bents basin state recreation area

resource inventory and preliminary development strategy

department of lands, n.s.w.

RESOURCE INVENTORY AND PRELIMINARY DEVELOPMENT STRATEGY FOR BENTS BASIN STATE RECREATION AREA

Prepared by the Parks and Reserves Division of the Crown Lands Office.

March, 1980.

Study Team: This report was prepared by the following members of the Parks and Reserves Branch, Crown Lands Office:-

Ian M. Garrard:	Scientific Officer, Project Co-ordinator
G. Williams:	Survey Draftsman
J. Francis:	Research Officer
A. Chaplin:	Reserves Inspector
E. Gibbons:	Research Assistant

The team gratefully acknowledges the assistance of the School of Landscape Architecture, University of New South Wales; the N.S.W. National Parks and Wildlife Service; Mr. Doug. Benson of the Royal Botanical Gardens and Mr. Bruce Lay of the Planning and Environment Commission of N.S.W. Their combined knowledge and effort has greatly assisted the collection of this resource inventory. Also the tracing, map production and clerical facilities of the Department of Lands.

TABLE OF CONTENTS

BENTS BASIN STATE RECREATION AREA

RESOURCE INVENTORY

1. INTRODUCTION

1.1 Background to the Inventory

In 1977 the Minister for Lands directed the Crown Lands Office to locate sites suitable for the establishment of State Recreation Areas to serve the Western Suburbs increasing needs for outdoor recreation opportunities. Bents Basin was one of numerous sites investigated and it merited a more detailed resource inventory. Such an inventory was undertaken with the purpose of determining the suitability of Bents Basin to become a State Recreation Area. This document reports the findings of that inventory and upon dedication of the Bents Basin State Recreation Area, will form the basis for the Area's Plan of Management. The Plan of Management simply shows how the park should be used. It details the scheme of operation proposed for the park, the range of outdoor recreation activities to be established and the nature of developments necessary to provide these activities.

1.2 State Recreation Areas

State Recreation Areas are permanent reservations in the form of large parks within the park system of the State of New South Wales.

The main purposes of establishing State Recreation Areas are to:-

- provide large regional parks to which people may come to relax and experience the natural environment;

- provide the opportunity for our predominantly urban society to engage in many and varied recreation experiences in an outdoor environment;

- relieve the recreation pressures on the National Parks of the State, which place more emphasis on conservation;

- establish recreational areas having a regional significance and also to provide parks for the extensive use of tourists and holiday makers; and

- conserve natural areas for the enjoyment and use of present and future generations.

For an area of land and water to qualify for designation as a State Recreation Area it should meet the following criteria:-

- it consists of a large area in a natural setting with the capacity for intensive recreational use in part thereof;

- it contains attractive physical features or areas of particular interest;

- optimum development and management is beyond the scope of local government;

- it contains the resources to provide for recreational use but is also able to serve other compatible uses;

- it is accessible and attractive to the regional population and tourists from other regions;

- it is capable of satisfying the regional recreation needs as identified; and,

- it falls into one of four categories based on the pattern of physical resource use by the community. The four categories are:-

  Coastline areas.

  Water storage areas.

  River valley areas.

  Specific interest areas.

1.3 Existing and Future Recreation Areas

Presently sixteen State Recreation Areas have been established within N.S.W. and offer a wide variety of outdoor recreation opportunities in diverse natural settings. Three parks are located in the Metropolitan Area, four are Coastal, while the balance are located west of the Great Dividing Range. (Fig. 1.1)

The three metropolitan parks - the Lane Cove River, Georges River and Davidson S.R.A.s are designed to service outdoor recreation needs of the well established suburbs of Sydney. Yet the expansion of the outer metropolitan growth areas (viz. Engadine, Heathcote, Camden, Campbelltown, Penrith, Windsor and Hornsby) requires additional park land. It is envisaged that a band of open space and parkland including suitable stretches of the Nepean and Hawkesbury Rivers, National Parks and S.R.A.s be established to supply a diversity of outdoor recreation opportunity. With this purpose in mind, Bents Basin will be the first S.R.A. established in this regional band.

Other proposals currently under investigation include S.R.A.s in the O'Hares Creek Catchment, south-east of Campbelltown, and various sites between Wallacia and Wisemans Ferry.

More than thirty new areas will be designated in the future. Ultimately the system of State Recreation Areas will provide a network of open space regional parks fulfilling the recreation needs of the people of N.S.W.

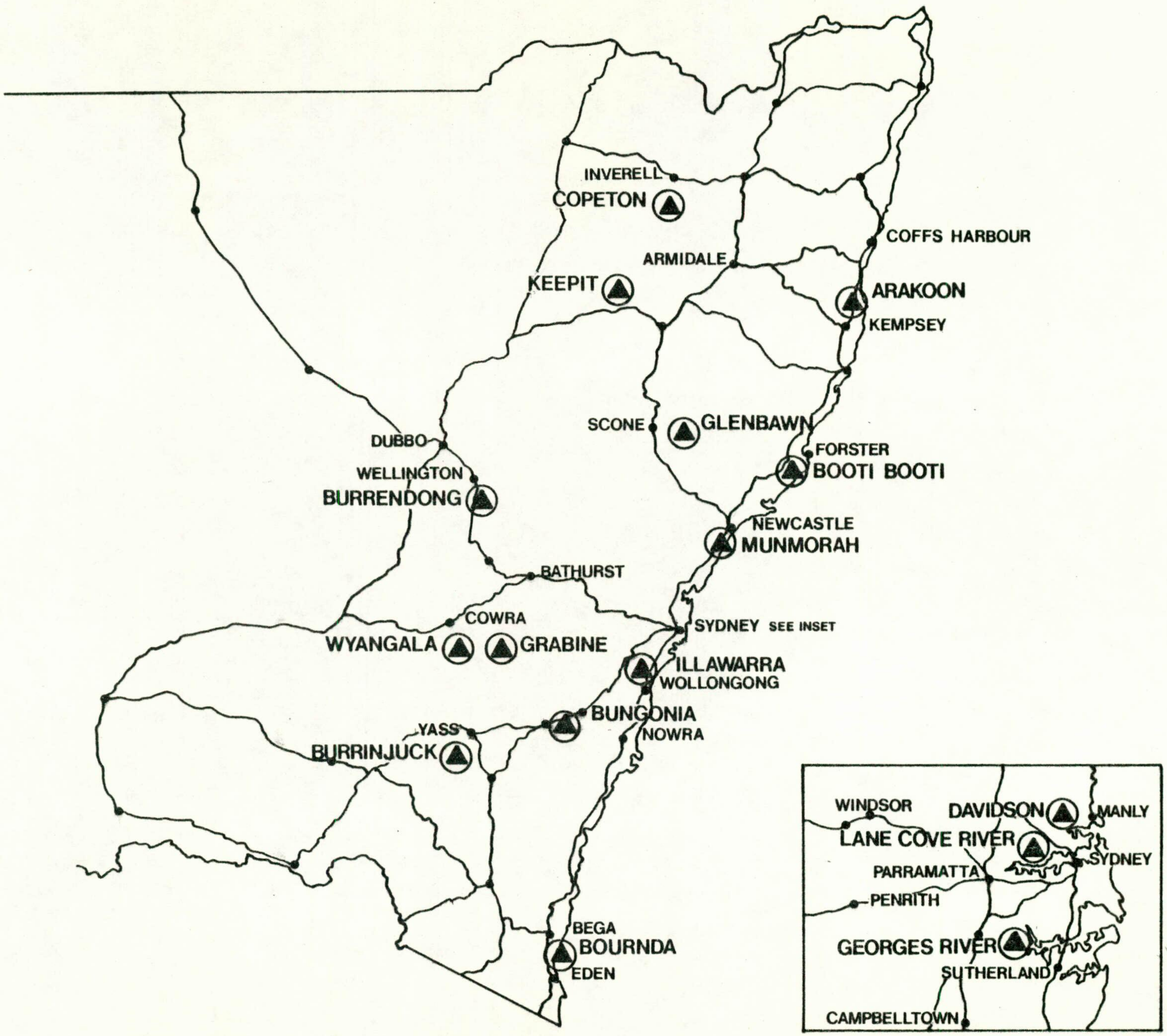


Fig 1-1

existing state recreation areas

N

2. GENERAL DESCRIPTION OF BENTS BASIN

2.1 Synopsis

The Bents Basin State Recreation Area will function as a regional park primarily servicing the outdoor recreation needs of the outer western suburbs of Sydney. The 400 ha. area, located near Wallacia, contains a diversity of landscapes formed by the action of the Nepean River and its tributaries dissecting the surrounding uplifted Hawkesbury sandstone. Adjacent to this uplift area is approx. 20 ha. of pastoral land. The site contains several botanical peculiarities which combine with its scenic and geomorphological qualities to create a valued natural resource.

The recreation value of the area lies in its proximity to the expanding Penrith, Campbelltown-Camden regions which are deficient in water orientated recreational resources. The potential demand generated by these regions and the need to conserve the natural qualities of the park will require precise planning and management to ensure land-use compatibility. Management must stress the provision of resource-based activities in environmentally sensitive areas and must promote a spectrum of recreational opportunities in other suitable locations.

2.2 Location and Area Definition

The proposed Bents Basin State Recreation Area incorporates the Parishes of Bringelly in the County of Cumberland and Warragamba and Weromba in the County of Camden. (Fig. 2.1) It also contains three local government boundaries - City of Liverpool, Wollondilly Shire and the Municipality of Camden.

The land within Bents Basin State Recreation Area will be permanently reserved under the provisions of Sections 37B and 37Q of the Crown Lands Consolidation Act, 1913, and comprises:-

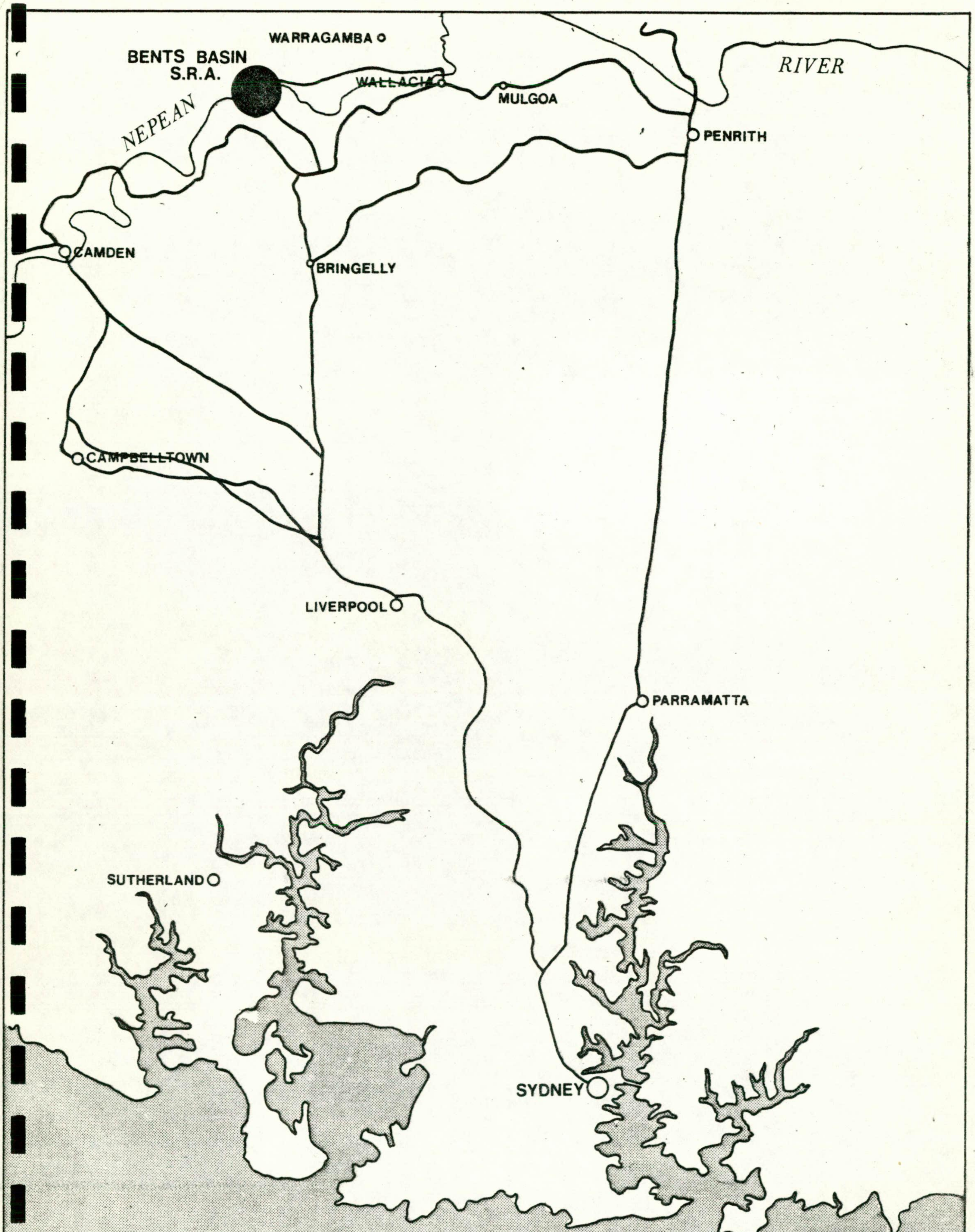
> "All that piece or parcel of land containing about 391 hectares excluding road and Lot 207 D.P. 249320, inclusive of the beds of the Nepean River, Forest Hill Creek, Bushranger Creek and easement for Transmission Line situate in the County of Camden, Parishes of Warragamba and Weromba and County of Cumberland, Parish Bringelly, and shown by black cross hatching in the plan catalogues Ms. 22935 Sy R in the Department of Lands".

The location of the site is shown in the copy of plan Ms. 22935 Sy R (Fig. 2.2). The area is in the process of gazettal.

2.3 History of the Bents Basin Area

The historical significance of the area lies primarily in its formation and aboriginal occupation rather than with European settlement. A number of old dwellings and tracks exist in the surrounding area but these are not of great significance. Contact with the Heritage and Conservation Branch of the Planning and Environment Commission supports this view. The European history of the area is briefly outlined below.

In 1802, the English explorer and botanist George Caley was employed by Sir Joseph Banks to explore and define the course of the Nepean River. In December of that year Caley left Prospect and made his way down to the area which is now known as Bents Basin. He named the spot 'Dovedale' after the



location Fig 2·1

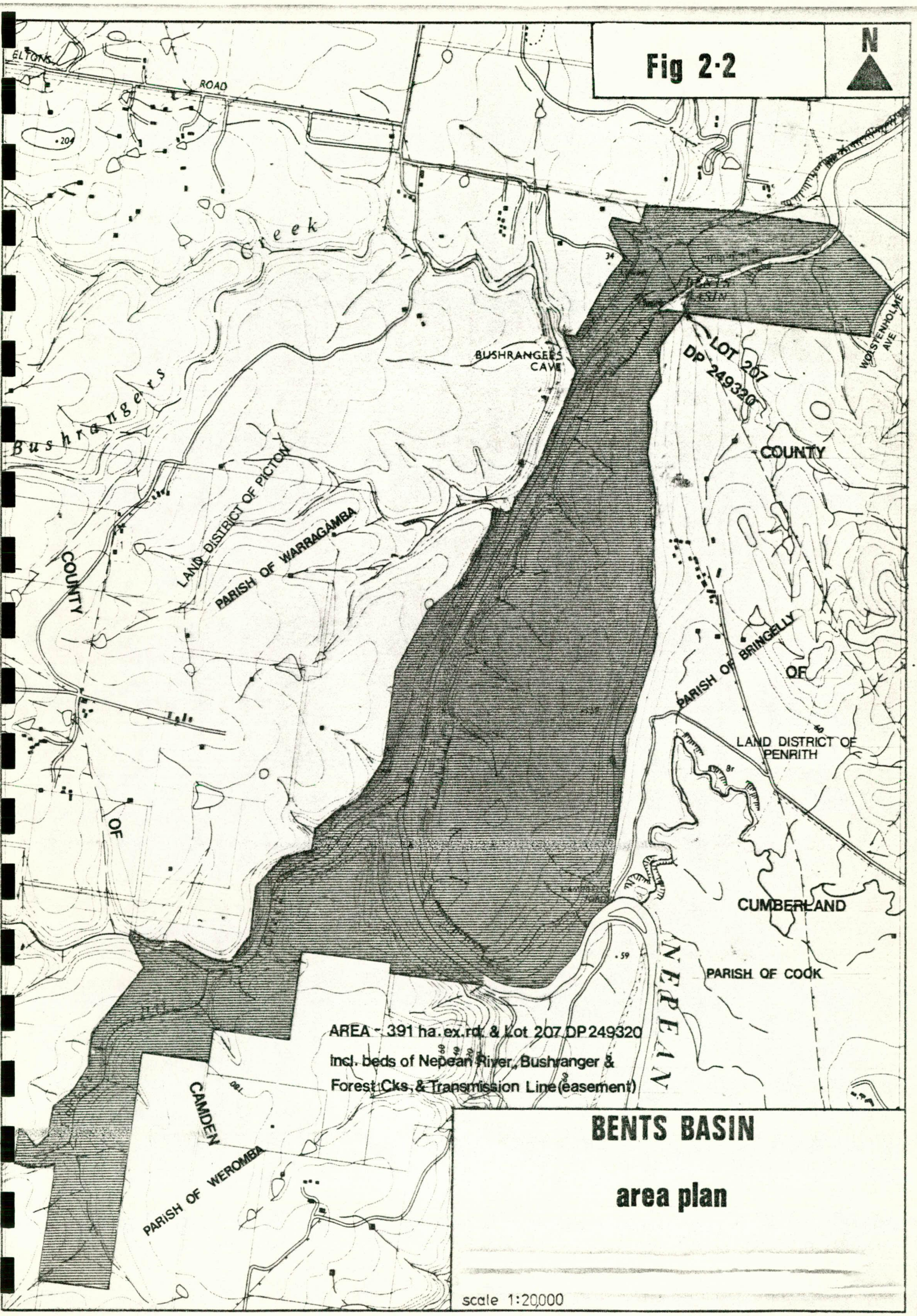


Fig 2·2
N
ELTONS
ROAD
Creek
Bushrangers
BUSHRANGERS CAVE
BENTS BASIN
LOT 207
DP 249320
WOLSTENHOLME AVE
COUNTY OF CUMBERLAND
COUNTY OF CAMDEN
LAND DISTRICT OF PICTON
PARISH OF WARRAGAMBA
PARISH OF BRINGELLY
LAND DISTRICT OF PENRITH
PARISH OF COOK
PARISH OF WEROMBA
NEPEAN
AREA - 391 ha. ex.rd. & Lot 207 DP 249320
incl. beds of Nepean River, Bushranger &
Forest Cks, & Transmission Line (easement)
BENTS BASIN
area plan
scale 1:20,000

valley in Derbyshire, England. Caley returned to 'Dovedale' in 1804 and stayed for two days collecting specimens of plants for the Royal Garden at Kew in England and the Banksian Herbarium in Sydney. These included the plant Hibberta hermaniifolia D.C., which can still be found around the Basin.

Bents Basin was named after Justice Ellis Bent (1783-1815) who became Judge Advocate of N.S.W. in 1809. Justice Bent accompanied Governor Macquarie from England to Sydney and became the first practising Barrister-at-law in Sydney, where he helped establish the Supreme Court and trial by jury. Justice Bent had leased a large area of land covering Bents Basin. (The area covered Portion 11 on Parish of Bringelly map.) He was the original lessee and held an important position in the community which is probably why the Basin was named after him.

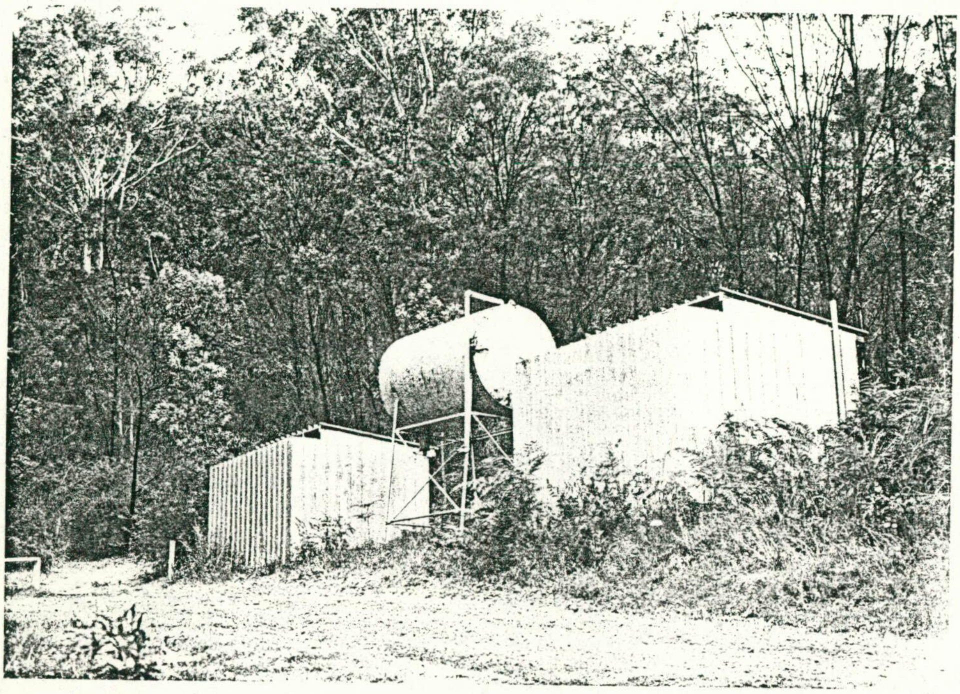
The area is thought to be rich in aboriginal relics though a full investigation has yet to be undertaken. A number of aboriginal paintings and other artifacts have been identified near Forest Hill Creek upstream of the park.

2.4 Land Use

The infertile shallow sandstone based soils covering much of the Bents Basin site discouraged agricultural development. The sections east of the Lapstone monocline are suitable for grazing and cultivation and have been put to agricultural use.

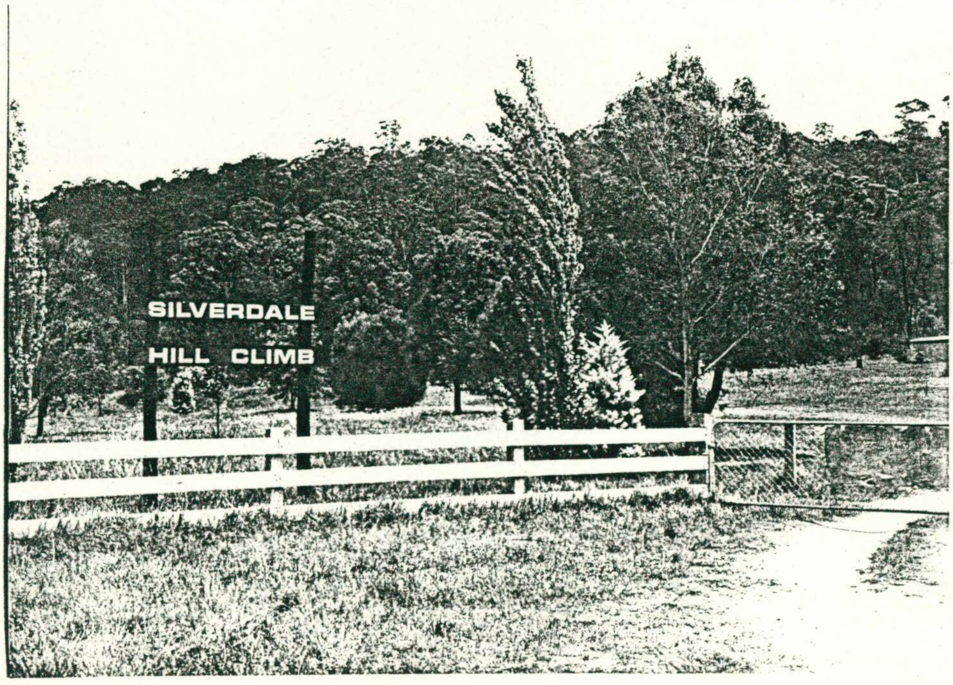
PASTORAL LANDSCAPE

The area surrounding the Basin has a history of recreational use. Direct road access is provided to the Basin, and a car park and toilet block have been constructed.



TOILETS AT BENTS BASIN

SILVERDALE HILL CLIMB



Development has also occurred at the southern end of the plateau. There are derelict shacks on the flat area adjacent to Campbells Ford and on top of the southern plateau. These buildings seem to have been associated with some form of scrap metal business and the areas are still littered with abandoned caravans and refuse.

The land use in areas surrounding Bents Basin State Recreation Area is changing. The predominantly agrarian character persists on the more fertile soils east of the area: including market gardening, horse studs, sheep and cattle grazing. Agriculture on the sandstone areas has taken on a secondary role giving way to residential and recreational usage by clubs and churches, (viz. Silverdale Hill Climb, "Tara" Girl Guide Camp and Shooting Club and hobby farms).

3. NATURAL RESOURCES OF BENTS BASIN

3.1 Access and Roading

Access to the proposed Bents Basin S.R.A. is presently confined to the northern end of the park and is granted by two roads (Fig. 3.1). Access to the Basin itself is via Bents Basin Road which branches off Silverdale Road slightly west of the Blaxland Crossing, Wallacia. Bents Basin Road is sealed for all but the last two of its seven kilometres; in parts the road is in a poor condition but overall, it fulfils its present purpose. Alternatively, access can be gained via Wolstenholme Avenue off the Greendale Road from Wallacia. The last half of Wolstenholme Avenue is sealed.

