitzgerald Biosphere Project, a community led group combining regional concerns with a planetary perspective. Management of remnants and corridors is prompted locally, by locals, for locals. Farm plans utilise native plant species, agricultural shelter belts can become wildlife corridors, and the numbers of at least one rare species is being increased by agricultural practices.

A regional approach to land management, relying on goodwill and human warmth, is compared to the taxonomic or discipline centred approach of transient professional scientists.

POSTER PAPERS

WESTRAIL RESERVE CORRIDOR

Peter Bothwell, Landscape Manager

Westrail, 605 Wellington Street, Perth WA 6000

This poster paper outlines what the Westrail Reserve Corridor is, how traditional maintenance techniques have affected that reserve and how reserve management techniques have changed to include the wider environment of the corridor.

CANBERRA NATURE PARK - PLANNING TO MANAGE AN URBAN BUSHLAND CORRIDOR

Tony Brownlie, Bernadette O'Leary, Andrew Tatnell

ACT Parks and Conservation Service, PO Box 1119 Tuggeranong ACT 2901

Canberra Nature Park (CNP) comprises most of the bushland hill and ridge areas in and around urban Canberra - providing a viable wildlife corridor. CNP is managed for wildlife, education, recreation and scenic values. Because CNP is within the urban area of a large city it has special management needs, but great potential for interpretation of the national environment. The Service acknowledges that a high level of community understanding, involvement and support is required for effective management. To achieve this the Service is seeking community participation in preparing a draft management plan for CNP.

THE ROLE OF THE TREE CARE AWARD IN STIMULATING COMMUNITY INTEREST IN CORRIDOR RETENTION AND ESTABLISHMENT

Peter J M Johnston, Member, Judging Panel, Greening Austeralia - ABC Tree Care Award

Principal Conservation Officer
Queensland Department of Environment and Conservation
PO Box 155, Brisband North Quay QLD 4002

The Tree Care Award is a joint project of the ABC TV program "Countrywide" and Greening Australia. The Award's aim is to increase community understanding of the value of trees and associated vegetation, especially in rural areas, and to recognise achievement in tree conservation and establishment. The Award has been presented annually since 1983 and a different theme is chosen each year.

Each year, entries are invited from persons and organisations in Australia and New Zealand, and the number received has ranged between 70 and 350. A panel of judges assessed all entries, and a crew from "Countrywide" film selected entries for a TV program telecast nationally in Australia.

The theme of the 1989 Award was "Tree corridors and linear features". As with previous topics, this theme and the TV program generated considerable interest and discussion, and the 1989 Award undoubtedly increased public interest in the conservation and establishment of corridors of native vegetation.

THE 1989 GREENING AUSTRALIA - ABC TREE CARE AWARD - AN OVERVIEW OF AUSTRALASIAN CORRIDORS

Peter J M Johnston, Member, Judging Panel, Greening Australia - ABC Tree Care Award

Principal Conservation Officer
Queensland Department of Environment and Conservation
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In 1989 the Tree Care Award, which is a joint project of the ABV TV program "Countrywide" and Greening Australia, had the theme "Tree corridors and linear features".

This topic attracted entries from all States of Australia which included State and Federal Government institutions, the corporate sector and individuals and groups of individuals, both urban and rural.

The award has provided a unique opportunity to overview the range and extent of a sample of Australian tree corridors in the 1980s.

THE CONSERVATION STATUS OF ANT COMMUNITIES ALONG THE WUBIN-PERENJORI CORRIDOR

N Keals and J D Majer

School of Biology, Curtin University of Technology
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The ant fauna in three farm paddocks, sixteen road verges and three areas of native vegetation along the Wubin-Perenjori Road Conservation Corridor was assessed. Ninety four species were found during the survey, most of which were represented along the road verge. Verges without native vegetation supported few more species than did the farm paddocks. The richness of the ant fauna was still low on narrow (5m wide) verges, but on wide (20m) verges which supported native vegetation there were as many species per plot as in similar areas of native vegetation. The presence of native vegetation next to the verges appeared to have subtle influences on ant species evenness, resulting in values more characteristic of pristine vegetation.

These results have important implications for the conservation of invertebrates, the provision of food for insectivorous vertebrates, and for the assessment of road verge environmental quality.

THE OLD YOGANUP MINESITE - WETLAND CREATION PROJECT

B K Masters Exploration & Development Manager
J W Biggs Rehabilitation Officer

Westralian Sands Limited, Capel WA 6271

Westralian Sands Limited mines mineral sand (ilmenite, zircon, leucoxene and monazite) from palaeo-beaches laid down during periods of higher sea level than today. Most mineral sand deposits are narrow, shallow and linear, reflecting their beach derivation.

Post-mining rehabilitation has created corridors of physically and biologically different land within the original landscape. Examples include pastured, agricultural corridors surrounded by low open woodland of jarrah, marri and banksia, and wetlands scattered over the length of the minesite interspersed with pastured land, all within low open woodland of native vegetation.

