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GEOGRAPHY

SETTLEMENT OF VICTORIA

Exploration and the pastoral period, 1800–1851

Early explorations of Victoria were made by Lieutenant Murray in 1802 when he discovered the harbour of Port Phillip Bay, and by Hume and Hovell in 1824–25 when they crossed the centre of the Port Phillip District of New South Wales (as Victoria was then known). Two small settlements had also been established on the coast at Sorrento in 1803 and at Corinella in 1825, but it was not until 1834 that the Hentys from Van Diemen's Land founded the first permanent agricultural settlement in the District at Portland.

One factor which deterred settlement of the District was the New South Wales Government's refusal to allow permanent occupation south of the Nineteen Counties of New South Wales in accordance with its policy of concentrated settlement. However, the shortage of pasture land in Van Diemen's Land, and the effect of a new Impounding Act encouraged unauthorised occupation in the District. Various persons initiated settlements in 1835 including Batman (on behalf of the Port Phillip Association) at Port Phillip and McKillop in Gippsland.

By 1836, only a small number of squatters from both New South Wales and Van Diemen's Land had followed the early settlers and occupied parts of the District, but the rush of squatters which occurred after Major Thomas Mitchell's enthusiastic reports of his exploration of the rich western district in that year prompted a keener interest in the settlement of the District.

Authorised settlement under the Imperial Land Acts and Regulations of the time commenced when Governor Bourke authorised the location of settlers on 9 September 1836. The first sale of Crown land was held on 1 June 1837 when allotments surveyed by Robert Hoddle, Surveyor-in-Charge, were auctioned in Melbourne and Williamstown.

In those years sale by auction under the Imperial Acts was the usual method of disposal of Crown land. Special Orders in Council were also part of the system, nine blocks of 2,072 hectares each and one of 12,700 hectares being sold without public competition. These lands were commonly termed Special Surveys and well known examples of this type of alienation of Crown land are Elgar's Special Survey at Box Hill and Dendy's Special Survey at Brighton. The Orders in Council also provided for the pastoral occupation of Crown lands and in 1847 authority was given to enable lessees of pastoral runs to purchase areas up to 259 hectares of each run; these usually embraced the homestead and the best land adjoining, and were known as Pre-emptive Rights.

In 1840, the population of Victoria was 10,291 and there were 782,000 sheep. By 1851, the start of the gold rushes, there were 97,489 persons and over 6 million sheep and 390,000 head of cattle.

During the period from the first settlement to 1851 pastoralists were dominant. At first they occupied a large proportion of the Port Phillip District without written authority and later were successful in having the Imperial schemes modified for expansion of settlement. This period saw some efforts to promote closer settlement as an alternative to restricting the pastoralists, but these efforts were hampered by lack of markets for agricultural

products, poor information about resources, and the lack of a serviceable transportation network.

Gold rush period and agricultural establishment, 1851–1890

Two important events occurred in 1851: first, the discovery of gold and second, the separation of the Port Phillip District from New South Wales and its creation as the Colony of Victoria.

The gold rush, which caused an increase in the population of Victoria from about 97,489 in 1851 to 539,764 in 1861, also brought about a social, political, and economic revolution. The great influx of gold seekers created a huge demand for all types of primary products. In addition, the influx coincided with technical advances in agriculture and improvements in transport. This increased population, many of whom were turning from gold seeking to more stable occupations, was the main factor responsible for the next phase of land settlement. The opening of the lands was seen as the prerequisite for a programme of encouraging closer settlement and immigration.

Although Victoria was granted self government on Separation in 1851, Great Britain retained control of the Crown lands until Royal Assent was given to the Constitution Act in 1855. By that Act, the laws then in force for New South Wales were to continue in operation in Victoria until altered by the Victorian legislature and it was not until 1860 that the first Land Act was enacted in Victoria. This was known as the Nicholson Act and "selection" as commonly understood dates from this period. The system of alienation by auction sale and pre-emptions by pastoral tenants of their homestead areas had by this time disposed of nearly 1.8 million hectares — about 8 per cent of the Colony's area.

When about 323,750 hectares had been sold (about half to selectors) under the 1860 Act, a further important Act was passed in 1862. This marked the adoption of distinctive principles of land legislation now emerging in Victoria, namely, selection after survey, and conditions which showed that settlement, and not merely alienation, was the aim. About 567,000 hectares was disposed of under the 1862 Act. However, the use of "dummy" selectors who were paid by the squatters, and other ruses defeated the intention of both pieces of legislation to provide land for genuine new settlers.

Further legislation in 1865 abolished the system whereby affluent selectors could obtain the freehold of allotments by immediate payment of the purchase money and substituted a full leasing system under which allotments from 16.2 hectares to 259 hectares could be selected but not freeholded until three years had elapsed and improvements to a value of two dollars per 0.4 of one hectare were effected. Under this Act about 1.2 million hectares were selected but only about 600,000 hectares matured into freehold titles. This Act also met the demands for occupation of land adjacent to goldfields by authorising the issue of licences for residence or cultivation for areas up to 8 hectares. Licensees were later given the right to freehold these sites.

In 1869, a new and very comprehensive Land Act was passed. It was perhaps the most successful in Australia in this period as by 1878 nearly 4.5 million hectares, mostly in Gippsland and the plains of the north-west, were selected under its provisions. "Dummying" was almost eliminated and none of the large estates increased. Some important features of the 1869 Act were selection on the basis of merit, a limit of 130 hectares only to be held by one person by selection, and a limit of 81,000 hectares which could be sold by auction each year.

Later Acts introduced modifications and provisions in respect of specific types of land such as Mallee land. The total area of land alienated by 1884 was approximately 10 million hectares of which 7.5 million hectares had been disposed of by selection. A consolidated Land Act was passed in 1890.

As authorised settlement proceeded, towns and villages were surveyed and proclaimed, commons were proclaimed, and many areas of land were reserved for various public purposes. A notable reservation occurred in 1881 when virtually all the significant rivers, streams, and lakes in Victoria and the frontages thereto were reserved for public purposes.

Agricultural development and intensification since 1890

This period saw gradual sub-division and development of land for better utilisation. Victoria had established its distinctive land laws in a period of prosperity and had pushed

a network of railways into the agricultural districts. These factors were instrumental in encouraging higher production and consequently were responsible for steady sub-division and development.

By the early 1890s, however, the land situation in Victoria as in all the Australian Colonies, had become unsatisfactory. The area under cultivation had not kept pace with the alienated area of land, and rural population was not increasing. There was a general land hunger and intending settlers had difficulty in obtaining suitable land.

Many large holdings of alienated land were undeveloped, and the Victorian Government eventually decided to pass legislation for a closer settlement scheme enabling the State to purchase such land and to sub-divide it. Early in this century, the re-purchase was effected by voluntary means, but after the First World War compulsory acquisition was also provided. Later a similar scheme was introduced for ex-servicemen of the Second World War.

Irrigation schemes, the first of which commenced before 1900 enabled the more intensive development of various areas which would otherwise have remained in large and comparatively under-developed holdings.

Settlement since the 1830s has resulted in some 60 per cent of the land of Victoria having been alienated from the Crown, and some 12 per cent having been reserved for national parks, forests, and other public purposes. In line with modern practice, virtually all the remaining Crown land in the State is being or will be reserved for the conservation of natural resources.

PROTECTION OF THE ENVIRONMENT

Ministry for Conservation

Introduction

The broad aims of the Ministry are to protect and preserve the environment, and to promote the proper management and utilisation of natural resources. Various government departments and branches which had been dealing with environmental and conservation matters for many years were brought together to form the Ministry for Conservation in January 1973. The Ministry originally linked six agencies: Environment Protection Authority, Fisheries and Wildlife Division, Land Conservation Council, National Parks Service, Port Phillip Authority, and the Soil Conservation Authority. In 1975, the Victoria Archaeological Survey was added to the Ministry.

Within the Ministry, the Environmental Studies Section co-ordinates a wide range of multi-disciplinary studies which are providing guidelines for resource managers. The Environment Assessment Division advises government and private developers on the likely environmental effects of proposed works. The Conservation Planning Group assists municipal councils, regional planning authorities, and government departments to ensure that necessary environmental considerations are taken into account in the planning of projects, while the Information and Extension Branch is involved with environmental education in the community. Each of these groups is dealt with in more detail below.

Environmental studies

To achieve proper management of natural resources, accurate information is needed; much of this is collected by the Ministry's Environmental Studies Section. The Section does not have a large staff of scientists, the research work being mostly contracted to other organisations including universities. To date, the Section has concentrated on regional studies centred on Port Phillip Bay, Western Port, and the Gippsland Lakes. Having collected relevant information, the Section then formulates guidelines for the planning, development, and management of the natural resources of each region. Results from the studies are made available to the public, and staff often make submissions on environmental matters to planning bodies.

The Port Phillip Regional Study has been chiefly concerned with areas under actual or potential stress from pressures such as urban development, industry, port use, and recreation. The main ongoing projects include an assessment of land-use and water resource relationships in such areas as Corio Bay, Hobsons Bay, and Werribee; management guidelines for use of groundwater resources; and demands upon roads and conservation areas due to recreational travel.

Following completion of Phase One of the Western Port Regional Study, the Victorian Government set up the Western Port Catchment Co-ordinating Group, to ensure that its findings were implemented in the future development and management of the catchment area. Shire councils, farmers, industry, conservation groups, and government bodies are represented.

For the Gippsland Regional Environmental Study, research has been initiated into land conservation, water quality (including aquatic ecosystems), flora, and fauna.

In addition to the regional work, other wide-ranging investigations are being undertaken. These include the heavy metals project, the demands on roads and conservation areas due to recreational travel, guidelines for the control of oil spills, and environmental implications of energy utilisation.

Gippsland Regional Environmental Study

The Gippsland Lakes and their associated catchment contain an important segment of Victoria's natural resources. Perhaps the most significant are the large deposits of brown coal, fresh water, large natural areas rich in plants and animals, and extensive forests. In addition, the Lakes system is a valuable recreation area. Some uses of these resources are complementary, while others are in conflict, so that an overall understanding of the environmental implications of resource use is essential before decisions are made about the area.

The Gippsland Lakes, an interconnected system of shallow coastal lakes covering an area of approximately 400 square kilometres, are located about 230 kilometres east of Melbourne. The catchment extends from the Great Dividing Range to the coast and has an area of approximately 20,550 square kilometres. Three substantial rivers, each having a lesser annual flow than the Yarra River, discharge into the Lakes system. These are the La Trobe, Thomson, and Mitchell Rivers.

Several extensive development projects which are likely to have widespread environmental implications have been proposed for the region. These include the Thomson River Dam, the Loy Yang electricity generating station, and a large number of real estate developments.

The Gippsland Regional Environmental Study commenced in 1976 with a preliminary exercise termed the "Desk Study". This brought together 70 persons from a wide range of institutions, both government and private. A series of six working groups assembled a compendium of existing information about the catchment, allowing the data gaps to be identified, and a series of recommendations for the course of the Gippsland Regional Environmental Study to be made. The Study is being conducted under four general headings, or "projects".

The first of these, the Aquatic Ecosystems Project, is the largest and has encompassed a variety of research tasks such as the gauging and chemical analysis of all rivers flowing into the lakes, the chemistry of the lakes themselves, the invertebrate and fish populations of the Thomson River, the aquatic plants in the lakes, the groundwater resources of the catchment, the sediments and bathymetry of the lakes, recreational fishing characteristics, sources of nutrient salt additions, and the dieback of peripheral reed beds. A wide survey of the fish population of the lakes, accompanied by studies of the plankton and bottom-living animals on which the fish feed, is in progress. Results to date indicate that the lakes and rivers are in a fairly healthy condition with the exception of Lake Wellington, which is denuded of bottom vegetation and subject to salt stress.

The second project, Criteria for Flora and Fauna Conservation, has included an inventory of wildlife in the catchment, a survey of land vegetation, the pathology of the wildlife, heavy metal occurrence, and two studies on sites of zoological and botanical significance.

The Land Use Guidelines Project has included aerial photography, compilation of land ratings, a summary of climate, a description of the geomorphology, studies of sand movement along the Ninety Mile Beach and erosion of the La Trobe River banks, a description of the land systems in the catchment, and a survey of sites of geomorphological significance.

The project devoted to Tourism and Recreation has been limited to four ventures — a study of public attitudes, a reconnaissance for an ABC television series on the natural

history of the catchment, a review of existing information, and a survey of the use by Melbourne residents of Gippsland facilities. Further studies will probably be devoted to identifying recreational resources and assessing their environmental capacity.

Results from all four projects are supplied to planners, government departments and committees, and private individuals. A summary report outlining the characteristics of the catchment and identifying critical environmental issues will be produced in 1981.

Marine studies

The Marine Studies Group is concerned with the physical, chemical, and biological aspects of the marine environment. With laboratory facilities and sea-water aquaria, the staff is able to undertake research tasks for other sections of the Ministry — in particular for the Environmental Studies Section, the Environment Protection Authority, and the Fisheries and Wildlife Division.

The Group has been closely involved in the Port Phillip, Western Port, and Gippsland Lakes Regional Environmental Studies, providing information for management plans relating to the conservation of the aquatic environment in these areas.