Vehicular access cannot be gained to Bushrangers or Forest Hill Creeks without crossing freehold land. A similar situation exists to the southern (Campbells Ford) end of the proposed park. Cut Hill Road from Cobbity affords access to within half a kilometre of Campbells Ford before crossing freehold land ("Josma") is necessary. The new subdivision of "Teresa Park" includes the construction of a two lane sealed road to within one and a half kilometres of the southern bank of the Nepean River at Campbells Ford.

A four wheel drive track runs - north to south - from Bents Basin to Campbells Ford, whence a number of side roads originate. This track would adequately fulfil the function of a service road though it needs upgrading for heavier use.

3.2 Landform

The proposed Bents Basin State Recreation Area contains a diversity of landforms (Fig. 3.2) which can be divided into: Bents Basin itself; the undulating pastoral land east of the Basin; the River gorge; the tributary gorge of Forest Hill Creek; the alluvium sand deposits north of the Basin and at Campbells Ford; and the uplifted sandstone plateau.

The elongated sandstone plateau stretches for three kilometres in a north-south direction and reaches a width of one kilometre. To the east it is bound by the Nepean Fault and to the west, north and south by the Nepean River. The plateau rises steeply from the undulating pastoral hills and low-lands to the east (Fig. 3.3), while it slopes gently to the east and west and is incised by numerous small streams. The southern end of the plateau levels out before falling steeply into the River gorge.

Generally the river has a sluggish nature as it flows over the alluvial plains to the north and south of the gorge. The flow increases as the river passes through the narrow, boulder filled confines of the gorge scouring the valley floor. The steep sided gully cuts through the sandstone plateau culminating in the actual Basin formation.

The character of the river changes drastically with its flow rate. In periods of low flow the river literally trickles through the park, moderate flow produces rapids along the river gorge, while in flood the river is literally a raging torrent.

Bents Basin is approximately oval in shape. Its long axis is about 300 metres and it reaches a depth of up to 22 metres. The slow turning action of the river as it enters and leaves the park has formed alluvial deposits. Down-stream of the Basin this deposition has taken the form of a large rectangular

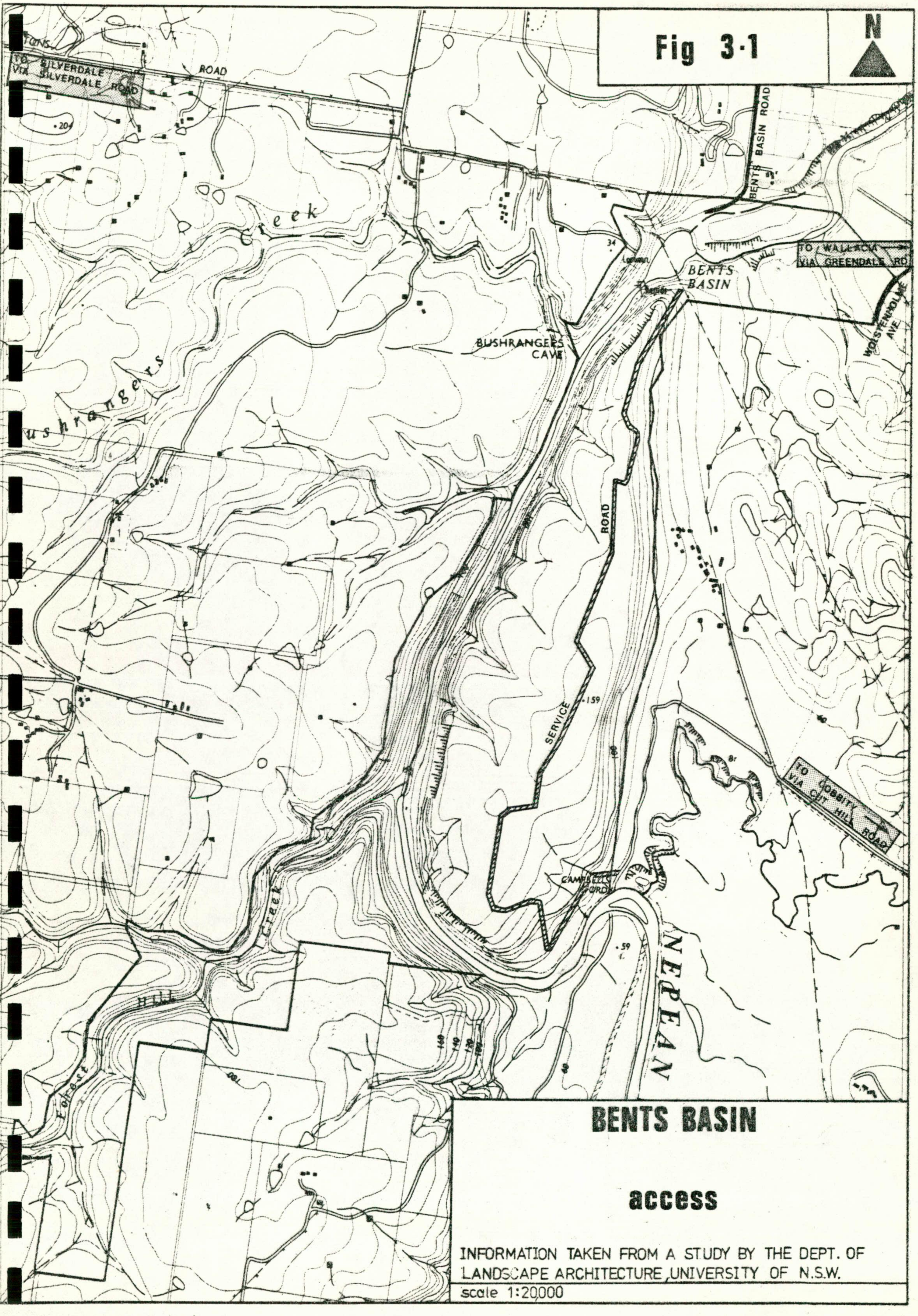


Fig 3·1

BENTS BASIN

access

INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.

scale 1:20,000

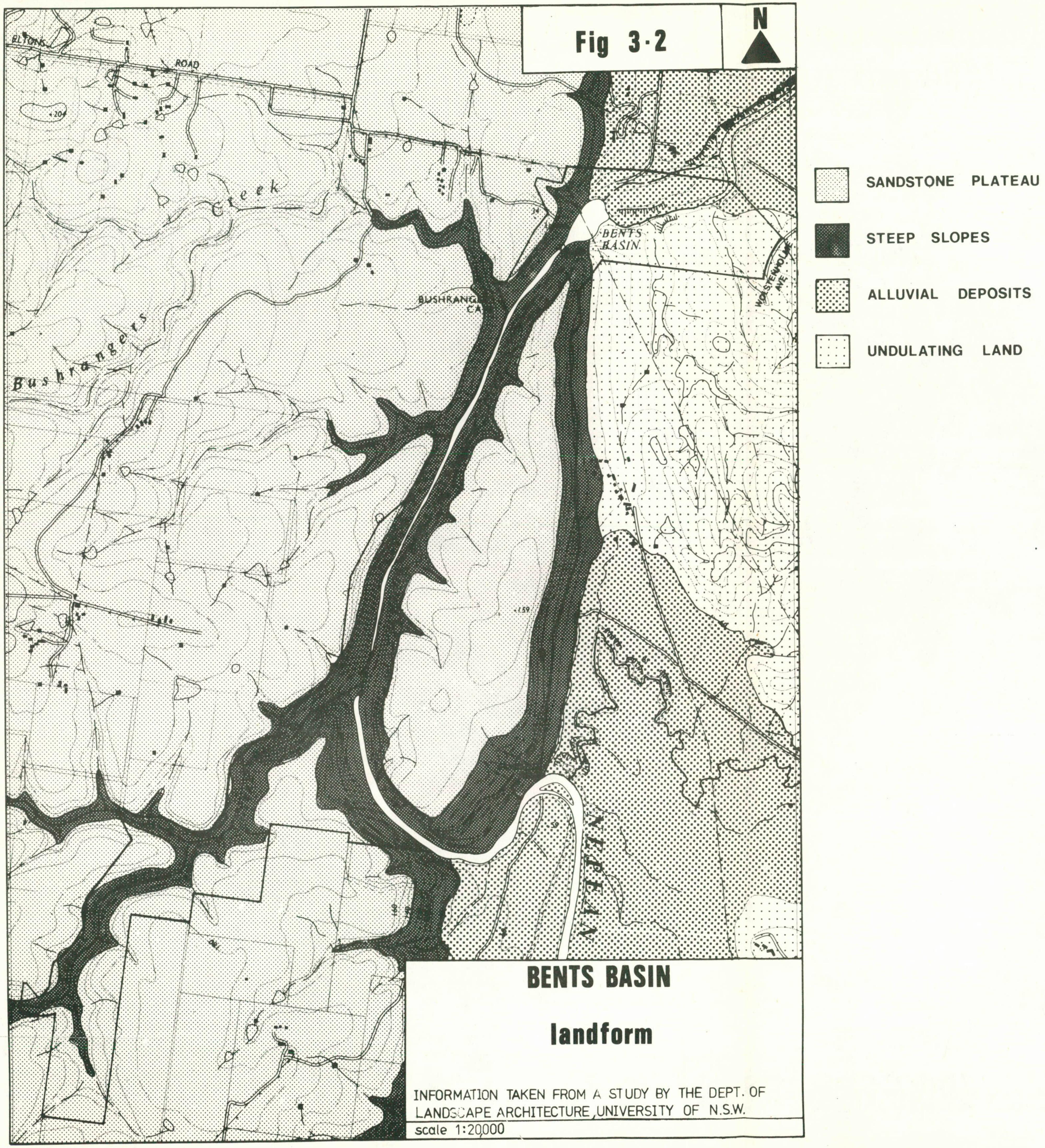


Fig 3·2

BENTS BASIN

landform

INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.

scale 1:20000

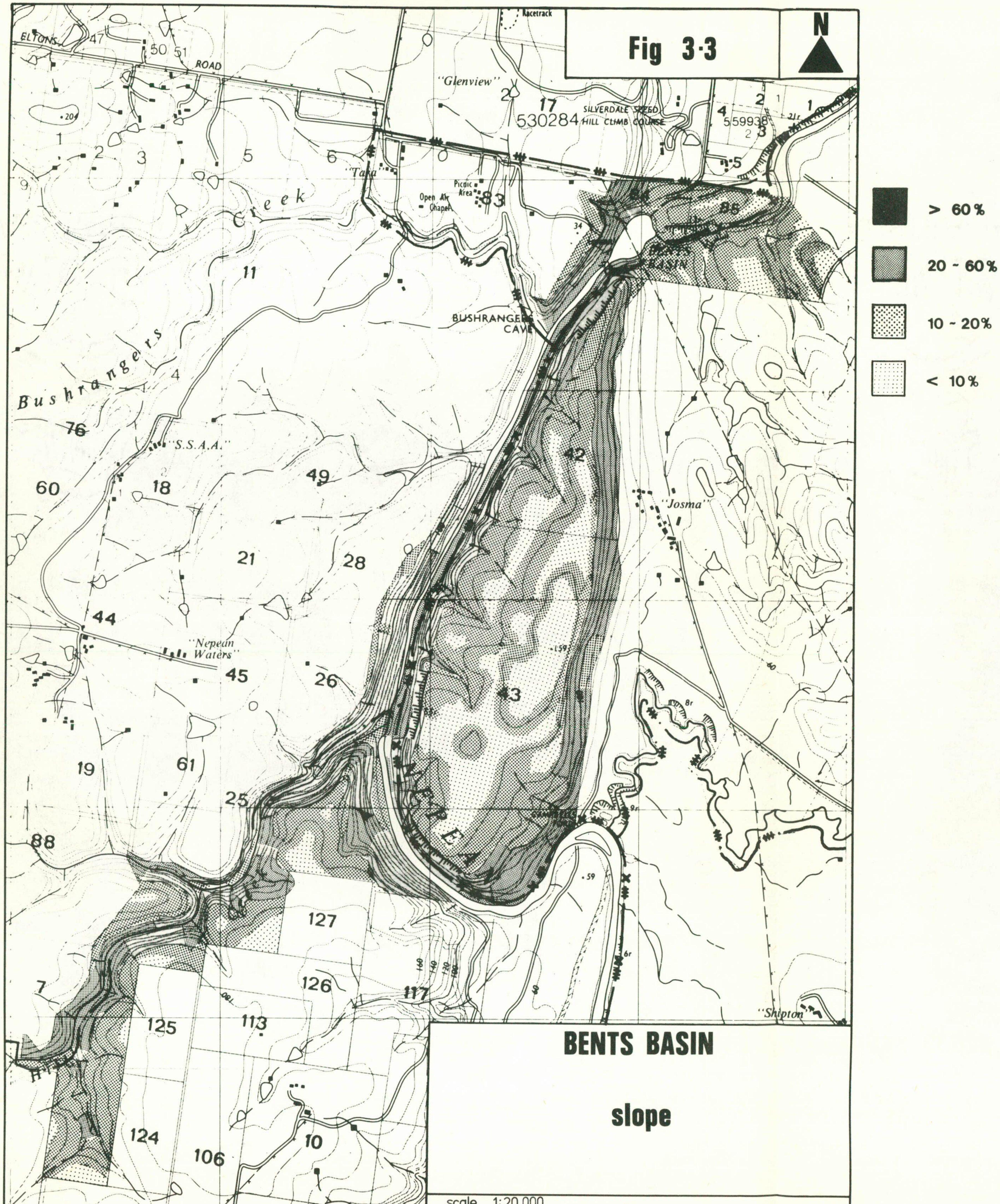
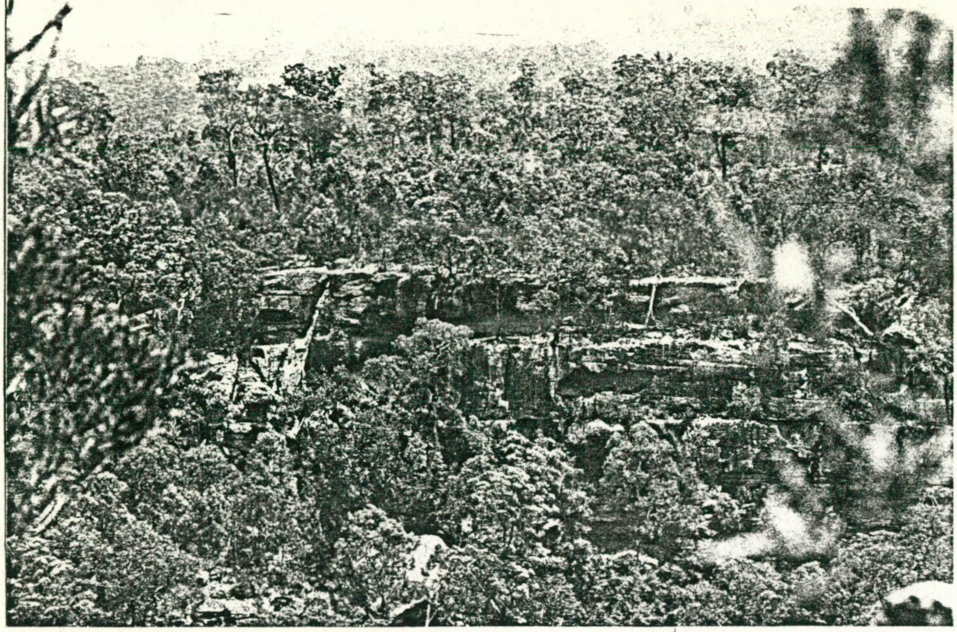


Fig 3·3

BENTS BASIN

slope

scale 1:20,000



ABOVE: UPLIFTED PLATEAU

CENTRE: PASTORAL LANDS

BELOW: BENTS BASIN

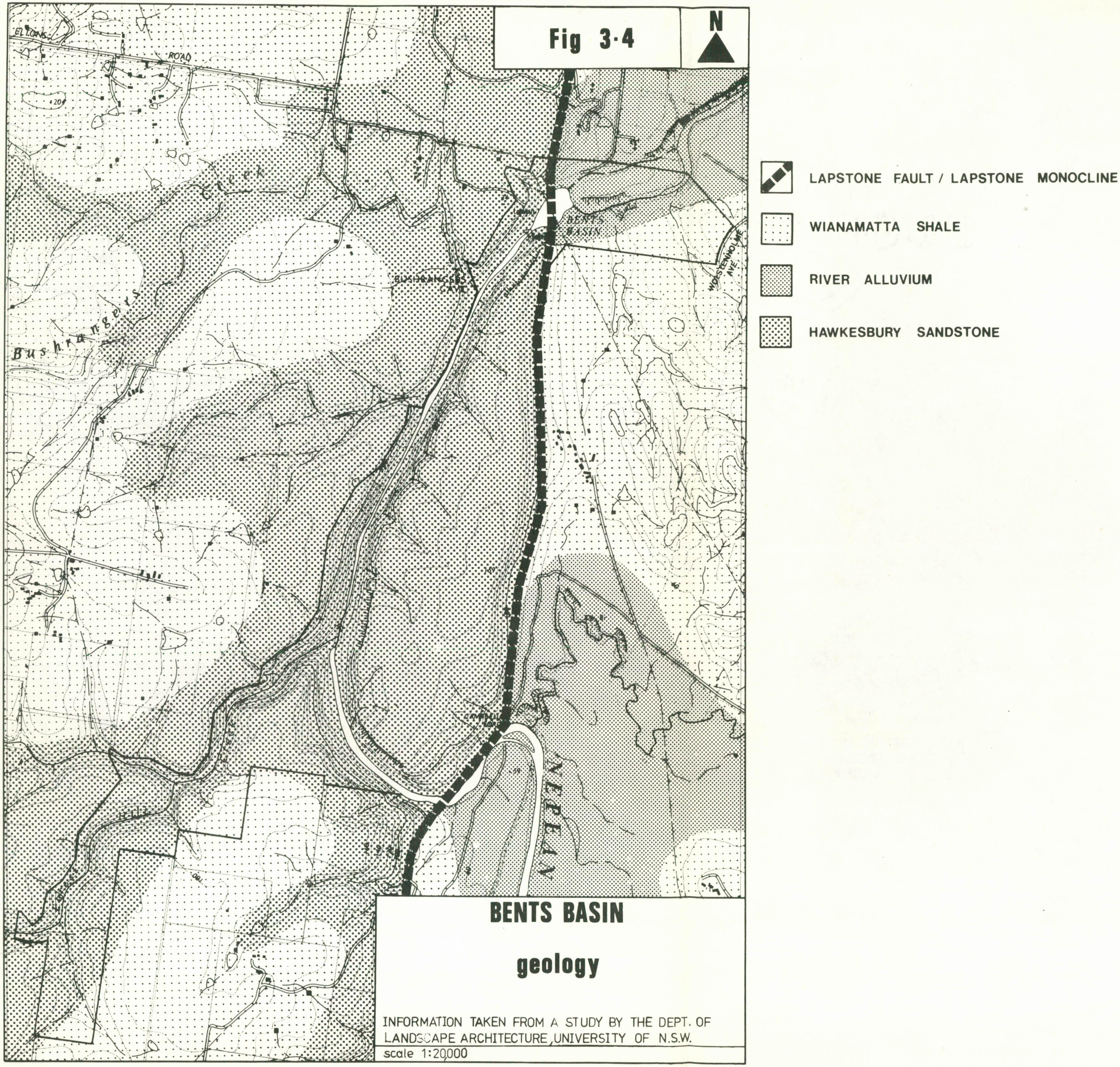


Fig 3·4
N
LAPSTONE FAULT / LAPSTONE MONOCLINE
WIANAMATTA SHALE
RIVER ALLUVIUM
HAWKESBURY SANDSTONE
ROAD
Bushrangers Creek
BENTS BASIN
BUSHRANGERS CAVE
NEPEAN
WOSTENHOLME AVE
BENTS BASIN
geology
INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.
scale 1:20000

sand body reaching five to ten metres above the river which bounds the body's southern and eastern extent. The sand body, 750m in length and 100m wide, bears a flood channel to its west boundary.

To the south of the river, adjacent to the sand bank, is 20 hectares of gently undulating land which differs from the rest of the park and has a history of pastoral use.

Sand deposition at Campbells Ford has created a gently sloping beach and a shoal at the turning point of the river. This beach, with its northern aspect, would be a prime addition to the S.R.A.

The final facets of the park's morphology are created by the three creeks - Bushrangers, Forest Hill and an unnamed creek which drains the area between the gorge and Silverdale Road. The creeks have cut deeply into the surrounding plateau creating steep sides and they are at times, thickly vegetated with Water Gum. Parts of Forest Hill Creek form small pools bounded by vertical rock faces creating miniature "fjord" like landscapes.

3.3 Geology

The geology of the park has been a prime factor in determining the area's character and its ability to accept development (Fig. 3.4). Historically, the shales of the Wianamatta group overlay the Hawkesbury sandstone but the gradual uplifting of the beds followed by the erosion of the shales has exposed the sandstone.

The shales are finely textured with lenses of greywacke and calcareous sandstone. The Hawkesbury sandstone consists of sandstone and conglomerate beds.

The uplifting was great enough to fracture as well as fold the beds hence the dual phrase, Lapstone monocline and Lapstone fault, have been used to describe the area's geological past. The uplifting was extremely slow and thus the Nepean River was able to cut through the sandstone beds without being deflected by the monocline warp.

The area is geologically stable and presents no hazards to development. It would be prudent to avoid construction of buildings over the fault line though this would not affect roads or walking tracks.

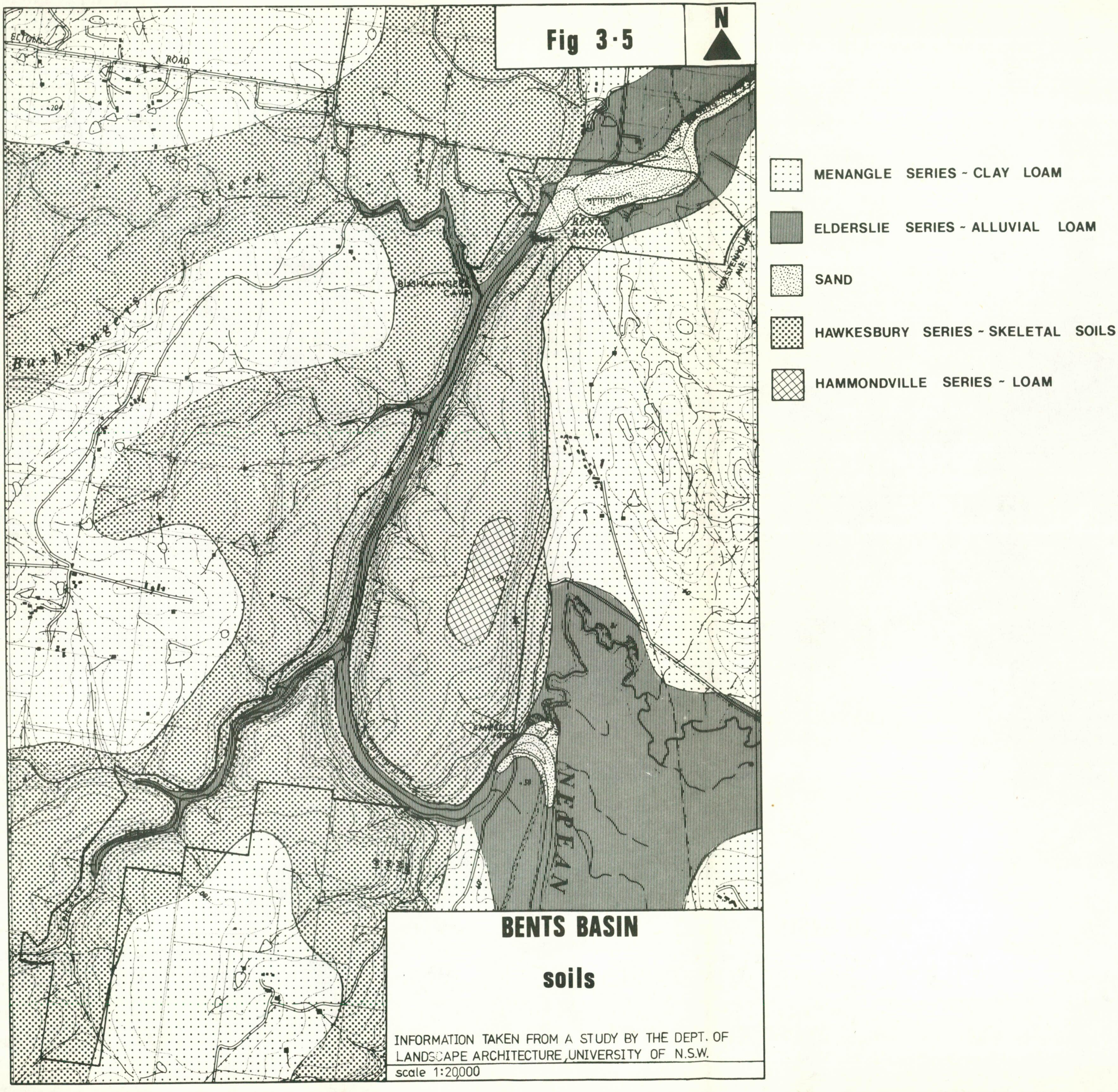
3.4 Soils

The soils covering Bents Basin S.R.A. closely reflect the underlying parent material and the action of the Nepean River (Fig. 3.5). East of the fault (overlaying the Wianamatta shales) are the red brown earths of the Menangle series which are moderately fertile and present no stability problems. Construction of septic systems in these soils should be located as high as possible on the hill sides and avoid any natural springs.

