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BYRON SHIRE

ABORIGINAL HERITAGE STUDY

DRAFT REPORT

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December 1992

PREPARED FOR THE BYRON SHIRE COUNCIL

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1: ARCHAEOLOGICAL RESOURCE MANAGEMENT

1.1. MANAGEMENT PRINCIPLES

Aboriginal archaeological sites and places of significance to contemporary Aboriginal people are protected in New South Wales under the National Parks and Wildlife Act (1974) and the Environmental Planning and Assessment Act (1979), with Regulations (1980). The emplacement of such legislation is confirmation that the people of this state recognise the scientific, historic and social value of the material evidence of their past.

Such legislation, however, is not designed to prevent development, nor does it require the entire archaeological resource to be retained. The legislation, rather, is aimed to ensure that the resource is carefully managed and that unmitigated destruction of cultural heritage materials does not occur. The issue for resource managers is to preserve a body of sites which is representative of the resource at a regional level. This is clearly only possible if the resource has first been defined. In the Byron Shire, as elsewhere, protection of a representative sample of sites can only be achieved after a sufficient number and range of sites in different environments have been recorded and assessed to enable determination of the range of variation in each site type present (Byrne 1989:23). It must be recognised, however, that European settlement and landuse within the Shire is likely to have severely impacted the archaeological resource and that this resource is being further depleted every day. Thus, in some parts of the Shire, particularly along the coastline, selective site retention is no longer a viable management option, with all surviving sites already providing only a very sparse sample of the original resource.

The present study aims to provide realistic management options for Aboriginal cultural materials present within the Byron Shire. This is done through a detailed assessment of both previously recorded Aboriginal sites and additional sites recorded during the course of this study. Sites are set within their environmental context and against a backdrop of the known body of sites in northern coastal N.S.W. Byron Shire Council's brief for the study is contained as Appendix 1 of this report.

To date very few archaeological surveys have been undertaken within the Byron Shire and all of those completed focus on coastal areas. No systematic surveys have been undertaken in plateau/mountainous hinterland environments. The currently

recorded body of Aboriginal sites within the Shire is thus likely to be but a small fraction of those which are actually present.

1.2. CRITERIA OF SIGNIFICANCE FOR ABORIGINAL SITES

The heritage value of an archaeological site is taken to include its 'aesthetic, historic, scientific or social significance, or other special value, for future generations as well as for the present community' (Australian Heritage Commission Act 1975, S4 [1]). All of these values must be considered when the significance of a site is being assessed and when plans are laid for its future management.

Australian archaeology, as a discipline, is in a state of continuing development. New field and analytical techniques, with the potential to elicit more sophisticated information about the prehistoric past, are extending the research value of sites formerly regarded as being of little importance. Often new techniques require that cultural materials be collected in specific ways and thus, material from earlier excavations may be unsuitable for such modes of enquiry. It is likely, too, that future technical developments will require even more specific collection methodologies, making current collections unusable. It is imperative, therefore, that a large and representative body of prehistoric sites be protected so that, as new techniques are developed, these resources can be mobilised to add to our knowledge of Australian prehistory.

The scientific (archaeological) significance of sites in the Byron Shire is viewed in terms of:
i) The size, contents, state of preservation and location of each individual site, and of the sites as a complex, representing the various aspects of Aboriginal activities in the area.
ii) The representativeness or uniqueness of the individual sites and of the site complex, and hence their potential contribution to future research questions.
iii) The sites' contribution to present research questions in Australian prehistory, including the study of such matters as the distribution of prehistoric Aboriginal sites, cultural boundaries, seasonal movements, subsistence strategies, length of occupation, leading to a reconstruction of the Aboriginal prehistory of the coastal regions of N.S.W. (Attenbrow & Negerevich 1984:139-140).

Archaeological sites have other important values. While some have readily apparent public appeal because of their aesthetic or historic value, all Aboriginal sites in Australia also have a significance to Aborigines which may override all other aspects (Sullivan 1984:vi). The significance of sites to Aboriginal people

varies from case to case and thus, the most appropriate means of assessing such significance is to consult directly with Aboriginal communities. Ceremonial sites, mythological sites and burials, for example, are highly significant while small open campsites may not necessarily be considered so.

1.3. LEGISLATION AND ABORIGINAL SITES

Both Commonwealth and State acts protect prehistoric and Aboriginal places and objects. It is essential that Shire employees and Council members understand these acts and have the ability to interpret them for Shire residents. The National Parks and Wildlife Service has prepared a handbook titled 'Planning for Aboriginal Site Management' (Ross 1986) which contains information concerning legislation, enforcement and departmental policies, while the Australian Heritage Commission's publication 'Protecting Australia's National Estate' (1985) deals specifically with legislation.

1.3.1. The Commonwealth

Australia, as a signatory to the World Heritage Convention, has places which have been declared World Heritage Properties. The standards which apply to this convention are recognised both nationally and internationally and have been adopted by State Governments. The Australian ICOMOS 'Burra Charter', a specific procedural code which was drafted to effect the conservation of cultural resources, provides a framework for heritage practitioners (Kerr 1982).

1.3.2. Aboriginal and Torres Strait Islander Heritage Act (1984)

If an artefact or place which is significant to Aboriginal people is threatened, an Aboriginal person, or someone acting on their behalf, may make representations to the Federal Minister. The Federal Minister may subsequently investigate the matter and is empowered to take action to ensure protection of the artefact or place. This Act overrides the provisions of State Heritage Acts.

1.3.3. Australian Heritage Commission Act (1975)

The Australian Heritage Commission is a statutory body of the Commonwealth Government which aims to catalogue the places within Australia which have 'aesthetic, historic, scientific, or social significance, or other special value, for present and future generations' (Yencken 1981:9). This catalogue is known as the

Register of the National Estate. It is deemed to include both recent and prehistoric archaeological sites as well as places of current significance to Aborigines (Yencken 1981:11; Mulvaney 1981; Flood 1979 cited in Bowdler 1983:15).

While the Act imposes 'no legal obligations on private individuals, private corporations, or on State or local governments within States' it does impose obligations on Commonwealth Ministers and authorities (Yencken 1981:11) not to act to adversely affect a place listed on the Register. Cocked Hat Rocks (Two Sisters Rocks mythological site), in the ocean off Broken Head, is the only site listed on the Register of the National Estate within the Byron Shire.

1.3.4. New South Wales National Parks and Wildlife Act (1974)

Generally, all Aboriginal 'relics' in N.S.W. are protected under the provisions of the National Parks and Wildlife Act and the administration of legislation pertaining to N.S.W. sites is, at present, the responsibility of the National Parks and Wildlife Service.

Under the provisions of the Act a relic (any deposit, object or material evidence, not being a handicraft made for sale, relating to indigenous and non-European habitation of the area that comprises N.S.W., being habitation both prior to and concurrent with the occupation of that area by persons of European extraction [Section 5(1)]) may not be disturbed, damaged or destroyed without written authority from the Director of the National Parks and Wildlife Service. The provisions of the Act apply to all sites regardless of whether they occur on privately owned or Crown Land.

Should any proposed development require the destruction of an Aboriginal site, therefore, a Consent to Destroy must first be obtained from the Director of the National Parks and Wildlife Service. Such consent is normally only given following review of a specialist report, consideration of the site's significance, advice from the local Aboriginal community and consideration of alternative conservation options.

In keeping with the provisions of the Act, a register of all recorded sites in N.S.W. is maintained by the National Parks and Wildlife Service at its Hurstville Head Office, while a register of sites in each region and district is maintained at regional and district offices respectively. A register of Aboriginal sites within the Byron Shire is maintained at the Lismore district office in Alstonville.

1.3.5. New South Wales Heritage Act (1977)

The provisions of this Act are designed to protect places of significant European heritage. Such places are, however, broadly defined as environmental heritage and as such, can include places of significance to Aboriginal people. Under the Heritage Act an area can be protected while survey and investigation is in progress even if no sites are known, and an area which is a natural mythological site or a sacred site can be protected as a significant environmental area until such time as it can be made an Aboriginal Place under the National Parks and Wildlife Act.

1.3.6. Environmental Planning and Assessment Act (1979) and Regulations (1980)

This legislation is a recognition of the need to protect the cultural and natural heritage of N.S.W., including Aboriginal sites. Under the Act a review of environmental and cultural factors may be required before an action is taken which would impact those resources. It adds an extra dimension to the National Parks and Wildlife Act by providing for forward planning prior to development, including an obligation for developers to consult persons of relevant expertise and experience. The main implication of this legislation for Aboriginal sites is that archaeological surveys by qualified archaeologists may be required or appropriate prior to the development of an area, and also that other cultural and aesthetic values should be considered. Such values include sites of significance to contemporary Aborigines (Bowdler 1983:14).

With respect to Aboriginal and prehistoric sites, the National Parks and Wildlife Service generally offers advice on the most appropriate way to proceed with respect to specific development proposals. It is desirable, however, that the Byron Shire Council establish a procedure whereby only matters which are likely to be relevant are referred to the Service.

1.3.7. Australian Museum Trust Act (1975)

Aboriginal relics which constitute part of an Aboriginal site must not be removed without the permission of the Director of the National Parks and Wildlife Service [Section 86].

Currently, all Aboriginal 'relics', apart from those which were in private

ownership before October 1967 and have not been abandoned by their owners, are the property of the Crown. The Australian Museum has custody and control of Aboriginal relics which are Crown property, apart from those on National Parks and Wildlife Service lands [Section 88(2)]. The National Parks and Wildlife Service has custody and control of relics on Service lands. The Museum is, however, able to dispose of, or give away relics which it has acquired. Under this provision Aboriginal people can legally obtain permission to keep artefacts or to have disturbed Aboriginal skeletal remains returned to them for keeping or reburial.

1.3.8. Aboriginal Land Rights Act (1983)

Local and Regional Aboriginal Land Councils have been established under this Act. The Far North Coast Regional Aboriginal Land Council has its office in Lismore, while the Jali and Tweed/Byron Local Aboriginal Land Councils are based at Cabbage Tree Island, Wardell, and at South Tweed Heads, respectively.

Provisions of the Act allow for claims to be made by Aboriginal councils with respect to unallocated Crown Lands.

1.4. MANAGEMENT BY THE SHIRE

'Whilst government authorities such as the National Parks and Wildlife Service and the Heritage Council of N.S.W. have specific conservation responsibilities conferred by their Acts, the main responsibility for ensuring conservation rests with local councils' (Dept. Environment and Heritage Circular No. 84; 16/8/85). The Aboriginal and prehistoric resources of the Byron Shire have the potential to enrich the cultural, scientific and educational values of society and care in planning and management is crucial if they are to be conserved for future generations.

Management by the Shire must include planning for and managing development with regard to both recorded and unrecorded sites. This study details the location and nature of all recorded sites. All of these are protected by legislation (National Parks and Wildlife Act [1974]) and as such, no development (neither designated nor non-designated under the Environmental Planning and Assessment Act [1979;1980]) can be allowed in their vicinity until an assessment of the likely impact of a proposed development on each site has been made. The Byron Shire Council should require that a qualified archaeologist be engaged by a proposed developer to provide such an assessment. It is always desirable for sites to be protected and retained within development areas and this can often be achieved through

modifications to original proposals. In some instances, however, plan modifcation may not be feasible and the prospective developer will then need to obtain Consent to Destroy the site/s from the Director of the National Parks and Wildlife Service. Such applications require an accompanying site assessment report prepared by a qualified archaeologist. It is Service policy that Consent to Destroy an archaeological site will be granted only when a proposed development is shown to be of more value to a community than the site itself. Consent, if granted, is often conditional upon total recording or salvage of cultural materials prior to destruction of the site (Ross 1986:65).

It is likely that those sites currently recorded within the Shire represent only a fraction of those in existence. This situation should be addressed by requiring archaeological survey of developments which are proposed for areas where known sites exist, and in areas which are deemed, through the present study, to have archaeological potential.

Archaeological survey of a proposed development site is generally not required if an area is deemed to have low archaeological potential, if it has suffered major ground disturbance in the past (e.g. sand mined areas) or when it has been subject of a past archaeological survey. The nature of sites like burials and stratified sub-surface middens and campsites, however, often precludes their discovery until a development is under way. In some areas, too, thick surface vegetation may prevent the discovery of some sites. Thus, in instances where there is cause to believe that undiscovered sites may exist within an area, the archaeologist undertaking the initial survey would normally recommend that further sub-surface archaeological investigation be undertaken prior to development approval being granted, and/ or that earthworks associated with development projects be monitored whilst in progress. Archaeological surveys may also be required for non-designated developments if they coincide with areas which are known to be archaeologically sensitive.

Shire planners need to consider constraints arising from Aboriginal cultural resources and to develop a strategy to effectively accommodate them. This study employs a five-zone environmental division of the Shire and provides recommendations which should be used as a guide in assessing the archaeological potential of, and appropriate management strategy for, each of the identified zones.

2: ENVIRONMENTAL CONTEXT OF THE BYRON SHIRE

The Byron Shire comprises an area of 55,686 hectares of land in coastal northern N.S.W. (Figure 1). It adjoins the Tweed Shire to the north, the Ballina Shire to the south and the Lismore Shire to the west. The Pacific Ocean marks the Shire's eastern perimeter. Main towns within the Shire include Byron Bay, Mullumbimby, Brunswick Heads and Bangalow.

2.1. CLIMATE

Byron Shire, located within the sub-tropical climatic zone, is characterised by hot, humid summers and mild winters. Mean annual temperature is 19.4 degrees C. The north coastal region of N.S.W. experiences a rainfall peak in February/March associated with both tropical and southern depressions. Annual rainfall is high, with up to 1800mm. a year being recorded for the Brunswick Valley. Although most months show rainfall in excess of 50mm., the region generally experiences a seasonal dry period in late winter-early spring.

On a more localised scale, climatic regimes within the Byron Shire vary according to topography, altitude, aspect, exposure and position relative to the ocean. Generally, diurnal temperature ranges, frosts, and fogs increase with increasing altitude and/or distance from the ocean, while rainfall decreases. Milder climates characterise the coastal zone, while extremes may be experienced in the mountainous western section of the Shire.

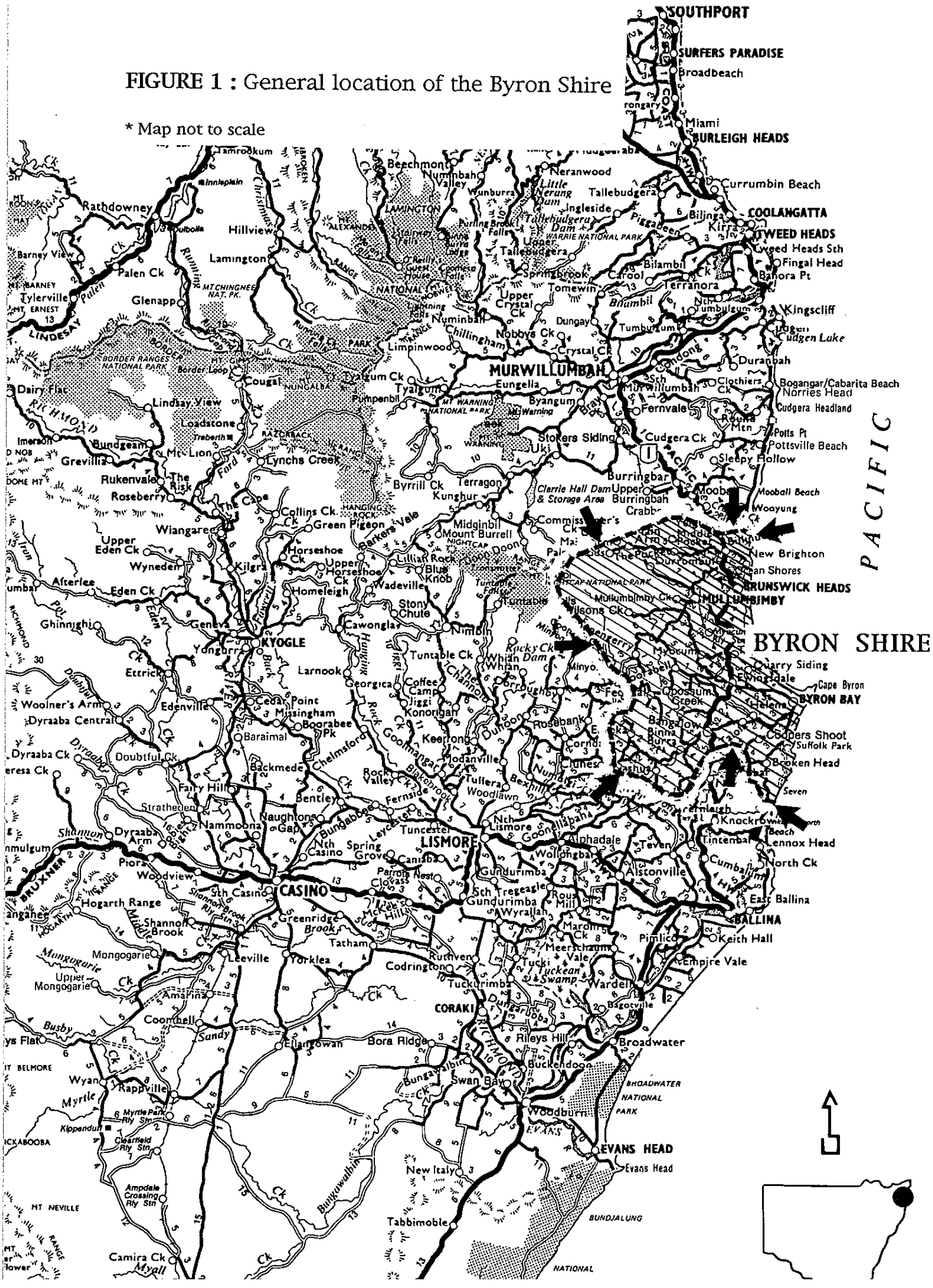
2.2. GEOLOGY

In the Richmond/Tweed area geological formations are basically characterised by two layers of sedimentary rocks which have been partly separated and later covered by lava during episodes of volcanic activity.

Within the Byron Shire metamorphosed sedimentary basement rocks outcrop north of Brunswick Heads and form the promontories of Cape Byron and Broken Head. Low bedrock hills extend toward the coastline north of the Brunswick River, forming discontinous spurs. Basalts from the Mount Warning shield cover this bedrock material over a large part of the Shire, forming an extensive volcanic plateau west of the coastal strip (see Figure 2).

FIGURE 1 : General location of the Byron Shire

* Map not to scale



2.3. SOILS

Soils of the area vary significantly within relatively small distances, reflecting variations in the soil parent material. The pattern tends to be a complex of many small units becoming more homogeneous to the west. Five main soil types have been recognised for the Shire (Hanna 1968; see Figure 3).

The first of these, aeolian and heath soils, are wind blown deposits found in a narrow strip adjacent to the ocean. The width of this strip varies from less than 500m. to around 12km. The parent material is sand, and because of the recent nature of most of the deposits little soil development has occurred. Podzolic soils are, however, beginning to form on some of the older deposits (inner barrier systems and sandy flats) where there is vegetation cover. Soil profiles generally consist of a grey A horizon, formed by the leaching of organic matter, which grades into white sand.

Peat soils with a high moisture content and waterlogged swamp soils are found bounding the aeolian soils. These are extremely porous, being composed of dark organic matter which is relatively homogeneous throughout the profile.

Alluvial soils edge the middle tracts of Shire's larger rivers and are variable in composition, being closely related to parent materials. These soils vary from deep loams (basalt parent material) to sandy loams (sedimentary parent material). Basaltic alluvials are the most common and result in brown clay loams. In lowland areas toward the coast, however, basaltic alluvials are poorly drained, strongly acidic, and are characterised by a dark grey surface horizon which overlays a grey mottled clay at a depth of 25-30cm. The sedimentary alluvials cover a much smaller area and are poor clay soils with little soil development.

Podzolic soils are found in those parts of the Shire where older sedimentaries outcrop. The soil profile commonly comprises two well developed horizons: an A horizon, consisting of grey sandy material approximately 30cm. thick which is often covered by a thin layer of organic matter; and a B horizon of yellow clay of undetermined thickness.

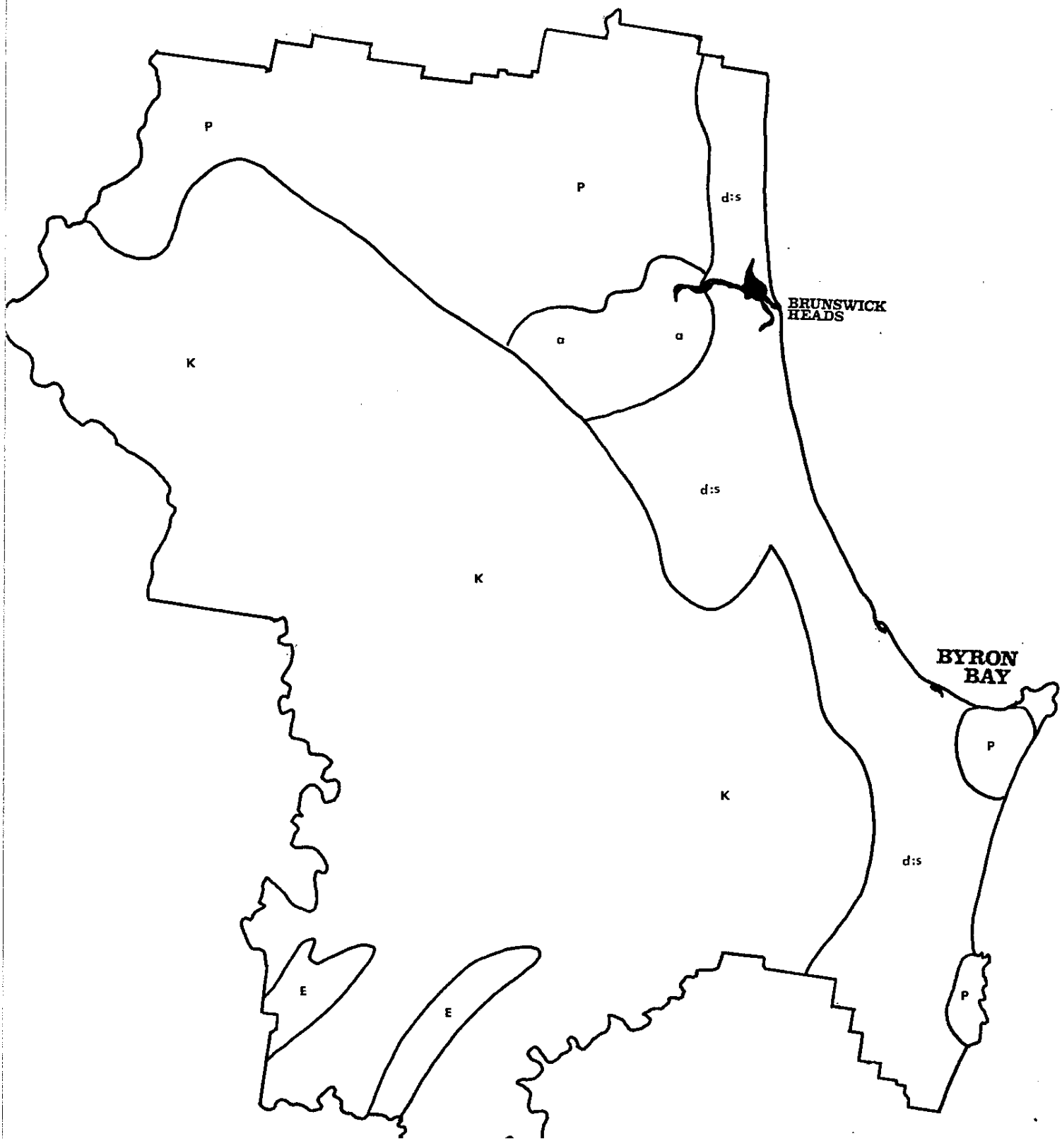
The most widespread and fertile soils of the Byron Shire are the krasnozems which characterise the undulating basaltic plateau area. These soils are brown, red-brown to red friable clays with low water holding capacity. Organic content is high toward the surface and the soil is strongly acidic. Basalt floaters occur on the surface where lower soil horizons have been exposed.

FIGURE 3 : Major soil types of the Byron Shire

(From Hanna 1968)

Key:

K	Wollongbar & Bangalow krasnozems	a	Alluviums of varying origin
P	Podzolic & cryptopodzolic soils	d:s	Coastal dune & swamp soils
E	Eltham alluviums		



2.4. LANDFORMS

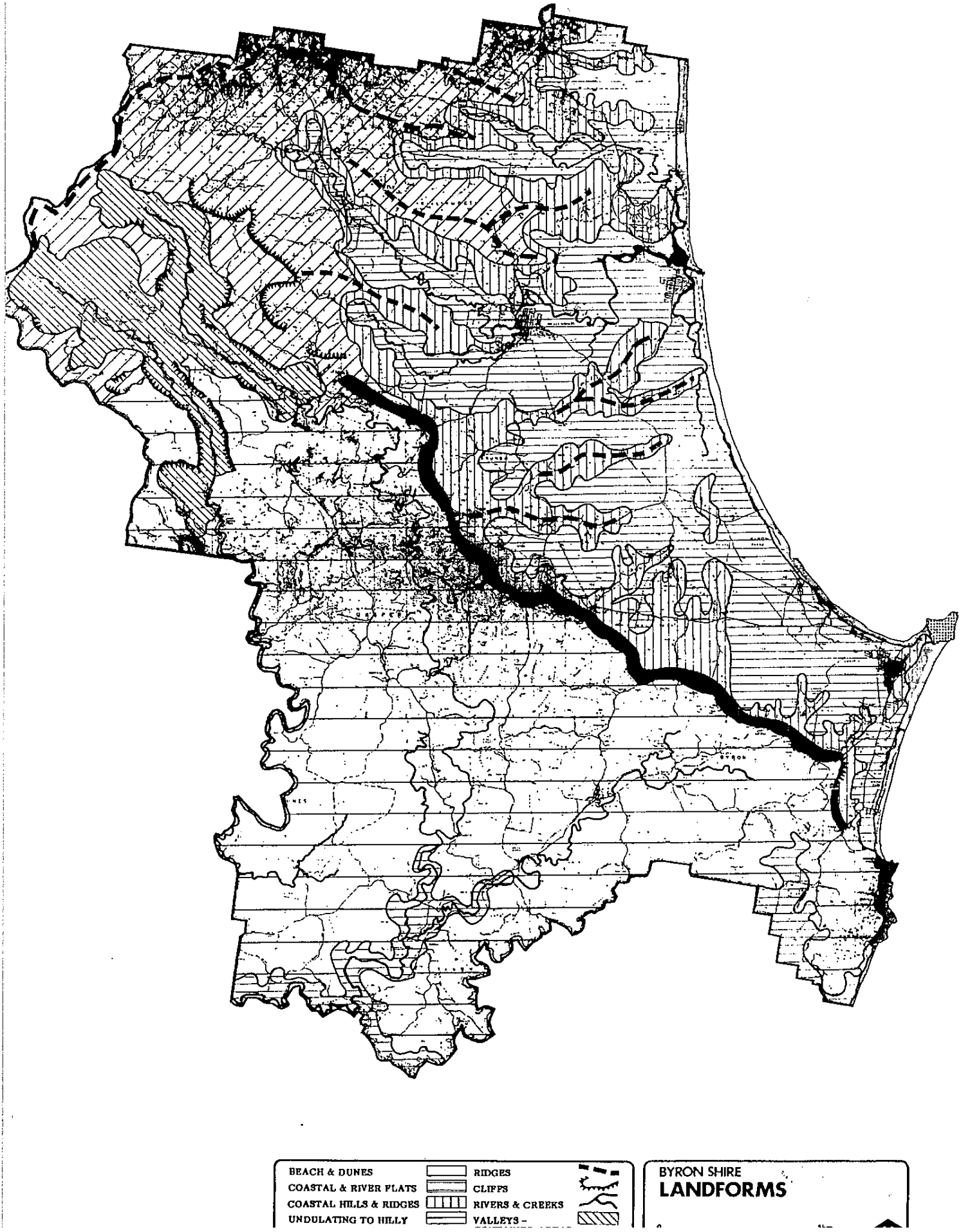
Landforms of the Byron Shire are varied and generally reflect underlying geology (Figure 4). The north west section of the Shire consists of mountainous country ranging in elevation from 300 metres above sea level (m. a.s.l.) to 810 m. a.s.l. at Jerusalem Mountain on the Shire boundary. The area is characterised by precipitous and narrow east-west trending ridges which are deeply incised by the upper tracts of Coopers Creek and the Brunswick and Wilsons Rivers. Much of this mountainous area falls within the Nullum and Whian Whian State Forests and is thus excluded from the current study (see Appendix 1).

The Shire is dissected by a steep coastal escarpment which stretches from the mountainous area in the north west to Broken Head on its south east margin. This escarpment separates the coastal areas to the east and north east from the inland undulating plateau which comprises almost half of the Shire's area. This plateau is variable in elevation, ranging between 30 m. a.s.l. on river flats bordering the Wilsons River on the Shire's south western perimeter, to 300 m. a.s.l. further north where it adjoins the mountains. The plateau is drained by tributaries which run south west into the Richmond River south of the Byron Shire boundary.

Landforms to the east and north east of the coastal escarpment are dominated by flat coastal lowlands. These lowlands are dissected by numerous low east-west trending ridges which, in several places, extend from the elevated inland regions to the coastline. In the north eastern part of the Shire such ridges define the extent of the Brunswick River drainage basin. The Brunswick is the Shire's only major river. With its headwaters in the Nullum State Forest it flows east through a narrow plain which widens to form extensive river flats on the lower reaches. The Brunswick River enters the sea at Brunswick Heads in the northern part of the Shire.

Byron Shire's coastline is characterised by long sandy beaches between 60 and 120 metres wide which stretch between the rocky promontories of Cape Byron and Broken Head. These beaches are generally backed by an eroded dune scarp 2-6 m. high. Between Byron Bay and Brunswick Heads is an extensive series of shoreline parallel beach ridges with elevations of 5-6 m. a.s.l. These ridges, spaced between 80 and 150 m. apart, were formed when barrier building sands moved onshore during a period of sea level rise. Up to 13 such ridges occur immediately north of Belongil Creek, reducing in number with distance north. Landward of these ridges low (2-3 m.a.s.l.) inner barrier dunes occur (Gordon et. al. 1978:49).

FIGURE 4 : Landforms of the Byron Shire



2.5. VEGETATION

In coastal regions the rising and warming of the sea after 10,000 years ago brought increases in rainfall and increased land temperatures. In general, the modern distribution of vegetation began to establish after that time (Hope 1967:7). The present northern N.S.W. environment is, however, substantially different to that of prehistoric times. Over a large part of the Byron Shire, for example, the original vegetation has been removed to be replaced by exotic species which are generally regarded as being 'natural'.

Aboriginal landuse patterns, resource use strategies and movement corridors are likely to have been dictated by the prehistoric vegetational regime. It is therefore essential that original vegetation distributions be reconstructed to enable a predictive model of archaeological site location within the Byron Shire to be formulated.

Jeans (1978; 1991) has developed a method for accurately mapping vegetation cover from the early period of European settlement through recourse to historical records. In 1864 new regulations were issued to Crown surveyors requiring them to record 'the boundaries of swamps, forests, plains, lands liable to inundations....' This information was to be shown on plans of all alienated lands, portion by portion as the demand arose, either by writing across the portion, or in a note (Regulations for the guidance of licensed surveyors connected with the Survey Department of N.S.W. 1864, quoted in Jeans 1978:94-95). Descriptions contained on such plans provide the general configuration of original vegetation and can be used to map boundaries between vegetation types. Using this method Jeans has mapped the original vegetation pattern of the Big Scrub area south of the Byron Shire (Jeans 1991:17). As this mapping must proceed on a portion by portion basis it is very painstaking work and unfortunately no such detailed reconstruction has been undertaken to date for the Byron Shire.

Mitchell (1978: Fig. 12), however, has produced a tentative reconstructed vegetation map for the north coast region by synthesising early survey maps, pastures and soils maps and comments from pioneer's reminiscences. Figure 5 shows this reconstruction for the Byron Shire. Five original vegetation types have been recognised over which a pattern of introduced species has been superimposed (Hanna 1968). The former distribution of these types closely coincides with the distribution of geology and soils.

The character of each type is discussed below:

i) On the coastal strip are the salt resistant species such as spinnifex and pigface which grow in areas where soil development is absent. Adjacent areas of sandy flats support low xeromorphic heath communities. Trees are largely absent but ti-trees (Melaleuca sp.) may occur. Heath communities are also found on the podzols around Broken Head and Byron Bay.

ii) Wetland areas generally have an almost continous cover of Melaleuca species, while below this cover reeds and other swamp vegetation is present. On better drained peats bracken fern is widespread.