A new marine science complex is being developed at Queenscliff to house the Marine Studies Group, and staff transferred to Queenscliff early in 1980.

Environment assessment

When any projects are planned which could have a significant or controversial environmental effect, such as the building of a dam, bridge, or freeway, the Ministry's Environment Assessment Division may become involved. The Ministry's role is to ensure that decision makers are aware of the likely environmental and social consequences of a project. Any government body proposing work may be required to prepare an Environment Effects Statement, which is reviewed by the Ministry. (This procedure applies to private works only when so required by a decision making body such as a planning authority.) The Ministry may also invite comments on the proposals from the general public. By working in co-operation with the project proposer, the Ministry is able to ensure that all reasonable alternatives are considered before a final decision is made.

Details of the procedure are set out in the Ministry's publication *Guidelines for Environment Assessment and Environment Effects Act 1978.*

Conservation planning

The Conservation Planning Section works in co-operation with municipal councils, government bodies, and private enterprise to obtain the best environmental solution to planning problems. Like the Environmental Studies Section, the Conservation Planning Section does not itself employ a large technical staff, but utilises the expertise of the Ministry's agencies and others to provide specific advice when needed. Members of the Section are frequently called upon to represent the Ministry at public enquiries and appeals tribunals when environmental issues are involved. Advice is frequently sought from the Section on government purchases of land for conservation purposes, such as for addition to State forests, national parks, and wildlife reserves.

Environmental architecture and landscape design

The first appointments were made to this section in 1978. Staff plan landscape areas where public facilities are located, for example, in national parks, and design buildings such as shelters and toilet blocks to harmonise with their surroundings. They also provide advice on environmental aspects of architectural and landscape development work to other government departments, to municipalities, and the general public.

Community education

An important role of the Ministry, carried out by the Information and Extension Branch, is to develop community education programmes related to the need for careful management of resources, the causes of environmental problems, and the means of avoiding or solving such problems. To this end, the Branch undertakes public awareness and education activities with the general public, various interest groups, and particularly with school teachers and students.

The Branch has several regional extension officers in country areas, who serve as links between the local communities and the Ministry.

Statistics

The total expenditure of the Ministry and its agencies amounted to $33.7m in 1978–79. Of this amount, salaries accounted for $16.4m. Staff of the Ministry and its agencies totalled about 1,223 persons.

VICTORIA—EXPENDITURE OF THE MINISTRY FOR CONSERVATION AND ITS AGENCIES
($'000)

Particulars	1974–75	1975–76	1976–77	1977–78	1978–79
Ministry					
General expenses	2,797	3,164	3,035	4,301	4,951
Land purchases	1,127	4,095	1,361	2,658	2,310
Environmental studies	906	1,181	1,614	2,211	2,516
Agencies					
National Parks Service	2,566	4,621	4,666	6,083	6,459
Environment Protection Authority	3,167	4,156	4,923	5,684	5,913
Soil Conservation Authority	3,184	4,325	4,096	4,553	4,736
Fisheries and Wildlife Division	3,266	4,433	4,348	5,145	5,944
Other (incl. Port Phillip Authority and Land Conservation Council)	384	631	698	908	892

Environment Protection Authority

The Environment Protection Authority, constituted under the *Environment Protection Act* 1970, is responsible for protecting and improving the air, land, and water environments of Victoria through the management of wastes, control of noise, and prevention of pollution, including litter. The three-member Authority is responsible to the Minister for Conservation and is supported by about 240 professional, technical, and administrative staff. The Authority is one of several agencies within the Ministry for Conservation.

The major activities of the Authority centre on the management of air quality, water quality, wastes on land, environmental noise, and waste control systems.

Land-use in relation to environmental quality

Adequate attention to planning and proper land-use can be of great assistance in avoiding problems of pollution and environmental degradation. Where such problems are known to exist or where they can be foreseen, it is possible to handle them more efficiently and more economically at the earliest possible stage, namely, the stage of project planning and initial investigation. This realisation has led to close collaboration between the Environment Protection Authority and land-use planners. For its part, the Authority values the important role played by planning authorities in preserving and protecting the environment. On the other hand, the planners recognise that environmental considerations constitute an essential aspect of their task and are making increasing use of the Authority's expertise in this area.

This collaboration is a function of the Authority's Planning and Research Branch. Established in 1973, the Branch endeavours to relate pollution control criteria for air, water, noise, and land-waste management to the practical aspects of land-use planning. Here it looks to current town planning legislation as an effective instrument to achieve ends of this kind. Through such legislation, for example, protection can be afforded to sensitive land-uses (e.g., hospitals) to to residential areas by appropriate land zoning and the provision of buffer zones. In this fashion the Branch works with planning authorities to incorporate environmental protection measures into existing and proposed planning schemes and to ensure that the process of issuing planning permits duly considers environment protection. A planning authority's most powerful contribution to pollution control lies in determining the nature and location of new development or redevelopment, given that pollution originates as waste from production and consumption activities.

The Authority's role in land-use planning is chiefly an advisory one. It is asked to comment, for instance, on Statutory Planning Schemes and Amendments and on Planning Applications (e.g., sub-divisions). In the context of this consultancy role, it becomes

involved in appeals before the Town Planning Appeals Tribunal against certain land-use proposals. In some cases the Authority itself lodges formal objections. In other cases bodies such as the State Rivers and Water Supply Commission, the Melbourne and Metropolitan Board of Works, or local authorities are the objectors, but seek the Authority's assistance and expert opinion.

The *Environment Protection Act* 1970 requires the Authority to recommend State environment protection policy. Among other considerations, this policy includes "long range development uses and planning". In view of this mandate the Authority recognises the need for co-ordination between State Environment Protection Policies and Statements of Planning Policy. To this end it maintains liaison with the Town and Country Planning Board. One result of this collaboration has been a sub-regional strategy plan for land-use in the area of the Gippsland Lakes. The strategy plan outlined options for waste management and their constraints on development proposals. Moreover, working committees, including Authority representatives, have pursued the task of restructuring inappropriate sub-divisions in the Gippsland Lakes area. Other concerns voiced by the Authority in relation to land-use have to do with factors such as the location of industry, electricity transmission lines and arterial roads, or the provision of noise barriers or buffer zones to reduce the impact of noise.

These activities in the area of land-use planning have been accompanied by research into related issues, such as the treatment and disposal of domestic waste water discharges (including common effluent drainage systems), soil testing in relation to effluent absorption, the location and operation of timber preservative treatment plants, or stream sedimentation from construction site erosion. The published reports stemming from such research are intended to assist those involved with land-use planning in its various aspects.

Further reference: ***Victorian Year Book*** **1979, pp. 28–9**

Land Conservation Council

The Land Conservation Council was established in February 1971 with the proclamation of the *Land Conservation Act* 1970. The Council of twelve members is composed of an independent chairman appointed by the Governor in Council, and the heads of the following Victorian Government departments and agencies: The Soil Conservation Authority, Department of Agriculture, Forests Commission, Department of Crown Lands and Survey, Department of Minerals and Energy, State Rivers and Water Supply Commission, Fisheries and Wildlife Division, and the National Parks Service. The other three members are persons with experience in various aspects of conservation and are appointed by the Governor in Council.

The functions of the Council are set out on pages 29–30 of the *Victorian Year Book* 1979.

The recommendations made by the Council are initially published as Proposed Recommendations, a copy of which is sent to all parties from whom submissions were received and to all government agencies and local authorities in the study area concerned. Further submissions are then received and considered by the Council prior to publication of the Final Recommendations which are forwarded to the Minister for government consideration.

Descriptive reports have been published for 14 of the 17 study areas as follows:- South West Districts 1 and 2, South Gippsland Districts 1 and 2, North East Districts 1, 2 and 3, 4 and 5, Melbourne, East Gippsland, Mallee, Corangamite, Alpine, North Central, and Ballarat Study Areas. Of these, Final Recommendations have been published for South West District 1, South Gippsland District 1, North East Districts 1, 2 and 3, 4 and 5, Melbourne, Mallee, East Gippsland, Alpine, and Corangamite.

In 1975, the Council published Final Recommendations for a number of areas which differed from earlier published recommendations in that they contained general policies for public land-use throughout Victoria. These policies related to the conservation of natural environments for low-intensity recreation and for biological reference, the protection of environmental education, wildlife conservation, and the preservation of rural landscapes.

Other policies dealt with the requirements of various recreation activities, the production of hardwood and softwood timber, extraction of minerals and stone, guidelines for use of coastal lands and the conservation and use of public lands along rivers and streams.

In these and previous recommendations the Land Conservation Council responded to current and future needs of the community and proposed that a number of reserves be established for uses more in keeping with current community needs than many earlier reservations.

Of considerable significance was the establishment of a system of national and State parks with the emphasis on conservation of important land systems and natural features as well as low-intensity recreation, while regional parks were proposed to provide recreational opportunities for large numbers of people in areas closer to cities and towns.

Other new types of reservation included:

Wilderness Areas. These are areas of land in which persons can experience isolation and refuge from the sights and sounds of modern urban life as well as the challenge of putting their powers of endurance and self reliance to the test.

Reference Areas. These are areas of land which are typical or important examples of a particular land type and which should be preserved in their natural state as far as possible, in order to serve as a standard against which altered or manipulated parts of the land type elsewhere can be compared.

Education Areas. These are tracts of public land supporting relatively undisturbed ecosystems which may be used as a source for community education.

Bushland Reserves. These are relatively small areas of land in predominantly agricultural regions which have been reserved to maintain the quality of local landscapes.

Highway Parks. These are small areas set aside primarily to provide rest and relaxation for travellers on major highways. They are sufficiently large to enable travellers to picnic or relax in a pleasant, relatively natural environment away from the noise and tension of the highway.

Uncommitted Land. These are areas which have been set aside to provide for future needs of the community. Provided that the capability of these areas to meet future demands is not reduced, they can be used to produce goods and services such as forest products and grazing.

In addition to these reservations, the Land Conservation Council has recommended additional areas for the preservation of flora and fauna. Large areas have been proposed for a major industry using public land, the timber industry, and provision made for the continued use of public land for mining and essential public utilities.

Major uses

The Land Conservation Council has recommended a number of national, State, and regional parks and also two wilderness areas. It has, in addition, recommended the establishment of other types of conservation reserves, for example, reference areas, flora, flora and fauna reserves, coastal reserves, bushland reserves, and streamside reserves.

Implementation of recommendations

Up to November 1979, the Victorian Government had accepted recommendations made for the South Gippsland Area, District 1, South Western Area, District 1, North Eastern Area, Districts 1 and 2, Melbourne, Mallee, East Gippsland, North Eastern Area, Districts, 3, 4, and 5, and Corangamite Areas.

Further reference: ***Victorian Year Book*** **1979, pp. 29-31**

Soil Conservation Authority

General

Under the *Soil Conservation and Land Utilization Act* 1958 and associated legislation, the Soil Conservation Authority has extensive responsibilities involving mitigation and control of erosion; the promotion of soil conservation; the determination of land-uses to achieve these objectives; the provision of advisory and technical services to landholders and other government authorities directed towards the efficient use and development of land and on-farm water resources; the protection of water catchments; supervisory

responsibility over all activities which may disturb the soil at altitudes over 1,220 metres; and the control and prevention of erosion along the Victorian coastline.

Dryland salting in Victoria

The problems of land despoliation, caused by unduly high salt concentrations at or close to the soil surface, have been steadily mounting over recent decades. There is little doubt that the cause has been an upsetting of the natural hydrologic balance, as a result of changed land-uses, often at locations far removed from the salt-affected land. In many cases, the changed land-uses have been in force for over a century and the result, now becoming more apparent, has been to initiate or to accelerate the movement of water-borne salt into the locations now being affected.

A typical Victorian example of the onset of dryland salting, the surface concentration of salts, has occurred in the Colbinabbin Range area, near Bendigo. When first taken up for settlement about one hundred years ago, this area featured many natural fresh water springs. As settlement developed, bores also were widely used as a source of water. In most cases, water was found at a depth of 40 to 50 metres.

Over the last fifty to sixty years, however, water salinity has increased and the water level in some bores has risen to 15 metres. Flow rates from existing springs appear to be increasing and, more recently, new springs have appeared in drainage lines but, in contrast to the original springs, they are salty. Many of them affect areas larger than 10 hectares. In 1977, 2 per cent of the whole area was found to be severely salted, an increase of 30 per cent over the previous six years. The problem has taken the forms of large hillside-seepage areas, drainage-line saltpans and saline springs and bores.

Over the past twenty to thirty years, similar dryland salted areas have appeared at many places in northern, western, and south-western Victoria. The problem affects about 1.5 per cent of the valuable grazing and cropping land which comprises most of the zone. Productivity has been generally lowered, often to the extent that the existing croplands and pastures have become completely unproductive in the affected areas. The loss of vegetative cover makes the salted areas more prone to erosion, resulting in loss of soil and sedimentation of adjacent land, streams, or reservoirs.

There is also a tendency for streams and farm dams to become saline. This is because of the increasing salinity of natural springs, or because of the rise in the levels of salty water-tables. When cut by erosion gullies, the latter then release salty water into the streams and dams. Along streams where the salinity has increased in this way, trees and shrubs are dying.