West of the fault is the Hawkesbury sandstone group which give rise to skeletal soils. These soils are shallow infertile yellow podsols, which commonly degenerate into rocky sands. They are susceptible to erosion and may require some stabilisation and planting on walking tracks and service roads on steep slopes.

On the top of the sandstone plateau is a remnant soil derived from the transitional zone between the shale and sandstone. This yellow podsolic soil is of the Hammondville series. It is not generally suitable for septic inputs

Fig 3·5


N
ELTONS
ROAD
Bushrangers Creek
BENTS BASIN
BUSHRANGERS CAVE
WOLSTENHOLME AVE
NEPEAN
MENANGLE SERIES - CLAY LOAM
ELDERSLIE SERIES - ALLUVIAL LOAM
SAND
HAWKESBURY SERIES - SKELETAL SOILS
HAMMONDVILLE SERIES - LOAM
BENTS BASIN
soils
INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.
scale 1:20000

but the good coverage of ironbarks should enable the establishment of small capacity pit toilets in the deeper soil. If larger scale facilities are intended, closer examination of the soil's capabilities will be necessary.

Alluvial loam and sand, derived from sandstone parent material, cover the remaining areas of Bents Basin S.R.A.

Within the main gorge little or no alluvium has been deposited. North and south of the gorge large amounts of material have been deposited on the alluvial plains. These deposits are very deep and structureless and consist of fine sandy red podsolic material. Sand deposits, also of this group, have formed a central island at Campbells Ford and a large sand bank to the north of the Basin.

3.5 Climate

The proposed Bents Basin State Recreation Area is located in a temperate zone receiving about 900 mm of rainfall each year (Fig. 3.6). Discomfort can be expected to occur on about 6 to 8 days a year due to high temperatures and 50 days due to the cold. The average frost season extends for approximately 150 days per annum.

Strong south easterly and south westerly winds occur in winter and can be expected to provide discomfort on the exposed areas of the gorge and plateau. Katabatic winds moving down the River and off the surrounding plateau spill through the gorge and over the lowland areas east of the monocline, causing cold winter temperatures. Relief from summer temperatures is afforded to a degree by moderate north easterlies and this katabatic effect.

In general climatic factors do not constrain the use of the park but require consideration in the siting of recreation facilities.

3.6 Hydrology

The very feature that created the recreation potential of Bents Basin also poses a major constraint to that potential. The Nepean River is subject to periodic flooding which varies widely in extent and frequency.

In consideration of flooding it is prudent to establish the 50 year flood level. This level was calculated on the recorded data at Wallacia covering the last century. On this basis the flood of March, 1978, represented a flood of slightly less than a 50 year return period. A field check of the debris level was made to confirm the extent of the 50 year flood plain. (Fig. 3.7)

Presently there is only one water retention facility on the park - a weir at the southern boundary. Yet the natural pooling of the river bed within the gully and at Bents Basin itself provides numerous swimming sites. A number of rapids occurring between the weir and the Basin add to the character of the valley.

Water quality is of prime importance in considering water-based recreation. The State Pollution Control Commission has reviewed the issue of water quality in Bents Basin and their findings indicate, that, the water quality will not impede recreation potential except for short periods following wet weather. (Appendix I) Following significant rainfall the Basin is not recreationally attractive. Gross turbidity and the extreme rates of flow are more serious considerations than any alteration to the river's biological or chemical characteristics. The condition of the River itself will naturally deter wet weather use, but some additional management restrictions may be necessary.

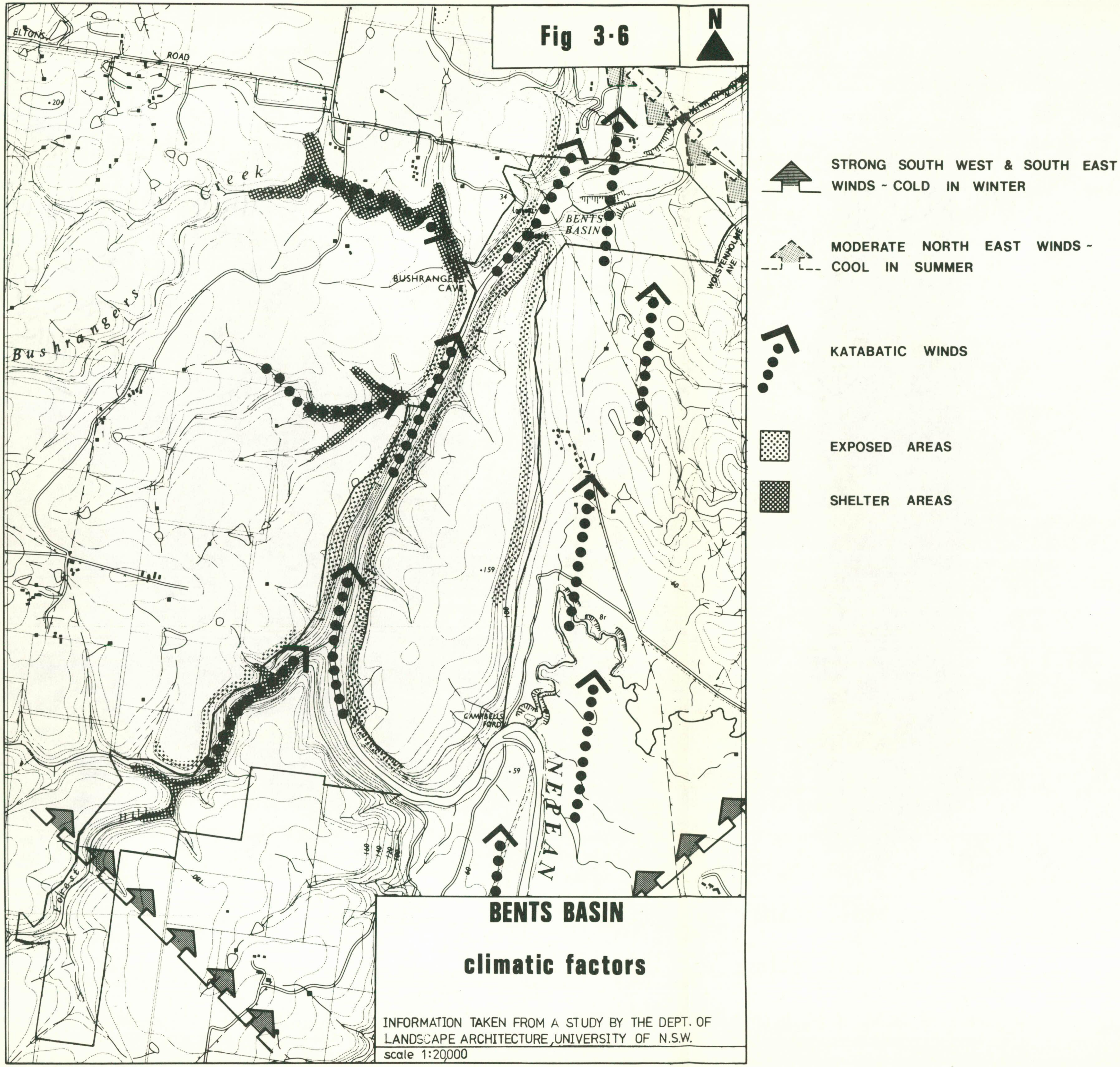


Fig 3·6

BENTS BASIN

climatic factors

INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.

scale 1:20,000

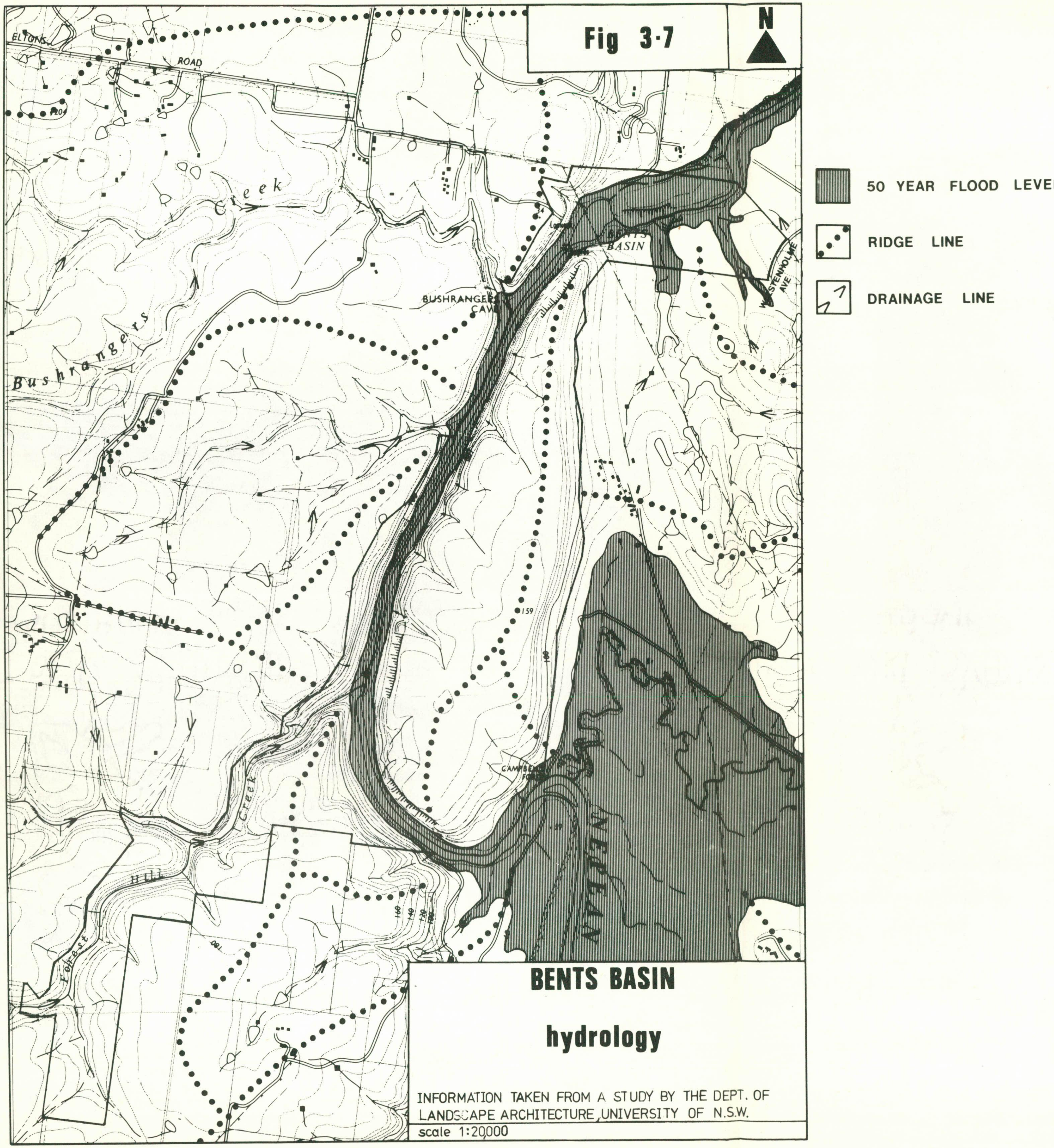


Fig 3·7
N
50 YEAR FLOOD LEVEL
RIDGE LINE
DRAINAGE LINE
ELTONS
ROAD
Creek
Bushrangers
BUSHRANGERS CAVE
BENTS BASIN
Creek
Hill
Forest
NEPEAN
BENTS BASIN
hydrology
INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.
scale 1:20000

It should be noted that the only point source entering the river which could directly influence water quality at Bents Basin is a sewage treatment plant some 24 kilometres upstream at Camden. Presently, an extensive treatment works is being conducted at Camden to handle the growth in the area. As such it is unlikely the present insignificant effect of these sewage treatment plants will change.(1) Of greater concern is runoff from the surrounding rural lands and the effluent from extractive industries along the Nepean River. These inputs are more difficult to control and would require monitoring to ensure public safety.

3.7 Vegetation

Vegetation within the Bents Basin area is basically dry schlerophyll forest commonly found on the Hawkesbury sandstone. The diversity of landform has provided a niche for the preservation of a number of interesting species. A detailed investigation of the area has been compiled (2) and this is diagrammatically represented in Fig. 3.8.

In addition to a number of species not normally occurring in the Sydney region (e.g. the Tableland species *Acacia falciformis*), a number of rare plants can be found: *Eucalyptus benthamii* and *Hibberta hermaniifolia*. *E. benthamii* and *E. elata* are the dominant trees on the sandbank and reach up to 25 m in height. This is the only area containing a stand of the Camden White Gum (*E. benthamii*) though isolated trees occur along the River. Formerly this species occurred more widely on the flats of the Nepean and its tributaries. The combined effects of flooding caused by the Warragamba Dam, pastoral clearing and the extractive industries have reduced the species to its present situation.

The second rare species, *H. hermaniifolia*, occurs on the sandstone hill slopes facing the southern edge of Bents Basin. The only other occurrence of this species is on the summit of Mt. Elizabeth in East Gippsland, Victoria.

The sand deposits at Campbells Ford have a southern aspect which has promoted a healthy stand of *E. deanei*; other interesting floristic features include the succession of plant species from plateau to river bed and the sharp transition between the Ironbarks on the plateau top and the surrounding smooth Bark Apple (*Angophora costata*) - Red and Yellow Bloodwoods (*E. gumnifera* - *E. eximia*) association.

3.8 Wildlife

The natural qualities and diversity of the area can be expected to support a similar variety of wildlife. A limitation to this diversity and number would have resulted from past clearing operations on neighbouring properties. The habitat types found on the S.R.A. are common in the area and are well represented within the Blue Mountains National Park or Warragamba Catchment Area.

Wildlife reported to inhabit the area include: wallaby, echidna, platypus, plover, sandpiper, pelican, ibis, black duck, pied geese, rainbow birds, white and black cockatoos, galahs, satin bower-birds, king parrots, crimson rosella, grass parrots, quail, whipbirds, cave robins, wonga pigeons and bronze wing pigeons. The river was stocked with brown trout prior to World War II and has in the past yielded perch, catfish and mullet.

---

(1) Note: This opinion is not shared by Wolonski and Collis further enforcing the need to monitor water quality in Bents Basin. Wolonski, E. and Collis, D. (1976) "*Aspects of Aquatic Ecology of the Hawkesbury River 1 Hydrodynamic Processes*".

(2) Benson, D. "*Vegetation Survey of Bents Basin and Associated Area, Wallacia* N.S.W." Unpublished Report. Refer to Royal Botanic Gardens, Sydney.

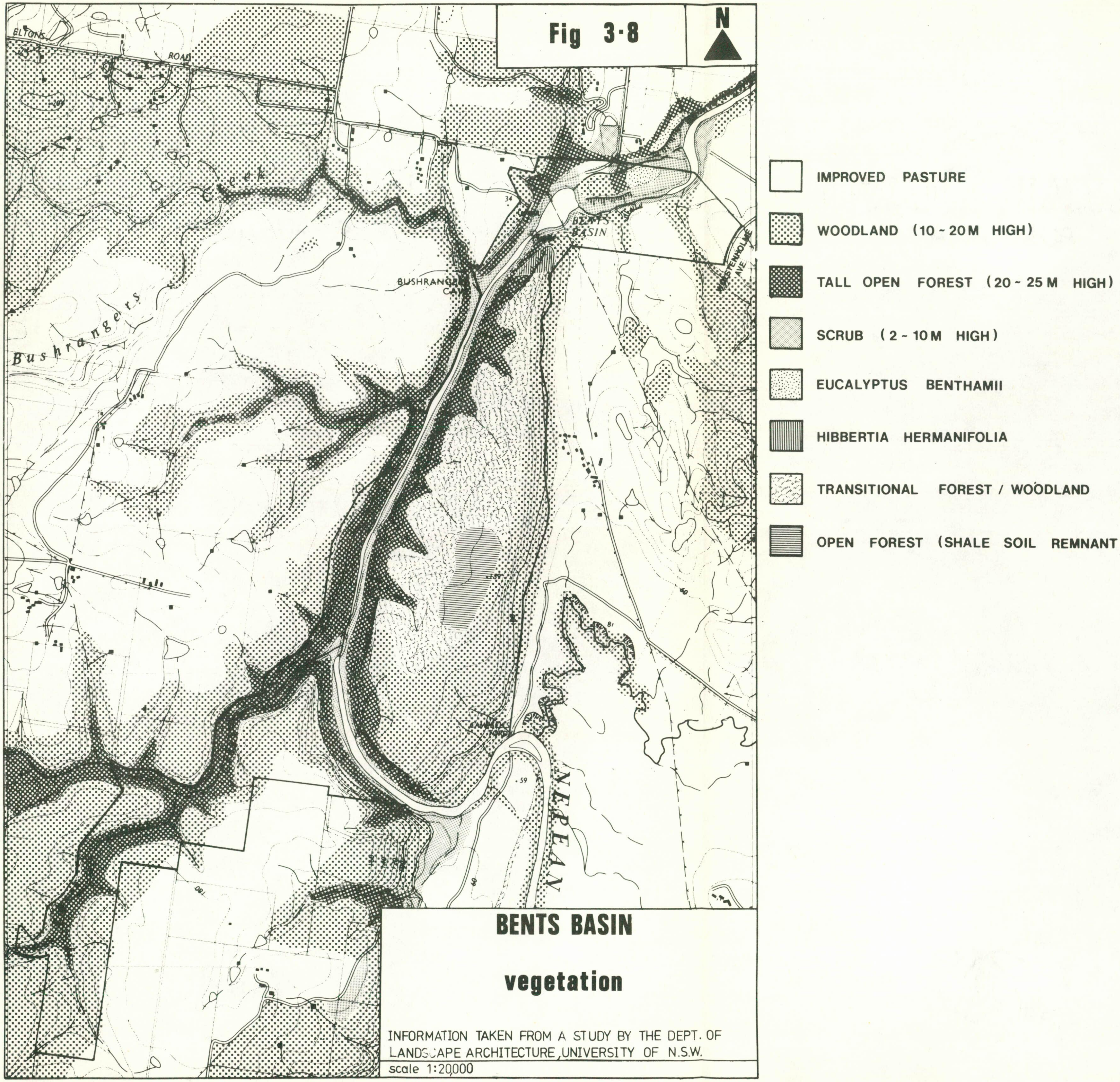


Fig 3·8
N
ELTONS
ROAD
Bushrangers Creek
BUSHRANGERS CAVE
BENTS BASIN
NEPEAN
IMPROVED PASTURE
WOODLAND (10 ~ 20 M HIGH)
TALL OPEN FOREST (20 ~ 25 M HIGH)
SCRUB (2 ~ 10 M HIGH)
EUCALYPTUS BENTHAMII
HIBBERTIA HERMANIFOLIA
TRANSITIONAL FOREST / WOODLAND
OPEN FOREST (SHALE SOIL REMNANT)
BENTS BASIN
vegetation
INFORMATION TAKEN FROM A STUDY BY THE DEPT. OF LANDSCAPE ARCHITECTURE, UNIVERSITY OF N.S.W.
scale 1:20,000

3.9 Visual Resources

The visual resources are one of the Bents Basin site's most notable features. This importance prompted the visual resources to be treated as an essential part of, and receive equal consideration with, the other basic land resources. It was necessary to both provide an inventory of the visual resources and a measurable standard for their management.

To accomplish this task the U.S. Forest Service's Visual Management System(3) was adopted. As the application of this System to State Recreation Areas is a new initiative it was felt necessary to give a full explanation of the process. The technical nature of the System required its findings to be published under a separate cover. Readers wishing to follow the System are encouraged to read the technical paper: Visual Assessment of Bents Basin S.R.A. The findings of the visual resource study are represented by visual quality objectives which assign management goals to the landscape of the park. (Fig. 3.9) Visual quality objectives are represented by five terms which in turn represent the following goals:-

Preservation.

Retention.

Partial Retention.

Modification.

Maximum Modification.

Excepting preservation, each category describes a different degree of acceptable alteration of the natural landscape based on visual criteria. The degree of alteration is measured in terms of visual contrast with the surrounding natural landscape. Two additional short-term management goals were also required:-

Rehabilitation.

Enhancement.

Once the short-term goal is attained, one of the five quality objectives is then applied.

Preservation

This objective allows ecological changes only. Management activities, other than very low visual impact facilities, are prohibited.

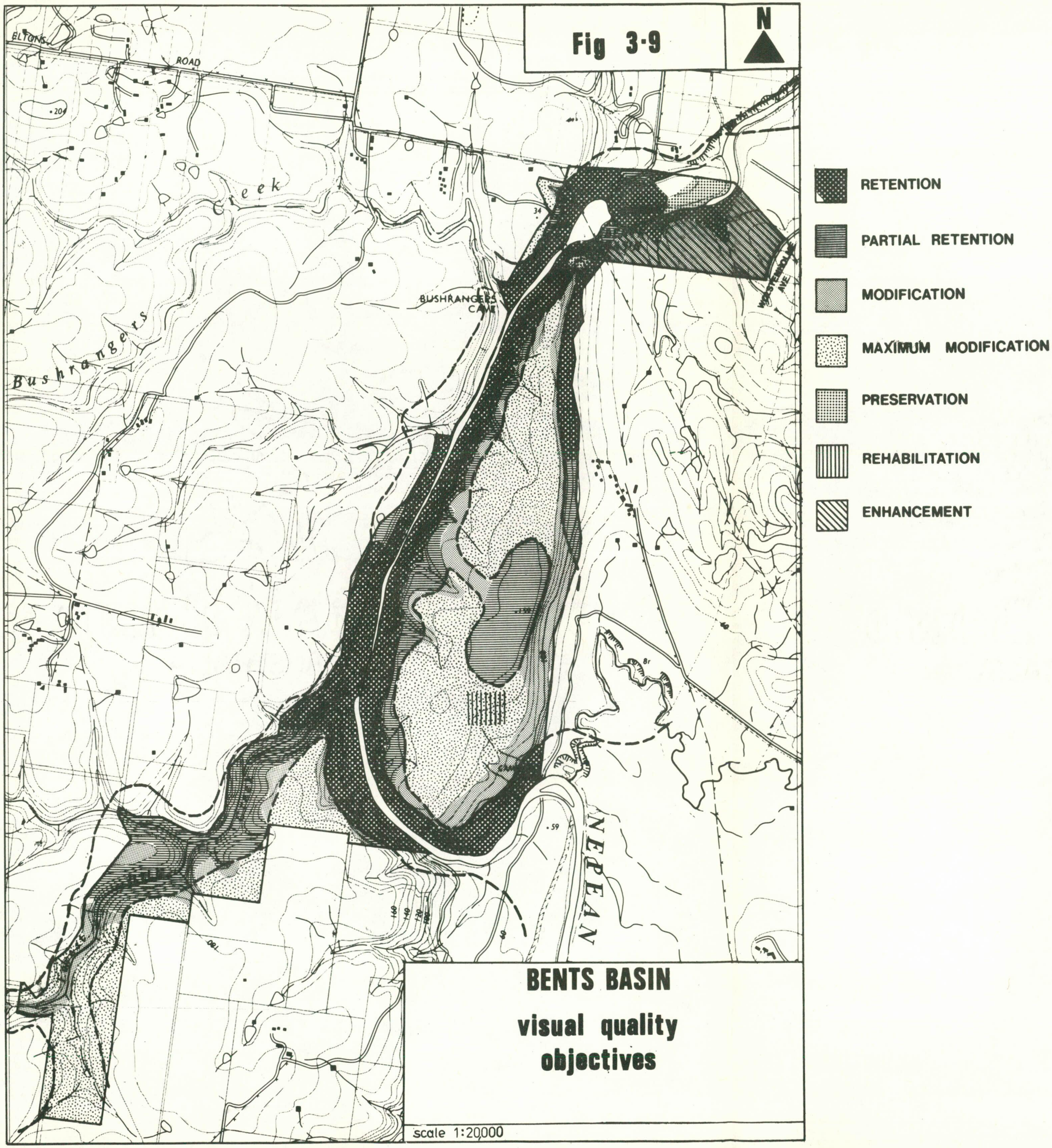
This objective applies to areas of the park bearing the two rare species *E. benthamii* and *H. hermaniifolia*. Only walking or nature interpretative tracks should be constructed in these areas and such constructions should create the minimum possible disturbance.

Retention

This visual quality objective provides for management activities which are not visually evident.

---

(3) U.S. Forest Service: "Chapter 1. The Visual Management System", National Forest Landscape Management Volume 2 Agricultural Handbook Number 462. (1974)



BENTS BASIN

visual quality objectives

Under this management objective, changes may only repeat form, line, colour and texture which are frequently found in the landscape. Changes in their qualities of size, amount, intensity, direction, pattern should not be evident.

Any clearing that may be necessary should repeat natural openings found in the surrounding area. Service roads should be kept to a minimum width (3-4 m. rather than 8-10 m.). The provision of utilities should maintain a low profile and be coloured to blend in with adjacent vegetation. Generally the activity should not be visually evident to the casual park user.

Partial Retention

Management activities should remain visually subordinate to the characteristic landscape under the "partial retention" category. Activities may repeat form, line, colour of texture common to the natural surroundings, but changes in their qualities of size, amount, intensity, direction, patterns, etc. must remain visually subordinate to the characteristic landscape.

Amenities and recreation facilities should repeat the form and colour of the surrounding landforms and vegetation so that they remain visually subordinate.