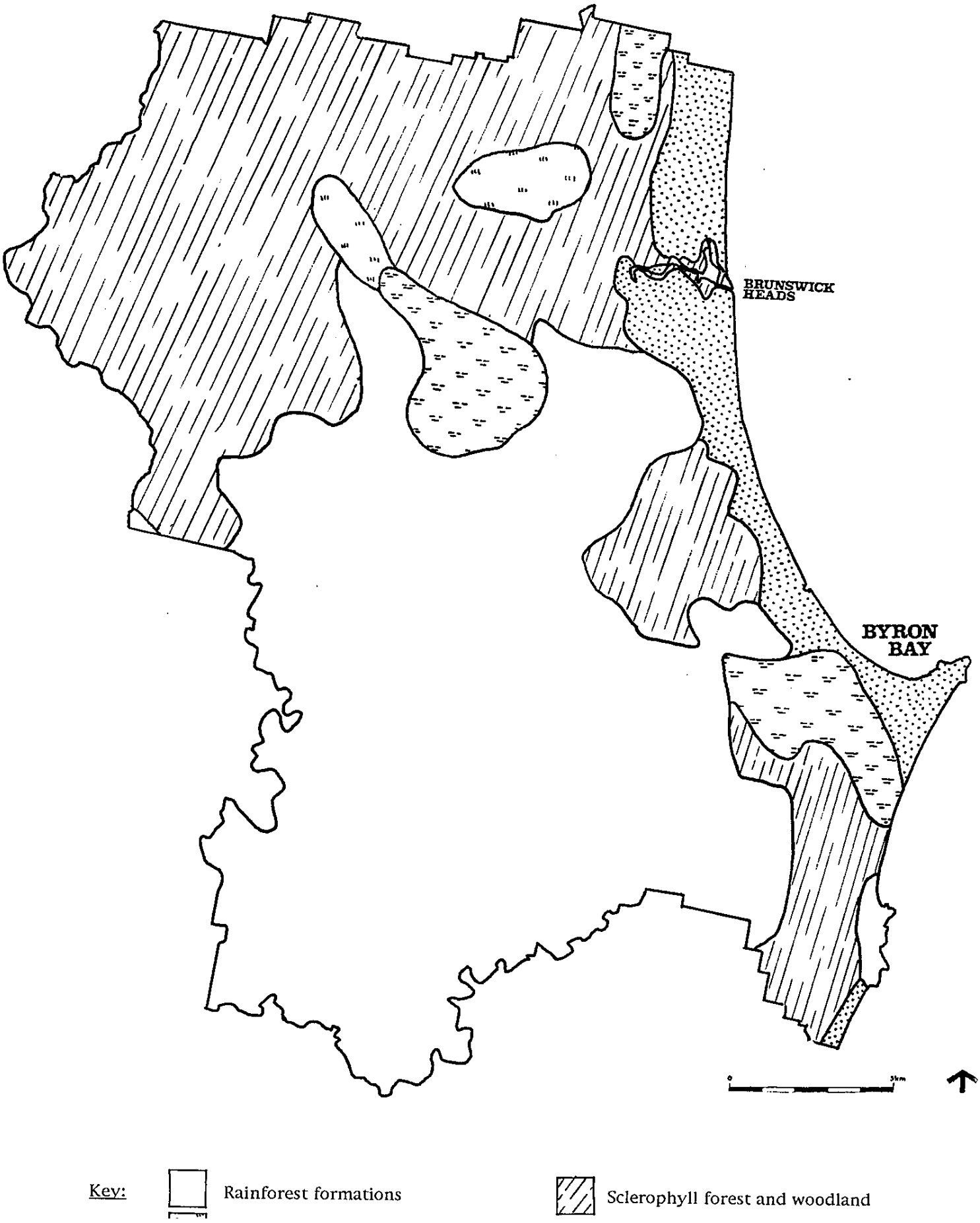
iii) Wet sclerophyll forest is the dominant vegetation type in the mountainous north west section of the Shire and in areas west of Brunswick Heads. Patches of such forest are also found between Byron Bay and Brunswick Heads and to the west of Broken Head. Drier open eucalypt woodland occurs north of Brunswick Heads and in some parts of the Brunswick Valley.

iv) Sub-tropical rainforest, locally known as the 'Big Scrub' originally covered much of the basaltic plateau, forming part of the largest rainforested area in N.S.W. (Frith in Goldstein 1977:12). This was typical rainforest with a dense layered tree cover with vines and other tropical plants binding the trees. Today the greater portion of this cover has been cleared and only isolated stands such as those at Broken Head, Hayter's Hill and Booyong Nature Reserve remain.

v) Two original pockets of grassland have been recorded on low hills and alluvial plains west of Brunswick Heads. These 'grasses' are said to have consisted of kangaroo grass (Themeda australis) and barbed wire grass (Cymbopogom refractus)(Mitchell 1978:61).

FIGURE 5 : Reconstructed prehistoric vegetation of the Byron Shire

(after Mitchell 1978: Fig. 12)



3: CULTURAL CONTEXT OF THE BYRON SHIRE

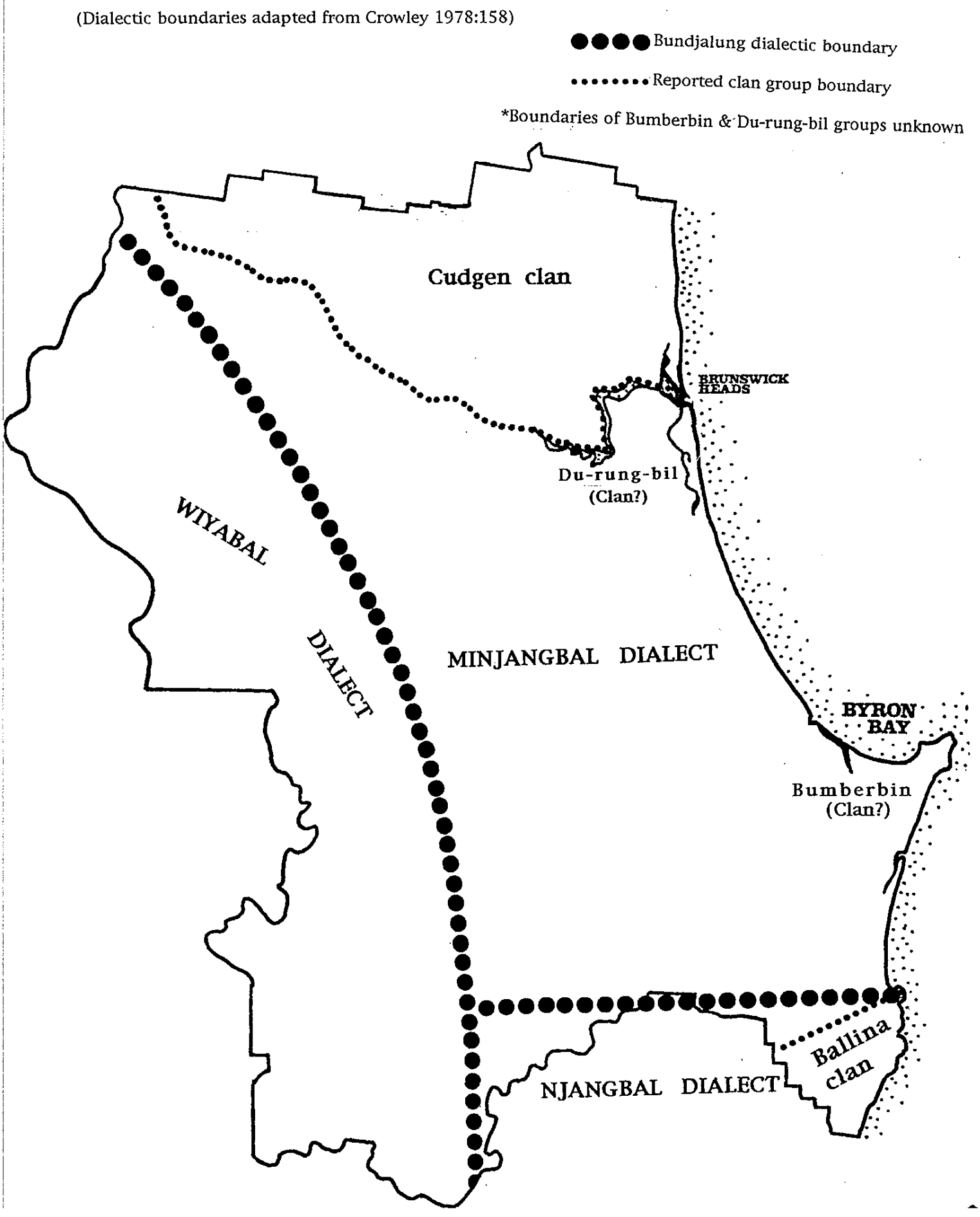
3.1. LAND DIVISION

The basic socio-economic unit of Aboriginal life was the extended family and usually several would co-operate, forming highly flexible clan groups (often described as 'tribes' by early writers) which regularly exploited a particular range or territory. Groups of such clans then formed relatively unstructured tribes (Lilley 1984:17).

It is generally acknowledged that the 'tribes' of the Byron Shire formed part of a larger linguistic unit, the Bundjalung, which occupied the area between the Clarence and Logan Rivers (Calley 1959; Longhurst 1980). This linguistic area was then divided into around twenty separate dialectic territories. Within the Byron Shire three of these dialects were reportedly spoken in traditional times. These include Njangbal, spoken around Broken Head to the south, Wiyabal, spoken to the the west, and Minjangbal, spoken in the remainder of the area (Crowley 1978: 150,152). Figure 6 shows the proposed location of boundaries between these dialectic groups. The Minjangbal dialect of the Byron Bay and Brunswick River area is today one of the few Bundjalung dialects for which grammatical outlines are available (Livingstone 1892 in Crowley 1978:2).

There are few early historical references to the location and names of the clan groups which traditionally inhabited the Shire. Clan territories were small, particularly in resource-rich coastal areas, and boundaries were clearly defined and generally known (Chevally 1946). To the north, two sources document a 'tribe', the Coodjungburra (Bray 1901), or Cudgen (Martyn 1947), which "had the part along the coast between the Tweed and Brunswick Rivers, about ten miles back from the coast" (Bray 1901:9). The Du-rung-bil people reportedly also lived on the Brunswick River (Harper 1894), while the Bumberbin 'tribe' are said to have inhabited the area around Byron Bay (Anon. 1954). Boundaries of Du-rung-bil and Bumberbin territories are, however, unknown. The south east section of the Byron Shire was reportedly within the hunting ground of the Ballina 'tribes' which "extended north to Broken Head and back from the beaches to the Big Scrub" (Ainsworth 1922:29). The territories of those clans reported from the Byron Shire are shown in Figure 6. It is likely that an additional Wiyabal- speaking clan was located in the Shire's hinterland, though there is no concrete evidence for this. A numerous clan may have had up to 100 members. In 1896 the Bumberbin of Byron Bay still had around 70 members despite the ravages of European disease and

FIGURE 6 : Proposed dialect and clan boundaries in the Byron Shire



displacement.

3.2. OCCUPATION AND SETTLEMENT PATTERN

Archaeological research undertaken on North Stradbroke Island shows occupation of the region to extend back at least 22,000 years (Neal & Stock 1986). At the end of the Pleistocene a sea-level rise of up to 170m. began, with stabilisation near present levels between 6,000 and 6,500 years ago. Coastal populations were forced to move inland with the trangressing sea and as populations grew, groups split and took up territories in non-coastal areas. By 2,500 years ago the east coast was populated by many autonomous groups with diverging languages (Hall 1990:7). These groups, however, did not operate in isolation, being linked through extensive systems of intermarriage and ceremonial obligation. Such social strategies worked to effectively increase the carrying capacity of regional resources (Morwood 1987).

In line with the environmental richness and resource diversity of the north coast, prehistoric population numbers were high relative to other parts of Australia. Densities on the coastal plain have been estimated at one person per 0.4-2.6 square km. with one person per 0.2 square km. in exceptionally rich areas such as at the mouth of the Richmond (Ainsworth 1922:13; Pierce 1971:13). Ainsworth (1922:13) claims that the area between Ballina and Broken Head, west to the Big Scrub was inhabited by 500 Aborigines in 1847. In foothill areas which lacked the broad subsistence base available on the coast, populations were smaller, at around one person per 5 square km. (Pierce 1971:13). It has been suggested that rugged mountainous areas were only very sparsely populated, if at all (Calley 1959:10-11) and that areas of rainforest may have been uninhabited or inhabited irregularly (Belshaw 1978:73). If the given estimates are correct, the Byron Shire would have been populated by between 120 and 220 Aboriginal people at the time of European contact, with the bulk of the population being clustered along the coastal strip.

A number of differing models have been proposed to explain prehistoric patterns of movement both within and beyond the coastal zone. Some archaeologists argue that coastal people ranged inland on a seasonal basis, possibly over long distances (Flood 1982; Poiner 1976; McBryde 1974). Others disagree, citing evidence for specialised marine adaptations in eastern Australia and for semi-sedentary occupation of the coastal margins (Coleman 1982; Belshaw 1978; Lampert 1971).

Early reports from the north coast (Ainsworth 1922:17-18; Dawson 1935:25; Moehead n.d.; Oakes n.d.) all suggest that coastal Aborigines exploited rainforest products in winter and returned to the coast in spring when fish became plentiful. Such a

pattern is also evident in myths from the area (e.g. Robinson 1965:27). During the normal course of daily foraging it is likely that groups remained within their own well-defined areas (e.g. see Radciffe-Brown 1929; Creamer 1974), moving in response to the availability of individual resources.

Land traditionally belonged clan groups and boundaries were clearly established in mythology (Creamer 1974). Inheritance of clan territory was patrilineal and rights were passed on to both male and female children. Bundjalung men, however, were required to choose their spouse from a clan 'a long way away', and for a period preceding and following marriage a man resided in the clan estate of his bride, developing social links which would last for the rest of his life (Calley 1959:64; Radcliffe-Brown 1929:237). Marriage was virilocal but even though a woman was required to live in her spouse's country she retained rights to her own clan territory. Such an arrangement, then, meant that there was potential not only for movement within, but also for long distance movement between, group territories.

Such a pattern of of demographic ebb and flow is well documented in ethnography for the region (e.g. see Morwood 1987:339). Steele (1984:13-17) cites early sources which refer to extensive movement of people between the Richmond and Tweed for initiation ceremonies, fights and corroborees. Aborigines from the Bunya Mountains in south east Queensland, for example, are said to have attended ceremonies at Wyrallah every year during the 1880's (Lang quoted in Steele 1984:13). Early sources refer to Richmond River Aborigines acting as guides across the Nightcap Ranges (Leycester 1880) and Wyrallah ridge was reportedly the main route of Aborigines "travelling to Lismore and beyond" (ibid:13). The most well-documented large scale movement, however, was the attendance of Aborigines from widespread areas (including the Byron Shire) at the triennial bunya feasts in the Bunya Mountains and Blackall Range, south east Queensland (Calley 1959; Petrie 1904; Bundock 1898). Feasting was accompanied by the reciprocal exchange of both women and material goods and the resulting alliances and kinship networks worked to ensure the future of inter tribal movement (Morwood 1987:340).

There is also evidence for contact and exchange of goods between the Aborigines of the Tweed, Richmond and Clarence valleys. Axes made on greywackes from the Clarence gravels were recovered in the Richmond and Tweed districts and an axe recovered at Station Creek near Woolgoolga south of the Clarence had been fashioned from stone from north west of Kyogle (Binns and McBryde 1972:81,94). Other axes found in the Richmond valley were made on materials from the Mount Warning volcanic complex further north. Of the 56 northern N.S.W. axes whose petrologies were analysed by Binns and McBryde, 18 had travelled at least 150 km.

from their material sources. Many had crossed several 19th century clan, dialectic and even tribal boundaries.

There is direct evidence too, for movement within the river valleys themselves. McBryde recovered pipi (*Donax deltoides*) shells from within her excavation at Seelands west of Grafton on the Clarence (McBryde 1974:) and Bundock writes that Aborigines at Kyogle obtained ornamental shells through trade with coastal groups (Bundock 1898 :4). Pipi shells have also been reportedly found in the Nullum State Forest west of Mullumbimby, 18km. from the coastline (R. Maslen pers. comm.) and were recently recorded within rockshelters bordering the Brunswick Valley 15km. from the coastline (Collins in prep.)

While it is not possible to distinguish between a purely economic and a purely social motivation for population movement, it is clear that such movement did occur. It is likely that systems of trade and contact were both maintained and reinforced by the network of kinship ties which extended associated rights and obligations to individuals in geographically removed areas.

Evidence for widespread movement of Aborigines, on both an individual and group basis, provides important data when considering models of prehistoric settlement pattern and landuse. The evidence suggests that geographical access routes both along the coastal plain and through the hinterland areas were frequently used and it is likely that archaeological sites will be concentrated along such routes.

3.3. MATERIAL CULTURE

In terms of material culture the northern rivers region is seen to form a unit distinct from surrounding areas. This distinction, however, is gained through the absence of certain artefacts rather than the presence of unique ones (McBryde 1978:187). The limited range of equipment used by Aborigines in this region was noted by early observers during the first decade of settlement. "A great scarcity of arms...is apparent when contrasting them with other tribes. But this.....may be attributed to their food which consisting of fish and honey is procured with facility and without those weapons so indispensable when the kangaroo and emu are the chief means of subsistence" (Fry 1843:653 quoted in McBryde 1978:197). The womera, multi-pronged fishing spear and shell fish-hook were apparently all absent from the region. Fish were caught in nets or speared in the shallows using straight wooden spears with fire-hardened tips (Dawson 1935:22). Spears barbed with bone, shell or stone were reportedly not used during the early historical period (McBryde 1978:187).

The range of material culture items from the region is however, wider than that from inland Australia. There are fewer multi-purpose and composite items and more which have been developed to suit specific tasks. It has been suggested that this was an outcome of the more sedentary lifestyle facilitated by the region's rich resource base (ibid:187).

The manufacture of shields has been clearly described by Dawson. Of the material he says "the Yahroohgul tree grew mostly in forest country of the Richmond...It was deciduous, its wood soft and heavy; it cuts like cheese when green but dries hard and tough" he continues "a shield piece was cut about 4" thick. It was then trimmed to an oval shape and shaped convex on the front side, the reverse being left flat. On the reverse the hand grip was cut out when the material was green and soft. Two incisions were made in the centre, a bar, round which the fingers were to cling, being left between the incisions. The complete shield was then smoke dried and the convex side was rubbed with bees wax and polished so that flying missiles might be deflected by it" (Dawson 1935:14).

Boomerangs were used for hunting and fighting, as well as for amusement. Their manufacture has also been described by Dawson. "The boomerang tree had symmetrically curved, thin slabby roots or hips above ground from which boomerangs could easily be cut with the right curve or shape needing only to be trimmed down to the correct thickness and weight (ibid:13). After being scraped down, the boomerang was dried and hardened over a fire. The returning boomerang is the type most often described by early European observers. "Each..(man)..had a couple of boomerangs and they used to have their sport throwing boomerangs to one another...and the boomerangs would come back to the thrower" (West n.d.:3). On the Richmond-Tweed non-returning boomerangs were used for hunting small marsupials, flying foxes and birds, as well as for combat (Sullivan 1964:76). Bundock, seeing Aborigines armed for a fight, recalls that they carried "a club, a couple of spears and three or four boomerangs..." (Bundock n.d.:1). Related to the boomerang were weapons for hand to hand combat (Sullivan 1964:76). Dawson describes the use of "a battle axe of flat hardwood curved at one end and pointed, and a battle axe of round wood curved at one end and pointed and used like a pick" (Dawson 1935:10).

Another weapon used in the region was the pademelon stick or throwing stick. This was chiefly used for hunting small animals and sometimes in tribal combat. It was "a weapon they (the Aborigines) always carried with them and used with skill...they threw (it) with great skill at a range of 15 to 20 yards. It was about one and a half feet long, an inch in diameter at one end and one and a half inches in

diameter at the other. It was usually made of mangrove wood" (Blanch n.d.).

The women's digging stick was another important piece of equipment which could be applied to many tasks. It was reportedly between 1.8 and 2 metres long, pointed at both ends and was manufactured from a similar hardwood to spears. It was thin and specially hardened by being placed on the fire (Anon. 1944). It was used to dig out yams and other vegetables, to kill small animals and reptiles and served as a woman's weapon during tribal fights (Sullivan 1964:79).

Nulla-nullas, or clubs, employed both hardwood and stone in their manufacture. The club itself was "carved and sometimes covered with sharp stones or bones to make it more effective" (Riley 1953). Apparently the stone or bone chips were attached to the wood using an adhesive agent (Sullivan 1964:85). One such club ('tabry'), approximately 45cm. long and bearing an incised zig-zag design on its end and a longitudinally smoothed handle, was found on the lower slopes of Mt. Chincogan near Mullumbimby during the 1960's (R. Maslen pers. comm.; pers. obs.).

Shell and stone tools were used in the manufacture of all wooden weapons and implements. Dawson is the only early European to have noticed these tools, and he refers only to shell and later glass scrapers (Sullivan 1964:80). As shell was an easily procurable commodity on the coast it has been suggested that it was often used in preference to stone. Early European reports mention the use of edge-ground axes which were generally hafted to wooden handles with string and grass tree gum or bees wax (Dawson 1935:202). These were used to cut toeholds when climbing or to cut possums and bee hives from trees. They were also used to cut out and shape weapons and implements such as shields, spears and boomerangs, and to cut bark and other materials for dwellings and canoes (Sullivan 1964:81). In this area ground-edged knives were also manufactured and apparently used for everyday tasks such as skinning animals and cutting meat (Flick 1934:6).

String was made from bark: "the bark was soaked in water, chewed, then twisted and rolled on the thigh, the result being excellent string almost as tough as whipcord" (Dawson 1935:24); dilly bags were woven from rushes and grasses; Bangalow palm leaves were fashioned into water and honey containers (Bundock 1898:2-8) and elaborate canoes were made from either bark or cut from a tree trunk, dug-out style (Sullivan 1964:96).

Fibre nets used for capturing game "...were constructed in long sections, four foot in width, which, when joined together for the purpose of the chase, would extend sometimes to a mile and a half in length" (Ainsworth 1922:17). Tow-row nets were

used extensively for fishing on the N.S.W. north coast. These consisted of finely meshed netting attached to a stick of bamboo, bent into the shape of a bow about 2.5 metres across (ibid:16; Simpson 1956).

During the 19th century several European settlers on the north coast made collections of Aboriginal artefacts, the bulk of which are now housed in the Australian Museum and in various museums around the world. McBryde (1978) has researched collections from the Richmond River area (including the Byron Shire) and provides a list of descriptions made by early settlers of items they observed in use. These descriptions serve to underline the variety and technological proficiency evident in Aboriginal material culture at the time of European contact. Information for the list of artefacts presented in Table 1 has been adapted from McBryde 1978: Table 3.

3.4. TRADITIONAL CULTURAL BELIEFS

The major characteristic of Aboriginal cultural beliefs, both on the north coast and in Australia generally, is the lack of a clear demarcation between secular and sacred life. On the north coast religion was strongly influenced by the environment, with beliefs themselves imposing certain controls such as food taboos and totemic practices on the exploitation of the environment.

Every land-owning clan group had a number of totemic increase centres (Djurebil) within its territory, each centre being associated with a particular species. Initiated men performed rites at a Djurebil to ensure the maintenance and well-being of its associated species. As each group did not have, within its boundaries, an increase centre for every species used, clan groups became economically inter-dependent. Local groups had to rely upon members of neighbouring groups to perform increase rites at Djurebils outside their own territory to ensure the future availability of particular resources. Thus, members of each clan had a responsibility not only to other clan members, but to the whole tribe "to see that the particular Djurebil in their care did its job " (Calley 1959:98-9).

The unity of secular and religious life is underlined by the initiation ceremonies ascribed to the region. These ceremonies and associated rites involved not only a gradual revelation of the sacred tribal objects and myths, but a corresponding growth in social and economic status. By the end of the ceremony a young initiate had become both the possessor of sacred tribal traditions and a fully fledged social and economic member who could hunt, marry and participate in tribal councils. The ascending levels of initiation, occurring over a period of years, included

TABLE 1: Material culture as observed on the Richmond, 19th century

Artefact	Raw material	Observed use	Date	Source
Shield	Light wood 'sometimes carved & painted'	Defence in fighting	1858-1880 Pre-1900	Ainsworth 1922, Dawson 1936:12, Flick 1934:1
Spear	'thin reedy weapons -no barbs'	Hunting Fighting	1870-1880 Pre-1900	Ainsworth 1922 Dawson 1936:63 Rankin 1900, Flick 1934, Bray 1923:8, Bundock 1898, Simpson 1957
Boomerang	'Painted'	Fighting Hunting Provide music for corroboree	1870-1890 Late 19th c. c. 1880	Flick 1934,West, Bundock 1898,Currie 1925.
Club (nulla nulla)	Spiked knobs at end	Fighting Hunting Weapon of war	1858 1870-1890 Pre-1900	Bray 1923:8,Flick 1934,Ainsworth 1922 Rankin 1900,Dawson, Bundock 1898:4
Club (pademelon stick)		Hunting flying fox	Pre-1900	Ainsworth 1922:28 Rankin 1900:133
Hafted axe		Cut out bees nests Cut out possums Taken to tribal fights	Late 19th c. 1858	Dawson:71, Bundock 1898:4 Bray 1923:8
Stone knife	Sharp stones 'Sharp piece of quartz' 'Flintstones'	Used for scarification Used to cut women's hair	c.1880 1870-1880 Late 19th c.	Currie 1925,Flick 1934,Bray 1923:6, Bundock 1898:2.
Shell knife	Piece of a large shell	Observed being carried by women	1834-1890	Flick 1934, Dawson:71.

Artefact	Raw material	Observed use	Date	Source
Net (Tow-row)	Grass tree & bark fibres Bark of the stinging tree Inner bark of nettle & kurrajong trees.	Fishing	1834-1890 Late 19th c.	Dawson:61, Ainsworth 1922:28 Bray 1923:2-3.
Net	Bark fibres	Hunting (with dogs) fixed b/n trees with brushwood wings. Fishing (fixed across streams)	Late 19th c.	Ainsworth 1922:28, Bundock 1898:4.
Hooks	Bone	Fishing	1834-1890	Dawson:61
Lines	Grass fibre cord with bone hooks	Fishing (women)	1834-1890	Dawson:61
Cord	Kurrajong bark Bark of strangler fig		Late 19th c.	Bundock 1898:4, Moehead.
Climbing vine	Blood vine or wisteria	Tree climbing	1834-1890	Flick 1934,Jones 1939,Currie 1925 Rankin 1900:132.
Digging stick (Yam stick)		Carried by women		Moehead
Digging stick		Used to dig graves		Simpson 1957
Canoe	Bark with closed ends	Used on waterways	1834-1890 1866	Dawson:60, Bray 1923:3.
Raft	Boughs tied with vine	Used to cross river		Bray 1923:3
Wooden water carrier (coolamon)	Made from a tree knot		1834-1890	Dawson:70

Artefact	Raw material	Observed use	Date	Source
Water carrier	Leaf of Bangalow palm	Used to carry water & honey	1870-1880	West,Bundock 1898 Flick 1934
Bark 'mop'	Inner bark stinging tree.	Used to catch & carry honey cut from tree.	1870-1880	Flick 1934
Dilly bag	Made from swamp reeds Bark of nettle & kurrajong		Late 19th c.	Currie 1925,Rankin 1900,Bray 1923:3 Moehead.
Woven bag	Woven from swamp rushes or grass. Also from bark of the hibiscus or kurrajong tree twisted into string.	Used as a carry-all Used for soaking conjevoi root & Black bean seeds	Late 19th c. 1870-1880	Bundock 1898:2, Flick 1934
Rug	Possum & koala skins Sewn with kangaroo sinews	Clothing-worn fur side in during winter	Pre-1900	Dockrill interv. by L. Daley,R.R.H.S. archive Ainsworth 1922, Rankin 1900,Bundock 1989:3.
Bone tools	Sharp bone	Used by women to engrave designs on skins & to soften Rug skins. Also Used as a hair comb	1834-1890	Dawson:70, Bray 1923:3
Bone needles		Used by women to sew skins together	Late 19th c.	Bundock 1898:3
Pegs	Wood	Used by women when stretching & drying skins	1834-1890	Dawson:70
Thread	Kangaroo sinews	Used by women when sewing skins together	1834-1890	Dawson:70, Bundock 1898:3

Artefact	Raw material	Observed use	Date	Source
Belt	Possum skin	Worn by men	1880	Currie 1925
	Fur		1866	Munro C.R.H.S.archive
	Marsupial skin			Simpson 1953,
	Possum fur with fringe	Worn by women	Late 19th c.	Bundock 1898:2
	Cane bungles 1" long strung on thread	Worn by men	Late 19th c.	Bundock 1898:2
Skirt	Strips of hide	Worn by women		Anon. Aborigines at Byron Bay,
	Bark fibres			Bray 1923:3.
Forehead band	Dogs' tails	Worn as ornament by men.	Late 19th c.	Bundock 1898:2
Necklet	Dogs' teeth & coloured beans	Worn around neck by men as ornament.	Late 19th c.	Bundock 1898:2
	Cane cut into bungles. Large piece Nautilus shell ground into an oval & strung on string.			
	Lawyer cane-made by women.		1870-1880	Flick 1934
	Shell-made by women	Worn around neck as ornament		
Head-dress	Parrot feathers	Worn by men for tribal fights.	1870-1880	Flick 1934,
	Feathers,dingo teeth & tails.			Bray 1923:4,
	Cockatoo feathers		Late 19th c.	Bundock 1898:1
Message sticks	Wooden stick	Used for important messages in Lismore area.		Bray 1923:7.

education in hunting and fighting, the development of self control and responsibility, and culminated in a ritual demonstration and test of these facets of tribal life (Sullivan 1964:123-4).

The major initiation ceremony involved the use of a Bora ring. The presence of such sites within the Byron Shire attests to their use in the locality. Due to the secrecy surrounding the use of ceremonial sites information concerning the associated ceremonies is limited (see Bray 1910:9-10). Descriptions mention the inclusion of stones, particularly quartz crystals, or wooden boards, vested with sacred status, in the initiation proceedings. A number of writers also describe the placement of an upturned tree stump in the centre of the bora ring (Gill 1944; Currie 1925; Mathews 1905:30). In association with initiation rites cicatrices (scars) were raised on the chests and backs of the initiates. According to Mathews (1904:258-70), the process of scarification was gradual and was closely connected to the gradual removal of food taboos. There is some information which suggests that, in some areas at least, women as well as men had their own Bora grounds and associated rites (Winterbotham 1983:75).

The presence of mythical beings, inhabiting the territory of the tribe, was an integral feature of traditional Aboriginal culture. Guardianship of the specific natural features of the landscape which related to mythical events, and the myths associated with them, were vested with chosen individuals. Sites varied in their significance and power and in their relationship to mythology. Some myths associated with landscape features explained the origin of aspects of the natural world while others were concerned with heroes or deities from the Dreaming who had been transformed.

Several myths have been recorded which relate to landscape features within the Byron Shire. The first tells of an encounter between Wao, a man from the Woodenbong area, and Nguthungulli "father of the whole world" who lives in a cave in a big rock which stands in the sea "six miles out from Byron Bay" (Julian Rocks ?) (Charlotte Williams in Robinson 1989:88-90). Wao followed two emus, the spirit of his deceased brother Jarring, from the mountains near Woodenbong down to the coast at Byron Bay. On his arrival at the coast Wao was taken by Nguthungulli to his cave and was given a song which he took back to his own people (Charlotte Williams in ibid:91-92).

Another myth tells of the formation of the Julian Rocks which stand in the sea close to Byron Bay. These were formed when two lovers from different tribes ran into the sea to escape their parents' wrath and were drowned, subsequently being transformed

into rocks (Cross 1954). Similarly, the Two Sisters Rocks (Cocked Hat Rocks) off Broken Head are, according to legend, drowned swimmers who were transformed to stone- a young girl became caught in a strong current while swimming. Her sister attempted to save her but both were swept away and became permanently fixed in the sea as rocks (N.P.W.S. file #4-5-56).

A version of the Three Brothers legend, which occurs in various forms in many parts of the N.S.W. north and mid-north coasts was recorded in the Byron Bay district by Livingstone in 1892. The legend, which is published in Steele (1984:46-48), relates the origin of Aboriginal people and of the three Bundjalung dialects which were spoken in the area. It tells of the culture hero Berrung who came with his two brothers and their wives and children in a great canoe, from an island across the sea. These were the first Aboriginal people to arrive in Australia. Berrung created the dialects, showed the others how to make fire and taught them their laws about kippara (the initiation ceremonies), and about marriage and food. "After a time a quarrel arose, and the brothers fought and separated.....This is how the paigal (Aborigines) were separated into tribes" (Livingstone 1892:3 quoted in ibid:48).

An unpublished myth, concerning the formation of the Brunswick River, Mt. Chincogan and Mt. Warning has been handed down orally. It was related by Lois Ansell of Cabbage Tree Island and had been told to her by her great grand-uncle Douglas Cooke (dec.). The myth tells of an old 'clever-man' who took a young wife. The wife, however, was an unwilling partner who persisted after her marriage in her affection for a young warrior. To remove her from temptation the old clever-man took his wife camping into the bush. The young warrior secretly followed the couple for three days and nights. On the fourth day the old clever-man instructed his wife to remain at camp while he obtained food. He returned from hunting, however, only to find that his wife had absconded with the young warrior. The pair were subsequently tracked down by the old clever-man who was furious that a his wife had been stolen. Mustering all his magic powers the old clever-man turned the young warrior into Mt. Chincogan, which means mountain of fertility; and his wife into the Brunswick River so that she would be doomed to be constantly running. He then turned himself into Mount Warning so that he could stand higher than Chincogan, warning people not to venture near.

3.5. EUROPEAN CONTACT

The first sighting of Aborigines in the region was made by Captain Cook on May 15, 1770 in the vicinity of Wooyung, immediately north of the Byron Shire-"we discovered smoke in many places and saw a group of natives" (Cousins 1933:9). Sailing

south, Cook also reported seeing a group of about 20 Aborigines on Seven Mile Beach south of Broken Head. The Aborigines ignored the 'Endeavour' (Prentis 1972:100-101). On October 31, 1823 the first face-to-face contact in the region took place when John Oxley sailed up the Tweed River and encountered 200 Aborigines armed with spears (Uniake 1825:40 in Navin 1989:2).

During the 1820's several Europeans lived with Aborigines at Moreton Bay and on the Richmond River. Three castaways are known to have lived with the Bundjalung up until 1823 (Rich 1990:120). In 1824 the Moreton Bay penal settlement was established and between 1825 and 1830 ten escapees from that settlement reached Port Macquarie. A number of escapees lived with Aborigines. In 1828 Captain Rous recaptured six who were living with Aborigines on the Richmond River (Prentis 1972:107).

Cedar cutters arrived on the Richmond River in 1842, the Tweed River in 1844 and by 1849 were cutting on the Brunswick. By 1845 the coast and lower reaches of both the Richmond and Tweed Rivers had been virtually taken over by the cedar trade (Rich 1990:120-121). Generally, contact was desultory and peaceful, with Aborigines adapting to cedar cutters by including them in their existing social networks (Prentis 1972:127). Aborigines assisted the cedar getters, guiding them to valuable stands of timber in return for rum, tobacco and tomahawks (Longhurst 1980). They became axemen, bullock drivers, rafters and ration carriers, and provided game, fish and honey (Prentis 1972:124).

The cedar-getters were, however, soon followed by the pastoral squatters of the 1840's with whom Aboriginal contact was constant (Daley 1961:6-17). Land clearing, stock running and its associated incursions into tribal territories seriously undermined the natural resources traditionally exploited by Aborigines.

"As the country is all parcelled out among the different tribes.....each having its own well-known boundaries, a tribe which has been driven from its hunting ground by European incursion has no place to retreat to..." (Lang 1847:270-271 quoted in Sullivan 1978:101). As Sullivan (ibid:101) points out, "the inevitable result was an often bloody conflict, reduction of tribal size, and consequent weakening of tribal organisation."