The clearing or grazing of the native vegetation, which consists of deep-rooted perennials, and its replacement with shallow-rooted annuals for pastoral use, and especially for cereal cropping, causes a reduction in actual evapotranspiration. Thus increased quantities of unused rain water percolate to the aquifers.

The basic cause of dryland salting, then, is increased infiltration and percolation of rain water which has resulted from reduced evapotranspiration, caused by the clearing of forest covers to enable expansion of grazing and cropping. There has been a consequent increase in the amount of excess water moving through the soils. This has resulted in greater accessions both of water and leached salts to the groundwater. In this way there has been some limited, localised salting due to the leaching of salts from the soil.

However, the major salting damage is caused by the groundwater when it rises to within capillary fringe range of the surface, or when the water-table itself intersects the surface. This often occurs some distance from the original location of the seepage. Under these conditions, salt concentrations rapidly increase to high levels as a result of concentration by evaporation, even if the groundwater itself may be only slightly saline. In many Victorian areas, however, the shallow groundwater lies in the salinity range 15,000 to 30,000 μS/cm.

The increased percolation of water into the ground, as a result of clearing, grazing, and cropping, is aggravated by the Mediterranean-type climate which prevails in the affected area. In the cool, wet winters, the potential evapotranspiration is much less than rainfall; in the warm, dry summers, this is reversed. Actual evapotranspiration in the summer, therefore, depends on the amount of water stored in the soil and the ability of root systems to extract it — that is, upon depth of root systems and perenniality of vegetation.

Regions affected

Although the principal cause of salting applies generally, there are many variations in detail, depending on the local geology, geomorphology, and climatic history. In Victoria, three geomorphic regions are mainly involved. These are:

(1) The western uplands, mainly pastoral, where salting is apparent in the forms of seepages and salt pans;

(2) the northern riverine plain, mainly cropping, where there are extensive areas of saline soils resulting from Quaternary groundwater salinity, and also salt pan areas with currently rising water-tables; and

(3) the north-western ridged Mallee plain, again mainly cropping, with extensive areas of dunes and stranded beach ridges. Here, there are large areas of originally saline subsoils which, when exposed by wind erosion, become scalds. Natural saline depressions are common, and numerous post-settlement salt pans occur at the bases of dunes, on the interdune flats, and adjacent to earthen water channels. However, salting is also widespread in the areas of deeply weathered rocks and on parts of the volcanic plains in the Western District.

Prevention and restoration of salted areas requires two basic approaches. The first involves regional land-use changes, which are fundamental to correction of existing problems and their future prevention. These have the objective of either restoring the original hydrologic balance, or establishing a satisfactory hydrologic balance which is compatible with new land-uses. It is necessary to avoid further clearing of forests from catchments in which a high salt concentration in the soil profile exists, or where adjacent land is underlain by a saline aquifer.

Long-term reclamation measures aim to increase the on-site water use in the intake catchment areas. This generally involves a regional catchment approach and hence requires consideration of socio-economic factors.

The problem in cropping areas is more critical than that in grazing areas, because the salt tolerance of cereals is relatively low. Bare fallowing, which is intended to prevent the transpiration of water, is the general practice. Furthermore, because cropping areas are mainly on the plains, the fundamental solution to dryland salting there will be long-term, because of the geographical extent of some of the required land-use changes.

Because the problem is complex and varies from district to district, it is essential to devise an effective strategy for each district. These strategies would ideally involve various forms of both regional land-use changes and site treatments. Engineering approaches may also be required in places. For such strategies to be worked out, it is necessary to conduct a detailed investigation of the processes, sources, and movement of salt, and of effective site treatments, for each of the affected areas.

The second approach involves site-specific treatment of affected sites, coupled with the measures, already described, to restore hydrologic equilibrium. In much of the corrective work already done in Victoria, this approach has been used. Except in irrigation areas, artificial drainage or leaching of the concentrated salts by applied water is not economically viable.

Reclamation of salted areas by site-specific methods is, therefore, mostly restricted to surface treatments aimed at reducing evaporation at the surface, while increasing transpiration from the whole root zone. These treatments induce leaching of the concentrated salts, by utilisation of the resulting improved infiltration of rainwater. They may involve the use of mulches, with or without soil additives such as gypsum, combined with the use of salt-tolerant plant species. These latter also provide both ground cover and grazing, on land which would otherwise remain bare.

Further references: Destruction of vermin and noxious weeds, *Victorian Year Book* 1963, pp. 491–2; Soil, land-use, and ecological surveys, 1966, pp. 465–6; Group conservation, 1969, pp. 295–6; Land Utilization Advisory Council, 1975, pp. 288–9; 1978, pp. 41–3; Dryland farming and land restoration, 1979, pp. 31–2

Port Phillip Authority

The Port Phillip Authority was established in 1966 to advise the Victorian Government on methods to co-ordinate development around Port Phillip Bay, preserve existing beaches and scenic beauty, prevent foreshore deterioration, and improve coastal facilities to enable the full enjoyment of the coastal area.

The coastal area is defined as a belt of public land 200 metres to 800 metres wide and the inshore waters and sea bed approximately 600 metres wide around the coastline of Victoria from Barwon Heads in the west to Cape Schanck to the east including Port Phillip Bay.

The Port Phillip Authority itself consists of a full-time chairman and part-time representatives from the Town and Country Planning Board, Public Works Department, Soil Conservation Authority, and the Department of Crown Lands and Survey.

Attached to the Authority is a Consultative Committee which comprises representatives from the Ministry of Tourism, Municipal Association (four councillors), State Rivers and Water Supply Commission, Victoria Police, Melbourne and Metropolitan Board of Works, Fisheries and Wildlife Division, and other bodies and organisations with a special interest in the Port Phillip Authority area.

The Authority exercises an overview of all developments within its area. Consent is required for a structure or works or removal of vegetation and is based on the premise of permitting only those activities which are water orientated and must be located near the shoreline. Others may be permitted, but subject to conditions.

A number of studies aimed at providing data from which guidelines can be determined for the optimum use and enjoyment of the coastal area have been completed or commenced. These include a coastal inventory of vegetation and geomorphology, coastal features maps, and a Port Phillip Coastal Study. The Study was released in March 1978 after two years of research.

The Study was implemented to develop a balanced approach to the use of the coastal resource that considers both priorities for use and compatibility between proposed uses and preservation of the coastal resource. The Study identified existing uses and in part through a public involvement programme recommended strategies for the future development, improvement, and protection of the coastal reserves of the Port Phillip area.

Acceptable uses include coastal dependent recreation and tourism; scientific, educational, and cultural activities; ports, harbours, and marinas; commercial fishing, agricultural and pastoral activities; coastal dependent secondary industry; and concentrated and well planned communities. Priorities were established among these competing uses to assure orderly balanced use and preservation of the coastal lands and offshore waters.

The Authority has recently established a Coastal Plant Nursery to provide native plants suited to foreshore conditions for committees of management and government authorities that are responsible for coastal reserves, as well as schools, conservation groups, and in special circumstances, private individuals. A Coastal Vegetation Service has also been formed to provide advice on tree planting, re-vegetation programmes, and the preparation of landscape plans. Landscape plans have recently been prepared for the Werribee and Sandringham coastal regions.

The Authority has also produced a publication *A Guide to Safe Boating in Port Phillip Bay*. It deals with safety regulations, and provides safety hints for divers and water skiers, as well as procedures to be followed in an emergency. It includes the location and condition of boat ramps, a section on understanding the weather, places where to shelter in case of sudden storm, and methods of using the radio. An occasional publication *Beach Use* was circulated to foreshore managers and others interested in recreational, vegetation, and management issues affecting Port Phillip Bay.

Further references: Port Phillip Bay Environmental Study, *Victorian Year Book* 1975, pp. 48–50, p. 382; Western Port Bay Environmental Study, 1975, pp. 50–1; Gippsland Lakes Environmental Study, 1975, p. 51; 1978, pp. 43–4

National Parks Service

Recent legislation

In December 1972, the Ministry for Conservation Act was passed and several conservation-oriented agencies from various State Government departments, including the National Parks Service, were brought into the new Ministry for Conservation.

Parliament approved a new National Parks Act in May 1975. Implemented in the following December, the 1975 Act retained the concept of the traditional national park, but, in addition, made it possible for the Service to manage other types of parks where recreation, education, preservation of historical features, or some other activity may be

the primary use. Although only one new national park (Brisbane Ranges) was created, making a total of 25, provision was made for the first time, by way of Schedule Three, for two "other parks" (Warrandyte State Park and Cape Schanck Coastal Park).

The National Parks (Amendment) Act came into effect in May 1978. This Act created one new national park and seven other parks as follows: Burrowa-Pine Mountain National Park (17,300 hectares), Warby Range State Park (2,775 hectares), Holey Plains State Park (10,450 hectares), Mt Worth State Park (221 hectares), Nepean State Park (908 hectares), Melba Gully State Park (48 hectares), Werribee Gorge State Park (207 hectares), and Haining Farm (64 hectares).

In December 1978, the *National Parks Act* 1978 was passed by the Victorian Parliament. This was the most significant legislation on national parks since the original Act of 1956. The effect of the new legislation has been to increase the area included under the National Parks Act to approximately 775,000 hectares — almost three times the area previously included under the Act. The Act came into force on 26 April 1979, but some of the new parks are to be declared from 26 April 1980.

Existing parks

At 31 December 1978, the National Parks Service managed 26 national parks and 9 other parks, together with another five areas managed on behalf of other organisations, the total area being approximately 291,304 hectares. This represented 1.29 per cent of the total area of Victoria and 3.21 per cent of the public lands.

The total area is made up as follows: national parks (244,219 hectares); other parks declared under the National Parks Act (15,885 hectares); and parks managed by the Service under other Acts (31,183 hectares).

Some of the existing national parks are quite small. These were established prior to 1975 when the Service could only manage national parks — there was no provision for any other types of parks under the National Park legislation. The smallest of these are Bulga (80 hectares) and Organ Pipes (85 hectares). The largest national park — Wyperfeld (56,500 hectares) was expanded to approximately 100,000 hectares in April 1979.

New parks

Four new national parks were declared on 26 April 1979. These are Croajingolong (86,000 hectares), Snowy River (26,000 hectares), Tingaringy (18,000 hectares), and Baw Baw (13,300 hectares). At the same time a number of other parks came under the Service's control, including the Big Desert Wilderness Park (113,500 hectares) and Coopracambra Park (14,500 hectares).

A feature of these new parks is that, for the first time, parks in Victoria adjoin parks across the borders of New South Wales and South Australia. With the establishment of these new parks, on the New South Wales border Croajingolong National Park links with the Nadgee Nature Reserve, Coopracambra State Park links with Nungatta National Park, and Tingaringy National Park links with Kosciusko National Park, while the Big Desert Wilderness Park links with the Scorpion Springs and Mt Shaugh Conservation Parks of South Australia.

Another feature is the considerable length of coastline brought under the National Parks Act. The three coastal parks (Discovery Bay, Cape Schanck, and Gippsland Lakes) and three national parks (Port Campbell, Wilsons Promontory, and Croajingolong) cover approximately one-third of Victoria's coastline.

VICTORIA—PARKS UNDER THE CONTROL OF THE NATIONAL PARKS SERVICE

Park	Parks and areas at 31 Dec 1978	Parks and areas from 26 April 1979	Parks and areas from 26 April 1980
A. National parks		*hectares*	
1. Alfred	2,300	2,300	2,300
2. Brisbane Ranges	1,182	7,470	7,470
3. Bulga	80	80	80
4. Captain James Cook	2,750	*(a)*	*(a)*
5. Churchill	193	193	193

VICTORIA—PARKS UNDER THE CONTROL OF THE NATIONAL PARKS SERVICE—*continued*

Park	Parks and areas at 31 Dec 1978	Parks and areas from 26 April 1979	Parks and areas from 26 April 1980
6. Fern Tree Gully	459	459	459
7. Fraser	3,100	3,750	3,750
8. Glenaladale	183	183	183
9. Hattah Lakes (Hattah/Kulkyne)	17,800	17,800	48,000
10. Kinglake	5,836	5,836	11,270
11. The Lakes	2,380	2,380	2,380
12. Lind	1,166	1,166	1,166
13. Little Desert	35,300	35,300	35,300
14. Lower Glenelg	27,300	27,300	27,300
15. Mallacoota Inlet	5,318	*(a)*	*(a)*
16. Morwell	140	140	140
17. Mt Buffalo	11,000	11,000	31,000
18. Mt Eccles	400	400	400
19. Mt Richmond	1,707	1,707	1,707
20. Organ Pipes	85	85	85
21. Port Campbell	700	700	700
22. Tarra Valley	140	140	140
23. Wilsons Promontory	49,000	49,000	49,000
24. Wingan Inlet	1,900	*(a)*	*(a)*
25. Wyperfeld	56,500	100,000	100,000
26. Burrowa-Pine Mountain	17,300	17,300	17,300
27. Baw Baw	..	13,300	13,300
28. Croajingolong	..	86,000	86,000
29. Snowy River	..	26,000	26,000
30. Tingaringy	..	18,000	18,000
Total — national parks	244,219	427,989	483,623
B. Other parks			
1. Cape Schanck	994	994	1,075
2. Warrandyte	218	218	218
3. Haining Farm	64	64	64
4. Holey Plains	10,450	10,450	10,450
5. Melba Gully	48	48	48
6. Mt Worth	221	423	423
7. Nepean	908	908	1,050
8. Warby Range	2,775	2,821	2,821
9. Werribee Gorge	207	375	375
10. Cape Nelson	*(b)*176	210	210
11. Discovery Bay	*(b)*8,450	8,450	8,450
12. Gippsland Lakes	*(b)*15,500	15,500	15,500
13. Mt Samaria	*(b)*7,600	7,600	7,600
14. Pirianda Garden	*(b)*11	*(b)*11	*(b)*11
15. Gellibrand Hill	*(b)*266	*(b)*266	*(b)*266
16. Big Desert	..	113,500	113,500
17. Cathedral Range	..	3,570	3,570
18. Coopracambra	..	14,500	14,500
19. Pink Lakes	..	50,700	50,700
20. Steiglitz	..	655	655
21. Beechworth	..	..	1,130
22. Chiltern	..	..	4,250
23. Eildon	..	..	24,000
24. Lake Albacutya	..	..	10,700
25. Murray River	..	..	1,550
26. Wabonga Plateau	..	..	17,600
27. Yea River	..	..	220
Miscellaneous smaller reserves	*(b)*18	*(b)*14	*(b)*470
Total — other parks	47,906	231,277	291,406
Total — all parks	292,125	659,266	775,029

(a) Incorporated in Croajingolong National Park.
(b) Managed by the National Parks Service but not declared under the National Parks Act.