The Old Yoganup minesite saw mining cease in 1974. In the late 1970's, rehabilitation commenced in earnest and a series of different activities has been undertaken in order to return the land to productivity. A flooded mining pit has had extensive tree and shrub planting on its upslope side; physical modification of the margins of the wetland has created a complex of islands with shallow and deep water areas and intricate shorelines. Nutrient additions have improved biological diversity by increasing microfauna productivity.

Today, this wetland area is mainly used as a summer and autumn waterbird refuge. The recent work to improve nesting conditions should see better bird usage as denser vegetation growth occurs.

THE ROLE OF CORRIDOR ATTRIBUTES IN THE DISTRIBUTION OF THE TAMMAR WALLABY

P K Roberts

50 Shenton Road, Mandurah WA 6210

Corridor attributes play an important role in the distribution of the Tammar Wallaby Macropus eugenii. Within the Perup Fauna Nature Reserve, Melaleuca viminea thickets provide habitat and act as corridors in the movement and use of these patches by the Tammar.

Corridor attributes found to significantly determine thicket occupation by the Tammar are the area and width of thickets, and the distance to the nearest thicket. Each corridor attribute is discussed in relation to a model formed with the dependent variable, Tammar Occupation.

Management strategies have been proposed which may improve the functioning of the habitat patches as corridors, and which may help to enhance the survival of this rare marsupial.

ROLE OF CORRIDORS IN FAUNA CONSERVATION IN PRODUCTION FORESTS IN TASMANIA

R J Taylor and P G Cale

Tasmanian Forestery Commission
30 Patrick Street, Hobart TAS 7000

Wildlife corridors are used in several Australian states to aid the conservation of fauna in areas subject to production forestry. However, few studies have been conducted to assess their value.

A study has commenced in Tasmania to assess the use of wildlife corridors as habitat reserves or refuges for fauna. The study will be carried out at sites in both wet and dry sclerophyll forest. Twelve months will be spent at each site carrying out surveys of all vertebrates and selected groups of invertebrates, both before logging and several years after logging. When the areas are logged streamside reserves 20m either side of the stream and two wildlife corridors each one hundred metres wide will be retained. The wildlife corridors will be based around streamside reserves but will include slope and ridge vegetation above streams. The proportion of the species surveyed that occur within reserved areas will be assessed and retention of these species after logging of surrounding forest will be examined. The value of streamside reserves and wildlife corridors will be compared.

A BIOLOGICAL CONSERVATION STRATEGY FOR PRODUCTION FORESTS IN TASMANIA

Kristen Williams, Fred Duncan and Robert Taylor

Tasmanian Forestry Commission
PO Box 207B, Hobart TAS 7001

One component of biological conservation in Tasmania is the reservation of representative areas of different forest types. Wildlife corridors form an important adjunct to these reserves. This poster describes the method used to select representative areas for the conservation of such vegetation. An example of the use of these areas in the establishment of wildlife corridors is illustrated.

GUIDE TO AUTHORS OF REVIEW PAPERS, CONTRIBUTED PAPERS, POSTER PAPERS AND WORKSHOP REPORTS FOR THE PROCEEDINGS OF THE CONFERENCE/WORKSHOP

REVIEWS, CONTRIBUTED PAPERS AND POSTER PAPERS

It was a condition of the acceptance of your offer to contribute to the conference/workshop that you were to provide Denis Saunders with a completed manuscript by the last day of the conference/workshop.

It is possible that, as a result of discussions during the conference/ workshop, authors may wish to amend their manuscript. In that case, 3 copies of the revised manuscript, suitable for refereeing and editing, are to be in the hands of Denis Saunders by Monday **16 October 1989**. Papers will then be sent to two independent referees for review and returned to the author thereafter. Papers not of sufficient merit to warrant publication in the Proceedings will be rejected.

For your guidance, reviews are to be a maximum of 15 published book pages, including references, figures and tables. See the book "Nature Conservation: the Role of Remnants of Native Vegetation" published by Surrey Beatty and Sons for a guide to format and length. Contributed papers are to be a maximum of 10 published book pages and poster papers a maximum of 4 published book pages.

WORKSHOP REPORTS

Each workshop facilitator should provide a short introduction, a summary of the discussion and a list of recommendations, if any. This should not exceed 2 published book pages. See the book "Nature Conservation: the Role of Remnants of Native Vegetation" for examples of format.

Please see that the workshop reports are with Denis Saunders by Monday **16 October 1989**. Workshop reports will be reviewed by 2 people who took part in the discussions to ensure their accuracy and returned to the author for revision if necessary.

PUBLICATION DATE

It is the intention of the Conference Organisers to publish the Proceedings of the conference/workshop as soon as possible after the meeting. Please be prompt with the submission of your manuscript, your revision in the light of referees'/editorial comments and with correcting page proofs and indexing. We would like to have the Proceedings published within one year of the meeting. Any unnecessary delays by contributors may make this impossible.

If you have any queries, please refer them to Denis Saunders, whose address and contact numbers are listed below.

