

Appendix B

Significant Natural Heritage Areas and Values

Introduction

1. The natural heritage areas of regional significance in the Auckland Region were first published in the Auckland Regional Planning Scheme (ARPS)(i.e., those that were the subject of Policy 7.28 of ARPS) have been carried into this RPS. These areas are the subject of Method 6.4.2.2 of the heritage chapter. The notes have been edited to a limited extent only, to remove statements no longer applicable or accurate. The locations of these areas are mapped in Volume II of the RPS (See Map Series 2, Sheets 1-3).
2. Only areas of regional significance are included in this appendix, so their reference numbers are not sequential – some areas which were numbered in the ARPS are omitted. Unless otherwise stated in the notes, values recorded in this appendix are considered to be of regional importance.
3. This appendix is not considered to be a complete record of all significant natural and physical heritage resources in the Auckland Region.

Readers are referred to the ARPS for documentation regarding the original creation of the annotations and maps.
4. Readers are referred to the Proposed Regional Plan: Coastal for further detailed information on coastal environment values.

The following abbreviations and symbols are used in the annotations

ACC	Auckland City Council
ARC	Auckland Regional Council
a.s.l.	above sea level
B.P.	before present
cumecs	cubic metres per second
NWASCO	National Water and Soil Conservation Organisation
OSNZ	Ornithological Society of New Zealand
RFBPS	Royal Forest and Bird Protection Society
sp., spp.	species (singular, plural)
WRPS	Waitakere Ranges Protection Society

- Notes about freshwater environments or species
- Notes about terrestrial environments or species
- ☒ Notes about coastal or marine environments or species
- ◆ Geological or landform notes

Annotations to Maps

- 4 LAKES SLIPPER, SPECTACLE AND TOMARATA are all dune lakes impounded by Holocene dune sands. Some enrichment of Lakes Slipper and Spectacle is evident, partly due to wastes supplied from adjacent farm land. The fern *Loxosoma cunninghamii* is found in the vicinity of Lake Tomarata and a significant freshwater wetland is situated on the southern and eastern margins of this lake. Lake Tomarata still retains a relatively unpolluted clear water environment although ease of access, the boat launching ramp and picnic facilities have encouraged swimming, skiing and powerboating which may need to be controlled in the future. Bird species around the lakes include banded rail, mallard duck, pukeko and possibly bittern.
- ☒ 8 BIRDS OF PAKIRI AREA include white-faced heron, blue reef heron, banded rail and pied stilt. New Zealand dotterel and variable oystercatcher breed in the area.
- ◆ □ ☒ 9 OKAKARI POINT to MANGAWHAI HARBOUR (Pakiri beach) is the only exposed east coast surf beach free of housing and backed by extensive sand dunes and dune lakes. As a wild and scenic coastline, it is of regional significance and should be protected. The endemic sedge, pingao (*Desmoschoenus spiralis*), is found on the dunes along the Pakiri coast.
- ☒ 12 CAPE RODNEY to OKAKARI POINT MARINE RESERVE. This reserve was gazetted in 1975 as New Zealand's first marine reserve. This area has a great diversity of near shore, reef-dwelling marine organisms in a clean silt-free environment which contrasts with much of the inner gulf area. Gordon and Ballantine

(1976) contains a comprehensive summary of the geology, climate, hydrology and biology of this area, and its regional significance. Continuing study of the area is going on at the adjacent University of Auckland Marine Research Laboratory. This reserve is considered to be of national importance.

- 15 OMAHA ECOLOGICAL AREA (Mt Tamahunga). This steep, elevated (330 m) area is covered mainly in broadleaf-podocarp forest with young kauri throughout. In gullies there are dense stands of taraire, kohekohe and towai.

The native frog *Leiopelma hochstetteri* inhabits this forest. It is the most primitive of all living anurans and has no free-swimming tadpole stage. It is known to be in the Waitakere and Hunua Ranges and in Dome Forest Stewardship Area (and outside the Region, in the Coromandel Range) and is considered to be a nationally threatened species. The ecological area is considered to be of national importance.

Omaha Ecological Area is on the New Zealand walkway north-south route.

This area is administered by the Department of Conservation.

- ◆ 16 MANGATAWHIRI BARRIER-SPIT (OMAHA) is composed of unconsolidated Holocene coastal sediments deposited either side of an initial barrier-ridge. The landform records the episodic depositional history of the area.

The present phase is characterised by erosion along the ocean beach, accentuated by the recent residential development involving a lowering of the dune topography. Ministry of Works and Development profile data (1965-68) indicates the 'elastic' nature of the beach front and the expected magnitude of change in beach dimension, 10-20 m per decade, which increases towards the distal end of the spit under the influence of current and tidal movements at the harbour entrance. The inherent mobility in the plan position of a fixed vertical such as high water mark is the fundamental reason why contemporary

erosion at Omaha is a problem, given the establishment in 1968 of a fixed property boundary related to the then high water mark. A beach protection plan has been implemented in an attempt to stabilise the eroding beach.

The Omaha Spit attracts a wintering flock of New Zealand dotterel.

- 17 LOWLAND KAHIKATEA SWAMP FOREST. This area has one of the best examples of this type left in Northland and Auckland; such forests are quite rare. This stand is of high quality with an intact canopy and an almost intact understorey although damage by stock is occurring. Its value is also increased as it is part of an intact vegetational sequence from estuarine salt marsh to forest; such sequences are now very rare. Because of its high ecological and scientific values, this example of this sequence is of national importance and is worthy of preservation. It is in private ownership.

- 20 DOME FOREST STEWARDSHIP AREA comprises 401 hectares of regenerating native forest and is dominated by a 336 m high flat-topped mountain, the Dome. The forest is a broadleaf-podocarp type with kauri, rimu, miro, totara and kahikatea mixed with taraire, puriri, kohekohe, and towai throughout. Subcanopy species include young canopy trees and a thick cover of mapou, nikau, ponga, rewarewa, rangiora and mingimingi. To the east of the Dome a small island of mature kauri still exists, giving an indication of the original composition of the forest.

The forest has added scientific value due to the presence in damp valleys of the native frog, *Leiopelma hochstetteri*. This frog is also found elsewhere in the Region (see note 15). This area is considered to be of national significance.

The Department of Conservation administers this forest.

- 21 The KAIPARA HARBOUR is one of the three areas in the Auckland Region which is of national and international ornithological significance, attracting

tens of thousands of birds each year from the South Island and from the arctic and subarctic regions. Regular large-scale movement of birds occurs between the Kaipara and Manukau harbours and the Firth of Thames. With its extensive tidal flats, mangroves and salt marshes, it is an important feeding area for waders such as godwit, knot, South Island pied oystercatcher, wrybill and pied stilt. The harbour and shore areas also support pied shag, white-faced heron, red-billed gull, caspian tern, white-fronted tern, mallard duck, cattle egret, welcome swallow and white heron. The black stilt and fairy tern are seen occasionally.