As pastoralists increased in number settlements were established and the shipping trade boomed. The Crown Lands Alienation and Occupation Act of 1861 ('The Robertson Land Act') effected the break-up of squatters' runs into small farms and brought intensive and permanent contact with whites. Inevitably, as tribal lands and resources were lost, Aborigines were forced to settle on stations, accept rations and to gradually abandon their traditional pattern of life. Sacred and ceremonial sites could

no longer be visited and initiations, critical to the maintenance of social control, were often difficult to perform. Early settlers observed and documented the destruction of tribal life: "During my own personal experience with our dark-skinned friends dating from 1869 to 1894, they had become more or less civilized, especially the younger ones, for they spoke fair English, wore clothes, and only went naked when back in the bush, were fairly regularly employed by white settlers, had acquired a liking for the white man's food, and alas, for his vices" (Dawson 1935:26)."The young men too, do not climb or use a boomerang as their fathers did. They work spasmodically on the stations and like riding and work amongst cattle but drink and gambling are their curses.....our tribe is fading away, though we do all we can to save them. I fear another generation will see few, if any, left" (Bundock in McBryde 1978:266). By the end of the 19th century Aboriginal material culture had been severely modified. On the Richmond River, for example, young women no longer made the traditional 'pitchie-pan' water vessels- "Never I been make 'em; always tin can" (ibid:266).

It is likely that Aborigines living away from the main river valleys and their desirable fertile soils were able to maintain their traditional lifestyles for some time. An article in the Sydney Morning Herald, 1874, supports this view, stating that "there is no settled portion of our colony which affords a better field for the study of original bush life than that presented by our northern rivers, for there, although decreasing yearly in numbers as their territories become settled upon by the white pupulation, the blacks preserve their customs and traditions, adhering more closely to true Aboriginal life than tribes in other districts of N.S.W." (quoted in Sabine 1970:1.9). Some religious and social aspects of Aboriginal culture were still maintained. Inter-tribal fights and corroborees, for example, were held at Tyalgum in the 1860's, at Rose Hill in the 1870's (Sullivan 1964:128) and at Tucki Tucki in 1875 (Steele 1984:51). In 1869 the Byron Bay area was still free of permanent settlers- "there was no trace of man save for an occasional timber-getter's camp there. In 1865, ... there was not a single human habitation to be seen at or near the Bay" (Hewitt, quoted in Ryan 1984:14). The first selector did not take up land in the Byron Bay district until 1881. Similarly, first selections were not recorded in the Parishes of Brunswick, Mullumbimby and Billinudgel until 1881, though some settlers are known to have used land in those areas prior to this date (Brokenshire 1988:40). By 1883, however, this situation had changed. Byron Bay (Cavanba) was becoming a focal point in the district for settlers from the hinterland and by 1870 Brunswick Heads was the chief cedar trading centre in N.S.W. (Gordon et. al. 1978).

European diseases severely depleted the Aboriginal population, further undermining their ability to withstand the white invasion. Smallpox killed "a large proportion" of Aborigines on the north coast, and sexually transmitted diseases increased sterility

(Rich 1990:123). During the 1850's epidemics of influenza and measels killed many Aborigines and in 1865 "hundreds" of Aborigines on the Tweed and Richmond Rivers died from dysentry (Piper 1976:40,46). In places it is estimated that up to two thirds of the Aboriginal population was lost to disease (Rich 1990:124).

By 1851 employment of Aborigines had increased. They worked as labourers, shepherds, horsebreakers, guides, bullock drivers and domestic servants and were paid meagre quantities of sugar, tea, meat, flour and tobacco in return. In 1876 the usual payment for carrying mail from the Tweed River to Ballina was "a fig of tobacco or a swig of rum" (Martyn 1923). As fringe dwellers in small camps around the settlements of Murwillumbah, Tweed Heads (Piper 1976:49), Lismore (Murray-Prior 1973:65) and Byron Bay (Cross 1954) Aborigines provided a ready pool of labour for whites (Prentis 1972:266).

In the 1860's and 1870's blankets and rations were distributed to Aborigines and a number of unsupervised reserves were established (Rich 1990:124). From the 1880's up until 1920, 41 reserves and stations were gazetted on the north coast by the Aborigines Protection [and later, Welfare] Board. These include reserves within the Byron Shire area at Mullumbimby (gazetted 1891, revoked 1915) and Byron Bay (gazetted 1908, revoked 1916) (ibid:118). The number of Aborigines in the region who did not live on reserves is unknown but is unlikely to have been substantial.

3.6. ABORIGINAL ARCHAEOLOGICAL SITES

Over 1,000 Aboriginal sites have so far been recorded in the N.S.W. north coast region, with most being concentrated along the coastline and within the valleys of the major river systems (see Fig.7). Sixty one of these sites are located within the Byron Shire (see Appendix 2). It can reasonably be expected that site types recorded on the National Parks and Wildlife Service register for the region will be present within the Shire area. These site types are defined and discussed below:

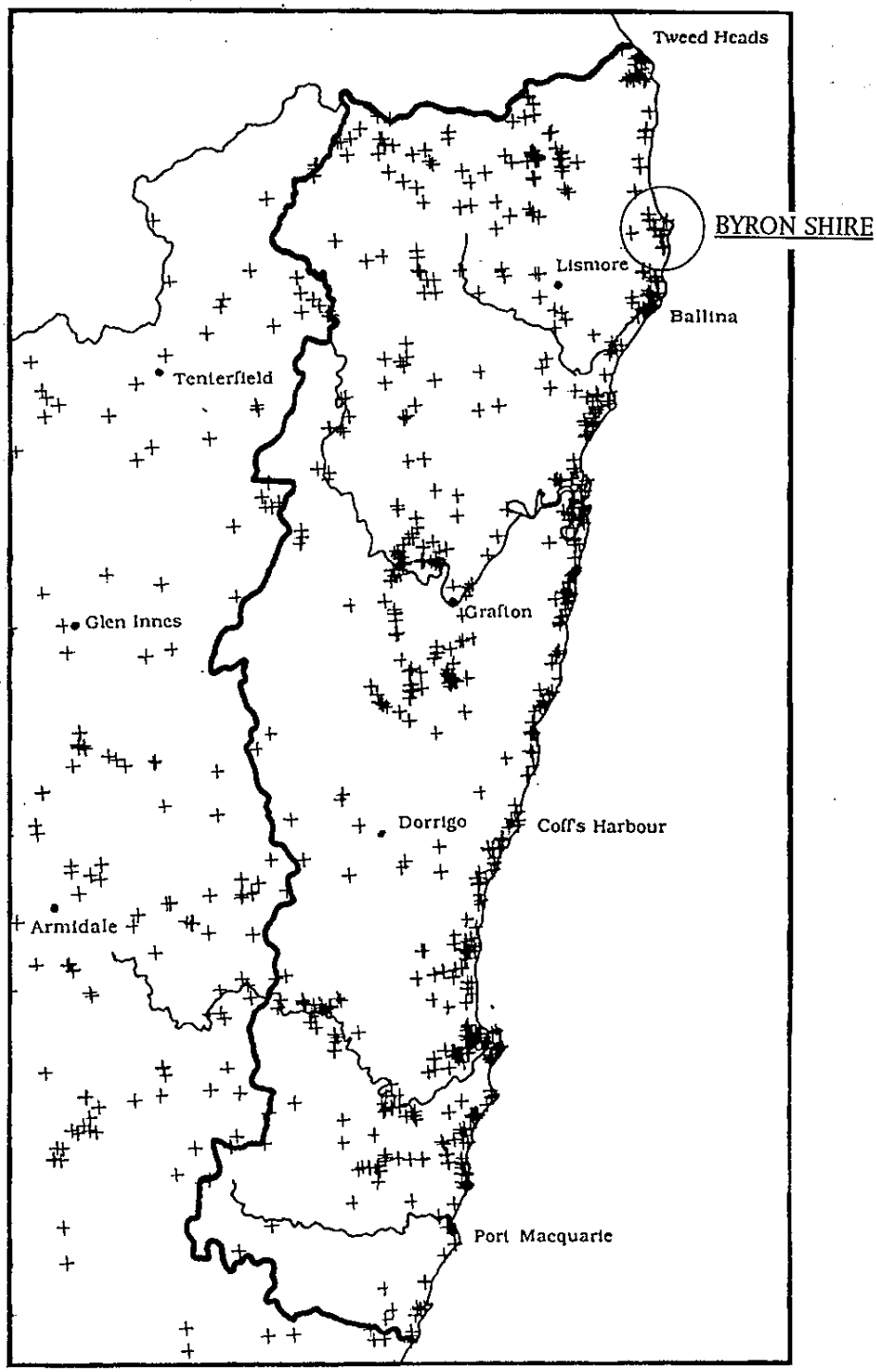
3.6.1. Rockshelters: occupation and art

Shelters provided by natural overhangs and caves were used by Aboriginal people throughout Australia as they are generally dry, relatively flat, and provide protection from the elements. Where shelters of sufficient size exist it is likely that they were, at some stage, inhabited. Because of their confined space and protection from erosion, shelters which were occupied by Aborigines often contain a build up of deposits which may contain food remains, charcoal from campfires, discarded stone artefacts and debris from artefact manufacture. If a shelter has been occupied over a long period of time such remains will be stratified within the deposit. Archaeological excavation of such a deposit can then reveal a chronological sequence of occupation and can identify changes in use of the shelter, changes in resource exploitation strategies and changes in technology. Because of the information which rockshelter deposits can potentially add to scientific research they are regarded as being archaeologically significant.

Although no rockshelters had been recorded within the Byron Shire prior to the present study, have been found to exist in the mountainous area to the north west where volcanic rocks outcrop. Five shelters have been recorded in such outcrops two kilometres west of the Shire boundary at Terania Creek (#4-4-27,#4-4-30, #4-4-31, #4-4-33, #4-4-34). One of these shelters (#4-4-27) is large and contains deep, stratified occupation deposit. Current National Parks and Wildlife Service policy is to record all shelters large enough to have been occupied regardless of whether or not cultural materials are visible at the surface. This practice stems from test excavation programmes which show that archaeological materials are present in a large proportion of shelters which have no remains on the surface (e.g. Attenbrow 1982:74).

FIGURE 7 : Recorded Aboriginal sites of the north coast

(From Byrne 1989: Map 4)



Rockshelters may also contain rock art. On the north coast such art generally consists of small figurative and non-figurative motifs in red ochre and charcoal which have been drawn onto the surface using dry pigment. Engraved sites may also occur,

though only one site, that at Smith's Creek Kyogle (#3-6-18), has been recorded to date in non-sandstone areas of northern N.S.W.

No art sites are recorded for the Byron Shire but again, these may occur in the mountainous area to the north west. One art shelter (#4-1-19) has been recorded two kilometres west of the north west corner of the Shire in the Nullum State Forest and is the only known example of rock art within the Tweed Valley. The drawings are in a poor condition and are said to consist of one human form, lines and several 'track-like' motifs (Piper 1976:125). As rock art is extremely rare in areas north of the Kangaroo Creek sandstone belt all such sites are archaeologically significant.

3.6.2. Open campsites

Open campsites may be loosely described as the archaeological remnants of non-rockshelter occupation. Because these campsites are exposed to weathering the actual occupation deposit rarely survives, leaving only the presence of stone artefacts, stone flaking debris and possibly some bone or charcoal at the surface to indicate past occupation.

Because few rockshelters exist in most coastal regions open campsites are a common site type. They may contain remains discarded as the result of extended camping episodes or may be only itinerant sites which were used overnight or for a short stop during the course of a day's foraging. Generally, those sites which were subject to longer term use contain a wider range of cultural remains, while the smaller 'dinner-time' camps contain evidence for a very limited set of activities. A 'dinner-time' camp may, for example, contain only a small scatter of stone flaking debris which has been left behind when a stone blade or axe has been resharpened, or a few stone artefacts which have been discarded after an animal has been butchered.

Seventy seven open campsites have been recorded in the region (i.e. Tweed 1:250,000 mapsheet) to date, representing 31% of all sites. It is likely that many more such sites are yet to be located and recorded. While little direct information may be gained from many of the smaller sites it is essential that they be recorded to enable their distribution across the landscape to be studied and questions regarding the spatial

range of past Aboriginal movements and landuse patterns to be addressed.

3.6.3. Middens

Middens are open campsites which contain shellfish remains. They are generally found near water and contain predominantly mature specimens of edible shell species. Like open campsites, they may also contain animal bone, stone tools and flaking debris, and charcoal and ash from cooking fires. Along the north coast human burials have also been recorded in direct association with shell midden deposits.

Middens vary considerably in size. Some are thin surface scatters which have constituted little more than a meal for a small group gathering food away from a main camp (Piper 1976:110), while others are well consolidated deposits several metres deep which have been consistently used by large groups of people for hundreds of years (e.g. McBryde 1982; Bailey 1975).

Eighty one middens have been recorded to date on the Tweed Heads 1:250,000 mapsheet, representing 32% of all sites. Although middens are the most common type of occupational evidence it is estimated that up to half of those present on the north coast, including many of those contained on the National Parks and Wildlife Service register, have been destroyed by sandmining (Byrne 1989:10). Remaining in situ midden deposits are now relatively rare and are thus considered to be regionally significant.

3.6.4. Quarry sites

Quarry sites "are typically, the exposures of a geological raw material where evidence for human extraction and/or preliminary processing has survived" (Navin 1989:5). These are usually located at points where siliceous rock types with good flaking properties, or ochre, are exposed and accessible. The 'quarrying' activity consisted of selecting and breaking down stone from its original form into manageable pieces which could subsequently be worked into tools (Byrne 1989:12).

While quarries may contain important material evidence for Aboriginal tool manufacturing technology, they are particularly significant in their ability to provide information concerning exchange networks which operated in prehistory. It is common, for intance, to find artefacts manufactured from several different types of stone at a single site. If exotic stones recovered in an archaeological context can be sourced to a particular locality, or more specifically, to a particular quarried outcrop,

then the extent of mobility of either people themselves, or of material goods, can be gauged.

Two quarries are currently recorded for the region; one (#4-2-37), near Murwillumbah, 25km. north of the Byron Shire boundary; and another at Doon Doon 6km. west of the Shire boundary (#4-4-18). There are also reports of an unrecorded ochre quarry near Cudgen (McBryde 1974:88).

Given that there are large areas of metamorphosed sediments in the northern section of the Byron Shire and some cryptocrystalline volcanics to the west, it is likely that quarrying of rock was undertaken within the area.

3.6.5. Carved and scarred trees

Carved trees were associated with either burials or Bora grounds. On the north coast the bark of a standing tree was carved with linear and geometric designs, including zig-zags, concentric diamonds, spirals and circles (McCarthy 1940; Bell 1980).

The trees, sometimes numbering up to 120 (McCarthy 1940:163), were usually situated around the smaller of the two rings normally found at a Bora ground, and along the track connecting the rings. During initiation ceremonies the myths and significance associated with the designs were revealed to the initiates (Byrne 1989:15).

Carved trees associated with burials are said to have marked the remains of notable tribal members. Generally only one tree was carved, but at times there were as many as four or five (ibid:15).

One carved tree has been recorded on the Tweed 1:250,000 mapsheet (#4-1-8). It is located at Limpinwood on a spur from the McPherson Range 25km. north west of the Byron Shire boundary.

Scarred trees are trees which carry scars caused through the removal of bark or wood for making artefacts such as canoes, shields, shelters and containers. Scars may also result when footholds have been cut to facilitate the collection of aboreal resources. Five such trees have been recorded on the north coast including one at North Ocean Shores within the Byron Shire (#4-2-50).

Both carved and scarred trees can only be detected where mature age trees exist. Today, only very small pockets of original vegetation remain within the Byron Shire in areas outside the State Forests.

3.6.6. Burials

Prehistoric and contact period burials, both as isolated individuals and as groups, are recorded for the north coast. They are generally found as primary interments in soft sediments in middens, campsites and sand dunes, but exposed skeletal remains have also been discovered in rockshelters.

At the time of first white settlement bodies were buried in a tightly contracted crouching position, usually upright, and were often wrapped in bark with their limbs tied (Sullivan 1964:175). While graves were sometimes marked by earth or stone mounds (e.g. #4-1-1), most of those recorded have been found eroding from sand dunes or creek banks, or have been disturbed during sandmining or road construction. Similarly, burials may be located during site survey only if they have been exposed through erosion or when some disturbance to sub-surface sediments has occurred.

Twenty burials have been recorded on the Tweed 1:250,000 mapsheet. Of these, eleven, including four within the Byron Shire (#4-5-34; #4-5-36, #4-5-37; #4-5-39), are located along the coastal strip; while nine burials have been recorded in hinterland localities.

3.6.7. Bora grounds

Bora sites are one of the few site types which stand as material manifestations of the social and ceremonial spheres of Aboriginal life. They figured in a number of complex social, cultural and environmental relationships. Given the nature of their construction, earthen Bora rings are extremely vulnerable to destruction and it is thought that all such sites recorded within the greater region (N.E. N.S.W. & S.E. Qld) most likely date to the recent past (McBryde 1974:53).

The most common type of Bora ground is composed of one or a pair of raised earth circles, ranging in size from two to fourty metres in diameter (Byrne 1989:18). According to early historical sources, Bora grounds with one large and one small circle were in use at the time of first white settlement. The two circles were connected by a pathway, often hundreds of metres long. Typically, one circle was associated with more public ceremonies and the other with restricted sacred rites (Petrie 1904:51).

Because Bora sites continued to be used well into the last century (Steele 1984: 127, 249, 250), there are several accounts of their function. While several early historical

sources describe the use of Bora rings as stages for the settlement of disputes (see Satterthwait & Heather 1987:12-14; Steele 1972), by far the greater number of descriptions concern Boras as initiation places. Initiation served 'the purpose of passing a lad into a certain stage of manhood' (Davis 1861:57 in Satterthwait & Heather 1987:14). There is some information which suggests that, in some areas at least, women as well as men had their own Bora grounds (Winterbotham 1983:75).

Satterthwait and Heather (1987), in a study of determinants of earth circle location in the Moreton Region, south east Queensland, provide information on social and economic factors which may have influenced the distribution and location of such sites. These include the size and duration of ceremonial gatherings, the scheduling and provisioning requirements of gatherings, and the prevalence of sites in the region.

Twenty two Bora sites have been recorded in the region (Tweed 1:250,000 mapsheet). Thirteen of these are found in non-coastal environments. Of the nine recorded coastal sites, four lie within the Byron Shire (#4-2-1, #4-2-5; #4-5-33, #4-5-36), though it appears that all of them have been destroyed. According to local mythology the first Bora ring made by the Three Brothers on their arrival in Australia was located at Brunswick Heads (Steele 1984:7).

3.6.8. Stone arrangements

These sites are defined as any arrangement of placed stones that can reasonably be assigned to Aboriginal activity (Navin 1989:5). Typically, such sites consist of groups of stone cairns or alignments of single or grouped stones.

Although there are no documented accounts of their use, stone arrangemnt sites appear to have been of ceremonial significance. They occur at points of mythological significance and near Bora grounds. It is thought that stone arrangements were constructed in relatively inaccessible places and that this may have been done to maintain secrecy regarding ceremonies with which they were associated (Byrne 1989:16-17).

According to Steele (1984:53) "Stone arrangements abound in the Mount Warning area, but many have been destroyed". He goes on to describe several stone arrangements, all of which have been destroyed. In all, there are only four stone arrangement sites recorded for the Tweed 1:250,000 mapsheet. Investigations by National Parks and Wildlife Service archaeologists have revealed, however, that two of

these sites (#4-5-35 & #4-4-41) are not of Aboriginal origin.

Recorded grid references place the remaining two sites within the Byron Shire. One of these sites, #4-5-32 at Tyagarah, has been destroyed. The arrangement, consisting of two spirals of water-worn stones approximately 2m. in diameter, was located in 1965 when the area was being cleared for sandmining. The stones were salvaged by a bulldozer driver and in 1987 were set in concrete at the entrance to the Mullumbimby 'Heritage Park' in what is said to approximate their original configuration (Ballina 'Echo' 18/4/90 in R.R.H.S. file; pers. obs.). It has been suggested that this arrangement is related to a local myth (Echo 18/4/90).

The second site (#4-4-32), a horseshoe-shaped cairn of granite boulders, is located within a remnant stand of 'Big Scrub' rainforest near Bangalow. Clearly, this site is regionally significant.

3.6.9. Grinding grooves

Repeated resharpening and grinding of cutting edges onto stone implements, particulary axes, leaves deeply incised grooves. The grooves are typically elliptical in shape, around 1-2cm. deep, 5-10cm. wide and between 10 and 30cm. long. They are generally found in clusters close to, or even within, the beds of rivers and creeks on relatively level outcrops of sandstone.

One set of grinding grooves has been recorded (#4-1-16) on a small outcrop of minor sandstone in the Nullum State Forest,10km. west of the Byron Shire boundary and is the only site of this type yet located in the region. Given that the presence of grinding grooves is dependent upon the presence of sandstone, the paucity of such sites in a region dominated by volcanic rocks is not surprising.

3.6.10. Natural mythological sites

These sites differ from other types of sites in that they are natural features of the landscape which have not been modified by Aboriginal people (Byrne 1989:19). On the north coast such sites include mountains, waterfalls, lakes, rocks and coastal headlands which are connected to myths describing events from the Dreaming (e.g. see Section 3.4). Usually these sites are of spiritual significance to living Aborigines and as such are an integral part of Aboriginal culture.

Natural mythological sites are not located through the normal process of site survey but rather, with the help of Aboriginal informants. There are currently sixteen natural mythological sites recorded for the Tweed 1:250,000 mapsheet, with four being located within the Byron Shire. All of these sites, the Two Sisters Rocks (#4-5-56), Taylors Lakes (#4-5-76), Kings Beach (#4-5-77) and Whites Beach Caves (#4-5-78) are located near Broken Head in the south eastern portion of the Shire. All of these sites are currently known and valued by local Aborigines.

4: ARCHAEOLOGICAL RESOURCE ASSESSMENT

For the purposes of this study the Shire has been divided into five broad environmental zones which are largely based on landform characteristics. Because geological, soil and vegetation patterns (and thus, the structure of prehistoric resources) closely correspond with the character of these landforms, it is likely that each zone will have been used differently by Aboriginal people. If this is the case it is reasonable to expect that each environmental zone will have its own characteristc distribution pattern of archaeological sites and its own suite of typical site types, though obviously, interrelationships will occur, particularly at zone junctions.

Similarly, European landuse has varied in each of the five identified zones. It can therefore be expected that the degree of preservation of the archaeological record will differ in each zone, as will the potential for existing sites to be discovered during survey.

Apart from straight-forward archaeological criteria, site location and condition is determined, to a large degree, by destructive elements such as European landuse and erosion; while the discovery of existing sites during survey is directly dependant upon surface visibility. Where surface vegetation cover exists, for example, artefacts are usually only detectable on erosion surfaces where bare earth is exposed.

Figure 8 overleaf shows the environmental zone divisions used in this study. The archaeological context and distribution of recorded sites has been discussed for each of these zones and separate predictive landuse/site location models constructed. Management recommendations are then detailed for each zone.

Environmental zone divisions are as follows:

Zone 1: Coastline

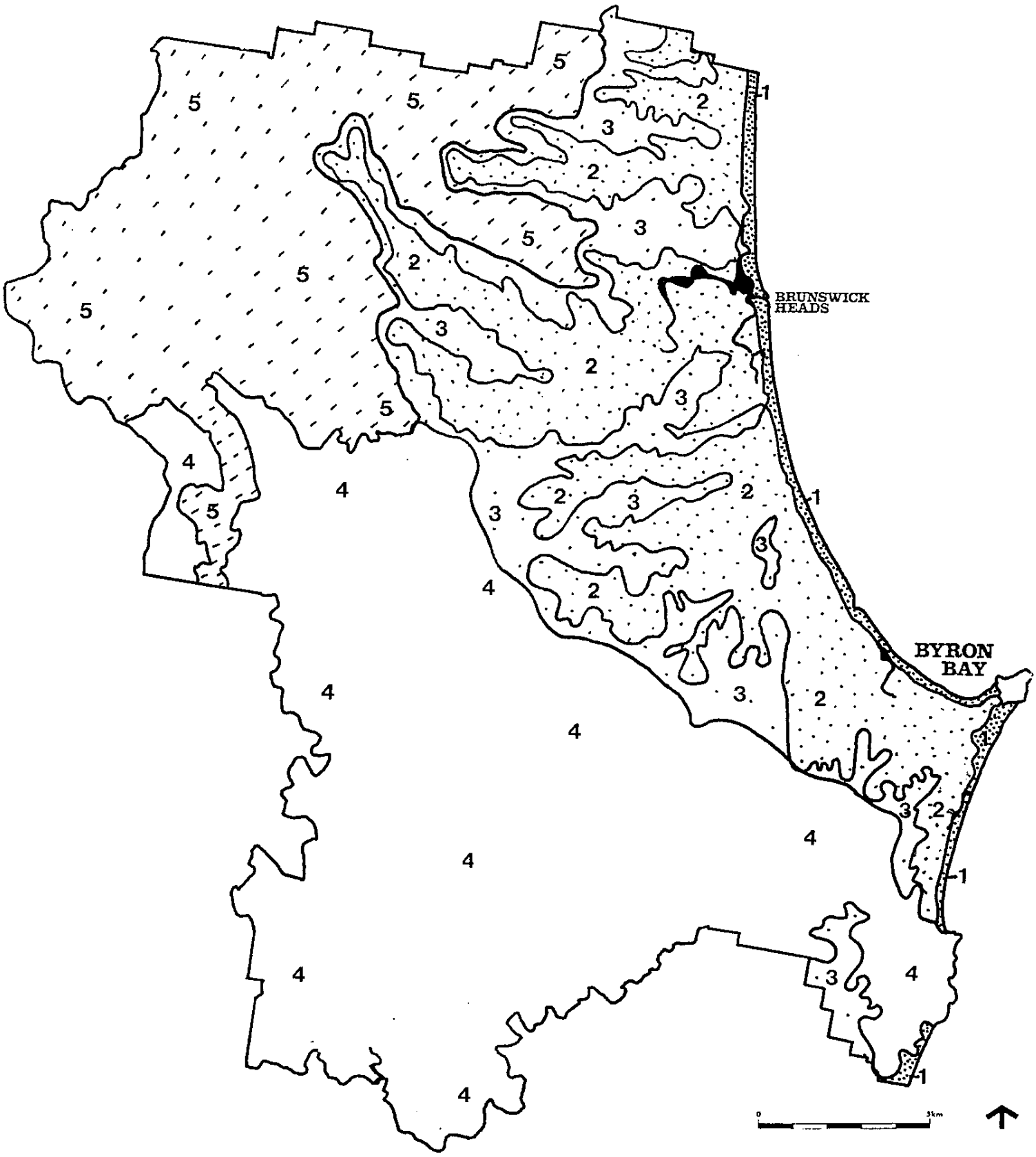
Zone 2: Coastal lowland

Zone 3: Coastal ridges

Zone 4: Undulating volcanic plateau

Zone 5: Mountain ridges and valleys

FIGURE 8 : Environmental zone divisions of the Shire



Key:

1	Coastline	4	Undulating volcanic plateau
2	Coastal lowland	5	Mountain ridges and valleys

4.1. COASTLINE ZONE

4.1.1. Definition

This zone comprises the immediate coastal strip and the Holocene outer barrier dune sands (Fig. 9). It is generally around 200m. in width, though is up to 600m. wide at Tallow Beach immediately south of Cape Byron. The zone includes 32km. of open sandy shore and four small sandy embayments of less than a kilometre each (Wategos Beach, Kings Beach, Brays Beach & Whites Beach) stretched between rocky headlands. The Shire's six headlands and their associated rock platforms are composed of the Devonian sediments of the Neranleigh-Fernvale beds (greywacke, slate, phyllite & quartzite) which are, in places, metamorphosed.

The landform is low-lying, with beaches backed by an eroded dune scarp with elevations of between two and six metres above sea level behind which extensive wetland areas are common. In several localities, both north and south of Cape Byron, creeks running parallel to the coastline (Tallow Creek, Belongil Creek, Simpsons Creek & Marshalls Creek) separate the immediate coastline zone from the coastal lowlands.

The coastline zone supports salt resistant vegetational communities including spinifex and pigface, while some heath communities occur, in places, along its western margin. Mangrove communities also occur within the zone at the mouth of the Brunswick River and along its tributaries of Marshalls and Simpsons Creeks, and along the lower reaches of Belongil Creek near Byron Bay.

4.1.2. The prehistoric environment

The present vegetation of this zone has, with a few exceptions, undergone little change since European settlement. Most of the alterations to the original environment are the outcome of sandmining. These include changes in dune vegetation with the introduction of Bitou Bush (*Chrysanthemoides monilifera*), and changes in dune topography. Erection of break walls at the mouth of the Brunswick River has effected changes in coastline morphology in that locality.

4.1.3. Aboriginal food resources

The coastline zone would have offered a wide array of estuarine and sea foods for its prehistoric inhabitants, including marine fish and shellfish and littoral plant foods.

Inter-tidal mudflats, like those present in this zone at the mouth of the Brunswick and its tributaries (Simpsons & Marshalls Creeks), are rich resource areas, providing refuge and breeding habitat for birds, flying foxes, reptiles, crustacea, molluscs, worms and fish. The Grey Mangrove (*Avicennia marina*), which also grows here, provides edible fruit during summer (Lear & Turner 1977:30). These fruits are around 3cm. in diameter and are said to have been an important part of the diet of some coastal Aborigines in the north (Cribb & Cribb 1974:81).

Below are listed species recorded as having been eaten by Aborigines in the region. These are likely to represent but a few of those which were actually exploited in this zone.

Fish:	Blackfish (*Girella tricuspidata*)	(McBryde 1982:32)
	Sea mullet (*Mugil dobula*)	(Ainsworth n.d.)
	Groper (*Cossyphus gouldii*)	(McBryde 1982:32)
	Jewfish (*Scioena antarcticus*)	
	Kingfish (*Regificola grandis*)	
	Leatherjacket (*Alteridae sp.*)	
	Bullseye (*Priancanthus macrocanthus*)	(ibid)
	Salmon (*Arripis trutta*)	(Ainsworth n.d.)
	Snapper (*Pagrus unicolor; Chrysophys guttulatus*)	
	Stingray (*Trygonoptera testacea*)	(McBryde 1982:32)
Crustaceans :	Lobster	(ibid)
	Crab	(Bundock 1898:4)
Shellfish:	Oyster (*Saccostrea cucullata*)	(Ainsworth n.d.)
	Mussel (*Mytilus planulatus*)	(ibid)
	Cockle (*Anadara trapezia*)	(McBryde 1982:32)
Food plants:	Pandanus palm fruit (*Pandanus pedunculatus*)	(ibid)
	Grey mangrove fruit (*Avicennia marina*)	(Baker 1915:266)

4.1.4. Archaeological context

The earliest human occupation of Australia dates back to 50,000 years B.P. (Before Present) at Malakunanja II, a rockshelter in the Arnhem Land escarpment (Roberts et.al. 1990; but see Hiscock 1990:122-124). At this time sea level stood 30-60km. off the present N.S.W. coastline and thus, it is likely that evidence for the earliest use the region was drowned by trangressing seas. A sea level rise of up to 170m. began around

17,000 years ago, with stabilisation near present levels around 6,500-6,000 years ago (Neal & Stock 1986:619). Sites in the coastal zone of the Byron Shire are therefore unlikely to be older than c.6,000 years as outer barrier dunes constituting the zone were formed only after stabilisation of the present sea level.

The relative stability of sea levels over the past 6,000 years allowed extensive estuarine and mangrove areas of concentrated biological productivity to develop in areas such as those found at the mouths of the Richmond, Tweed and Brunswick Rivers. The development of such areas along the east coast of Australia significantly increased the marine resource base available to Aboriginal people and it is thought that this abundance of resources triggered an accelerating population increase in the region, especially after 4,000 B.P.(Morwood 1987:343). This population increase is evident in the archaeological record through increases in the rate of site formation (Attenbrow 1982; Morwood 1984; Ross 1985), increases in the occupational intensity of sites (Morwood 1984, 1987) and more intensive resource exploitation (use of new habitats, resource types, extractive technologies and management strategies (Beaton 1982; Hall 1982; Lourandos 1983, 1985; Morwood 1987)).

Evidence suggests that on the north coast at least, demographic and social changes continued until relatively recently. Linguistic changes have occurred within the past 2,000 years (Crowley 1978; Sharpe 1978) and some artefact types including the elouera (a form of backed blade) and ground-edge axes and knives were incorportated into the tool kit after c.2,300 years ago (McCarthy 1976:96-98). Evidence from coastal midden sites excavated in northern N.S.W. indicates, too, that open shore shell fish gathering practises may be relatively recent.

Several excavations of stratified middens in the vicinity of local estuaries show estuarine shellfish exploitation to be of greater antiquity than the exploitation of open shore species. Those most applicable to the Byron Shire include an excavation of the oyster deposit at Chickiba Creek, Ballina which dated to 1,720 years B.P. (Bailey 1975) and that at Terranora on the Tweed dated to 605 years B.P. (Barz 1980;1982). The Terranora midden showed an apparent change from a diet based predominantly on fish, to one involving a greater use of shellfish over time (Barz 1980). More recently, an estuarine midden site excavated at Hope Island on the bank of the Coomera River, Gold Coast, dated to at least 4,200 years ago when the shoreline was a little further inland than it is now (Walters et. al. 1987). This midden demonstrated a change in frequency of use of various shell species through time. From the period of first use of the midden up until c. 2,600 years B.P. the deposit was dominated by oyster, but cockles, whelks and some mussel shells were also present. After this time the percentage of oyster shells increased so that the deposit consisted almost solely of

them (ibid:88-89).

Beach middens excavated at Evans Head and at South Ballina, on the other hand, have been dated to only 350 and 260 years B.P. respectively, while pipi lenses at Jerusalem Creek near Evans Head have been dated to c. 200 years B.P. (McBryde 1982:77).

4.1.5. Site types in the Coastline Zone

4.1.5.i. Middens

To date 80 midden sites have been recorded between South Ballina and the Queensland border and are the dominant site type in coastal areas. They vary from shallow lenses of shell and occupation debris in the beach dunes and the remnants of once substantial accumulations exposed in wind-eroded hollows, to deep stratified deposits. The deeper, more extensive deposits are generally found close to estuaries, particularly those of the Tweed, Richmond, Clarence and Macleay Rivers.

Typically, open beach middens in the region consist almost entirely of pipi (*Donax deltoides*), while rock oyster shells (*Saccostrea cucullata*) form the greater part of the estuarine middens. M. Sullivan (1982), in her overview of middens in coastal N.S.W., found that on the north coast rock platform species are a major component in only 20% of middens, while estuarine species dominate in over 40% of middens. She found that, while north coast pipi middens can be extensive, they are "almost invariably a single shell horizon sitting on a stable but not very old dune surface, and now covered by very recent windblown sand" (ibid:124) and are likely to represent only the remains of shellfish processing and the preparation of meals (ibid:111). Pipi middens, while recorded in considerable numbers, are not thought to have contributed significantly to the Aboriginal diet. Most of these sites may be interpreted as representing single-use 'dinner-time' camps.