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WORKSHOP SESSIONS
MONDAY SEPTEMBER 11 1989

INVENTORY AND ASSESSMENT

A. What information needs to be recorded for a database on corridors?

Facilitator: G Arnold

B. Constructing a database that is acceptable to all potential users.

Facilitator: R Ledger

C. Community involvement in corridor evaluation.

Facilitator: P Johnson

D. Survey Methods.

Facilitator: L Mattiske

E. The role of corridors in education for nature conservation.

Facilitator: K Wallace

TUESDAY SEPTEMBER 12 1989

VALUE OF CORRIDORS

A. How valuable are linear remnants as records of plant distribution?

Facilitator: S Hopper

B. Corridors as networks in a regional context.

Facilitator: T Norton

C. Role of corridors in a changing climate.

Facilitator: J Blyth

D. Landscape values of corridors.

Facilitator: M Cooper

E. What are the essential criteria for designation of wildlife corridors?

Facilitator: J Watson

THURSDAY SEPTEMBER 14 1989

MOVEMENT OF BIOTA

A. Does corridor width or composition affect movement?

Facilitator: G Friend

B. Are corridors necessary for the movement of biota?

Facilitator: G Merriam

C. What type of organisms will use corridors?

Facilitator: A Bennett

D. Gene flow along corridors.

Facilitator: D Coates

E. Negative values of corridors.

Facilitator: D Panetta

FRIDAY SEPTEMBER 15 1989

MANAGEMENT

A. Management of corridors on public and private land - who should be responsible?

Facilitator: R McKellar

B. Management of urban corridors.

Facilitator: B Low

C. Creation of synthetic corridors.

Facilitator: L Dalziel

D. Methods of rehabilitation.

Facilitator: B Dawson

E. How can edge effects be minimised?

Facilitator: T Start

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MID WEEK TOUR - WEDNESDAY 13TH SEPTEMBER

THE LEEUWIN-NATURALISTE RIDGE - A LINEAR FEATURE

AIM: a. To study National Park management.
b. To study roadside management.

BACKGROUND

The Leeuwin-Naturaliste Ridge is a distinctive feature with prominent rounded hills ranging between 160m and 220m in height. It is 95km long from Cape Leeuwin to Cape Naturaliste and between 7 and 14km wide.

The western coastline has long sandy bays with steep sand dunes between rocky headlands. In places there are limestone cliffs. This coast bears the brunt of the westerly storms and heavy ocean swells generated in the Roaring Forties to the south-west.

The Ridge has extensive stands of native vegetation and even with much of the area cleared for agriculture there remain many stands of trees. Combined with the undulating topography this creates attractive scenery.

Seaward facing slopes are covered by heath and scrub communities with the scrub increasing in height and tending towards open forest in the more sheltered areas. Inland open forest of jarrah E. marginata and marri E. calophylla occurs with pockets of karri E. diversicolor. In the south these become quite extensive and the State Forest in the region of Boranup has been extensively logged and regenerated.

The Ridge is delineated on its eastern side by the Dunsborough Fault. It consists of Proterozoic "granite" overlain by Quaternary limestones. Caves have formed in these limestones, and springs occur at the unconformity between granite and limestone.

THE LEEUWIN-NATURALISTE NATIONAL PARK

The genesis of this park lay in the creation of reserves for "Health and Pleasure Resorts" around the major caves in the early 1900s. Many other reserves have been added over the years and consolidation still continues with the purchase of suitable freehold land when it becomes available. (See Table 1 and Map 2). The Park is managed by the Department of Conservation and Land Management.

The fragmented linear nature of the Park, and its heavy visitor usage (est. 350,000 per year) lead to a number of management problems. This year, a Management Plan has been produced by CALM.

The tour will look at various natural features of the Park and consider management strategies.

TRANSPORTATION CORRIDORS

A major planning conflict in the area involves high-speed travel on narrow roads. There are two types of road users :

- the person who wishes to get from A to B as fast as possible (commercial traffic and some local residents)
- the pleasure driver (tourist traffic and some local residents).

Conflicts between these objectives often leads to divisions within the community and a compromise which satisfies no-one.

The tour will look at examples of different types of roads to illustrate the problem of vegetation conservation vs road use.

A. Major roads. These should be: wide, relatively straight, with an even grade and unimpeded vision. e.g. Bussell Highway.

B. Minor roads. These may be narrow, winding with changes of grade and the vegetation is close to the roadway or may even form a tunnel effect. e.g. Wildwood Road
Yelverton North Road
Metricup-Yelverton Road
Forest Grove Road.