- ☒ 22 TAUHOA SCIENTIFIC RESERVE comprises 291 hectares, 75-80% of which is dense mangrove forest. It is one of only two such significant reserves in New Zealand and is administered by the Department of Conservation. It was vested in the University of Auckland in 1949 and classified as a flora and fauna reserve. It is open to the public but entry may be restricted to scientific groups if necessary. The reserve is considered to be of national importance.
- ☒ 24 GUM STORE CREEK has a rich assemblage of habitats – mangroves, mudflats, sand banks, scrub and freshwater wetlands. It is an important shag roosting area.
- ☒○ 25 The TAPORA COAST has an unusually rich variety of habitats, making this an area of national and international significance for bird life: freshwater wetlands, pingao on mobile sands, salt marshes, mangroves and islands of hard sand. With its hard sand areas and coastal margins, it is a major roosting area in the Kaipara Harbour for waders. The OSNZ survey made in March 1978 resulted in sightings of the following species: South Island pied oystercatcher, New Zealand dotterel, banded dotterel, wrybill, godwit, turnstone, knot, pied stilt, grey plover and eastern golden plover. Also eight species of water birds were seen. Many of the roosting areas in the Kaipara have been destroyed by reclamation. The Tapora coast together with Jordan's and Oyster

point are the major roosts remaining on the eastern side of the harbour. Sand Island is a wildlife management reserve now administered by the Department of Conservation. The area between Waikiri Creek and Te Ngaio Point was allocated to the Department of Conservation in 1987 for administration as a stewardship area.

- ☒◆ 26 PAPAKANUI SPIT is a mobile sandspit enclosing Waionui inlet. The spit is administered by the Department of Conservation. This area is an outstanding wildlife habitat within the Region and is of national importance. It also has areas of pingao. It is important as a breeding and roosting area for the New Zealand dotterel and the fairy tern. The spit was important as habitat for caspian tern, however the birds have moved to other parts of the Kaipara Harbour, possibly as a result of disturbance from activities on the spit. The spit itself borders the Papakanui Stewardship Area which is managed by the Department of Conservation, gazetted as an Air Weapons Range and used by the New Zealand Defence Force.
- ☒ 27 WAIONUI INLET is an important estuarine habitat with a rich diversity of bird life including the fernbird. The estuarine fringes are notable for the succession of plant communities between the tidal flats and dune areas.
- ◆ 28 KAIPARA SAND DUNES. The South Kaipara dune barrier is a complex sedimentary structure built at the same time and in the same manner as the Manukau barrier. The Holocene dune of the South Kaipara barrier, with only an incipient soil cover, extends 3.5 km inland from the western shore line. Dune belts 5 (youngest) to 1 (oldest) represent 5 stages of progradation during periods of sea-level regression alternating with periods of transgression. They illustrate fluctuations in the overall fall in post-glacial sea level from approximately 10,000 years ago until the beginning of this century (Schofield 1960; 1975).

- ◆ 29 NORTHERN UNCONSOLIDATED DUNE AREA. The area is a varied complex of low and high sand landforms. The high unconsolidated dune rises to over 60m and is unique in the Region. The dunes have significant native vegetation and bird life. Wetlands within this area have rich botanical associations and contribute to habitat variety. The area is attractive for off-road vehicle recreation, and should be regulated to prevent conflict with the natural processes and character of the area. Because of the rich and varied land form and rich biological associations, this area is of national significance. It should be protected from development and other activities which would detract from its natural character.
- 30 COAL SEAM HILL BIOLOGICAL AREA is a striking kanuka-covered land form rising 30m above the surrounding dune land which, prior to sand stabilisation, had an island-like appearance. The hill has a small seam of coal containing sub-fossil remains of broadleaf and coniferous trees. At the hill-top there is a well concealed flat-bottomed 'crater-like' basin. This basin is entirely surrounded by stable vegetated sand slopes, although two small 'blow-ins' are permitting sand spillage into it.
- The slopes and rim of the basin are covered with kanuka forest composed of a kanuka canopy with a shrub layer of small kanuka with scattered mingimingi, *Coprosma*, *Myrsine divaricata*, *Corokia cotoneaster* and broom.
- The actual basin is dominated by the presence of one massive puriri, flanked on the fringes by 15m high kanuka, scattered cabbage trees and a tall subcanopy of *Lophomyrtus obcordata*, houpara, karamu and *Myrsine divaricata*.
- This land is protected by a covenant.
- 31 KAIPARA DUNE LAKES. This extensive system of lakes is regionally significant in that it provides an open, shallow freshwater habitat for a number of threatened species of wildlife as well as for more common ones.
- During the 1970s some of the lakes dried up considerably. Therefore the larger, deeper lakes – Kereta, Kuwakatai, Ototoa, Okaihua – have become of critical importance to wildlife. While the levels of water in the smaller and shallower lakes fluctuate seasonally and from year to year, they remain significant habitats for birds. In addition to the four lakes mentioned above, Kereta South I, Otakanini Topu South, and the Okiritoto Stream and swamp are of very high value for wildlife. Pukeko, pied shag, little shag, little black shag, black shag, mallard duck, grey duck, grey teal, white-faced heron, black swan, paradise duck, New Zealand shoveler, pied stilt, caspian tern, kingfisher, bittern and harrier are among the species found in the dune lakes area. The fernbird, bittern, and New Zealand scaup – the numbers of which are on the decline throughout New Zealand because of the continual drainage of fresh-water wetlands – are also found around the lakes. The OSNZ has noticed a decline in the number of New Zealand scaup over the last few years. Small numbers of dabchick breed here. The dune lake system provides the specialised habitat which is required by these threatened species and, as such, warrants preservation.
- 32 LAKE OTOTOA may be the only water body in the Region where freshwater crayfish, koura (*Paranephrops planifrons*), are abundant. (See note 31.)
- The following bird species are known from the lake (from OSNZ, 1978 Surveys): little shag, pukeko, black swan, black shag, white-faced heron, pied shag, little black shag, dabchick, kingfisher, harrier, mallard duck, grey duck, bittern. (See note 31.)
- 34 LAKE KUWAKATAI is valued for its wildlife significance. The following birds have been recorded (from OSNZ, 1978 Surveys): pukeko, mallard duck, pied shag, black shag, little shag, grey duck, paradise duck, white-faced heron, dabchick, little black shag, bittern, black swan, shoveler duck, rosella parakeet, pied stilt, harrier. There is also a pied shag colony on this lake.