Modification

Management activities may visually dominate the original landscape under the "modification" objective. However, vegetation and landform alteration must borrow from naturally establish form, line, colour, or texture so that their visual characteristics are those of natural occurrences within the surrounding area. Such activities include ranger housing, visitor interpretative centres or other buildings, signs and roads. The following examples indicate the type of measures taken to meet this objective. Road alignment should follow the alignment of the landforms. Road banks should be rounded back to appear as part of the existing landform. When vegetative clearing takes place for the construction of roadways, vegetation should be left adjacent to the road's edge. Signs, though dominating the landscape, should borrow form, line and colour so as to be compatible with the natural surroundings.

Maximum Modification

Here, alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, they may not appear to borrow completely from naturally established form, line, colour, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences as seen in foreground or middle ground.

Introduction of additional structures, roads, or recreation facilities must remain visually subordinate to the proposed composition as viewed in background.

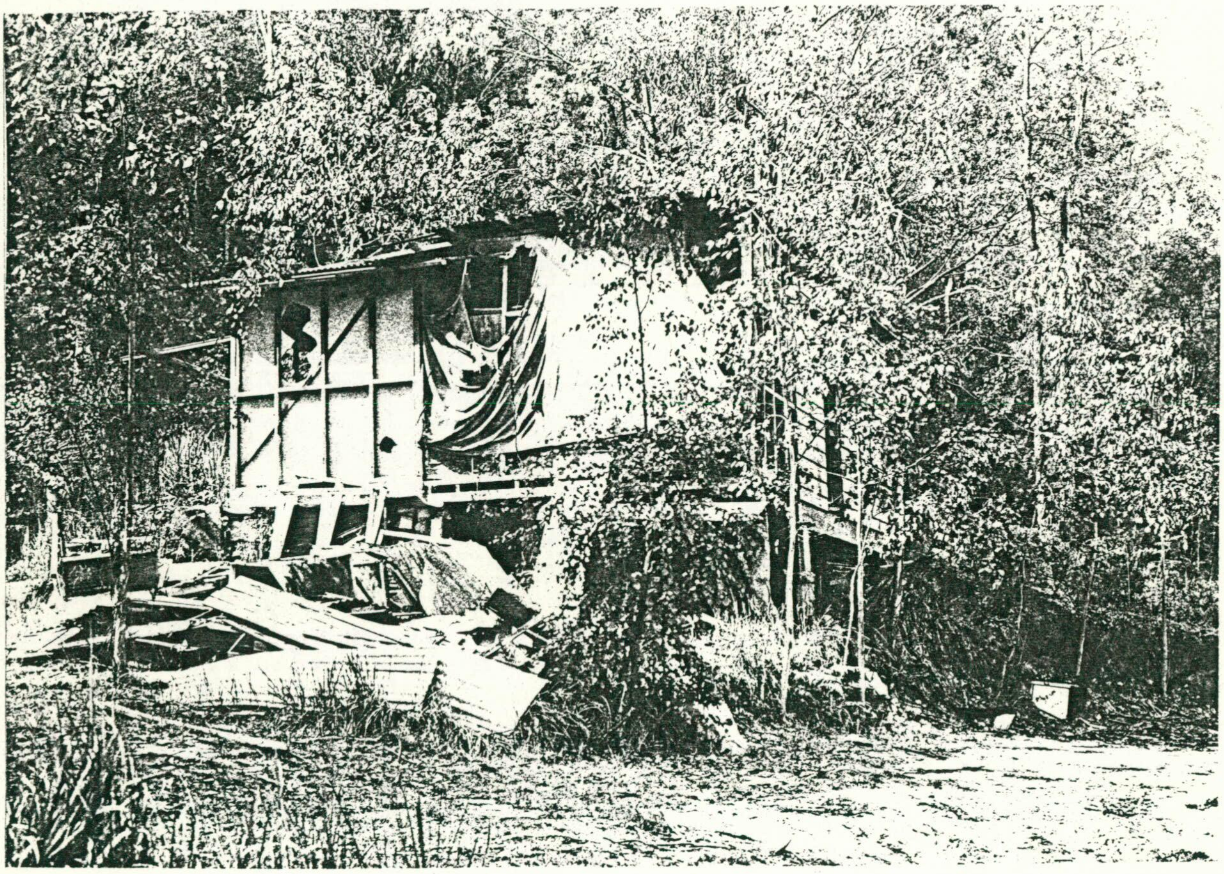
Enhancement

Enhancement is a short-term management alternative aimed at increasing positive visual variety where little variety now exists. Enhancement may be achieved through addition, subtraction, or alteration of vegetation, water, rock, earthforms, or structures, to create additional variety of forms, edges, colours, textures, patterns, or spaces. One possible example:

The pastoral land east of the Basin has been given this short-term objective. It is one of the few areas appropriate for active recreation and picnic facilities, although its present state would not encourage these activities. Additional planting and structure will enhance this landscape.

Rehabilitation

Landscape rehabilitation is a short term management alternative used to restore landscapes containing undesirable visual features to a desired visual quality. It may not always be possible to achieve the prescribed visual quality objective immediately with rehabilitation, but it should provide a more visually desirable landscape in the interim. Rehabilitation may be achieved through alteration, concealment, or removal of obtrusive elements.



DERELICT SHACK AT CAMPBELLS FORD

Some proposals for restoration are:-

* Vegetative alternatives to eliminate obtrusive edges, shapes, patterns, colours, etc.

* Terrain alterations to blend with natural slopes.

* Alteration, concealment, or removal of structures containing obtrusive form, colours, or light reflections.

* Revegetation of cut-and-fill slopes.

* Alteration, concealment, or removal of construction debris.

* The derelict shacks located at Campbells Ford and south of the Iron Bark stand require removal. Land enhancement will also be needed near the Iron Bark stand.

* The river bed downstream of the Basin is choked with flood debris which is unsightly and degrades water quality. Most of it is timber and its removal will also provide a valuable source of fire wood.

* The flood channel at the sand bank's western edge is littered with an abandoned car body and is a haven for exotic plant species.

* Rehabilitation will also be necessary to overcome existing problems emanating from the existing car park and amenities blocks north of the Basin.

4.0 OUTDOOR RECREATIONAL PLANNING

4.1 Why plan?

Planning for land use has in the past generally been decided in the market place. The amount of land supplied for a specific proposal has automatically adjusted to the demand as major landuses are market orientated. On the other hand, many of the benefits of outdoor recreation cannot be expressed in monetary terms and thus governments have been required to supplement recreation opportunities through State Recreation Areas, National Parks and Sport and Recreation Centres, etc.

To determine the degree of governmental support required it is essential to examine the demand for outdoor recreation sites and identify the areas of greatest need. In this way the most efficient means of providing outdoor recreation can be identified and implemented in the light of limited land and finances.

Identifying demand through the consideration of public preferences, participation rates, etc., and comparing it with existing supply establishes both present and future social needs. Once recognised, the goals of recreation planners and managers can be geared to meet these needs.

4.2 The Planning Process

This process involves identifying the important elements of outdoor recreation planning and relating them to each other so that a model can be developed embracing all factors which influence planning and implementation. The demand for increased outdoor recreation facilities should be assessed in the light of the existing situation. The model should also recognise the site's maximum capabilities for development.

Special methods are needed for each part of the planning process, particularly for the analysis of existing levels of outdoor activity, for the assessment of site capability and the identification of needs. The lack of available data makes the projection of any proposed site's latent and future demand an extremely difficult task. A standardized approach is required to facilitate a systematic and objective assessment of different park proposals.

For this study, the planning process commonly used in North America and recently adopted in New Zealand(4) was taken as a starting point. The system will be modified and refined to meet Australian conditions as methods and data become available.

A schematic representation of the process used for Bents Basin is presented in Figure 4.1. A brief description of each planning element is provided below, and a full explanation, as it applies to the Bents Basin site, is given in the following chapters.

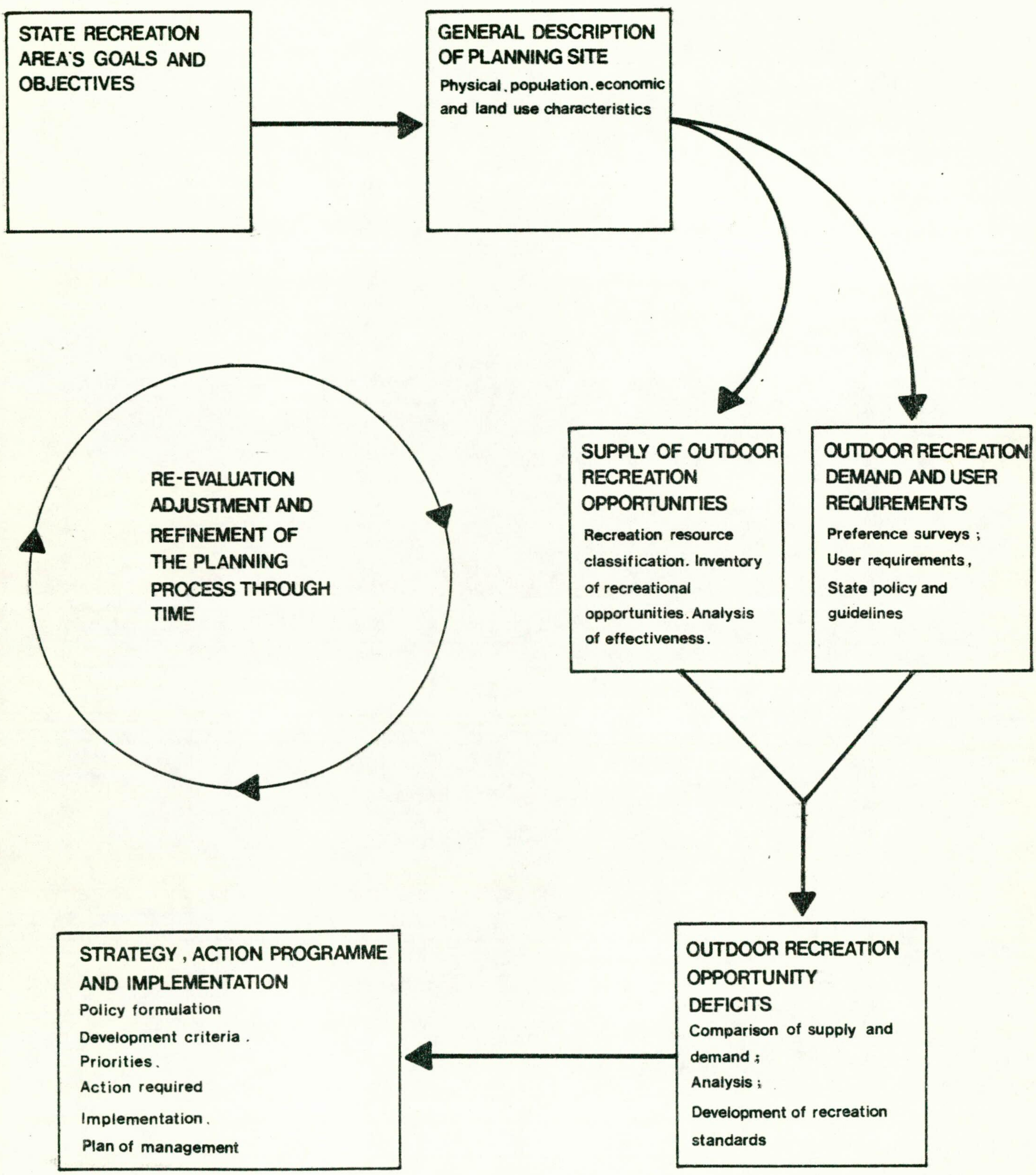
4.3 Goals and Objectives

The goals and objectives for the proposed Bents Basin site are the same as those for all State Recreation Areas. They are outlined in section 1.2 of this report.

---

(4) Outdoor Recreation Planning Marlborough Pilot Study. N.Z. Department of Lands and Survey. ISSN 0110-1226. Wellington. 1977.

the planning process | **Fig 4·1**



4.4 General Description of the site

Chapter 3 of this report provides a resume of the natural resources of Bents Basin and indicates the site's suitability for S.R.A. selection.

4.5 Outdoor Recreational Demand and User Requirements

Total demand is ascertained by studying residential and non-residential demand and user requirements. There are numerous methods of projecting future demand, varying from intuitive judgment to intricate mathematical calculation. The former is subjective and generally prohibits systematic assessment; while the latter provides quantitative results closely related to specific implementation programmes but is not wholly reliable - errors in assumption or calculation will lead to unrealistic results. Accurate basic information is necessary for any refined calculation of demand. However, a simple extension of population growth trends in combination with participation patterns provides a general indication of demand which can, in turn, enable the projection of recreation needs. This was the method used in the study of Bents Basin.

4.6 The Supply of Outdoor Recreational Opportunities

Two main factors were assessed to determine outdoor recreational supply at Bents Basin: existing regional opportunities and land capability of the site to support specific activities. The site's regional significance was determined by identifying existing recreation facilities in the district. The more specific issue of land capability enabled Bents Basin's potential supply to be expressed in terms of hectares of land (and water) and/or facilities (e.g. picnic tables).

4.7 Outdoor Recreational Needs

Outdoor recreational needs are determined by comparing the effective supply of land and facilities with the site's recreational demands. This need then reveals the land areas and facilities required for various activities. Activity standards enable an assessment of the site's ability to accommodate a particular activity and its participants, and they express the physical, environmental and social capacity of an area.

According to its inherent characteristics, each land type has a different carrying capacity. The system used to measure carrying capacity in the Bents Basin study attempted to allow for the site's individuality.

4.8 Development Strategy and Action Programme

The development strategy and implementation programme provide the necessary direction, timing and management of outdoor recreational needs at Bents Basin. At present, the development strategy is at a preliminary stage. Although the park's role and theme have been suggested, both will need modification before a complete Plan of Management can be drawn up.

4.9 Basic Information Deficiency

The methodology adopted in this report requires the quantification of existing outdoor recreation participation rates; the effect of travel distance on participation; present and future population size; recreation facility capacity; turnover rates and resource requirements. Since most of this information is unobtainable, it has been necessary to substitute appropriate American data and the accuracy of the assessment suffers as a result of this substitution.

The results of this study should not be viewed as the final plan for Bents Basin, but rather as a tool to aid decision making. The study provides an estimate of recreation needs derived from the available data and methodologies.

In an effort to overcome current data deficiencies the Parks and Reserves Branch of the Crown Lands Office is undertaking a major research effort to quantify recreation use patterns in State Recreation Areas. The results of this research should be forthcoming in late 1980 - early 1981.

4.10 Terminology

The terms used in the analysis of demand, supply and need require some explanation:

Activity day: The participation in one activity by one individual during a portion or all of a 24 hour day.

Participation Rates: The average number of activity days for each participant during a year. e.g. Each swimmer, on the average, goes swimming 13 days a year.

Per Capita Rate: The average number of individual activity days during a year if the total population participated. This rate is derived by dividing the total participation (in activity days, for a specific activity) by the total population of the region. e.g. If 1000 people spent a total number of 12,000 activity days swimming, the per capita rate would equal 12 days.

5.0 ESTIMATING OUTDOOR RECREATIONAL DEMAND FOR BENTS BASIN

5.1 Introduction

The demand for recreation at Bents Basin is generated by the people who surround it. The living standards, recreation value judgments and the nature of alternative resources available to the population interplay to determine this demand. An individual's use of Bents Basin is dependent upon his knowledge of alternative resources, recreation interests and values, adequate leisure time, mobility and finances. The future recreation demand will be influenced by shifting technology, fuel costs and availability, environmental quality, social values and available recreation resources. The complexity of predicting recreation consumption is a reflection of the intricate combination of the above factors across the wide spectrum of outdoor recreationists. Yet the task of estimating demand is a basic necessity for effective planning and management decisions.

5.2 Goals and Objectives

The major goal of the demand analysis was to quantify the existing and future demand for recreation facilities, and land and water areas at the Bents Basin site.

Based upon this goal, the objectives of the demand analysis were to -

- identify the potential recreation market area to be served by Bents Basin.
- establish the present and future (1981, 1986, 1991, 2000 AD) population of the recreation market area.
- identify the present and future demand generated for outdoor recreation activities suited to the resource capabilities of Bents Basin.
- develop a technique to determine the proportion of present and future demand attributable to Bents Basin.
- express demand in terms of recreation resources (i.e. facilities and land and water areas) for each activity.

5.3 Demand Methodology and its Limitations

The demand methodology utilized in this study follows the traditional approach adopted within the U.S.A. Participation rates in swimming, camping, picnicking and nature walking expressed on a per capita basis were multiplied by the present and future populations to establish a gross demand. The proportion of this gross demand that can be attributed to Bents Basin is determined on travel distance criteria. Participation rates are assumed to remain constant over the planning period. This assumption has been necessary as the magnitude of change amongst the factors influencing future recreation demand is unknown (as is their degree of influence on that demand). These factors are not considered in the demand methodology utilized in this report and as such represent (in combination with the lack of indigenous data) a serious limitation which should be kept in mind when reviewing this study.

A number of limitations stem from the demand methodology and the use of U.S. data:

1. The projections of demand assume future conditions will be a continuation of current (1975) recreation patterns;

2. The population projection figures, although derived from the Planning and Environment Commission, possess varying degrees of accuracy. Where a range of population estimates were available the figure most accurately reflecting the 1978 population was used.

3. The U.S. based participation rates may be an underestimate of Australian rates because of the shorter U.S. summer recreation season. The available rates are applicable to 4 activities only and thus limit the demand analysis to these activities.

4. The demand figures are based on surveys of recreation participation rates - a measure of consumption which is determined by supply as well as demand. No estimate of latent demand has been attempted.

5. The methodology's assumption that travel distance is a proxy for recreation demand and that land area is a proxy for recreation supply, have decreased validity as the scale of the study area decreases.

For the purpose of planning, the derived estimates should be treated only as a guide and their accuracy taken as an order of magnitude rather than an absolute definition.

5.4 Recreational Market Area

Bents Basin will function as a regional park servicing Sydney and, more specifically, the outer western suburbs. The regional use of Bents Basin is expected to stem primarily from Penrith, Wallacia, Camden, Campbelltown and Liverpool; and to a lesser extent from the remaining areas of Metropolitan Sydney, the Blue Mountains and the Picton-Tahmoor area.

The recreation market area for Bents Basin was divided into regions coincidental with the Australian Bureau of Statistics' divisions (Fig. 5.1). The regional boundaries reflect local government boundaries which, in some instances, have been combined to simulate concentric rings about Bents Basin (Fig. 5.2 - 5.4). These regions and their present and future population are indicated in Table 5.1.

5.5 Participation Rates

Some six U.S. State Outdoor Recreation Plans were examined for their suitability to Bents Basin. Four of these plans utilized the same methodology for estimating demand and had, through recreation surveys, determined activity participation rates (Table 5.2). As such, these activity rates (expressed as per capita rates) were averaged to gain a "best estimate" of participation. The demand projections derived from these rates should be given no greater credence than a substituted estimate. Yet the findings of the four U.S. surveys show an encouraging degree of consistency.

The average participation rates were used to estimate demand for each activity emanating from the thirteen regions. The Oregon Study further broke down swimming participation into pool and non-pool swimming - a proportion of 80%:20%. The unique natural qualities of Bents Basin would qualify as a 'non-pool' swimming resource. Consequently the demand for non-pool swimming was determined and not the total swimming figure.

recreational market area for bents basin by regions

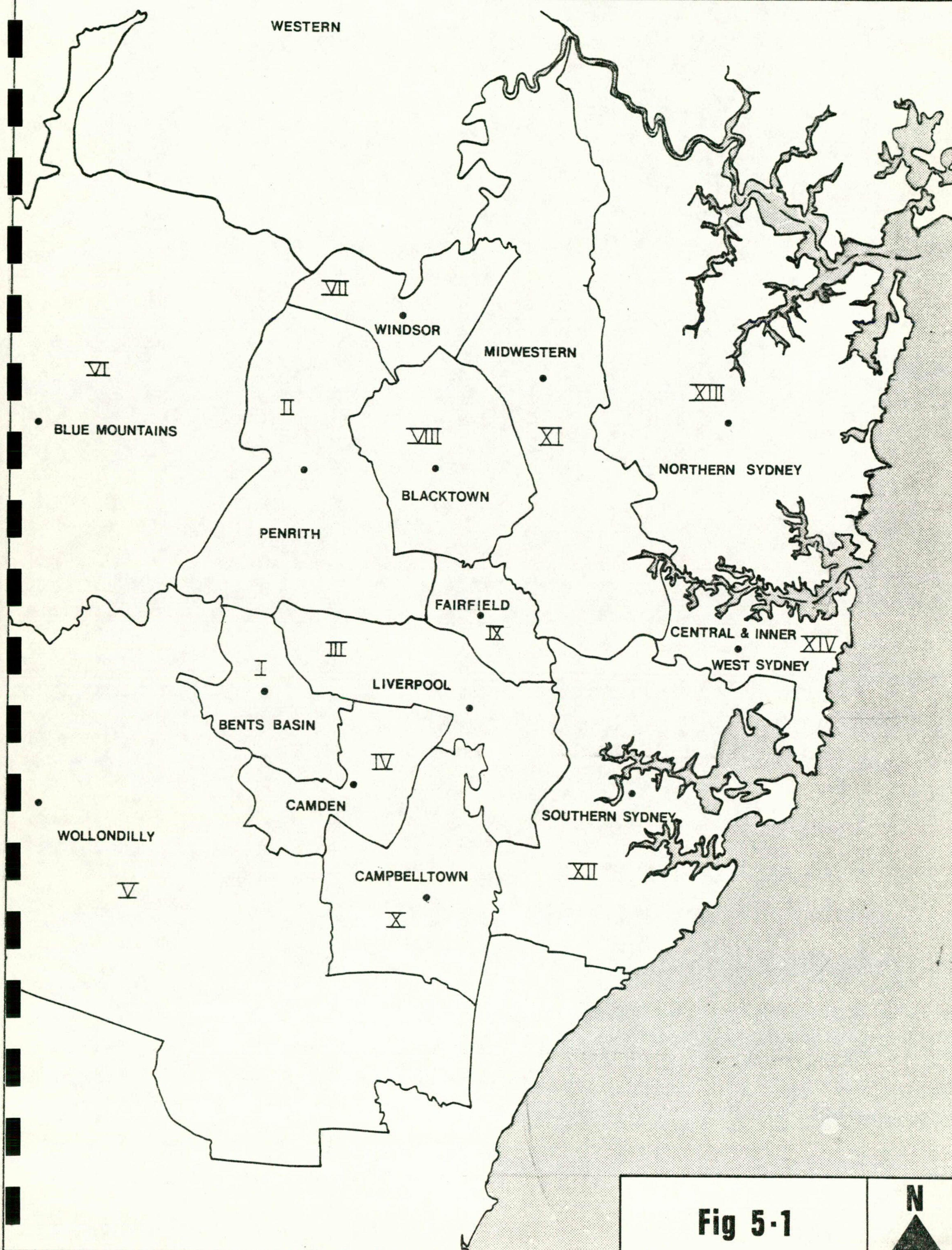


Fig 5·1

TABLE 5.1: PROJECTED REGIONAL POPULATION COMPRISING THE RECREATION MARKET AREA FOR BENTS BASIN STATE RECREATION AREA.

REGION (1976 Census) June	Regions	1971	1975	1976	1977	1978	1981	1986	1991	2001
I	Bents Basin[1]	952	1,188	1,247	1,306	1,365	1,542	1,837	2,132	2,722
II	Penrith[2]	61,100	77,850	80,000	84,600	88,900	96,000	105,500	115,000	131,000
III	Liverpool[3]	83,150	90,200	91,100	92,600	94,550	96,000	99,000	103,000	136,000
IV	Camden[3]	10,800	13,700	14,200	14,650	15,450	17,000	19,500	24,000	34,000
V	Wollondilly[2]	12,850	14,600	15,150	15,650	16,150	17,000	18,500	19,000	22,000
VI	Blue Mountains[2]	37,200	45,550	46,800	47,800	49,300	54,000	60,000	66,000	74,500
VII	Windsor[2]	15,700	18,200	18,550	19,000	19,500	20,000	21,000	21,000	21,000
VIII	Blacktown[2]	135,400	158,750	163,300	168,300	173,700	178,000	187,000	204,000	232,000
IX	Fairfield[2]	114,550	117,150	117,250	117,500	118,500	131,000	142,000	148,000	155,000
X	Campbelltown[2]	34,700	47,150	53,700	60,160	68,150	89,000	101,000	108,000	122,000
XI	Mid-Western[5]	321,800	337,500	342,250	345,700	349,350	352,000	360,500	368,500	382,500
XII	Southern Sydney[4]	689,150	690,100	687,750	691,100	691,600	697,500	723,000	745,500	785,000
XIII	Northern Sydney[4]	668,250	683,950	683,900	684,300	685,900	690,500	702,000	717,500	741,000
XIV	Central & Inner West[4]	693,500	655,350	644,500	639,850	636,650	625,500	620,500	626,000	646,000

(1) Bents Basin is the combination of Camden Subdivision 1905, Collection District 5 with Liverpool Subdivision 2304, Collection District 7. Linear growth from 1971-1976 is extrapolated to '2000.

(2) Local Government Area.

(3) Camden and Liverpool Local Government area minus Bents Basin[1] where applicable.