A special article on national parks in Victoria, supported by photographs and a map, appears on pages 1–35 of the *Victorian Year Book* 1975.

Further reference: *Victorian Year Book* 1979, pp. 33–4

ROYAL BOTANIC GARDENS AND NATIONAL HERBARIUM

The Royal Botanic Gardens and National Herbarium form a Division of the Department of Crown Lands and Survey.

The gardens were established on the present site in 1846 and now occupy 36 hectares approximately 2 kilometres from the centre of Melbourne. They contain a reference collection of plants from all over the world which are used for scientific, educational, and pleasure purposes, and are beautiful examples of the English landscape tradition of the eighteenth and nineteenth centuries.

The basic landscaping was carried out by W.R. Guilfoyle in his period as Director from 1873 to 1909. Baron von Mueller, his predecessor, was responsible for the importation of much of the plant material used by Guilfoyle. Mueller, who was Government Botanist for 43 years prior to his death in 1896, was also responsible for the establishment of the National Herbarium. The collection of dried and pressed plant specimens, the largest in the southern hemisphere, contains over 1 million sheets including many of the specimens collected on early historic exploratory journeys. Associated with the herbarium is an archival library of taxonomic and horticultural material.

The Gardens, with the Herbarium, form a resource for scientific, educational, legal, horticultural, and recreational purposes for which there is an ever increasing demand.

The Gardens and the Herbarium provide an official plant identification service for the people of Victoria. This ranges from legal requirements under the Poisons Act, identifying material for other government departments and interested bodies working in the environmental fields, to providing the home gardener or interested collector with the correct name of the plants they possess.

The professional botanists have a research function in which they investigate the taxonomic affinities of various groups of plants and revise any anomalies that may be apparent. Areas of special interest include the genera *Acacia* and *Casuarina*, native orchids, and aquatic genera.

To enable specimens to be readily found, an assessment of every plant growing in the Gardens is being undertaken. The locations will be based on a new metric map being produced by the Department's Division of Survey and Mapping. The resultant information will be collated on a computer and will be updated constantly by the insertion of new plantings and removal of deaths. This is the first full assessment for nearly 90 years.

While the Gardens are financed principally by the Government they are assisted by the "Miss M.M. Gibson Trust" and its associated Gardens Branch Research Trust formed from gifts and bequests. The charter of these trusts is to assist the Gardens and Herbarium in many ways that have significant interest to the trusts. They have financed the publication of the *Key to Victorian Plants*, the guide book on the gardens, and the printing, for sale to the public, of examples of botanical art by Margaret Stones and Betty Connabere. (See *Victorian Year Book* 1977 page 65). Revenue from the sale of these items is used for other new projects.

In addition to the main gardens in Melbourne, is the native plant garden at Cranbourne to the south-east of Melbourne, and the mansion gardens of Werribee Park to the south-west of Melbourne.

Werribee Park

Werribee Park stands in approximately 385 hectares of land adjacent to the Werribee River, 36 kilometres south-west of Melbourne. It was originally the property of Thomas and Andrew Chirnside and was acquired by the Government of Victoria in 1973 and opened to the public in 1977.

The property includes the opulent "Italianate" style mansion built in 1875, an earlier homestead, farm buildings, 10 hectares of formal garden, kitchen garden, vineyard, orchard, parkland, and adjoining grazing lands.

The garden, with its trees and shrubs representing 376 species laid out in the late 1870s, is in contrast to the surrounding treeless plains. The old homestead is surrounded by a sunken bluestone boundary fence or "ha-ha", the oldest of its kind in Australia. These fences effectively kept cattle from entering the homestead garden and pre-date the use of wire fencing at a time when upright stone walls and hedges were in widespread use.

A well insulated "ice-house" with lake for supplying ice was built in one corner of the gardens in the best Scottish gardening tradition. It was doomed not to function for the purpose of cold storage of salt beef as the lake never held water for more than a fortnight, but was diverted from a garden folly into a shell house or grotto.

Restoration of a grand parterre garden laid out around the fountain on the northern lawn was commenced in 1978 and restoration of the first sunken glasshouse was completed in 1979. Photographs taken by the Chirnside family in the early part of the twentieth century have made it possible to restore these features which became derelict in the depression years of the 1930s.

In the same spirit as the Chirnside family grew plants collected from all parts of the world, a small area of the grounds has recently been set aside for plant introduction and acclimatisation purposes for use in the Western District generally. Some 200 species had been planted by the end of 1978 and include such interesting plants as *Simmondsia chinensis* — the sperm whale oil substitute plant and *Acacia harpophylla* from Queensland.

Further references: *Victorian Year Book*, 1979, pp. 706–7; Cranbourne Annexe, 1979, pp. 35–6; Illustrated flora of Victoria, 1979, p. 36

ZOOLOGICAL BOARD OF VICTORIA

Royal Melbourne Zoological Gardens

In 1857, a Society known as the Zoological Society of Victoria was formed and this led to the Royal Melbourne Zoological Gardens being the first to be established in Australia. The original site of the Zoological Gardens was known as Richmond Paddock, and was located opposite the Botanic Gardens, on the Yarra River. The collection was moved to the present site of 22 hectares in 1862.

In 1910, the Society, which had been incorporated with the Acclimatisation Society, was granted a Royal Charter, and became known as the Royal Zoological and Acclimatisation Society of Victoria. This Society controlled the Zoological Gardens until 1937, when the Victorian Government assumed responsibility for the administration of the Gardens through the Zoological Board of Victoria. The responsibility for ministerial jurisdiction of the Zoo was transferred from the Chief Secretary's Department to the Ministry for Conservation from 1 June 1973.

A reconstruction programme for the Zoological Gardens commenced in 1965 and embraced all aspects of animal exhibition, essential services, catering, and gardens beautification.

In 1969, the Zoological Board of Victoria established an education service with the appointment of a trainee education officer. The following year a teacher was seconded to the Zoo on a half-time basis from the Victorian Education Department. There was such a substantial demand for lessons in the Zoo during 1970 that the next year a teaching staff of four full-time and three half-time teachers was seconded from the Education Department. The Zoological Board provided office space and appointed a full-time administrative officer to the Service. By 1977, the total teaching and administrative staff in the Zoo's Education Division had risen to fifteen, including a teacher experienced in handling handicapped children. The Board, through the generosity of donations from industry, community service groups, and foundations, had by this time also provided four classroooms, as well as a building specially equipped for handicapped children.

On 6 October 1977, 120 years following the first meeting of the then Zoological Society, the Gardens received the Royal prefix, and became known as The Royal Melbourne Zoological Gardens.

Werribee Zoological Park

In 1975, the Board was given powers to manage areas other than the Melbourne Zoological Gardens, and this applied in particular to the Werribee Zoological Park, a rural area of 120 hectares, which formed part of an estate purchased by the Victorian Government in 1973 to preserve the area and the historic home on the site. (See also pages 47–8). The development of Werribee Zoological Park, predominantly for hoofed mammals, Australian animals, and water birds, commenced in 1975.

Sir Colin MacKenzie Fauna Park

At the foothills of the Great Dividing Range, about five kilometres south of Healesville and about 65 kilometres north-east of Melbourne, is the Sir Colin MacKenzie Fauna Park. The Park occupies 173 hectares of timbered country with tall native trees, chiefly eucalpyts, and smaller shrubs. In 31 hectares of this area the public can move quite freely among many of the animals. The remaining 142 hectares are kept as a permanent reminder of the original appearance of the country. This part is called the Coranderrk Bushland. It was once part of the old Coranderrk Aboriginal Reserve, where members of the diminishing Yarra Yarra tribe were housed by former Victorian Governments.

The Aboriginals who lived in the area before the arrival of European settlers were led by "King" Barak. They called the valley through which Badger Creek flows and the mountain from which it rises Coranderrk. This name was given by them to a plant which flourished over the whole area and which always flowered there early in summer.

The Fauna Park was established in 1922 as a research station by Dr Colin MacKenzie, an anatomist from Melbourne. He studied the arrangement of the bones, particularly in the front legs in Australian animals and found a way of making special splints to help children who had infantile paralysis. When Sir Colin went to Canberra in 1928 to become the first Director of the Australian Institute of Anatomy, all the animals and cages at Healesville became part of a public reserve where visitors could go and picnic and see the animals. In 1944, the Victorian Government, realising the importance of this area as a sanctuary for scientists and tourists appointed a small committee to look after it. In 1978, this Committee was replaced by the Zoological Board of Victoria.

Further reference: National Museum of Victoria, *Victorian Year Book* 1979, p. 36–7

VICTORIAN INSTITUTE OF MARINE SCIENCES

The Victorian Institute of Marine Sciences (VIMS) was established by an Act of the Parliament of Victoria (No. 8607) on 3 December 1974. It is an autonomous body with an independence similar to that of a university.

The objects of the Institute, as set out in the Act, can be summarised as: To provide facilities for, and to foster, carry on, and support scientific research and technological development in all branches of the marine sciences; to advance knowledge of the marine sciences and the practical application of such knowledge to commerce and industry; to provide facilities for instruction, demonstration, and training in subjects related to the sea and its resources; to disseminate information in printed form or otherwise concerning the work of the Institute; to provide library facilities; and to establish centres for the display of marine exhibits.

The Institute is governed by a Council consisting of representatives of the Parliament of Victoria, the four Victorian universities, the Victoria Institute of Colleges, and the Royal Society of Victoria, together with ten other persons from industry and commerce or having special qualifications in the marine sciences and technologies. The Director of the National Museum of Victoria, the Director of the Fisheries and Wildlife Division of the Ministry for Conservation, and the Director of the Ministry for Conservation's Marine Laboratory (when appointed) are also *ex officio* members of the VIMS Council. Thus VIMS, as a consortium of interests, provides an effective and economic focus for the marine science expertise and resources in this region of Australia.

Although constituted under a Victorian Act, VIMS has a charter that extends beyond the borders of the State of Victoria. It is planned to develop VIMS as a national centre for the marine sciences and technologies in south-eastern Australia. Disciplines involved will include oceanography, marine chemistry, biology, marine geology and geophysics, and marine engineering.

VIMS is developing with only a modest permanent staff but with a range of facilities and equipment including, eventually, field stations and sea-going vessels. Its permanent staff will comprise a core of scientists and technicians, but much of its work will be done by employing the skills and resources existing in the institutions associated with VIMS. The Institute will provide a centre of stimulation, a focus of activity, and an accumulation of resources for scientific workers from educational institutions, government departments, and industry.

The Victorian Government provided small grants to establish VIMS on an operational basis in 1977–78 and 1978–79. It has also provided a site at Queenscliff, to be shared between VIMS and the Victorian Ministry for Conservation.

In 1978, VIMS embarked upon a major multi-discipline study of the Bass Strait region. In recognition of the contribution that the study will make to its own marine programmes, the Victorian Government provided an amount of $200,000 towards the cost of the first stage of this research project.

The educational activities of VIMS will help to ensure that students are stimulated to study marine science and that there will be an ample supply of trained scientists and technicians available in the future to staff Australia's expanding system of marine science stations.

PHYSICAL FEATURES

Boundaries and areas

Creation of Victoria

The boundaries of the Port Phillip District of New South Wales were defined in *Imperial Act* 5 & 6 Victoriae c.76 of 30 July 1842 ("An Act for the Government of New South Wales and Van Diemen's Land") as follows:

'. . . the Boundary of the District of Port Phillip on the North and North-east shall be a straight Line drawn from Cape Howe to the nearest Source of the River Murray, and thence the Course of that River to the Eastern Boundary of the Province of South Australia.'