- It is significant because it is unusual to find such colonies on freshwater lakes. Some little shags are also found in the colony.
- 36 MURIWAI AND RANGITIRA BEACH TOHEROA BEDS. This is the only location for toheroa in the Region. The shellfish population normally fluctuates between 2-5 million but in recent years stocks have dwindled to well below this level due to a number of factors including over exploitation, natural population fluctuations, wave action and vehicular damage to the sand habitat. The viability of the habitat may be dependent on freshwater seepage from the dune lakes.
- The toheroa population is too low to support an open season. The Ministry of Agriculture and Fisheries which administers the beds continues to monitor toheroa numbers.
- 37 MURIWAI AND RANGITIRA BEACHES are long, exposed surf beaches with sandy shores, backed by sand dunes, often covered with pingao. Birds of the coast line include the variable oystercatcher, New Zealand dotterel, banded dotterel, pipit, pied stilt, white-fronted tern, little black shag, little shag, white-faced heron, blue penguin, and caspian tern.
- 38 MOTUREMU ISLAND is a scenic reserve administered by the Department of Conservation. It is a significant area for eastern golden plover and the endangered kaka beak. Pied stilts and grey faced petrels are known to breed in the area. This area is considered to be of international importance.
- 39 ATUANUI STEWARDSHIP AREA (MOUNT AUCKLAND). An indigenous state forest since 1887, this area of podocarp/kauri/hardwood forest, although logged, has never been damaged by fire. Rimu and kauri are found in scattered groups and are regenerating throughout. Kahikatea and totara are also seen in scattered locations. Associated with this is a dense mosaic of hardwood species including taraire, karaka, puriri, kohekohe, hinau and kowhai. There are many epiphytes and lianas, and a rare orchid *Yoania australis*
- is found beneath the taraire. The forest is considered to be of national importance. The Mt Auckland section of the New Zealand walkway passes through the Glorit farm settlement, through the forest via the Mt Auckland summit (305m) and a small area of exotic afforestation.
- 40 JORDAN'S FARM AND OYSTER POINT. Due to reclamation there are few remaining roosting areas in the Kaipara Harbour. The Tapora coast is one of the major roosts (see note 25). Jordan's Farm and Oyster Point are the only major ones in the southern part of the harbour where up to 10,000 birds roost during the summer, and are therefore of national and international importance. The following species have been sighted: South Island pied oystercatcher, New Zealand dotterel, banded dotterel, wrybill, godwit, turnstone, knot, grey plover, and eastern golden plover. Pied stilt are known to breed in the area.
- 43 KAUKAPAKAPA ESTUARY SCIENTIFIC RESERVE has been set aside as it is a significant area of regenerating kauri. It is an important habitat area for wildlife with a colony of shags and other species of birds nesting. The 209 hectare forest is administered by the Department of Conservation.
- 45 PARAKAI GEOTHERMAL FIELD. This is the hottest geothermal water resource in the Region. Hot water is presently abstracted at an average rate of about 560 cubic metres per day at up to 65°C. There are no surface springs.
- It is estimated that the field can sustain up to 700 m³/day draw off.
- 47 MAHURANGI HARBOUR. This area is a regionally important centre for oyster farming. The catchment should be managed to maintain water quality. Several oyster farms are located within the harbour. Mangroves are significant and important in this harbour. The upper reaches of the harbour are bordered by remnants of kahikatea swamp forest. Much of the land of the northern side is reserve land.

- ☒ 58 THE WEITI ESTUARY is notable for the series of chenier-type shell spits which have formed within the estuary. These have been used to derive a sea level curve for the last 10,000 years and are considered to be internationally significant landforms. The estuary is not a significant wading bird feeding ground, but the shell spits are a good high tide roosting site for the wading birds that feed in the adjacent intertidal areas to the south and for the coastal birds that use the estuary itself. The most seaward shell bank is particularly important as one of the key breeding grounds in the Region for the threatened New Zealand dotterel.
- ☒ 59-61 WITHIN THE WAIWERA, WENDERHOLM AND PUHOI area there is a considerable variety of intertidal substrates which together form a complex array of habitats supporting a variety of animal and plant communities. The communities living on the wave-cut platforms at Wenderholm have been found to be diverse and in good condition. The mobility of the substrate on the open beach at Wenderholm means that benthic organisms tend to be confined to subtidal areas. Along the hard shores here the natural marine area adjoins an important area of coastal taraire forest on a headland or peninsula. The intertidal flats within the Waiwera and Puhoi estuaries are used as a feeding ground by a variety of wading birds, many of which use these estuaries as a stepping stone in their travels. Many of these birds roost on the sandy area at the entrance to the Waiwera Estuary at high tide. A variety of other coastal birds feed and roost within this area. A limited amount of saltmarsh and mangrove line the Waiwera Estuary, but it is still a good habitat for coastal fringe birds because of the presence of the freshwater Straka's Dam on the boundary. The saline vegetation areas in the Puhoi Estuary are more substantial and are some of the best in the Rodney ecological district.
- ◆ 62 WAIWERA GEOTHERMAL FIELD. Abstractions of geothermal water from this field average at about 1150 cubic metres/day at up to about 53°C. The capacity of the resource is estimated at 1300 cubic metres/day. Hot springs on the beach ceased in the 1970s due to declining water levels in the field.
- ☒ 63 OREWA ESTUARY is a moderately sized estuary with a variety of habitats for plants and animal communities in the marine area. About 85% of the estuary is made up of intertidal banks upon which migratory wading birds feed. They use this estuary as a stepping stone in their travels. A range of coastal birds, particularly shags, also feed within the estuary as do a number of species of waterfowl that utilise the estuary and the adjacent oxidation ponds on the southern margins. The mangroves and saltmarsh that occupy the remaining parts of the estuary are a habitat for secretive coastal fringe birds particularly where adjoining terrestrial vegetation provides shelter for the birds at high tide and potential nesting sites.
- 68 TIRITIRI MATANGI ISLAND. Grazing animals were removed from this island in 1972 and the plant succession from pasture is being studied. In limited areas succession has progressed from grass land to manuka and kanuka to mapou dominance and further to kohekohe and mahoe. Pohutukawa are now appearing in former grass land and bracken areas. The lack of possum and kikuyu grass makes the island suitable for research on forest regeneration. The absence of rats (other than kiore) and mustelids makes the island of considerable value as a wildlife refuge. It is thus ideal for the study and introduction of native fauna. Numerous bird species breed on the island – tui, spotless crane, little blue penguin, pukeko, grey-faced petrel, fantail, grey warbler, silvereye, kingfisher, pipit, and harrier. It is the nearest island to Auckland inhabited by the bellbird. The red crown parakeet was

introduced in 1974 from aviary-reared stock. Saddleback were also introduced in 1985, and are breeding successfully. Diving petrel and sooty shearwater nest on the rock stacks. Kaka, tomtit and pigeon visit the island.

This island is part of the Hauraki Gulf Maritime Park. There is now open access and people freely visit to experience the wide variety of forest and shore birds found close to Auckland. Since 1984, school groups and members of the public have been involved in tree planting (at a rate of about 37,000 trees per year) to recreate coastal forest in a joint project run by the Department of Conservation and the World Fund for Nature.

☒☐ 69 THE NOISES, which include Motuhoropapa Island, Otata Island, Maria Island and David Rocks, are small and unpopulated. They have a diverse and abundant bird life, which depends on their comparative inaccessibility, lack of predators and the plentiful marine life available in surrounding waters and on the foreshores. Norway rats were present on Maria Island for a number of years, although it now appears that since 1962 these have been eradicated by the (then) Wildlife Service. Norway rats were also originally present on Motuhoropapa and Otata islands, and were eradicated in 1962, and again in 1993. Unfortunately there are now a number of environmentally damaging plants which are undermining the natural values of this island group. For example, *Rhamnus alaternus* is on Motuhoropapa Island, *Phoenix canariensis* on Otata Island, and mile-a-minute and boxthorn are present on Maria Island.

Maria Island is one of the few places in the Auckland Region where the white-faced storm petrel breeds. Birds commonly seen in the Noises include kingfisher, blue reef heron, red-billed gull, black shag, pied shag, little shag, white-fronted tern and gannet. The black-backed gull, harrier, welcome swallow, little blue penguin and the less commonly seen grey-faced petrel breed on the islands. The grey

warbler, fantail and silvereye are abundant and are known to breed on the islands. Tui, morepork and shining cuckoo are occasionally seen.