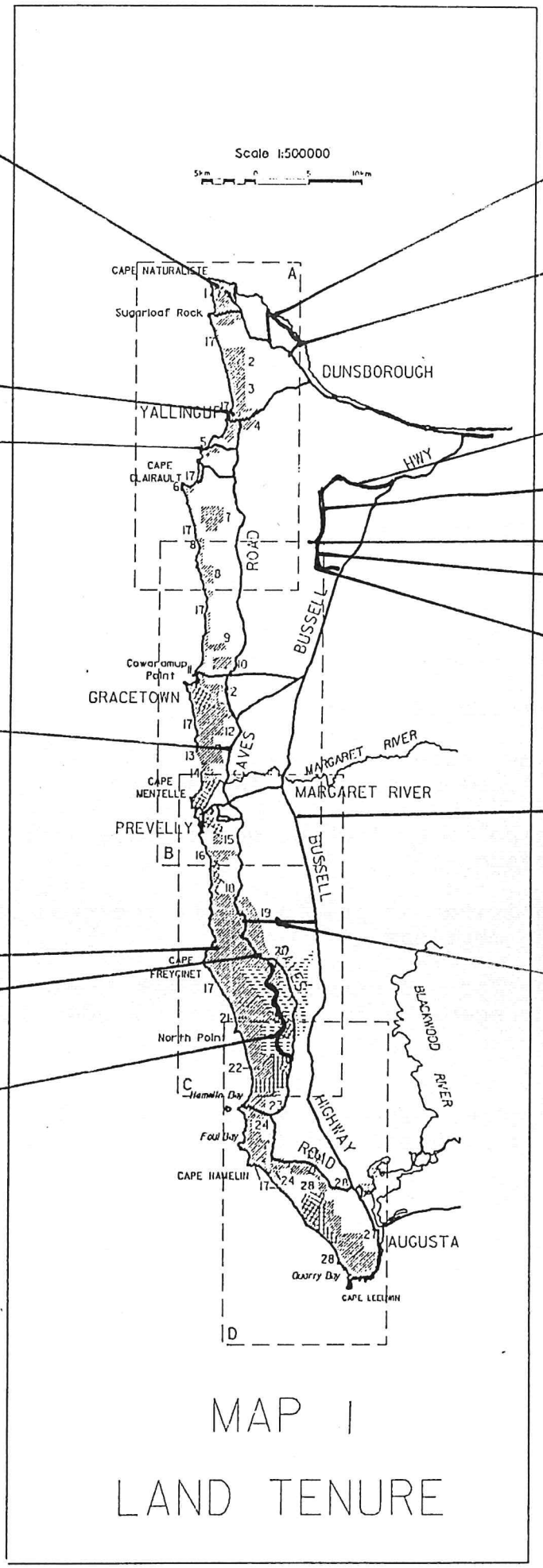
C. Tourist Drives. Very narrow, winding, hilly, treed, slow speed necessary. e.g. Boranup Drive.

D. "Compromise" Roads. e.g. Caves Road
Cape Naturaliste Road
Meelup Beach Road.

MANAGING AUTHORITIES

Roads in the area are managed by

- Main Roads Department
- Local Government Authorities (Augusta-Margaret River Shire Council, Busselton Shire Council)
- Dept. of Conservation and Land Management.



MAP 1

LAND TENURE

shaded area = NP or proposed NP

THE TOUR

1. WILDWOOD ROAD

This is a narrow winding road on a one chain (20m) road reserve. It has good stands of trees (mostly marri) giving a tunnel effect and in some places the understorey survives as well.

Management considerations:

- trees are too close to the road for fast driving.
- overhanging trees impede the passage of large commercial vehicles.
- it provides access to several tourist attractions, and is much used for scenic driving.

2. YELVERTON NORTH ROAD

For the majority of this road, the road reserve is 2 chains (40m) wide. This is because the land has been released subsequent to the government decision to provide wide road reserves for conservation.

Management considerations:

- note the excellent survival of the whole suite of native flora on the wide roadside.

  Note also the lack of weeds where there has been no disturbance.

- fast driving is possible with the good visibility on straight sections.