Previously, by *Imperial Act* 4 & 5 William IV c.95 of 15 August 1834, *Letters Patent* of about 19 February 1836, and *Imperial Act* 1 & 2 Victoriae c.60 of 31 July 1838, the eastern boundary of the Province of South Australia was fixed as '. . . the One hundred and forty-first Degree of East Longitude . . .'.

By *Imperial Act* 13 & 14 Victoriae c.59 of 5 August 1850 ("An Act for the better Government of Her Majesty's Australian Colonies"), the District of Port Phillip was granted the right to separate from New South Wales.

Boundaries

On 2 May 1851, The Victoria Electoral Act of 1851 was passed *(New South Wales Act* 14 Victoria No. 47) which provided for the division of the Colony of Victoria into electoral districts. A schedule to the Act set forth the boundaries of the electoral districts, being based on the boundaries of the counties then in existence. Those boundaries of the electoral districts which formed the boundaries of Victoria were described as:

'a line running in a westerly direction from Cape Howe to the source of the nearest tributary of the Murray';
'the River Murray';
'the South Australian frontier';
'the 141st meridian being the line dividing the Colony of New South Wales from South Australia';
'the sea';
'the sea shore';
'the sea coast';
'including the Lawrence and Lady Julia Percy's Islands';
'including all the islands at Port Fairy';
'Port Phillip Bay';
'the shores of Port Phillip Bay';
'the waters of Port Phillip';
'including the small islands near the channels at the mouth of Port Phillip and those of Geelong Bay';
'including French and Phillip Islands and the small islands in Western Port Bay'.

Writs for the election of a Legislative Council in Victoria were issued on 1 July 1851, thereby establishing the Colony of Victoria.

Murray River

The separation of Victoria from New South Wales in 1851, and the successful navigation of the Murray by steam vessels, encouraged widespread evasion of New South

Wales customs duties on articles taken across from Victoria and South Australia. The question arose as to which Colony had jurisdiction over the waters of the Murray River. The position was finally clarified with the passing of the New South Wales Consitution Statute *(Imperial Act* 18 & 19 Victoriae c.54 of 16 July 1855) which decreed that the whole watercourse of the Murray River from its source to the eastern boundary of the Colony of South Australia was thereafter to be within the Territory of New South Wales, thus fixing the left bank as the boundary between Victoria and New South Wales.

Cape Howe to the Murray River

In 1866, following the discovery of gold on the tributaries of the Snowy River near where the boundary was thought to be, it became evident that the remaining portion of the New South Wales–Victoria boundary should be marked on the ground. A definitive point at Cape Howe was agreed upon by the two colonies following an on-site conference between the New South Wales Surveyor General (P. F. Adams) and the Victorian Government Astronomer and Superintendent of Geodetic Survey (R. L. J. Ellery). This point was marked and named Conference Point.

Late in 1869, Alexander Black, a Victorian geodetic surveyor, was directed to determine the headwaters of the Murray River. These he identified as a certain spring near Forest Hill. Black then proceeded to clear and mark the western portion of the boundary while another Victorian geodetic surveyor, Alexander C. Allan, marked the eastern portion. The marking was completed in early 1872 and the line, which extended some 115 kilometres through extremely rugged country, passed within 5.6 metres of the provisionally established Conference Point.

The official technical description of the boundary gave as the initial azimuth 116° 58′09″ .42 from the spring to Station No. 1 on Forest Hill (452.6 metres away), while from a point on the coast at Cape Howe, 176,492.1 metres from the spring, the azimuth of the same line extending out to sea was given as 115° 53′41″ .36 to a point distant one league (5.56 kilometres) from high water line at Cape Howe.

The total length of the New South Wales boundary including the Murray River is about 2,050 kilometres.

Victoria–South Australia border

The boundary between South Australia and Victoria has had an interesting history, involving heroic work by surveyors and later much litigation between the colonies which culminated in an appeal to the Privy Council.

Prior to the creation of the Province of South Australia, New South Wales covered all of the mainland of Australia as far west as the 135° east meridian. South Australia was established in the 1830s, the boundaries being '. . . on the North the Twenty-sixth Degree of South Latitude, on the South the Southern Ocean, . . ., and on the East the One hundred and forty-first Degree of East Longitude . . .'. Thus the western boundary of New South Wales between the 26° south parallel and the coast was defined by the 141° east meridian.

By the late 1830s, it had become apparent that the south-eastern corner of South Australia would need to be located and marked on the ground, as the Hentys of Portland Bay had extended their pastoral activities over the Glenelg River to Mount Gambier and there were disputes as to which Government (South Australia or New South Wales) had jurisdiction there.

Late in 1846, surveyors Henry Wade from New South Wales and Edward R. White from South Australia commenced the marking of the 141° east meridian. Their starting point was some 2 kilometres west of the Glenelg River which had previously been determined to be the most likely position of the meridian. In July 1847, after completing 198 kilometres of the boundary, the party was forced to discontinue the survey due to sickness. Subsequently both colonies issued proclamations adopting the boundary as marked. Surveyor White was requested to proceed with the survey and in December 1850 reached the Murray River after suffering months of overwhelming privations which contributed to his early death.

Doubts about the accuracy of the determination of the 141° east meridian (upon which Wade's and White's surveys were based) were expressed in the 1840s and grew in the

1850s, but no action was taken until the late 1860s. Although there was no conclusive evidence, the Governments of South Australia and New South Wales were agreed that it was desirable to verify the longitude of the line marked by Wade and White, before proceeding with the marking of the boundary between those two colonies north of the Murray River.

There was reason to believe that a more accurate location of the 141° east meridian could be established. Since the determinations of the position of the 141° east meridian near the coast between 1839 and 1845 there had been increases in scientific knowledge, larger and more accurate instruments were available, and the electric telegraph had been developed. Furthermore, as the result of the appointment of government astronomers in Sydney and Melbourne, there were more accurate values for the longitudes of these cities. In May 1868, a temporary observatory was established at Chowilla and as a result of precise observations, and with the aid of the newly developed electric telegraph, George Smalley, New South Wales Government Astronomer, and Charles Todd, South Australian Superintendent of Telegraphs, determined the 141° east meridian to be approximately 3.6 kilometres east of the boundary marked by White.

After many years of vain efforts asking Victoria to relinquish the land between the marked boundary and the more accurately determined 141° east meridian, the South Australian Government in 1911 appealed to the High Court of Australia. When this appeal failed, it appealed to the Privy Council which ruled in favour of Victoria in 1914. Thus ended the dispute; the boundary as marked, approximating to a longitude of 140° 58′ east, was confirmed as the State boundary.

There remains the question of the location of the border in the far north-western corner of Victoria, along the Murray downstream from the 141° meridian (as determined by Smalley and Todd) to Wade and White's line. The length of this section of the river is about 10 kilometres with Victoria to the south and South Australia to the north of the river.

Recent legal opinion suggests that ordinary common law principles would apply; consequently, the boundary is presumably the centre thread of the Murray as at 1842 (as modified by slow and imperceptible natural changes in its course since then).

Offshore boundaries

The *Imperial Act* 13 & 14 Victoriae c.59 of 5 August 1850 which separated the Colony of Victoria from New South Wales described only the land boundaries of the new Colony; no southern boundary was defined. However, the northern boundary of Van Diemen's Land (Tasmania) was defined in 1825 as the latitude 39° 12′ south and this has generally been accepted as the southern limit of Victoria's jurisdiction. It lies about 7 kilometres south of Wilsons Promontory. The lateral offshore boundaries between Victoria and the adjoining mainland States have not been defined.

In 1973, the Commonwealth Government passed the *Seas and Submerged Lands Act* 1973 (No. 161), and it received the Royal Assent on 4 December 1973. The Act declares that the sovereignty in respect of the territorial sea of Australia, and in respect of the air space over it and in respect of its bed and subsoil, is vested in and exercisable by the Crown in right of the Commonwealth. The Act gives the Governor-General power to proclaim the breadth of the territorial sea, and the power to proclaim the baseline from which the breadth of the territorial sea is to be measured. The Act declares that the sovereignty in respect of the internal waters of Australia (that is to say, any waters of the sea on the landward side of the baseline of the territorial sea) not within the limits of a State, and in respect of the airspace over those waters and in respect of the sea-bed and subsoil beneath those waters, is vested in and exercisable by the Crown in right of the Commonwealth.

Baselines from which the territorial sea is to be measured are delimited according to procedures spelt out by the Convention on the Territorial Sea and the Contiguous Zone which was signed at Geneva on 29 April 1958, and under which Australia has obligations under international law.

The six Australian States challenged the validity of the Seas and Submerged Lands Act in the High Court of Australia, but in the decision handed down on 17 December 1975, the High Court dismissed all actions thereby confirming that, broadly speaking, the

sovereignty of the Crown in right of the States extends only to low-water line. This applies both to the mainland and to islands off the coast which belong to the State, which in the case of Victoria would probably mean all islands between 140° 58′ and 149° 58′ east longitude (approximately) to the north of 39° 12′ south latitude.

Depth

Although no depth limitation for Victoria was given in the Imperial Statutes defining the boundaries of Victoria, it has always been accepted that the Crown has sovereignty to the centre of the earth. The Land Act of 1891 imposed a depth limit in new Crown grants and, since 8 August 1892, 99 per cent of Crown grants issued have been limited to the surface and down to a depth of 15.24 metres below the surface. Since 3 July 1973, the depth limitation for new Crown grants has been 15 metres. A well or spring to obtain water from the ground is not necessarily subject to the depth limitation imposed in the Crown grant.

The exceptions to the 15 metres depth limitation on freehold tenure are:

(1) In areas close to coal mines, gravel deposits, etc., where the depth limits were fixed in 1909 at 7.62 metres, sometimes 6.10 metres, or 9.14 metres — e.g., Wonthaggi, Kirrak, Korumburra, Woolamai, and Tarwin. Crown grants issued since 3 July 1973 in Wonthaggi and Kirrak are to be the same as elsewhere, namely 15 metres;

(2) on sites for buildings with deep foundations, e.g., 30 metres, 60 metres;

(3) some land at Morwell and Churchill — 305 metres; and

(4) lands vested in the Commonwealth. The depth limitation is usually 76 metres (occasionally 15 metres) but by sections 8 and 10 of the *Lands Acquisition Act* 1955-1973, the Commonwealth can compulsorily acquire Crown lands to unlimited depth, thus implying that the State of Victoria extends to the centre of the earth.

Height

Although no height limitation for Victorian territory was given in the Imperial Statutes defining the boundaries of Victoria, it has generally been accepted that the Crown has complete and exclusive sovereignty over the air space above its territories.

The Convention on Civil Aviation of 1944 (the Chicago Convention), to which Australia was a party, recognises that every contracting State has complete and exclusive jurisdiction over the air space above its territory. Territory is defined for the purposes of the Convention as being the land areas and territorial waters adjacent thereto under the sovereignty of the contracting State.

The Commonwealth Parliament has the constitutional power to legislate to give effect to the Chicago Convention and in relation to air navigation with respect to trade and commerce with other countries and among the Australian States.

The Victorian Parliament has power to make laws relating to the control and use of the air space above its territory which are not inconsistent with laws made by the Commonwealth Parliament on the matter.

In pursuance of its constitutional powers the Commonwealth Parliament has passed legislation regulating air navigation within the air space over the whole of Australia. The Victorian Parliament has passed the Air Navigation Act of 1958 which provides that the Air Navigation Regulations made under the Commonwealth Air Navigation Act, to the extent that they do not apply to the air space over Victoria of their own force, apply to air navigation within that air space as Victorian law.

Geographic position and area

The most southerly point of Wilsons Promontory, in latitude 39° 08′ S., longitude 146° 22½′ E., is the southernmost point of the mainland of Victoria and similarly of the mainland of Australia; the northernmost point is where the western boundary of the State meets the Murray, latitude 33° 59′ S., longitude 140° 58′ E.; the point furthest east is Cape Howe, situated in latitude 37° 31′ S., longitude 149° 58′ E. The westerly boundary lies upon the meridian 140° 58′ E., and extends from latitude 33° 59′ S. to latitude 38° 04′ S.—a distance of 451 kilometres.

Victoria covers an area of about 227,600 square kilometres. It is therefore slightly smaller than Great Britain which (if inland water is included) contains 229,900 square kilometres.

The following table shows the area of Victoria in relation to that of Australia, the other States, and mainland Territories:

AUSTRALIA—AREA OF STATES AND TERRITORIES

State or Territory	Area	Percentage of total area
	square kilometres	
Western Australia	2,525,500	32.88
Queensland	1,727,200	22.48
Northern Territory	1,346,200	17.52
South Australia	984,000	12.81
New South Wales	801,600	10.44
Victoria	**227,600**	**2.96**
Tasmania	67,800	0.88
Australian Capital Territory	2,400	0.03
Australia	7,682,300	100.00

Mountain areas

A wedge of mountainous country extends across Victoria; it tapers from the high peaks of the north-east and far east of the State to the western limits of the highlands at the lower Dundas Tableland near the South Australian border. This belt of high country, which includes the Great Dividing Range, separates the Northern, Wimmera, and Mallee plains from the plains and uplands of the coastal areas and forms the watershed dividing the northern flowing tributaries of the Murray River from the southern flowing streams. Further information on the Great Dividing Range in Victoria can be found in Chapter 1 of this *Year Book*.