4.1.5.ii. Open campsites

Sites which contain stone artefacts and are devoid of shell debris are termed open campsites. There are very few such sites along the immediate coastline, with shellfish remains being present in most sites.

4.1.5.iii. Stone resource sites

The coastline zone offers a readily available range of stone types in the form of beach pebbles which are known to have been utilised by Aboriginal people to manufacture both finely flaked tools and unifacially flaked pebble implements (e.g. Rogers 1976; 1977; 1978). The high frequency of pebble cortex remaining on discarded cores and tools, and the general lack of stone curation strategies in flaking techniques suggests that pebbles were obtained casually from the beaches as the need arose.

In some areas where pebbles of superior flaking quality occurred, however, specialised and concentrated exploitation of pebble beds was undertaken. At Schnapper Point, a rocky headland south of the Evans River, for example, pebbles of quartz, quartzite, sandstone and chacedony were intensively exploited. In all, 2,164 artefacts were recorded in association with a natural pebble bed exposed beneath an eroding dune. Artefacts present at the site included ground-edge artefacts, uniface pebble tools, scapers, bipolar pieces, elouera, burins, flakes, cores, grinding stones, anvil stones, hammerstones, modified pebbles and flaking debris (McBryde 1982:61).

4.1.6. Archaeological surveys in the Byron Shire

The first systematic investigation in the Byron Shire was undertaken by Starling (1971,1974), who concentrated her work in the coastline zone, targetting areas likely to be further impacted by sandmining. Although the SIM Committee (1968) found that the greater part of this coastline had already been mined for mineral sands, effectively destroying most archaeological sites, Starling succeeded in recording over four kilometres of discontinuous shell middens, some containing Aboriginal skeletal remains, along foredunes north of the Cape (#4-5-37). Some of these middens have been subsequently re-recorded and entered onto the Site Register (#4-4-42, #4-4-43, #4-5-24,#4-5-61, Collins present investigation). In 1968, when investigating sites for the SIM Committee, Starling had also recorded discontinuous midden (#4-5-35) and a burial site in the vicinity of Tallow Beach (Starling 1971).

In 1986 Byrne surveyed a one square km. beach-frontage block (the proposed C.A.E. campus) on the southern side of Broken Head. He located thin lenses of pipi shell containing three stone artefacts and a small grinding stone eroding from the foredune beach cliff at nine points along c.1.4km. of coastline. None of these sites were listed on the Sites Register.

In 1982 Barz undertook a survey at North Ocean Shores and located 14 small exposed

pipi lenses behind the foredunes of Crabbes Creek Beach (Barz 1982:1). These sites were not entered onto the site register. The North Oceran Shores development area (900ha.), the majority of which falls within north eastern extremity of the Byron Shire, was subsequently resurveyed by Navin (1989). The survey included 1.75 km. of the coastline zone where four midden sites were recorded (#4-2-40, #4-2-43, #4-2-44, #4-2-48). These were small midden scatters, predominantly containing pipi shell, located along and behind foredunes. One of the middens (#4-2-44) contained fractured beach pebbles (Navin 1989:17).

Collins (1990) undertook a survey of a 1,000 ha. area at Broken Head which included the northern section of Seven Mile Beach (2km.), one km. of coastline between Broken Head and Suffolk Park, and the three small beaches (Kings Beach, Brays Beach & Whites Beach) contained between rocky headlands from Broken Head south to Jews Point. Six middens, one open campsite and three natural mythological sites were recorded during this survey. Three of the sites were small pipi lenses eroding from foredunes along the northern section of Seven Mile Beach (probably some of those located by Byrne 1986)(#4-5-89, #4-5-90, #4-5-91). The remaining three midden sites (#4-5-85,#4-5-86, #4-5-88) were located close to rock platforms and contain both open shore species (pipi) and rock platform species (cartrut [*Thais orbita*] and periwinkle [*Nerita atramentosa*]). Flaked beach pebbles are present at two of these sites and form the assemblage present at the open campsite recorded near a perennial waterway on Brays Beach (#4-5-87). The three natural mythological sites recorded during this survey, Taylors Lakes (#4-5-76), Kings Beach (#4-5-77), and Whites Beach Caves (#4-5-78), were all found to be of both traditional and contemporary importance to local Aboriginal people.

Limited surveys of coastline foredunes were undertaken during the present study. These included the stretch between Byron Bay and Belongil Creek mouth, where midden sites had been reported. None of the recorded sites were located and it is likely that they have been eroded by storm waves. A high (4-5m.) seaward sand cliff is present along the length of this beach. A scatter of flaked stone artefacts with a small amount of associated fractured pipi shell was, however, recorded east of Border St. Foredunes south of Cape Byron and south of Brunswick Heads were also surveyed but no sites were located. It is likely that any sites which originally existed in these localities have been destroyed by sandmining.

4.1.7. Impacts on the archaeological resource of the Coastline Zone

4.1.7.i. Erosion

The natural cycle of formation, progradation and movement of barrier dune systems along the coastline seriously affects the survival and integrity of archaeological sites within them. Blowouts features, which often occur in foredunes where sufficient vegetation cover is absent, cause midden and artefactual material to deflate, forming lags on new and lower sand levels. This surface may be subsequently re-covered by windblown sands, destroying the stratigraphic integrity of sites and creating a situation where a combination of in situ and reworked/disturbed material is present throughout the various levels of the sand profile (Byrne 1986:25).

The disturbance, degradation and redeposition of artefactual material contained in and on foredunes may also be effected by storm waves. The stratigraphic integrity of in situ sites is often destroyed, along with any excavation potential. Storm waves may also strip foredunes of stabilising vegetation cover, hastening progradation of dune profiles and further threatening archaeological sites. Throughout the 1970's, foredunes north from Byron Bay to the Shire Boundary were eroding at an average rate of around half a metre per year. The only exception to this pattern occurs along a 2km. strip immediately south of Brunswick Heads were sand is accreting at a rate of up to three metres per year (Gordon et. al. 1978). Along most sections of the coastline wave action has created sand cliffs several metres high along the seaward face of the foredunes. Midden sites recorded along Seven Mile Beach, for example, have been identified as layers stratified within exposed faces of wave-eroded sand beach cliffs. It appears too, that the majority of the midden sites recorded by Starling (1974) along Clarkes Beach were once stratified within sand cliffs, but that most have been destroyed as the cliffs were eaten away by successive episodes of storm wave activity. Given an erosion rate of around 5m. per decade, it is likely that many such sites will have been lost to erosion.

In 1960 and again during the early 1970's severe storm wave erosion occurred along the entire stretch of coastline north of Brunswick Heads. Immediately north of the Heads the sea broke through into Marshalls Creek and in 1976 a foredune was constructed along the coast between the Heads and New Brighton (Gordon et. al. 1978:26).

4.1.7.ii. Sandmining

In the Byron Shire sandmining has played a major part in changing the morphology of foredune systems and thus, has had a major impact on the distribution of archaeological sites in the Coastline Zone.

The Department of Mineral Resources has maintained maps showing sandmined areas only since the early 1970's. Zircon Rutile Ltd., however, commenced operations in the Byron Bay area in 1935 (Northern Star 25/4/35), operating well into the 1960's, and applications for zircon and rutile mining leases were lodged for areas between Brunswick Heads and Tallow Beach as early as 1927 (Gordon et. al. 1978:20). Initial recovery methods involved the shovelling off of the overburden by hand or horse-drawn scoop, and the manual loading onto drays (M.McSwan pers.comm.). Such methods were gradually replaced by bulldozers, draglines and overhead loaders until the advent of dredging operations. The Byron Bay plant opened up large deposits of mineral sands on a commercial basis and leases included the coastal stretch both immediately north and immediately south of Broken Head. Seams along the frontal dunes at Seven Mile Beach were worked during the 1950's and again, and as better recovery methods were developed, during the 1960's. Mines department records show that extensive sandmining was carried out by Cudgen R.Z. & Associated Minerals Consolidated from Byron Bay north to Hastings Point during 1962 and 1963 (Gordon et. al 1978:23). According to one informant, some foredune areas north of Brunswick Heads have been mined at least seven times (C. Staff pers. comm.).

Extraction methods implemented during the 1960's involved the use of a dredge, floating in its own artificial lake, which advanced along the foredune, redepositing sand behind it. Sandmined areas were subsequently revegetated, though often with species exotic to the area.

Given that sandmining was undertaken within the Coastline Zone of the Byron Shire over a period spanning at fifty years, with some foredune stretches being mined repeatedly, it is clear that a great many archaeological sites will have been destroyed and that those which now survive represent only a small proportion of those which were originally present. Figure 10 shows areas known to have been sandmined. They represent over two thirds of the Shire's Coastline Zone and it is possible that additional areas were mined prior to the 1960's.

4.1.8. Trends in site location

Although few areas of N.S.W. were systematically surveyed for sites prior to the advent of sandmining, some trends in site location have been isolated from the 800 campsites (including middens) recorded with the N.S.W. National Parks and Wildlife Service (Sullivan 1980:143-146).

Location of campsites appears to have been primarily determined by the availability of water. 77% of all shell middens on record are within 100m. of drinking water and 95% are within 500m. Site aspects also reflect a tendency to shelter from wind. With cold winds on the northern N.S.W. coast blowing from the south or south east, 89% of campsites lie between west and north east of potential shelter. 70% of these are behind headlands and 30% are behind sand accumulations. Campsites show a marked preference for being established on sand or other soft sediments which supported vegetation, though destabilised dunes were also used (Coutts 1966:341).

Most of the sites which have been recorded in the Byron Shire's Coastline Zone consist of small surface scatters or thin stratified lenses of shell exposed along the seaward side of foredune beach cliffs or immediately behind the foredunes. Middens containing significant numbers of stone artefacts are located in areas where resources other than those from the immediate coastline could be exploited (e.g. Kings & Brays Beaches on the margin of littoral rainforest). While all of the recorded sites are well within 500m. of potential water sources, smaller middens appear to have been located on top or toward the front of foredunes in exposed situations. Given their size and degree of exposure, it is likely that these sites represent the remnants of 'dinner time' camps where shellfish were gathered and immediately eaten, either while in transit along the most easily traversed coastal unit, or while other marine resources were procured to be taken back to base camps located around the margins of swamps or along the estuarine reaches of creeks further inland. All of these small exposed middens contain exclusively pipi shell.

Those middens which contain rock platform and/or estuarine shellfish (cartrut, periwinkle or oyster) are located either behind the foredune or, in the case of the Broken Head sites, within the margin of littoral rainforest close to rock platforms. Such areas offer shelter from prevailing weather conditions and while their size does not suggest 'base camp' use, they are generally larger and contain a wider range of archaeological material than the more exposed sites. It is likely that such areas represent favoured intermittent campsite locations which were used by small groups systematically exploiting resources in the locality.

4.1.9. Aboriginal landuse model for the Coastline Zone

Recent work on coastal and island adaptations in South East Queensland has added confirmation to models proposing semi-sedentary occupation of the coastal margins (e.g. Coleman 1982; Lampert 1971) by yielding evidence for marine orientated populations which had little need at any time of year to move far from the coastal strip in search of resources (Lilley 1984:8; Hall 1982:87).

In line with Coleman's (1982) model, that large semi-permanent base camps would have been located at intervals along the coast in the most resource-rich areas, it follows that most activity within the Coastline Zone would have been concentrated along routes connecting base camps. It is likely that the beachline would have provided easiest transit routes, while lightly vegetated foredunes would have provided ideal conditions close to fresh water sources for itinerant 'dinner time' camps, used as the need arose, for groups ranging from base camps on foraging expeditions, or for groups travelling between base camps. Other campsites close to ecotonal zones, including beaches bordered by littoral rainforest and foredunes backed by swamps, were most likely used as specialised sites where specific resources were exploited as part of the seasonal round by small dispersed groups. Such sites are likely to contain evidence of associated foraging strategies and a wider range of archaeological materials than the smaller 'dinner time' camps.

4.1.10. Predictive model for archaeological sites

Past surveys involving total coverage of stretches of coastline in the Cooloola region of Queensland (McNiven 1985, 1990) and near Brooms Head south of the Clarence River (Rowland 1977) have produced average site densities in the order of 2 sites per 1 km. (Byrne 1986:27). In the Byron Shire, where only 6km. of coastline has been systematically surveyed, site density is in the order of 1 site per 1 km. Given, however, that large stretches of this coastline have not been surveyed, and that the bulk of the Zone has been sandmined several times, it is likely that original site densities would have at least matched, if not surpassed, those recorded elsewhere. Such an assertion is reinforced by the fact that maps contained in the Sim Report (1968) show continuous midden deposits stretching from the mouth of Tallow Creek north to Cape Byron (ibid:231) and that over 4km. of discontinuous shell middens were once located along foredunes north of Cape Byron (Starling 1971).

Clearly, the Byron Shire Coastline Zone was subject to relatively intensive use during

prehistory. Although the only unsurveyed portion of the coastline which does not appear to have been sandmined (Cape Byron north to Black Rock) is prone to wave erosion, it is likely that further midden sites exist there. One such site, a small midden with an associated scatter of flaked stone artefacts, was recorded near Byron Bay during the present investigation. While sandmining is likely to have destroyed the bulk of sites elsewhere, it is possible that some may have survived either intact or as material redeposited when the overburden was removed prior to the initiation of mineral extraction.

It is likely that undiscovered midden sites will be located along the seaward face of foredunes and may be detected either as small stratified lenses of shell within the upper units of sand cliffs, or as material deflating down the face of such cliffs. It is further likely that larger surface scatters of midden shell will be located behind foredunes along the western margin of the Coastline Zone and that these will be found close to small creeks, soaks or backdune swamps. Such middens are likely to contain stone flaking debris and possibly artefacts and non-molluscan faunal remains.

Based on evidence from recorded sites, it is predicted that middens located along the open beaches will be composed almost entirely of pipi valves (fragmented or whole), while those close to rock platforms will be dominated by rock platform species (most commonly cartrut). The rock platform species component of middens will gradually decrease with distance from their source.

It is also likely that Aboriginal burials, either single or as groups, presently lie undetected beneath foredunes. While the location of such sites cannot be predicted, the majority of burials found along the coastline occur in association with either middens or open campsites. Burials have been discovered within the Shire eroding from foredunes (e.g. #4-5-37) or have been uncovered during sandmining (R.Maslen pers. comm.). Development activities involving the excavation or remodelling of dunes have a significant potential for exposing or destroying burial sites.

4.1.11. Management recommendations

Archaeological resource management in the Coastline Zone is focussed on the management of middens and of foredunes which are likely to contain Aboriginal burials. The foredune strip is inherently unstable. Wave erosion will periodically occur and sites will continue to be either redeposited or completely destroyed. Sites will, however, be further prograded by human disturbance. Past sandmining activities, for example, have clearly destroyed a large number of sites which might otherwise have survived.

The most immediate concern for protection of foredune sites is disturbance to the stabilising vegetation cover. Unnecessary destruction and disturbance of foredune sites may be avoided by programmes of dunal revegetation, by limiting vehicular access to beaches and by providing pedestrian walkways to beaches. Sites along the northern section of Seven Mile Beach and along the unmined section of Clarke's Beach are particularly threatened by pedestrian traffic. It is recommended that chained plank walkways be constructed to provide pedestrian beach access at the end of Jews Point Road and at a point along Border St. Byron Bay in an effort to prevent degradation of recorded midden sites in these localities.

Sites identified within the proposed North Ocean Shores development area should be dealt with according to specific recommendations contained in the archaeological report for that area (Navin 1989). In particular Site 9 (#4-2-48), an in situ pipi midden, should be conserved and stabilised (ibid:24).

A pipi midden at Palm Valley near Wategos Gap (#4-5-61) appears to be quite extensive and it is recommended that no further development occur in the site vicinity. At present a barbecue and two picnic tables are present on the site.

Because it is likely that those sites recorded within the Coastline Zone already represent but a small sample of those originally present, it is recommended that complete conservation of the archaeological resource be effected wherever possible. All designated developments which will affect this Zone should be preceded by archaeological surveys and developers should be required to retain all undisturbed sites located and implement appropriate management procedures (e.g. the revegetation and stabilisation of exposed sites).

All non-designated developments should be preceded by liason with the National Parks and Wildlife Service and field assessment.

4.1.12. Coastline Zone : Site list

Site No.	Site name	Situation	Shellfish species	Stone artefacts	Preservation status
North Ocean Shores					
Middens:					
4-2-44 Navin	N.O.S.5	Behind foredune	Pipi/oyster	4 fract.pebbles	Disturbed/redeposited
4-2-48 Navin	N.O.S.9	Behind foredune	Pipi		In situ/part disturbed
4-2-40 Navin	N.O.S.1	Behind foredune	Pipi,oyster, cartrut		Disturbed by track
4-2-43 Navin	N.O.S.4	Foredune	Pipi		Disturbed by track
Byron Bay					
Middens:					
4-5-24 Stockton	Byron Bay 1	Foredune	Pipi		Destroyed storm waves?
Not yet listed Collins		Foredune cliff	Pipi	10 flakes & flaked pieces	Disturbed/deflated
4-4-42 Cawthorn	Byron Bay Beach	Foredune cliff	Pipi		Not relocated
4-4-43 Cawthorn	Byron Bay Beach	Foredune cliff	Pipi		Not relocated
4-5-85 Collins	B.H.12	Foredune sth. rocky headland	Cartrut/pipi		Part eroded/redeposited
4-5-86 Collins	B.H.13	Foredune cliff b/n rocky headlands	Pipi/cartrut	4 flaked beach pebbles	Partly eroded
4-5-88 Collins	B.H.15	Foredune cliff nth rocky headland	Pipi/cartrut	21 beach pebble flakes	Disturbed/redeposited
4-5-89 Collins	B.H.16	Foredune	Pipi		Disturbed by track
4-5-90 Collins	B.H.17	Foredune cliff	Pipi		Partly eroded
4-5-91 Collins	B.H.18	Foredune cliff	Pipi/cartrut		Partly eroded

Open campsites:

4-5-37 Starling	Cape Byron	Foredune ?	Pipi		Destroyed? (Clarkes Beach Byron Bay)
4-5-61 Gonda	Palm Valley	Beside beach/ littoral rf.	Pipi	No information	Disturbed by drain
4-5-87 Collins	B.H.14	Beside beach/ littoral rf.	Periwinkle/ cartrut/pipi	63 flaked beach pebble pieces	Surface/in situ

Burials:

4-5-37 Starling	Cape Byron	Foredune? With open camp.	Pipi		Destroyed? (Clarkes Beach Byron Bay)

Natural mythological sites:

4-5-56 Morris	Two sisters rocks			Ocean off Broken Head	
4-5-76 Collins	Taylors Lakes			Disturbed by sandmining	
4-5-77 Collins	Kings Beach			Broken Head Nature Reserve	
4-5-78 Collins	Whites Beach	caves increase site		Crown land (beach)	

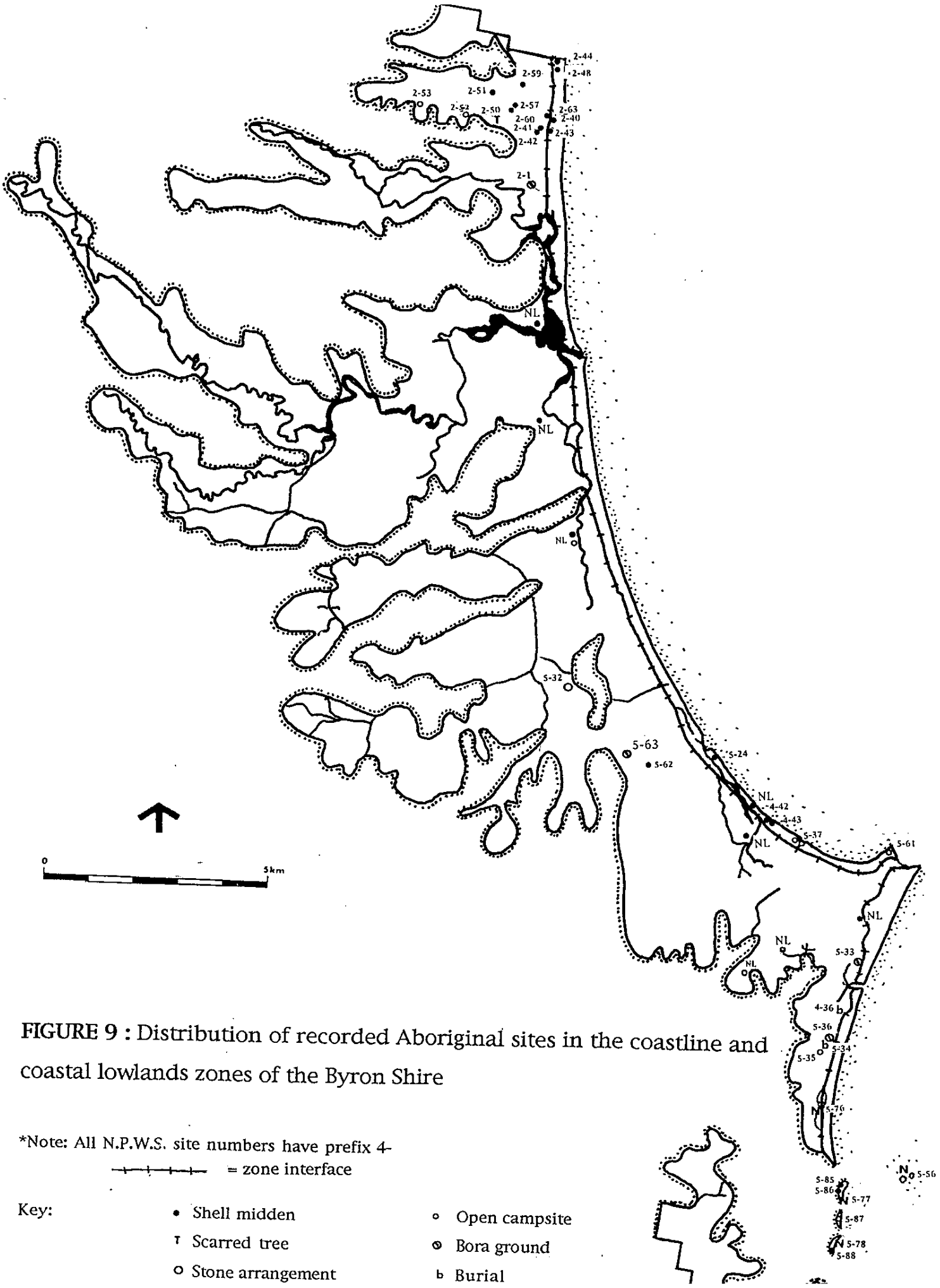


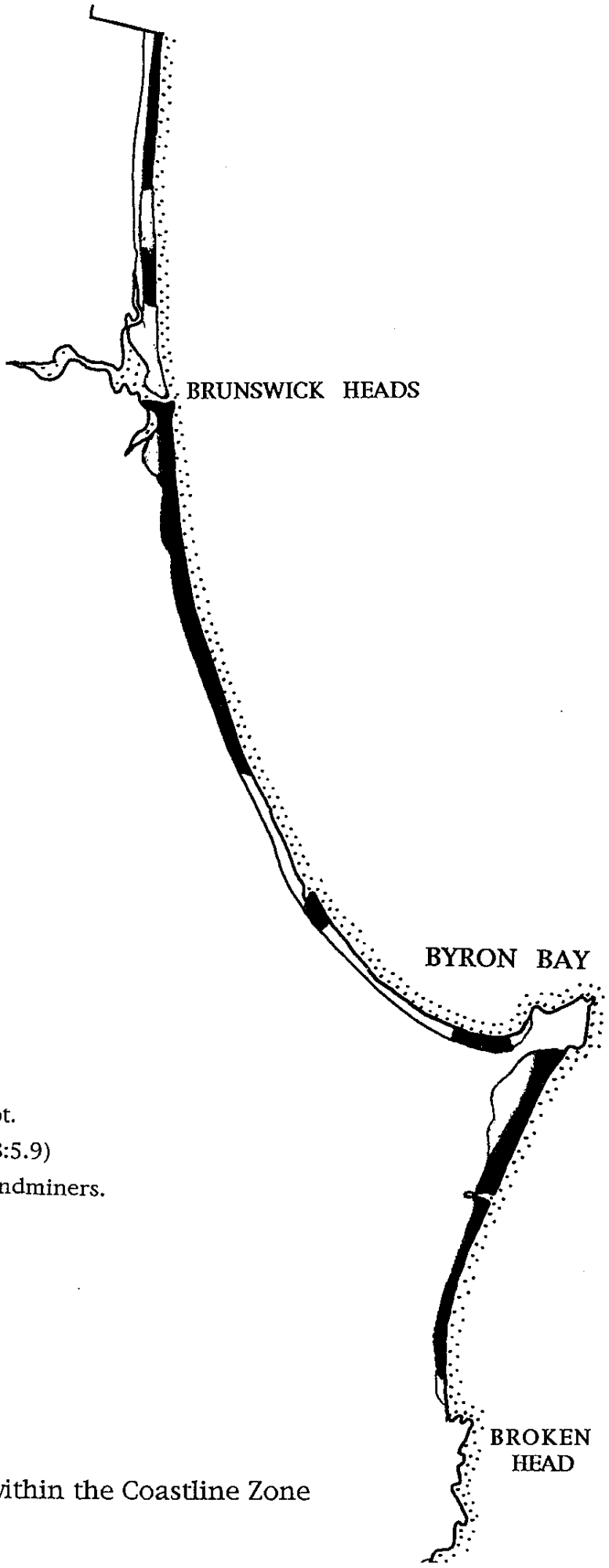
FIGURE 9 : Distribution of recorded Aboriginal sites in the coastline and coastal lowlands zones of the Byron Shire

*Note: All N.P.W.S. site numbers have prefix 4-

= zone interface

Key:

- • Shell midden
- T Scarred tree
- o Stone arrangement
- o Open campsite
- ⊙ Bora ground
- b Burial



* Based on information supplied by Dept. of Mines, Lismore (in Gordon et. al. 1978:5.9) and information supplied by former sandminers.

FIGURE 10: Reported sandmined areas within the Coastline Zone

4.2. COASTAL LOWLAND ZONE

4.2.1. Definition

The Coastal Lowland Zone adjoins the Coastline Zone along its eastern margin and stretches inland to the 10m. contour line (Fig. 9). The Zone is narrow along Tallow Beach south of Byron Bay and gradually widens toward Brunswick Heads where it edges the Brunswick River, extending inland for 15km. It includes a series of shoreline parallel beach ridges with elevations of 5-6m. a.s.l. stretching north from Belongil Creek and lower inner barrier dunes further inland.

The eastern portion of the Zone is composed of aeolian and heath soils with little soil development. Here, soil profiles generally consist of a grey A horizon, formed by the leaching of organic matter, which grades into white sand. Peat soils with a high moisture content and waterlogged swamp soils composed of dark organic matter commonly bound the aeolian soils. In the north west section of the Zone alluvial soils edge the Brunswick River. These vary from deep loams to sandy loams depending on their geological derivation.

Toward the coast vegetation comprises xeromorphic heath communities interspersed with Melaleuca-dominated wetlands. Bracken fern is widespread on better drained peats adjacent to these wetlands. Mangroves also occur in the Zone's eastern section at the mouth of the Brunswick River, along its tributaries of Simpsons and Marshalls Creeks and along Belongil Creek at Byron Bay, while littoral rainforest occurs on the northern side of the Brunswick River at Brunswick Heads.

In the eastern section of the Zone several estuarine creeks flow parallel to the coastline. These include Simpsons and Marshalls Creeks in the northern part of the Shire, and Belongil and Tallow Creeks near Byron Bay. Taylors Lakes, located behind foredunes north of Broken Head, were once filled with fresh water and small freshwater creeks abound throughout the Zone.

The western section of the Zone now, for the most part, consists of grassland used in grazing cattle, though some areas are used for horticultural purposes and for cane cultivation.

4.2.2. The prehistoric environment

The vegetation in many parts of this Zone is largely different to that present at the

time of first European settlement. Alterations have been effected through the draining of large areas of former swampland and the clearing of sclerophyll forests.

During prehistory large permanent freshwater swamps were located west of Byron Bay (Cumbebin Swamp, at Mullumbimby and in some parts of North Ocean Shores. Smaller swamps also existed west of Tallow Beach and west of the mouth to Belongil Creek. It is estimated that at the time of first European settlement wetlands occupied two and a half times more area than at present (Goodrick 1970:3).

Prior to clearing vegetation bordering the coastal heathlands consisted chiefly of sclerophyll forests and open woodland. Exceptions to this pattern were found in small areas north of Byron Bay and south of Brunswick Heads, where sub-tropical rainforests extended onto the lowlands, and west of Mullumbimby within the Brunswick Valley, where at least two pockets of grassland are known to have occurred (see Fig.5).

Other alterations to the pre-European environment include those effected by breakwalls and levees along the lower reach of the Brunswick River. Rock walls extend intermittently inland for over 1 km. along both banks and are likely to have altered the natural flow of both the Brunswick itself and of its major tributaries, Simpsons and Marshalls Creeks which enter the river close to its mouth. Boat mooring facilities have been constructed and sands dredged from the river bed have been used to fill adjacent areas.

4.2.3. Aboriginal food resources

The Coastal Lowlands are likely to have been the most productive Zone in terms of Aboriginal food resources. Extensive freshwater swamps present within the Zone would have provided optimum habitat for waterfowl and a range of other aquatic foods including eggs, fish, turtles and molluscs, while the estuarine reaches of the Shire's creeks would have provided an array of marine foods. Intertidal mudflats support mangrove communities which again, provide not only fruits, but refuge and breeding habitat for birds, flying foxes, reptiles, crustacea, molluscs, worms and fish.

In addition to acquatic resources the native yam (*Ipomoea pes-caprae*), a staple part of the Aboriginal diet, is known to have covered large areas of sandy flats surrounding Byron Bay (Turner 1906 quoted in Mitchell 1978:63). The plant's fleshy tap roots, up to a metre in length, were pounded and baked (Cribb & Cribb 1974:142). In swampy areas throughout the Shire bungwall fern (*Blechnum indicum*) occurs. The underground stems of this plant formed a major component of the prehistoric diet in south east

Queensland (see McNiven 1990) and it has been suggested that they were also used in the Tweed Valley (Piper 1976:107). It is interesting to note that the people of Brunswick Heads, where bungwall fern abounds in water-logged areas, are said to have been known as the 'Bungawalla people' (Clarke 1931 quoted in Mitchell 1978:152). It is clearly possible, therefore, that this plant also featured heavily in the diet of Aborigines within the Byron Shire.

Numerous marsupials, birds and reptiles including koala, swamp wallaby, grey kangaroo, emu, lizards and snakes were available within heathland communities, while sclerophyll forests, which extended over the western section of the Zone, provide the most productive habitat for large and medium-sized mammals and many species of birds (ibid:79).

Below are listed species recorded as having been eaten by Aborigines in the region and which are likely to have been exploited withinthe Shire's Coastal Lowlands.

Estuarine

Estuarine & river fish:	Black bream (*Chrysophrys australis, Sarba*)	
	Silver bream (*Mylco butcheri*)	
	Garfish (*Hemirhamus regularis*)	
	Whiting (*Sillago ciliata, Sillago maculata*)	
	Flathead (*Platycephalus fuscus*)	
	Trevally (*Caranx geogianus*)	
	Mullet (*Mugil dobula*)	
	Cod (*Serramus dameli*)	
	Perch (*Percalates colonorum*)	
	Catfish (*Neoarius australis*)	(McBryde 1982:32)
Crustacea:	Prawns	(ibid)
	Crayfish	(ibid)
	Crab	(Bundock 1898:4)
Shellfish:	Oyster (*Ostrea sinciata, Saccostrea cucullata*)	
	Mussel (*Mytilus planulatus*)	(Ainsworth n.d.)
	Cockle (*Anadara trapezia*)	(McBryde 1982:32)
Plant foods:	Grey mangrove fruit (*Avicennia marina*)	(Baker 1915:266)
	Native yam tuber (*Ipomoea pes-caprae*)	(Turner 1906)
	Cypress pine (Resin for hafting) (*Callitris columellaris*)	(White 1992)

Wetland/swamps		
Fish & aquatic fauna:	Eel (*Anguilla* sp.)	
	Tortoise (*Chelodina longicollis*)	(McBryde 1982:32)
Shellfish:	Freshwater mussel (*Velesunio* sp.)	(ibid)
Plant foods:	Bungwall fern root (*Blechnum indicum*)	(Uniake 1843:58)
	Rush roots (*Typha angustifolia*)	(Petrie 1904)
	Blue water lily tubers (*Nymphaea gigantea*)	(Flick 1934)
Birds:	Swan (*Cygnus atratus*)	(Towner n.d.:3)
	Wild geese (*Nettapus coromandelianus*)	(McBryde 1982:32)
	Wild duck (*Anas siperciliosa, Anas castanea, Anas rhynchotis*)	
	Swamp hen (*Porphyrio porphyrio melanotus*)	
	Pelican (*Pelecanus conspicillatus*)	
	Quail (*Corturnix* sp.)	
	Brolga (*Grus rubicundus*)	(ibid)
Sclerophyll forest		
Mammals:	Kangaroo (*Macropus giganteus*)	(Bundock 1989:4)
	Flying squirrel(*Schoinobates volans,Petaurusbreviceps*)	
	Possum (*Trichosurus vulpecula, Pseudocheirus peregrinus*)	
	Koala (*Phascolarctus cinereus*)	(Flick 1934:2)
	Bandicoot (*Perameles nasuta, Isoodon* sp.)	(Bray 1901:9)
	Echidna (*Tachyglossus aculeatus*)	(Bundock 1898:5)
	Rat-kangaroo (*Aepyprymnus rufescens*)	(ibid)
	Flying fox (*Pteropus scapulatus, Pteropus poliocephalus*)	(Cross 1954)
Birds:	Cockatoo (*Calyptorhynchus* sp.,*catactua* sp.)	
	Emu (*Dromaius novaehollandiae*)	
	Parrots (*Trichoglossus chlorolepidotus, Alisterus scapularis, Platycercus elegans, Platycercus eximius*)	(McBryde 1982:32)
Reptiles:	Goanna (*Varanus varius*)	(Ainsworth n.d.)
	Carpet snake (*Morelia spilotes*)	(Bundock 1898:3)

Plant foods:	Wattle seeds & pods (*Acacia* sp.)	(Byrne 1986:47)
	Burrawang seeds (*Macrozamia communis*)	(Simpson 1956)
	Bracken fern root (*Pteridium esculentum*)	(Maiden 1889)
	Flax lily (basket fibre) (*Dianella laevis var aspera*)	(Maiden 1889:621)
	Blue flax lily fruit & roots (*Dianella revoluta*)	(ibid)
Other:	Woodgrubs	(Martyn 1946:2)
	Earthworms	(Simpson 1956)
	Honey	(McBryde 1982:32)

4.2.4. Archaeological context

The oldest dated evidence for Aboriginal occupation of the region comes from the Wallen Wallen Creek site, located on a relict parabolic dune adjacent to a freshwater swamp on North Stradbroke Island (Neal & Stock 1986:619). Here a continuous archaeological sequence (consisting of shell material and stone artefacts) spans a period of at least 22,000 years, showing that the east coast of Australia was occupied throughout the Pleistocene, well before rising seas reached their present levels (ibid:620). The Wallen Wallen site has been interpreted as representing "a temporary transit camp located on an access route between major resources located on the coast to the east and the river valley and mountains to the west" (ibid:621).

