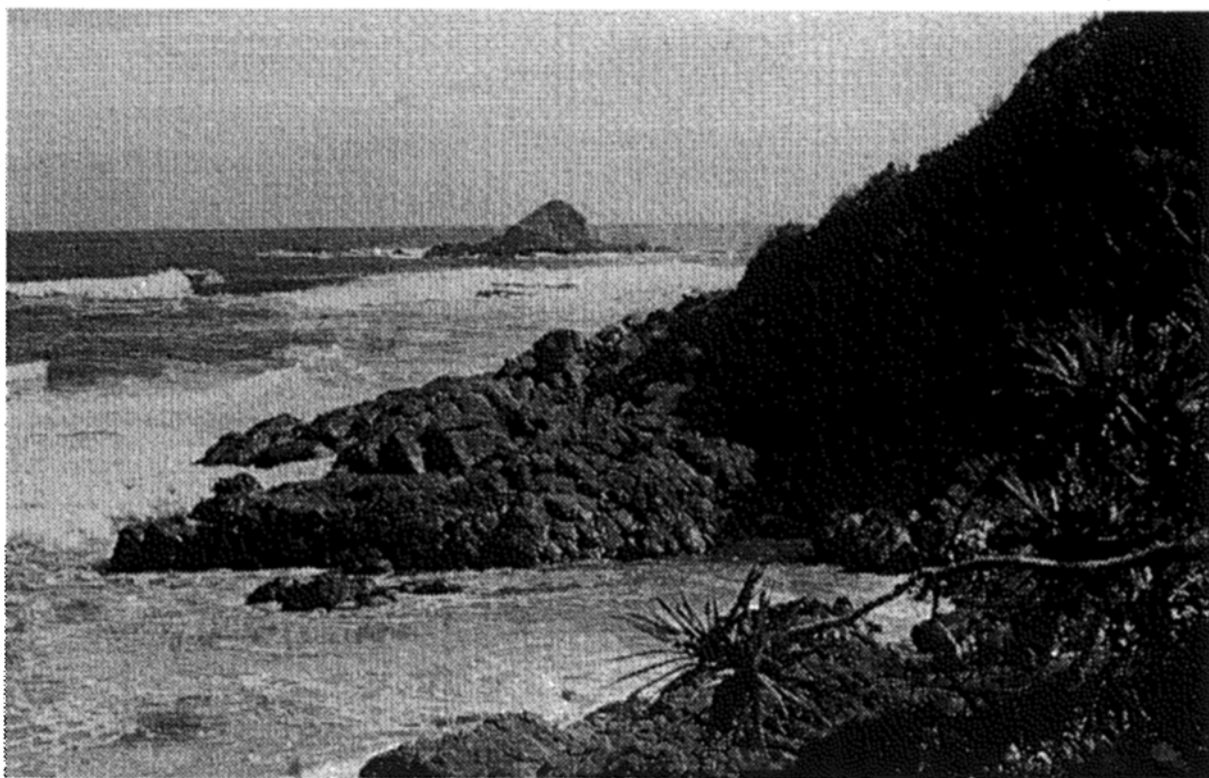




The Byron Coast Group of Nature Reserves

(Incorporating Brunswick Heads, Tyagarah and
Broken Head Nature Reserves)



Plan of Management

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

**THE BYRON COAST GROUP OF NATURE RESERVES
PLAN OF MANAGEMENT**

**(INCORPORATING BRUNSWICK HEADS, TYAGARAH
AND BROKEN HEAD NATURE RESERVES)**

NSW NATIONAL PARKS AND WILDLIFE SERVICE

FEBRUARY 1998

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FOREWORD

The Brunswick Heads, Tyagarah and Broken Head nature reserves cover about 922 hectares. These three areas lie within a regionally important landsystem which comprises both erosional and depositional landforms on the coast within the ancient valley of the Brunswick River and its related streams. The NSW Government is also finalising proposals for a significant new nature reserve and an addition to Broken Head Nature Reserve in the Byron Bay area which will complement these existing conservation areas.

The three existing nature reserves and the proposed new areas contain remnant communities of littoral rainforest, wet and dry heathland, eucalypt forests and woodlands as well as areas of undisturbed freshwater and estuarine wetlands. This produces a high level of habitat diversity which in turn, supports a diverse range of wildlife communities, including refuges for numerous threatened plant and animal species.

In the context of the Richmond-Tweed region, the Byron Coast group of nature reserves are of even greater importance not only because they are essential links for species migrating both north-south and east-west, but also because they complement other groupings of protected areas such as the Big Scrub Nature Reserves and the Caldera Parks and Reserves which conserve different but related natural heritage of the region.

The Byron Coast group of nature reserves and the proposed new areas are however pressed on all sides by urban, tourist and rural developments. An important strategy in this plan of management is to ensure their survival as remnant natural areas within the highly modified landscape of the far north coast of NSW.

A second important strategy in this plan is to continue to permit low impact recreational use of the beaches within the three existing nature reserves generally based on the current pattern of roads and facilities. Many aspects of existing use do however, require more intensive management to ensure that impacts on the conservation values of the nature reserves are minimised.

This plan recognises that responsibility of ensuring these reserves are managed appropriately, lies with the Service. The community also has a vital role to play in understanding and supporting the management and protection of our natural heritage.

The new nature reserve and the proposed addition to Broken Head Nature Reserve have not been incorporated in this plan of management. As soon as the new areas are dedicated, however, this plan of management will be reviewed and a new plan of management will be prepared which will address the management of all the conservation areas along the Byron Coast.

This plan of management establishes the scheme of operations for the Byron Coast Group of nature reserves. In accordance with the provisions of Section 75 of the National Parks and Wildlife Act, 1974, this plan of management is hereby adopted.

PAM ALLAN

Minister for
the Environment

CONTENTS

| | PAGE |
|-----------------------------------------------|-------------|
| FOREWORD | |
| 1. INTRODUCTION | 1 |
| 2. MANAGEMENT CONTEXT | 2 |
| 2.1 Nature Reserves in NSW | 2 |
| 2.2 The Byron Coast Group of Nature Reserves | 2 |
| 2.2.1 Location and Regional Setting | 2 |
| 2.2.2 Importance of the Reserves | 4 |
| 3. OBJECTIVES OF MANAGEMENT | 11 |
| 4. POLICIES AND MANAGEMENT FRAMEWORK | 12 |
| 4.1 Nature Conservation | 12 |
| 4.1.1 Landforms, Geology, Soils and Hydrology | 12 |
| 4.1.2 Native Plants and Animals | 13 |
| 4.1.3 Introduced Plants and Animals | 17 |
| 4.1.4 Fire Management | 22 |
| 4.2 Cultural Heritage | 24 |
| 4.3 Use of the Three Areas | 25 |
| 4.3.1 Recreation | 25 |
| 4.3.2 Research | 29 |
| 4.3.3 Management Operations | 29 |
| 5. PLAN IMPLEMENTATION | 31 |
| 6. SELECTED REFERENCES | 32 |

1. INTRODUCTION

The National Parks and Wildlife Act, 1974, requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document which outlines how the nature reserve will be managed for the foreseeable future. It can be revised and rewritten if necessary to accommodate changes in management practices and resources or in response to new knowledge of the area's natural resources. One plan can include two or more areas.

The procedure for the preparation of a plan of management for a nature reserve is specified in the Act:

- * The Director-General of National Parks and Wildlife shall cause a plan to be prepared.
- * The plan is referred to the National Parks and Wildlife Advisory Council for its consideration and advice.
- * The Director-General shall then submit the plan of management with any comments or suggestions of the Council to the Minister who before adopting the plan, considers the comments and suggestions of Council.
- * The Minister may adopt the plan with or without alterations or refer it back to the Director-General and the Council for further consideration.

Although not a requirement of the Act, this plan of management was placed on public exhibition for three months ending 25th July 1994. The plan of management attracted 33 submissions which raised 20 issues.

All comments received during the period of public exhibition were referred to the National Parks and Wildlife Advisory Council, along with the plan, for its consideration and advice. The comments and suggestions of the Advisory Council were, in turn, considered by the Minister in adopting this plan.

Once a plan of management has been adopted by the Minister, no operations may be undertaken within the national park except in accordance with the plan.

For additional information or enquiries on any aspect of the management of the Byron Coast Group of Nature Reserves, please contact the

The District Manager,
National Parks and Wildlife Service
Lismore District
P O Box 91
ALSTONVILLE NSW 2477

2. MANAGEMENT CONTEXT

2.1 NATURE RESERVES IN NEW SOUTH WALES

Reserving areas for nature conservation as a general purpose was introduced into Australia with the establishment of Royal National Park in 1879.

Fauna reserves in New South Wales were first established under the Fauna Protection Act of 1948. Under the National Parks and Wildlife Act of 1967 fauna reserves were reclassified as nature reserves. The Fauna Protection Act was replaced by the National Parks and Wildlife Act, 1974.

Under the National Parks and Wildlife Act, nature reserves are areas of special scientific interest containing wildlife or natural environments or natural phenomena.

The purposes of nature reserves are defined in the Act as:

- (a) the care, propagation, preservation and conservation of wildlife;
- (b) the care, preservation and conservation of natural environments and natural phenomena;
- (c) the study of wildlife, natural environments and natural phenomena; and
- (d) the promotion of the appreciation and enjoyment of wildlife, natural environments and natural phenomena.

Nature reserves are valuable refuge areas, where natural processes, phenomena and wildlife are protected and can be studied. They differ from national parks which include, as a major objective the provision of appropriate recreation opportunities.

The Byron Coast group of nature reserves are an important part of the region's land use pattern. The management of these areas is primarily directed towards the protection of their natural heritage.