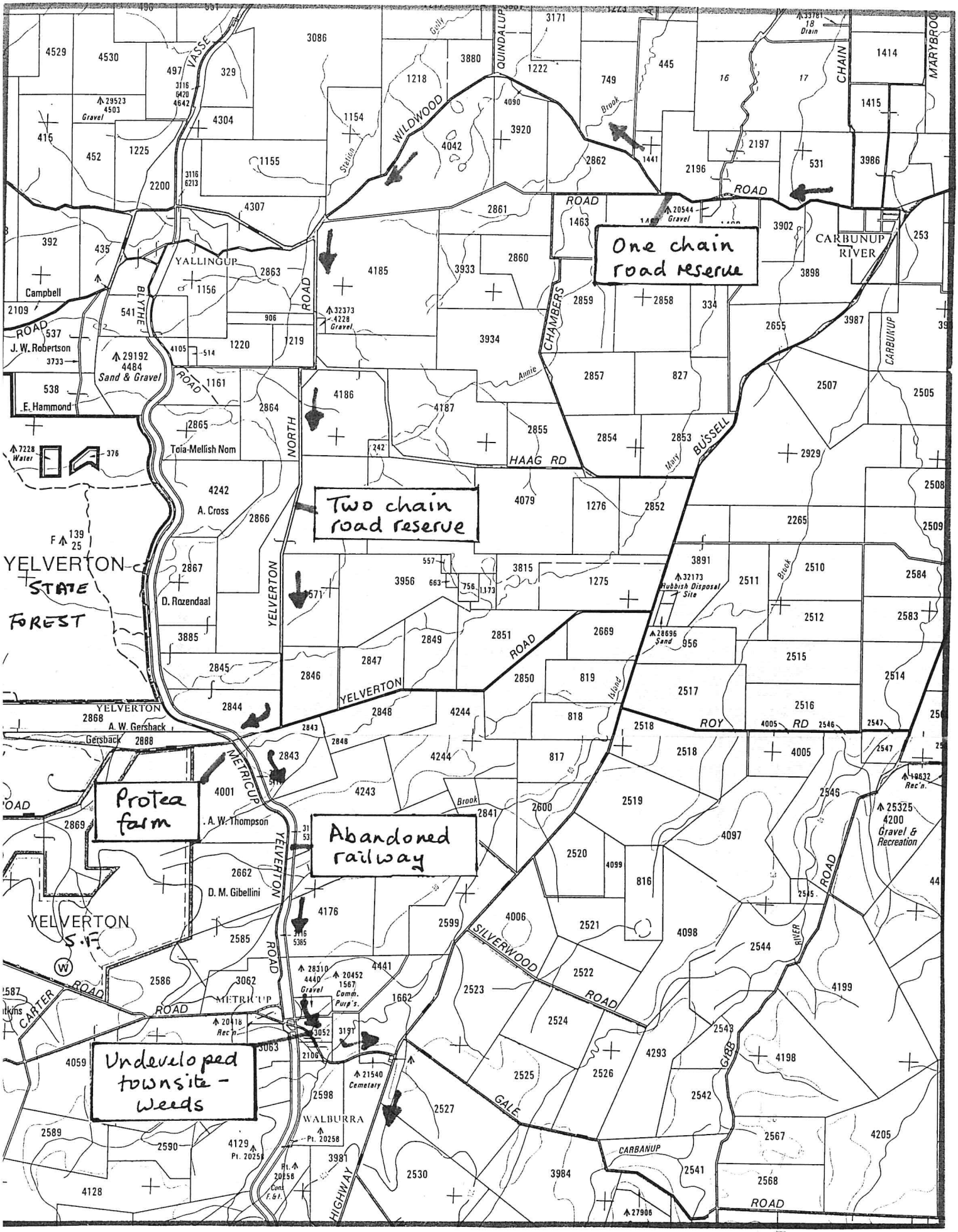
- despite its conservation value, this road does not have the scenic driving value of Wildwood Road.

3. PROTEA FARM

Note the protea farm at the turning to Metricup-Yelverton Road. There are several such farms in the region.

Management consideration:

- Proteas are exceptionally sensitive to Phytophthora Dieback. Road managers should ensure that their activities do not bring the fungus into an area. Legal claims for compensation a future possibility?


One chain road reserve
Two chain road reserve
Protea farm
Abandoned railway
Undeveloped townsite - weeds
YELVERTON STATE FOREST
YELVERTON S.F.
YALLINGUP
METRICUP
WALBURRA
CARBUNUP RIVER
VASSE
WILDWOOD
QUINDALUP
CHAIN
MARYBROOK
ROAD
CHAMBERS
BUSSELL
HAAG RD
NORTH
YELVERTON
METRICUP
ROY
SILVERWOOD
GALE
CARBANUP
HIGHWAY
CARTER
GIBB
RIVER
CARBUNUP
BLYTHE
Campbell
J. W. Robertson
E. Hammond
A. Cross
Toia-Mellish Nom
D. Rozendaal
A. W. Gershack
A. W. Thompson
D. M. Gibellini
Gravel & Recreation
Rubbish Disposal Site
Sand & Gravel
Cemetary
Comm. Purp's.

4. ABANDONED RAILWAY - AN OPPORTUNITY LOST

The Busselton-Augusta railway was closed in the mid 1950s. It could have become an excellent long-distance trail (hiking, cycling, horse-riding) with campsites at the sidings, as well as being a fine native vegetation corridor.

Unfortunately, despite urging by the National Trust and others, much of the land has been leased to or "commandeered" by adjoining landholders. It is fenced and often totally cleared, and no longer offers the same possibilities for a trail.

Management consideration:

. Where abandoned rights of way (e.g. railways, stockroutes) occur elsewhere, trail propositions should be seriously considered.

5. METRICUP SCHOOL SITE

This area shows clearly how weeds will take over once native vegetation is disturbed. Apart from Marri trees and bracken, all the vegetation in this area is introduced.

6. BUSSELL HIGHWAY

This is intended as a high-speed transportation route, and designed accordingly. The seal is nominally 7.4m, while north of Margaret River the shoulders are 1.2m wide on each side and south they are 2.4m. Grades and curves are designed for maximum speeds - 110kph.