(4) Statistical Subdivision of Sydney Statistical Division

(5) Mid-Western is Auburn[2], Parramatta[2], Holroyd[2] and Baulkham Hills[2] combined. (Sources: 1971-1978 records from Australian Bureau of Statistics; Planning and Environment Commission's [redacted]

5.6 Regional Estimate of Outdoor Recreational Demand

The demand for swimming depends on the number of people who wish to swim and how often they do so. To estimate, for example, the demand for swimming in the Penrith Region in 1981, one must multiply the 1981 population projection (96,000 people) by the swimming participation rate (11.9 activity days per capita) to reach a total of 1,142,400 swimming activity days. The demand for picnicking, camping and nature walking has been estimated similarly for the present (1978 census) and future (1981, 1986, 1991 and 2001) populations of each region (Appendix II).

5.7 Distribution of Demand

Once the magnitude of outdoor recreation demand has been quantified it is necessary to indicate how it will be distributed. Simply, this distribution shows the distance people will travel and which regions they choose to satisfy recreational preferences.

TABLE 5.2 PARTICIPATION RATES (ACTIVITY DAYS) EXPRESSED ON A PER CAPITA BASIS DETERMINED IN FOUR U.S.A. RECREATION SURVEYS.

Source Activity	A	B	C	D	Mean	Standard Deviation
Picnicking	4.23	2.91	6.16	6.96	5.07	3.18
Swimming	10.96	8.05	13.73	14.74*	11.9	5.2
Camping (tent)	0.60	0.53	1.83	---	.99	1.034
Nature Walks	----	----	3.87	3.62	3.745	1.77

Source:

A. United States Department of Interior, Bureau of Outdoor Recreation (1972), Appendix M Outdoor Recreation prepared for the North Atlantic Regional Water Resources Study Coordinating Committee (NAR Study).

B. United States Department of Interior, Bureau of Outdoor Recreation (1974), "Chesapeake Bay Study Demand, Supply, Needs".

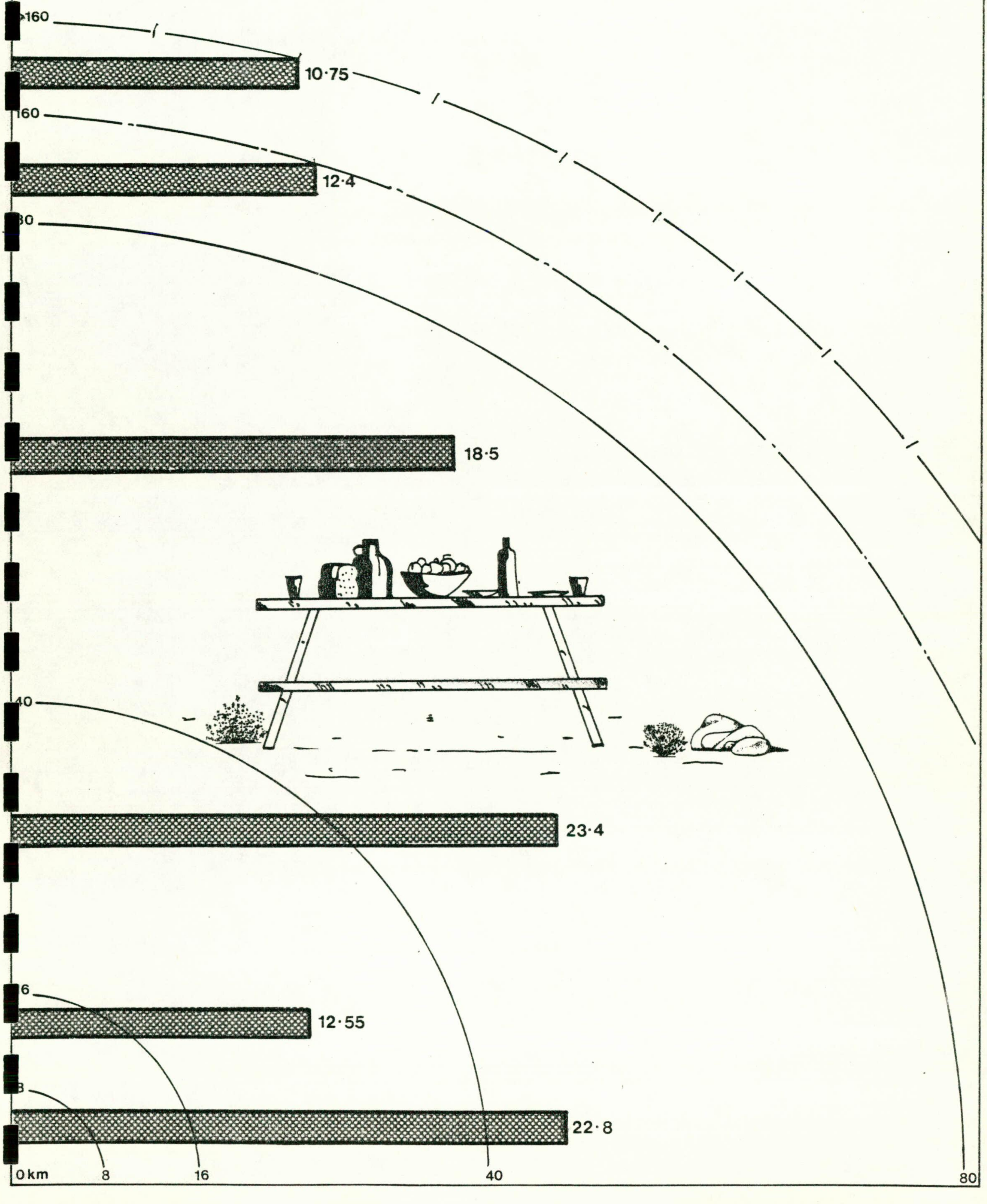
C. Idaho State Department (1975) 'The 1975 Idaho Outdoor Recreation Survey.

D. Oregon Department of Transport (1976) 'Oregon Recreation Demand Bulletin 1975'.

* non pool = 2.92 activity day/person
pool = 11.82 activity day/person

DISTRIBUTION OF THE PERCENT OF PICNICKING ACTIVITY DAYS BASED ON DISTANCE FROM POPULATION CENTRE

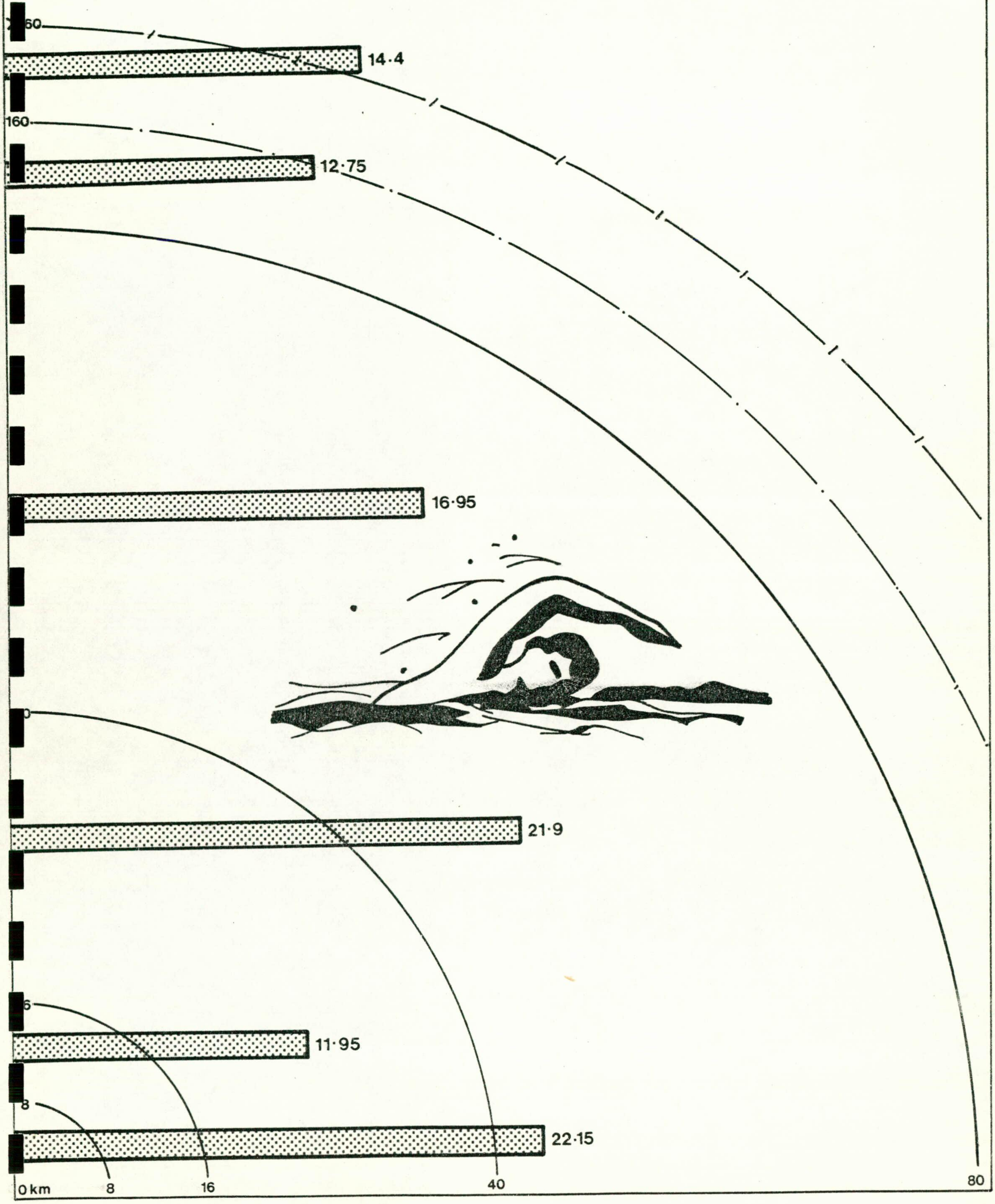
picnicking | **Fig 5·2**



DISTRIBUTION OF THE PERCENT OF SWIMMING ACTIVITY DAYS BASED ON DISTANCE FROM POPULATION CENTRE

swimming

Fig 5·3



DISTRIBUTION OF THE PERCENT OF CAMPING ACTIVITY DAYS BASED ON DISTANCE FROM POPULATION CENTRE

camping

Fig 5·4

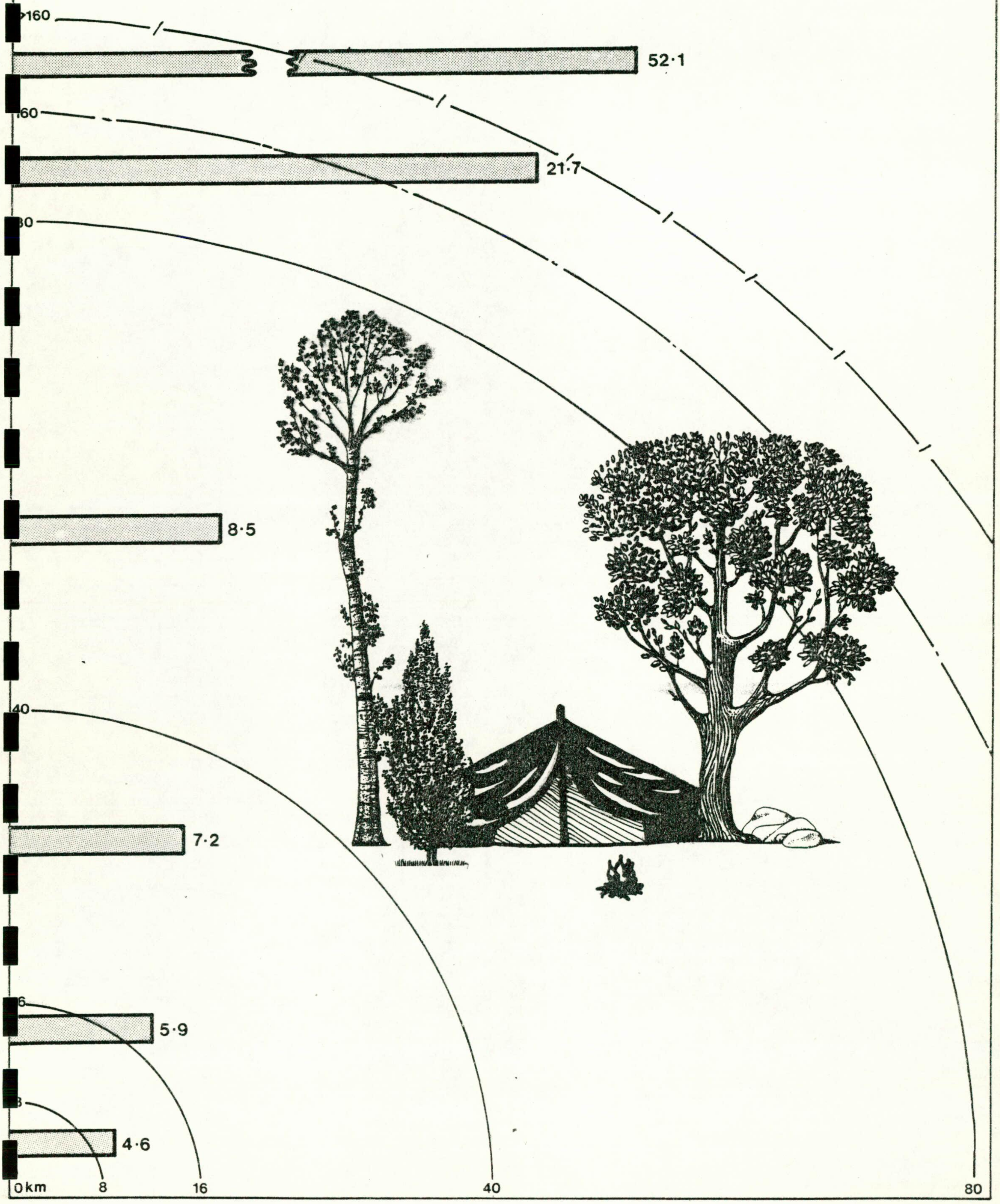
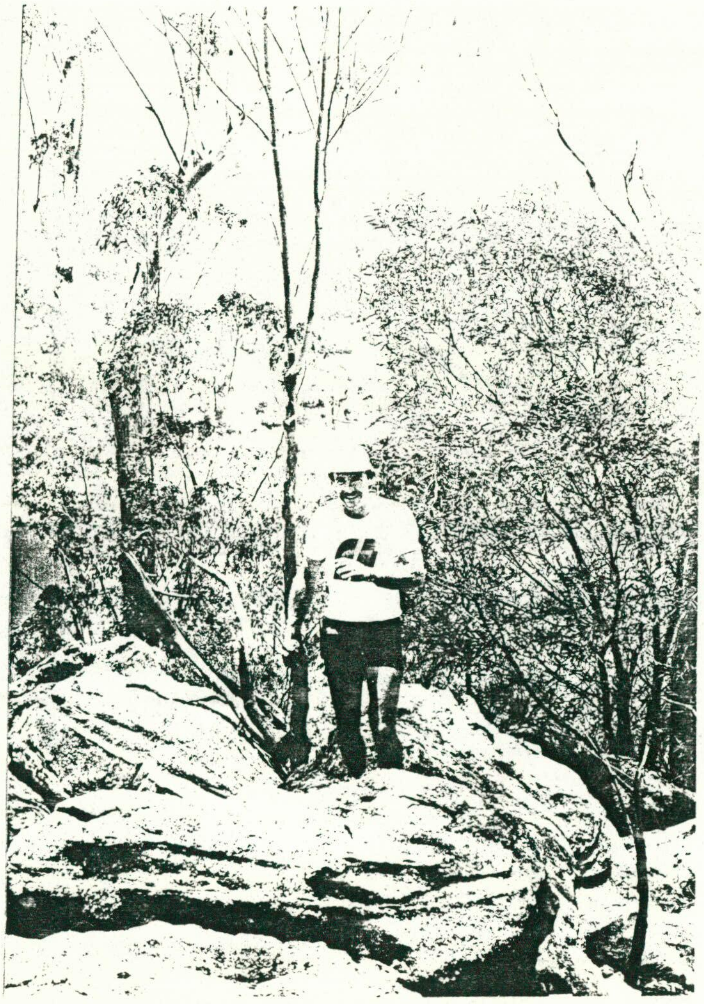


TABLE 5.3 Travel Distance from Regional Centres to Bents Basin State Recreation Area.

Region	Regional Centre	Av. Distance (km)
I	Bringelly	10
II	Penrith	30
III	Liverpool	25
IV	Camden	25
V	Burragorang	98
VI	Katoomba	85
VII	Windsor	50
VIII	Blacktown	50
IX	Fairfield	42
X	Campbelltown	40
XI	Baulkham Hills	60
XII	Sutherland	55
XIII	Terrey Hills	75
XIV	Stanmore	65



HIKING

Distribution is difficult to predict. For example, if the only swimming area is located five, ten or fifteen miles from a population centre, it will attract all the swimming done by the population - not just the amount that the distance above would indicate. The distribution of recreation demand is dependent upon the nature of the recreation activity, the location of alternative sites and the distance recreationists are willing to travel. A distinct relationship exists between travel distance and participation. Two U.S. studies have established this relationship and these have been averaged for the purposes of this study (Table 5.4, Fig. 5.2 - 5.4).

TABLE 5.4 Distribution of the Percent of Activity Participation Days Based on Distance from Population Centre

Distance (km)							
Activity							
Swimming	1	16.2	13.0	24.1	18.6	13.5	14.8
	2	28.1	10.9	19.7	15.3	12.0	14.0
	3	22.15	11.95	21.9	16.95	12.75	14.4
Picnicking	1	17.2	13.7	25.1	19.6	12.8	11.5
	2	28.4	11.4	21.7	16.5	12.0	10.0
	3	22.8	12.55	23.4	18.5	12.4	10.75
Camping	1	6.6	6.6	6.6	6.6	21.4	52.1
	2	2.6	5.2	7.8	10.4	22.0	52.0
	3	4.6	5.9	7.2	8.5	21.7	52.05
Nature Walking	-	No data available					

1 Chesapeake Bay Study
2 NAR: Appendix M Outdoor Recreation
3 Average

The travel distance from each of the fourteen Sydney regions was determined by weighting the geographical centre of each region to reflect concentrations of urban use. The road distance between this weighted regional centre and Bents Basin was then measured (Table 5.3). Recognizing the travel distance and the relationship between this distance and participation (Fig. 5.2 - 5.5), it is possible to determine the proportion of total demand emanating from each region that is attributable to the Bents Basin Site[5] (Tables 5.7 - 5.9).

5.8 Non-Resident Demand

The Bents Basin S.R.A. is considered to fulfil the role of a regional park and the demand generated by the surrounding regions has been estimated accordingly. Yet in addition to this demand from the recreation market area there is also non-resident demand.

5.9 Resource Requirements

The conversion of projected participation in the four selected recreation activities is basically a function of turnover rates, design loads and climatic conditions as they affect the duration of seasonal use. These factors were

(5) Appendix III describes this process of distribution in more detail.

TABLE 5.7 PREDICTED DEMAND FOR PICNICKING BY REGION IN THE BENTS BASIN REGION

(in 00's of activity days)

	REGION	1978	1981	1986	1991	2001
I	Bents Basin	9.5	10.7	12.7	14.8	18.8
II	Penrith	36.6	39.5	43.4	47.3	53.9
III	Liverpool	51.5	52.2	53.9	56.1	74.0
IV	Camden	40.8	44.9	51.5	63.4	89.8
V	Wollondilly	5.8	6.1	6.7	6.9	33.9
VI	Blue Mountains	11.4	12.5	13.9	13.5	17.2
VII	Windsor	4.5	4.6	4.9	4.9	5.0
VIII	Blacktown	62.6	64.2	67.4	73.6	83.6
IX	Fairfield	43.7	48.3	52.4	54.6	57.2
X	Campbelltown	26.2	34.2	38.8	42.5	46.9
XI	Mid Western	73.3	73.8	75.6	77.3	80.2
XII	South Sydney	13.8	13.9	14.5	14.9	15.7
XIII	Northern Sydney	54.8	55.2	56.1	57.3	59.2
XIV	Central & Inner West	61.9	60.8	60.3	60.9	62.8
	TOTAL:	496.3	521.0	552.0	587.8	698.2

TABLE 5.8 PREDICTED DEMAND FOR SWIMMING BY REGION IN THE BENTS BASIN REGION

(in 00's of activity days)

	REGION	1978	1981	1986	1991	2001
I	Bents Basin	21.5	24.3	29.0	33.6	43.0
II	Penrith	62.2	87.1	94.2	104.3	118.8
III	Liverpool	113.9	115.7	119.3	131.9	163.9
IV	Camden	92.5	101.7	116.7	139.8	203.5
V	Wollondilly	12.8	13.5	14.7	15.1	17.4
VI	Blue Mountains	25.0	27.3	30.4	33.4	37.7
VII	Windsor	9.9	10.1	10.6	10.6	10.6
VIII	Blacktown	137.6	141.0	148.2	161.6	183.8
IX	Fairfield	96.0	106.2	115.1	120.0	125.6
X	Campbelltown	57.6	75.2	85.3	91.2	103.1
XI	Mid Western	160.3	161.5	165.4	169.0	175.5
XII	South Sydney	29.8	30.1	31.2	32.2	33.9
XIII	Northern Sydney	117.9	118.7	120.6	123.3	127.3
XIV	Central & Inner West	133.8	131.4	130.4	131.5	135.8
	TOTAL:	1070.6	1143.7	1210.9	1297.5	1479.8

TABLE 5.9 PREDICTED DEMAND FOR CAMPING BY REGION IN THE BENTS BASIN REGION

(in 00's of activity days)

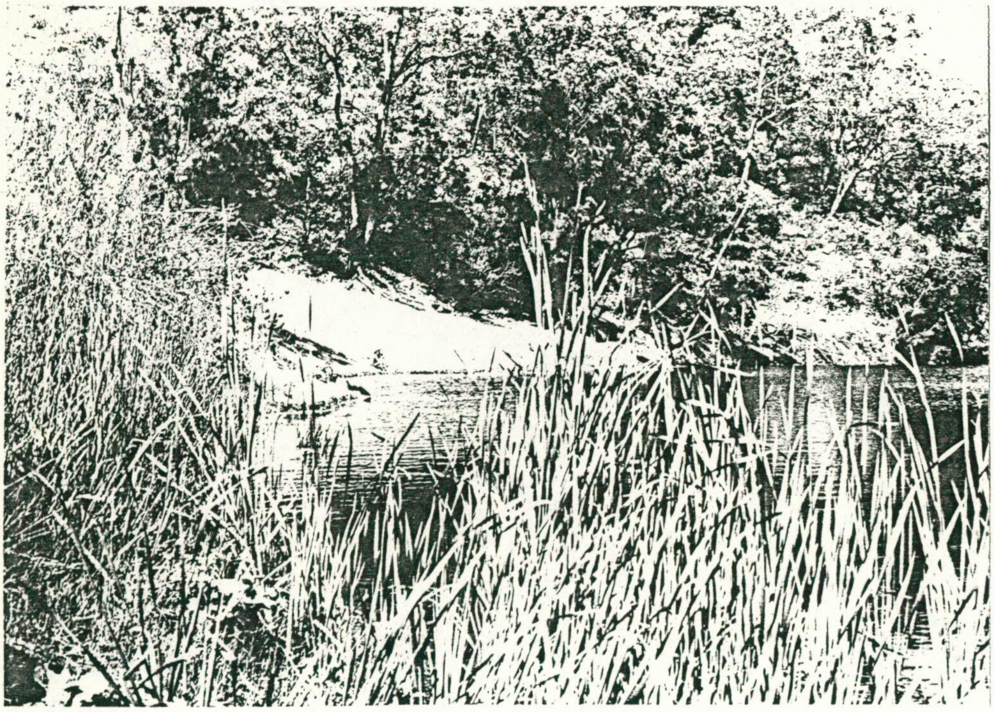
	REGION	1978	1981	1986	1991	2001
I	Bents Basin	0.4	0.4	0.5	0.6	0.8
II	Penrith	2.4	2.6	2.8	3.1	3.5
III	Liverpool	3.8	3.9	4.0	4.2	5.5
IV	Camden	2.2	2.5	2.8	4.4	5.9
V	Wollondilly	0.4	0.4	0.4	0.4	0.5
VI	Blue Mountains	0.7	0.8	0.9	1.0	1.1
VII	Windsor	0.3	0.3	0.3	0.3	0.3
VIII	Blacktown	3.8	3.9	4.1	4.4	5.0
IX	Fairfield	2.7	3.1	3.2	3.3	3.5
X	Campbelltown	1.6	2.1	2.4	2.6	2.9
XI	Mid Western	4.8	4.9	5.0	5.1	5.3
XII	South Sydney	1.2	1.2	1.2	1.3	1.3
XIII	Northern Sydney	4.9	5.0	5.0	5.1	5.3
XIV	Central & Inner West	5.3	5.0	5.0	5.0	5.2
	TOTAL:	34.5	36.0	37.7	40.9	46.3

accounted for[6] and demand translated into facility requirements (picnic tables, camp sites etc.) within the Bents Basin Region (Table 5.10).

5.10 Viability of Demand Methodology

Much of the present (and future) demand for Bents Basin results from the western and south-western Metropolitan growth areas (Parramatta, Penrith, Liverpool, Camden, Campbelltown). This expansion is dominated by young people establishing a home. This is an expensive phase of life leaving little extra money available and thus placing a strong dependance upon local recreation facilities. As such it can be expected that the 'average' participation rates and 'travel-distance' relationship assumed in the demand methodology may under estimate demand generated by the expansion centres surrounding Bents Basin.