Considerable physiographic and geological variation occurs in the highlands with granitic intrusives, volcanic complexes, and sedimentary, metamorphic, and tectonic structures all in evidence. Broad plateaux, high plains, and extensive ridge and valley terrain are the chief topographic characteristics with only occasional high peaks and deep gorges occurring. A broad low pass to the north of Melbourne (the Kilmore Gap) provides an easy route across the highlands and this is utilised by the major road and rail links to the north. The Kilmore Gap provides a convenient reference point at which to divide the highlands into eastern and western sections.

Eastern section

The highlands of eastern Victoria consist of strongly dissected and steeply sloping forested country with narrow ridges and deep V-shaped valleys. The area which includes the highest peaks is contiguous with the Kosciusko massif in New South Wales, but the Victorian mountains lack the clear evidence of past glacial activity that can be found in limited areas of Kosciusko. Frost weathering has been intensive at higher elevations and some spectacular accumulations of weathered rock occur as block streams or rock rivers such as at Mt Wombargo near the headwaters of the Murray River.

The high country is not typically alpine in character: sharpened peaks and precipitous bluffs are rare, although the Cobberas, The Bluff, and the Mt Buffalo gorge all have impressive cliffs. One distinctive feature of the generally dissected mountain landscape is the High Plains country. Flat to gently undulating topography at elevations of 1,300 metres and above occurs, for example, as the Nunniong, Bogong, and Dargo High Plains, and the High Plains of the Snowy Range. These plains are remnants or residuals of formerly more extensive upland surfaces and include many different rock types—the basalts of the Bogong and Dargo High Plains being two of the best known.

Although snow capped for the winter season with a snow line at about 1,000 metres, even the highest peaks—Mt Bogong (1,986 metres) and Mt Feathertop (1,922 metres)—become free of snow in summer.

Western section

The highlands here are of much lower relief than the eastern section and in places lack the clearly defined watershed of the eastern ranges. A notable feature is the concentration of volcanic activity (Newer Volcanics) extending from just north of Melbourne to the Ballarat district in the west. Over 200 eruption points have been identified with many of

the lava flows now forming ridges which bury the pre-volcanic stream channels and give rise to auriferous deep leads (gold bearing gravels). Diversion and modification of river courses by lava flows has led to the formation of waterfalls, for example, on the Coliban River at Trentham Falls where the river runs across lava and cascades over 20 metres onto bedrock.

The following table lists some of Victoria's highest mountains:

VICTORIA—HEIGHT OF SELECTED MOUNTAINS
(metres)

Mountain	Height	Mountain	Height
Bogong	1,986	Niggerhead	1,843
Feathertop	1,922	McKay	1,843
Nelse North	1,883	Cobberas No. 1	1,838
Fainter South	1,877	Cope	1,837
Loch	1,874	Spion Kopje	1,836
Hotham	1,861	Buller	1,804

The most rugged section of highland in western Victoria is The Grampians, a series of resistant sandstone ridges etched out by differential weathering and removal of softer siltstones and shales. The highest peak, Mt William (1,167 metres), has a spectacular easterly facing escarpment and a broad plateau-like summit surface. The Grampians form a major water catchment for the Wimmera and Glenelg systems and provide recreation and wildlife preservation opportunities.

Coastline

The Victorian coastline comprises many types of environments. Broad sandy beaches and impressive cliffed headlands along the ocean coast contrast with mangrove-fringed mudflats and marshland of the sheltered embayments and estuaries. There are approximately 1,200 kilometres of ocean coast between Cape Howe and the South Australian border; in addition three large embayments—Port Phillip Bay (260 kilometres), Western Port (140 kilometres), and Corner Inlet (80 kilometres)—partially enclose protected waters and provide opportunity for port and harbour development.

Much of the ocean coast is exposed to high wave energy from strong and regular ocean swells and storm wave activity generated in the Southern Ocean. In western Victoria, swells arrive predominantly from the west and south-west, while the coastline of eastern Victoria (particularly east of Wilsons Promontory) is subject to swell from the south-east across the Tasman Sea. The shape of the long gently curving Ninety Mile Beach from Corner Inlet to Lakes Entrance is determined by wave action from this swell.

Three general coastal types may be recognised: cliffed coasts, sandy coasts, and salt marsh and swamp coasts. The most extensive cliffed section is west of Port Phillip Bay from Torquay to Warrnambool, including a zone where the Otway Ranges lie adjacent to the coastline. The sandstone rocks of the Otways generally dip seaward and form steep cliffs, commonly with a level rock bench called a shore platform lying between high and low tide marks. Intricate weathering and erosion forms develop, etching out details of rock structures in the cliffs and platforms. Along this sector, sandy beaches are rare, being confined to small embayments or river mouths and often containing a high component of gravel.

West of Cape Otway to Warrnambool and particularly from the Gellibrand River to Peterborough is a spectacular cliffed coastline cut into soft horizontally bedded limestones and clay rocks. Wave action has eroded along fractures and weaknesses in the rock to produce near-vertical cliffs up to 60 metres high and forming blowholes, arches, and isolated rock stacks. Many of these features may be observed in the Port Campbell National Park.

High cliffed sectors are formed in volcanic rocks near Portland where Cape Duquesne and Cape Bridgewater illustrate many of the features associated with volcanic explosions and lava flows. As well, the coast at Cape Schanck and the ocean coast of Phillip Island is cliffed into layers of early Tertiary lava flows. Along the Gippsland coast sandstones form high cliffs at Cape Paterson and Cape Liptrap, while the plunging cliffs of Wilsons Promontory are of granite. Shore platforms occur in both the sandstone and the volcanic rocks but no such feature is found along the granite sectors.

Sandy beaches backed by extensive dune topography extend around Discovery Bay in far western Victoria. In many places these sand ridges are actively eroding and sand is spilling and blowing inland to cover coastal vegetation. Similar erosion is noted along the Ninety Mile Beach and on the sandy beaches and dunes further east between Lakes Entrance and Cape Howe.

Estuary and lagoon systems occur at river mouths or where embayments have been partially or wholly enclosed by sand. Rivers such as the Snowy, the Barwon, and the Glenelg have lagoons occupying their lower reaches and the river mouth may be constricted by the growth of sandy spits. These may be breached and modified by flood discharge: in the floods of early 1971 the Snowy River shifted its outlet over one kilometre to the west by breaking through the dune-capped barrier that deflects the entrance eastward of Marlo.

The Gippsland Lakes are an extensive lagoon system enclosed behind broad sandy barrier systems. In the sheltered lake waters deposits of silt and mud have accumulated among the reed swamps at the mouths of rivers to form long silt jetties or deltas. The largest of these, the Mitchell delta, and its companion at the mouth of the Tambo River are no longer extending, but are subject to erosion by wave action.

In the shallow and sheltered waters of Western Port and Corner Inlet, mangrove swamps and salt marsh form a broad coastal fringe. Creeks and channels cross the soft, sticky mud-flats exposed in front of the mangrove fringe and form intricate patterns of tidal drainage. Smaller areas of mud and mangrove occur in the estuaries of the Barwon River and the Tarwin River; in the latter, the rapid spread of an introduced, salt-tolerant plant *(Spartina anglica)* is of particular interest.

Physical divisions

The chief physical divisions of Victoria are shown in Figure 4 on page 57. Each of these divisions has certain physical features which distinguish it from the others, as a result of the influence of elevation, geological structure, climate, and soils, as is recognised in popular terms such as Mallee, Wimmera, Western District, and so on. The following is a table of these divisions:

1. Murray Basin Plains:
   - *(a)* The Mallee
   - *(b)* The Riverine Plains
   - *(c)* The Wimmera
2. Central Highlands:
   - A. The Eastern Highlands
   - B. The Western Highlands:
     - *(a)* The Midlands
     - *(b)* The Grampians
     - *(c)* The Dundas Tablelands
3. Western District Plains:
   - *(a)* The Volcanic Plains
   - *(b)* The Coastal Plains
4. Gippsland Plains:
   - *(a)* The East Gippsland Plains
   - *(b)* The West Gippsland Plains
5. Southern Uplands:
   - *(a)* The Otway Ranges
   - *(b)* The Barrabool Hills
   - *(c)* The Mornington Peninsula
   - *(d)* The South Gippsland Highlands
   - *(e)* Wilsons Promontory

Murray Basin Plains

These plains include the areas commonly known as the Mallee, the Wimmera, and the Northern Plains or Riverine Plains. The plains are effectively subdivided by a north-south fracture known as the Leaghur Fault which runs sub-parallel with the Loddon River immediately west of Kerang.

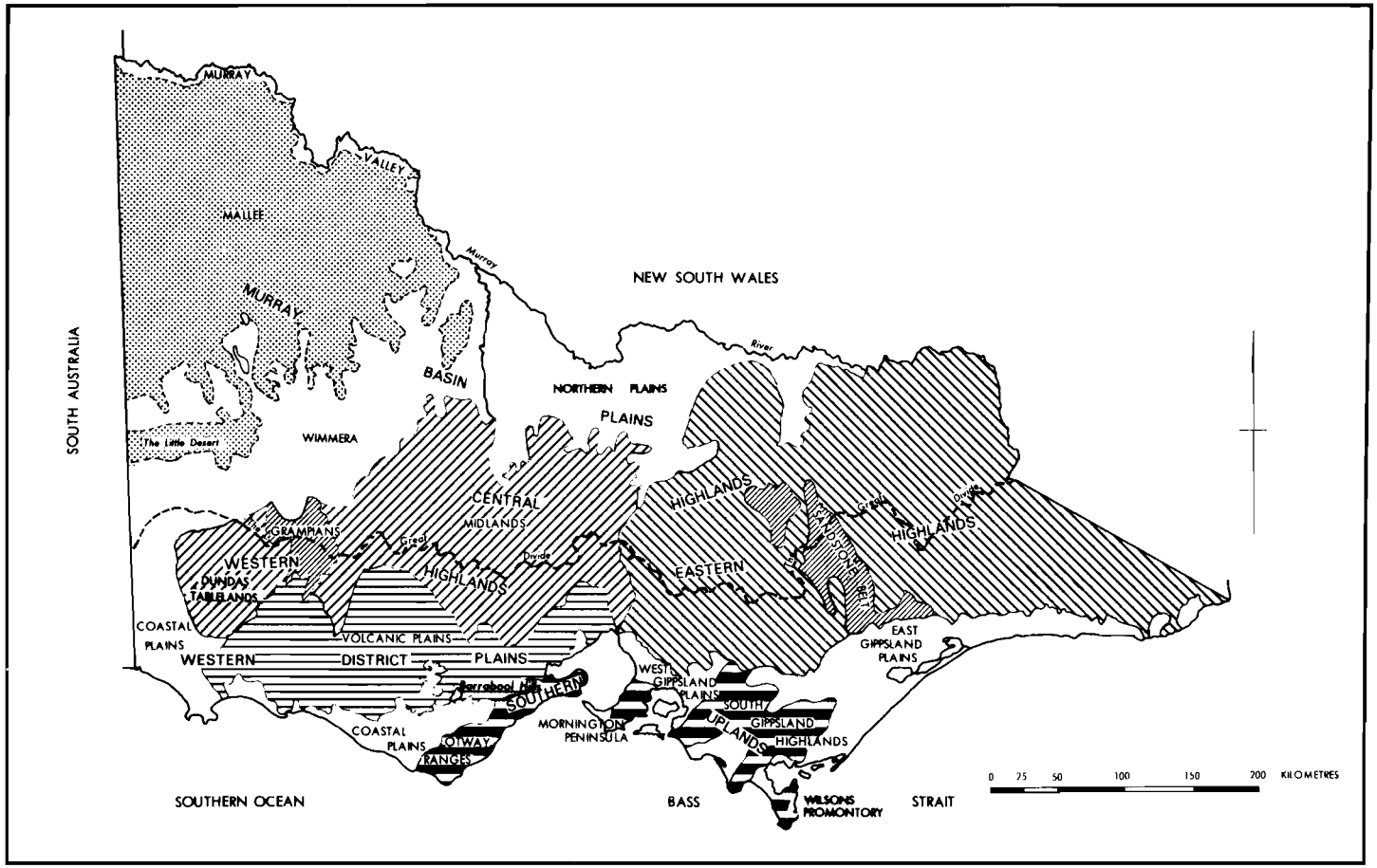

FIGURE 4. Physiographic divisions of Victoria.

From the Murray River to the Central Highlands, eastwards of the Leaghur Fault, is the remarkably flat landscape of the Riverine Plains, which are coalescing alluvial plains of the Murray, Loddon, and Campaspe Rivers, formed by fluvial sedimentation. Crossing the Riverine Plains is an extensive system of dry abandoned stream courses known as prior streams.