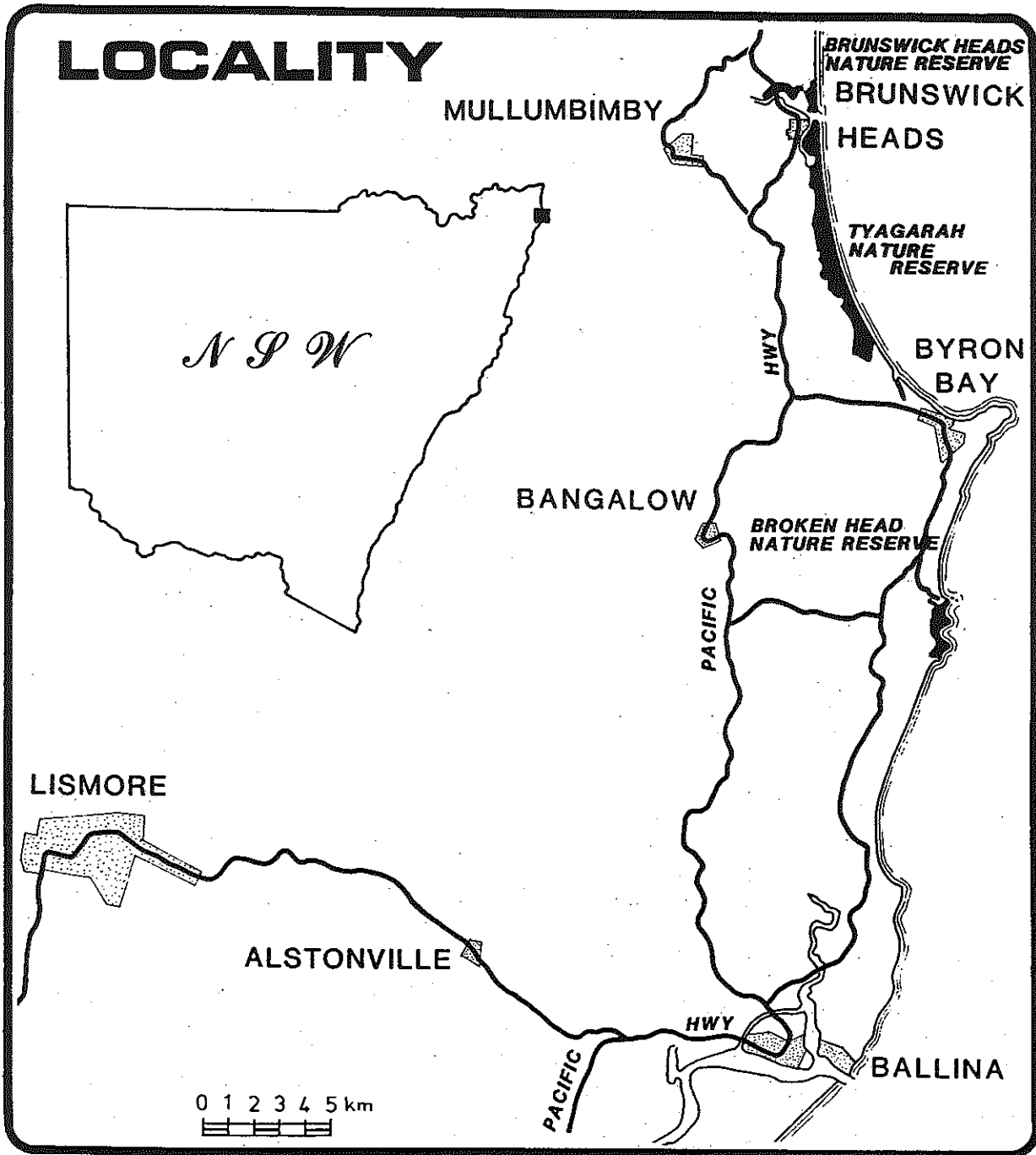
2.2 THE BYRON COAST GROUP OF NATURE RESERVES

2.2.1 Location and Regional Setting

The Byron Coast group of nature reserves are located on the far north coast of New South Wales and comprise a total area of about 922 hectares (Map 1 refers, page 3).

Brunswick Heads Nature Reserve: Brunswick Heads Nature Reserve (84 ha) consists of two sections. The western section is situated on the northern bank of the Brunswick River and is bounded by Ocean Shores in the north and Marshalls Creek in the east. The Pacific Highway passes through this section. The eastern section incorporates the North Head of the Brunswick River, locally called "Harrys Hill". This section is bounded in the west by Marshalls Creek and in the north by the village of New Brighton. The Pacific Ocean forms the eastern boundary. (Map 2 refers, page 5)

Tyagarah Nature Reserve: Tyagarah Nature Reserve (750 ha) comprises much of the extensive sand plain between the townships of Byron Bay in the south and Brunswick Heads in the north. It is bounded in the west by Simpsons Creek and by the Pacific Ocean in the east. (Map 3 refers, page 7)



MAP 1

Broken Head Nature Reserve: Broken Head Nature Reserve (98 ha) is located 5 km south of Byron Bay township. It is bounded in the north by the Broken Head Caravan Park and to the south it adjoins the northern end of Seven Mile Beach. Seven Mile Beach Road runs along the western boundary of the reserve. The Pacific Ocean is the eastern boundary. (Map 4 refers, page 9)

2.2.2 Importance of the Byron Coast Group of Nature Reserves

The Social Environment.

The Byron Coast group of nature reserves are the only mainland coastal nature reserves on the far north coast of NSW. Aside from their outstanding nature conservation values, these nature reserves greatly contribute to the unique natural character synonymous with the Byron Bay area. Indeed, the very existence of these nature reserves is largely the result of the local community's high level of awareness and commitment to the protection of their local environment.

The Natural Environment.

These three areas lie within a regionally important conservation system which protects a reasonably full range of both erosional and depositional coastal landforms and related biological features and which demonstrate the evolution of the coastline along the Byron coast.

The landscape of the Byron Coast is a complex mix of coastal depositional and erosional landforms. In Brunswick Heads Nature Reserve a former off-shore island, Harrys Hill has been captured by the process of coast building. Tyagarah Nature Reserve demonstrates the development of a Pleistocene inner beach barrier system and transgressive dunes within the Cape Byron embayment. These marine depositional landforms include irregular longitudinal sand ridges through which meander freshwater and saline drainage depressions and swamps.




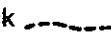

The estuarine and freshwater wetlands of the Brunswick Heads and Tyagarah Nature Reserves include important components of the system of the Brunswick River estuary, including Marshalls and Simpsons Creeks.

Broken Head Nature Reserve because it lies on the high southern watershed of the Brunswick River system contrasts with the other two areas and demonstrates a youthful coastline with steep headlands, small coves and beaches.

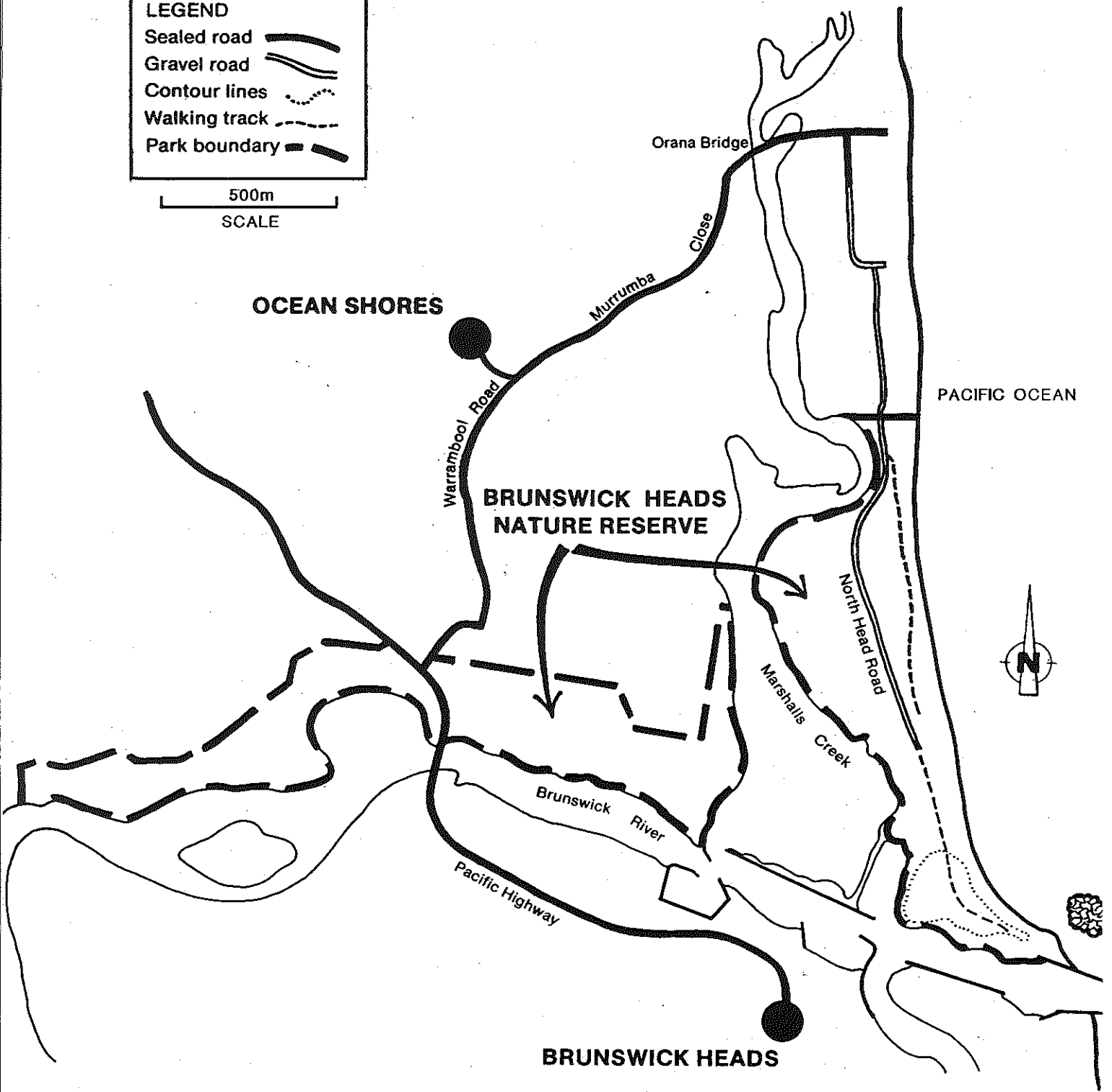
Combined, the three areas contain extensive areas of littoral rainforest, wet and dry heathland, eucalypt forests and woodlands as well as areas of undisturbed freshwater and estuarine wetlands. This produces a high level of habitat diversity which in turn, supports a diverse range of wildlife communities, including refuges for numerous rare and endangered plant and animal species.