The vegetation on some of these islands is close to primitive conditions, but others in the past have suffered from burning. Now the important species are pohutukawa, karo, houpara, tawapou and coastal mahoe (*Melicactus novae-zelandiae*).

Such habitats are of regional and national importance.

☐ 74 RIVERHEAD ECOLOGICAL AREA. This is the last stand of indigenous forest of an appreciable size left in the Riverhead Forest. The most striking feature of the block is its variability with forest types being exhibited from a relatively simple kanuka-*Gahnia* association to highly complex podocarp forest, and all intermediate stages of 'nursery' kanuka-hardwood and scrub-hardwood types. In addition, a coastal forest type is also present.

The two-tier kanuka-*Gahnia* association grades into a number of kanuka-scrub-hardwood types, one of which contains a canopy layer of kanuka with subcanopy and shrub layers of mapou, mahoe, toro, kohuhu, lancewood, hangehange and karamu. Another type consists of emergent rewarewa and putaputaweta with scattered kanuka over a dense mamaku and ponga subcanopy with the same broadleaf species as above.

The simplest type of coastal forest consists of a dense canopy of puriri and nikau with tree ferns mixed throughout the subcanopy.

The most complex of the forest types in the area is podocarp forest. Here canopy layers vary from more or less pure kauri, kahikatea or totara stands to mixtures containing kauri, rimu, totara, tanekaha, miro and even matai. Shrub and ground layers are similarly well developed and contain a number of species not commonly found within the other associations such as maire, *Alseuosmia macrophylla*, *Corokia buddleioides* and *Gleichenia cunninghamii*.

- The indigenous fern, *Loxsona cunninghamii*, which is found in only a few other areas in the Region, grows in this reserve.
- 76 LOOKOUT BIOLOGICAL AREA. This area, the dominant vegetative cover of which is kanuka forest, is a representative remnant of a type once found in the area. Where the kanuka canopy is absent, a scrub-hardwood forest has developed.
- The kanuka forest has a definite three-tier structure consisting of a canopy layer of kanuka up to 15m high, a dense thicket layer of *Pseudopanax* spp. and a low scrub tier of *Coprosma* spp. and mingimingi. Modifications of this basic pattern are common where rewarewa, kohuhu, akeake are added to the canopy, mapou, mahoe to the subcanopy and kawakawa, *Corokia cotoneaster* and ferns to the ground storey. The scrub-hardwood association is characterised by mahoe, karamu, hangehange, mapou, five-finger and scattered emergent rewarewa, akeake, kohuhu and cabbage trees. Rangiora, kawakawa and *Coprosma* spp. are found in the subcanopy.
- This land is protected by a covenant.
- 77 HODGES BASIN BIOLOGICAL AREA. This area contains valuable 'relic' groves of typical coastal forest once common in the area. The common pattern is one of dense groves of coastal forest in the sheltered hollows with a kanuka overstorey fringing these on the ridges and slopes.
- The pockets of coastal forest contain groups of large karaka, old puriri and emergent rewarewa with kohekohe, wharangi, mangeo, akeake, titoki and ngaio scattered throughout.
- The kanuka forest has isolated cabbage tree and rewarewa emergents with a shrub tier of divaricating *Coprosma* spp., *Myrsine divaricata* and mingimingi.
- This land is protected by a covenant.
- 78 LAKE OKAIHAU BIOLOGICAL AREA. This reserve contains the best example of true coastal forest still remaining in Woodhill, as well as areas of kanuka-broadleaf scrub and raupo swamp.
- The coastal forest consists of a dense canopy layer formed by karaka, puriri, pohutukawa and titoki. Nikau and kawakawa alone are common as ground to subcanopy species. The older trees are blanketed by orchids, ferns, *Astelia* spp., and lianas. On the fringes of these dense groves, a subcanopy layer of broadleaf trees, including kohekohe, whau, turepo, houpara, karamu, wharangi, mahoe and the occasional kowhai and ngaio occurs beneath the more scattered canopy of karaka. A shrub layer of nikau, kawakawa, hangehange, and *Coprosma rhamnoides* occurs in these areas.
- The kanuka-broadleaf scrub areas occur on the eastern side of the reserve and consists of about equal portions of kanuka and broadleaf species throughout. The latter includes mahoe, wharangi, karamu, akeake, lancewood, mapou, rangiora, hangehange and cabbage trees.
- The swamp areas around Lake Okaihau are chiefly raupo dominated although flax, *Juncus* spp. and *Cyperus ustulatus* are common. Broadleaf shrubs such as karamu, rangiora, hangehange and cabbage trees border the areas.
- This land is protected by a covenant.
- BIRDS OF LAKE OKAIHAU AREA (OSNZ 1978 Survey) include: mallard duck, pukeko, pied stilt, paradise duck, white-faced heron, rosella parakeet, little shag, black shag, harrier, and black swan. It is a valuable area for wildlife.
- 80 MURIWAI GANNET COLONY on Motutara Island (known locally as Sugarloaf), a small rock stack off the headland at Muriwai beach, is a spill-over from the larger colony on Oaia Island. Motutara Island has become overcrowded. Repeated attempts by the birds to nest on the mainland, though at first thwarted by interference from humans and dogs, have since been successful. There are now two mainland gannet nesting colonies. All colonies are considered to be of national importance. Restraining fences have been built to protect the colonies and a viewing platform has been provided.

- ◆ 82 ANDESITIC PILLOW LAVA FLOWS. This lava has been deposited under water to form a heap of cylindrical bodies like a pile of pillows. The examples at Maori Bay are the best in New Zealand and among the best in the world; they are therefore of national significance. The pillow lavas are extremely well formed. They include a number of very large individual pillows, deposited in 1500m depth of water. A second series of pillows exposed in the cliffs at the south end of Te Henga are also well preserved. The largest has a diameter of 8m (av. 1-2m) and is deposited under shallower water than those at Maori Bay. These two features provide useful comparative material for the study of pillows formed under different conditions (Searle 1964; WRPS 1978).

- ☒☐ 83 ERANGI POINT, the high promontory north of the Waitakere River, supports the only mainland spotted shag nesting colony in the North Island. There are two grey-faced petrel colonies on Ihumoana Island and Kauwahaia Island north and south of Erangi Point. This petrel (oi) is a burrow dweller and needs protection from rats, cats, people and other predators. Erangi Point is considered to be of national importance.

- ☒○◆ 84 TE HENGA-WAINAMU AREA. Swamp lands, lakes, dunes and native forest provide a complex of habitats with rich and diverse flora and fauna not found elsewhere in the Region. The area is considered to be of national importance and worthy of protection.

Te Henga marsh covers some 80 hectares and is the largest coastal freshwater swamp within 120 km of Auckland. It contains virtually all of the notable northern-swamp plant species including large monocotyledons. It provides the required habitat for a number of animal species. This swamp illustrates seral succession related to the depth of the substrate from the water table. Adventive water lilies (*Nymphaea* spp.) and the water fern *Azolla pinnata* are found colonising the open water margins. In shallow waters are found the tall spike rush

(*Eleocharis sphacelata*), the native swamp millet (*Isachne australis*), and a milfoil (*Myriophyllum propinquum*). Raupo (*Typha orientalis*), Baumea spp. and swamp millet are the dominant species found in areas where the water is a few centimetres deep. Cabbage trees, flax and manuka are found on the margins or islands within the swamp. Te Henga marsh supports up to 15 native bird species. Some of these are not common, in particular, the fernbird, bittern, marsh crake, spotless crake, and banded rail require protection. Those common species found in the swamp include grey ducks, mallard ducks and pukeko.