7. FOREST GROVE ROAD

This 20m road reserve was densely treed on either side of the carriageway. Following a complaint related to safety (the road is straight, but the trees are close) the Local Government Authority began to totally clear the roadside. This provoked a storm of protest, so the clearing ceased some 2km westwards.

Management considerations:

. Should all roads be capable of taking vehicles at the maximum permitted speed?
. Is "consistency of hazard" a possible option for some roads?
. Where the community is polarised on an issue, who should make the decision?

8. BORANUP DRIVE AND KARRI FOREST

This road is not on a public road reserve, and is managed by CALM. In origin it is an upgraded fire protection track, designed to show tourists the karri forest.

Management consideration:

Should upgrading take place? (n.b. this would inevitably increase both the number and the speed of vehicles using the drive.) Would this negate its purpose?

The karri forest here has been logged and is regrowth forest of varying ages. The shrub layer includes Karri Wattle Acacia pendadenia, Karri Hazel, Chorilaena quercifolia and Tree Hovea, Hovea elliptica while the ground layer may contain small delicate ferns and orchids such as the Potato Orchid Gastrodia sesamoides. Fire is used as a management tool to reduce the density of the undergrowth, and so minimise the impact of high intensity fires which kill mature karri trees When this is done frequently the under storey may become dominated by bracken Pteridium esculentum.

9. GIANT'S CAVE

Caves are the reason the area was first promoted as a recreational destination.

This is one of about a dozen caves open for sightseeing tours in the early years of this century (only 4 now remain as "tourist caves".)

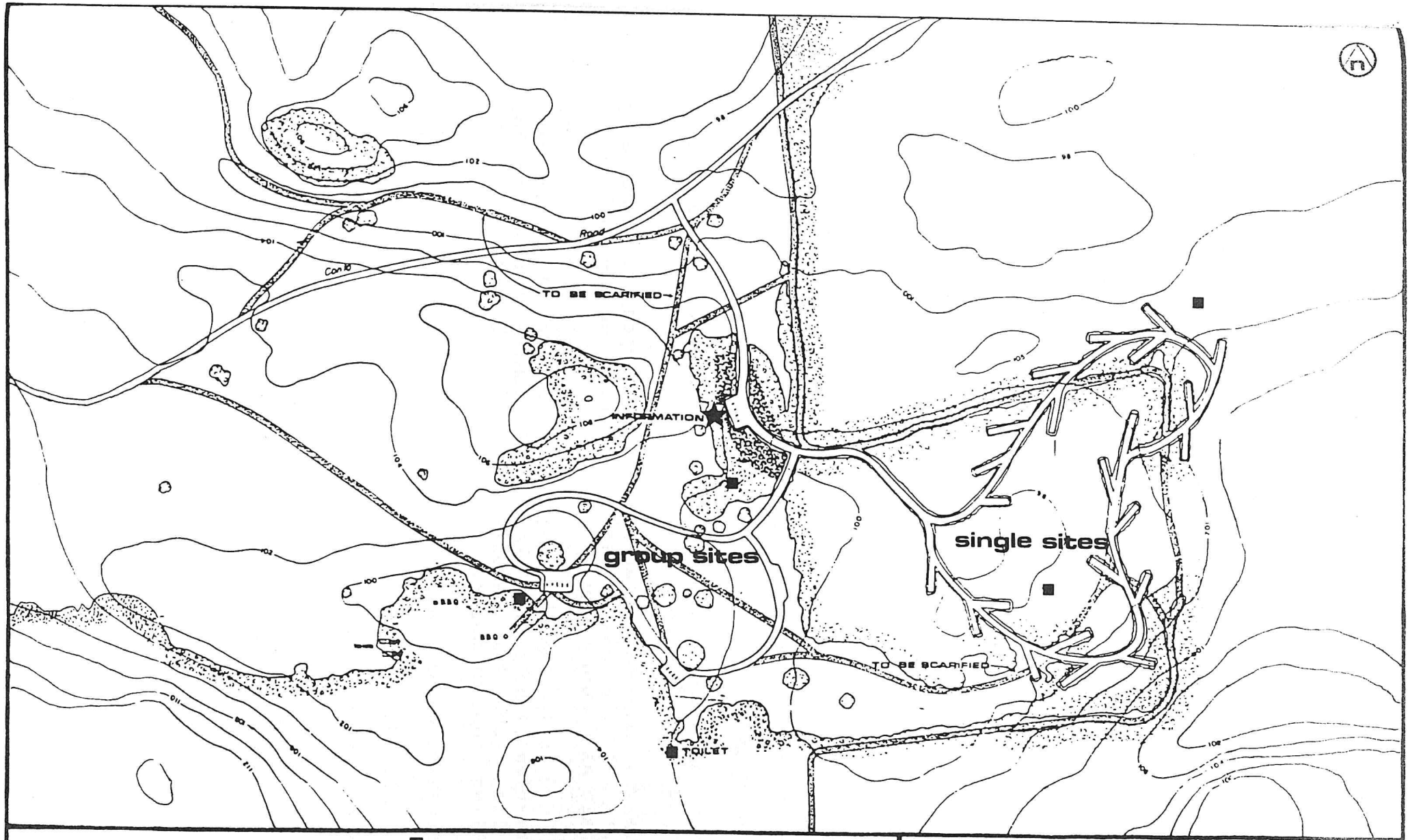
On the trip through the cave, beside the usual cave formations, note the karri roots coming through from the ceiling and the astonishing "drill holes" caused by falling drops of water.