Littoral rainforest is a distinctive form of vegetation derived from sub-tropical rainforest but which occupies sites which are subjected to persistent wind and salt spray. In relatively sheltered areas littoral rainforest occurs as a low forest 10-20 metres high. With increasing exposure it may be reduced to a dense wind-sheared thicket. Littoral rainforest is widespread along the NSW coast but the total area is very small. The small and fragmented nature of individual littoral rainforest stands poses severe problems for the long-term protection of this vegetation type.

LEGEND

- Sealed road 
- Gravel road 
- Contour lines 
- Walking track 
- Park boundary 

500m
SCALE



Remnant areas of rainforest in the Tweed-Richmond region, including Broken Head Nature Reserve are of seasonal importance for birds which are dependent on rainforest plants and insects. There is a pronounced influx of birds during the cooler months of the year; notably between March and October. This seems to represent an east-west migration of species from higher altitudes.

The heathlands of Tyagarah Nature Reserve are found on the Quaternary marine sediments. Heath in NSW is best developed on soils that are low in phosphorus and nitrogen and often in areas of poor drainage. Heath communities are also well adapted to fire.

The coast of NSW has a discontinuous chain of heathlands that are essential for the north-south migration of animals, for example honeyeaters. Tyagarah Nature Reserve, because it is the only area of protected heath on the Byron coast and falls on a stretch of coastline that has been extensively modified is of critical importance as a link in this chain.

A major factor which contributes to the high species diversity of the reserves is their location within the McPherson-McLeay Overlap Zone. Within this zone, Bassian (or south-eastern Australian) and Torresian (or northern Australian) species overlap; the former being at the northern extent of their range, the latter being at the southern extent of their range.

The reserves protect a range of important features of the Byron Coast, an important sub-region of the far north coast of New South Wales. Their importance as a group of protected areas is greater than their importance individually for nature conservation.

In the context of the Richmond-Tweed region, the Byron Coast group of nature reserves is of even greater importance because the reserves are essential links to and complement other groupings of protected areas such as the Big Scrub Nature Reserves and the Caldera Parks and Reserves which conserve different but related physical and biological phenomenon of the region.

An essential aspect of the management of these three areas is to recognise their significance within the framework of a regional conservation strategy. The aim of such a strategy is to promote the concepts of biodiversity and its protection, with emphasis on the inter-relationships that exist between individual protected areas or groups of protected areas and between protected areas and other forms of land-use. The protection of a network of conservation areas is essential to allow plant and animal communities to maintain a maximum level of resilience to the increasing impacts of the human environment.

The Cultural Environment






Aboriginal sites which have been recorded within the Byron Coast group of nature reserves include shell middens in dunal and estuarine deposits, ceremonial and mythological sites, campsites, burial sites and many stone tools. Of particular importance to the Aboriginal community is the Dreamtime story associated with the Two Sisters, the off-shore rocks at the northern boundary of Broken Head Nature Reserve. These sites are very significant to the Aboriginal People of today because they form vital spiritual connections with their traditional Aboriginal ancestors and their culture in the coastal environment. This significance has also been recognised by the listing of Broken Head Nature Reserve on the National Estate Register.

European heritage within the reserves is mainly evidenced by settlement patterns and natural resource use and high recreational activity.

BRUNSWICK HEADS

Brunswick River 7

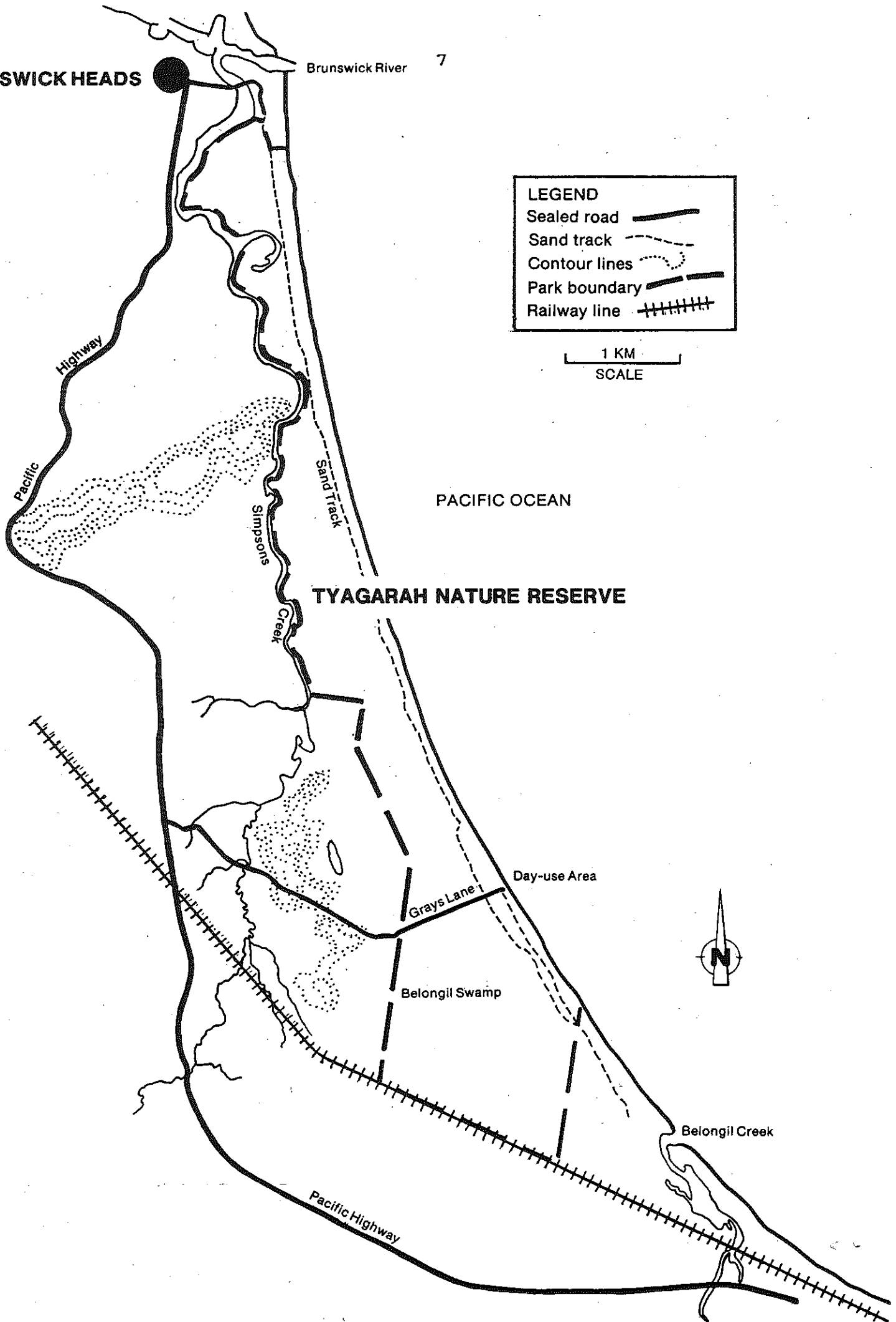
LEGEND

- Sealed road 
- Sand track 
- Contour lines 
- Park boundary 
- Railway line 

1 KM
SCALE

PACIFIC OCEAN

TYAGARAH NATURE RESERVE



North-eastern New South Wales and south-eastern Queensland are part of the most rapidly growing region of Australia. With a favourable climate, attractive coastline and spectacular scenery, this area is experiencing a rapid residential and industrial growth rate. As a result the three nature reserves are located within an area of the north coast of NSW where tourism is the major industry.

There is a high level of expectation amongst both locals and visitors to the region that access and use of the coastline, particularly the beaches will be permitted. The basis of such use pre-dated the establishment of all three areas as nature reserves and the infrastructure of recreational and other use was in place when the Service undertook management of them.

The importance of the Byron Coast group of nature reserves can be summarised as:

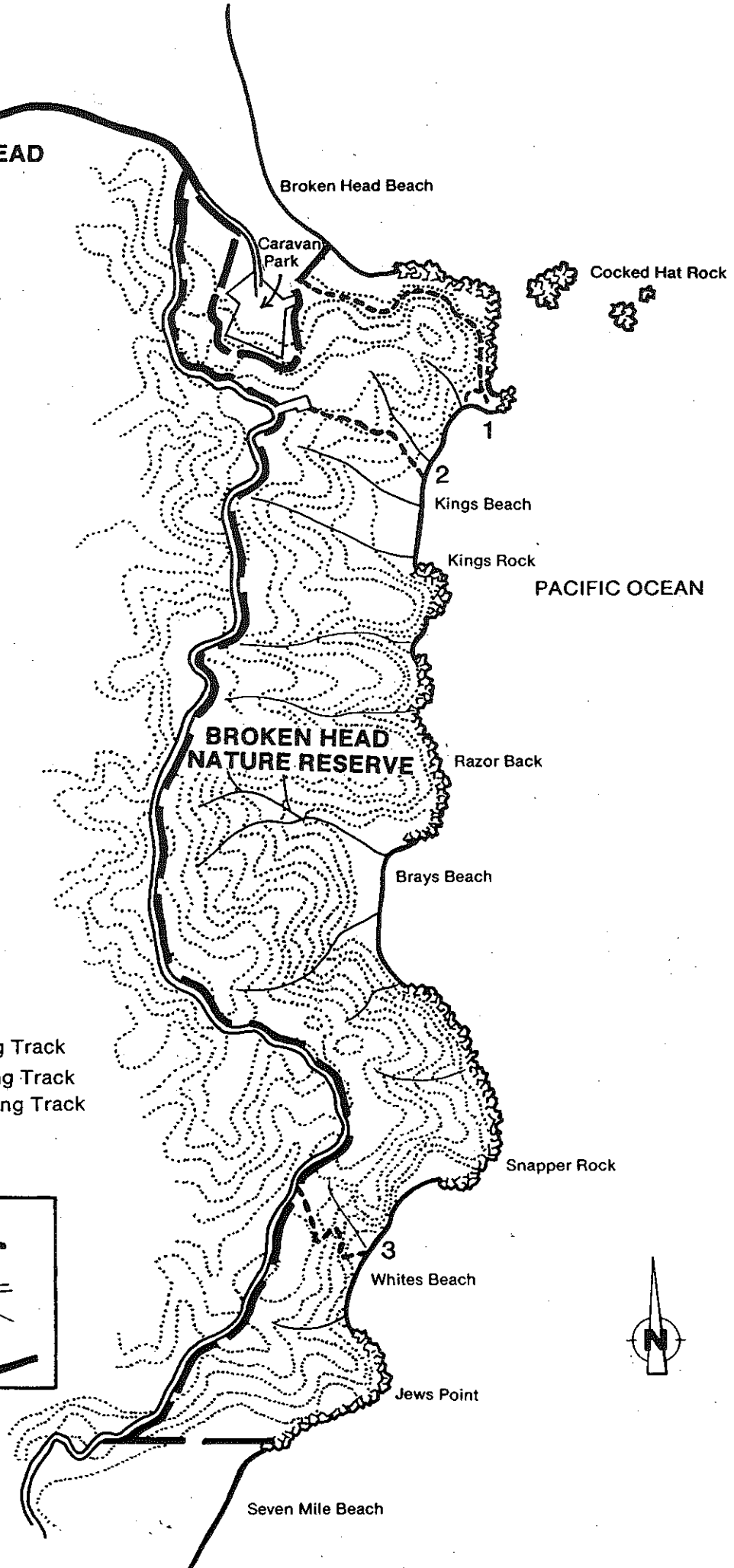
Nature Conservation Significance: The Byron Coast group of nature reserves:

- are the only mainland coastal nature reserves on the far north coast of NSW;
- include within the nature conservation system, the only coastal outcrops of the Beenleigh Block which are representative of the important Yarrol Orogeny in eastern Australia;
- demonstrate the evolution of the Byron Coast over the past two million years and protect examples of a wide range of coastal landforms;
- protect a wide range of coastal vegetation communities including wet and dry heathland, littoral rainforest, eucalypt forest and woodland as well as fresh water and estuarine wetlands;
- protect habitats which support a diverse range of wildlife communities including refuges for plants and animals of ecological significance;
- contain coastal examples of both northern and southern native plant and animal species which demonstrate the MacPherson-Macleay Overlap Zone;
- are important links in the north-south migration of certain animal species;
- are important sites in the east-west or altitudinal migration of certain animal species; and
- are important parts of the broader nature conservation system of the far north coast of NSW and complement other programs aimed at the conservation of biodiversity in the Richmond-Tweed region.

Cultural Significance: The three nature reserves include sites which;

- are of spiritual significance to the Aboriginal community;
- demonstrate the pattern of Aboriginal occupation and economy; and
- demonstrate patterns of European settlement and exploitation of the district's natural resources.

BROKEN HEAD



- 1. Two Sisters Walking Track
- 2. Kings Beach Walking Track
- 3. Whites Beach Walking Track

LEGEND

- Sealed road
- Gravel road
- Drainage lines
- Contour lines
- Park boundary

250m
SCALE



MAP 4

Seven Mile Beach

Educational, Scientific and Recreational Values: The Byron Coast group of nature reserves:

- provides opportunities for environmental education and field studies;
- is of value for scientific investigation into the coastal landforms and the plant and animal communities of the far north coast of NSW;
- provides a limited range of opportunities for low-key, natural based outdoor recreation; and
- significantly contributes to the unique natural and aesthetic qualities synonymous with the Byron Bay area.

3. OBJECTIVES OF MANAGEMENT

In accordance with the National Parks and Wildlife Act 1974, the following general objectives relate to the management of nature reserves in New South Wales:

- * the protection and preservation of scenic and natural features;
- * the maintenance of natural processes as far as is possible;
- * the conservation of wildlife;
- * the preservation of Aboriginal sites and historic features: and
- * the encouragement of scientific and educational enquiry into environmental features and processes.

In addition to these general objectives the following specific objectives apply to the management of the Byron Coast group of nature reserves:

- * to protect their significant natural values;
 - ‘- the conservation of littoral rainforest;
 - the conservation of plant and animal communities of coastal and estuarine landsystems;
 - the protection of habitats required by migratory species; and
 - the protection of critical habitats required by rare and endangered plants and animals.’
- * to promote appropriate land use planning and management amongst neighbours and other land use authorities which will afford the highest practicable protection for the natural condition of the three nature reserves and adjacent lands; and
- * consistent with the protection of the natural values of the three nature reserves, to permit limited opportunities for low impact recreational use of the beaches.

OVERALL STRATEGY

The Byron Coast group of nature reserves will be managed to ensure their survival as remnant natural areas within the highly modified landscape of the far north coast of NSW. Emphasis will be given to the restoration of modified lands and the control and minimisation of any unacceptable impacts of public use.

4. POLICIES AND MANAGEMENT FRAMEWORK.

This section contains the policies and actions for the management of the Byron Coast group of nature reserves together with relevant resource information. Policies are summarised under the following headings:

- * nature conservation;
- * cultural heritage; and
- * public and management use.

The policies established in this plan of management will provide the framework for management consistent with the realistic level of resources available to the Service for the next 5 to 10 years. The actions identified are those to which priority will be given in the foreseeable future. Other management actions may be developed over the life span of this plan consistent with the policies set out in the plan.

4.1 NATURE CONSERVATION

4.1.1. Landforms, Geology, Soils and Hydrology

The Byron Coast group of nature reserves represent unique examples of terrestrial, fluvio-estuarine and marine landsystems formed by the natural processes of the coastal environment in this part of NSW.

The management of the Byron Coast group of nature reserves recognises that they are the only coastal mainland reserves on the north coast of NSW between Ballina and the Queensland border.

Brunswick Heads Nature Reserve and Broken Head Nature Reserve include areas of Silurian-Devonian metasediments of the Beenleigh Block which are about 400 million years old. These elevated areas comprise the western section and the Harrys Hill section of Brunswick Heads Nature Reserve and the main sub-coastal range of Broken Head Nature Reserve

These rocks consist of phyllite, slate, greywacke and quartzite which weather to produce podsollic soils of moderate to low fertility with a heavy clay subsoil. They are highly erodible if the surface vegetation is disturbed.

The main ridgeline of Broken Head Nature Reserve reaches a maximum height of 60 metres and is aligned in a north south direction. The top of this sub-coastal ridge forms the present western boundary of the reserve and is the general route of Seven Mile Beach Road. Intermittent creeks drain to the east into the Pacific Ocean. The dunal areas of Kings, Brays and Whites Beach are composed of recent sand deposits and have formed sand podsols where well drained and humic podsols and organic acid peats where drainage is impeded.

Brunswick Heads Nature Reserve and Tyagarah Nature Reserve contain estuary landforms of the Brunswick River, Marshalls Creek (north arm of the Brunswick River) and Simpsons Creek as well as coastal barrier sand-dunes.

The hydrology of Tyagarah Nature Reserve is dictated by the beach dune and swale topography of the marine sediments and generally drains in a north westerly direction into Simpsons Creek which in turn flows northwards to meet the Brunswick River near its mouth. The southern area of the reserve forms the northern extensions of the Belongil wetland system.

Soil formations from both coastal sand and fluvio-estuarine deposits include sand podsols where the land is well drained and humic podsols and organic acid peats where drainage is impeded. These soils are also highly erodible if disturbed.

Brunswick Heads Nature Reserve has two areas formerly used for gravel extraction in the western section of the reserve adjacent to the Pacific Highway

Numerous artificial lagoons formed during sandmining remain in the Grays Lane area of Tyagarah Nature Reserve. These lagoons provide habitats for water birds and aquatic organisms.

Policies

- * Features of geomorphological significance will be protected, in particular:
 - the freshwater and estuarine systems of the Brunswick River, Marshalls Creek and Simpsons Creek;
 - the beach dune systems; and
 - the steeply dissected topography of the North Head Section of Brunswick Heads Nature Reserve and of Broken Head Nature Reserve.
- * The cooperation of relevant authorities will be sought to minimise the impacts of surrounding land uses on the soils and hydrological systems of the Byron Coast group of nature reserves.
- * All land management and development within the three nature reserves will incorporate effective soil erosion and sedimentation control principles and practices.
- * The former beach sand-mining lagoons in the Grays Lane area of Tyagarah Nature Reserve will be retained as aquatic habitats.
- * The cooperation of the local community will be sought to assist in dune management and other rehabilitation projects.

Actions

- * A dune management plan for Brunswick Heads, Tyagarah and Broken Head Nature Reserves will be prepared.
- * The impact of recreation on all dune areas within the three nature reserves will be monitored.

4.1.2 Native Plants and Animals

The distribution of plant communities in the Byron Coast group of nature reserves is predominantly influenced by topography, hydrology, soils and degree of exposure to coastal influences.

Littoral rainforest is regarded as one of the rarest subformations of rainforest in Australia and is well represented in Brunswick Heads and Broken Head Nature Reserves. Isolated patches also occur in Tyagarah Nature Reserve. Littoral rainforest occurs on both sand deposits and sedimentary rocks. Typical species of the canopy of littoral rainforests include tuckeroo (*Cupaniopsis anacardioides*), broad-leaved lilly pilly (*Acmena hemilampra*),

Bennets ash (*Flindersia bennettiana*), three-veined laurel (*Cryptocarya triplinervis*), guioa (*Guioa semiglauca*), brushbox (*Lophostemon confertus*), hard corkwood (*Endiandra sieberi*) and emergent hoop pine (*Araucaria cunninghamii*).

Mid and understorey species include muttonwood (*Rapanea howittiana*), grey ebony (*Diospyros fasciculosa*), bolwarra (*Eupomatia laurina*), acronychia (*Acronychia imperforata*) blue lilly pilly (*Syzygium oleosum*) and soft corkwood (*Duboisia myoporoides*). Ground and shrub layer species generally consist of plum myrtle (*Pilidiostigma glabrum*), midjim (*Austromyrtus dulcis*), native ginger (*Alpinia caerulea*), flax lilly (*Dianella revolata*), mat rush (*Lomandra longifolia*), gristle fern (*Blechnum cartiligenum*) and the shining burrawang (*Lepidozamia peroffskyana*). Bangalow palms (*Archontophoenix cunninghamiana*) often form groves along drainage lines within the reserves.