Te Henga marsh is of high ecological value as such habitats are increasingly rare. It is worthy of protection from drainage, infilling, and waste materials with high oxygen demand on nutrient values, as any such action could cause irreversible damage to this ecosystem. Parts of this swamp have been purchased with the aim of preservation. The Royal Forest and Bird Protection Society owns approximately 30 hectares of it. The Auckland Acclimatisation Society owns 2 blocks totalling 13 hectares. The balance remains in private ownership.

Lakes Waiataru, Kawaupaku, and Wainamu and the lake at the junction of the Waiti and Te Aute streams have been formed by the damming of deep stream valleys by wind-blown Holocene sands. In recent years the Te Henga dunes have been stabilised by vegetation in the area behind the foredune. This has cut off the supply of sand to the inland dunes resulting in accelerated removal of sand from the western parts of the inland dunes and the exposing of large areas of bare rock. The advance of the dune into Lake Wainamu will probably stop as the sand supply runs out. In 1979, 154 hectares around Lake Wainamu, which is the largest natural lake in the Waitakere Ranges were acquired for reserve purposes through joint funding by the then Department of Lands and Survey, Waitemata City Council, Auckland Regional Authority, and the Waitakere

Ranges Protection Society and the Queen Elizabeth II National Trust. The reserve, adjoining the Cascades Kauri Park, has a range of habitats – lake shore, sand dunes, pasture and native forest. Some of the dune area near the lake is a Waitakere City Council reserve, set aside for the purpose of preservation.

Pingao (*Desmoschoenus spiralis*) and silvery sand grass (*Spinifex hirsutus*) are found on the two large dune areas which remain in their natural state. On the humus-rich sand around the mouth of the Waitakere River there is a distinctive maritime plant community which includes a native herb, milfoil, arrowgrass and *Gunnera arenaria*. Birds which can be seen on the beach and dunes include New Zealand dotterel, banded dotterel, pipit, black-backed gull and red-billed gull. Pied stilt are regularly seen in the small lagoon near the mouth of the main stream. There is a spotted shag colony on Erangi Point.

□ Scrublands and forest types in the area are varied. The most widespread type is dominated by manuka and kanuka; on the cliffs and promontories flax and cabbage trees with numerous native herbs dominate. On the series of fossil sand dunes to the north-east of Lake Kawaupaku, there occurs an unusual type of scrub dominated by manuka and kanuka associated with coprosmas, kowhai, mingimingi and a number of less common species such as rohotu (*Lophomyrtus obcordata*), poataniwha (*Melicope simplex*) and weeping matipo (*Myrsine divaricata*). Nikau and cabbage trees occur in the hollows, and pohutukawa coastal forest around Erangi Point, Ihumoana and Kauwahaia Islands. Surrounding Lake Kawaupaku the coastal forest is comprised of tawapou, karaka, pohutukawa, kohekohe, mahoe and mangeao. To the north of Te Henga swamp there is a kauri-podocarp forest where standards of kauri rickers dominate the ridges. A mixture of rimu, kahikatea, tawa and titoki is found in the gullies. Approximately 70 hectares of this forest are owned by the Royal Forest and Bird Protection Society. The

scrub areas support silvereye, fantail, grey warbler and tui. In addition to these, the native forest areas have rosella parakeet, shining cuckoo, morepork and pigeon.

☒ 85 BULL KELP (*Durvillea antarctica*) is rare in the Region. It is found in significant quantities only along the west coast between Te Henga and Piha.

☒◆□ 87 The WAITAKERE RANGES. These hills of Miocene volcanic rock rising to 475m above sea level are the major landform feature west of the urban area and provide water catchment supply areas and outdoor recreation facilities for the Region. It is a botanically rich area containing 20% of all New Zealand's flowering plant species and 60% of all New Zealand fern species. There are a few species which do not extend beyond the borders of the Waitakere Ranges – the local kowhai (*Sophora microphylla* var. *fulvida*), a forget-me-not (*Myosotis petiolata*) and *Hebe bishopiana*. A large number (43) of regionally threatened plants are found in the Waitakere area. The uncommon orchid *Yoania australis* is dependent on taraire forest and is still found in the Waitakeres.

In spite of extensive milling and clearing in parts for farming, the greater portion of the ranges is clad in native forest, some nearly virgin. Forest unaffected by milling, or only lightly logged, covers about one-fifth of the Waitakeres. Areas which have developed beyond the tea tree stage, and forest which was heavily milled but not burnt, cover more than a third of the ranges. Most is in the Piha – Anawhata – Bethells area. Tea tree makes up about one third of the vegetative cover (Esler 1974).

The unmilled forest has kauri as its most distinctive tree. The kauri tree grows singly or in small clusters, frequently, but not always, on the crests of ridges. Between the widely spaced crowns of mature kauri, emerge rimu, northern rata, miro, totara, tawa, tanekaha and rewarewa. Dense stands of kauri rickers are also found. A very distinctive set of plants grow with kauri grass and species such as tawari,

kawaka, *Dracophyllum latifolium* and the ferns *Gleichenia cunninghamii* and *Schizaea dichotoma* which are more likely to be found with the kauri than away from it. There are parts of the unmilled forest where kauri is not common. In the upper Nihotupu catchment there is a fine stand of rimu and northern rata with no kauri.

The cut-over forest is of variable age, and comprises northern rata with small quantities of tawa, rewarewa, rimu, totara, puriri and kahikatea. The distinctive feature of the canopy is the variety of crown shapes and shades of green. There are many component species such as mahoe, heketara, kohuhu, mapou, coprosmas, tree ferns and nikau. The climbers, supplejack and kiekie, are abundant.

Coastal forest is not extensive but fragments are encountered in many places. Pohutukawa dominate with associates such as flax, *Astelia banksii*, *Gahnia lacera*, kawakawa, kowhai, tawapou, houpara, rangiora, the ferns *Asplenium oblongifolium* and *Polystichum richardii*, the succulent *Peperomia urvilleana* and the renga lily. In the more sheltered gullies pohutukawa forest grades into the forest of the interior through a zone comprising kohekohe, karaka, wharangi and whau.

The vegetation around Welsey Spragg Memorial includes quantities of *Dracophyllum sinclairii*, *Persoonia toru* and *Gleichenia circinata* and a smaller amount of flax. This plant community approaches what is called gumfield shrubland which is becoming increasingly rare in the Region.

Differences among tea tree communities result from variations in age, topography (altitude, aspect, slope), proximity to the coast and the effect of grazing cattle. Manuka (*Leptospermum scoparium*) dominates sites adjacent to the coastline, being more resistant to wind-borne salt c.f. kanuka, (*Kunzea ericoides*) found further inland. Tea tree communities represent a transitional stage in the succession towards mature forest, and some are now giving way to kauri or rimu dominated forest (Esler and Astridge, 1974).