At Hope Island on the Coomera River, south east Queensland, occupation of an excavated estuarine midden site occurred over a period from c.5,000 to 1,500 years ago and for a short time afterward (Walters et.al. 1987). Earlier midden levels here contained oyster, cockles, whelks and some mussel, but over time the relative proportion of oyster shells increased so that levels post-dating 2,500 B.P. were composed almost entirely of oyster (ibid:88-89).

The oldest dated estuarine midden in northern N.S.W. is located at Wombah, on the banks of a small tidal creek near the Clarence River. This site was first occupied c.3,260 years ago and was used up until the contact period (McBryde 1982). While the Wombah midden contained a wide assortment of estuarine shellfish as well as a small number of pipis, it contained vast numbers of oyster shells which continued to dominate throughout the deposit (Campbell 1982). The midden also contained significant numbers of stone artefacts including ground-edge tools, uniface pebble tools, backed blades, points, scrapers, bipolar cores and flakes as well as artefacts of bone and shell and retouched glass flakes (McBryde 1982:22).

Closer to the Byron Shire, stratified middens, located along the Richmond River estuary at Ballina, have been investigated by Bailey (1975). These middens, which are largely composed of oyster shells (98% by weight), consist of mounds up to 400m. long and 4m. high which have accumulated within the past 2,000 years (ibid:46). Bailey excavated a single square metre of one of these middens along Chickiba Creek with a basal date of 1,720 years B.P. The site had been used continuously up until the contact period (ibid:51).

Site distributions in northern N.S.W. show a marked concentration along the estuarine reaches of coastal rivers and along the eastern margin of the coastal lowlands. Sullivan (1982:121) has suggested that watercraft would have enabled people to travel extensively along creek and river banks and thus, remnants of campsites will be found in many places along waterways.

4.2.5. Site types in the Coastal Lowland Zone

4.2.5.i. Middens

Many midden sites have been recorded on inner barrier dune formations, along the margins of estuaries and around freshwater swamps along the N.S.W. coast. While these middens vary in size, they tend to be larger than those present on foredunes.

Middens on inner barrier dunes along the coastline usually contain open shore species such as pipi (*Donax deltoides*), while those bordering estuaries and tidal creeks contain large proportions of shellfish available in those resource zones. These commonly include oyster (*Saccostrea cucullata*), whelk (*Pyrazus ebeninus*) and cockle (*Anadara trapezia*). Larger middens may contain stone artefacts, mammal and fish bone and possibly human burials.

Because site densities are higher in areas with more diverse environments (Sullivan 1982:77) it follows that a geater density of sites may be expected to occur within the Coastal Lowlands Zone than along the Coastline Zone. In her overview of coastal middens Sullivan (1982) found that sites behind the coastal dunal sands generally face toward lagoons or swamps and are generally composed of pipi shells which may have been carried inland for some distance. Such midden deposits are thought to represent campsites adjacent to fresh water and other aquatic resources where shellfish were consumed (ibid:100).

4.2.5.ii. Open campsites

Although they do not occur as frequently as midden sites, open campsites are a consistent feature of the Coastal Lowlands. They are generally composed of open scatters of stone artefacts which, like midden sites, occur close to creeks, swamps and estuaries on areas of elevated ground.

4.2.5.iii. Burials

Two burials have been recorded within this Zone near Tallow Creek. One of these (#4-4-36) is a contact burial site (dating to the late 1890's) where additional burials are likely to occur (L.Vidler, L. Kelly pers. comm.). The other burial (#4-5-34) is associated with an open campsite (#4-5-35) and a Bora ground (#4-5-36), all of which appear to have been destroyed by development.

There is also some oral evidence to suggest that an Aboriginal burial site is located on a low round sand hill surrounded by swampland south of Myocum (R. Maslen pers. comm.) and 'bones' are said to have been dug up by sand miners not far from the site of the former Tyagarah stone arrangement (C. Maslen, sandminer, pers. comm. to R. Maslen).

Other burials recorded in the region have occurred within estuarine middens. At Wombah on the Clarence, for example, two skulls were recovered from a midden during the construction of the Iluka road (Byrne 1986:38) and burials were found within a mounded midden at Terranora on the Tweed estuary (Barz 1980).

4.2.5.iv. Post-contact campsites

Two post-contact campsites are located near Tallow Creek south of Byron Bay. The first of these, the site of the Byron Bay Aboriginal Reserve (established 1908, revoked 1916), is located in the vicinity of the #4-4-36 burial site at the 'Wheel House Resort', while a small shack located on Crown Land west of the mouth to Tallow Creek was once the home of the Kaye family. Both of these sites are significant to local Aboriginal people.

4.2.5.v. Bora sites

Bora grounds have been recorded on Coastal Lowlands along the north coast and four such sites are registered for the Byron Shire, though all appear to have been destroyed. Further Boras are also said to have once been located at Tyagarah, at Brunswick Heads, on the northern side of the Brunswick estuary, at several places

along the Main Arm of the Brunswick on river flats upstream from Mullumbimby, and in the Wilsons Creek area (Brokenshire 1988:40).

Evidence suggests that substantial groups of people assembled at Bora sites for dispute settlement or initiation. While estimates of group sizes range up to 3,000 individuals (Howitt 1904:606 in ibid:21), Sullivan (1977:35-36) suggests 1,000 as a more likely maximum. Early reports describe activities associated with Bora ceremonies as lasting for between two days (Uniake in Steele 1972:74-75;78-82; Mathews 1910:106) and three weeks (Petrie 1904:50,54; Mathew 1910:98-106). As Satterthwait and Heather (1987:21) have underlined, up to 1,000 people gathered in one place, even for a few days, can greatly tax local food resources. It is thought that ceremonies were therefore timed to coincide with abundances of local resources and that the size and duration of aggregations were directly related to the resource yielding capacity of the locality. As a consequence of the exhaustion of resources near Bora sites during gatherings, it is likely that a set of such sites were used in rotation, thereby allowing an adequate period of environmental recovery in the vicinity of each site (ibid:48).

4.2.5.vi. Stone arrangements

Although there are no documented accounts of their use, stone arrangements are thought to have been of ceremonial significance. Two stone arrangement sites have been recorded within the Zone, however one of these (#4-5-41) has been assessed as being a natural formation (N.P.W.S. file, report 10/7/80; Collins 1991:22-23).

The remaining site (#4-5-32) was destroyed in 1965 when the stones were removed prior to sandmining. It consisted of two spirals of water-worn stones which were apparently located on a cleared sandy knoll in the middle of a melaleuca swamp (C. Maslen, sandminer, pers. comm. to R. Maslen). The stones are currently located at the entrance to Heritage Park at Mullumbimby (The Echo 18/4/90). There are also reports that a ring of 'football sized' stones was found in the Tyagarah locality during the 1930's (R. Maslen pers. comm.).

4.2.6. Archaeological surveys in the Byron Shire

Surveys in the Coastal Lowland Zone are confined to those undertaken by Barz (1982) and Navin (1989) at North Ocean Shores, and by Collins (1990,1991) and Piper (1983) near Byron Bay. In addition Davies (1991) surveyed a narrow strip of land between Andersons Hill and the Shire's northern boundary and has recently undertaken a survey for a proposed by-pass road immediately west of Brunswick Heads (S. Leber pers. comm.). Limited areas were also surveyed during the course of the present study.

In 1989 Navin surveyed areas at North Ocean Shores which were deemed to be archaeologically sensitive. This entailed the survey of areas (where past European disturbance had not occurred) comprising relatively level gradients on well-drained ground close to fresh water sources. Resource-rich ecotonal areas and locations which may have been used as movement corridors were also surveyed. In all Navin recorded nine sites within the Coastal Lowlands Zone. Two of the sites are small scatters of pipi shell (one contains some oyster fragments) located immediately west of the foredunes (#4-2-41 & #4-2-42), while three are shell scatters containing stone artefacts, pipi (#4-2-59), whelk and oyster (#4-2-57 & #4-2-60) located on Pleistocene dunes. An additional pipi scatter (#4-2-51) was located on a low saddle at the end of a ridgeline. Two open campsites were also recorded by Navin within the Coastal Lowlands Zone. Both of these sites (#4-2-52 & #4-2-53) are located at the low end of coastal spurs on the Zone's periphery and comprise scatters of 14 and 3 stone artefacts respectively. Navin also recorded a scarred tree (#4-2-50) within this Zone. The tree, a mature Blackbutt (*Eucalyptus pilularis*) is located in a valley between coastal ridgelines.

Closer to Byron Bay, Piper (1983) surveyed a portion of land 300m. inland from the coastline on the northern end of Bayshore Drive near Belongil Swamp. While Piper found no cultural remains within his area of study, he did record a disturbed pipi midden (#4-5-62) on a Pleistocene dune immediately east of its boundary. This site is threatened by development and has recently been subject to further archaeological investigation (Navin in prep.).

In 1991 Collins undertook a survey of the Byron Shire's proposed urban development areas (Collins 1991) which included parts of the Coastal Lowlands Zone. Two isolated stone artefacts were recorded bordering swampland at Skinner's Shoot and artefacts which had been collected by a local landowner over many years from a large open campsite, also at Skinner's Shoot, were photographed and recorded. This campsite was once located within rainforest/wet sclerophyll vegetation beside a small creek (ibid 45-46). A widely dispersed scatter of pipi midden shell was recorded adjacent to freshwater swampland near Belongil Creek and a further pipi midden scatter was recorded close to Simpsons Creek south of Andersons Ridge. Two stone artefacts were recorded beside a drain immediately south of the Simpsons Creek scatter.

During field reconnaissance for the present study a mounded estuarine midden was recorded near the northern bank of the Brunswick River within the Brunswick Heads Nature Reserve. The mound is 7m. long, 4m. wide and up to a metre in height. It contains pipi, oyster, whelk, cartrut and cockle shells as well as some stone artefacts. The mound has been cut by a track and is likely to have once been up to 7m. in width. It is the only estuarine midden to have been recorded to date along the Brunswick

River. A small badly disturbed pipi midden was also recorded beside the Pacific Highway on the southern outskirts of Brunswick Heads.

4.2.7. Impacts on the archaeological resource of the Coastal Lowlands Zone

The most immediate threat to the archaeological resource of the Coastal Lowlands is urban development. Such development appears to have already destroyed at least two of the four Bora rings located within the Shire (#4-2-1 & #4-5-36), one stone arrangement (#4-5-32) and at least one burial site (#4-5-34). Further, it is likely that many Lowlands sites have been destroyed during housing development at Byron Bay, Brunswick Heads, and most recently, at Ocean Shores. Where archaeological sites coincide with urban developments it is probable that they will be completely destroyed unless they are identified and protected early in the planning process.

Given that only one midden site has been recorded for the estuarine reach of the Brunswick River and that largescale alteration to the river banks in the form of retaining walls and landfills has occurred, it is likely that many sites which were once present have been destroyed in this locality. The lower Tweed and Richmond Rivers contain a relative abundance of midden sites and it follows that a similar concentration of such sites would also have occurred along the Brunswick. According to one local resident an Aboriginal campsite was once located near the confuence of Kings Creek and the Brunswick River east of Mullumbimby in an area which is now cultivated with sugar cane (Mr. Borridale pers. comm. on information from his grandmother).

The alluvial valleys of the Brunswick River and its tributaries west of Mullumbimby are devoid of recorded sites. These areas are intensively settled and are, for the most part, sown with pasture grasses used in cattle raising. It is likely that European landuse has disturbed sites in these areas and in valleys to the south, closer to Byron Bay, where some plantations of exotic crops exist.

Although no records show the area east of Belongil Swamp near Tyagarah to have been sandmined, field inspection revealed an anomalous widespread concentration of quartz and quartzite stones on the surface throughout the area, suggestive of major sub-surface disturbance. Further, the stones from the Tyagarah stone arrangement (#4-5-32) which were collected from this area, are said to have been collected by a sandminer in 1965 (Echo 18/4/90). If this area has indeed been mined, it is likely that a Bora (#4-5-63) which is recorded in this locality (no site card in N.P.W.S. files, Alstonville) has been destroyed.

4.2.8. Trends in site location

The Coastal Lowlands, sandwiched between the Coastline Zone where marine resources could be exploited, and the Coastal Ridge Zone containing forest resources, presents a well-watered area where a wide range of foods and other materials could be procured within easy travelling distance. In general, site densities are higher in areas which present such diverse environments (M. Sullivan1982:77). Proximity to fresh water has been found to be the single most important factor in site location, with larger sites being located close to water sources. Site sizes decline sharply with increased distance from water, though for all midden sites, there appears to be a clear preference for camping on sandy surfaces (ibid:90-91,100).

On the north coast, midden sites are concentrated along the estuarine reaches of the larger rivers and archaeological investigations and ethnographic accounts show that exploitation of these estuaries was commonly associated with the exploitation of terrestrial environments (e.g. the hunting of land mammals) (ibid:125). Within the Byron Shire the largest middens recorded in the Zone are located near the mouth of the Brunswick River (see Section 4.2.6) and at Palm Valley, Byron Bay (#4-5-61). Both of these sites are on littoral rainforest ecotones where a range of both terrestrial and marine resources could be easily procured.

Open campsites recorded in the Zone generally occur further inland than midden sites. Those at North Ocean Shores and isolated artefacts recorded at Skinners Shoot were located close to coastal ridge systems.

Four Bora sites have been recorded within the Byron Shire and all occur on the Coastal Lowlands. It is thought that the location of such sites was influenced by their spatial relationship to each other. In a study of the determinants of Bora site location in the Moreton region of south east Queensland, Satterthwait and Heather (1987) found that sites tend to be placed equidistant from two or more neighbouring sites and that they have an identifiable association with fresh water sources, ridges, unstructured soils and geological boundaries. Of these, the presence of sandy or loamy soils and proximity to ridges appear to have been a priority (ibid:47). As Satterthwait and Heather point out, the periodic aggregation and dispersal of Aboriginal people appears to have been a general feature of social and ceremonial life, and thus, resource availability will have played a major role in Bora site location. The use of such sites by large numbers of people would have exhausted local resources and frequent gatherings would have required the use of a set of such sites in rotation.

4.2.9. Aboriginal landuse model for the Coastal Lowlands Zone

Lilley (1984), in a study of late Holocene subsistence and settlement in subcoastal south east Queensland, synthesised available data on resources, early references to population organisation, and past archaeological research, to construct a model of Aboriginal landuse for the region. This model holds that in winter, large gatherings of people, composed of many family groups, gathered at base camps clustered near major rivers and lakes to exploit resources from the fringing forest/aquatic zones and the lowland open forests. Lilley contends that the main staples of subsistence were fish, waterfowl and aquatic plant foods, and that camps would have been situated in flat sandy places close to reliable water. Further, as groups were large and resources localised, winter base camps are likely to have been "extensive linear arrangements moved relatively infrequently over short distances along or around focal water sources" (ibid:27). According to this model, most summer base camps would have been situated along major tributary streams in the foothills from which upland terrestrial resources could be exploited. Summer groups are seen as being smaller and more mobile than winter groups. Summer camps were therefore ephemeral, being moved frequently according to resource availability (ibid).

Lilley's subcoastal landuse model may be used in tandem with Coleman's (1982) coastal model. Both argue for the presence of large base camps situated in resource-rich areas close to water sources. On Moreton Island, south east Queensland a similar pattern of sites has been identified. Sites here, consisting of middens containing both open beach and estuarine species, were found to be concentrated in open woodland or forest areas in close proximity to swamps and creeks (Hall & Robbins 1984).

It is clear that the Shire's Coastal Lowlands would have provided a rich and diverse resource base and that these resources were sufficient to support a substantial Aboriginal population on a year-round basis. It is likely that large semi-permanent base camps would have been located at intervals along the coast in productive areas close to fresh water sources. Resources from the immediate environment (aquatic and terrestrial foods) would have been heavily exploited and groups would have ranged from such camps into the Coastline Zone and onto the Coastal Ridges to exploit marine and terrestrial resources which were brought back for preparation and consumption. Canoes would have offered an expedient method of movement from base camps and foraging groups may have covered wide areas via the major waterways and subsidiary channels in this manner.

It is also likely that smaller resource-specific and single use camp sites would also have been located within the Coastal Lowlands in close proximity to swamps,

environmental ecotones and other resources of reduced distribution. Given that such sites were used by smaller dispersed groups they are likely to far outnumber base camp sites.

Given that four Bora sites and a stone arrangement were located at intervals along the eastern section of the Zone, it follows that a range of social, ceremonial and religious activities were carried out here. Such activities would have entailed largescale movement of people to the sites and intensive camping and resource exploitation of their immediate environments.

4.2.10. Predictive model for archaeological sites

Research in south east Queensland and north eastern N.S.W. shows that archaeological sites are not evenly distributed over the landscape. Rather, sites tend to conform to the distribution of fresh water, exploitable resources and to the presence of optimal camping areas (flat, soft and sheltered) (e.g. Hall & Robbins 1984; Robbins 1983).

Archaeological surveys described in Section 4.2.6. have demonstrated that a relatively high concentration of archaeological sites exist on the Coastal Lowlands with densities in the order of 1.6 sites per square km. Although parts of the Zone, including the Byron Bay to Suffolk Park area and Ocean Shores, have already been impacted by development most has not been subject to European disturbance.

Based on available evidence it is predicted that undiscovered open campsites and/or middens will be located on elevated sand areas close to former swamplands and freshwater creeks, and along the edges of saline creeks (e.g. Tallow, Belongil, Marshalls and Simpsons Creeks) throughout the Zone. It is further predicted that the largest midden sites within the Shire will be located along the Brunswick River and its subsidiary channels in areas which have not been subject to European disturbance. It is likely that surface vegetation will hamper the discovery of sites in all such areas.

Midden sites, which may contain a combination of both open shore and estuarine species, are likely to be present only in the eastern section of the Zone. Further west, sites are likely to be open campsites, evident through the presence of stone artefacts at the surface. Most of these open campsites will consist of a small scatter of surface flaking debris, though large base camps, containing a wide array of stone materials, faunal remains and shell are likely to be present in resource rich parts of the Zone. Such sites may be stratified within sub-surface deposits and if so will have significant archaeological potential.

Within the Zone elevated sand areas which were originally surrounded by swampland occur. The Tyagarah stone arrangement (#4-5-32) was reportedly found on one such feature. A burial site is also said to exist on a similar feature in the western section of the Zone near Myocum (R. Maslen pers. comm.). Clearly such features would have provided dry areas for camping and other activities and it is likely that similar raised sandy locations throughout the Zone would have been used by Aboriginal people.

Although no sites have been recorded to date along the alluvial flats of the Brunswick River and its inland tributaries it is likely that unrecorded sites will exist there. Lilley (1984:27) contends that ephemeral summer camps would have been located along the major inland tributary streams and that from these camps both aquatic and upland resources were exploited. In line with this model it is predicted that small open campsites will be located at intervals along the Brunswick and its tributaries. Such sites along the estuarine stretch of the River may include shell species such as oysters and whelks. Sites further up river are likely to consist of scatters of stone artefacts and possibly, faunal remains.

Aboriginal burials may exist within sand bodies throughout the Zone, though these will not usually be evident until some disturbance to sub-surface deposits has occurred. Scarred trees are likely to be present in areas where mature tree stands remain. Field reconnaissance suggests that North Ocean Shores is one of the few localities within the Coastal Lowlands where major forest clearance has not occurred. One scarred tree has been recorded here (#4-2-50) and it is likely that further such trees will be present.

4.2.11. Management recommendations

Aboriginal sites on the Coastal Lowlands are vulnerable to impact from several types of development, including residential sub-division, roading, sand quarrying and agriculture.

Residential development has a long history in the Zone and future developments are likely to threaten sites. Urban expansion of Byron Bay is occurring south of the town to Suffolk Park in an area which is of considerable significance and concern to local Aborignal people. The area contains Taylors Lakes (#4-5-76), a natural mythological site of both traditional and contemporary importance, and a burial site (#4-4-36) where additional burials are likely to be located (L.Kelly pers. comm.; L.Vidler pers. comm.). At least two of the Shire's recorded Bora rings appear to have been destroyed by urban development (#4-2-1 & 4-5-36). The North Ocean Shores area, which is yet to be developed, contains many recorded sites and is an area of concern to the Tweed/Byron L.A.L.C.

The Coastal Lowlands Zone is considered to be archaeologically sensitive. Many different types of sites have already been recorded within the Zone (though a good proportion of these have been destroyed) and it is likely that many more sites remain to be discovered.

It is recommended that all designated developments on the Coastal Lowlands be preceded by archaeological surveys. The only exception to this would be developments located on drained former swampland which is not considered to have archaeological potential. Given the high attrition rate of those archaeological sites already identified within the Zone, all sites should be assessed by an archaeologist and those which are found to be in situ should be retained.

Roadworks carried out on previously unroaded sand-based grounds should also be preceded by archaeological survey and earthworks associated with developments in areas previously surveyed should be monitored to prevent destruction of undetected sites.

It is likely that burials and/or other sites will be located close to former swamplands on elevated sandy grounds. All developments, both designated and non-designated, of elevated sand areas should be preceded by archaeological surveys which may need to include some form of sub-surface testing in an effort to detect non-surface sites (e.g. ground-probing radar, excavation of shovel pits, augering). Sensitive areas include sandy rises at Myocum and Tyagarah.

It should be underlined here that the strip between Byron Bay and Suffolk Park is of particular sensitivity. At least two separate burial sites, two Bora rings (not relocated; thought to have been destroyed by sandmining and housing development) and a mythological site have been recorded in this area. It is recommended that no designated development occur here without prior survey and assessment and that all identified sites be retained. Non-designated developments should not be permitted in this area without liason with the National Parks and Wildlife Service and assessment in the field and without consultation with the Jali Local Aboriginal Land Council. Proof of such liason should be required by Council prior to granting development approval.

Because of the particular significance of Taylors Lakes (#4-5-76) to the Jali people it is recommended that Council move to ensure that urban development does not threaten the integrity of this site. A naturally vegetated buffer Zone of at least 20m. should be retained around the Lakes. Neither the Lakes themselves, nor the buffer zone, should be impacted by development.

Navin (1989:24-25) has provided management recommendations for all Lowlands sites recorded at North Ocean Shores and these recommendations should be followed. In addition, it should be pointed out that the North Ocean Shores development area is large (900 ha.) and presently constitutes the largest remaining undeveloped portion of Coastal Lowlands in the Shire. It has also been shown to contain a concentration of archaeological sites. As Navin's survey was of a sample nature only, it is recommended that total coverage surveys of sections of the area be undertaken at North Ocean Shores prior to the initiation of development there. Such surveys could potentially confirm or refute the presently identified pattern of site distribution in the area and further in situ sites may be identified. It is desirable that all in situ sites in the area be retained.

It is recommended that the mounded midden site on the northern side of the Brunswick River, recorded during the present study, be stabilised. Shells are presently eroding from the midden where it has been cut by a disused track. Such stabilisation may be achieved by placing a load of earth or sand along the cutting which could then be held in place by vegetation. This site is located within the Brunswick Heads Nature Reserve, administered by the N.S.W. National Parks and Wildlife Service.

4.2.12. Coastal Lowlands Zone : Site list

Site No.	Site name	Situation	Shellfish species	Stone artefacts	Preservation status
North Ocean Shores					
Middens:					
4-2-41	N.O.S.2 Navin	Sub-coastal dune	Pipi		Disturbed by track
4-2-42	N.O.S.3 Navin	Sub-coastal dune	Pipi,oyster		Disturbed by track
4-2-51	N.O.S.12 Navin	Low sandy spur	Pipi	1 retouched flake	Disturbed by track
4-2-57	N.O.S.18 Navin	Inner barrier dune	Pipi,oyster, whelk	Pebbles,flaked & retouched artefacts 1 backed blade	Disturbed/In situ
4-2-59	N.O.S.19 Navin	Inner barrier dune	Pipi	2 flakes	Disturbed by mining
4-2-60	N.O.S.20 Navin	Inner barrier dune	Pipi,oyster, whelk	1 split pebble	Disturbed by track some in situ
4-2-63	Crabbes Ck.2 Davies	Sub-coastal dune	Pipi		Disturbed by road
Open campsites:					
4-2-52	N.O.S.13 Navin	End of spur near swamp		14 artefacts: 2 edge-ground axe frags 1 scraper, 1 backed blade piece	Disturbed-logging, part in situ?

4-2-53 N.O.S.14 Navin	End of spur		3 artefacts: 2 flakes,1pebble piece	Disturbed/eroded

Scarred trees:

4-2-50 N.O.S.11 Navin	Valley-wet sclerophyll		Blackbutt, 2 scars	Living

Bora grounds:

4-2-1 Yelgun McBryde	Estuary	Small Bora & sacred well		Destroyed by development

Brunswick Heads

Middens:

Not yet listed Collins	Brunswick R. near litt. r.f.	Pipi,oyster, whelk,cartrut cockle	Artefacts present	Disaturbed/In situ mounded midden
Not yet listed Collins	B/n Creek & spur	Pipi,oyster		Disturbed by road
Not yet listed Collins	Sand deposit near Ck.	Pipi	2 flakes nearby	Disturbed/In situ?

Byron Bay

Middens:

4-5-62 Byron Bay 1 Piper	Inner barrier sand deposit	Pipi		Disturbed/In situ
Not yet listed Collins	Near salt Ck. on sand deposit	Pipi		Disturbed
Not yet listed Collins	Sub-coastal dune sand	Pipi		Disturbed by track

Open campsites:

Not listed Collins	Sand below spur	Isolated flake	Within drain spoil
Not listed Collins	Low end of spur	Isolated flaked pebble	On eroded track
4-5-35 Suffolk Beach Starling	Sub-coastal dune sand	Unknown	Destroyed by housing develop.

Bora Grounds:

4-5-63 Byron Bay Unknown	Sub-coastal sand plain	Unknown	Unknown
4-5-33 Tallow Beach Aust.Museum	Sub-coastal dune		Destroyed by sandmining?
4-5-36 Suffolk Beach Thorpe	Sub-coastal	Pipi	Destroyed by housing develop?

Stone arrangements:

4-5-32 Tyagarah Mumberson	2 spirals of water-worn stones		Destroyed

Burials:

4-5-34 Suffolk Beach Aust.Museum	Sub-coastal dune		Destroyed by housing develop?
4-4-36 Tallow Beach Gonda	Sub-coastal dune	Post-contact burial site	In situ/protected

4.3. COASTAL RIDGE ZONE

4.3.1. Definition

The Coastal Ridge Zone adjoins the Coastal Lowland Zone along its eastern margin, stretching from the 10m. contour line inland to the coastal escarpment (approximately to the 100m. contour line) (Fig. 11). The Zone comprises a complex of east and north east trending ridges which are often strongly dissected into relatively short minor spurs.

Ridges east of Coopers Shoot and at Skinners Shoot near Byron Bay consist of moderately inclined sand-based dunes with a local relief of up to 25m. The remainder of the coastal ridges are relatively steep and are composed of soils which relate to their bedrock geology. Ridges located from Brunswick Heads south to Byron Bay are based on the Tertiary lavas of the Lamington Volcanics and consist of red krasnozem soils. Those north of Brunswick Heads, largely based on the metamorphosed sediments of the Neranleigh-Fernvale Beds, are composed of strongly leached podzolic soils.

Sand-based ridges near Byron Bay support pasture grasses and wet sclerophyll woodland. Along their eastern perimeter they peter out to abutt swamps in several places. Ridges composed of knasnozems have been largely cleared and support pasture grasses as well as some tropical fruit orchards, while the less fertile podzolic ridges in the north of the Shire support pasture grasses, shrublands of regenerating dry and wet sclerophyll forest and small relict pockets of mature wet sclerophyll forest. The ridge system immediately north of Brunswick Heads has been intensively developed for residential use (Ocean Shores).

4.3.2. The prehistoric environment

While the landforms themselves remain unchanged, much of the vegetation on the Coastal Ridges has been altered since European settlement.

Both relict pockets of vegetation and available reconstruction maps (Fig. 5) suggest that the sand-based ridges near Byron Bay and the podzolic ridges north of Brunswick Heads once supported mature high canopy closed forest communities with a predominance of wet sclerophyll forest including *Lophostemon confestus* and Blackbutt *Eucalyptus pilularis* as dominant species (Hogg 1986; Gilmore et. al. 1986). Ridges north of Brunswick Heads supported dry sclerophyll forests on drier aspects

dominated by Forest Red Gum *Eucalyptus tereticornis*, Ironbark *Eucalyptus siederophloia* and Blackbutt (Navin 1989:9).

Prior to clearing ridges composed of krasnozem soils supported sub-tropical rainforest.

4.3.3. Aboriginal food resources

The Coastal Ridges, with their extensive sclerophyll forests and rainforests would have contained an array of both faunal and vegetable foods available for exploitation. Sample surveys have shown that within even small areas of closed forests, food plants are present in each layer of the forest structure (Spencerley 1975; Gilbert 1971; Nicholls 1967). Fruiting takes place regularly in subtropical closed forest formations, particularly in summer months, while seeds are available in late summer/autumn. Apical buds of palm species such as *Livistonia australis* and *Archonotophoenix cunninghamiana*, which grew within the rainforests, are available year round (Cubis 1977:49). Toxic vegetable foods which required knowledge of preparation are also found within the rainforests. These include cunjevoi roots (*Alocasia macrorrhizos*), burrawang (*Macrozamia denisonii*) and black bean (*Castanospermum australe*) seeds. Sclerophyll forests are known to provide the most productive habitat for large and medium-sized mammals and many species of birds (Mitchell 1978:152).

Aboriginal foods mentioned by early Europeans include many species which would have been available on the Coastal Ridges. These include pademelons, possums, small wallabies, koalas, bandicoots, goannas, carpet snakes, birds and eggs, wood grubs and earth worms (Sullivan 1964:8). Tweed Valley Aborigines are said to have eaten "honey robbed from the nests of wild bees, soft grubs, edible roots, leaves, stems and berries..." (Martyn 1947), while flying foxes were widely used as a food source (Bundock n.d.:5). An anonymous writer, describing Aborigines at Byron Bay in 1896, comments that "there was a large flying fox camp a couple of miles out of town on the palm swamp up Skinner's Road with hundreds of flying foxes in it. It was the blacks main supply of food, supplemented by fish, oysters, birds and other food. The blacks, though often shifting camp, seldom went far away on account of this food supply" (Anon. 1954). The area described is Skinners Shoot and it is likely that the 'palm swamp' was located along the eastern margin of a sand-based ridge, probably between the ridge crest and the adjoing wetland. This account is the only concrete ethnographic evidence for food exploitation within the Shire and firmly places the role of hinterland dunes in the prehistoric economy.

A list of foods which would have been available within sclerophyll forest formations is included in Section 4.2.3., while a list of available rainforest foods is contained in

Section 4.4.3.

4.3.4. Archaeological context

There have been very few systematic surveys and no excavations carried out on sub-coastal ridges in northern N.S.W. or in south east Queensland. There is, therefore, little factual basis for reconstructing landuse patterns. Such reconstruction can only be undertaken with reference to the distribution of known sites both within the Coastal Ridge Zone and in adjoining Zones.

4.3.5. Site types in the Coastal Ridge Zone

4.3.5.i. Middens

Three pipi middens have been recorded on sand ridges at Skinners Shoot. These sites, which would once have been situated within wet sclerophyll vegetation, are within close proximity to both swampland and rainforest. It is noteworthy that no middens have been recorded on non-sand matrices, though minor scatters of fractured shell have been recorded in association with two open campsites on podzolic soils at North Ocean Shores.

4.3.5.ii. Open campsites/isolated artefacts

Open campsites, generally consisting of open scatters of stone artefacts, are found within the Coastal Ridge Zone either along the spines of ridges or on the lower ends of spurs which provide dry elevated camping areas adjacent to swamps and creeks. Six such sites have been recorded within the Shire to date.

4.3.6. Archaeological surveys in the Byron Shire

Surveys on the Coastal Ridge Zone are confined to those undertaken by Barz (1982) and Navin (1989) at North Ocean Shores and by Collins (1991) in the Byron Shire Urban Investigation Areas.

In 1989 Navin surveyed those parts of North Ocean Shores which were deemed to be archaeologically sensitive. This entailed survey of saddle, shoulder and knoll areas along the spines of ridges and spurs and the lower ends of spurs close to resource-rich wetlands. Such areas were considered to provide the most level and sheltered camping places available. Navin succeeded in recording three sites within the Coastal Ridge

Zone. Two of these are open campsites located along level sections of a main ridgeline. The first (#4-2-54) consists of 54 stone artefacts and a small concentration of cockle shell scattered for 40m. along the surface of a gravel road. The other (#4-2-55) is a scatter of four stone artefacts also located on the road surface. The third of Navin's sites (#4-2-56), also an open campsite, was located on the lower end of a spur. It consists of 12 stone artefacts scattered along a 150m. section of road, and a concentration of 20 small flakes associated with a small concentration of fractured pipi and cockle shell.

In 1991 Collins undertook a survey of the Byron Shire's proposed urban development areas which included parts of the Coastal Ridge Zone. At Skinners Shoot a pipi midden was recorded along the spine of a sand ridge and an isolated stone artefact was recorded along the ridge margin bordering wetland. Fifteen stone artefacts collected from an open campsite by a local landowner were also recorded. This campsite (#4-5-58) was apparently once located on the lower end of a sandy spur close to an intermittent stream. Artefacts from the site include a wide range of types (including ground-edge artefacts, grindstones and a scraper) and raw materials. Despite survey of krasnozem ridges at Ewingsdale and Quarry Lane west of Byron Bay, and at The Saddle/Andersons Hill south of Brunswick Heads, however, only a single open campsite, composed of two small stone artefacts, was recorded. The artefacts were located on a cattle track on the crest of a ridge overlooking the coastal lowlands. The locality where the artefacts were found would once have supported rainforest vegetation.