Rare plant species of littoral rainforest within the Byron Coast group of nature reserves include the scented acronychia (*Acronychia littoralis*), white yiel yiel (*Grevillea hilliana*), stinking cryptocarya (*Cryptocarya foetida*), marblewood (*Acacia bakeri*), rusty plum (*Amorphospermum whiteii*) veiny laceflower (*Archidendron muellerianum*), palm lily (*Cordyline congesta*), ball nut (*Floydia praealta*), xylosma (*Xylosma terrae-reginae*) and the ground orchid (*Acianthus amplexicaulis*).

Open eucalypt forests and woodlands occur mainly on the elevated areas of the north-western section of Tyagarah Nature Reserve and the western section of Brunswick Heads Nature Reserve. Dry sites support pink bloodwood (*Eucalyptus intermedia*) and grey ironbark (*E. siderophloia*). Wet sites support redgum (*E. tereticornis*) and swamp mahogany (*E. robusta*). Scribbly gum (*E. signata*) occurs in some areas, particularly along Simpsons Creek.

Swamp sclerophyll forest is located on poorly drained sites within Tyagarah Nature Reserve and Brunswick Heads Nature Reserve. These forests are dominated by paperbark (*Melaleuca quinquenervia*) and swamp oak (*Casuarina glauca*) with *Callistemon salignus*, *M. quinquenervia* and tall groundberry (*Acrotiche aggregata*) forming a mid layer. The ground layer commonly consists of the fern (*Blechnum indicum*), swamp lilies (*Crinum pedunculatum*) with occasional masses of the mangrove fern (*Acrostichium speciosum*).

Wet and dry heathland communities are mainly represented in Tyagarah Nature Reserve and are present in the extensive dune/swale landforms in this area. Dry heath occurs on the beach ridges and common species in this community include coast banksia (*Banksia integrifolia*), saw banksia (*B. serrata*), coast wattle (*Acacia longifolia* var. *sophorae*), she oak (*Allocasuarina littoralis*) and grass trees (*Xanthorrhoea* sp). The significant low heath shrub *Strangea linearis* also occurs in the dry heathland communities.

Wet heathland species include the banksias (*B. ericifolia* and *B. oblongifolia*), paperbark (*M. quinquenervia*) and lemon scented tea tree (*Leptospermum flavescens*). The significant *Leptospermum whiteii* occurs in association with wet heathland communities.

Extensive stands of mangroves occur along Simpsons Creek adjoining Tyagarah Nature Reserve, along Marshalls Creek and in the western and north-western section of Brunswick Heads Nature Reserve. These communities contain grey mangrove (*Avicennia marina* var. *australascia*), river mangrove (*Aegiceras corniculatum*), black mangrove (*Rhizophora stylosa*), milky mangrove (*Excoecaria agallocha*), orange mangrove (*Bruguiera gymnorrhiza*) and cottonwood hibiscus (*Hibiscus tiliaceus*).

Saltmarsh communities are represented in both Tyagarah and Brunswick Heads Nature Reserve in areas subject to tidal influences along the banks of Marshalls Creek and Simpsons Creek. Typical species include the bare twig rush (*Baumea juncea*), mangrove fern (*Acrotichum speciosum*), sedgeland with feathergrass (*Phragmites australis*), the flowering shrub *Melastoma denticulatum*, common aotus (*Aotus eridiodes*) and mat grass (*Hemarthria uncinata*) on the margins. Salt couch grass (*Sporobolus virginicus*) occurs along the banks of the creeks.

The diversity of habitats contained in the Byron Coast group of nature reserves has enabled the development of a rich assemblage of animal communities. Bird species which are widely distributed in the reserves include the whistling kite (*Haliastur sphenurus*), scaly breasted lorikeet (*Trichoglossus chlorolepidotus*), white browed scrub wren (*Sericornis frontalis*), little wattle bird (*Anthochaera chrysoptera*), Lewins honeyeater (*Meliphaga lewinii*), silveryeye (*Zosterops lateralis*) and the variegated fairy wren (*Malurus lambertii*).

Rare bird species recorded in the reserves include the Brahminy kite (*Haliastur indus*), osprey (*Pandion haliaetus*), pied oystercatcher (*Haematopus longirostris*), sooty oystercatcher (*H. fuliginosus*), little bittern (*Ixobrychus minutus*), jabiru (*Xenorhynchus asiaticus*), bush hen (*Gallinula olivaceae*), grass owl (*Tyto longimembris*) and white eared monarch (*Monarcha leucotis*).

Mammal species which are common in the reserves include the northern brown bandicoot (*Isodon macrourus*), grassland melomys (*Melomys burtonii*), fawn footed melomys (*M. cervinipes*), swamp rat (*Rattus lutreolus*), bush rat (*R. fuscipes*), short beaked echidna (*Tachyglossus aculeatus*), swamp wallaby (*Wallabia bicolor*), brown antechinus (*Antechinus stuartii*), common dunnart (*Sminthopsis murina*), mountain brushtail possum (*Trichosurus vulpecula*) and sugar glider (*Petaurus breviceps*).

Rare mammal species recorded in the reserves include the long nosed potoroo (*Potorous tridactylus*), koala (*Phascolarctos cinereus*), common planigale (*Planigale maculata*), Queensland blossom bat (*Syconycteris australis*) and the North Queensland long eared bat (*Nyctophilus bifax*).

Reptiles common in the reserves include the eastern water dragon (*Physignathus leseurii*), striped skink (*Ctenotus robustus*), eastern grass skink (*Lampropholis delicata*), Burtons snake lizard (*Lialis burtonis*), scaly footed lizard (*Pygopus lepidopodus*) yellow faced whip snake (*Demansia psammophis*), eastern small eyed snake (*Rhinocephalus nigrescens*), brown tree snake (*Boiga irregularis*), green tree snake (*Dendrelaphis punctulata*), lace monitor (*Varanus varius*), major skink (*Egernia frerei*), carpet python (*Morelia spilotes*) and dwarf crowned snake (*Cacophus krefftii*).

Amphibians common in the reserves include the striped marsh frog (*Limnodynastes peronii*), northern banjo frog (*L. terraereginae*), clicking froglet (*Ranidella signifera*), eastern dwarf tree frog (*Litoria fallax*) and red backed toadlet (*Psuedophryne coriacea*).

Amphibians classified in the "acid frog" group which are dependent on the acidic low nutrient waters of wallum habitats include the wallum froglet (*Crinia tinnula*) and the green and golden bell frog (*Litoria aurea*). These two species are listed on Schedule 12 of the National Parks and Wildlife Act 1974 as Endangered Fauna. The record in Tyagarah Nature Reserve of the green and golden bell frog is also the northern most record for this species. Other significant species include the wallum tree frog (*L. olongburensis*), laughing tree frog (*L. tyleri*) and Freycinets frog (*L. freycineti*).

Although not listed as rare and endangered these three species have only a restricted distribution.

The invertebrate fauna of the Byron Coast group of nature reserves are poorly documented, although it is known they include mainly rainforest dependent species. Broken Head in particular supports endemic rainforest butterflies and a number of subtropical species at or approaching their southern limit.

Rare species include the cephenes blue (*Pseudopisas cephenes*) which is near its southern limit and breeds at two sites at Broken Head. This species depends on rainforest and breeds at its edge in ecotones with wet sclerophyll forest. It is also dependent on the ant species (*Iridomyrex gilberti*) which attends its larvae and pupae.

The diggles blue (*Hypochrysops digglesii*) breeds at one site at Broken Head, which represents the southern limit of its range. The endemic rainforest butterflies, the regent skipper (*Euschemon rafflesia rafflesia*) and the Richmond birdwing (*Ornithoptera richmondia*) have a stronghold at Broken Head. Each species is dependent on a particular plant species for larval food. The regent skipper feeds exclusively on the rainforest shrubs *Wilkea macrophylla* and *W.huegeliana*. The Richmond birdwing feeds exclusively on the rainforest vine (*Aristolochia praevenosa*).

The Byron Coast group of nature reserves are remnant areas of the original natural landscape and of native plant and animal communities. They are of high nature conservation importance and their continued protection is a major contribution to the maintenance of the pattern of biodiversity in the Brunswick Heads/Byron Bay sub-region.

Not only do each of the three areas have an importance for nature conservation in their own right, but they have added significance as part of a sub-regional nature conservation system. They are the only protected areas on the north coast between Broadwater and the Queensland border. As such the Byron Coast group of nature reserves are of critical importance for north-south migratory animals. The coastal location of the three areas is also of critical importance for east-west migratory species.

The management prescriptions in this plan of management complement those for the Big Scrub group of nature reserves and the Caldera National Parks and Nature Reserves.

The Byron Coast group of nature reserves are however very small isolated remnants of natural ecosystems which are highly susceptible to the impacts of the human environment such as urban and rural developments.

To ensure the long term protection and enhancement of the reserves' ecological diversity, stability and subsequent viability and resilience to the adverse affects of adjoining land use, the Service will endeavour to secure protection of high conservation areas, on both private and publicly owned land, which adjoin or are in close proximity to the existing nature reserves by either:

- * Seeking protection of the area as a nature reserve under the National Parks and Wildlife Act 1974; or
- * Encouraging an environmentally sympathetic approach to current and future land use and respective planning.

Land use practices which recognise the importance of protecting natural habitats and processes will greatly enhance the value of the remnant lands protected in the nature conservation system.

The occurrence and distribution of native plants and animals (including rare species) in the reserves are progressively stored on the Service's Environmental Resources Mapping System (E-RMS) and Wildlife Atlas computer data bases. This information is available to the public on application.

Policies

- * The Byron group of nature reserves will be managed with emphasis on:
 - the conservation of littoral rainforest;
 - the conservation of plant and animal communities on the coastal and estuarine landsystems;
 - the protection of habitats required by migrating species; and
 - the protection of critical habitats required by rare and endangered plants and animals.
- * The understanding of the importance of the nature reserves and their management by the Service will be promoted through public awareness programs.
- * The Service will endeavour to provide effective protection for areas of high conservation value which adjoin or are in close proximity to the existing nature reserves.
- * The Service will promote land use practices which recognise and protect the important nature conservation values of the area.

Action.

- * Records of native plants and animals will continue to be updated and progressively entered into E-RMS and Wildlife Atlas data bases.