West of the Leaghur Fault the landscape and soil are very different. Here the *Mallee* country starts, with its surface cover predominantly of fine sands. Parallel north north-east to south south-east orientated Pliocene beach ridges or dunes which ripple the landscape are the basic landscape element of the Mallee, and formed on the margin of a retreating sea. Hollows between these ridges are partly filled by Pleistocene fluvio-lacustrine clays; the ridges are partly obscured by younger east to west orientated longitudinal dunes, parabolic dunes, and sand plains. Of significance are areas of groundwater discharge such as the gypsum playas and salinas, as exemplified by Lake Tyrell.

The Mallee is the marine plain from the former Murray Basin, with a veneer of wind-blown sands overlying fossiliferous marine Tertiary sands and silts, which reach eastwards to the Gredgwin Ridge on the Avoca-Loddon divide near Kerang. Westward of the Loddon River all the Mallee streams, because flow volumes are low and percolation and evaporation high, fail to reach the Murray River and terminate in brackish or saline shallow lakes commonly bordered by lunettes.

The *Wimmera* is essentially the low alluvial fans, alluvial plains, and abandoned river channels lying between the Western Highlands and the Murray Basin or the Mallee, as the sand-strewn surface of this basin is commonly known.

Central Highlands

Extending east to west across Victoria is a mountainous and hilly backbone known as the Central Highlands. In eastern Victoria, it is rugged and mountainous, and with plateau-like features commonly capping elevated mountain areas. Known as the *Eastern Highlands,* these mountains in eastern Victoria attain elevations of above 1,800 metres at the highest points such as Mt Bogong and Mt Hotham, and elevations of at least 1,200 metres are common. The major rivers of Victoria with high flow-rates, with the exception of the Glenelg River, all rise in the Eastern Highlands, and characteristically show steep-sided deep and narrow valleys. Residuals of Lower Tertiary basalts occur in the Eastern Highlands, filling old valleys as at the Dargo High Plains and the Bogong High Plains.

The topography of the Eastern Highlands has been strongly influenced by the variety of rock types and structures present. Thus a flat-topped and step-like landscape is found in the hard almost flat-lying Upper Devonian sandstones and rhyolites between Briagolong and Mansfield; plateaux are preserved in granite at Mt Buffalo and the Baw Baws; and lower elevations with dendritic drainage are generally seen in areas of folded Lower Palaeozoic mudstones.

The *Western Highlands,* in contrast to the Eastern, are much lower in elevation and generally are subdued hills rather than mountains. Rugged areas are mostly found only near fault scarps. The general elevation reaches a maximum of about 600 metres at Ballarat, but elevations are usually considerably less. Resistant masses of igneous rocks such as Mt Macedon and Mt Cole rise well above the general level, but fall well short of the main peaks in the Eastern Highlands. Extensive flat and only slightly dissected areas of basalt from the Upper Tertiary cover parts of the Western Highlands, conspicuously in the Ballarat area where they have yielded rich soils, and above the basalt flows rise prominent eruption points such as Mt Warrenheip near Ballarat.

The Grampians, sharp-crested strike ridges of hard sandstone reaching 1,200 metres in height, are prominent mountains rising far above the declining general level of the highlands as they trend westwards. The westerly extremity of the Western Highlands is the Dundas Tablelands, a warped plateau reaching to Dergholm, formed in contorted Lower Palaeozoic rocks capped with laterite and dissected by the Glenelg River system.

Valleys in the Western Highlands are generally broad rather than deep, apart from where rejuvenating movements have occurred along fault scarps to cause, in some cases, gorges.

The Central Highlands owe their elevation—and relief caused by resultant erosion—to varied upwarping movements and faulting during Tertiary time.

Western District Plains

The Western District Plains stretch westwards from Werribee to Camperdown, Hamilton, and Portland. They subdivide naturally into volcanic plains and coastal plains.

Volcanic Plains

With an area of 2,300 square kilometres, the Volcanic Plains are the third largest volcanic plains in the world. They begin at an east-west line through Colac and Warrnambool and reach northwards to the foot of the Grampians.

The Volcanic Plains are almost horizontal, with only a slight southward inclination, and are composed of Pliocene to Holocene basalt flows and some basaltic ash. The Camperdown area shows extensive minor irregularities known locally as "Stony Rises", formed by lava collapse during solidification; these are so young that they are unmodified by erosion and soil formation. Volcanic cones, frequently of scoria, rise sharply from the plains as at Mt Elephant (394.4 metres) and Tower Hill (98.4 metres), and to some cones can be traced extensive areas of basalt. Much of the scoriaceous basalt of the "Stony Rises" can thus be linked with Mt Porndon (289.2 metres). Crater lakes in some cones occupy craters formed by explosive vulcanism.

The plains are crossed by some streams such as the Hopkins River with narrow incised valleys, but much drainage is internal, with precipitation finding its way to shallow lakes and underground.

Coastal Plains

Coastal plains, interrupted by the Otway Ranges, extend from Torquay to Warrnambool and northwards to Colac. They are flat or undulating, and are essentially the uplifted surface of Tertiary sedimentary rocks, including limestones, partly dissected by streams and commonly veneered with Quaternary dune limestone and sands. The limestones beneath the plains are cavernous, and are high yielding aquifers for groundwater. A broad coastal plain, bounded by a fault-scarp to the north-east, extends to the west and north-west from Portland.

Gippsland Plains

As a planar surface, the Gippsland Plains begin near Yallourn and Port Albert, and spread eastwards to the Bairnsdale area, between the ocean and the Eastern Highlands. Further east, through Orbost to Cann River, they form coastal downs—a dissected coastal plain—rather than a plain.

West of Yallourn, the Gippsland Plains continue, but they are fractured by late Tertiary block faulting to give the Moe Swamp and the Western Port Sunkland down faulted blocks, and uplifted areas such as the Drouin block and the Haunted Hills which are now maturely dissected. Faulting is responsible for related plains bordering the South Gippsland coast in the Wonthaggi area and landward from Cape Liptrap.

The present plains are the upper surface of a Tertiary and Quaternary basin, in which thick sequences of marine and fresh-water sediments have accumulated, including the major brown coal seams of the La Trobe Valley. The plains are generally covered with piedmont-type sands, sandy clays, and gravels, which originated from the Eastern Highlands during the final late Tertiary movements which elevated them to their present height, and into these gravels the streams have cut broad alluvium-filled valleys with flights of terraces that can be traced back into the Highlands.

A former coastline can be recognised behind the present coastline in the Bairnsdale-Lakes Entrance area. The conspicuous Ninety Mile Beach is a barrier bar which has cut off some of the Gippsland Lakes from the sea, and both spits and islands inland from the beach betray a complex history of barrier formation and erosion related to changed sea levels. Present-day coastal dunes are prominent along sections of the Ninety Mile Beach, and earlier dunes and beach ridges are found on the barriers; earlier dunes are even found north of Woodside and east of Stratford.

Southern Uplands

South-west of the Gippsland Plains is a steep mountainous region, the Southern Uplands, formed by upwarping and faulting, and separated from the Eastern Highlands by the westerly extension of the Gippsland Plains appropriately named by J.W. Gregory as the "Great Valley of Victoria". These mountains, together with the Barrabool Hills near Geelong and the Otway Ranges, are formed of freshwater Cretaceous sandstones and mudstones, and all display a characteristic rounded topography, due in part to very extensive land-slipping and structural weakness in these rocks.

Areas of weathered basalt from the Lower Tertiary are found on the Uplands in plateau-like form at Thorpdale and Mirboo North in South Gippsland, and many smaller remnants are found elsewhere in these ranges; the basalts yield rich soils.

The Otway Ranges similarly originated by upwarping and faulting during Tertiary time.

A further element in the Southern Uplands is the Mornington Peninsula, which is a raised fault block of Palaeozoic granites and sedimentary rocks separating the downwarped Western Port Sunklands and the Port Phillip Sunklands. A subdued spit of calcareous dune rock extending westwards from the Peninsula to Portsea almost closes Port Phillip Bay.

Land surface of Victoria

The present topography of Victoria is the result of interaction between the rock types present, themselves events in geological history, changes in elevation and deformation recorded in that history, processes such as weathering and erosion—including climatic effects—and the stage of development reached by these processes. Hard resistant rocks, for example, will after prolonged erosion tend to stand out in relief, whereas softer more weathered rocks will be topographically more depressed. Over extensive lengths of geological time without major sea-level changes, erosion will tend to wear down a land mass to a surface of low relief—known as an erosion surface—not far above sea-level. In the highlands of Victoria remnants of several such erosion surfaces can be recognised as plateau-like features raised to elevations of hundreds of metres by uplifts.

Jurassic erosion surface

In the Eastern Highlands, plateau remnants are widespread as, for example, the Cobberas, the Mt Hotham area, Mt Buffalo, the Snowy Plains, Mt Wellington, and the Baw Baw Plateau: they are all in hard rocks such as granite, rhyolite, and massive sandstone. These plateau remnants, and ridge tops at similar levels are relics of the most ancient landscape or erosion surface preserved in Victoria. They are the surviving parts of a sub-planar surface which was close to sea-level in Jurassic time, before uplift and warping late in the Jurassic commenced its destruction, and began to form troughs or sedimentary basins in which the sediments represented in the Otways and the South Gippsland Highlands were deposited during Cretaceous time. These upwarps had already begun to define the Central Highlands.

Later evolution

Uplift and downwarping continued intermittently during Tertiary time, with the development of sedimentary basins such as the Murray Basin in north-west Victoria and the Gippsland and Otway Basins in southern Victoria. In the basins was deposited detritus carried down by streams from the rising Highlands, and in swamp conditions great thicknesses of brown coal were laid down in the Gippsland Basin. Deep valleys were cut into the Central Highlands, which were then lower than their present height; in some of these valleys gold-bearing gravels were deposited. Parts of the landscape and some of the valleys were filled with Lower to Mid-Tertiary basalts.

Erosion proceeded to advanced stages during parts of the Tertiary Period, as attested by remains of younger erosion surfaces, preserved at lower levels than the Jurassic erosion surface on the Kinglake Plateau, the hill summits immediately east of Melbourne and around the Dandenong Ranges to Gembrook, and elsewhere in the Central Highlands.

By Miocene time, downwarping movements were at their maximum. Embayments of the sea covered much of Gippsland, the Port Phillip Basin, an extensive area of western Victoria south of Lismore and the Grampians (the Otway Basin), and north of the Grampians the Murray Basin spread as far as Broken Hill, New South Wales. The record

of this transgression is left in limestones and other sedimentary deposits. Retreat of the sea towards its present position during the Pliocene was accompanied by further uplift of the Central Highlands, leading to further erosion, valley deepening, and the accumulation of extensive sheets of sands, clays, and gravels both on the lowland plains and as piedmont gravels on the spurs leading down to the lowlands.

The Upper Tertiary and even Quaternary saw vast volcanic activity in central and western Victoria. From Melbourne to Hamilton basalts and tuffs were outpoured and ejected. Flows followed pre-existing valleys in the Western Highlands, burying auriferous gravels as deep leads in the Ballarat district.

Final downwarpings, assisted by the melting of glacial ice at the end of the Pleistocene, led to the drowning which has given Port Phillip Bay and Western Port their present configurations, and concomitant upwarps in the Central Highlands elevated them to their present level.

Changing climate has played a role in this physiographic evolution. Thus the Mid-Tertiary, with the rich flora evident in the brown coals, appears to have been a time of higher rainfall than at present, with the result of larger streams with more erosive power, and changing Quaternary climates are recognised in the changing regimes evident in the former lakes and prior streams of the Riverine Plains.

Further reference: Geology of Victoria, *Victorian Year Book* 1976, pp. 77-80

Hydrology

Water resources

The average annual rainfall over Victoria is about 660 mm. As the area of the State is 227,600 square kilometres, the total precipitation is, therefore, about 148 million megalitres. Only 21 million megalitres appear in the average annual flow of the State's river systems. It is not yet known how much of the remainder soaks underground to recharge groundwater resources, but this will be elucidated by a long-term programme of investigation being carried out by the Victorian Mines Department.

Victoria's surface water resources are unevenly distributed in both space and time. Their distribution in space can be conveniently described by considering the State as being divided into four segments, by an east-west line along the Great Dividing Range and a north-south line through Melbourne. The north-west segment contains 40 per cent of the State's area, and the other three segments 20 per cent each. Surface water resources, represented by average annual river flow, are heavily concentrated in the eastern segments, each accounting for about 40 per cent of the total. The western segments account for only 20 per cent of total flow, with only 3 per cent in the north-west segment.

Quality of stream flow also deteriorates from east to west. Waters of the eastern rivers mostly contain less than 100 parts per million of total dissolved solids. In the western rivers the figure is generally above 500 parts per million, except near their sources, and increases downstream to figures in excess of 1,500 parts per million.

River flows in Victoria exhibit a marked seasonal pattern, and marked variability in annual flow from one year to another and from place to place, affecting the usability of the transitory local surface supplies of fresh water.

Over the State as a whole, about 60 per cent of the average annual flow is accounted for between July and October. In western streams this percentage approaches 75 per cent. Everywhere, flows typically recede in the summer and autumn, at the time of year when water requirements for most uses are at a peak.