Surveys[7] have shown that people have a strong preference towards recreation areas adjacent to water bodies even when involved in passive land activities. Furthermore, they prefer clean and safe access to water, comfortable conditions for sunbaking and clear visibility of the water for child supervision. Current indications show that Bents Basin has the recreation qualities and location likely to fulfil the needs of many recreationists. Even at its current state of development Bents Basin has encouraged (100) picnickers and swimmers[8] and (3) canoeists: figures which compare well with better known Menangle Park (516 swimmers and picnickers, 7 canoes). Considering the present (relatively) undeveloped state of Bents Basin it can be anticipated that current visitation will increase upon the establishment of facilities consistent with an S.R.A. The demand studies indicate this is likely to approximate an 8 fold increase over the next 5 years.



RIM OF BENTS BASIN

---

(6) Appendix IV describes the conversion of demand into resource requirements in more detail.

(7) Planning and Environmental Commission (1977) '<u>Interim Recreation Plan Hawkesbury/Nepean Study</u>'. Sydney Regional Planning Section.

(8) Deleuw, Cather of Australia Pty. Ltd., (1977). <u>The Hawkesbury Nepean River effects of water based recreation activities in Sydney</u>.

TABLE 5.10 PREDICTED RECREATION RESOURCES DEMANDED ON A PEAK CAPACITY DAY: IN THE BENTS BASIN REGION FOR SWIMMING, PICNICKING, CAMPING; AND THE TOTAL RECREATION MARKET AREA DEMAND FOR NATURE WALKING.

ACTIVITY		1978	1981	1986	1991	2001
Swimming:	swimmers	624	666	706	756	862
	: water area (m^2)	5741	6127	6495	6955	7930
Camping:	camp sites	17	18	18	20	22
	: area (ha)	1.1	1.2	1.2	1.3	1.5
Picnicking:	picnic tables	38	40	43	46	54
	: area (ha)	1.3	1.4	1.5	1.6	1.9
Nature Walking:	walkers	8974	9142	9428	9744	10390
	: km of track	680	693	714	738	787

6.0 SUPPLY OF OUTDOOR RECREATION OPPORTUNITY IN THE BENTS BASIN REGION

6.1 Introduction

The supply inventory is used in conjunction with demand data to make an assessment of the need for specific recreation areas and facilities.

Population data is multiplied by developed recreation standards to determine the resource levels required to satisfy that population. The resource levels are then compared with the available supply data to determine recreational needs. In all cases, supply is a physical resource, whether a structure (picnic table), a facility (campsite) or an area (beach space, length of walking trails).

6.2 Goals and Objectives

The goals of the supply inventory were to:

- compile and summarise supply data for use in the demand - supply - needs analysis for the Bents Basin Region.

- facilitate prescription of a plan of management for the Bents Basin State Recreation Area.

Based upon these goals, the specific objectives for the supply inventory were to:

- identify major regional natural resources, multiple-use resources and amusement parks that offer recreational alternatives to Bents Basin S.R.A. for the demand area of the western suburbs.

- describe the location, character, size, administration and operation of outdoor recreation areas within the Bents Basin Region.

6.3 Inventory Methodology

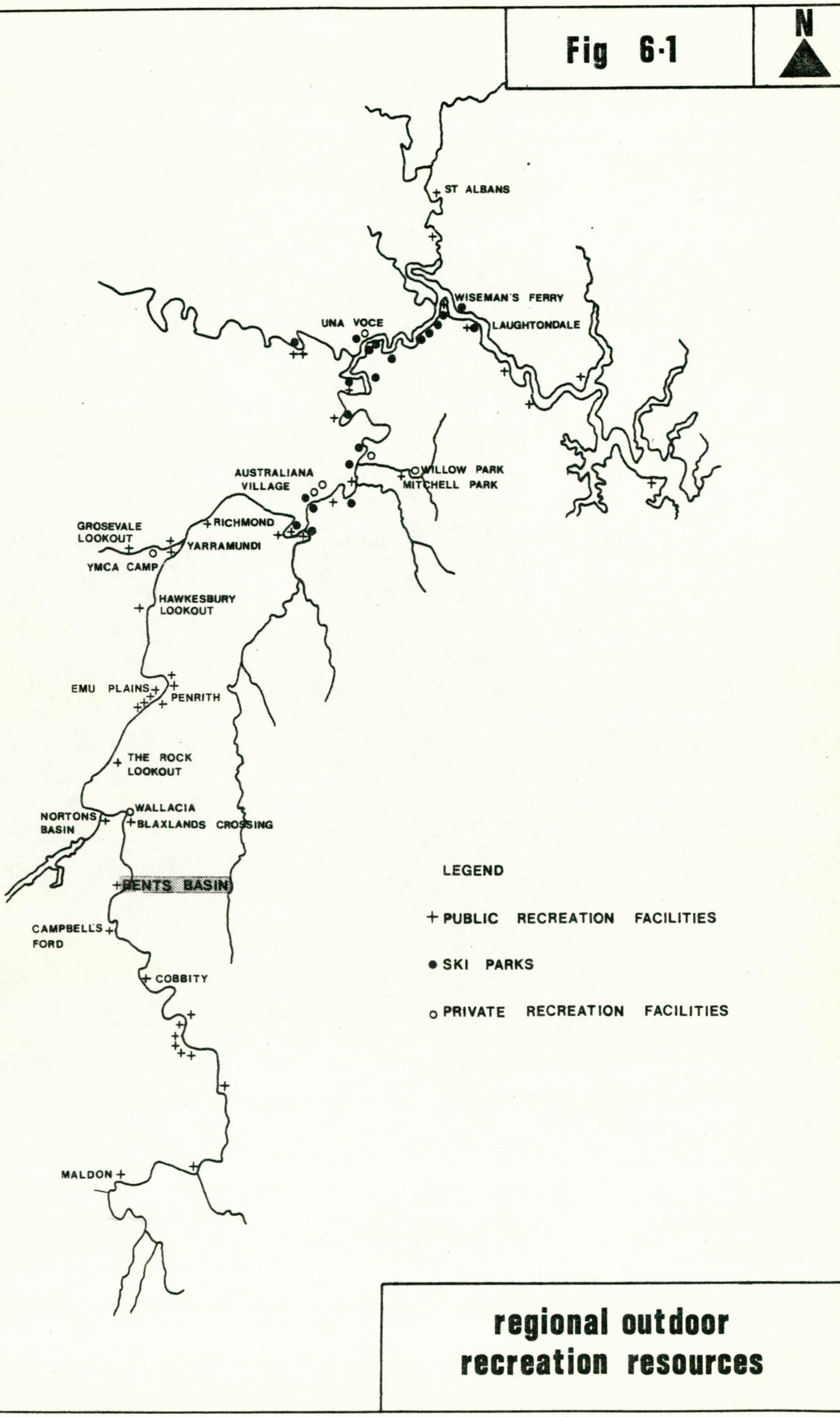
Two sources were used to compile the supply inventory: a review of existing published information to ascertain a regional overview; and a field investigation of existing outdoor recreation facilities in the Bents Basin Region and alternative facilities in neighbouring regions.

6.4 The Metropolitan Context

The current expansion of population occurring in the outer western and southern suburbs and peripheral areas of Sydney exacerbates the existing inequity of water orientated outdoor recreation opportunity. The natural waterways of Sydney provide a vast array of recreation potential. However, the location of these resources places the western and southern areas of Sydney at a disadvantage. The recreation opportunities available to this population are further hindered by their isolation from coastal beaches and at present, few alternatives are available to them.

The Nepean River is a prime recreation resource in the southern and western areas of Metropolitan Sydney - being the only convenient area for water based recreation. The demand for use of the River emanates further afield and is a valuable component in the supply of outdoor recreation opportunity to Sydney at large. Downstream, the Nepean becomes the Hawkesbury and the River's

Fig 6·1



regional outdoor recreation resources

character changes to accept a wider range of water activity. Water skiing, power boating, sailing, rowing and fishing complement the existing picnicking, swimming and water allied pursuits. Private industry in combination with the Government has provided a number of recreation parks to fulfil the additional facility requirement of these activities. (Fig. 6.1)

6.5 Outdoor Recreation Opportunities Adjacent to the Bents Basin Region

It is clear the nature and recreational use of the Hawkesbury River's tidal zone differs greatly from its non-tidal reaches. Accordingly, it is appropriate on the basis of resource type to review Bents Basin in the light of other recreation resources in the non-tidal reaches.

Much of the upper Nepean and its tributaries - the Avon, Cordeaux, Cataract and the Warragamba River catchments - are used for domestic water collection purposes and are unavailable for recreation use. Though in each case picnic/BBQ and other basic facilities have been established around the dam site. Of these Warragamba Dam is the most significant recreation alternative to Bents Basin.

Access to the Nepean River upstream of Penrith is a further hindrance to recreation use. Access is all but limited to relatively infrequent road crossings as much riparian land is under freehold ownership. The most notable sites have been identified as Maldon, Douglas Park, Menangle, Bents Basin and Wallacia (Table 6.1). These sites presently represent a major recreation resource, though primarily at the local level.

TABLE 6.1 Park Day Use of Recreation Areas Adjacent to Bents Basin[9]

Area	Facilities		
	swimmers, picnickers	water craft	cars
Maldon	49	---	23
Douglas Park	263	7	79
Menangle	516	7	172
Bents Basin	100	3	32
Blaxland Crossing	70	8	30

A number of other sites on the adjacent areas have a wider appeal including Warragamba Dam, Blaxland Crossing, the Lion Park and the Blue Mountains National Park. The Lion Park is a private venture and offers a specialist attraction whereas the remaining facilities relate more closely to those offered by Bents Basin. For this reason a more detailed survey of these facilities was undertaken.

BLAXLAND CROSSING: Blaxland Crossing is a Crown reserve under the care, control and management of a trust. The park offers both day-use and camping areas which provide the following facilities:

Facility	Number
picnic tables	24
BBQ	28 (wood) 4 (gas)

(9) De Leuw, Cather. op. cit.

Facility	Number
Toilets/showers	4 blocks
hire boats	12 canoes 6 john boats
campsites (powered)	40
tent sites	60
river access	fair

A small fee is charged for day use and in the peak summer periods the reserve accommodates up to 400 vehicles. The powered campsites have 100% occupancy throughout the year. Further land is available for future development.

WARRAGAMBA DAM: Since its opening Warragamba Dam has been a popular attraction with an annual visitation in excess of half a million people. The main attraction of the area is the Dam and its excellent picnic facilities:-

Facilities	Number
picnic areas (2)	20 ha.
picnic tables	200
BBQ	89
children's playground	2
toilet blocks	8
hot water fountains	3

On peak summer days the picnic areas are used to 100% capacity, which would average out at approximately 80% over the year. A growing trend is for picnickers to bring their own BBQ: the carrying capacity of facilities have largely been attained.

BLUE MOUNTAINS NATIONAL PARK: The Blue Mountains National Park occupies a vast area of land extending from Glenbrook in the east to Bell-Mt. Victoria to the west. The Park primarily exists to preserve the natural resources of the area and as such its recreation potential must be limited and its capacity low. Yet within the Park one particular site has a recreation potential very similar to Bents Basin. This site, Jellybean Pool, offers the visitor a similar experience to that available at Bents Basin and as such gives an indication of likely demand.

6.6 Outdoor Recreation Opportunity within the Bents Basin Region

The demand methodology determines the proportion of total demand, emanating from the recreation market area, that can be attributed to the Bents Basin Region. It is necessary to identify the existing supply of recreation opportunity in this Region to establish if a need exists. A survey of the Bents Basin Region shows that (except for the proposed S.R.A.) there is only one other reserve for public recreation (R. 81721 notified 19th June, 1959). This reserve (with an area of 6.4 ha) has no recreation facilities and can be discounted for the purpose of this study. The Bents Basin S.R.A. will receive all the demand attributed to the Bents Basin Region (Tables 5.7 to 5.9).

6.7 The Capability of Bents Basin to Provide Outdoor Recreation Opportunities

Bents Basin S.R.A. is an interface between gently undulating pastoral land typifying the River valley and the rugged Sydney sandstone country. This dichotomy is similarly reflected in the type of outdoor recreation opportunities each land type offers. To assess the capabilities of the park, recreational capability criteria were formulated (Appendix V). The various land and water areas that meet the activity criteria are outlined below:

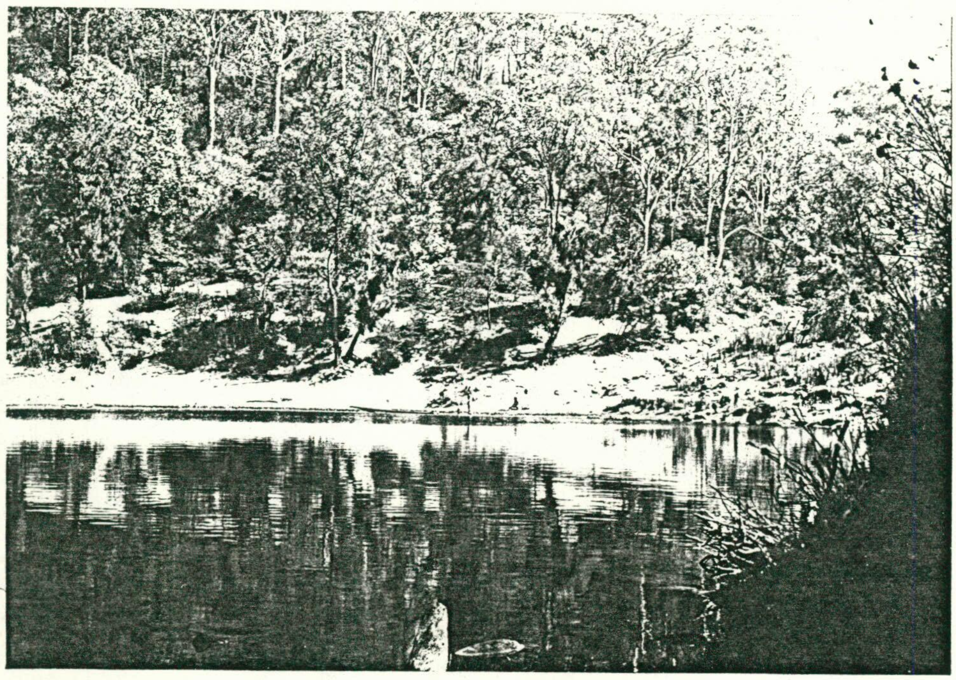
6.7.1 Water Activities

Swimming: The park contains some four kilometres of River and Bents Basin itself. A weir has been constructed half a kilometre downstream from Campbells Ford and maintains the River at a height sufficient to allow swimming and non-power boating. A number of natural pools in the gorge provide congenial swimming areas. There is no vehicular access to Campbells Ford or the natural pools, so the realization of their full potential is restricted.

Bents Basin itself has an area of 3 ha. and a shoreline of 500 m. Sandy beach runs for 350 m along the water's edge. The Basin is very deep and its banks fall steeply away from the sides. On average, it is 7 m from the water's edge out to a depth of 2 m; limiting the safe swimming/wading area to 1400m^2 and providing a carrying capacity for 150 swimmers at any one time.

Campbells Ford is suitable for swimming but the area's utilization will be light since access is open only to bushwalkers. There is a flat, sandy location adjacent to the river at Campbells Ford, but its potential for swimming is limited by a southerly aspect and the undercutting of the river bank.

Wading: Wading will be confined to the river bed south of the large sand bank. The bed is sandy and the water shallow here. This stretch of the river abuts the potential picnic area site and is well located to facilitate child supervision. At present flood debris chokes this stretch of water and will need removal.



BEACH AREA
BENTS BASIN

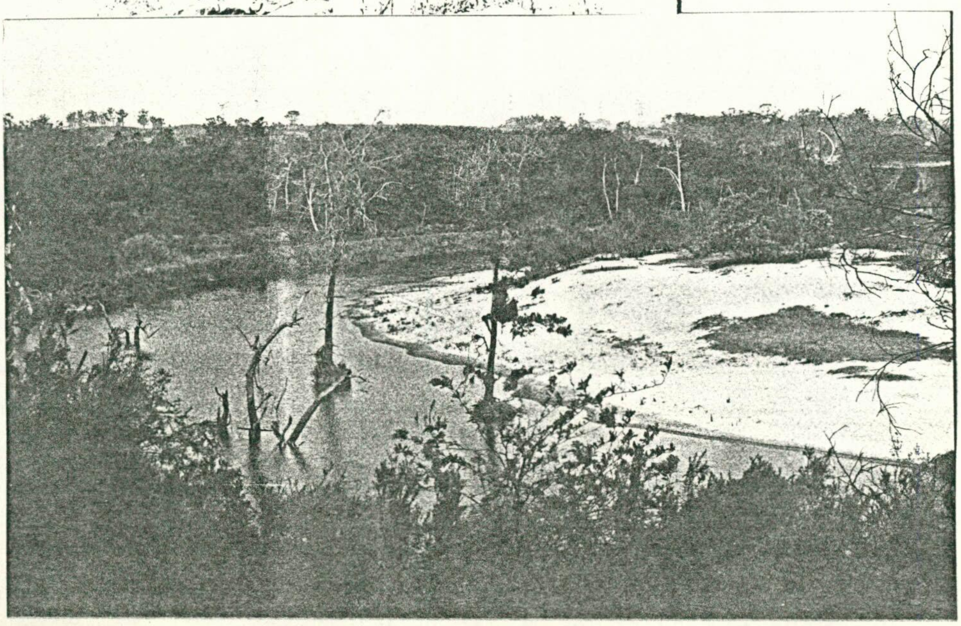
<u>Boating</u> (Rowing and Canoes): The two areas of the park capable of providing non-power boating are the Basin itself and the area upstream of the weir at Campbells Ford. The remaining sections of the river are either too shallow or obstructed by flood debris.

The Basin has a water surface area of 3 ha. and a carrying capacity for 6 craft at any one time. Its steep banks will keep swimmers and waders away from the periphery. Although there might be some overlapping of use in the beach area, little conflict is expected. Only easily transportable craft will be able to use the Basin.

Access is the main problem hindering use of the water held by the weir downstream of the Ford. The water is very deep at Cobbity weir and Campbells Ford and conditions are well suited to boating, but lack of public access to the area inhibits this proposal.

BENTS BASIN BACKED BY UPLIFTED PLATEAU

CAMPBELLS FORD



6.7.2 User-Based Land Activities

Picnicking: Several areas within the park satisfy the resource criterion for picnicking but, with the exception of the pastoral land and sand bank, vehicular access is not feasible. The pastoral land (a total of 21 ha.) will become the visitation focus: supporting the park entrance, car park, ranger's office/residence and workshops. It will also be the stepping-off point for resource based activities on the sandstone areas. Presuming that the western section of the pastoral land (40%) is allocated to formal picnicking - some 250 picnic tables can be supplied with a capacity to seat 1100 people at one time.

The eastern half of the sandbank should be closed off to help preservation of the E. benthamii. The western half of the bank is susceptible to flooding and erosion: its development will be limited to informal picnicking. The area's light usage should be further ensured by its distance from the pastoral section and the physical barrier of the river. Until park development begins in earnest the area will continue to function as the main informal picnic area.

PASTORAL LANDS

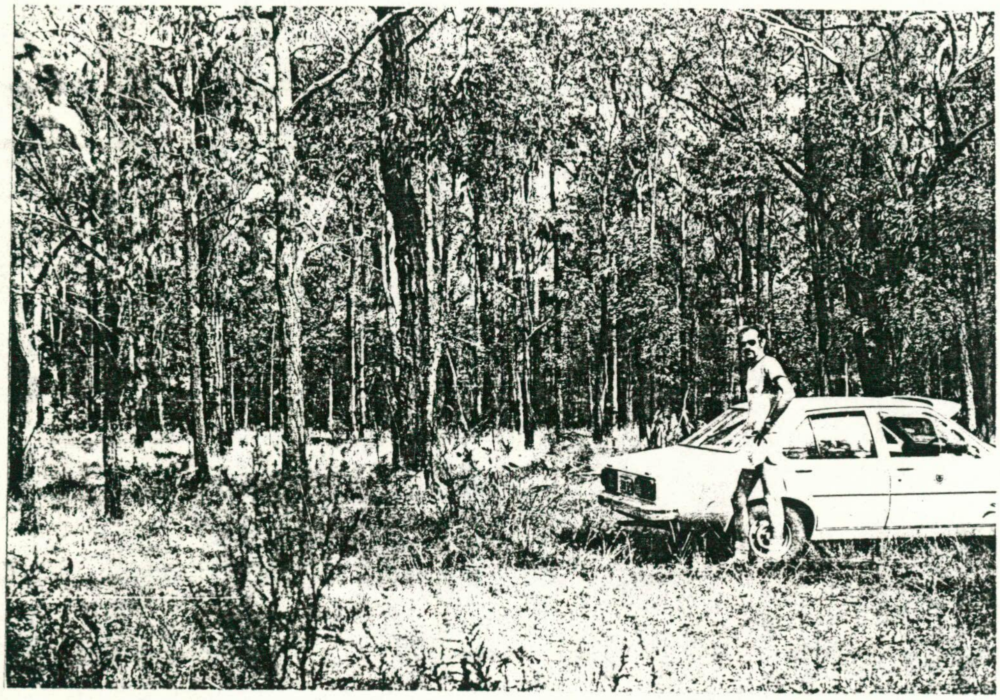
Camping: The limitations of vehicular access and the relative scarcity of flat land prohibit caravan or trailer camping. Powered caravan sites are available at Blaxland Crossing, Wallacia - a site with potential for expansion; and land resources will be used more rationally at Bents Basin if primitive tent sites only are provided. Two sections are most suited for primitive camping - the ironbark stand on top of the plateau, and the pastoral area. The ironbark stand is particularly suitable for walk-in camping groups such as scouts, youth clubs, bushwalking clubs etc. The stand, occupying some 18 ha., is well shaded with a grass understorey and its underlying soil will accept septic effluent. The site will have a capacity of 250 campsites, satisfying some 350 campers. It could function as a nature interpretative centre and is ideally located to provide a base for one day hikes to the Basin, Campbells Ford or the aboriginal cave paintings along Forest Hill Creek.

A section of the pastoral land, notably the north east corner, could also be allocated to camping. It will be more appropriate for private campers with a user-based rather than resource-based interest. It is but a short distance from this area to the Basin, the river and the sand bank. Vehicular access will be possible but a degree of tree planting and land enhancement will be required.

The envisaged site will have an area of some 5 hectares with 75 campsites providing for approximately 150 campers per day.

Open Space (Informal Games): The criterion for open space (Appendix V) applies only to the pastoral land - particularly its central sections. Its appearance is stark and land enhancement will be needed to fringe the open areas.

Children's Playground: The need for supervision necessitates the location of the playground adjacent to the picnic area. The playground should be situated away from roadways and traffic, and the quiet areas of the park.



IRONBARK STAND

6.7.3 Intermediate-Based Land Activities

Horse Riding: Provision of horse riding opportunities at Bents Basin will be consistent with the surrounding land use: carefully designed bridle trails could follow the sandstone plateau.

However, a number of constraints do exist. It is necessary to separate riding and walking tracks, but this may be difficult at the junction of the Basin, the sandstone plateau and the pastoral areas where the land is especially steep and narrow. Vehicular access will probably end at this junction and, as the starting off point for most of the park's resource based activities, it will need careful design to avoid congestion.

Stables and auxiliary facilities will be needed for transportation and maintenance. These facilities would be best established on the level areas of the plateau, as they will be incompatible with user-orientated activities on the pastoral lands.

Cross Country Running and Orienteering: These pursuits will require open pastoral land for the starting and finishing of races, picnic facilities, car park services etc., and the sandstone plateau for running tracks.

The difficulties associated with the separation of tracks and the problems of congestion recur when considering plans for running and orienteering tracks.

6.7.4 Resource-Based Land Activities

Bushwalking and Scenic Tracks: The visual quality of Bents Basin is undoubtedly one of the finest features of the park. Visual features should be considered when planning walking tracks: they have been incorporated in the following proposals.

Short tracks: sand bank, *E. benthamii* stand
: around the Basin

Intermediate tracks: Bents Basin Lookout
: Bushranger's Cave

Long tracks: Along the gorge rim
: Campbells Ford
: Ironbarks' stand
: River bed

A range of tracks with varying lengths and grades should provide a spectrum of bushwalking opportunities and, at the same time, afford access to the park's most significant features.

Primitive Hiking: The rugged terrain of the gorge, river bed and Forest Hill Creek provide the land qualities outlined for primitive hiking (Appendix V). The route along Forest Hill Creek, which offers interesting views of aboriginal cave paintings, will prove especially rewarding. Campbells Ford may be sufficiently isolated to function as a primitive hiking base.

Nature Observation: (Observation of Wildlife and Flora, Photography & Painting). Nature observation will be a side benefit of establishing walking tracks throughout the park. The development of interpretative information centres, the creation of a nature trail through the *E. benthamii* and *H. hermaniifolia* regions and the signposting of other Basin features are suggested. Once photographers and painters have been given suitable access, their use of the park needs little further encouragement.

Educational Uses: The ironbark camp site should function as a suitable base for field studies. The integration of the walking and nature trails, and the botanic and geological features of the park with the camp site should provide a suitable infra-structure for a teaching base.

Scientific Uses: Any equipment necessary for field studies or scientific assessment will be best erected on the flat sandstone areas.

It is likely the use of the park will range from intense picnicking to primitive hiking in near wilderness conditions. Thus the effect of a wide range of visitation patterns will be available if required.