4.1.3 Introduced Plants and Animals

All three nature reserves have been subject to disturbance including clearing and planting for intensive agriculture and grazing, homesites, sandmining, rock and gravel extraction, recreation development and road and track construction.

One of the more intensive works in Brunswick Heads Nature Reserve was associated with the construction of the breakwaters and river walls at the mouth of the Brunswick River. These works involved quarrying and road construction for a limited time. Subsequently these sites were closed and reverted to informal recreation areas but with a major weed invasion problem. Following the dedication of the nature reserve, extensive rainforest regeneration works have been carried out as part of the general rehabilitation of these sites.

The subdivision of Ocean Shores adjoining the northern boundary of the western section of the reserve and a former settlement on the northern head section of Brunswick Heads Nature Reserve known as Settlement Palms both involved considerable clearing of land and establishment of exotic garden plants. These

plants are threatening the nature conservation values of the nature reserve and require continual control within the reserve.

The Noxious Weeds Act 1993 took effect from 1 July 1993. The Act places an obligation upon public authorities to control noxious weeds on land that it occupies to the extent necessary to prevent such weeds spreading to adjoining lands. The Noxious Weeds Act also provides that landowners have a duty to fully and continuously suppress certain notifiable weeds on their properties and to control the spread of other classes of weeds. The Noxious Weeds Act provides for review of the Schedule of Noxious Weeds for the Far North Coast County District. The Service will seek the co-operation of the County District authorities in including weed species on the Schedule which pose an environmental or other threat to any one or more of the nature reserves

In Broken Head Nature Reserve a major area of disturbance lies on the northern boundary of the reserve adjoining the Broken Head Caravan Park where clearing of the dune and rainforest has taken place. As a result the rainforest margins have been exposed to salt damage. The Service, in conjunction with Byron Shire Council has undertaken a rainforest regeneration program, including fencing, of cleared lands within the nature reserve.

A small property above Brays Beach in Broken Head Nature Reserve was originally grazed and developed for plantation crops. The grounds of this property and the gully to the north retain many introduced plant species.

To the south between Brays and Whites beaches in Broken Head Nature Reserve there are a further three former house sites. These sites also require programmes for the control of introduced plant species.

There are a number of introduced plant species in the Byron Coast group of nature reserves. The following pose significant threats to native plant communities due to their ability to invade both disturbed and undisturbed areas:

Bitou Bush (*Chrysanthmoides monilifera* ssp. *rotundata*): Bitou Bush is native to South Africa. This species is a legacy of past sandmining activities and dominates foredune and hind-dune areas of Tyagarah and Brunswick Heads and to a lesser extent Broken Head, where it is also present on exposed headland areas.

Camphor Laurel (*Cinnamomum camphora*): This species is most abundant in heavily disturbed areas adjoining the three nature reserves. Due to prolific seed production with the fruits eaten and dispersed by frugivorous birds, it is present in small areas within the reserves. Once established, this species can out-compete natural regeneration.

Lantana (*Lantana camara*): Native to South America, this species is well established in the hind dune areas of Tyagarah Nature Reserve and some disturbed areas of littoral rainforest in Brunswick and Broken Head Nature Reserves. It assumes the habit of a scrambling shrub or liana and is particularly prevalent on the edges of undisturbed plant communities or along road edges.

Groundsel Bush (*Baccharis halimifolia*): A noxious species native to eastern North America and is particularly invasive to moist sites such as disturbances in swamp sclerophyll forests and saltmarsh areas. It has the potential to form dense thickets which displace native plant communities.

Madeira Vine (Potato Vine) (*Anredera cordifolia*): Native to South America, this climbing species is particularly threatening to native plant communities on moist sites, particularly littoral rainforest. With stems to twenty metres long, sub surface and aerial tubers, this plant if left uncontrolled, can destroy the rainforest canopy. It is present in small infestations in Brunswick Heads and Broken Head Nature Reserves.

Asparagus Fern (*Protasparagus spp.*): Native to South America both the ground habit and climbing species are present in rainforest in Brunswick Heads Nature Reserve, particularly the North Head Section. This species is a vigorous reproductive species and is also a potentially destructive species if left uncontrolled.

Morning Glory (*Ipomoea cairica, I. purpurea*): A vigorous perennial climber which invades mainly disturbed areas of littoral rainforest and coastal shrubland. This species is particularly prevalent on rainforest areas and urban interface at the western part of Brunswick Heads and the northern boundary areas of Broken Head Nature Reserve adjoining the caravan park.

Wandering Jew (*Tradescantia sp.*): A ground herb which is a common escapee from gardens and is present at North Head and in the western sections of Brunswick Heads Nature Reserve adjoining Ocean Shores. Wandering Jew is also present in former house sites within Broken Head Nature Reserve.

Mothers of Millions (*Bryophyllum delagoense*): A succulent ground herb which occurs along the edges of littoral rainforest and roadsides, track edges and old house sites within Broken Head Nature Reserve.

Glory Lily (*Glorisia superba*): This species is also a common exotic garden plant which has escaped and persisted at Brunswick Heads Nature Reserve. There are minor infestations within Broken Head Nature Reserve.

Crofton Weed (Mistweed) (*Ageratina adenophora*): This species is found on disturbed areas within or on margins of littoral rainforest and is particularly prevalent along disturbed drainage and creek lines.

Cassia (*Cassia coluteoides, C. floribunda*): Common species on disturbed roadsides, walking tracks and edges of littoral rainforest and banksia shrubland.

Salvinia (*Salvinia molesta*): Salvinia is a water plant native to Central and South America that has become established in abandoned sand-mining ponds within Tyagarah Nature Reserve. This plant can be very invasive if it gains access to streams and can adversely impact other aquatic plants and animals.

Two native species not endemic to the area are well established following their introduction during sandmining rehabilitation at Tyagarah Nature Reserve. They are *Acacia saligna* (endemic to Western Australia) and *Leptospermum laevigatum* (well north of its range). The latter species is an aggressive invader of heathland communities and dominates the hind dune areas of the Tyagarah Nature Reserve.

Another native species which has become naturalised to this area is the Umbrella Tree (*Schefflera actinophylla*) which prefers the moist sites of disturbed rainforest areas. A popular ornamental tree which spreads into surrounding native communities and exists in minor infestations in the boundary areas of Brunswick

Heads Nature Reserve (west) and Broken Head Nature Reserve adjoining the caravan park.

Various species of introduced grasses occur along roadsides and in boundary areas of each of the nature reserves where they adjoin urban and other disturbed lands.

The Catchment Management Act came into effect in 1989. Total catchment management provides an umbrella framework to aim for amongst other matters, cleaner water, less soil erosion, improved vegetation cover, the maintenance of ecological processes and a balanced and healthier environment. It also provides a focus to balance conservation needs and development pressures and encourages a more aware and involved community. An important means of achieving these aims is the formation and support of catchment management committees and landcare groups at a local level

Introduced animals which occur in the reserves include the cane toad (*Bufo marinus*), cat (*Felis catus*), fox (*Vulpes vulpes*) and dog (*Canis familiaris*). The status of these animals in the three nature reserves is not well known. The beaches adjacent to Tyagarah and Brunswick Heads Nature Reserves are designated "dog exercise areas" by Byron Shire Council. This designation exacerbates the continuing problems of the illegal entry of visitors accompanied by dogs in the nature reserves.

Recent investigations have established that European honeybees compete with and displace native animals, particularly native bees, nectar feeding birds and small mammals and have damaging effects on native plants. There is one licensed apiary site in Tyagarah Nature Reserve. The licence for the existing apiary site is non transferable and may be dealt with in accordance with Service policy.

Policies

- * Introduced plants and animals will be controlled and where possible eliminated. Preference will be given to control techniques which have minimal environmental impact and maximum effectiveness.
- * Control programs will be undertaken in conjunction with neighbours where appropriate.
- * Priority for control of introduced species will be given to those which:
 - conflict with significant natural resources;
 - have a high capacity for dispersal;
 - are new isolated occurrences;
 - have the potential to be spread along roads and management tracks;
 - are or may affect neighbouring lands; and
 - may be a threat because of disease.
- * The Service will continue to participate in and support district total catchment management committees and encourage community groups involved in landcare programmes who wish to assist in weed control and regeneration projects on the three nature reserves.
- * Local seed sources will be used in replanting and restoration programs.
- * Dogs, domestic stock and other introduced animals will not be permitted in the three nature reserves with the exception of guide dogs for the blind.

- * The agreement of Byron Shire council to the removal of dog exercise areas on beaches adjacent to the nature reserves will be sought.
- * No new bee hive sites will be licensed in Tyagarah Nature Reserve. The existing site is non transferable and may be renewed in accordance with Service policy.
- * Bee hive sites will not be permitted in Broken Head Nature Reserve or Brunswick Heads Nature Reserve.

Actions

- * The occurrence, distribution and density of introduced plants and animals causing significant environmental damage will be mapped.
- * A strategy for the control of weeds will be implemented with priority on:
 - the protection of littoral rainforest;
 - the protection of the habitat of rare and endangered species;
 - revegetation of the Brays Beach cottage site and other former house sites within Broken Head Nature Reserve;
 - isolated occurrences of camphor laurel
 - the control of bitou bush; and
 - liaison with neighbours, volunteers and the Far North Coast County District.
- * Supplementary planting in the vicinity of the access road and the old gravel quarry at the western section of the Brunswick Heads Nature Reserve will be undertaken.
- * Regeneration of littoral rainforest on the northern boundary of Broken Head Nature Reserve and other areas suffering from salt dieback exposure will be undertaken.
- * The co-operation of Byron Shire Council will be sought to provide additional regeneration works within the Caravan Park and fore dune areas at Broken Head will be sought.
- * Neighbours of the three nature reserves will be encouraged to reduce the impacts of introduced plants and animals particularly relating to:
 - domestic animals including livestock; and
 - the spread of introduced plants from domestic gardens.
- * The Service will seek the co-operation of the Far North Coast County District in including weed species on the Schedule for the district which pose an environmental or other threat to any one or more of the nature reserves

4.1.5 Fire Management

Fire has been an important factor influencing the environment of the Byron Coast group of nature reserves for many thousands of years. Together with climate and soil type, fire or its absence, has been largely responsible for determining plant and animal distribution.