Rivers

Topography

The topography of Victoria is dominated by the Great Dividing Range, which extends from a triangular mountainous mass in the east, through the narrower and lower central highlands, and terminates at the Grampians in the west. This divide separates the State and its rivers into two distinct regions: those rivers flowing northwards towards the Murray River and those flowing southwards towards the sea. The only other significant high country within Victoria is formed by the Otways in the south-west and the Strzelecki Ranges in South Gippsland. For further information see Chapter 1 of this *Year Book*.

Geography

Of all the major Victorian rivers, the Snowy River is the only stream not wholly situated within the State, the headwaters of this river being in the Snowy Mountains of New South Wales. The Murray River, although an important water supply source for Victoria, is legally wholly in New South Wales as the State boundary coincides with the southern bank of this stream. (See pages 50–1.)

Of the major northern rivers, all except three flow into the Murray River. The three exceptions—the Avoca, Richardson, and Wimmera Rivers—finish their course at inland lakes in the Wimmera–Mallee region, with the Avoca, on rare occasions, overflowing its lakes system, to reach the Murray River.

Of the major southern rivers, the La Trobe, Thomson, Macalister, Avon, Mitchell, and Tambo Rivers all flow into the Gippsland Lakes system, which is linked with the sea by an artificial cut constructed many years ago for navigation purposes. The Woady-Yaloak River in the west flows to the inland Lake Corangamite, while the remaining southern rivers find their way directly into the sea.

Water availability

The eastern rivers of Victoria, both northerly and southerly flowing and those rising in the Otway ranges, have their sources in high rainfall country and provide abundant water resources, while those in the western portion of Victoria, with the exception of the Glenelg, have limited useful yield and many are frequently dry in summer. In fact, approximately 78 per cent of Victoria's available water resources originate in the eastern half of the State and only 22 per cent in the lower ranges to the west.

Physical properties

The actual physical properties of Victorian rivers differ markedly from the east to the west. Rivers in the far east to north-eastern regions of Victoria flow for most of their journey through mountainous terrain in deep gorges, and then into flood plains, before reaching either the Murray River or the sea. Heavy shingle has been scoured from the bed and banks of these fast flowing mountainous streams and finally deposited downstream in the plain area. Water quality of these streams is clear and free from excessive suspended mud and silt.

Rivers in central and western Victoria, on the other hand, have comparatively short mountainous sections, and for the majority of their length wander sluggishly through undulating to flat country. Velocities of flow are far less than for their mountainous counterparts, and material carried by these streams consists of fine silt and clay which causes the muddy turbid waters, distinctive of these central and western rivers.

For those rivers that flow to the sea, there is a tendency at the river mouth to form sand spits and dunes, with the consequent obstruction of the mouth. Some of the smaller streams become blocked entirely and breach only in times of flood.

Salinity

Rivers in the Eastern Highlands, flowing mainly through heavily timbered mountain tracts, generally have very good quality water suitable for all purposes. In the lower Central Highlands, salinities vary from stream to stream but generally flows are fresh in the winter and spring and slightly saline in the summer and autumn. In the south-west regions of Victoria, catchments consist mainly of grasslands, with scrub regions in the north-west, and streams here are slightly to moderately saline for most of the year.

Flooding

Rainfall throughout Victoria is erratic during the year and hence the majority of the State's rivers are prone to flooding at any time, with rivers in Gippsland often subject to summer flooding. Flooding problems on a number of major streams have been markedly reduced by the construction of dams which, although designed for the supply of water and not for flood mitigation, provide substantial temporary storage above the full water supply level.

VICTORIA—MAIN STREAM FLOWS

Stream	Length	Drainage area	Annual stream flows in million cubic metres				
			Mean	Max.	Min.	No. of years gauged	Site of gauging station
	kilometres	square kilometres					
NORTHERN RIVERS							
Murray	1,926 (from source to Victorian border)	6,527 (upstream of Jingellic)	2,507	6,148	675	90	Jingellic, N.S.W.
Mitta Mitta	286	5,058	1,411	4,256	250	49	Tallangatta
Kiewa	185	1,145	567	2,071	166	94	Kiewa
Ovens	228	5,827	1,312	4,897	221	64	Wangaratta
Broken	193	1,924	227	1,091	19	94	Goorambat
Goulburn	566	10,772	2,211	7,369	145	98	Murchison
Campaspe	246	3,212	236	820	1	78	Elmore
Loddon	381	4,178	235	740	9	85	Laanecoorie Reservoir
Avoca	270	2,624	85	395	3	90	Coonooer
Wimmera	291	4,066	125	589	—	87	Horsham
SOUTHERN RIVERS							
Snowy	162 (in Victoria)	13,421	1,838	4,002	381	43	Jarrahmond
Tambo	200	943	58	121	21	15	Swifts Creek
Mitchell	251	3,903	959	2,834	193	42	Glenaladale
Thomson	209	1,088	400	680	175	50	Cowwarr
Macalister	202	1,891	502	1,533	45	61	Lake Glenmaggie
La Trobe	251	4,144	937	3,240	271	65	Rosedale
Bunyip	63	661	153	304	69	47	Bunyip
Yarra	246	2,328	783	1,494	176	62	Warrandyte
Maribyrnong	183	1,303	107	327	4	49	Keilor
Werribee	124	1,155	92	314	7	63	Melton Reservoir
Moorabool	153	1,114	76	221	1	34	Batesford
Barwon	188	1,269 (excluding Leigh and Moorabool Rivers)	141	328	7	14	Inverleigh
Hopkins	282	1,347	32	127	1	48	Wickliffe
Glenelg	457	1,570	127	540	3	60	Balmoral

Lakes

Lakes may be classified into two major groups: those without natural outlets which are called closed lakes, and those with a natural overflow-channel which may be termed open lakes. For closed lakes to form, annual evaporation must exceed the rainfall: this is the case over most of Victoria.

Closed lakes occur mainly in the flat western part of the State. They fluctuate in level much more than open lakes and frequently become dry if the aridity is too high. For example, Lake Tyrrell in the north-west is usually dry throughout the summer and can consequently be used for salt harvesting.

The level of water in an open lake is more stable because as the lake rises the outflow increases, thus governing the upper lake level and partially regulating streams emanating from it. This regulation enhances the economic value of the water resources of open lakes, but Victoria does not possess any natural large lake-regulated streams. However, there are small streams of this type in the Western District, such as Darlots Creek partly regulated by Lake Condah and Fiery Creek by Lake Bolac.

Salinity is often a factor which limits the use of lake water; even the use of freshwater lakes is not extensive in Victoria due to the cost of pumping. The average salinity of closed lakes covers a wide range depending upon the geological conditions of the catchments and the water level.

Lake Corangamite is Victoria's largest lake. It can be regarded as a closed lake, although during the wet period in the late 1950s it rose to within 1.2 metres of overflowing. The total salt content of the Lake is about 16.32 million tonnes, giving it a salinity somewhat higher than seawater under average water level conditions.

The Gippsland Lakes are a group of shallow coastal lakes in eastern Victoria, separated from the sea by broad sandy barriers bearing dune topography, and bordered on the ocean shore by the Ninety Mile Beach. A gap through the coastal dune barrier near Red Bluff, which was opened in 1889, provides an artificial entrance to the lakes from the sea. However, seawater entering this gap has increased the salinity of some lakes, which in turn has destroyed some of the bordering reed swamp and led to erosion. The Gippsland

Lakes have been of value for commercial fishing and private angling and also attract many tourists.

A number of Victorian lakes and swamps have been converted to reservoirs. Waranga Reservoir is an example of this, as are Lake Fyans, Batyo Catyo, and Lake Whitton in the Wimmera. A good example of lake utilisation is the Torrumbarry irrigation system on the riverine Murray Plains near Kerang in north-west Victoria.

Groundwater resources

Groundwater resources move slowly through pores and cracks in soil and rock and respond sluggishly to seasonal and annual fluctuations in recharge. For this reason, groundwater can be regarded as a generally more reliable source of water through drought periods. However, mapping of resources in terms of depth, yield, and quality is much more complex than the mapping of visible surface resources.

The present position, very broadly stated, is that there are groundwater resources of reasonable quality and yield for domestic and irrigation purposes over about 4,000,000 hectares or about one-sixth of Victoria's area, mainly in the far west and south-west and in alluvial valleys in the north and south-east.

On the other hand, there is about half the State's area, in the central and western sectors, where groundwater is generally not available at qualities better than 3,000 parts per million of total dissolved solids.

Groundwater has played a very important part in providing supplies of water for domestic and stock use in pastoral settlement. It is also used for some isolated town supplies, and is being increasingly used for irrigation, the area irrigated from groundwater now being about 12,000 hectares.

For the future, there are prospects of generally increased use for irrigation, and for the augmentation of town water supplies on the south-west coast, in the Barwon Valley, and in Gippsland. However, these prospects can only be clarified by continuing investigation.

Further reference: Natural Resources Conservation League, *Victorian Year Book*, 1965, p. 47

Survey and mapping

The Division of Survey and Mapping of the Department of Crown Lands and Survey is responsible for the development of the National Geodetic Survey within Victoria; the preparation of topographic maps in standard map areas; the survey of Crown lands under the provisions of the *Land Act* 1958; the co-ordination of surveys throughout the State under provisions of the *Survey Co-ordination Act* 1958; surveys for the Housing Commission, the Rural Finance and Settlement Commission, and other departments and authorities; and the documentation of these surveys.

An Australia-wide primary geodetic survey was completed in 1966, and in Victoria this is continuously being extended to provide a framework of accurately fixed points for the control of other surveys and for mapping. A State-wide network of levels was completed in 1971. The datum, based on mean sea level values around the whole coast of Australia, is known as the Australia Height Datum (AHD), and its adoption obviates the multitude of local datums formerly in use throughout the State. Issued lists of level values on the AHD are in metres.

An official map of Victoria showing highways, roads, railways, watercourses, towns, and mountains, together with other natural and physical features, has been published in four sheets at a scale of 1:500,000. A less detailed map of Victoria is also available in one sheet at a scale of 1:1,000,000. Topographic maps at a scale of 1:250,000 providing a complete map coverage of the whole State have been published by the Division of National Mapping of the Department of National Resources and the Royal Australian Survey Corps. A joint Commonwealth-State Government mapping project, commenced in 1966, is proceeding with the production of topographic maps at a scale of 1:100,000 with a 20 metre contour interval. A number of these maps have been published. The Mines Department and the Forests Commission also contribute to State mapping by publishing maps for geological and forestry purposes.

A series of 26 maps at a scale of 1:25,000 showing streets, rivers, creeks, and municipal boundaries in Melbourne and its suburban area, including the Mornington Peninsula, has been produced. A long-term programme for production of general purpose standard

topographic maps, at 1:25,000 scale with a 10 metre contour interval, has been planned to extend this map coverage over the greater metropolitan area, and to embrace many of the larger provincial centres. Other maps of urban and suburban areas at 1:10,000 scale, showing full subdivisional information, are being prepared of the Mornington Peninsula area; similar maps of various rural centres are on programme in conjunction with Commonwealth Government maps at the same scale required for census purposes.

Large scale base maps have been prepared for rapidly developing areas throughout the State, including the outer metropolitan area, Mornington Peninsula, Ballarat, Geelong, Bendigo, Phillip Island, and a number of other rural areas. These maps were originally compiled at a scale of 1:4,800 (400 feet to 1 inch) with a 5 foot contour interval. However, with the introduction of the metric system, all new maps will be prepared at a scale of 1:5,000, generally with a 2 metre contour interval. The publication *Official Map and Plan Systems Victoria* has been issued setting out the standard format size and numbering systems which have been adopted for the production of maps and plans at the standard scales of 1:20,000, 1:16,000, 1:10,000, 1:5,000, 1:2,500, 1:1,000, 1:500, and 1:250. The systems are based on the Australian Map Grid (AMG), which fulfils the basic principles necessary for the complete integration of surveys.

The Division carries out cadastral surveys of Crown lands for the purpose of defining boundaries and for determining dimensions and areas of reservations and of allotments for the subsequent issue of Crown grants. This information forms the basis for the compilation of county, parish, and township plans, which are published at various scales and show details of the original subdivision of Crown lands. Recently further investigations have been made with the object of introducing a fully integrated topographic-cadastral map and plan system. Although cadastral requirements may result in the publication of plans using an additional range of scales, it will be a fundamental principle that the Australian Map Grid will be the basic framework of their compilation.

As part of its mapping activity, the Department provides an aerial photography service. As part of the Central Plan Office, a Map Sales Centre now operates at 35 Spring Street, Melbourne, where an Aerial Photography Library comprising approximately 300,000 photographs is maintained. Photographs may be inspected and orders lodged for the purchase of prints and enlargements. Maps and plans are also available for purchase from the Map Sales Centre.

Further references: Hydrography, Coastline, *Victorian Year Book* 1966, pp. 33–6; Coastal physiography, 1967, pp. 32–6; Plant ecology of the coast, 1968, pp. 31–7; Marine animal ecology, 1969, pp. 36–40; Marine algae of the Victorian coast, 1970, pp. 39–43; Erosion and sedimentation on the coastline, 1971, pp. 44–6; Conservation on the Victorian coast, 1972, pp. 37–43

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