Management considerations:

. All the cave problems you can think up!

10. CONTO'S FIELD. LUNCH STOP

The track into this area has recently been upgraded and a camping site laid out among the peppermint woodland (See map 4). The land was once pasture, and its open nature minimises fire risk.



Map 4

CONTO'S FIELD

Site Development Concept Plan

information
toilet
special interest
scale 0 50 100

Management considerations:

. What happens when such sites become overcrowded? (previously camping was at Conto's Spring on the coast, which was heavily overused.)

11. CAVES ROAD

This road was developed as a tourist road in 1901 and designed to be a scenic route between the various caves. It carries increasing amounts of traffic, much of which desires to travel at high speed.

For example, spur roads lead to the coast and surfies wish to drive very quickly from one site to another in order to inspect the beach conditions. Tourists also go from one site to another, but in a far more leisurely fashion.

In consequence, Caves Road has become a "compromise road" neither fast nor straight enough for safe high speeds, nor meandering and tunnel-like enough for true scenic attractiveness. Any work being done on it immediately becomes a cause célèbre and divides the road-using public.

Management consideration:

. Who should make the final decision?

12. CANAL ROCKS

This is an attractive and much-used bit of rocky coast. Pressure exists to create a larger boat ramp.

Management considerations:

. How can people be prevented from downgrading what they have come to see?

13. YALLINGUP AND SMITH'S BEACH

On the western shoreline, the settlements of Prevelly, Gracetown and Yallingup are surrounded by National Park. This leads to a number of management problems, especially where the residential area is separated from the shore by a narrow strip of foreshore reserve. Currently the size of the settlements is limited by a lack of fresh water. At Smith's Beach, a large development is planned for a freehold block.

North of Yallingup a stretch of steep coastline without direct access runs 10km to Sugarloaf Rock. Half way between them is Cabegup, a favourite surfing spot. Surfies used an unauthorised track from Yallingup to reach the site but it was leading to severe erosion. Construction of a spur road over the ridge also could lead to problems.

Management considerations:

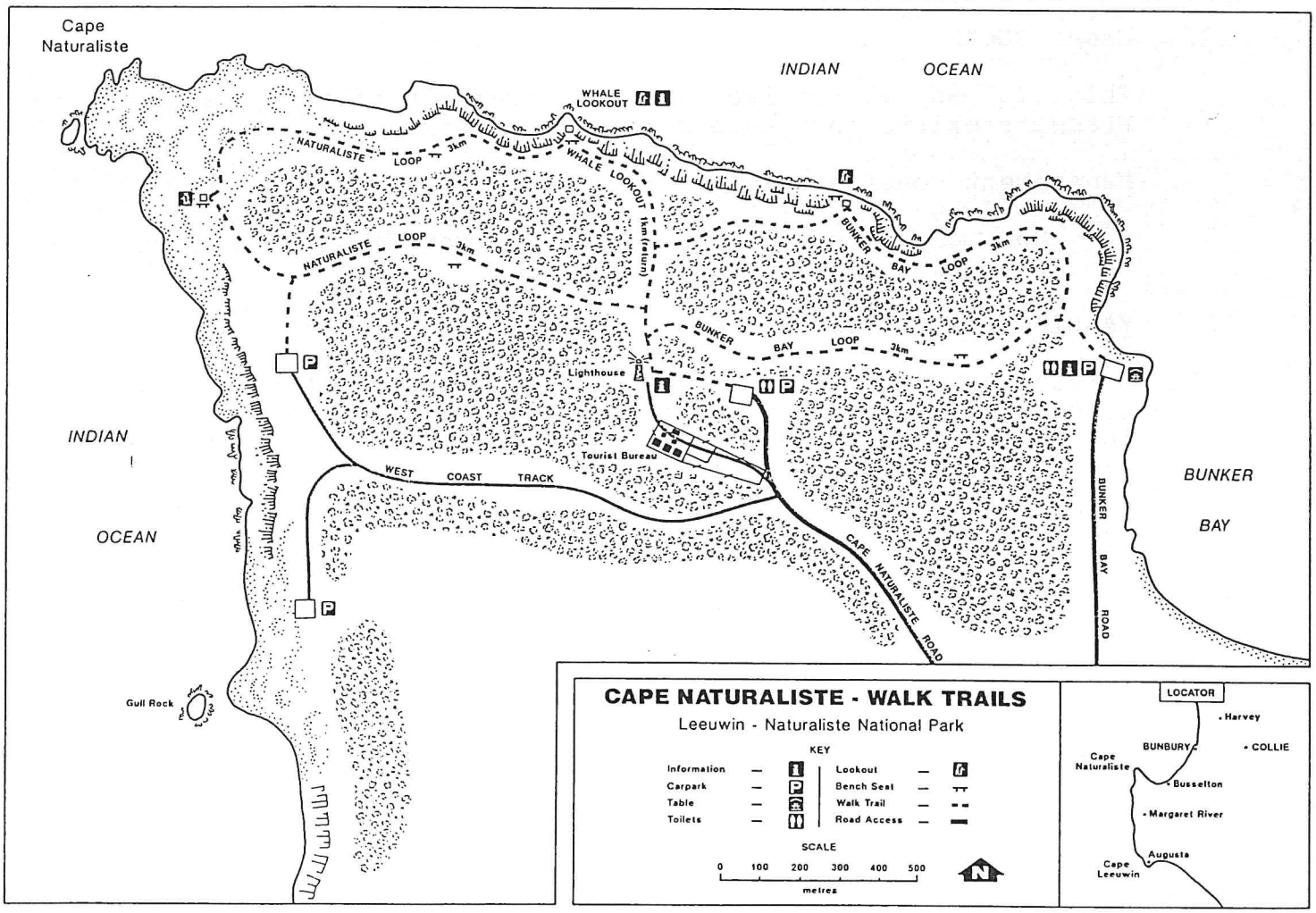
. Fire protection for settlements surrounded by bush.
. Limitations of foreshore access.
. Provision of water supply.
. Parallel -to-coast roads.
. etc!