7.0 NEED FOR OUTDOOR RECREATIONAL FACILITIES AT BENTS BASIN S.R.A.

7.1 Introduction

Outdoor recreational needs are defined as the difference between activity demand and the available supply. These needs are translated into requirements for activity areas or facilities. Recreation needs also include research, legislation and other efforts that are necessary if Bents Basin S.R.A. is to meet area and facility requirements.

To translate the activity demand into a specific amount of supply, it is necessary to adopt standards. Standards usually represent the average amount of supply necessary to meet a given amount of demand. (The standards used in this analysis are discussed more fully in the previous two chapters).

Projections of future recreation area and facility needs are made by comparing the demand data with current supply. Coupling this data with an assessment of the environmental impact in establishing the park affords an information base for the decision making process. A completed needs assessment makes it possible to determine the policy directives ("concept plan") and implementation programme that allow for an effective and responsive S.R.A.

7.2 Goals and Objectives

The major goals of the needs analysis were to:

- estimate the current and future recreation facility and activity area needs at Bents Basin S.R.A. through survey analysis.

- identify the likely environmental impact of establishing an S.R.A. at Bents Basin.

- provide an information base for the prescription of a plan of management which provides an equitable range of recreation opportunities.

Based upon these goals, the objectives of the needs analysis were to:

- conduct a statistical analysis of the demand and supply data to establish the need for recreation facilities and activity areas.

- develop an implementation schedule identifying development needed, its cost and timing.

7.3 Recreational Facilities and Activity Areas Needed

The supply inventory of the Bents Basin Region indicated that the existing availability of public recreation areas was negligible. As such, the need for recreation areas and facilities is the full demand demonstrated in Fig. 7.1. Also indicated in Fig. 7.1 are the land capabilities of the Park to provide accepted recreation area and facility development. As can be seen, the park has the land capability to meet recreation demand for picnicking and camping beyond the year 2000 A.D. The Basin's capacity to provide swimming is below existing regional demand and additional water resources are needed. Capacity is also available on the pastoral and sandstone areas to provide a wide range of those other activities specified in section 6.7.

Swimming and picnicking facilities have, in light of the surrounding recreation areas, the highest priority for development. The 1980-1982 development schedule is outlined below. This is a preliminary schedule and requires review prior to the prescription of the park's plan of management.

Year	Recreation Development
1980/81	50 picnic tables
	Beach restoration
	Walking track (Basin - Lookout)
1981/82	20 Campsites
	Walking track (Basin - Ironbarks - Campbells Ford)
	Walking track (Basin - Forest Hill Creek)
	Playground, kiosk, canoe hire, open areas, interpretation building.

7.4 Future Provision of Service and Amenity Needs (TABLE 7.2)

Electricity: Electricity supply is under the Prospect and Nepean County Councils. High voltage power is available from both the northeast and southeast and may be connected without difficulty. A provisional amount of $10,000-00 should be set aside for this purpose; consideration should be given to underground supply.

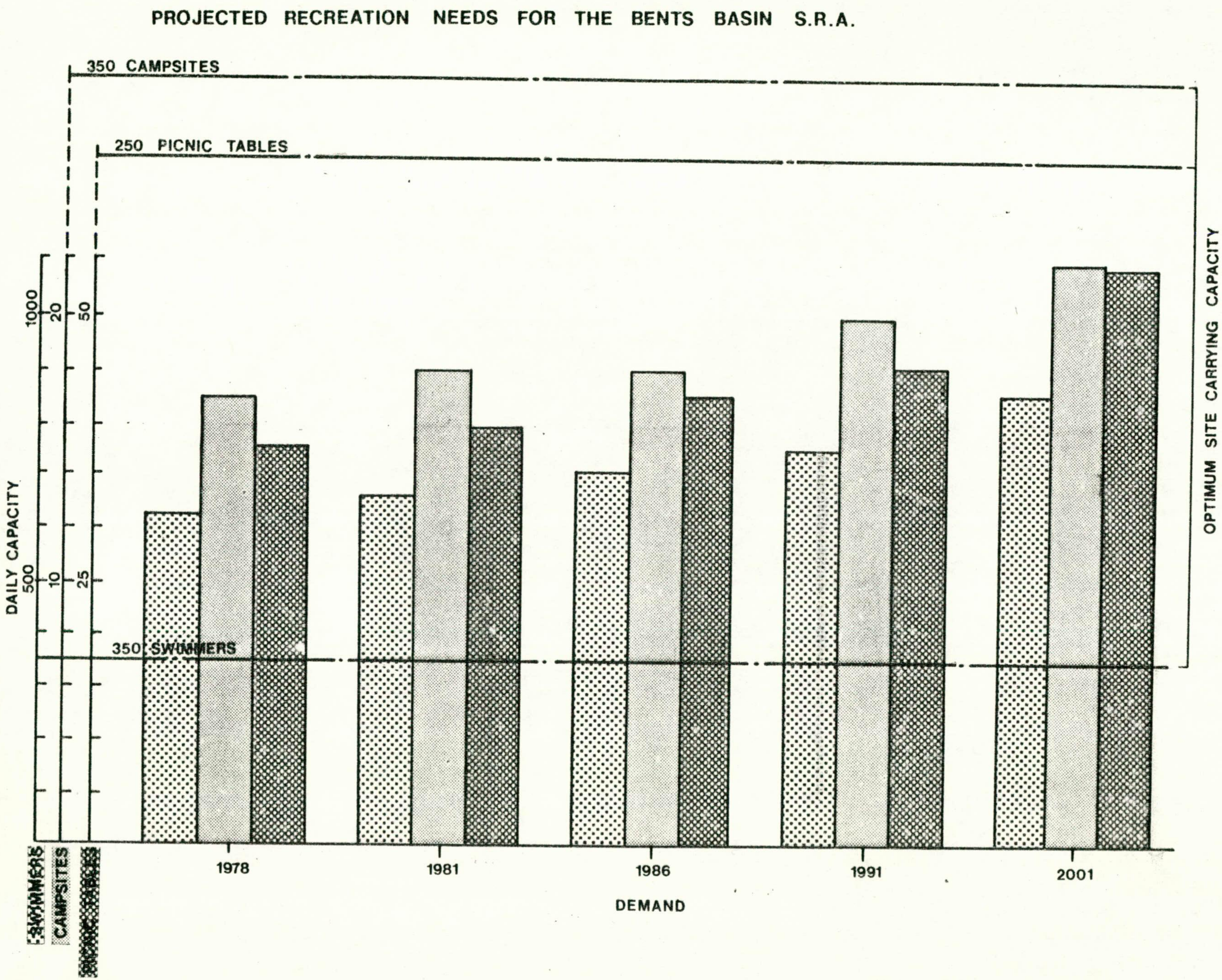
Water: The nearest town water supply to Bents Basin is at Wallacia, covering the upper parts of Greendale and Silverdale Roads. The most economical water supply will be provided by the River after appropriate chlorination. Estimated cost $15,000.

Sewerage: The only sewerage treatment works in the immediate district is at Warragamba Village and extension of these works to Bents Basin is impracticable. On site treatment to a tertiary level is needed to meet health and water quality standards for inland water effluent. Effluent from the "Ironbark Campsite" could be met by a septic system ($2,000-00) though investigation will be needed to determine the needs of the main (pastoral) picnic area (toilets with capacity for 1000 people will cost $60,000-00).

Solid Waste: Liverpool City Council presently provides a collection service by way of a contractor: discussion should be held with the Council to meet the needs of the State Recreation Area.

Fire Control: The existing fire trail/service road from Bents Basin to Campbells Ford requires upgrading and repairs estimated to a cost of $10,000. Ultimately a return road may be necessary to ensure fire safety. A fire management plan should be formulated as soon as possible to identify needs and responsibilities. Four bushfire brigades (Luddenham, Bringelly, Cobbity, Silverdale) and five fire stations (Penrith, Camden, Campbelltown, Liverpool, Warragamba Village) service the district.

Law Enforcement: Traffic control and complaints of minor crime and antisocial offences can be expected to place an additional demand on police services; police stations are located at Warragamba Village, Penrith, Liverpool, Camden and Campbelltown.



PROJECTED RECREATION NEEDS FOR THE BENTS BASIN S.R.A.
350 CAMPSITES
250 PICNIC TABLES
350 SWIMMERS
DAILY CAPACITY
1000
500
20
10
50
25
OPTIMUM SITE CARRYING CAPACITY
SWIMMERS
CAMPSITES
PICNIC TABLES
1978
1981
1986
1991
2001
DEMAND

Fig 7·1

needs

TABLE 7.2 EXPENDITURE BENTS BASIN 1980/81

EQUIPMENT		
1 4 x 1 ton Diesel (Toyota)	$ 9,000	
1 Trailer	500	
1 Diesel Tractor	10,000	
Tractor Accessories	2,500	
General Tools and Equipment	2,000	
2 Way Radio Network	2,000	
Small Boat and Motor	1,000	
Fire Fighting Equipment	1,000	
	$ 28,000	$ 28,000
CARRY ON		
Wages (2 Park Workers)	$ 20,000	
Administration Costs	2,000	
Operational Costs	3,000	
Maintenance Costs	1,000	
	$ 26,000	$ 26,000
DEVELOPMENT		
Ranger House and Site Works	$ 55,000	
Workshop and Compound	25,000	
Entry Road	15,000	
Power Supply	10,000	
Water Supply and Reticulation	8,000	
Sewerage Disposal	5,000	
	$118,000	$118,000
		$172,000

1981/82

EQUIPMENT		
General; as required	$ 1,000	$ 1,000
CARRY ON		
Wages (2 Park Workers)	$ 20,000	
Administration Costs	2,000	
Operational Costs	3,000	
Maintenance Costs	2,000	
	$ 27,000	$ 27,000
DEVELOPMENT		
Toilet Blocks (2)	$ 60,000	
Parking Areas	25,000	
Landscaping	9,000	
Park Furniture	6,000	
Fire Trail	10,000	
Walking Tracks	2,000	
Entry Gate and Ticket Box	12,000	
Water Supply	7,000	
	$131,000	$131,000
		$159,000

80/81	$172,000
81/82	$159,000
	$331,000

The on-site ranger service should minimise the need for protection of the park itself.

The need for search and rescue operations will increase and the compact nature of the park and its good surrounding access will help such operations.

Health Facilities: First-aid equipment will be provided on site and park rangers are trained in first aid. Hospitals are located at Penrith, Camden, Liverpool and Campbelltown, with ambulance stations at Warragamba Village, Penrith, Camden, Campbelltown and Liverpool.

There should not be a significant increase in the demand for health facilities in the local area.

Traffic: In the early 1980's it is anticipated that on a peak summer's day the area will attract some 2000 people. This will generate a traffic flow of some 1000 vehicles per day (i.e. 500 vehicles with two movements/day). At this flow rate the unsealed section of Wolstenholme Avenue (2.6 km) will need to be sealed.

The environmental sensitivity of the Basin area warrants an extension of the current protection it receives. As such, the Bents Basin should remain unsealed in an effort to deter its use. NB. As well as providing residential and commercial access, Bents Basin Road serves the Silverdale Hillclimb and Bents Basin. Moreover, the capacity of the existing parking area at the north of the Basin should be downgraded and much of its present area rehabilitated for picnicking or other recreational activity. This should be done after the establishment of picnic areas east of the Basin leading to an expected change in demand for this eastern site.

8.0 SOCIO-ECONOMIC IMPACT ON LOCAL AREAS AS A RESULT OF THE DEVELOPMENT OF BENTS BASIN AS A STATE RECREATION AREA

8.1 Introduction

To date there has been little research in N.S.W. into the socio-economic impact of S.R.A.s or National Parks on their surrounding communities.

This study, as a theoretical basis for further investigation, incorporates the possible socio-economic consequences for the local community as a result of the establishment of Bents Basin as an S.R.A.

8.2 Employment and Population

Projected staffing of the proposed Bents Basin S.R.A. will be one ranger, two park workers and occasional casual staff. They will be required to carry out maintenance and development works, supervision of public use and protection of the natural environment. Any significant effect on employment in the local area would be indirect. One such effect envisaged is the setting up of roadside stalls. The area surrounding Bents Basin is pastoral and with approximately 200,000 visitors per year to the State Recreation Area, the establishment of stalls should prove an attractive proposition to local market gardeners.

Business is likely to improve in the local area because of the expected economic inflow resulting from development of Bents Basin. This will arise from initial expenditure in the area for park development and the consequent patronage of services by park users.

The creation of the Bents Basin S.R.A. will improve employment prospects in the surrounding district and will greatly enhance the community's economic stability.

8.3 Expenditure Required for Development of Bents Basin as an S.R.A.

Estimated budget funds for the first two years of operation would cover most of the expenditure necessary for the development of Bents Basin as an S.R.A.

The major works should be undertaken during the financial years of 1980-1981 and 1981-1982.

Most of the money for equipment, maintenance, development, wages and administrative costs will be expended in the local area: in 1980-82, approximately \$236,300 local expenditure is foreseen out of the proposed \$331,000 total S.R.A. cost. A significant economic boost for the community.

Equipment. Only a small percentage of equipment costs will be spent in the local community, approximately \$7,000 in the first financial year and \$1,000 in the second financial year. These costs will go towards providing a trailer, general tools and equipment, a small boat and motor and fire fighting equipment; approximately 15% of the purchase price of a 4 x 1 ton "Toyota" diesel, one diesel tractor and tractor accessories will go to the local agents as commission.

Carry-on Funds. Wages for the two park workers, administrative costs, operational costs and maintenance costs (approx. \$53,000 for the two financial years), will be expended in the local area.

Development Funds. About 70% of the total $249,000 development costs for the two years will be spent in the local district. In the first year this amount covers the development of the ranger house and site works, workshop and compound, entry road, power supply, water supply and reticulation, and sewerage disposal.

The second year will see the development of the two toilet blocks, parking areas, landscaping, park furniture, fire trail, walking tracks, entry gate and ticket box, and water supply.

8.4 Impact on Local Stores

Stores in the surrounding area, such as Wallacia, which are most likely to experience increased sales as a result of the establishment of a State Recreation Area at Bents Basin are:-

(1) Petrol Stations

(2) Milkbars and other places providing refreshments.

Petrol stations should experience a significant increase in petrol sales, with about 50,000 extra motor vehicles per year passing through to the Basin. Some of these vehicles would be travelling a considerable distance from the heavily populated areas of Sydney.

Milkbars will attract families with small children. Many young families inhabit the outerlying Western Suburbs, the area where people are most likely to be attracted to Bents Basin. Families also tend to be attracted to S.R.A.s as they provide recreation and activities for all age groups.

Grocery and general stores are likely to experience a similar rise in sales for picnic items.

8.5 Schools and Education

The development of Bents Basin as a S.R.A. should not have an appreciable effect on local schools considering the small number of staff needed for the maintenance and management of Bents Basin. However, more generally, the establishment of the Nature Interpretative Centre at the site should assist local schools and community groups understand their surrounding environment.

8.6 Housing and Land Utilisation

Land utilisation by campers and hikers in the area surrounding Bents Basin can be expected to rise once Bents Basin S.R.A. is advertised and facilities are provided. However, the population attracted to the area will be mobile and it is unlikely to make any appreciable impact on housing.

8.7 Traffic

Undoubtedly the flow of traffic from Wallacia to Bents Basin will dramatically increase and will change the character of Wolstenholme Avenue. The intended upgrading of Wolstenholme Avenue should minimise the adverse impact of increased traffic flow (such as dust generation). Presently, roads to Wallacia carry a considerable weekend recreation flow to Warragamba Dam and the Lion Park. The effect of establishing a Park at Bents Basin should be reviewed in the light of this existing flow.

8.8 Community Services

Section 7 has outlined the ways in which the S.R.A. will affect law enforcement, fire protection and health services. For the most part this impact will be minimal, though the additional facilities at the park can be viewed as a positive improvement.

9.0 CONSTRAINTS

9.1 Physical

The major constraint to park development is the lack of land capable of accommodating the diversity of recreational pursuits normally associated with an S.R.A. The area most capable of accepting this diversity is confined to the 21 hectares of pastoral land east of the Basin. The physical qualities of the park are more in line with the "special interest" classification of the S.R.A.s.

The linear shape of the park in conjunction with the topography, present difficulties in providing vehicular access throughout the park. These factors, in addition to the relatively small land area, will hinder the construction of permanent roading. Access to the plateau, Forest Hill Creek and Campbells Ford should remain pedestrian for the present.

Present access to the park is via Bents Basin Road to the Council car park north of the Basin. The close proximity of the road and car park to the rare E. benthamii stand should prompt the gradual downgrading of that road and car park, with the area of concentrated use being transferred to the pastoral lands abovementioned. Development of the latter area should attract the bulk of the park's visitation and prove a more than adequate substitute.

A further physical constraint is the lack of land access to Campbells Ford. A sandy beach area rimmed by large Eucalypts and backed by an extensive area suitable for passive recreation is loacted immediately south of Campbells Ford. This area has public access and may, in the future, complement Campbells Ford in this regard.

9.2 Ecological Constraints

The two main ecological constraints to the development and management of Bents Basin S.R.A. are, firstly, the rare plants found around the Basin and secondly, the Nepean River's water quality and propensity to flood.

The steep slopes upon which the H. hermaniifolia is found affords the species a degree of physical protection. This is not the case with the E. benthamii. To ensure maintenance and regeneration of the existing stand, the eastern half of the sand bank should be managed for its preservation. However, a nature interpretative trail could incorporate the stand and would enable park visitors to appreciate the species and the need for its preservation.

The State Pollution Control Commission has indicated that water quality and rate of flow are intrinsically linked. In periods of low flow water quality presents no problem to body contact recreation. In periods of high flow the turbidity created is highly dangerous. In this way the use of the River is, to a degree, self-regulating. Water sampling may be necessary to ensure the safety of swimmers following periods of high flow rate.

Flooding will also constrain recreation development and access. Taking the 50 year flood level (equivalent to the 50m contour) as a prudent safety mark, access into the park would be prevented by two creeks running across the pastoral land. Fortunately there is sufficient high ground adjacent to these creeks for safety. Major structures such as workshops, ranger's house, offices, visitor centres, etc., should not be constructed below the 50 metre contour. Recreation facilities such as picnic tables may be below this level if necessary but amenity blocks should be on higher ground.

Soils found in this area also restrict location of amenities and management. Soils of the Menangle and Hammondville series (that is, the pastoral land and Ironbark stand on top of the plateau) can accept varying degrees of septic effluent. The remaining soil type overlaying the sandstone is shallow and susceptible to erosion. The latter cannot accept septic effluent and may require stabilisation when being developed for walking tracks.

The steep sides of the sand bank east of the Basin are very susceptible to slip. Management should restrict visitor activity in this area.

10.0 PARK ROLE AND THEME

The primary role of the Bents Basin S.R.A. is to meet the needs of Metropolitan Sydney and, particularly, its western and southern suburbs, by providing outdoor recreation activities in a natural setting. These suburbs are notably deficient in water orientated recreation areas and surrounding land based areas have reached or are nearing their respective carrying capacities. The park is ideally located to function as a regional park.

The park should provide the opportunity for safe water sports and the enjoyment of passive recreation adjacent to the Basin and Nepean River. Furthermore, the concept of escaping the city should be enhanced by the provision of walking tracks, nature interpretative trails and camping. Education of the public in an appreciation and enjoyment of the natural qualities of Sydney's sandstone country should also be a prime role of Bents Basin S.R.A.

To fulfil this role the park should adopt the theme of an interface of man and nature in a recreational context. The natural assets of rare flora and native fauna, spectacular gorge landscapes, rugged terrain, river rapids, sandy beaches and the Basin itself should be used to promote the theme of "man enjoying nature". The park theme will be dual: the traditional recreational theme encompassing both active (swimming, canoeing, walking and sight seeing) and passive (picnicking, sunbathing, relaxing) pursuits.

In addition, the park should promote an involvement with nature and an emphasis on education - through interpretative tracks, primitive camping and hiking, and the viewing of aboriginal paintings.

11.0 THE BENTS BASIN RESOURCE INVENTORY AND PRESCRIPTION OF A PLAN OF MANAGEMENT

The Department of Lands has adopted a Plan of Management Framework which functions as a cookbook to prescribe the development and management of State Recreation Areas. It is imperative in the case of Bents Basin that this plan not only provides a diverse range of recreational opportunities but also emphasises the value of conserving the site's intrinsic, natural qualities.

The Bents Basin Resource Inventory and Preliminary Development Strategy has been undertaken to establish an information base for the prescription of the Plan of Management. The resource inventory in combination with its public review will provide this base and aid in determining the necessary strategies to enable Bents Basin to fulfil its role as a regional park.

Received
SECRETARIAT 12 MAR 1979

APPENDIX I

New South Wales Government

State Pollution Control Commission

Central Square Building
323 Castlereagh Street
Sydney 2000
G.P.O. Box 4036, Sydney 2001

The Undersecretary and
Registrar General
Crown Lands Office
Box 39 GPO
SYDNEY 2001

Our reference: 701700 LJY:DR

Your reference:

Telephone: ~~2124033~~
275011

Dear Sir

Bent's Basin State Recreational Area
Attention Mr Ian Garrard

Attached is a copy of a brief report on the water quality of the Nepean River at Bent's Basin.

Yours faithfully

for D B O'CONNOR
Acting Secretary

Encl

RECEIVED
Papers
12 MAR 1979
I G.
PARKS AND RESERVES BRANCH

WATER QUALITY IN BENT'S BASIN

Bent's Basin is an enlarged section of the Nepean River located approximately 10 kilometres upstream of Wallacia. The basin itself is a naturally-formed lake measuring some 300 metres at its widest point and is in places up to 22 metres deep. The area is popular for recreation and is used extensively for swimming, especially at weekends.

With the exception of treated sewage entering the river at Camden some 24 kilometres upstream, there are no point-source discharges to the river which have a direct influence on the water quality of Bent's Basin. There are however a number of diffuse sources of contamination; Bushranger's Creek and Forest Hill Creek for example, which enter the Nepean just upstream of Bent's Basin, drain largely pastoral areas of Silverdale and Werombi.

As part of a series of intensive studies in the Nepean River the quality of the waters in Bent's Basin were assessed under both wet and dry weather conditions. The attached summary tabulates the mean values recorded for a number of parameters measured during October and November 1978.

Under dry weather conditions the waters are clear, well oxygenated and contain relatively low concentrations of nutrients. Algal activity is well established and bacterial quality is high.

Under wet weather conditions (more than 50 mm of rain in the preceding 48 hours) there is a significant increase in flow in the river. Run-off from both the surrounding areas and from the developed areas upstream near Camden causes large quantities of silt to enter the river; nutrient levels increase and there is a rise in bacterial levels; dissolved oxygen concentrations are not affected.

The suitability of Bent's Basin for recreational use during dry weather has long been recognised. After significant rainfall however the Basin is not so recreationally attractive; the river becomes a fast-flowing stream of muddy water and is aesthetically unpleasant. The fact that E. Coli levels increase during wet weather does not necessarily indicate a lowering of body-contact recreational value; sight should not be lost of the fact that the incidence of disease is not concomitant with high faecal coliform counts.

As with most river swimming areas, adequate wet-weather constraints are imposed on the use of the basin by the very nature of the river during and shortly after heavy rainfall; gross turbidity and extreme rates of flow are more serious considerations than any marginal alteration to the rivers chemical characteristics.

SUMMARY OF WATER QUALITY IN BENT'S BASIN
(OCTOBER - NOVEMBER 1978)

	Wet Weather	Dry Weather
NH_3-N mg/L	0.1	0.02
NO_x-N mg/L	0.5	0.1
TK-N mg/L	0.8	0.4
P-total mg/L	0.13	0.06
NFR mg/L	45	5
Chlorophyll a ug/L	7	9
E. Coli per 100 mL	960	0
D.O. % saturation	107	121
Conductivity $uScm^{-1}$	750	300

PREDICTED TOTAL DEMAND FOR PICNICKING BY REGION IN THE RECREATION MARKET AREA (in 000's of activity days)

	REGION	1978	1981	1986	1991	2001
I	Bents Basin	7	8	9	11	14
II	Penrith	451	487	535	583	664
III	Liverpool	479	487	502	522	690
IV	Camden	78	86	99	122	172
V	Wollondilly	82	86	94	96	112
VI	Blue Mountains	250	274	304	335	378
VII	Windsor	99	101	106	106	106
VIII	Blacktown	881	902	948	1034	1176
IX	Fairfield	601	664	720	750	786
X	Campbelltown	346	451	512	548	619
XI	Mid Western	1771	1785	1828	1868	1939
XII	Southern Sydney	3506	3536	3666	3780	3980
XIII	Northern Sydney	3478	3501	3559	3638	3757
XIV	Central & Inner West	3228	3171	3146	3174	3275

PREDICTED TOTAL DEMAND FOR SWIMMING BY REGION IN RECREATION MARKET AREA (in 000's of activity days)

	REGION	1978	1981	1986	1991	2001
I	Bents Basin	16	18	22	25	32
II	Penrith	1058	1142	1255	1369	1559
III	Liverpool	1125	1142	1178	1226	1618
IV	Camden	184	202	232	286	405
V	Wollondilly	192	202	220	226	262
VI	Blue Mountains	587	643	714	785	887
VII	Windsor	232	238	250	250	250
VIII	Blacktown	2067	2118	2225	2428	2761
IX	Fairfield	1410	1559	1690	1761	1845
X	Campbelltown	811	1059	1202	1285	1452
XI	Mid Western	4157	4189	4290	4385	4552
XII	South Sydney	8230	8300	8604	8871	9342
XIII	Northern Sydney	8162	8217	8354	8538	8818
XIV	Central & Inner West	7576	7443	7384	7449	7687

PREDICTED TOTAL DEMAND FOR NATURE WALKS BY REGION IN THE RECREATION MARKET AREA (in 000's of activity days)

	REGION	1978	1981	1986	1991	2001
I	Bents Basin	5	6	7	8	10
II	Penrith	353	360	395	431	491
III	Liverpool	354	360	371	386	509
IV	Camden	58	64	73	90	127
V	Wollondilly	60	64	69	71	82
VI	Blue Mountains	185	202	225	247	279
VII	Windsor	73	75	79	79	79
VIII	Blacktown	651	667	700	764	869
IX	Fairfield	444	491	532	554	580
X	Campbelltown	255	333	378	404	457
XI	Mid Western	1308	1318	1350	1380	1432
XII	South Sydney	2590	2612	2708	2792	2940
XIII	Northern Sydney	2569	2586	2629	2687	2775
XIV	Central & Inner West	2384	2342	2324	2344	2419
	TOTAL:	11269	11480	11840	12237	13049

PREDICTED TOTAL DEMAND FOR CAMPING BY REGION IN THE RECREATION MARKET AREA (in 000's of activity days)

	REGION	1978	1981	1986	1991	2001
I	Bents Basin	1	2	2	2	3
II	Penrith	88	95	104	114	130
III	Liverpool	94	95	98	102	135
IV	Camden	15	17	19	24	34
V	Wollondilly	16	17	18	19	22
VI	Blue Mountains	49	53	59	65	74
VII	Windsor	19	20	21	21	21
VIII	Blacktown	172	176	185	202	230
IX	Fairfield	117	130	141	147	153
X	Campbelltown	67	88	100	107	121
XI	Mid Western	346	348	357	365	379
XII	South Sydney	685	691	716	738	777
XIII	Northern Sydney	679	684	695	710	734
XIV	Central & Inner West	630	619	614	620	640

DISTRIBUTION OF TOTAL DEMAND

A series of concentric rings were drawn around each regional population centre, with radii of 8, 16, 40, 80 and 160 km. The areas covered by each concentric ring are as follows:

8 km ring	-	203 km^2
16 km ring	-	610 km^2
40 km ring	-	4270 km^2
80 km ring	-	15250 km^2
160 km ring	-	60995 km^2

The potential demand for recreation opportunities within the Bents Basin Region, originating from each region was then determined. This was accomplished by comparing the land area of the Bents Basin Region with the total land area of the appropriate concentric ring.