4.3.7. Impacts on the archaeological resource of the Coastal Ridge Zone

It is likely that future threats to the archaeological resource of the Coastal Ridges will take the form of urban development of those parts of the Zone closest to Byron Bay and at North Ocean Shores. It is likely that many sites will have already been destroyed at Ocean Shores where such development was not preceded by archaeological survey.

Sand extraction, which is currently being undertaken on ridges at Skinners Shoot, has resulted in the destruction of at least one midden (#4-5-60 N.P.W.S. site file). The concentration of recorded sites in this locality, along with ethnographic evidence of its use by Aborigines exploiting the flying fox population, shows it to be of considerable archaeological sensitivity. Unless further development in this area is preceded by archaeological investigation aimed at retaining significant sites it is likely that the archaeological resource will be rapidly depleted.

4.3.8. Trends in site location

The Coastal Ridges meet the Coastal Lowlands along their eastern margin and lower slopes provide dry and elevated areas which often adjoin wetlands. People camping at sites located on the lower ridge slopes would thus have had easy access to both aquatic and forest resources.

Site densities are generally higher in areas with diverse environments and larger sites occur close to fresh water sources. Studies also show that sandy surfaces were clearly preferred (Sullivan 1982:77-100). It is not suprising then that the most concentrated site complex recorded in the Zone is located on sand ridges at Skinners Shoot. The largest open campsite recorded for the Shire (#4-5-58), which may have been a semi-permanent base camp associated with flying fox exploitation, was once located here on a lower ridge slope near an intermittent water source and within easy reach of wetlands.

In the rainforests and wet sclerophyll forests of the Upper Tweed Valley spot-check surveys have found that relatively large numbers of small open campsites are located on flat areas along ridgelines and adjacent to creeks (Byrne 1987:64-69). This pattern of site location was also encountered during large-scale surveys of coastal ranges on the south coast of N.S.W. (Byrne 1983; 1984). Although these areas do not constitute coastal ridges, a similar distribution pattern is evident within the Byron Shire at both Skinners Shoot and at North Ocean Shores.

Field survey at North Ocean Shores, where two major east-trending ridgelines exist, confirmed that the flat areas along them were the most archaeologically sensitive features within this landscape unit. While sites were found along both of the ridgelines, the larger and more diverse sites were situated along the ridgeline which meets coastal lowlands close to the Bora ground at Wooyung in the Tweed Shire. Navin suggests that this preference almost certainly relates to the proximity of the Bora ground complex and its function as a meeting place for a large number of related groups. The location of sites along both ridgelines is seen as reflecting their use as access routes to the Coastal Lowlands (Navin 1989:18).

4.3.9. Aboriginal landuse model for the Coastal Ridges

Given the proximity of the Coastal Ridges to the Coastal Lowlands and given that marine shell is present in ridgeline sites it is is likely that considerable overlap of Zone use occurred.

In Moreton Bay, south east Queensland, the distribution of the core territories of the 'fishing people' is seen to roughly correlate with the coastal lowland unit. Studies of ethnographic accounts in tandem with archaeological surveys and excavations suggest that in that area at least, the subsistence round was also confined to the lowland environment of swamps, beaches and lowland forests (Hall 1982:85). Given the model put forward for the Coastal Lowlands Zone (Section 4.2.9) which contends that large base camps would have been located in productive areas close to fresh water sources and that smaller resource-specific and single use campsites would have been located close to swamps, environmental ecotones and other resources of reduced distribution, it is clear that a similar scenario may be suggested for use of the lower ridge slopes. In many instances these would have provided elevated camping areas edging productive and permanent water sources. The range of artefacts recovered from campsite #4-5-58,which suggest its use as a base camp, supports such an argument.

Extensive and frequent movement is likely to have occurred between Zones. Ocean shore shellfish have, for example, been carried inland to Skinners Shoot where regular camping appears to have been undertaken. It is likely that both the rainforests and sclerophyll forests of the Coastal Ridges were subject to frequent exploitation by groups ranging from both semi-permanent and resource-specific campsites located on the Coastal Lowlands or around the margins of the Zone itself. Available evidence supports Sullivan's (1982:100) contention that campsites were preferentially located on sand-based grounds.

Given the location of open campsites along the spines of ridges at North Ocean Shores it is likely that ridgelines were used as access routes for groups ranging between the coast and inland areas. Such corridors may have been kept open by regular firing. The meagre evidence available suggests that ridgelines connecting inland areas with coastal ceremonial sites (e.g. the Wooyung Bora ground) were subject to more intensive use that those elsewhere (Navin 1989:18).

4.3.10. Predictive model for archaeological sites

There is insufficient data to enable estimates of site density to be made for this Zone. Given, however, that archaeological surveys have been undertaken on sand-based ridges at Skinners Shoot (Collins 1991), on krasnozem ridges which once supported sub-tropical rainforest at Ewingsdale, Quarry Lane, The Saddle and Andersons Hill (ibid), and on podzolic ridges supporting wet sclerophyll forests at North Ocean Shores (Navin 1989), some predictions may be made concerning the location and relative density of sites.

These surveys have demonstrated that a relatively high concentration of archaeological sites exists on inland sand ridges and that such ridges should be regarded as having considerable archaeological potential. It is predicted that additional middens and open campsites will be located on sand ridges at Skinners Shoot. These sites may be in a stratified context and are likely to be located either along ridgelines or on lower slopes close to fresh water sources.

Despite survey of coastal ridges which once supported rainforest (the krasnozem soil ridges), only two stone artefacts have been recorded on them. These artefacts were found together on an eroded cattle track on a ridgeline overlooking an extensive coastal wetland. While the widespread clearing of rainforest is likely to have disturbed any archaeological materials, it is expected that original site densities within this vegetation unit would have been lower than on ridges supporting wet sclerophyll forests. Given that most of the formerly rainforested ridges now support a thick covering of pasture grasses the discovery of sites on them will be severely restricted by lack of surface visibility. It is likely that sites on these ridges will consist of small surface scatters of stone artefacts or isolated artefacts located either on lower slopes close to rainforest margins or along the spines of ridges which may have been used as transit routes. It is possible that larger open campsites may be located on lower slopes where these meet wetland. There seems to be some justification for using the North Ocean Shores site pattern as a model for predicting the location of sites on the rainforested ridges. If this pattern holds it would be expected that sites will be located on flat sections of the ridgelines connecting with the Bora ground at Belongil Swamp (#4-5-63) and with the former stone arrangement site (#4-5-32) at Tyagarah. Parts of the Quarry Lane ridgeline (which peters out close to the Bora ground) have however been surveyed without success, though it is conceded that the majority of the area has little surface visibility (Collins 1991).

Based on the archaeological survey conducted at North Ocean Shores (Navin 1989) it is predicted that further sites, comprising scatters of stone artefacts which may be associated with midden shell, will be located on flat sections along the spines of the podzolic soil ridges north of Brunswick Heads. Similar sites will also be found on lower ridge slopes close to water sources. Given that surface vegetation will hamper the discovery of sites during survey it is likely that they will only be detectable where their location coincides with the location of a road or an erosion feature. Some mature stands of sclerophyll forest occur on these ridges and it is likely that scarred trees will also be present.

4.3.11. Management recommendations

Aboriginal sites on the Coastal Ridges are vulnerable to impact from residential developments, roading, quarrying and agriculture. It is likely that residential development will occur on the easterly sections of all of the Coastal Ridges and agriculture is likely to intensify on ridges further west.

Archaeological sensitivity of the ridges is seen to vary according to soil and prehistoric vegetational regime.

Sand ridges at Skinners Shoot are deemed to be archaeologically sensitive. All designated developments on these ridges in previously unsurveyed areas (i.e. Collins 1991:43) should be preceded by archaeological surveys. Given the high attrition rate of sites in this area (two sites destroyed, one partly destroyed) all sites identified should be assessed by an archaeologist prior to development and those which are found to be significant should be retained. Non-designated developments should not be permitted without prior liason with the National Parks and Wildlife Service and assessment in the field. Roadworks carried out on previously unroaded parts of the sand ridges should also be preceded by archaeological survey.

Podzolic ridges north of Brunswick Heads are considered to have further archaeological potential. Navin (1989:24) has provided management recommendations for ridge sites recorded at North Ocean Shores and these recommendations should be followed. It is recommended that all designated developments on these ridges be preceded by archaeological surveys where these have not been undertaken (i.e. Navin 1989) and management recommendations should be based on individual assessment of each site identified. Such assessment should be made in the context of specific development proposals.

Krasnozem ridges which supported rainforest vegetation are considered to have low archaeological potential. Given, however, that very few rainforest sites are known in northern N.S.W. and that this paucity of sites has not enabled a secure model of rainforest use to be constructed, it is clear that archaeological surveys are essential if this issue is to be addressed. The apparent low sensitivity of krasnozem ridges then does not preclude the need for archaeological surveys prior to large scale developments. Surveys should be required for such developments in areas not previously surveyed (i.e. Collins 1991: 34; 37; 41) until such time as it is securely established that these areas do in fact have little potential. Any in situ sites identified will be unique and as such will be archaeologically significant. All such sites should be retained intact.

4.3.12. Coastal Ridges Zone : Site list

Site No.	Site name	Situation	Shellfish species	Stone artefacts	Preservation status
North ocean shores					
Open campsites:					
4-2-54 Navin	N.O.S.15	Ridgeline	Cockle	54 artefacts 10 alluvial pebbles	Disturbed by road
4-2-55 Navin	N.O.S. 16	Ridgeline knoll		4 artefacts	Disturbed by road
4-2-56 Navin	N.O.S. 17	Lower spur	Pipi, cockle	32 artefacts	Disturbed by road
Andersons Hill					
Open campsites:					
Not yet listed Collins		Ridgeline		2 artefacts	Disturbed on cattle track
Byron Bay					
Open campsites:					
4-5-58 Gonda		Skinners Shoot Rd.		15 artefacts collected	Destroyed
Middens:					
4-5-59 Gonda		Skinners Shoot Rd.	Pipi	Flakes	Largely destroyed/ some in situ

4-5-60 Gonda	Skinners Shoot Rd.	Pipi		Destroyed
Not yet listed Collins	Skinners Shoot Rd.	Pipi		Part disturbed/ stratified (?)

Isolated artefact:

Not listed Collins	Skinners Shoot Rd.		Flaked pebble	On cattle track

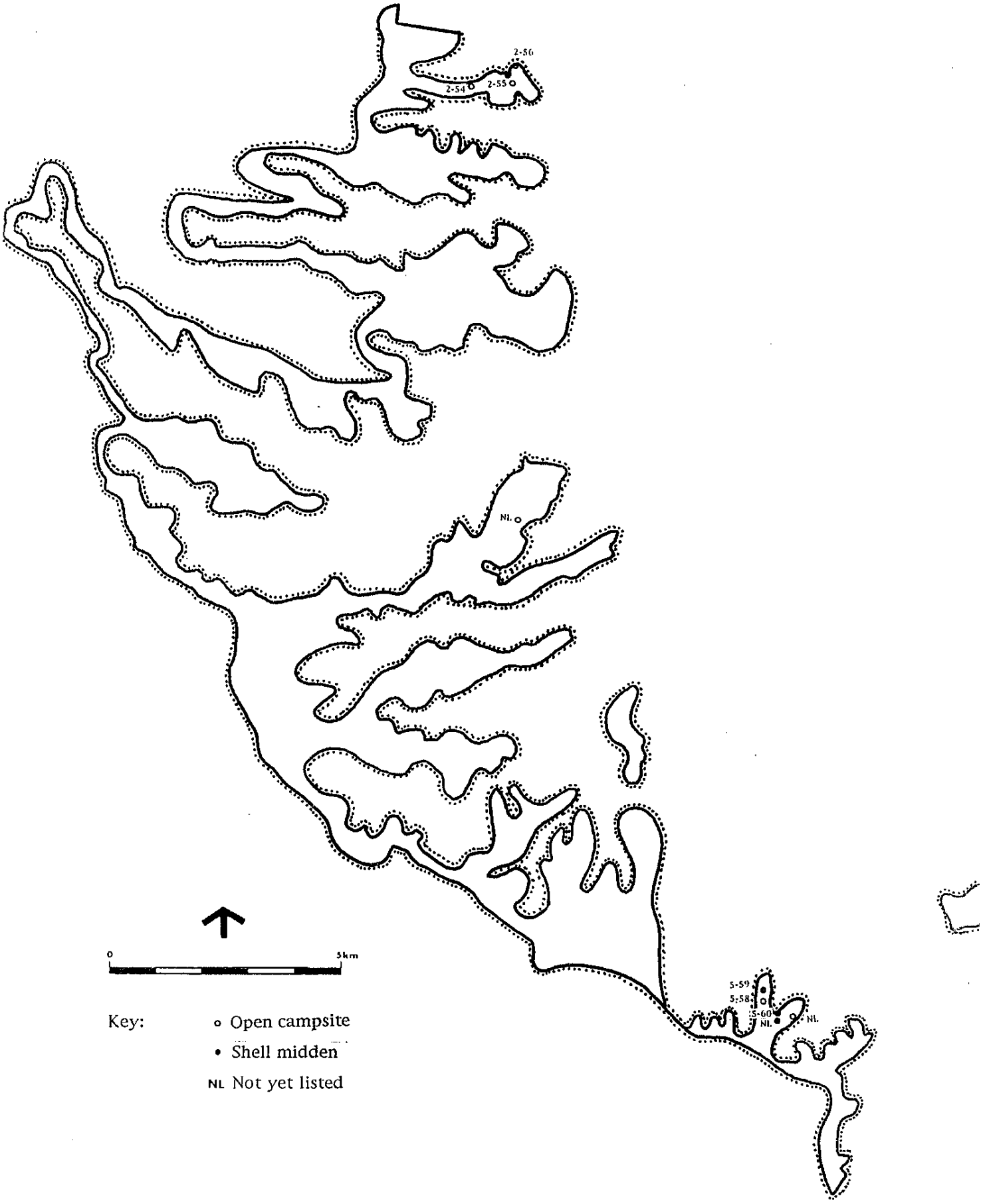


FIGURE 1 1 : Distribution of recorded Aboriginal sites in the coastal ridge zone of the Byron Shire

4.4. UNDULATING VOLCANIC PLATEAU ZONE

4.4.1. Definition

The Undulating Volcanic Plateau covers the south western portion of the Shire, extending from mountainous areas in the north to the coastal escarpment along its eastern margin (Fig. 12). Although not strictly part of the plateau, Broken Head has been included in this Zone due to its elevated undulating character and because of the prevalence of rainforest vegetation there. It forms the south easterly margin of the coastal escarpment.

The Plateau proper, which constitutes almost half of the Shire's area, is composed of acidic red-brown and red krasnozem soils which have developed from the decomposition of basalts from the Mount Warning shield. At Broken Head podzolic and cryptopodzolic soils are present, associated with the metamorphosed sediments of the Neranleigh-Fernvale Beds. The Plateau is variable in elevation, ranging from 30m. a.s.l. on river flats bordering the Wilsons River in the south west, to 300m. a.s.l. on its northern perimeter adjoining the Mountain Ridges and Valleys Zone. The Plateau is drained by tributaries which run south west into the Richmond River, while the many creeks present at Broken Head drain either south into North Creek or eastward into the ocean.

Today the Undulating Volcanic Plateau largely supports a thick carpet of pasture grasses interpsersed with extensive plantations of Macadamia nuts and exotic fruits. Camphor Laurel trees characteristically line creek margins and fencelines. At Broken Head wet sclerophyll woodland and pockets of sub-tropical rainforest occur, while littoral rainforest extends along the eastern margin of the area edging the ocean.

4.4.2. The prehistoric environment

Vegetation of this Zone has been radically altered since European settlement. The largest expanse of lowland sub-tropical rainforest in Australia once extended from a few kilometres east of Lismore to the edge of the coastal plain at Ballina and to the coastal ridges west of Byron Bay. From the ridges above Meerschum Vale in the south, it extended through Rous, Alstonville, Clunes and Bangalow to Goonengerry in the north. Known locally as the 'Big Scrub' this rainforest covered three quarters of the entire Mount Warning basalt flow at altitudes from sea level to c.300m., (Frith in Goldstein 1977:12). The first farmer settled in the Big Scrub in 1862 and by 1900 only 300ha. of its original 75,000 ha. remained (Ritchie & Pugh 1981:10).

Distribution of the Big Scrub coincided with the distribution of the krasnozem soils, covering the Undulating Volcanic Plateau Zone to the west of Broken Head (see Fig. 5). Evidence shows that pockets of grassland (Mitchell 1978:61) and scattered patches of sclerophyll forest (Baur 1962:7-9) occurred within the Big Scrub, though none have been reported within the Byron Shire.

Prehistoric vegetation at Broken Head, on the eastern margin of the Zone, comprised wet sclerophyll forest interspersed with remnant stands of sub-tropical rainforest (Gordon et. al. 1978:49). The eastern margin of the area still supports littoral rainforest.

4.4.3. Aboriginal food resources

Plant diversity in sub-tropical rainforests greatly exceeds that in any other environment within N.S.W. However, such forests lack dominance in any one species and there is characteristically only a small number of individuals belonging to any given species in any given area (Fedorov 1966:9; Richards 1952:3-4). It has been noted that such a distribution pattern would require that considerable movement be undertaken if people were to preferentially exploit particular plant foods (Harris 1978:118). Given that different species fruit at different times of year Byrne (1987:41) suggests that Aborigines may have found difficulty in efficiently extracting a reasonable quantity of fruit and seeds from the rainforest at any one time. On the other hand, roots of cunjevoi (*Alocasia macrorrhizos*) and lilies and fern rhizomes were edible and these may have been extensively distributed along rainforest margins or at the edges of tracks, clearings and watercourses, providing easy targets for systematic harvesting (ibid).

There are few mammalian species in the depth of rainforest. In the Big Scrub these were restricted to dingoes, pademelons, possums, bandicoots, mice and rodents. The neighbouring sclerophyll forests and the interface between the two forest types supports a much wider variety. Rainforest is, however, an important habitat for birds. The Big Scrub was noted for fruit pigeons, brush turkeys, lyrebirds, log runners, bower birds, riflebirds and many other smaller varieties (Frith n.d.). Of the faunal foods available to Aborigines within rainforest ethnographic accounts refer to the common inclusion in the diet of carpet and diamond pythons (*Morelia spilota variegata & M. spilota spilotes*), the red-necked pademelon (*Thylogale thetis*) and the brush turkey (*Alectura lathami*). Of these, evidence suggests that only pademelons, which inhabited the rainforest margins, were caught in large numbers (Byrne 1987:44).

Non-consumable rainforest resources were used extensively in the manufacture of material goods which depended heavily on wood, vines and bark fibres. Rainforests

provided various timbers used for making shields, clubs and spears, bark fibres for netting, grasses and reeds for basketry and Bangalow palm leaves used as water carriers. It also supplied the climbing vine which was kept carefully coiled and used for hunting tree animals and obtaining honey and birds eggs (Sullivan 1964:64).

A list of species reportedly exploited by Aborigines within the regions rainforests is provided in Table 2 below. Foods of the wet sclerophyll forests are listed in Section 4.2.3.

TABLE 2 : Aboriginal rainforest foods

Plant Foods:
(From Byrne 1987; Sullivan 1978)

Plant	Plant type	Edible part	Comment
Littoral rainforest			
AUSTROMYRTUS dulcia Midginberry	Shrub	Fruit	
PANDANUS pendiculatas Pandanus palm	Tree	Fruit	Sweet pulp obtained from lower part of fruit segments
STERCULIA quadrifida Peanut tree	Tree	Seed Root	Shiny black seeds in large red follicle Maiden (1889)-roots also eaten
Many species listed as belonging to sub-tropical rainforest also occur within littoral rainforests.			
Sub-tropical rainforest			
ACMENA brachyandra fruit Red apple	Tree	Fruit	Red with white firm fruit 2-4cm dia. with one large seed.
ACMENA hemilampra Broad-leaf lilly pilly	Tree	Fruit	White firm-fleshed berry 1-2cm dia. Lampert & Sanders (1971)
ACRONYCHIA paucifolia Soft Acronychia	Shrub	Fruit	White drupe 7-9mm red/black seed

ALOCASIA macrorrhizos Cunjevoi	Herb	Seeds Bulbs Shoots	Roots & seeds ground or roasted & laid in running water for several weeks to remove toxins. Then pounded into paste & roasted. Maiden (1889), Ainsworth n.d., Bundock (1898:3)
ARAUCARIA Cunninghamiana Hoop pine	Tree	Seed	Similar seed to Bunya nut of S.E. Qld
ARCHONTOPHOENIX cunninghamiana Bangalow palm		Leaves Shoots	Attenbrow (1976)
AUSTROMYRTUS dulcia Midginberry	Shrub	Fruit	
AUSTROMYRTUS fragrantissima Small-leaf myrtle		Shrub Fruit	Small orange/red berry
BLECHNUM cartilagineum Gristle fern	Fern	Rhizome	Attenbrow (1976)
BLECHNUM nudum Fish-bone fern	Fern	Rhizome	Attenbrow (1976)
BLECHNUM Wattsii Hard water fern	Fern	Rhizome	Attenbrow (1976)
BRACHYCHITON acerifolus Flame tree	Tree	Seed	Boat-shaped follicle with many seeds
CALAMUS muelleri Lawyer vine	Vine	Fruit	Round fruit 1cm dia. with acid fleshy layer set around seed.
CARISSA ovata Kunkerberry	Tree	Fruit	Purplish/black berry up to 1.5cm long, sweet flesh.
CASTANOSPERMUM australe Black bean Moreton-Bay chestnut	Tree	Seed	Pods 5x25cm with 2-5 large seeds. Maiden (1889)-called 'irtalie' by Richmond Aborigines leached, pounded & roasted (otherwise toxic)

CORDYLINE rubra Red-fruited palm lily	Lily	Root	
CYMBIDIUM madidum Banded cymbidium	Orchid	Pseudo-bulbs	Clumps of starchy pseudobulbs
DAVIDSONIA pruriens Davidson's plum	Tree	Fruit	Plum-like juicy purple flesh
DENDROBIUM speciosum King orchid	Orchid	Pseudo-bulbs	Grows on cliff faces & trees.Clumps of starchy pseudobulbs c.50cm long.
DENDROCNIDE excelsa Giant stinging tree	Tree	Fruit	Clusters of small fruit with juicy swollen stems.
DENDROCNIDE moroides Gympie nettle	Tree	Fruit	Clusters of small fruit.
DIOSCOREA transversa Native yam	Climber	Root	Starchy tuber,dug up with digging stick & eaten raw if young,otherwise roasted whole or made into bread. Ainsworth n.d.,West n.d.,Flick (1934)
DIPOGLOTTIS cambellii Native tamarind	Tree	Aril	Light brown capsule with 1-3 seeds in fleshy aril.
ELATOSTEMA reticulatum Smooth nettle	Herb	Leaf Stem	Thick-stemmed herb found along streams
EXOCARPUS latifolius Orange vine	Shrub	Fruit	Orange-red globose fruit. Maiden (1889)
FICUS fraseri Sandpaper fig	Tree	Fruit	Yellow-orange fruit 2cm long.
FICUS macrophylla Moreton-Bay fig	Tree	Fruit	Orange-purple fruit 2cm dia.
FICUS virens White fig	Tree	Fruit	Pink/brown or white fruit 1cm dia.

FLOYDIA praealta	Tree	Seed	Seeds 5cm diam.
GLEICHENIA dicarpa Coral fern	Fern	Rhizome	Attenbrow (1976)
HERICIUM clathroides Stalactite fungus	Fungus	Fungus	Whitish fungus to 15cm high, grows on wood.
LEPIRONIA articulata Giant sedge	Sedge	Stem	Forms dense stands along streams, underground stems edible.
LINOSPADIX monostachyus Walking stick palm	Palm	Fruit	Fleshy fruit up to 1cm dia. clustered along pendant spike.
MACADAMIA tetraphylla Macadamia nut	Tree	Nut	Simpson (1956)
MACROZAMIA spiralis Burrawong palm	Cycad	Seed	Roasted, pounded & leached (otherwise toxic). Simpson (1956).
MICROCITRUS australasica Finger lime	Shrub	Fruit	Lemon-like yellow/purple fruit 2-20cm long.
MACUNA gigantea Velvet bean	Climber	Seed	Maiden (1889)-eaten by Aborigines after preparation (otherwise toxic).
NYMPHAEA gigantea Waterlily	Lily	Tuber	Tuber was dived for & used to make bread. Flick (1934)
PASSIFLORA aurantia Blunt-leaf passionfruit	Climber	Fruit	Pale green oval fruit 4-5cm dia. with many black seeds in grey pulp.
PERSOONIA attenuata Scrub geebung	Shrub	Fruit	Small ovoid drupe (rainforest margin)
PHYSALIS minima Native gooseberry	Shrub	Fruit	Similar to introduced Cape gooseberry Maiden (1889)

PIPTURIS argenteus Native mulberry	Shrub	Fruit	Small white fruit 6mm dia. with sweet juicy flesh.
PLANCHONELLA chartacea Thin-leaf plum	Tree	Fruit	Blackish ovoid berry 2-2.5cm long.
PLOYPORUS mylittae Blackfellow's bread	Fungus	Fungus	Hard round underground tuber to 30cm dia. with hard white interior.
PORTULACA oleracea Pigweed	Herb	Seed	Large quantities of very small seeds.
PSYCHOTRIA simmondsiana Small psychotria	Shrub	Fruit	Pale yellow drupe 6mm. diameter.
PTERIS tremula Tender bracken	Fern	Rhizome	Attenbrow (1976)
RAPANEA subsessilis Red muttonwood	Shrub	Fruit	Dense clusters of berries with single seed surruonded by fresh.
SYZYGIUM moorei Rose apple	Tree	Fruit	Round fruit 5cm dia. Maiden (1889)-Aboriginal name 'durobbi'.
TYPHONIUM brownii Purple arum lily	Lily	Stem	Starchy tuberous stem.Maiden (1889) Preparation as for conjevoi (toxic).
URTICA incisa Scrub nettle	Scrambler	Leaf Shoot	Leaves up to 10cm long.
VITUS hyperglaucia	Scrambler	Fruit	Simpson (1956).

Faunal foods:

(From Sullivan 1978:110-111)

Food	Equipment	Method	Season & environment	Remarks	Reference
Possum	Climbing vine	Tree climbed using vine to secure the climber & an axe to cut footholes	Rainforest	Bundock n.d. Dawson 1935:22	Graham 1929 Flick 1934:2
Flying fox		In wet weather the tree bearing them was cut down	Wet weather; rainforest	As many as could be carried were gathered	Bundock 1898:5
	Boomerang or club	Knocked out of tree	Dry weather		Ainsworth n.d.
Carpet snake					Bundock 1898:3 Graham 1929 Barling 1953:2 Moehead 1922:2 West n.d.:3
Earthworms					Simpson 1956
Wallaby Pademelon	Nets/dogs	Long sections 4' wide were joined & extended half a mile in a semi-circle. Animals were run into this.	Rainforest	Immense quantities of food..secured	Ainsworth n.d.
Bandicoot	Nets/dogs	As above	Rainforest	Immense quantities of food..secured	Ainsworth n.d. Bray 1901:9 Graham 1929 Bundock 1898
Rat Kangaroo					Bundock 1898

Marsupials	Men drove animals toward the women, children & some dogs who killed them.	Rainforest	Enough food was obtained in such a drive to supply two tribes for a week.	Ainsworth n.d.
Birds/ eggs	Boomerang			Bundock 1898:2 Flick 1934:2,4 West n.d.:2
Scrub turkey/ eggs		Rainforest		Kirkwood 1924 Bray 1901:9

4.4.4. Archaeological context

As early as 1889 it was noted that a discrete Aboriginal population inhabited the tropical rainforests of north east Queensland and that these people possessed a distinctive 'rainforest culture' (Lumholtz 1980:113; Roth 1901-1910; Meston 1889). Elements of this culture included a heavy reliance on toxic food plants and a specialised processing technology to exploit them, and specialised material culture items such as long flat 'swords', large shields, bicornual baskets, bark blankets, waterproof huts and pitted nut processing stones (ibid). The 12 tribes represented by these people are the only ones to have permanently resided within the Australian rainforest ecosystem (Tindale & Birdsell 1941), though it is known that these groups also had access to adjoining environmental zones (Harris 1978).

Archaeological excavation in the Cairns tropical rainforest at Jiyer Cave (Horsfall 1983) revealed a low-intensity occupation dating to around 2,000 years BP, followed by deposits dating to the post-contact period. Shells of yellow and black walnut, which require leaching and roasting to remove toxins, were present throughout, though they occurred with greatest density in post-contact layers. Stone artefacts made on locally available raw materials were present throughout the deposits and bones (from python, lizard, water dragon and possum) were present in upper layers only (Horsfall 1983:173-174). Synthesising ethnohistoric, anthropological and archaeological evidence from north east Queensland, Horsfall (1984) presents an hypothesis for an early occupation of tropical rainforest at low population densities. At some later time population densities increased, the exploitation of rainforest resources intensified and toxic plant processing techniques were increasingly utilised (ibid:169).

Closer to the Byron Shire, archaeological sites, mostly rockshelters, have been found both within present distributions of sub-tropical rainforest and within cleared areas which supported such forests in prehistory. Of the known sites only two have been excavated. Both are located in south east Queensland.

Bushrangers Cave is a large rhyolite rockshelter located at the base of the cliffline on the eastern edge of the Lamington Plateau. Sub-tropical rainforest occurs above the cliffline on the plateau and directly around the site, though the site itself is considered to be located on the rainforest 'edge' (Hall 1986:91). At this site analyses of cultural materials document a fairly uniform cultural pattern over a period spanning from 6,200 years ago to relatively recent times. A wide range of fauna is represented at the site including pademelons, carpet pythons, *Rattus fuscipes*, bandicoots and brush turkey egg shells. Hall suggests that the early Holocene occupation of the site may be related to an increase in population density at that time in the Moreton Bay region (ibid:100).

Excavation conducted at Bishops Peak rockshelter, a rainforest site on the western margin of the Lamington Plateau, yielded a basal date of 2620 +/-80 BP for the cultural layers (Edmonds 1986). The analysis of technological and morphological features of the stone artefacts showed little change in manufacturing processes through time and the majority of artefacts were made on locally available materials. Discard rates, however, steadily increased to peak between 1650 and 1100 years ago, declining again after this. The fauna identified at the site shows that the species commonly exploited resided in the rainforest and adjoining wet sclerophyll forest (ibid:91). Pademelon was the most consistently represented species at the site (ibid:87).

4.4.5. Site types in the Undulating Volcanic Plateau Zone

4.4.5.i. Open campsites

Despite survey of rainforested areas within State Forests of northern N.S.W., only a single isolated stone artefact has been recorded in a non-shelter situation. This artefact was found on a track close to a creek in the upper Richmond Range (#3-6-25, N.P.W.S. site file). The only other known open rainforest site was recorded during limited surveys undertaken for the present study. This consisted of three stone artefacts which were found on and beside a walking track within the Booyong Nature Reserve on a terrace beside the Wilsons River. The presence of such sites shows that rainforests were penetrated and exploited by Aborigines, although possibly at a very low level.

A much larger concentration of open campsites (stone artefact scatters) has been recorded in wet sclerophyll forests bordering rainforested areas, suggesting that rainforests may have been generally exploited from camps located close to, but not within them (e.g. Byrne 1987; McIntyre 1984). These sites have been located on creek flats and on flat sections along the spines of ridges and spurs. A similar distribution of open campsites has been recorded at Broken Head where seven have been recorded. Six of these sites are located on creek flats, while the other is located on the crest of a hill overlooking coastal flats (Collins 1990). Six of the Broken Head sites are located within former wet sclerophyll forest and are within easy reach of remnant pockets of sub-tropical rainforest. The remaining site is located within littoral rainforest close to the coastline (#4-5-38).

4.4.5.ii. Rockshelters

Three rockshelters with evidence of occupation have been recorded within the rainforests of northern N.S.W. The first of these is reportedly located on Mount Warning (Byrne 1987:67), while the others are at Terania Creek (#4-4-27 & #4-4-30). Several additional shelters have been recorded at Terania Creek but they are devoid of cultural materials.

Similar to open campsites, rockshelter sites have also been recorded within wet sclerophyll forest close to rainforest margins (ibid:66-67) and it is likely that rainforest exploitation was undertaken from such bases.

Although no rockshelters have been recorded within the Zone, several do occur along the coastal escarpment between the base of Hayters Hill to Suffolk Park. Several of these have been inspected (Collins 1991:42 and fieldwork for present study) but none have been found to contain evidence of Aboriginal occupation. Those inspected are small and are thus considered to have limited occupation potential.

4.4.5.iii. Burials

One burial (#4-5-39) has been recorded for the Zone. Though no information is held on file for this site, grid references place it close to the coastline within a littoral rainforested gully at Broken Head. No burials have been reported on the knasnozem soils, though they may be present.

According to an early account bodies were generally tied into a small bundle and buried upright in a small 3' deep hole before being covered over with earth, sticks and stones (Bray 1923; Currie 1925). Cemeteries are said to have been located on the

hillsides where rains would wash away the earth, leaving the skeletons exposed. One such cemetery is said to have been located at Bexhill, west of the Byron Shire (Bray 1923).

An account of an Aboriginal funeral near Lismore in 1860, however, indicates that not all disposal of the dead involved primary interrment. Here the body was reportedly placed in the fork of a rainforest tree around 12' from the ground and a canopy of branches was built to cover the head (Smith 1973).

4.4.5.iv. Stone arrangements

Two stone arrangement sites are known from the rainforests of northern N.S.W.

The first of these, which seems to have been destroyed, stood on the western slopes of Mount Warning (#13-1-90). It reportedly consisted of two low cairns of basalt boulders aligned side by side on a flat ridgeside 'bench'. A second group (number unknown) of cairns was apparently located c.3m. away from these (Byrne 1987:67).
The second stone arrangement is within the Byron Shire (#4-4-32) and is morphologically different from that described above. It consists of a single horseshoe-shaped cairn of basalt boulders located within a remnant stand of sub-tropical rainforest on a hillside near Bangalow. Given that the site is indeed of Aboriginal, it is likely to have been used for ceremonial purposes and shows that Aborigines penetrated the rainforest for a considerable distance to undertake such pursuits.

4.4.6. Archaeological surveys in the Byron Shire

The only survey to be conducted on the krasnozem soil area of the Undulating Volcanic Plateau Zone was recently undertaken by S.J. Davies who surveyed a 3m. wide corridor across the plateau along the route of a proposed Telecom fibre optic cable. Although the report on the work is not yet available the survey was conducted with the assistance of Artie Ferguson of the Jali Local Aboriginal Land Council. Mr. Ferguson reports that no archaeological sites were located (A. Ferguson pers. comm.).