Birds which live in the forest include grey warbler, silvereve, fantail, tui, pigeon, rosella, morepork, shining cuckoo, kingfisher, kaka (seasonal) and tomtit. New Zealand falcon and long tailed bats have been reported from the Karekare area.

The forest gecko and native frog *Leiopelma hochstetteri* (both depleted species) are found in the Waitakeres. Two species of native land snail, *Rhytida greenwoodi* (southern) and *R. dunni* (northern), are found throughout the ranges; a large variety (over 100 species) of smaller snails are numerous. *Paryphanta busbyi*, the large carnivorous kauri snail, can be found in some areas.

The Waitakere Ranges are considered to be of national and international importance.

◆ ☒ 88

WHATIPU BEACH is an unconsolidated mobile sand area of dense black sand with large admixtures of titano-magnetite characteristic of west coast harbour entrances of the Region. The beach has a history of rapid progradation and recession. High water mark was along the cliff-line in the 1840s and 1930s, and near the present position (about 1 km west) in the 1960s and further out in the 1950s (Williams 1977; Esler 1974). The remote wilderness character of this area is protected by ARC policies of foot access only to the area.

Whatipu is an important nesting area for the white-fronted tern and a feeding area for the caspian tern and blue reef heron. Pingao is also found on the mobile sands, and a diverse range of freshwater wetlands are found on the sand flats close to the coastal cliffs. The area as a whole is considered to be of national importance.

☒ 90

The HUIA AREA is characterised by a diversity of estuarine and salt marsh habitats, scrub, coastal forest, pasture and kauri dominant rain forest. At the end of the lower Huia dam, in the water catchment area, there is a small area of native forest containing a rich variety of species some of which are rare. At the salt

marsh at Huia a small weevil (*Peristoreus australis*), previously only found in the South Island, has been discovered. A newly discovered species of moth has been found in the area living in the flowers and leaves of the marsh ribbonwood. Blue reef heron, pied stilt, oystercatcher and white-faced heron are found on the intertidal flats of Huia Bay.

- 95 KAIPATIKI ESCARPMENT. These steep south-facing slopes are partly within a reserve area and contain extensive areas of high quality native vegetation consisting of kauri and mixed podocarp-broadleaf forest. The area contains some large kohekohe, puriri, kahikatea and taraire trees with abundant kauri and beech trees. The presence of beech trees, *Nothofagus truncata*, makes the area of special interest.

- 97 SMITH'S BUSH, now dissected by the motorway, has an outstanding grove of giant puriri (some up to 6m in girth) and thousands of slender, conical kahikatea as well as smaller numbers of taraire, kowhai, titoki, karaka, tawa and totara. Ground ferns, climbing ferns, sedges and grasses are also found in the reserve.

- 98 KAURI POINT is the most prominent tree clad headland in the Waitemata Harbour.

- 99 CHELSEA BUSH, now confined to the stream areas, is a remnant of the kauri mixed forest which was once common in the Region. Here kauri and hard beech can be seen growing together and near the reservoir a fine stand of the sedge, *Eleocharis spachelata*, can be found.

THE WAITEMATA HARBOUR

- 91 UPPER WAITEMATA HARBOUR CREEKS. Brighams, Rangitopuni, Paremuremo, Lucas and Hellyers creeks in the upper reaches of the Waitemata Harbour offer largely unspoilt tidal inlets with hill sides of regenerating native forest in places, particularly in the area of Lucas and Paremuremo creeks.

The forest cover consists of kauri on the ridges with puriri and kahikatea dominants on the slopes and in the gullies. The coastal forest is comprised of pohutukawa, kowhai and karaka

dominants. Hard beech is also found along the Hellyers Creek escarpment.

The extensive sheltered intertidal areas retain large quantities of soft sediment derived from the watershed. The mangroves and salt marshes are important as wildlife habitats. Birds which can be found in the area include black shag, kingfisher, ducks and white-fronted tern. The ARA/NWASCO Upper Waitemata Harbour Catchment Study provided detailed information on the environment and sensitivity of the catchment above the Greenhithe bridge.

- 100 BIRDS OF THE UPPER WAITEMATA HARBOUR. Birds which are commonly seen throughout the Waitemata Harbour include pied shag, little black shag, little shag, pied stilt, black-backed gull and red-billed gull. Pukeko, mallard duck and kingfisher are commonly found in the tidal creeks and mangroves. The caspian tern can often be seen in the sheltered waters of the upper harbour where they feed on fish caught by diving. The white-fronted tern is found in the vicinity of Hobsonville and Whenuapai. Banded rail are not common but can be seen in some of the mangrove areas. The white-faced heron is commonly found around the tidal flats of the upper harbour where it finds an abundant supply of food in the mangroves. Blue reef herons can be seen in small numbers in the outer harbour area. White herons can on rare occasions be seen at Pollen Island. The black shag is also seen occasionally around the Te Atatu peninsula. The South Island pied oystercatcher is common in numbers of up to 500. As many as 180 banded dotterel have been sighted on Pollen and Traherne islands. Wrybills are present in season as are godwits. Since 1978 the New Zealand dotterel has made a return to the harbour and has nested successfully in three areas.

- 101 HOBSONVILLE. Opposite Kaiwhanake Point is a shell bank that attracts a variety of waders. In 1981 this area had a wintering flock of New Zealand dotterel. This is also one of the two major roosts

- in the Waitemata Harbour for godwit in the summer and for South Island pied oystercatcher in the winter. The area has no public access except by boat. New Zealand dotterel have nested here but not successfully.
- ☒ 102 TE ATATU NORTH. At the tip of the mangrove area is a series of small shell banks. These are major roosting areas for waders in the Waitemata Harbour, particularly godwit. New Zealand dotterel and caspian tern have successfully nested here in recent years.
- ☒ 103 SOLDIERS BAY, with its sand flats, mangroves, shell bank, saltmarsh and bulrush swamp, has great potential for wildlife, recreational and educational purposes. Pied stilt, white-faced heron, kingfisher, gulls, white-fronted tern, caspian tern and, occasionally, gannet can be seen in the area.
- ☒ 104 TE ATATU – WHAU RIVER. On the east side of the Te Atatu peninsula south of Harbour View Road there are extensive, clean, high-tidal sandflats, healthy mangroves, a prominent shell bank and a high-tidal salt marsh along the shoreline. Such a combination is unusual to find in the Waitemata Harbour and is one of the few worthy of wildlife reserve status. However, the shell banks are deteriorating due to constant use by motorcycles and few birds roost here. The off-shore area remains a major feeding ground. Gulls, terns, pied stilt, white-faced heron and kingfisher are seen in this area.
- The mangroves and salt marshes in the Whau River are also worthy of preservation. An extensive and ecologically healthy area of mangrove and salt marshes can be found in the Henderson Creek. This area is readily accessible and contains good examples of the natural communities for educational purposes.
- Kingfisher, pied stilt, white-faced heron, red-billed gull, black-backed gull, pied shag, black shag, welcome swallow, and pukeko are among the birds seen in the area.
- ☒◆ 105 POLLEN AND TRAHERNE ISLANDS. These low-lying islands with extensive shell banks, mangroves and salt marshes comprise an important wildlife area in the Waitemata Harbour. While the shell banks at the northern end of Pollen Island are lower than they have been, shell banks have developed 50m off-shore on the harbour side of Pollen Island and are significant roosting areas. Traherne Island is also an important roosting area for birds and is the main roost for banded dotterel and wrybill in the Waitemata Harbour. New Zealand dotterel and fernbird nest in the area. The fernbird colony which survives represents an extremely valuable avian resource. This species is now rare in the Auckland area. The tidal mud barrier on the southern side has probably been very important in preventing access of predators and deterring access by people. The south end of Pollen Island is the only known locality in New Zealand of the minute ant, *Mayriella abstinens*; it is also the type of locality for a new species of psyllid, *Anomalopsylle* which is less than 1mm long. Limiting public access is essential to the preservation of this important wildlife area. The Pollen Island locality is a proposed marine reserve and is considered to be of national importance.
- ☒◆ 106 TE TOKAROA (BLACK) REEF is a basaltic lava flow, probably from Mt Eden (possibly Mt Albert) which extends into the Waitemata Harbour. It provides a range of habitats and flora and fauna "which is unique both within the Waitemata Harbour and throughout New Zealand" (Larcombe 1973, 339). Extensive salt marshes and mangrove communities associated with the reef enhance the great educational value of this area.
- ◆ 107 TANK FARM is a former freshwater crater lake formed by explosive eruptions and surrounded by steep tuff rings. With rising sea level this crater has been breached by the sea, and provides sheltered intertidal mangrove and salt marsh communities important as fish and bird habitats. Tank Farm is of regional significance.