14. CAPE NATURALISTE

Walk to the whale lookout to get a good idea of coastal heath. Jarrah, Marri and Peppermint do occur here, but as wind-pruned shrubs. Other components of the heath are Parrot Bush, Dryandra sessilis, Cockies Tongues, Templetonia retusa, Southern Diplolaena, Diplolaena dampieri and Jacksonia horrida.

Management considerations:

. Design of walking trails.



15. EAGLE BAY - MEELUP

Note the narrow, winding, close-to-coast track. Calothamnus graniticus ssp graniticus which grows in profusion around the rocks here, has a restricted distribution. Melaleuca lanceolata forms stands of open forest close to the beach that have suffered damage due to car parking beneath them. The northern shore of Cape Naturaliste is one of the very few areas in SW-WA where tall vegetation grows right down to the beach. Note the development at Meelup and the much wider new road.

- Is the design of the road for higher speed justified?

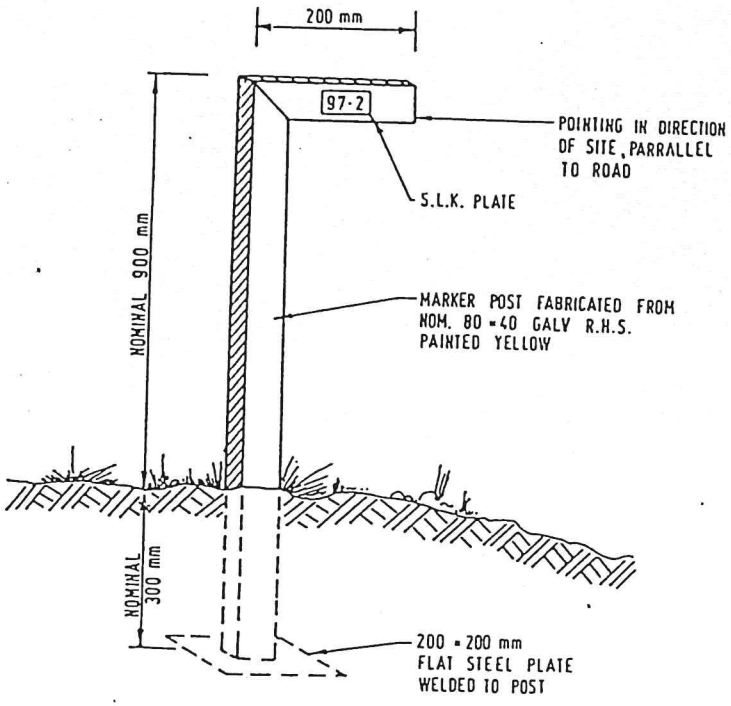
16. SPECIAL ENVIRONMENTAL AREA

Note the markers for Eucalyptus phylacis whose only known population is in this region. It is necessary to alert road workers to the necessity for care in the area, but these posts are an individual design, not the standard "inverted yellow L" used elsewhere.

Management considerations:

- Road construction personnel change frequently, and so a form of marker system permits recognition of a site for special care. However, the markers can also alert ill-disposed persons to the presence of something important.

- Should they be used, or not?
- What design?



1. Marker post can be fabricated from material salvaged from damaged sign supports. All posts should be painted yellow.

2. Data plate can be fabricated from aluminium plate with punched SLK numerals. The plate should be riveted to the carriageway side of the marker only.