The distribution rings containing the Bents Basin Region were identified and the proportion of those rings overlapping the Bents Basin Region measured. Thus the demand attributed to Bents Basin is directly proportional to the percentage of distributional rings which overlap the Region's boundaries. Examples are presented below:

Influence of the Bents Basin (Region 1) on itself

Figure III.I depicts regions I to IV and their respective population centres. Superimposed on Region 1 (Bents Basin) are circles having radii of 8 and 16 km drawn to scale. This diagram indicates that a certain proportion of the total area of Region 1 lies within that area's 8 km distribution ring. In fact, the area of Region 1 lying within the 8 km circle is 120km^2 or 59% of the total area (203.3km^2). On the other hand only a small portion of Region 1 lies within its 16 km distribution ring. Hence, the percentage would be small ($\frac{10}{610}$ km = 1.6%). The same procedure was followed for the 40 and 80 kilometre zones of Region 1.

Influence of Other Regions on Region 1

While figure III.I shows the influence of the distribution rings of Region 1 on itself, figure III.2 represents the influence of the distribution rings of the surrounding regions on Region 1. The cross-hatched area in the diagram represents those areas where there is an overlap of one or more zones.

By looking at figure III.2 it can be observed that none of the area of the 8km ring around Region II cuts into or is occupied by Region 1. However a small portion of Region II's 16km (1.1%) and a larger portion (2.88%) of the 40km ring, is occupied by Region 1.

These percentages were calculated in the same manner as for Figure III.1; the area of that portion of the distribution ring radiating from Region II and cutting into Region 1 divided by the total area of Region II's zone of influence. The other zones (40 and 80 km) of Region II and the resulting percentages are calculated in the same way. This format is followed for the other thirteen regions and their influence on Region 1 through Table III.1.

DIAGRAM REPRESENTING METHOD USED TO DISTRIBUTE RECREATION DEMAND

THE EFFECT OF BENTS BASIN REGION ON ITSELF

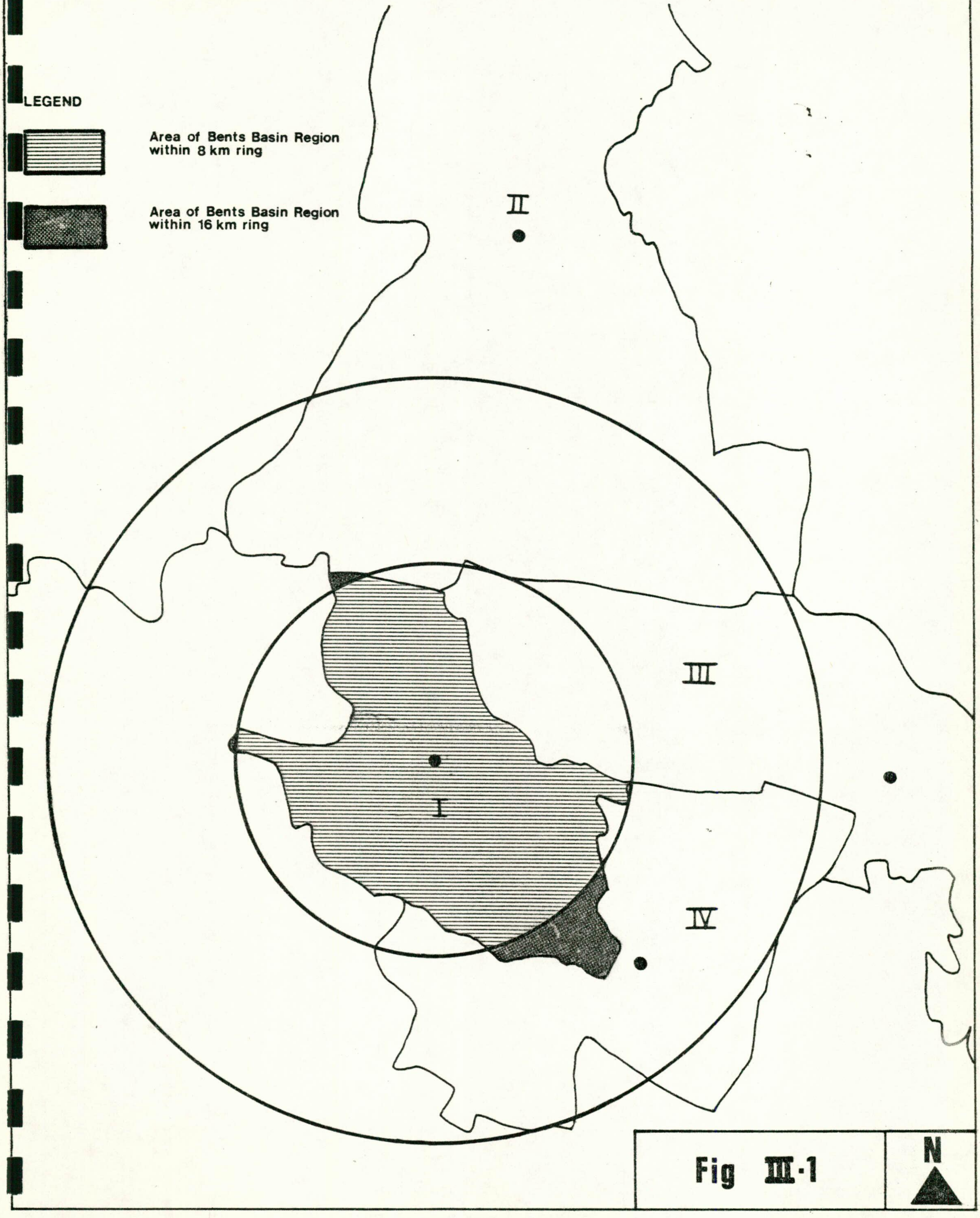


Fig III·1

DIAGRAM REPRESENTING METHOD USED TO DISTRIBUTE RECREATION DEMAND

EFFECTS OF SURROUNDING REGIONS ON THE BENTS BASIN REGION

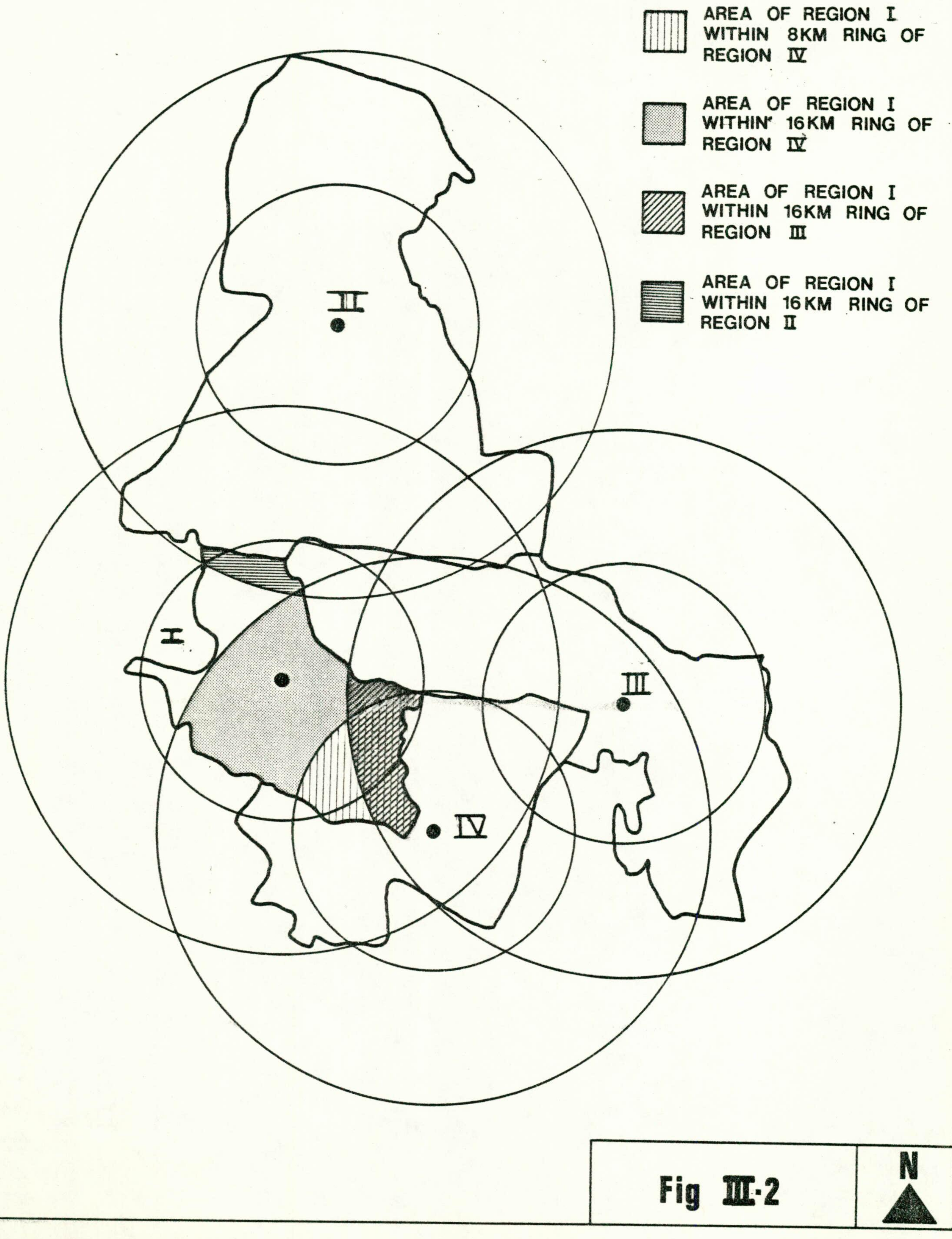


Fig III·2

TABLE III.I PROPORTIONAL DISTRIBUTION OF DEMAND GENERATED BY ALL REGIONS AFFECTING THE BENTS BASIN REGION (REGION 1)

Region	Distribution Ring	Area of Ring km^2	Area of Bents Basin within the Ring km^2	%
I	8	203.3	120	59
	16	610.0	10	1.6
	40	4269.6	0	0
	80	15248.6	0	0
II	8	203.3	0	0
	16	610.0	7	1.1
	40	4269.6	123	2.88
	80	15248.6	0	0
III	8	203.3	0	0
	16	610.0	24	3.93
	40	4269.6	106	2.48
	80	15248.6	0	0
IV	8	203.3	32	15.74
	16	610.0	72	11.80
	40	4269.6	26	0.608
	80	15248.6	0	0
V	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	130	3.04
	80	15248.6	0	0
VI	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	70	1.639
	80	15248.6	60	0.393
VII	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	70	1.639
	80	15248.6	60	0.393
VIII	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	130	3.04
	80	15248.6	0	0
IX	8	203.3	0	0
	16	610.0	1	0.163
	40	4269.6	129	3.021
	80	15248.6	0	0
X	8	203.3	0	0
	16	610.0	3	0.491
	40	4269.6	127	2.974
	80	15248.6	0	0
XI	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	60	1.405
	80	15248.6	70	0.459
XII	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	102	0.0234
	80	15248.6	28	0.1836
XIII	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	0	0
	80	15248.6	130	0.852
XIV	8	203.3	0	0
	16	610.0	0	0
	40	4269.6	8	0.187
	80	15248.6	122	0.800

CONVERSION OF DEMAND FROM ACTIVITY DAYS TO RESOURCE REQUIREMENTS

The method for converting demand into facility units (camp sites, picnic tables, etc.) was taken from the NAR Study(1) and is summarised as follows:-

$$R = \left(\frac{D}{CTU}\right)$$

where R = resource requirements in terms of specified facility units (hectares, m^2, tables, sites)

D = demand, projected number of activity days taken from Tables 5.7 - 5.9

C = capacity utilisation days, when multiplied by the capacity of the facility, will be equivalent to the total seasonal attendance. The season for camping, trail walking and picnicking was taken as 52 weeks and 26 weeks for swimming. Three peak capacity days per week (Saturday, Sunday and Monday to Friday counting as one capacity day) were assessed to establish a design criteria.

Activity	Capacity Utilisation days		
swimming	26 x 3	=	78
picnicking	52 x 3	=	156
camping (primitive)	52 x 3	=	156
nature walking	52 x 3	=	156

T = turnover rate, mean number of parties at each facility per day.

Activity	Daily Turnover Rate[2]
swimming	2.2 people per swimming space
picnicking	1.8 parties per picnic sites
camping (primitive)	1.0 party per camp site
nature walking	4.6 hiker/km

U = unit capacity, number of persons accommodated simultaneously at a facility unit

Activity	Unit Capacity
swimming	1 swimmer
camping (primitive)	1.3 persons/camp site
picnicking	4.6 persons/picnic table
nature walking	1 hiker

To compute resource requirement in terms of land and water areas (i.e. hectares of land water or kilometres of walking track) the facility units determined by the above method are multiplied by a spatial factor.

That is:

$$R = \left(\frac{D}{CTU}\right) S$$

S = spatial factor[1] assigned to the facility units:

Activity	Capacity
swimming	$9.2m^2$ water/swimmer
camping (primitive)	15 sites/ha
picnicking	29 table/ha
nature walking	13.2 hikers/km

---

(1) op. cit. Table 5.2 - Source A

(2) Bureau of Outdoor Recreation (U.S.A.) (1977) 'Guidelines for Understanding and Determining Optimum Recreation Carrying Capacity BOR # 5-14-07-S.

The spatial factors represent an optimum recreation use, that is, the amount of recreation use which reflects a base level most appropriate for both the protection of the resource (physical carrying capacity) and the satisfaction of the participant (social carrying capacity). The figures are suggested base levels and may require adjustment in light of park administrator or planner's experience or unique site situations.

For example, the predicted demand (D) for picnicking in the Bents Basin region (region 1) in 1981 is 52,100 activity days. The recreation resource (in terms of facility units) needed to satisfy this demand is:

$$R = \left(\frac{D}{CTU}\right)$$

$$= \frac{52{,}100}{156 \times 1.8 \times 4.6}$$

$$= 40 \text{ picnic tables}$$

D = 52,100 activity days
C = 156 days
T = 1.8 daily turnover
U = 4.6 persons/picnic table
S = 29 tables/ha

Or in terms of land area the equation becomes:

$$R = \left(\frac{D}{CTU}\right)^S$$

$$= 1.4 \text{ ha}$$

Table 5.10 lists the facility requirements for the Bents Basin Region for 1981, 1986, 1991 and 2001 by region.

OUTDOOR RECREATION ACTIVITY CRITERIA

WATER ACTIVITIES

Swimming:

Resource

Capability	- water area and immediate surrounds able to withstand medium-to-high intensity use.
Type	- river, basin or stream.
Requirements	- safe water areas free of currents, rips, deceptive holes or submerged obstacles.
	- water quality.
	- standard 9.2 m^2 water/swimmer (3.3 m apart if equally spaced).

Facilities

- toilets and adjacent barbecue facilities.
- garbage bins.
- car park.

Constraints

Resource	- flood debris.
	- steep banks.
	- water pollution.
Other activities	- boating.

Wading:

Resource

Capability	- water area and immediate surrounds able to withstand medium-to-high intensity use.
Type	- stream, river.
Requirements	- safe shallow water free of deep holes and flood debris.
	- sandy bottom
	- shade provision
	- safe water quality
	- child supervision
	- standard: as for swimming

Facilities

- toilets and adjacent picnic areas.
- garbage bins
- car park.

Constraints

Resource	- flood debris.
	- water quality

Boating: (Canoes and Row Boats)

Resource

Capability	- water areas able to withstand medium-to-high intensity use.
Type	- open water.
Requirements	- sheltered water.
	- greater than 1 ha surface area and 1 m depth.
	- free of major currents and obstructions.
	- no interference with other users.
	- standard: 1.9 boats/ha (70 m between boats if equally spaced).

Facilities

- car park nearby to facilitate transport and movement.
- proximity to picnic areas and park facilities.

Constraints

Resource	- flood debris.
	- water quality.
	- dangerous flood waters.
	- water weeds.
Other uses	- swimming/wading
	- use of beach area.

Source: (1) U.S. Bureau of Outdoor Recreation (1977), - Guidelines for Understanding and Determining Optimum Recreation Carrying Capacity BOR # 5-14-07-S

(2) U.S. Bureau of Outdoor Recreation (1970), Outdoor Recreation Space Standards

USER-BASED LAND ACTIVITIES

Picnicking:

Resource

Capability	- able to withstand medium-to-high intensity use.
Type	- flat to undulating areas preferably with scenic outlook over River or Basin.
Requirements	- flat to undulating grassed area with summer shade.
	- degrees of privacy depending on group size.
	- scenic or visually attractive areas.
	- good road access
	- standard: 29 tables/ha (17.6 m between tables if equally spaced).

Facilities

- Barbecue, picnic tables, good access to water, toilets and garbage bins.
- adjacent open space for informal activities.
- adjacent to river or basin.
- adjacent to walking tracks.

Constraints

Resource	- rough/poor road access.
	- cleanliness of the area.
Other recreation uses	- compatible with most other activities and relates well to family group activities.

Tent Camping - Primitive:

Resource

Capability	- able to withstand low-moderate intensity, occasional use.
Type	- high-medium quality forest areas for education, exploration, outdoor instruction.
Requirements	- extensive area of undisturbed forest.
	- high scenic value.
	- privacy and sense of isolation. Must be removed from other park users.
	- availability of camp sites with adequate shelter and safety for children.
	- walking track access.
	- Preferably close to safe water areas.
	- standard: 15 sites/ha (20.4 m between sites if equally spaced).

Facilities

- vehicle storage area.
- suitable drinking water.
- toilet and washing facilities.

Constraints

Resource - areas of moderate slope preferred for larger groups; avoid unsafe and non-sheltered positions.

Other activities - generally compatible with conservation and scientific studies.

Open Space (Informal Games):

Resource

Capability - able to withstand medium-to-high intensity use.

Type - flat area, $<5\%$ slope.

Requirements - flat, level, grassed site.
- open tree-fringed area.
- safety.
- road access not necessary.
- standard: 1000 people/ha.

Facilities

- close proximity to toilets.
- adjacent to picnic area.

Constraints

Resource - need for large contiguous location.

Other uses - the resulting noise should not disturb passive activities nearby.

Children's Playground:

Resource

Capability - able to withstand medium-to-high intensity use

Type - compact area of flat to gently undulating land.

Requirements - safe area removed from traffic.
- supervision must be possible from the picnic area.
- scenic position.
- standard: 5 m^2/child; size: 150-500 m^2 of playground.

Facilities

- safe, interesting playground equipment
- materials and colour to be consistent with the visual objective of the whole area.

Constraints

Resource - present debris in and around river.
- need to be located away from the Basin (water hazards).

Other activities - distance from main access routes.

INTERMEDIATE-BASED LAND ACTIVITIES

Horse Riding:

Resource

Capability	- able to withstand medium-to-high intensity use.
Type	- large, open, undulating areas.
Requirements	- open country, various terrains to suit riders with varying degrees of experience.
	- free of major obstructions or dense bushland.
	- standard: 3.4 groups/km (350 m between groups if evenly spaced).

Facilities

- establishment of bridle tracks.
- sign posting.
- adjacent to car park, toilets and water.

Constraints

Resource	- physical obstacles, rough stony areas.
	- potential overuse of tracks and potential for erosion.
Other activities	- largely compatible with other activities; must be located away from walking tracks.

Cross Country Running and Orienteering:

Resource

Capability	- able to withstand low to moderate intensity use with occasional high use.
Type	- diverse terrain; both open and forested areas.
Requirements	- reasonable grading; large area.
	- scenic quality.
	- suitable open area for the start and finish of races.
	- standard: 60 m between runners.

Facilities

- looped tracks.
- adjacent to car park, toilets and water.
- adjacent to group picnic facilities.

Constraints

Resource	- avoidance of physical obstacles and excessive slopes en route.
Other uses	- potential overcrowding especially in orienteering.
Other activity	- may cause disturbance to other resource based activities.

RESOURCE-BASED LAND ACTIVITIES

Bushwalking and Scenic Tracks:

Resource

Capability	- able to withstand high to moderate intensity use.
Type	- maintain forest and riparian lands.
	- high scenic quality.
Requirements	- well designed tracks.
	- well maintained, easy grades.
	- significant destination points.
	- loop tracks providing for (20) m to half day walks.
	- standard: 7.5 group/km ("group" is a hiking party of more than one individual).

Facilities

- good sign posting.
- information about track length and terrain.

Constraints

Resource	- steep grades on physical barriers.
	- poor, dangerous or overgrown tracks.
Legal	- right of access over freehold land.
Other uses	- overcrowding will detract from value of the experience.
Other activities	- compatible with other resource orientated activities.

Primitive Hiking:

Resource

Capability	- able to withstand low-intensity use overall with moderage intensity in peak periods.
Type	- scenic quality: wilderness area - river gorge and mountainous terrain.
Requirements	- extensive undisturbed areas for daylong hikes.
	- sense of remoteness and isolation.
	- interesting, diverse and challenging terrain, (which should not require climbing equipment).
	- emphasis on scenic quality, interesting vistas.
	- access to car park.
	- standard: 2.2 groups/km

Facilities

- primitive track without sign posting.
- information facilities for basic safety and park familiarity.

Constraints

Resource	- extreme grades and demanding physical conditions

Legal	-	right of access, particularly over freehold land.
Other activities	-	trail bikes or any large number of people will detract from the experience.
Other hikers	-	only occasional encounters with other hikers desirable.

Nature Observation (Wildlife Observation, Photography, Painting):

Resource

Capability	-	able to withstand low to moderate intensity use.
Type	-	undisturbed natural area, good fauna habitat, variety of native flora.
Requirements	-	reasonable likelihood of observing fauna.
	-	high scenic values.
	-	diverse varieties of flora.
	-	viewing areas.
	-	standard: 7.4 people/ha. (36 m between observers if equally spaced).

Facilities

- interpretative information.
- group camp sites with cooking/washing facilities.
- search and rescue plan and equipment.

Constraints

Resource	-	overall areas of flat to moderate slope preferred by larger groups; unsafe and unsheltered areas; not desirable.
Other uses	-	quiet areas, undisturbed by other park users, essential.
Other activities	-	group camp sites provide some difficulties but generally compatible with conservation/scientific preservation etc.

Educational Uses:

Resource

Capability	-	able to withstand moderate to high continued use.
Type	-	representative examples of habitat types and interesting natural features.
Requirements	-	wilderness areas.
	-	adequate camp sites.
	-	environmental field study centre an advantage.
	-	availability of resource information and handouts.

Constraints

Resource	-	overall areas of moderate slope etc. preferred for larger groups, unsafe and unsheltered areas not desirable.
Other activities	-	possible overuse of area around camp sites.
	-	occasional contact with resource orientated activities (e.g. hiking) acceptable.

Scientific Uses:

Resource

Capability	-	able to withstand low-intensity use.
	-	able to provide examination of flora, fauna, geological materials, and limited provision of specimens.
Type	-	areas of scientific interest.
Requirements	-	available for long term studies.
	-	some limited vehicular access
	-	areas where equipment will be safe from vandalism and disturbance.

Facilities

- convenient storage areas, huts and shelters.
- field study centre an advantage.

Constraints

Resource	-	access and availability for use.
Other activities	-	must be isolated by area or management from other park users.