A sample survey conducted at Broken Head on the eastern margin of the Zone resulted in the recording of six open scatters of stone artefacts (61 artefacts in all) and an isolated artefact (Collins 1990). All were found within areas which would have once supported wet sclerophyll vegetation and were within easy reach of rainforest pockets. Although a range of raw stone material types were present at these sites, quartz, available in the immediate environment, was the dominant material used. All

but one site was located on flats close to creeks where erosion had provided surface visibility. The remaining site had been exposed on a hill crest during surface grading.

Appleton (1992) surveyed a 68ha. area at Broken Head which included a small part of that previously surveyed by Collins (1990). Vegetation in the area was dominated by wet sclerophyll forest and ribbon rainforest was present along creek banks. No cultural materials were found during survey (Appleton 1992:2).

4.4.7. Impacts on the archaeological resource of the Undulating Volcanic Plateau Zone

Given the widespread and intensive nature of land clearance which has been undertaken on the plateau since the time of first European settlement it is likely that the archaeological resource of the area has already been severely depleted. The extensive system of roads present on the plateau characteristically follows expedient routes provided by the ridgelines. As it is likely that Aboriginal transit corridors across the plateau also followed the most expedient routes is seems likely that few sites along them will have survived European impact.

Fruit and nut plantations are also located on extensive sections of the plateau, including ridgelines, and houses and their related infrastructure are generally present on crests. Although plantations rarely extend onto creek flats it is likely that their future expansion poses the most immediate threat to the remaining archaeological resource of the krasnozem plateau, while low intensity urban development planned for Broken Head will impact the resource in that locality.

4.4.8. Trends in site location

Given that only one small open campsite (the Booyong Nature Reserve artefact scatter) and a stone arrangement have been recorded within the Big Scrub no secure trends in site location can be identified. Both of the recorded sites are within remnant pockets of rainforest which have been spared the major disturbance experienced elsewhere. In addition, no systematic archaeological surveys have been conducted on the plateau and any trends identified through the distribution of known sites are thus extremely tentative.

It should be pointed out, however, that the open campsite is located on flats close to the Wilsons River and the stone arrangement site is located on a hillside above Byron Creek, a tributary of the Wilsons River. Both of these sites could, therefore, have been

accessed by groups travelling along the river system within the rainforest. It is tempting to propose a model whereby access to these sites was gained from the Lismore locality via grasslands which stretched south and east of Lismore and from there along Macleans Ridges which supported sclerophyll forest in the midst of the Big Scrub (see Jeans 1991:17 for vegetation reconstruction of this area). These comparatively open ridges meet Pearces Creek 12km. south of its confluence with the Wilsons River at Booyong. Travel to Booyong along any route would have entailed a minimum of 10 kilometre's walk through the Big Scrub.

Sites at Broken Head follow a distribution pattern similar to that identified in other wet sclerophyll areas, being located on creek flats and ridgelines. Unlike the sites recorded on the Coastal Ridges, however, the vast majority of sites at Broken Head are found on creek flats. It is likely that this distribution is attributable to a separate pattern of landuse. Sites along the spines of Coastal Ridges are likely to be documenting movement corridors rather than exploitation patterns, while creek flat sites at Broken Head appear to be documenting exploitation patterns rather than transit routes.

4.4.9. Aboriginal landuse model for the Undulating Volcanic Plateau

Although very few rainforest sites have been recorded in northern N.S.W. ethnohistorical sources clearly show that Aborigines both passed through the Big Scrub and exploited its resources. The extent of this use, however, is yet to be established. Table 3 provides a list of early accounts which testify to the use of the rainforests. These suggest that camps made on the plateau were located in grassy clearings rather than within the rainforest itself. Corroborees also appear to have been held in such clearings. Leycester (1880) describes movement through rainforest via ridgelines ("along the top of the Nightcap Range") following routes which were known and used often enough for grassy clearings along them to be maintained. Other accounts relate Aborigines penetrating the edge of the rainforest in order to engage in co-operative pademelon drives (e.g. Flick n.d.). The only rainforest foods described as being eaten in any great quantity are padmelons (Petrie [1932:86] saw Aborigines catch ".. over 20 pademelons in their nets at one trial" within gallery rainforests at Moreton Bay), flying foxes (during summer months thousands of flying foxes camped in the scrub- "....the blacks used to catch great numbers, almost living entirely on them now and then" [Petrie 1932:186]), cunjevoi (on the Macleay, Henderson [1851:142] comments that ".....the blacks consume [the root] in great quantities") and yams (on the Macleay it is said to have been the principal vegetable food obtained from the 'brush' [Hodgkinson 1845:225]). Of these, both pademelons and cunjevoi most commonly occur along rainforest margins.

TABLE 3 : Ethnohistorical accounts relating to Aboriginal use of rainforests in the Richmond River region.

(information from Byrne 1987:Table 3)

Encounters and associations

Type	Reference	Details
General	Flick n.d.	Grassed clearings three-parts surrounded by trees were chosen for corroborees. [In Big Scrub ?]
Specific	Flick n.d.	A big fight was held on the site of the Lismore racecourse- a grassed flat. [Close to,if not within, the Big Scrub]
Specific	Flick n.d.	Following a big fight Aborigines hunted pademelons on the slopes of a rainforested hill overlooking a grassed flat.
Specific	Leycester 1880	Accompanied (guided ?) by Aborigines on a journey along the top of the Nightcap Range. [Traversed rainforests and camped in rainforest clearings]
Definite	Simpson n.d.	Uralba area.Just upstream from the Duck creek bridge is where Aborigines gathered for corroborees.
Definite	Ainsworth 1922:29	Hunting drives with nets in the rainforests of the Ballina area.

Hunting

Animal	Reference	Details
Pademelon	Leycester 1880	Aborigines accompanying Leycester while camping in rainforests of Nightcap Range.
Pademelon	Ainsworth 1922:29	General reference to the use of long nets for hunting drives in rainforest. Pademelons and other animals were caught with the assistance of dogs.
	Flick n.d.	After a big fight a pademelon hunt was carried out on the slope of a hill behind Lismore, in the Big Scrub."This big party penetrated the thick scrub in single file and encircled about 200-300 acres. The women and children and some of the many dogs were left on the flat to kill and slaughter the wallabies as they were hunted out of the scrub".
Brush turkey	Leycester 1880	Aborigines accompanying over Nightcap Ranges with 2 brush turkeys on one occasion and 3 on another as part of their 'bag'.
Carpet python	Leycester 1880	An Aboriginal woman in Leycester's party killed a nine foot carpet snake as they were travelling.
Possum	Leycester 1880	Aborigines in his party obtained 2 possums while camped in a rainforest clearing in the Nightcap Ranges.

Bandicoot	Ainsworth 1922:29	Bandicoots were among the animals caught by Aborigines in the Ballina rainforests [Big Scrub] using long nets.
Lizard	Ainsworth 1922	'Iguanas' were among the animals caught by Aborigines in the Ballina rainforests [Big Scrub] using long nets.
Pigeons	Leycester 1880	Aborigines in his party obtained 5 pigeons while camped in a rainforest clearing in the Nightcap Ranges.

Gathering

Plant	Reference	Details
Blackbean	Oakes 1982	Blackbean seeds were crushed, roasted and leached in string bags in running water for several weeks.
Cunjevoi	Oakes 1982	The root was crushed, roasted and leached in string bags for several weeks.
Yam	Leycester 1880	Yams were collected and cooked each day by Aboriginal women in his party while on expedition through the Nightcap Ranges.
	Ainsworth 1922:29	Yams were obtainable in the scrubs. They grew to 2 feet in length by one to two inches diameter.

Other products

Object	Raw material	Reference	Details
Body oil	Carpet snake fat	Leycester 1880	A woman used lumps of fat from a carpet snake she had caught to oil her body.
Water vessels	Bangalow palm leaf	Flick n.d.	Bangalow palm leaf with the ends turned in and fastened securely to a stick across the top was used or carrying water and honey.
Fish nets	Stinging tree bark	Ainsworth 1922	Cordage for fishing nets made from the inside bark of the stinging tree.
Hunting nets	Stinging tree bark	Ainsworth 1922	Hunting nets similar to those used for fishing were made from the inside bark of the stinging tree. These were up to half a mile long.
Dilly bags	Stinging tree bark	Flick n.d.	Net bags were made from stinging tree bark.
Climbing vine	Vine	Calley 1957:212	A young man walked out of camp into the bush"...trailing his climbing vine behind him." [a Bundjalung legend]
Honey cloth	Stringing tree bark	Flick n.d.	Cloth made from the inside bark of the stinging tree was used for wiping up honey. The bark was pounded till it resembled cloth.

Fire-lighter	Fungus	Calley 1957:168	"..a fungus from the boles of rainforest trees, dried and pulverised, was used as tinder".
Drum	Booyong buttress	Flick n.d.	Aborigines 'spoke to each other' by drumming on the spurs of the boyong (sic.) tree.
Apparel	Lawyer vine	flick n.d.	Necklets were made from lawyer vines.
	Ferns & mosses	Flick n.d.	Flick observed a corroboree in the vicinity of the Big Scrub where women were clad in "..varying wild dresses made from ferns & mosses. Grotesquely carved logs representing animals were "..relieved with branches of fern & moss.."
Clubs	Midginbil palm	Simpson n.d.:9	Used for making nulla nullas.

Firing of

Context	Reference	Details
Inside	Leycester 1880	Nightcap Range."..it was a small prairie on a bald hill, surrounded by brush..". This grassed hilltop was "..replete with every comfort a bush camp in Australia can afford, that of grass, water, and game, in abundance of the best kind." This place had an Aboriginal name- "Byangully" [this suggests that the camp had been used previously by Aborigines]
Inside	Leycester 1880	Nightcap Range. Leycester & Aboriginal companions also camped on 'Tanning Mountain'- "The mountain had a table top covered with fine grass, and studded over with a beautiful species of palm tree, called by the Aborigines 'Tanning', its sides were covered with dense brush, containing cedar and pines of gigantic size." [the fact that the place had an Aboriginal name suggests that it had previously been used as a campsite]
Edge/inside	Mitchell 1978:130	In the 1860's there was a camp on the west bank of the Richmond near Tucki Tucki, sited in a break in the galley forest.

Neither data on available rainforest foods nor that gained through recourse to the ethnohistoric literature would suggest that Aborigines habitually camped within the northern N.S.W. rainforests. Plant foods were scattered, only a limited number of small game species was available and the general dampness of the forest floor would have made camping uncomfortable. One report claims that in the Macpherson Ranges Aborigines rarely penetrated more than a loud calling distance into the rainforest and

always came down each night (Groom 1949:100,125). The Big Scrub was large and its core area would have been outside the daily range of foraging groups based on its margins. Exploitation of core areas would thus have required camping within the forest itself (Mitchell 1978:132) and it has been suggested that clearings within the rainforest were used for such camps (ibid:32-33; Byrne 1987:52).

At the time of European contact the Big Scrub is known to have contained numerous patches of sclerophyll forest and 'grasses' (e.g. see Jeans 1991:17). These patches, which may have initially resulted from cyclone devastation of limited areas, could have been maintained and extended by regular Aboriginal firing (Byrne 1987:53; Mitchell 1978:133). Leycester (1880) has described the use of two such clearings by Aborigines in the Nightcap Ranges. The maintenance of rainforest clearings, while providing suitable camping locations, would also have encouraged the development of a mosaic pattern of vegetation with a greater length of rainforest fringes. Given that the fringes are the most productive parts of the rainforest, being the favoured habitat of both pademelons and cunjevoi, there would have been a distinct ecomonic advantage in the maintenance of clearings.

Evidence also suggests that transit corridors existed within the rainforest. Wyrallah people, for example, are said to have gone to the beaches via the Wollongbar hills (Bray 1923). While part of this route is likely to have entailed travel through the sclerophyll forests along McLeans Ridges, it would also have required a lengthy traverse of the rainforest (See Jeans 1991:17). In the tropical rainforests of south east Cape York over 500km. of Aboriginal pathways have been mapped (McCracken 1989:103). These paths were used during the course of resource exploitation and as routes to social gatherings or tribal meetings. Aborigines are said to have kept these tracks open by breaking young saplings over at hip height and by cutting off vines and lawyer cane (ibid). As Mitchell (1978:59) notes, mature rainforest is not difficult to penetrate although travel can be slow, given the presence of slippery clay soil, damp falled logs and branches, and basalt floaters. Where formal pathways like those described by McCracken existed, however, movement through rainforest could have been quickly and expediently undertaken.

Although the paucity of known Big Scrub sites is likely to be attributable to the fact that no systematic archaeological surveys have been undertaken there, present evidence supports the lowland rainforest model proposed by Mitchell (1978) and Byrne (1987). Both of these writers see rainforest products as being scheduled within the mainstream economy, with most rainforest exploitation occurring from major campsites located close to the productive rainforest margins in adjoining ecosystems. Campsites are also likely to have been situated in rainforest clearings. These are likely

to have been used as bases for the exploitation of core areas beyond the daily foraging range of margin sites and as 'staging camps' for transit through the forests (ibid :55). Although site distributions are insufficient to support such a contention, it seems likely that movement corridors existed along ridgelines and major creeks and rivers and that these would have taken the form of formal tracks which were maintained and cleared to facilitate rapid travel.

4.4.10. Predictive model for archaeological sites

While data is insufficient to enable any predictions of site density within rainforest to be made, it is likely that densities will be generally lower than those present in other ecosystems.

Given the predicted low level of use of rainforest environments, the extensive vegetation clearance which has occurred, and the high degree of surface cover present over the whole of the krasnozem plateau, sites will be very difficult to find during archaeological survey. It is predicted that undiscovered sites on the plateau will consist of open campsites (evidenced by small surface artefact scatters) and isolated stone artefacts and that these will occur on terraces along major rivers and creeks. It is likely that such sites will only be detectable on erosion surfaces and that they will be concentrated in rainforest remnants which have been spared major European impact. It is also possible that small scatters of stone artefacts and isolated artefacts may be present along ridgelines, though many former sites will have been destroyed by roadworks.

It is further predicted that exploitation bases, evidenced by surface and possibly stratified stone artefacts, will coincide with the location of former pockets of grassland and/or sclerophyll forest. Although no such pockets have been recorded within the rainforests of the Byron Shire (Fig. 5), no secure reconstruction of prehistoric vegetation regimes from early surveyors records has been attempted (see Section 2.4). It is thus possible that such pockets did exist but until their location is mapped, no likely locations for core rainforest campsites can be established. It should be noted here that there is one locality, known as Peter's Grass, which comprises a small knoll at Montecollum near the north east margin of the plateau. This is likely to have been a grassed rainforest pocket and as such may have been maintained and used by Aborigines.

At Broken Head, where small open campsites have been recorded on creek flats, it is likely that additional sites, which are presently masked by surface vegetation, will be found in similar contexts.

4.4.11. Management recommendations

As has been established, few sites are known from the Undulating Volcanic Plateau Zone. It is likely that a low density of cultural materials was discarded within the rainforests and it it can be expected that most of these will have been either disturbed or destroyed through extensive land clearance and cultivation.

Although it is unlikely that many sites survive on the plateau it is important that those which do exist are identified and protected before they are lost. The two recorded sites are unique and should be retained intact.

The open campsite lies within the Booyong Nature Reserve and as such is already in a protected context. The stone arrangement (#4-4-32), on the other hand, is on private property and may therefore be threatened by future development. It is desirable that the rainforest remnant within which the arrangement is situated be fenced and annually monitored by the National Parks and Wildlife Service. Goats are currently run on the property and it therefore possible that both the arrangement itself and its protective rainforest pocket are being degraded by the animals. The condition of the stone arrangement could not be ascertained during this study as the owner advised that access was not possible until February 1993.

The site potential of the krasnozem plateau is assessed as low and is seen as insufficient to justify archaeological survey and assessment for small-scale development projects. Given, however, that the plateau is virtually an archaeological blank it is considered that the apparent low distribution of sites can only be confirmed or refuted through systematic survey work. On this basis it is recommended that archaeological surveys be required for large-scale development projects. Given the general lack of surface visibility it is likely that such surveys will also need to include sub-surface investigation designed to establish the presence or absence of sites in those areas deemed to be most archaeologically sensitive (i.e. ridgelines and river/creek terraces). Where in situ sites are identified they should be retained intact.

Collins (1990:51-57) provides management recommendations for sites at Broken Head and these recommendations should be followed.

4.4.12. Undulating Volcanic Plateau Zone : Site list

Site No.	Site name	Situation	Stone artefacts	Preservation status
Broken Head				
Open campsites:				
4-5-38 Oakes	Broken Head	Within Nature Reserve	Unknown	Unknown
4-5-79 Collins	B.H.5	Hill crest	17 artefacts	Disturbed & displaced
4-5-80 Collins	B.H.6	Creek bank	20 quartz artefacts	Disturbed by wash
4-5-81 Collins	B.H.7	Slope near creek	9 artefacts	Disturbed by road
4-5-82 Collins	B.H.9	Quartz outcrop near ck.	4 artefacts	Disturbed by road
4-5-83 Collins	B.H.10	Creek flat	4 artefacts	On eroded patch
4-5-84 Collins	B.H.11	Near creek bank	7 artefacts	On eroded patch
Burial:				
4-5-39 Thorpe	Broken Head	Close to beach		Unknown

Bangalow

Open campsite:

Not yet listed Collins	Booyong Nat. Res.	River flat	3 artefacts	Exposed on track

Stone arrangement:

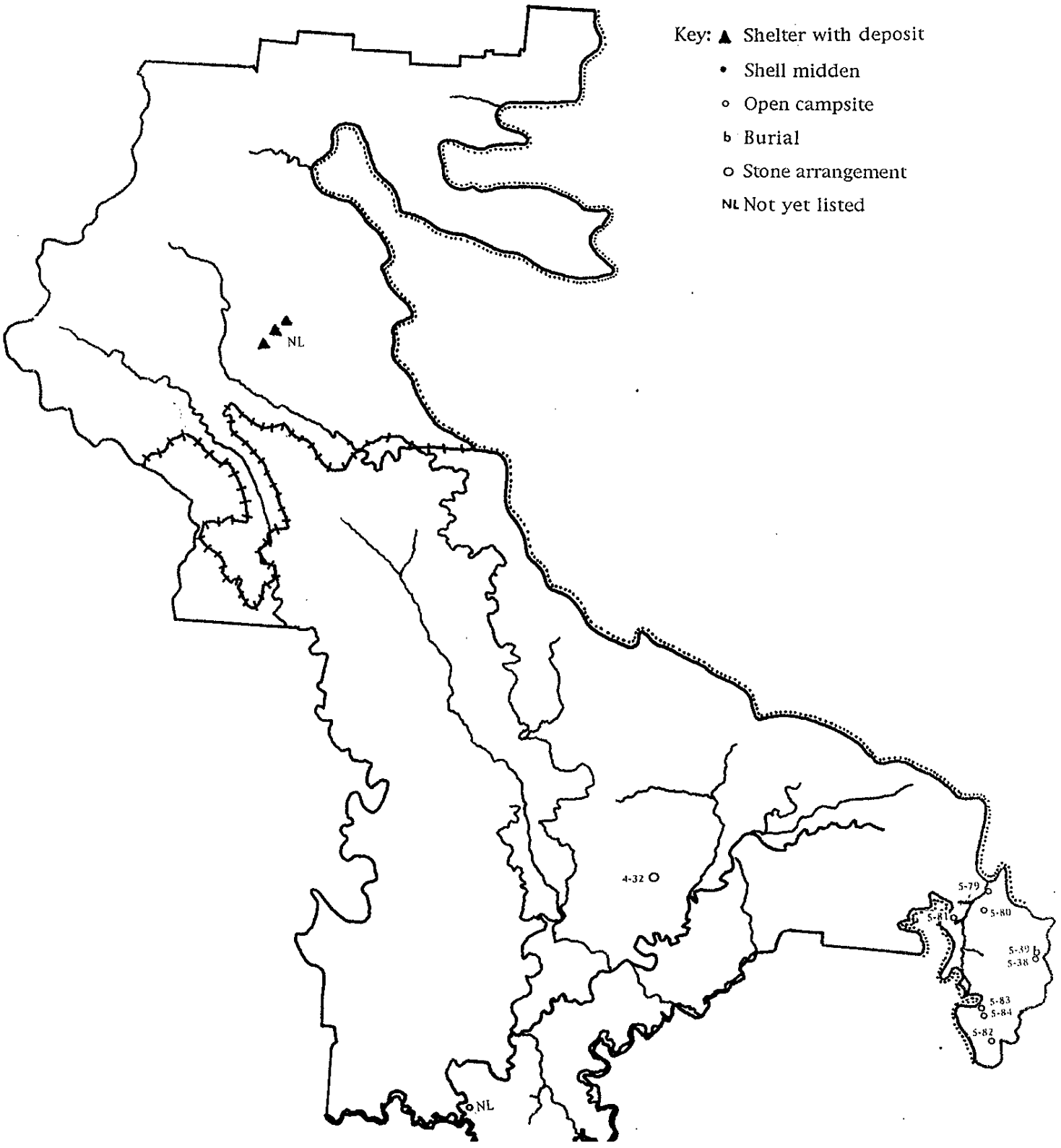
4-4-32 Donnelly	Possum Ck.	Hill slope	Single cairn	Extant within rainforest pocket

FIGURE 12 :

Distribution of recorded Aboriginal sites in the 'undulating volcanic plateau' and the 'mountain ridges and valleys' zones of the Byron Shire

*Note: All N.P.W.S. site numbers have prefix 4-

= zone interface



4.5. MOUNTAIN RIDGES AND VALLEYS ZONE

4.5.1. Definition

The Mountain Ridges and Valleys Zone adjoins the northern perimeter of the volcanic plateau, covering the north western section of the Shire (Fig. 12). Ranging from 300m. a.s.l. up to 810m. a.s.l. at Jerusalem Mountain, the Zone is characterised by a series of precipitous and narrow eastward trending ridges which are deeply incised by the upper tracts of Coopers Creek and the Brunswick and Wilsons Rivers. Much of the Zone falls within the Nullum and Whian Whian State Forests and as such is excluded from the current study. Ridges generally consist of a high rocky escarpment with steeply inclined footslopes falling to the valleys. Valley watercourses contain volcanic boulders and cobbles and outcrops of Chillingham Volcanics occur along their banks.

The lower sections of the Mountain Ridges generally support wet sclerohpyll forest, while dry sclerophyll forests are present along the ridge spines and in exposed south-easterly locations. In the Valley bottoms ribbon rainforest occurs along waterways and disturbed areas have been invaded by lantana (*Lanatana camara*).

4.5.2. The prehistoric environment

Although timber has been harvested from the State Forests and relatively intensive residential settlement has occurred within the Valleys, the present vegetation pattern is not likely to radically differ from that present prior to European settlement. Land clearance has occurred along the eastern margin of the area where cattle graze on footslopes and where banana plantations extend upslope to the escarpment. Overall, the zone retains its pre-European character.

4.5.3. Aboriginal food resources

Sclerophyll forests are known to provide the most productive habitat for large and medium-sized marsupials and many of those present are likely to have been exploited by Aborigines. The following list is a selection of those which are likely to have been used.

Mammals: Eastern grey kangaroo (*Macropus giganteus*)
Red-necked Wallaby (*Macropus rufogriseus*)
Black Wallaby (*Wallabia bicolor*)

Koala (*Phascolarctos cinereus*)
Brush-tailed Possum (*Tricosurus vulpecula*)
Flying squirrel (*Schoinobates volans, Petaurus breviceps*)
Short-beaked Echidna (*Tachyglossus aculeatus*)
Bandicoot (*Perameles nasuta, Isoodon* sp.)
Bush Rat (*Rattus fuscipes*)

Reptiles: Bearded Dragon (*Amphibolurus barbatus*)
Diamond python (*Morelia spilotes*)
Blue-tongued Lizard (*Tiliqua scincoides*)
Lace Monitor (*Varanus varius*)

Birds: Cockatoo (*Calyptorhynchus* sp., *Catactua* sp.)
Parrots (*Trichoglossus chlorolepidotus, Alisterus scapularis, Platycercus elegans, Platycercus eximius*)

Plants: Wattle (*Acacia* spp.)- Seeds and pods
Burrawong (*Macrozamia communis*)- Seeds
Bracken (*Pteridium esculentum*)- Root

Other: Honey
Grass tree (*Xanthorrhoea* sp.)- Hafting resin

4.5.4. Archaeological context

Although the central Queensland Highlands are known to have been occupied since the Pleistocene (e.g. Kennif Cave, excavated by Mulvaney [1975:288] gave a basal date of 19,000 BP), uplands sites along the east coast have all yielded Holocene dates. Evidence suggests that this Zone was only used to any extent after the sea reached its present level, effectively halving the distance between the mountains and the coastline.

At Brooyar Rockshelter, a site situated in sclerophyll forest of the Gympie (Qld) hinterland, a basal occupation date of 2,762 BP was obtained (McNiven 1988:139). At this site macropods appear to have conrtibuted most to the diet and only a minimal input was gained by vegetable foods. On this basis McNiven interprets the site as small, emphemeral, specialised 'residential base camp' or a specialised mammal hunting transit field camp. Food remains from Brooyar Rockshelter are seen to represent a very small component of the annual cycle of an Aboriginal group (ibid:151). In contrast, specialised marine exploitation of the Cooloola coastline, 50km. east of

Brooyar, dates to within the past 1,000 years (McNiven 1988b; 1990). This has led McNiven to conclude that specialised subsistence strategies were initiated in the area during the late Holocene (McNiven 1988:154).

Excavations described in Section 4.4.4. at Bushrangers Cave (Hall 1986) and Bishops Peak (Edmonds 1986) as well as at Gatton Rockshelter (Morwood 1986) in the mountainous hinterland of south east Queensland are in general agreement with results from Brooyar Rockshelter. A common feature of these sites is the exploitation of food resources from wet sclerophyll/rainforest-open forest ecotones with activities focussed upon the hunting of wallabies and pademelons (McNiven 1988:153).

Until archaeological excavations are undertaken in the northern N.S.W. mountainous hinterland, however, few inferences concerning the articulation of coastal and uplands economies can be made. It is presently unclear whether sites in the Mountain Ridges and Valleys Zone are seasonal complements of those located on the coastline and coastal lowlands or whether they represent integrated components in the exploitation activities of groups solely confined to the hinterland. Given that pipi shells were visible on the surface at two rockshelter sites recorded during the present investigation (1 individual at each site) there is some evidence to support a coastal-inland model of exploitation.

4.5.5. Site types in the Mountain Ridges and Valleys Zone

4.5.5.i. Rockshelters

Prior to the present investigation no sites had been recorded for this Zone within the Byron Shire. During limited field surveys conducted on the Koonyum Range three shelters with deposit were recorded. All are located on the western perimeter of the range within the Nullum State Forest, occurring at the base of the escarpment on the 450m. contour line.

The escarpment itself is composed of Lamingtom Volcanics which overlay conglomerates in this area. Where these conglomerates are exposed they have weathered in many places to create habitable shelters at elevations of around 250m. above the river/creek valleys. It is extremely likely that many further occupation shelters will be located within the escarpments.

4.5.5.ii. Open campsites

As there has been no systematic survey work conducted in this Zone it is not

surprising that no open sites have been recorded. Spot-check surveys in wet and dry sclerophyll forests of the upper Tweed Valley, however, have located large numbers of small open sites on flat areas along ridgelines and adjacent to creeks (Byrne 1987:64-70) and it is likely that a similar distribution pattern exists within the Byron Shire.

4.5.5.iii. Natural mythological sites

No mythological sites have been recorded for the Mountain Ridges and Valleys Zone but there is evidence to suggest that Mount Chincogan north of Mullumbimby was such a site (Richmond-Tweed Regional Library 1984:36; L. Ansell pers. comm.- see Section 3.4). The mountain is said to have been a fertility site and women camped in secret spots around its base to perform associated rituals. A womens pathway connected Nimbin Rocks (another Natural mythological site [#4-4-16]) with Mount Chincogan and the Brunswick River via Mt Burrell (Byorgin Natural mythological site [#4-4-1]). Men are also said to have maintained a separate pathway to the Brunswick River (L. Ansell pers. comm. on information from D. Cooke[dec.]).

4.5.6. Archaeological surveys in the Byron Shire

No archaeological surveys have been undertaken within that portion of the Zone administered by the Shire. Surveys have however been conducted within the State Forests though results of these are not currently available (S. Leber, Tweed-Byron L.A.L.C. pers. comm.).

4.5.7. Impacts on the archaeological resource of the Mountain Ridges and Valleys Zone

Outside of State Forests where timber harvesting is likely to impact open sites the greatest threat to the archaeological resource of this Zone is likely to be posed by vandalism of rockshelter deposits. One of the deposits recorded during this study had been apparently dug into with a shovel and it is likely that artefacts had been illegally collected from the surface. Given that many shelter sites are likely to be situated on freehold land it is difficult to both register them and enforce their legal protection.

It is, therefore, imperative that landowners be made aware that all Aboriginal sites and artefacts, whether they have been registered or not, are automatically protected under the N.S.W. National Parks and Wildlife Service Act. No site or artefact is to be disturbed without formal written Consent from the Director of the N.P.W.S. To disturb, deface or

damage such a site/artefact is illegal and offenders will be prosecuted.

4.5.8. Trends in site location

Although only limited spot-check survey was conducted during the current investigation it has served to establish that rockshelter sites with deposit are located around the base of the mountain escarpment west of Mullumbimby. Around 30% of the overhangs inspected contained occupation deposit, suggesting that the area was relatively intensively used during prehistory.

Although no open sites have been recorded within this Zone of the Shire distribution trends from neighbouring areas suggest that such sites will be located along the spines of the ridges and spurs and on terraces beside the rivers/creeks of the mountain valleys.

4.5.9. Aboriginal landuse model for the Mountain Ridges and Valleys Zone

Lilley (1984:27) has proposed a model for sub-coastal south east Queensland which holds that clear differences existed between coastal and hinterland groups and that each operated its own economy. There is evidence to suggest that strict rules preserved the integrity of group territories and that movement between them was subject to compliance with prescribed social conventions (ibid:20). According to Lilley's model large winter base camps would have been clustered near major rivers to allow access to forest and aquatic resorces. The main winter subsistence foods would have been fish, water birds and aquatic plant foods. In summer, on the other hand, Lilley contends that base camps would have been located along major tributary streams, allowing access to both seasonal water sources and their associated resources as well as to rich mountain resources including open forest fauna. Summer groups are seen as being smaller and more mobile than winter groups. Camps were thus emphemeral, being frequently moved between patches of food resources (ibid:27).

As discussed in Section 4.5.4., there is no secure evidence for coastal-inland landuse patterns for north eastern N.S.W. Researchers do, however, generally support the contention of a coastal/inland dichotomy as proposed by Lilley (Mitchell 1978:167; H. Sullivan 1977:5-6; Piper 1976:1,61,179).

Irrespective of whether groups were economically independent or not, however, it is clear that some coast-inland movement did occur. Wyrallah people are said to have travelled to the beaches (Bray 1923), and an early account (by an Aborigine) describes

Aboriginal 'tribes' in 1870 and before, coming from Murwillumbah and Lismore to Byron Bay. From Byron Bay groups are then said to have moved up the beaches at low tide to Southport, across to Beaudesert and back home (Kaye family file, Richmond River Historical Society Archives). In addition, a pathway is said to have connected Nimbin Rocks with the Brunswick River (L. Ansell pers. comm.) and pipi shells were found on the surface of two rockshelter deposits on the Koonyum Range (this report). According to oral evidence there was (until recently) also a marine shell midden further west on a mountain crest above the source of the Brunswick River. This midden was reportedly located close to Manns Road within the Nullum State Forest (personal observation of R. Maslen, Mullumbimby).

Although based on very scant evidence I would contend that upland use was integrated into the overall economy, though this economy may not have included the immediate coastal Zone. Base camps are likely to have been located along the major permanent waterways in the woodland river valleys (e.g. the upper Brunswick and Wilsons Rivers). Ceremonial activity was also undertaken in these areas (e.g. Brokenshire 1988:40). As Lilley (1984) contends, smaller seasonal camps are likely to have been situated further west on creekflats adjacent to upland forests. Rockshelters within the mountain forests may have been used emphemerally by small mobile groups ranging from the valley camps. Such groups are likely to have been engaged in exploiting the relatively dispersed faunal resources of the uplands.

Alternatively, the mountain rockshelters may have been used as transit campsites by small groups travelling inland along the spines of the ridges. It is unlikely however, that the three shelter sites recorded on the Koonyum Range during the current study were used in this capacity. This part of the range is dissected to the west by a steep escarpment, forming an 'island' surrounded by lowland. Thus, the ridgeline does not provide a viable transit route to inland areas. All evidence, however, points to some coast to inland movement (or vice versa). Given that open campsites have been recorded along sclerophyll ridges at North Ocean Shores east of the mountains it is likely that coastal groups accessed the mountains via the coastal ridges and moved further inland via the mountain ridges. It is likely that the mountain ridges provided east/west routes which were used in preference to those on the volcanic plateau further south. The dry sclerophyll forests supported along the spines of most mountain ridges would have provided more expedient transit corridors than ridges within the Big Scrub further south. I am of the opinion that considerable movement of small groups occurred throughout north eastern N.S.W. and that most of this movement was undertaken for ceremonial purposes. The Nimbin Rocks/Mt. Burrell area to the west was extremely important ceremonially, Mount Chincogan is said to have been ceremonially connected with Nimbin Rocks, and a plethora of Bora rings

reported for the Brunswick Valley and the eastern margin of the Coastal Lowlands. It is clearly possible that movement between Nimbin and the coastal ceremonial sites was undertaken via the ridges of the Byron Shire, skirting around rather than through the rainforests.

4.5.10. Predictive model for archaeological sites

On current evidence it can be predicted that further rockshelters with occupation deposit will be located at the base of the mountain escarpments where the underlying conglomerate layer is exposed. All of the shelters observed during survey were small (i.e. narrow front to back) and it is likely that they have accommodated small transit groups or small specialised hunting parties exploiting forest fauna. While it is possible that shelters in the area may contain rock art this seems unlikely given that interior shelter surfaces are roughly textured and prone to granular disintegration.

It is predicted that small open campsites composed of surface scatters of stone artefacts will be located on flat sections along the spines of ridges and spurs. Scarred trees may also be found in such areas if mature trees exist. Larger campsites, which may consist of stratified stone artefacts, charcoal and food remains (though these are not expected to have survived in acidic krasnozem soil areas) are likely to be found on lower creek terraces within the Mountain Valleys where major European disturbance has not occurred. Given the dense native and foreign vegetation coverage along the creeks, however, it is likely that sites will only be detectable during survey where they coincide with an eroded or otherwise disturbed surface.