Brunswick Heads and Broken Head Nature Reserves mainly consist of littoral rainforest vegetation communities which are either fire-free or subject to very infrequent fire.

Rainforest margins are, however, susceptible to fire damage; particularly to the cumulative effects of frequent fires. Fires may therefore change the composition of rainforests and favour those species which are resilient to fire such as eucalypts. Fire may also increase the rainforest community's susceptibility to salt dieback and to invasion by introduced plants. Exclusion of fire in littoral rainforest communities is an important management strategy to ensure their survival.

In contrast, the native plant communities of Tyagarah Nature Reserve are coastal heathland and sclerophyll forest which are well adapted to fire. However, because it is now such a small, isolated remnant of natural land, fire in the nature reserve takes place at a frequency and intensity that may not be consistent with the long term survival of these plant communities.

There have been no major fires in Tyagarah Nature Reserve since its reservation in 1986. In 1984-85, however, a large area of the reserve was burnt in a wildfire which started at the Byron Bay industrial estate to the south. Thus, much of the reserve is currently of an even age class.

This circumstance is not ideal for conservation purposes. A mosaic of vegetation age classes is the preferred situation as this increases the level of habitat diversity for native plants and animals. The existing condition of Tyagarah Nature Reserve of an even age fire class and hence even aged plant community offers only limited habitat variation.

To provide a mosaic of native plant communities with the aim of maximising the variety of habitats for native plants and animals is a desired outcome of fire management in Tyagarah Nature Reserve. At this stage in the management of the nature reserve, however, the knowledge required to implement an ecologically sound fire management regime is not available.

Until a more comprehensive understanding of the fire ecology of the reserve is gained, fire management in Tyagarah Nature Reserve will aim to contain fire within the minimum possible area of the nature reserve.

To implement ecologically based fire management may require the establishment of strategic management tracks. A major difficulty in managing fire in the nature reserve is its linear configuration and few usable fire management tracks. The only practicable fire management tracks are Grays Lane and a track along the southern boundary of the nature reserve. The impacts of establishing a network of additional and permanent fire management tracks would, however, be unacceptable in such a small reserve.

Accordingly, in the event of wildfire, temporary fire control lines may need to be constructed with the view to contain a fire within as limited an area as possible. All new tracks constructed for fire management operations will be closed and rehabilitated as soon as possible after each emergency.

All three nature reserves are also vulnerable to fire from arson and illegal camp-fires because of their proximity to settlement.

Under the Bushfires Act (1949) the Service is a fire authority. It is responsible for containing fires on reserve areas and to ensure they do not cause damage to other land or property. This responsibility includes the implementation of fuel management programs. The Service may also assist with the control and suppression of fires adjacent to the reserves.

The Service regards cooperative fire management as essential for both the protection of property and of the natural heritage of the three nature reserves. An important part of the Service's fire management is participation as a member of Local District Bushfire Committees in the preparation of District Fire Management Plans under Section 41A of the Bushfires Act.

Policies

- * Wherever practical fire will be suppressed in the Byron Coast group of nature reserves with the objective of reducing the level of unscheduled fire and its impact on the natural heritage of the three nature reserves.
- * The management of fire in the Byron Coast group of nature reserves will aim to:
 - protect human life and property;
 - maintain species and habitat diversity;
 - protect specific communities, including rainforest, from fire;
 - protect cultural features and recreation facilities;
 - control public use of fires; and
 - encourage research into fire.
- * All wildfires will be managed and contained within the minimum possible fire control lines.
- * New tracks will be constructed where necessary for fire control or other emergency operations. All new tracks constructed for emergency operations will be closed and rehabilitated as soon as possible after each emergency.
- * Preference will be given to fire suppression methods which have least adverse environmental impact on the reserves.
- * Use of heavy plant and equipment off existing roads and tracks will be avoided wherever possible.
- * Liaison will be maintained with bushfire brigades, local government, and neighbours to ensure coordination in suppression of wildfires in the reserves and on adjoining lands.
- * The Service will continue to develop cooperative strategies with other authorities and land-holders as a basis for fire management.
- * Research into fire behaviour, fire hazard and risk assessment, and the impact of fire on native plant and animal communities will be encouraged. The use of

fire for research purposes will need to demonstrate that such burning is justified on established scientific principles and objectives.

Actions

- * A Fire Management Plan will be prepared for the Byron Coast group of nature reserves by June 1996. The fire management plan will be placed on public exhibition and this plan of management may need to be amended to conform to the fire management plan when adopted.
- * The Service will participate in the preparation of District Fire Management Plans in accordance with the Bush Fires Act 1949.
- * Records of fire occurrence will be maintained for the reserves.
- * Until more information becomes available covering the effects of fire, fire will be excluded from the following areas as far as practicable:
 - rainforest communities;
 - the habitats of rare and endangered plant and animal species known to be fire sensitive; and
 - Tyagarah Nature Reserve
- * Where possible recreation and access management strategies will complement fire management within the reserves.

4.2 Cultural Heritage

Brunswick Heads and Tyagarah Nature Reserves lie within the Minjungbal tribal area between Byron Bay and Southport and extending inland to Murwillumbah. A smaller clan within this boundary has been documented and is known as the Coodjinburra Clan and these people inhabited the area between the Tweed and Brunswick Rivers extending approximately 10km inland.

Broken Head Nature Reserve is within the Bundjalung Tribal area and people of the Arakwal clan inhabited the area extending from Byron Bay south to Ballina and inland to Woodburn, Coraki and Lismore.

Aboriginal sites which have been recorded in the district's Aboriginal Sites Register include 5 shell middens (1 within Brunswick Heads Nature Reserve, 1 within Tyagarah Nature Reserve and 3 within Broken Head Nature Reserve), 1 stone arrangement and 2 bora ceremonial grounds in within Tyagarah Nature Reserve and 3 open campsites, 1 burial site and 3 mythological sites within Broken Head Nature Reserve. All Aboriginal sites within the three nature reserves are protected under the National Parks and Wildlife Act.

The modification of the natural environment associated with European agriculture and industry, including port development, sandmining, timber getting and whaling are important themes of the history of the area. There are a number of sites within the three nature reserves which are evidence of some of these activities. These include the works associated with the port development of the Brunswick River and village settlement within Brunswick Heads Nature Reserve, sandmining in Tyagarah Nature Reserve and rural settlement in Broken Head Nature Reserve. Recreation sites are also found in all three areas.

An important part of the history of the Byron Coast group of nature reserves is the concern for conservation shown by the local community which resulted in the dedication of Brunswick Heads and Broken Heads Nature Reserves in 1974.

Continued local interest in the protection of natural areas led to further additions to Brunswick Heads and Broken Head Nature Reserves and to the establishment of Tyagarah Nature Reserve.

A small cottage within Broken Head Nature Reserve above Brays Beach has been variously used as a field study centre and for ranger accommodation. The cultural significance of the cottage will be assessed.

Policies

- * The provisions of the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter) will guide management decisions regarding Aboriginal and historic places within the three nature reserves.
- * Aboriginal sites will be recorded, conserved, and protected in consultation with the relevant Local Aboriginal Land Council and custodians.

Actions

- * The register of Aboriginal sites for the three nature reserves will be maintained.
- * The register of historic places for the three nature reserves will be maintained.
- * The cultural significance of the cottage above Brays Beach within Broken Head will be assessed.

4.3 Use of the Three Areas

The Byron Coast group of nature reserves will be managed to ensure that their use, whether by the general public, special interest groups, the Service or other authorities is consistent with the Act and the objectives of this plan of management.

Uses that may be consistent, to varying degrees, with the management of Service areas include:

- education and promotion of the area, the Service and the conservation of the natural and cultural heritage;
- research;
- certain types of outdoor recreation; and
- management operations by the Service and other authorities.

The extent to which these uses are appropriate to the Byron Coast group of nature reserves is indicated in the following sections.

4.3.1 Recreation

The Byron Coast group of nature reserves are remnant areas of relatively unmodified coastline and are hence of high nature conservation importance. They are also, however pressed on all sides by increasing urban and intensive rural developments.

On the one hand, the areas warrant the highest level of protection if their natural condition is to be preserved. On the other hand, there is a high level of expectation

that reasonable access and use of the three areas, particularly the beaches will be permitted. The basis of such use pre-dated the establishment of all three areas and the infrastructure of recreational and other use was in place when the Service undertook management of them.

Prior to their dedication as nature reserves the use of the areas was unmanaged and resulted in significant environmental degradation. This is still evidenced by continuing problems of illegal camping, fires, vegetation destruction, rubbish dumping, sand removal, vandalism to visitor facilities, domestic animals (mainly dogs) in the reserves and indiscriminate horse and four wheel drive vehicle usage.

The strategy in this plan is to permit low impact recreational use of beaches within the three nature reserves based on the existing pattern of roads and facilities. This recognises that many aspects of existing use require more intensive management to ensure that impacts on the conservation values of the nature reserve are minimised.

An important element in this strategy is the promotion of an understanding and awareness of the nature conservation values of the Byron Coast group of nature reserves. These programs may include environmental education, interpretation and public involvement in the management of the three areas.

Vehicle Access.

The pattern of use in the three nature reserves is a product of the vehicle access system and the proximity of residential areas, notably to Brunswick Heads and Tyagarah Nature Reserves. There are a small number of low key recreation sites in Brunswick Heads and Tyagarah Nature Reserves which have been developed by the Service to formalise and control visitor impacts.

Vehicle access to the western section of Brunswick Heads Nature Reserve is provided by a gravel road which runs eastwards along the northern bank of the Brunswick River. This terminates at a small day use area. Access to Harrys Hill on the North Head of the Brunswick River in the eastern section is via North Head Road through Ocean Shores. This road terminates at visitor facilities provided by the Service.

Vehicle access to Tyagarah Nature Reserve is:

- via Grays Lane to the southern section of the reserve; and
- via Brunswick Heads.

Grays Lane is excluded from the nature reserve and terminates at the beach where the Service has provided day use visitor facilities.