- ◆ 108 LAKE PUPUKE is also formed in a volcanic explosion crater which has been preserved by its tuff sides. The nearly circular freshwater lake has a surface area of 100 ha and is over 50m deep in the centre. The lake is enriched but supports a variety of fish and bird life including pied shag, ducks, black swan, pukeko, white-faced heron, Canadian geese (all of which breed on the lake), tui, fantail, silvereye, and grey warbler.
- ☒ 109 SHOAL BAY, north of a line east of the Northcote motorway interchange, is an important feeding and roosting area. Caspian tern, New Zealand dotterel, pied stilt, white-faced heron, pukeko, kingfisher and gulls can be seen in the area. There are only two significant roosting areas remaining in the bay – a shell bank on the Takapuna side, and another on the motorway side. The latter is the only roosting area used by the New Zealand dotterel between Traherne Island and Browns Island and is a nesting area for the New Zealand dotterel, caspian tern and pied stilt. These shell banks deserve protection not only in their own right and for their ornithological value but also because of the protection they afford coastal margins, salt marsh and mangrove communities. The Wairau and Milford catchments drained through the Shoal Bay valley before the Pupuke eruptions blocked the valley.
- ◆ 110 MOUNT VICTORIA (TAKARUNGA) is a steep scoria cone, the largest north of the harbour with a summit crater breached towards the south east from whence lava flowed into the Waitemata valley.
- ◆ 111 NORTH HEAD (TAKAPUNA). This notable landmark at the entrance to Auckland Harbour has been considerably eroded by the sea and in the recent past (5000 years ago) has been an island. The lower part of the mount is composed of tuff beneath the central scoria cone from which a small lava field flowed.
- ☒ 113 BIRDS OF HOBSON BAY include white-fronted terns, gulls, kingfishers, white-faced herons, pied stilts, mallard ducks and pukeko. The native pigeon can also be seen in the area.
- ☒◆ 114 ORAKEI BASIN is a phreatic explosion crater which formed a freshwater crater lake (maar) which has been breached to form a tidal mudflat. Subsequently the basin has been closed off by the railway embankment and the water level and flushing of the basin is now controlled. Little shags, pied shags, and little black shags nest around the basin. This volcanic features is considered to be of national importance.
- 115 PUREWA VALLEY contains remnants of coastal forest and one of the finest examples of mangrove forest in the Auckland area with some trees up to 4m in height. Several patches of eelgrass, now a rather uncommon species in the Waitemata Harbour since its devastation by disease in the 1950s, are found on the tidal flats. There are some old kanuka, cabbage trees, kowhai and pohutukawa. The forest on the steep northern valley side has a valuable and instructive botany, zoology and geology. ACC and local groups have undertaken the protection and enhancement of this area. Birds of the area include mallard ducks, pied stilts, kingfishers, blue reef herons, grey warblers, tui and pukeko.
- ◆ 118 to 131 VOLCANIC LANDFORMS OF THE AUCKLAND AREA. The Auckland volcanic field is notable because of the very large number of individual volcanoes set in so small an area, and for the small size of the individual volcanoes. Volcanic activity was thought to be restricted to the last 60,000 years of geological history. Recently other methods of dating indicate that the oldest eruptions may have occurred up to 150,000 years ago. Only a few sites such as Albert Park, Symonds Street and perhaps Pupuke are older than 50,000 years; others such as Albert, Roskill, Three Kings, Panmure, Taylors, Victoria, North Head, Hobson, St John, and Pukaki probably date from the period 20,000 – 50,000 B.P.; while Eden, Wellington, One Tree

Hill, Smart, Mangere, Green Hill, Wiri and Browns Island are less than 20,000 years old. Only Rangitoto Island has been active in historic times. Searle (1964), and Searle and Davidson (1975) give details of volcanic activity in the Region. Short notes on individual features are given below.

Many of the features identified as contributing to the regional significance of Auckland's volcanic landforms have been damaged by infill, drainage, quarrying or other development. However the remnants may retain high scientific value as partial or exposed records of geological activities. In these cases protection is sought for those remaining values which are not within operative quarry zones or where quarrying is an existing or approved use.

- ◆ 118 MOUNT ALBERT (Owairaka). "Poor, pathetic, decapitated Albert – what can be said of its mutilated torso other than it was once a beautiful scoria cone" (Searle and Davidson 1975). Lava flows from it, streamed mainly to the north to reach the present coast near the Oakley interchange, and at Meola Creek.
- ◆ 119 MOUNT ROSKILL (Puketapapa) a small but complex scoria cone; small lava flows extended south and east to the Oakley Creek.
- ◆ 120 THREE KINGS (Te Tatua a Riukiuta). Now almost completely quarried away, the Three Kings area provided a miniature but complete collection of volcanic structures – scoria cones, tuff cones, and craters; explosion pits, horseshoe rings and breached craters; dykes and flows, tuff, scoria and lapilli beds. There is also an extensive 200 m cave system with individual chambers up to 10 m wide. The primary heritage feature of value is the remaining cone which is a reserve, and the quarried face of the tuff ring.
- ◆ 121 ONE TREE HILL (Maungakiekie). One of the largest of all the volcanoes in the Auckland volcanic field. The summit peak of the scoria mound overhangs a small elliptical crater and appears to be a remnant of a larger structure destroyed in later eruptions. Two large breached craters in the north and west were the sources of vigorous lava flows and resulted in the spectacular amphitheatres of One Tree Hill. One Tree Hill is considered to be of national importance.
- ◆ 122 MOUNT EDEN (Maungawhau). A complicated scoria cone structure with three main craters in a row, giving an oval shape. Basaltic lavas flowed in all directions filling valleys and depressions and causing massive landscape changes. Lava flows towards Khyber Pass and Newmarket piled up to form a thick pedestal to the mountain, which is today exposed in the quarries below Auckland Grammar School. Mt Eden is considered to be of national importance.
- ◆ 123 MOUNT ST JOHN (Te Kopuke). A simple scoria cone formed on associated lava flows, with a typical saucer-shaped crater formed by the deposition of scoria around the vent, and not from an explosive blast.
- ◆ 124 MOUNT HOBSON (Remuwera). A small scoria mound with a minor ash-covered lava flow, probably the last member of the Eden cluster to erupt. An armchair-shaped scoria mound formed from fire-fountaining in the north, while lava flowed to the south over swampy land towards the present day railway.
- ◆ 125 AUCKLAND DOMAIN is one of Auckland's oldest volcanic sites. The sports grounds occupy the explosion crater, while the museum and hospital stand on portions of the tuff ring. A small scoria cone, Pukekaroa, forms a knoll behind the Winter Gardens within the main crater (castle-and-moat). There are number of small lava vents and a further scoria cone remnant at Outhwaite Park. The volcanic features of the Domain are considered to be of national importance.
- ◆ 126 MOUNT WELLINGTON (Maungarei). The most recent site of mainland activity (about 9000 years ago). Scoria and lava deposits overlie tuff deposits from early eruptions. Lava flows streamed from various points to Penrose and thence