Mount Chincogan is likely to have been used as a ceremonial area with both men and women having separate campsites around its lower slopes. On this basis it is predicted that open campsites will be distributed around the mountain's lower slopes. These campsites will be evidenced by surface scatters of stone artefacts. If the same campsites were habitually used then stratified (i.e. sub-surface) open campsites may occur.

4.5.11. Management recommendations

The bulk of the Mountain Ridges and Valleys Zone has low archaeological potential and sensitive areas within the Zone can be predicted with relative certainty. It is highly unlikely, for example, that campsites will be located on steep footslopes or on scoured floodways. Where developments are based in such areas they are not likely to impact the archaeological resource.

It is recommended that archaeological surveys be required for both designated and non-designated developments when the proposed development area encompasses mountain escarpment rock outcrops. Unless occupation sites are recorded in such areas before they are locked up within developments and monitored periodically by the National Parks and Wildlife Service they may be subject to unchecked vandalism.

No designated development should be allowed either on Mount Chincogan itself or on its lower slopes without the approval of the local Aboriginal community (represented by the Tweed-Byron Local Aboriginal Land Council). The area is considered to be potentially sensitive and all designated developments here should be preceded by archaeological survey.

Settlement of the Mountain Valleys is proceeding through the development of small rural blocks. Houses along the valleys, sited on elevated terraces above creeks in the most habitable spots, have a high probability of being on terrain which was similarly preferred by Aborigines. As these more select sites are increasingly developed for housing it can be expected that the archaeological resource will correspondingly diminish. While it is impractical to require archaeological surveys to be undertaken prior to the development of small blocks within the Zone it is recommended that such surveys be required for both large-scale designated developments and environmental impact assessments where these are warranted.

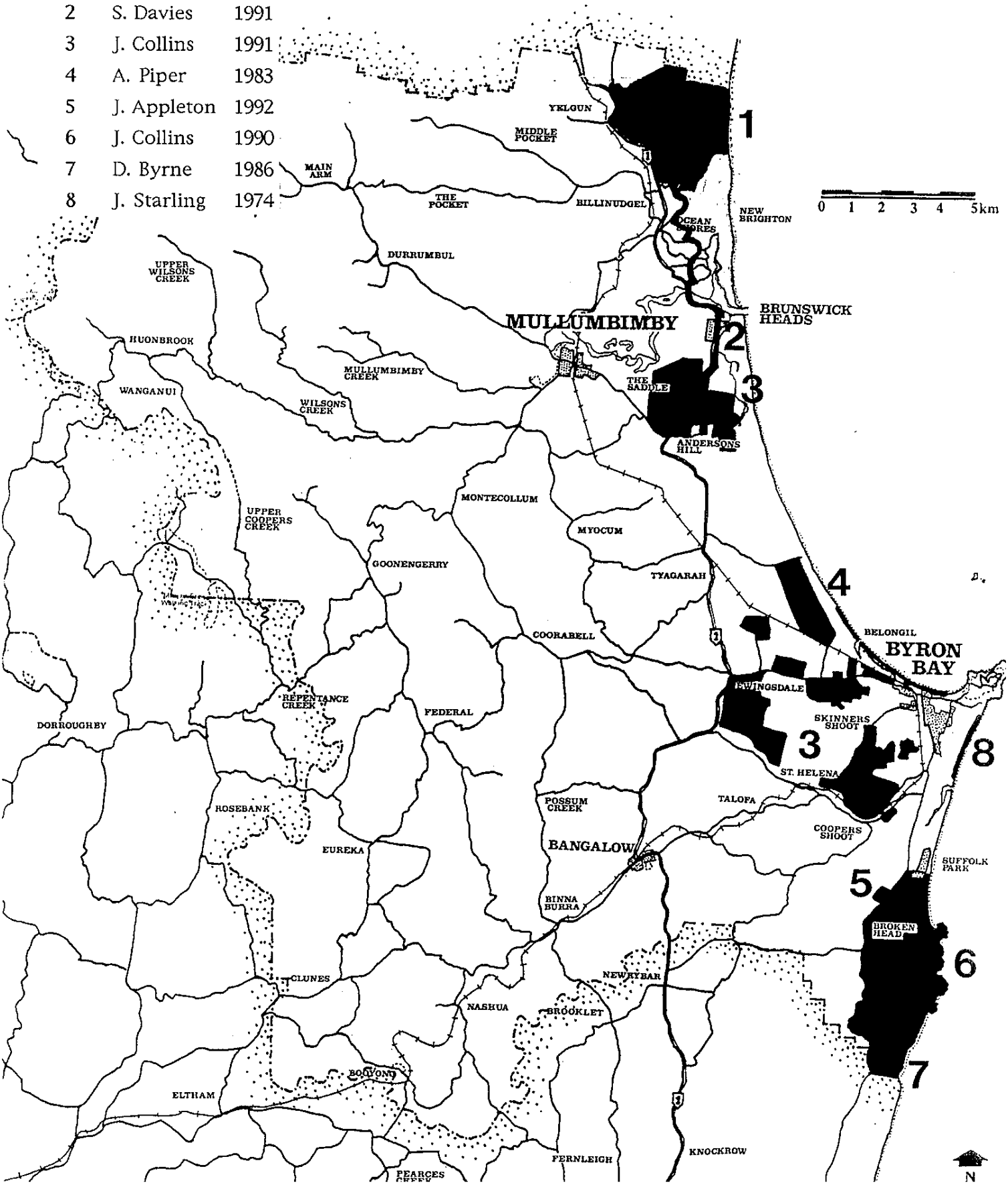
4.5.12. Mountain ridges and valleys Zone : Site list

Site no.	Site name	Situation	Artefacts	Preservation status
Mullumbimby				
Occupation shelters:				
Not yet listed Collins	K.R.1	Top of escarpment	Stone;bone;charcoal;pipi	Stratified/water wash
Not yet listed Collins	K.R.2	Top of escarpment	Stone; ochre; charcoal	Stratified
Not yet listed Collins	K.R.3	Top of escarpment	Stone; charcoal; pipi	Stratified/disturbed by digging

FIGURE 13 : Archaeological surveys in the Byron Shire

Key:

1	K. Navin	1989
2	S. Davies	1991
3	J. Collins	1991
4	A. Piper	1983
5	J. Appleton	1992
6	J. Collins	1990
7	D. Byrne	1986
8	J. Starling	1974



5: ABORIGINAL CONSULTATION

5.1. ABORIGINAL LINKS WITH THE SHIRE

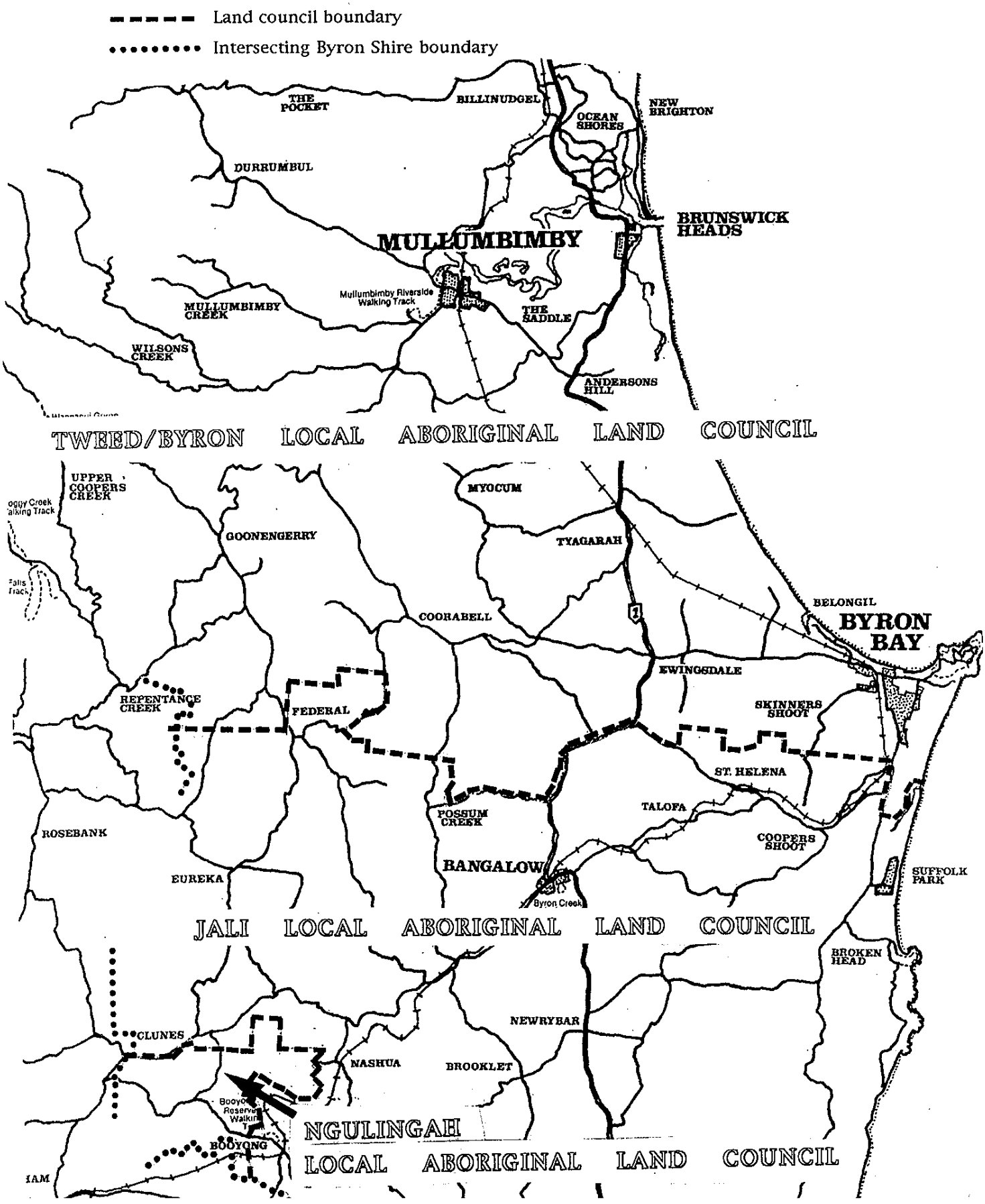
Census reports released by the Aborigines Protection Board show that, by the early 20th century, the Aboriginal population of the Byron Shire area had been almost completely decimated. In 1900 there were reportedly nine Aborigines living at Mullumbimby- the men earning their keep by scrub cutting, clearing and by doing general farm work, while the women were employed as domestic servants; and according to the 1909 census, nine people of Aboriginal extraction were left in Byron Bay. Discussions with people from Byron Bay indicates that by 1912, only two Aboriginal families lived in that locality and that one of these had moved to Byron from Lismore (D. Keevers pers. comm.). Even at Ballina, a locality which had supported the densest prehistoric population in the region, only three Aborigines remained by 1909. Given that the Cabbage Tree Island Reserve was well under way by this time it is likely that it already contained most of the region's surviving Aborigines. In 1920, only 7,228 people of Aboriginal extraction were recorded for the whole of N.S.W. (R.R.H.S. Aborigines Protection Board File).

Given the severity of European impact on the indigenous Aboriginal population of the Byron Shire it is not surprising that few people with traditional knowledge of the area remain.Individuals known to have traditional links with the Byron Shire include the grandchildren of 'King' Harry Bray and his wife Clara; Mrs. Millie Boyd of the Muli Muli community near Woodenbong; and Mr. Leo Williams of the Lismore district. One of Harry Bray's granddaughters, Mrs. Lorna Kelly (nee Kay) lives at Cabbage Tree Island, while another, Mrs. Linda Vidler (nee Kay) lives at Byron Bay. There are, however, many Aboriginal people who maintain a contemporary interest in the Shire and of sites within it.

5.2. ABORIGINAL LAND COUNCILS

Under the N.S.W. Aboriginal Land Rights Act (1983) a three-tier system of Land Councils was initiated to function at the State, regional and local level. The Byron Shire falls within the area administered by the North Coast Regional Aboriginal Land Council and three Local Aboriginal Land Councils have territory within the Shire: Tweed/Byron Local Land Council territory includes the entire northern half of the Shire, Jali Local Land Council territory covers most of the southern half of the Shire and a small section between Booyong and Clunes falls within the Ngulingah Local Land Council area (see Fig. 14 for L.A.L.C. boundaries and Appendix 3).

FIGURE 14 : Local Aboriginal Land Council Boundaries in the Byron Shire



Although the Land Rights Act does not give Aborigines jurisdiction over Aboriginal sites it is generally accepted by the N.S.W. National Parks and Wildlife Service (which does have jurisdiction over sites) that Local Aboriginal Land Councils speak for the local community on heritage matters. Relevant Local Aboriginal Land Councils should, therefore, be consulted in relation to all site management decisions.

It is important that the Byron Shire Council adopt a policy of ongoing liasonon with the Local Land Councils in matters which may affect, or which involve, the Shire's Aboriginal heritage. Local Aborigines have a legitimate interest in sites of traditional and historic importance and such sites serve to maintain the unique identity of the Aboriginal culture. Consultation with the Local Aboriginal Land Councils has revealed a concern not only for traditional and mythological sites, but for archaeological sites which remain as yet undetected. Such sites not only demonstrate the presence of Aborigines in particular places in the past, but foster pride in the Aboriginal identity, visibly linking it with past generations.

Major areas of Aboriginal concern within the Byron Shire, of which the Council should be made aware, are discussed below.

5.3. ABORIGINAL CONCERNS IN THE BYRON SHIRE

5.3.1. The North Coast Regional Aboriginal Land Council

Although control over heritage matters rests with the relevant Local Aboriginal Land Council, the Regional Land Council will support the Local Land Councils in such matters as the need arises.

Consultation with John Roberts, Chairman of the North Coast R.A.L.C., revealed that the issue of development at Taylor's Lakes is of major current concern.

These Lakes were recorded by Collins (1990) as a Natural Mythological (womens birthing) site (#4-5-76) as a result of consultations with Millie Boyd, a Gidabal elder from Muli Muli, and with Jali people from Cabbage Tree Island. The Lakes were found to be significant to several Aboriginal people and most Aborigines were aware of their mythological status (ibid:18-19).

There are current plans to develop residential blocks which will stretch between the immediate coastline and the Lakes. The Jali L.A.L.C. were apparently initially consulted about the development but were not informed of its extent, believing it to be confined

be confined to the area immediately south of Suffolk Park and not in the immediate vicinity of the Lakes (J. Roberts pers. comm.; A. Sims pers. comm.). According to John Roberts, Taylors Lakes, as one of only four surviving women's sites in the entire region, is unique. The site is of considerable significance to local Aborigines and forms an integral feature in the region's cultural landscape. It is thought that the Lakes are mythologically connected to sites further south at Evan's Head (L. Ansell pers. comm.).

The North Coast R.A.L.C. is concerned that, if the proposed development proceeds, the edges of the Lakes will be urbanised and will lose their innate character. The Land Council does not support the proposed development and wishes a buffer Zone of current vegetation to be retained around the Lakes so that their current character can be preserved. Before any development can be initiated in the vicinity of the Lakes or between the Lakes and Suffolk Park the Regional Land Council wishes an archaeological survey to be undertaken and an anthropological report on the significance of the Lakes to be prepared.

Given that Taylors Lakes are a registered Mythological site (#4-5-76) an anthropological report including management recommendations should be required by both Council and the National Parks and Wildlife Service early in the planning stages of any development which is to encroach upon them.

The regional Aboriginal Land Council is further concerned for the fate of sites which may be located along the coastal lowlands between Byron Bay and Suffolk Park. This stretch is known to be a particularly sensitive area. Burials and Bora rings have been recorded here and according to John Roberts unmitigated small-scale sand extraction and development is being allowed to occur without prior archaeological assessment (J. Roberts pers. comm.).

Recommendations for this stretch are contained in Section 4.2.11. of this report. It has been assessed as having particularly high archaeological sensitivity and it is recommended that all designated developments here be preceded by archaeological surveys. Non-designated developments should be allowed to proceed only after assessment and consultation with the National Parks and Wildlife Service and the Jali Local Aboriginal Land Council. All in situ sites identified in this area should be retained.

The Regional Aboriginal Land Council wishes the Byron Shire Council to consult with the Local Land Councils concerning heritage matters on a regular and ongoing basis. The R.A.L.C. considers that, at present, satisfactory consultation is not being

undertaken and that many developments are being allowed to proceed in sensitive areas without prior archaeological assessment (J. Roberts pers. comm.).

5.3.2. The Jali local Aboriginal Land Council

The Jali Local Aboriginal Land Council have several concerns within the Byron Shire.

The most immediate concern is with the development of the Taylors Lakes Natural mythological site (#4-5-76). The Regional Aboriginal Land Council is supporting the Jali people in their objection to the proposed urban development in the vicinity of the Lakes and objections have been outlined in Section 5.3.1. above.

The Jali L.A.L.C. is also concerned for an area at Broken Head where oral tradition holds that the massacre of Aborigines by Europeans occurred (see Collins 1990:18 & Fig. 4:22a). It is thought that skeletal remains are likely to exist in this area and there is fear that these remains will be exposed if future development is undertaken here.

The Jali Local Aboriginal Land Council wishes to receive details of all Development Applications received by the Byron Shire Council on an ongoing basis. This would allow the Land Council to be aware of the extent and location of proposed work and if any Aboriginal heritage concerns are raised they could be discussed and resolved in liason with Council at the earliest stage of the development process.

The granddaughters of Harry Bray (the Kay sisters, Lorna Kelly and Linda Vidler) are members of the Jali Local Aboriginal Land Council and are supported by both the Jali and Tweed/Byron L.A.L.C's in their concern for their former house site at Byron Bay. Both of the Kay girls were reared at Tallow Creek south of Cape Byron and during their early years lived in a tin hut close to the beach at the creek mouth. When this locality was sandmined the Kay family moved inland to an area below the foot of a coastal spur at the end of Ironbark Avenue, Byron Bay. The family's tin and wooden hut still stands here on a portion of Crown Land which is believed to be Leasehold (L. Kelly pers. comm.; L. Vidler pers. comm.). This hut is an important remnant of Byron Bay's history and should be afforded protection. Both Lorna Kelly and Linda Vidler are concerned that the hut may be destroyed and the land used for development.

Another locality of major concern to the Jali Local Aboriginal Land Council is that at and near the 'Wheel House Resort' at Tallow Beach. The graves of Harry and Clara Bray (#4-4-36), buried in the late 1890's, are located here. These have been marked by a plaque and concrete slab. While these graves are not likely to be inadvertently disturbed there is good evidence to suggest that further burials exist in this locality.

Both Lorna Kelly and Linda Vidler maintain that the area was once a known cemetery site and that there is likely to be many more graves located here. According to one elderly local resident, Harry Bray's brother, who died during the early part of the 20th century, was buried somewhere in the vicinity of the Wheelhouse Resort, though the exact grave location is uncertain (M. Wright pers. comm.). The Jali people are thus understandably concerned that undetected burials will be unearthed if future development, entailing disturbance to sub-surface deposits, is allowed in the area. Review of Development Applications for this area by Council will need to take into account the very real possibility that Aboriginal burials are located here. No development, neither designated nor non-designated, can be allowed to proceed in this locality without first establishing that burials will not be unearthed during the course of the development. Secure establishment of such can only be achieved by sub-surface investigation. Ground-probing radar devices, for example, can establish the presence or absence of burials in sandy deposits to a depth of over 2 metres and provide an avenue for non-invasive investigation of sub-surface deposits (e.g. Collins and Griffin in prep.).

5.3.3. The Ngulingah Local Aboriginal Land Council

The Ngulingah Local Aboriginal Land Council, based in Lismore, covers a small section on the south west perimeter of the Byron Shire (825ha; 1.5% of the Shire). The Ngulingah section is located on the red krasnozem volcanic plateau and falls within the area covered by the Big Scrub in prehistory.

No archaeological sites are known from the Ngulingah section of the Shire and the Land Council has no particular concerns for specific areas or sites within the Byron Shire (Cedric Roberts pers. comm.). Naturally this situation may change if sites were to be found within the Ngulingah area.

It is recommended that details of Development Applications received by the Byron Shire Council and falling within Ngulingah territory be sent to the Land Council so that it can be made aware of the extent and location of proposed work. If any Aboriginal heritage concerns are raised they can then be discussed and resolved in liason with Council at the earliest stage of the development process.

5.3.4. The Tweed/Byron Local Aboriginal Land Council

The Tweed/Byron L.A.L.C., like the Jali, wishes to receive details of all Development Applications received by the Byron Shire Council on an ongoing basis. Again, this

would allow the Land Council to be aware of the extent and location of proposed work and any heritage concerns raised could be discussed and resolved in liason with Council at an early stage of the development process. In this way prospective developers could also be made aware of Aboriginal heritage concerns and of legal obligations which cover areas included in Development Applications.

The Tweed/Byron L.A.L.C. is concerned for the furture of cultural remains at North Ocean Shores. It supports Navin's (1989) recommendations for individual sites and wishes to see these followed through if and when development takes place (S. Leber pers. comm.). Also, as the Navin survey was of a sample nature only, the Tweed/Byron people would like further archaeological surveys to be undertaken in formerly unsurveyed parts of the area as individual parcels of land are opened up for development. Sam Leber, Co-ordinator of the Tweed/Byron L.A.L.C., assisted with field survey of North Ocean Shores and is of the opinion that further in situ archaeological sites exist there.

Tweed/Byron L.A.L.C wishes the Byron Shire Council to take Aboriginal concerns, including the known and predicted location of archaeological sites, into account when planning development. It would like more frequent consultation and liason to occur between the Council and the Aboriginal people and wishes the Council to ensure that archaeological surveys precede development in areas which are likely to contain sites.

5.3.5. Conclusion

Aboriginal heritage resources are being depleted in all parts of the north coast as development pressures increase and this situation is not likely to change until Shire Councils, the Aboriginal Land Councils and the National Parks and Wildlife Service take a united approach to conservation and management of Aboriginal sites.

It is likely that the Local Aboriginal Land Councils will play an increasingly greater role in future site management and it is therefore essential that the Byron Shire Council establishes communication networks and ongoing working relationships with the North Coast Regional Aboriginal Land Council and with its three Local Aboriginal Land Councils.

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APPENDIX 1

STUDY BRIEF

ABORIGINAL HERITAGE STUDY - BYRON SHIRE

INTRODUCTION

Byron Shire Council resolved at its meeting of 26th November 1991 to finalise the Review of its Residential Release Strategy which is to cover specific investigation areas in the Byron Bay and Broken Head locality as well as a large area of the Shire's rural lands located around main town centres. The Council has already undertaken a detailed Aboriginal Heritage Study for the investigation areas in the Byron Bay and Broken Head localities. The subject study would represent the completion of Council's aboriginal heritage investigations for the remaining areas to be considered in the Residential Release Strategy Review.

The Study will complement land capability assessments and infrastructure feasibility assessments presently being undertaken by Council as part of its Residential Release Strategy Review.

THE STUDY AREA

The Study area is to include all the Shire's existing urban and rural areas excluding those lands zoned for Environmental Protection, Forestry, National Parks or nature reserves; or lands previously investigated for Council in terms of their Aboriginal heritage.

AIM OF STUDY

The aim of the Study is to prepare an overview of the Aboriginal Heritage of the Shire, outlining known sites of Aboriginal significance and providing the necessary basis for identifying those lands which may warrant closer investigation prior to any residential development proceeding in those areas.

SPECIFIC OBJECTIVES

The specific objectives of the Study are as follows:

- Provide a history of Aboriginal settlement and traditional cultural beliefs based on existing available information.

- Establish the nature and significance of existing archaeological evidence of Aboriginal settlement within the Study Area and provide an analysis of the constraints on development arising from that evidence.

- Provide an indicative model describing settlement patterns and habits which may be used to determine characteristic areas likely to have a high probability of past Aboriginal habitation.

- Liaise with relevant Aboriginal communities, including the Far North Coast Regional Aboriginal Land Council, the local Jali Land Council and the local Tweed-Byron Land Council and establish contemporary Aboriginal values for the sites of significance identified in the Study.

SPECIFIC STUDY TASKS

The Study tasks required to be undertaken are described in the following stages:

Stage 1:

1. Review the anthropological literature and unpublished reports concerning Aboriginal heritage and culture within the Study Area held by the National Parks & Wildlife Service.

2. Consult representatives of the Aboriginal community to confirm the findings of Item 1 and to establish current concerns for significant sites.

3. Review the archaeological records for the Study Area, assessing the quality and completeness of coverage and identifying the requirement for any additional field surveys. Limited non-systematic field surveys should be undertaken, if the need arise, in land units where current records are insufficient to allow a model of past Aboriginal landuse to be established.

Stage 2:

1. Devise an indicative model of past Aboriginal settlement outlining the types of habitat that are most likely to have been frequented, the characteristic types of usage of such habitats, and the nature of archaeological artifacts or signs of habitation that may be relevant to such areas. Regard should also be had to any change in vegetation and habitat quality that may have occurred since european settlement in the Study Area.

Stage 3:

1. Prepare a report which presents all technical findings in a manner which can be accounted for by Council in the determination of the suitability, or otherwise, of specific areas for inclusion in its revised Residential Release Strategy. The report should make it clear as to under what circumstances any additional site investigations should be required, and, where known sites of Aboriginal significance exist, their implication of in terms of the future development potential of such areas.

APPENDIX 2: List of Recorded Aboriginal sites in the Byron Shire

This Heritage Study has employed the 1:25,000 National Topographic Series as its base. Seven mapsheets cover the Byron Shire. Locational information available for the recorded sites varies widely in its degree of precision. Sites recorded on 1:250,000 maps, for example, lack the accuracy of those plotted on sheets of larger scale. Unfortunately many sites listed on the National Parks and Wildlife Service register carry 1:250,000 co-ordinates only. In most cases, however, precise locational information can be gained through consultation of site files. Copies of files for all Byron Shire sites are kept at the Alstonville office of the N.S.W. National Parks and Wildlife Service (restricted access).

Landscape units are listed below and follow those described in the body of the report.

C	Coastline
CL	Coastal Lowlands
CR	Coastal Ridges
P	Undulating Volcanic Plateau
M	Mountain Ridges and Valleys

Site No.	Name	Type	Grid ref.	Landscape	Condition
		POTTSVILLE 1:25,000 SHEET			
4-2-1	Yelgun	Bora	55320 684770	CL	Destroyed
4-2-40	N.O.S.1	Midden	55386 684885	C	Disturbed
4-2-41	N.O.S.2	Midden	55368 684860	CL	Disturbed
4-2-42	N.O.S.3	Midden	55369 684857	CL	Disturbed
4-2-43	N.O.S.4	Midden	55386 684852	C	Disturbed
4-2-44	N.O.S.5	Midden	55390 684965	C	Disturbed
4-2-48	N.O.S.9	Midden	55386 684954	C	In situ
4-2-50	N.O.S.11	Sc.tree	55235 684820	CL	Extant
4-2-51	N.O.S.12	Midden	55209 684889	CL	Disturbed
4-2-52	N.O.S.13	Open camp	55200 684850	CR	Disturbed+In situ
4-2-53	N.O.S.14	Is. artefact	55053 684848	CL	Disturbed
4-2-54	N.O.S.15	Open camp	55164 684976	CR	Disturbed+In situ
4-2-55	N.O.S.16	Open camp	55235 684985	CR	Disturbed
4-2-56	N.O.S.17	Open camp	55237 685005	CR	Disturbed
4-2-57	N.O.S.18	Midden	55275 684888	CL	Disturbed/In situ
4-2-59	N.O.S.19	Midden	55295 684935	CL	Disturbed
4-2-60	N.O.S.20	Midden	55275 684888	CL	Disturbed+In situ

4-2-63	Crabbes Ck.2	Midden	55380 684890	CL	Disturbed

BRUNSWICK 1:25,000 SHEET

4-5-63	Byron Bay	Bora	55550 683370	CL	Unknown
4-5-32	Tyagarah	St.arrang.	55550 683360	CL	Destroyed
4-5-41	Mullumbimby	St.arrang.	55160 684060	N/A	Not a site-natural
To be listed	Mullumbimby	Open camp	55235 684024	CR	Eroded
To be listed	Brunswick R.	Midden	55328 684343	CL	Disturbed/In situ
To be listed	Brunswick Hds	Midden	55315 684113	CL	Disturbed
To be listed	Simpsons Ck.	Midden	55408 683900	CL	Extant
To be listed	Simpsons Ck.	Is. artefacts	55407 683887	CL	Disturbed

BYRON BAY 1:25,000 SHEET

4-4-32	Possum Ck.	St.arrang.	54962 682736	P	Extant
4-4-36	Tallow Ck.	Burial	55970 682762	CL	Extant
4-4-42	Byron Beach	Midden	55950 683150	C	Wave erosion
4-4-43	Byron Beach	Midden	55950 683150	C	Wave erosion
4-5-24	Byron Bay	Midden	55580 683360	C	Destroyed
4-5-33	Tallow Beach	Bora	56050 682880	CL	Unknown
4-5-34	Suffolk Beach	Burial	55930 682710	CL	Destroyed?
4-5-35	Suffolk Beach	Open camp	55930 682710	CL	Destroyed?
4-5-36	Suffolk Beach	Bora	55933 682710	CL	Destroyed?
4-5-37	Cape Byron	O.cp/Burial	55620 683180	C	Destroyed?
4-5-38	Broken Head	Open camp	56000 682350	P	Unknown
4-5-39	Broken Head	Burial	56000 682350	P	Unknown
4-5-56	2 Sisters Rocks	Nat.Myth	56050 682420	C	Extant
4-5-58	Byron Bay	Open camp	55740 682950	CR	Disturbed
4-5-59	Byron Bay	Open camp	55740 682960	CR	Disturbed
4-5-60	Byron Bay	Open camp	55775 682935	CR	Destroyed
4-5-61	Palm Valley	Open camp	56135 683185	C	Disturbed/In situ
4-5-62	Byron Bay 1	Midden	55705 683300	CL	Disturbed
4-5-76	Taylors Lakes	Nat.Myth	55960 682510	C	Extant/disturbed
4-5-77	Kings Beach	Nat.Myth	56020 682370	C	Extant
4-5-78	Whites Beach	Nat.Myth	56005 682205	C	Extant
4-5-79	B.H. 5	Open camp	55922 682465	P	Disturbed
4-5-80	B.H. 6	Open camp	55918 682445	P	Disturbed
4-5-81	B.H. 7	Open camp	55847 682427	P	Disturbed
4-5-82	B.H. 9	Open camp	55905 682140	P	Disturbed

4-5-83	B.H.10	Open camp	55795 682175	P	Disturbed
4-5-84	B.H.11	Open camp	55799 682160	P	Disturbed
4-5-85	B.H.12	Midden	56015 682390	C	Wave disturbance
4-5-86	B.H.13	Midden	56010 682378	C	Eroded+in situ
4-5-87	B.H.14	Open camp	56005 682315	C	Disturbed
4-5-88	B.H.15	Midden	56008 682281	C	Wave disturbance
4-5-89	B.H.16	Midden	55956 682155	C	Eroded+In situ
4-5-90	B.H.17	Midden	55955 682147	C	Eroded+In situ
4-5-91	B.H.18	Midden	55951 682140	C	Eroded+In situ
To be listed	Belongil	Midden	55780 683148	CL	Disturbed+In situ
To be listed	Skinners	Midden	55770 682928	CR	Disturbed+In situ
To be listed	Byron Bay	Open camp	55880 683252	C	Eroded

HUONBROOK 1:25,000 SHEET

To be listed	Koonyum R	Shelter dep.	53955 684200	M	Stratified
To be listed	Koonyum R	Shelter dep.	53950 684195	M	Stratified
To be listed	Koonyum R	Shelter dep.	53910 684180	M	Stratified/dist.

DUNOON 1:25,000 SHEET

To be listed	Booyong	Open camp	54345 682020	P	Disturbed

APPENDIX 3 : Jali Local Aboriginal Land Council Boundary

* NB: Tweed/Byron (Fingal) area covers Shire to the North of the Jali bounary
Ngulingah (Lismore) area covers Shire on south-west margin of Jali boundary

Commencing at the intersection of the eastern prolongation of the southern boundary of Portion 471, Parish of Riley, County of Richmond with the shore of the South Pacific Ocean: and bounded thence by that prolongation and boundary, the southern boundary of Portion 196 and its prolongation westerly and part of the south-eastern and the south-western boundaries of Portion 420 south-westerly and north-westerly to the Pacific Highway; by that highway south-westerly to the eastern boundary of Portion 186; by that boundary, a line and the eastern boundary of Portion 191 southerly, the eastern and part of the southern boundaries of Portion 192 southerly and westerly and the eastern and part of the southern boundaries of Portion 206 southerly and westerly to the northern prolongation of the eastern boundary of Portion 104; by that prolongation and boundary, a line, and the eastern boundaries of Portions 149 and 148 southerly, the eastern and the southern (and its prolongation) boundaries of Portion 147 southerly and westerly, and the eastern boundaries of Portions 79, a line, 126 and its prolongation southerly to Evans River; by that river, Tucombil Canal, Rocky Mouth Creek and Richmond River downwards to the generally southern boundary of the Parish of Broadwater, County of Rous; by that boundary and the generally western boundary of that parish generally westerly and generally northerly, the generally western and part of the generally northern boundaries of the Parish of Meerschaum generally northerly and generally easterly, the

boundaries of the Parish of Tuckombil generally northerly and generally easterly, part of the generally western boundary of the Parish of Teven generally northerly and part of the generally southern boundary of the Parish of Clunes generally westerly to Coopers Creek; by that creek upwards to the generally southern boundary of the Parish of Jasper; by part of that boundary generally easterly to Kings Road; by that road generally north-easterly to the northern boundary of Portion 76; by that boundary and its prolongation easterly to Wilsons River; by that river upwards to the western prolongation of the northern boundary of Portion 95; by that prolongation and boundary easterly to the generally western boundary of the Parish of Byron; by that boundary generally southerly to the southern boundary of Portion 13; by that boundary and part of the generally south-eastern boundary of that portion easterly and generally north-easterly and the northern boundary of Portion 29 easterly to Oppossum Creek; by that creek downwards to Possum Creek Road; by that road generally easterly and Pacific Highway generally north-easterly to the generally southern boundary of the Parish of Brunswick; by that boundary generally easterly to the northern boundary of Portion 60, Parish of Byron; by that boundary and the northern boundary of Portion 61 easterly, the northern and the eastern boundaries of Portion 62 easterly and southerly, part of the northern boundary of Portion 63 and the northern boundaries of Portions 290 and 160 easterly to the road from Byron Bay to Lennox Head via Suffolk Park; by that road generally southerly to the northern boundary of Portion 243;

by part of that boundary easterly to Tallow Creek; by that creek downwards to the shore of the South Pacific Ocean, aforesaid, and by that shore generally southerly to the point of commencement.