A former mining track exists from Grays Lane north to Brunswick Heads within Tyagarah Nature Reserve. Indiscriminate use of this road has unacceptable impact on the natural values of the reserve, particularly in the dunal areas. There is no reason to maintain this road for public use within such a small nature reserve and it is proposed that it be closed. This track will however be maintained for management and emergency vehicle access. This access will be facilitated by the issue of gate keys to bonafide personnel including Police, Ambulance, Fire Control and Council officers.

Byron Shire Council regulates vehicle access on the beaches adjoining Tyagarah and Brunswick Heads Nature Reserves below mean high water mark. Access is currently available to professional anglers and to other authorised organisations and individuals.

Vehicle access to Broken Head Nature Reserve is by Seven Mile Beach Road which generally forms the western boundary of the reserve and terminates at Seven Mile Beach approximately 5km to the south of the Broken Head caravan park. Seven Mile Beach Road is controlled and maintained by Byron Shire Council which is currently reviewing the future of the road.

Impacts of this road on the nature reserve include sedimentation, the spread of introduced plant species and salt die back of rainforest communities in numerous areas.

Walking Tracks

There is one walking track located in the North Head section of Brunswick Heads Nature Reserve. This track uses the existing Department of Public Works maintenance road which extends to the northern breakwater of the Brunswick River. Formal walkways from this access enable visitor access to the beach. The western section of the nature reserve has no established walking tracks although neighbours do walk through the reserve. The impacts of usage in the western section requires monitoring to assess impacts on the natural condition of the nature reserve.

Tyagarah Nature Reserve presently has no formal walking tracks. However, upon closure, the sand track from Grays Lane to the northern boundary of the reserve is proposed to be retained for walking access.

Broken Head Nature Reserve has three established walking tracks. The Two Sisters Walking Track provides access from the Broken Head Caravan Park on the northern boundary of the reserve to a lookout platform on the northern headland. This track has interpretation facilities, providing information on the natural and cultural features of the reserve.

The Kings Beach Track provides access from the Seven Mile Beach Road to the popular Kings Beach. The Whites Beach Track to the south also provides walking access from the Seven Mile Beach Road to Whites Beach.

In addition to these constructed tracks there are a number of informal walking routes which give access to all beaches within the reserve. The usage of these informal routes is mainly generated by the existence of Seven Mile Beach Road. These walking tracks include those to Brays Beach and Snapper Headland which be progressively formalised by sign posting, steps, drainage, edging and surfacing. This upgrading will utilise the existing alignment as far as practicable to limit impacts of their use to existing disturbed areas.

These tracks are degrading because of their current levels of use. They will be upgraded where necessary and maintained to an environmentally and engineeringly acceptable level to reduce the impacts of visitor use. Only locally available gravel sources will be used in upgrading and maintenance and the tracks will not be widened.

Seasonal ranger programs are conducted during the New South Wales school holiday periods and place emphasis on interpreting the natural and cultural features of the reserves.

Horseriding occurs in Tyagarah Nature Reserve and is currently limited to the beach below mean high water mark and along Grays Lane. These limits are not being observed and environmental damage is occurring elsewhere within the reserve, particularly in foredune areas. Horseriding also conflicts with the more passive

public uses which are appropriate within the nature reserve and has been the subject of complaints to the Service.

In accordance with established Service policy horseriding will not be permitted within the three nature reserves.

Policies

- * The impact of visitor use will be monitored and any necessary action taken to reduce or eliminate unacceptable impact.
- * Interpretive and environmental education programs will be directed towards promoting an appreciation and understanding by the public of the importance of the Byron Coast group of nature reserves with emphasis on their management and the impacts of inappropriate public use.
- * Seasonal ranger programs may be provided in one or more of the three nature reserves during peak visitation periods.
- * A proposal by Byron Shire Council to restrict vehicular use of Seven Mile Beach Road, on the western boundary of Broken Head Nature Reserve, will be supported by the Service.
- * Liaison with Byron Shire Council will be maintained with regard to beach access for professional fishermen and other authorised people.
- * Vehicle use off the public access roads is not permitted.
- * Horseriding will not be permitted within the three nature reserves, apart from designated public access roads.

Actions

- * The following roads will be maintained for public use:
 - North Head Road in Brunswick Heads Nature Reserve; and
 - Brunswick River road in Brunswick Heads Nature Reserve.
- * The north-south sand track between Brunswick Heads and Grays Lane in Tyagarah Nature Reserve will be closed to public vehicular use.
- * The following walking tracks will be upgraded where required:
 - the Harrys Hill walking track in Brunswick Heads Nature Reserve;
 - the existing sand track in Tyagarah Nature Reserve;
 - Two Sisters walking track in the north of Broken Head Nature Reserve;
 - the Brays Beach walking track in Broken Head Nature Reserve;
 - the Snapper Headland walking track in Broken Head Nature Reserve;
 - Kings Beach walking track in Broken Head Nature Reserve; and
 - Whites Beach walking track in Broken Head Nature Reserve

- * The standard of the Two Sister's, King's, Brays, Snapper Headland and White's Beach walking tracks within Broken Head Nature Reserve will be upgraded.
- * The King's Beach Track will be re-routed where necessary to minimise environmental and visitor impacts and reduce track maintenance.
- * Visitor information including interpretive signs will be provided for all formal walking tracks within the three nature reserves.
- * The following day use facilities will be maintained:
 - at Harrys Hill in Brunswick Heads Nature Reserve;
 - on the Brunswick River in Brunswick Heads Nature Reserve; and
 - the Grays Lane Picnic Area in Tyagarah Nature Reserve;
- * All informal vehicle and walking tracks will be closed and rehabilitated.

4.3.2 Research

The function of research is to assist in the understanding of the natural and cultural heritage of the three nature reserves, their use and effective management.

Existing research activities include natural resource inventories and specific studies mainly undertaken by the University of New England, Northern Rivers Campus. This research enhances the Service's information concerning the reserve's nature conservation resources.

There is a need to monitor the impact of recreation in the three nature reserves.

Policies

- * Service conducted research will give priority to improving the management of the three reserves; in particular to understanding:
 - the conservation requirements of rare and endangered species;
 - fire ecology and the impact of fire on native plant and animal communities
 - visitor usage and impacts; and
 - bush regeneration.
- * The impact of recreation on the natural and cultural resources of the three nature reserves will be monitored.

4.3.3 Management Operations

Some vehicle tracks are required for essential management including fire control, rehabilitation works, maintenance and introduced plant and animal control programs. These tracks are also required for scientific research and for emergencies.

Within Brunswick Heads Nature Reserve there is a short 200 metre management track to the northern breakwater. The sand track proposed to be closed in Tyagarah

Nature Reserve will be maintained as a walking and management track. Broken Head Nature Reserve currently has no management track system.

A number of organisations and individuals currently occupy or use lands within or adjacent to the Byron Coast group of nature reserves. These occupations and uses although not directly associated with reserve management affect the natural and cultural values of the reserves. They include:

Department of Public Works: The Department of Public Works has developed the mouth of the Brunswick River for port and river enhancement purposes. This has involved construction of breakwaters at the mouth of the river and of riverbank walls upstream.

The area now reserved as Brunswick Heads Nature Reserve was required for access and for quarrying purposes during the construction of the works. Two roads which were constructed for these purposes; one to the river entrance and one along the northern bank of the river are included in the nature reserve. These roads give public access to features in the nature reserve and may be required by the Department for future access.

The Service has provided basic maintenance of these roads since dedication of the nature reserve.

Sand Mining Leases: Five sand mining leases were current in Tyagarah Nature Reserve when the reserve was established in 1986. Sand mining operations ceased during the mid nineteen-seventies.

There is also an active sand mining operation directly adjoining this reserve's south western boundary in the vicinity of Grays Lane.

Oyster Leases: There are a number of oyster leases adjacent to the western section of Brunswick Heads Nature Reserve. These leases are below high water mark and are hence not included in the nature reserve. Access to the leases is via the road constructed by the Department of Public Works for the management of the northern shores of the Brunswick River.

Policies

- * The following roads will be maintained for management purposes:
 - the track to the northern breakwater of the Brunswick River within Brunswick Heads Nature Reserve; and
 - the north-south sand track within Tyagarah Nature Reserve.
- * New tracks will be constructed only where necessary for fire control or other emergency operations. All new tracks constructed for emergency operations will be closed and rehabilitated as soon as possible after each emergency.
- * The Service will oppose any proposals for further mining or mineral exploration in Tyagarah Nature Reserve.
- * The sand mining operations adjoining Tyagarah Nature Reserve's south-western boundary will be monitored to ensure that the reserve is not affected.
- * Access to the oyster leases within Brunswick Heads Nature Reserve will continue to be provided along the Public Works Road on the northern bank of the Brunswick River.

5. PLAN IMPLEMENTATION

This plan of management is part of the system of management developed by the Service. The system includes the Corporate Strategy, the National Parks and Wildlife Act, management policies and established conservation philosophy. It also includes district programming.

The orderly implementation of this plan of management will be undertaken within the annual programs of the Services Lismore District. Priorities will be determined during the development of these programs and will be subject to regional priorities and to funding, staff and any special requirements of the Minister and/or Director-General.

District programs will be reviewed annually and performance for the year compared with objectives laid down in this plan. The environmental impact of all development proposals will continue to be assessed at all stages from planning to implementation, and any necessary investigations will be undertaken in accordance with established environmental assessment procedures.

Under Section 81 of the National Parks and Wildlife Act, this plan shall be carried out and given effect to, and no operations shall be undertaken in relation to the Byron Coast group of nature reserves unless the operations are in accordance with this plan. However, if after adequate investigations, operations not included in the plan are found to be justified, this plan may be amended in accordance with Section 76 (6) of the Act.

As a guide to the orderly implementation of this plan, relative priorities for identified activities are summarised below:

High Priority

- mapping of feral animals
- mapping of weeds
- preparation of weeds strategy
- regeneration of rainforest
- preparation of fire management plan
- maintain fire records
- assess Broken Head cottage
- progressively formalise Brays Beach and Snapper Headland walking tracks

Medium Priority

- dune maintenance works
- plantings
- liaison with Byron Shire and with Far North Coast County District
- close all informal vehicle and walking tracks

Ongoing

- fire management
- maintain cultural heritage register
- maintain specified walking tracks within the nature reserves
- maintain specified public roads within the nature reserves
- maintain specified day-use facilities within the nature reserves

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