- to the Manukau Harbour. While the entire Mt Wellington volcanic complex is of geological interest, much of the lava flow has been modified by urban and industrial development, and consequently the primary heritage value is the remaining scoria cone which is reserved. Mt Wellington is considered to be of national importance.
- ◆ 127 PANMURE BASIN. A tidal maar formed by a phreatic eruption resulting from the contact of magma with ground-water. The basin is a nesting area for the pied shag and white-faced heron. The volcanic feature of Panmure Basin is considered to be of national importance.
 - ◆ 128 MOUNT RICHMOND (Otahuhu). A vast 'castle-and-moat' volcano in which the scoria mount 'castle', composed of a coalescing cluster of cones and craters of small size but considerable complexity, lies against one wall of the tuff moat.
 - ◆○ 131 ONEHUNGA SPRINGS tap groundwater from below One Tree Hill lava flows. Three springs are known, located in Bycroft and Grotto streets and Captain Springs Road.
 - ☒◆ 134 MANUKAU FORESHORE. The foreshore and shoreline area from Mangere Bridge westward along Kiwi Esplanade is an important roosting area for seabirds and wading birds. The western part of this land is now reserved as Ambury Regional Park. The coastline to the west is an important bird habitat, being a particularly rich feeding ground and roosting area. Over the last 30 years, 86 species have been sighted in the area, many of which are overseas migrants. Species which breed here include the white-faced heron, banded rail, shoveler duck, pied stilt and welcome swallow. The feeding grounds are also used by waders such as the South Island pied oystercatcher, wrybill, banded dotterel, godwit, knot, turnstone, and golden plover. Dabchicks, paradise ducks, white herons, little egrets, royal spoonbills, black-fronted and New Zealand dotterels are seen occasionally. Rare visitors include the black-fronted tern, black stilt and black-billed gull. Two small islands just off shore in the oxidation ponds and in the Manukau Harbour are being kept clear of vegetation to provide more roosting space in an attempt to keep the birds away from the airport. The foreshore area is considered to be of national importance.
 - ◆☒ 135 PUKETUTU ISLAND is a volcanic island joined to the mainland by a causeway. Early explosive eruptions formed a large crater and widespread tuff ring. In the centre of the island was a cluster of coalescing cones piled upon one another, but reaching only 70m above sea level. Lava flows filled the moat between the cone and tuff ring. A small lava field was built and now surrounds the island except where wedges of tuff separate flows. The main areas on the island of value in terms of geological heritage are the remaining volcanic cones, undisturbed areas of tuff ring, the unmodified lava flow surfaces and the intertidal lava reefs which extend into the sea on the western side of the island. These intertidal lava reefs are also of value for coastal bird species and for their association with small saline wetlands. Bird species which utilise the island include stilt, oyster catcher, spoonbill, dotterel and wrybill. In the rehabilitation of the quarried areas of the island, consideration of returning surfaces so that they resemble their original contour is recommended.
 - ◆ 138 MANGERE LAGOON is a sea invaded maar with a tiny scoria cone, now surrounded by sludge lagoons associated with the Mangere Waste Water Treatment Plant.
 - ◆ 139 MANGERE MOUNTAIN erupted about 18,000 years ago. A huge scoria mound has filled the explosion crater from a number of central vents. Lava escaped from the crater through a breach in the east and the adjacent breached crater (playing field). A small lava dome in the main crater may be a 'tholoid' extruded from a vent beneath. Ash covered lava surrounds the mound extending northwards to form the Manukau Harbour foreshore. Mangere Mountain is considered to be of national importance.

- ◆ 142 BURIED FOREST. When Maungataketake erupted about 29,000 years ago, the tuff buried an extensive area of surrounding forest. A well-preserved sample of this ancient vegetation has been exhumed by the sea at Ihumatao and lies exposed on the wide tidal flats which are littered with the remains of forest trees. Some fallen trunks are more than 20m long and show no sign of branching at that height, while other stumps are up to 4m diameter. Today the preserved timber of the trees looks not unlike that of modern drift logs on a beach. The Ihumatao buried forest is considered to be of national importance.
- ☒ 143 THE WIROA ISLAND artificial roost is currently a major wrybill roost in the harbour and is widely used by other birds including gulls. The roost has been constructed to attract birds away from the airport approaches and thus reduce the collision hazard.
- ☒ 144 PUHINUI CREEK area is comprised of a variety of habitats including extensive shell banks, intertidal mudflats, mangroves and extensive shoreline salt marsh. Thousands of international migratory birds and New Zealand endemic waders feed on the mudflats and use the shellbanks as a high tide roost. Banded rails, and fernbirds inhabit the saltmarsh. Part of the area is a wildlife refuge. The water quality of the Puhinui Stream should be maintained and adverse effects on valued natural heritage features from activities on adjoining land and in the coastal marine area should be avoided.
- ◆ 145 PUKAKI LAGOON is a simple circular explosion crater with a tuff ring breached on the seaward side by a narrow channel. The crater was formed during a single burst of activity which piled up a tuff cone on top of a low flat area. The crater became tidal when the sea level rose to become filled with mud, but has recently been drained. This landform has been only slightly damaged and it is an excellent example of a circular explosion crater. The crater, virtually unspoiled by urban development, is a splendid natural amphitheatre.
- ◆ 146 CRATER HILL east of Pukaki is larger and less regular, the tuff ring having been destroyed by subsequent eruptions to the north east as far as the present railway line at Papatoetoe. The inner slopes of the tuff ring have also been eroded back by a freshwater and at times swampy lake. These processes make it unique in the Auckland field and protection, at least in part, is therefore warranted. A strip section down the inside of the crater showing the processes of construction would be appropriate. The area has been exploited as a source of peat, the eastern side modified by a road and parts of the area have been quarried. Crater Hill is considered to be of national importance.
- ◆ 147 MOUNT ROBERTSON (Sturges Park). A wide explosion crater with a gently sloping tuff ring was the first structure built and constituted the major unit of the volcano. Part of the Otahuhu commercial area is built on one edge of this ring. As explosions ceased, lava rose in the vent and a very short spasm of splashing and spouting created a low cone in the centre of the crater forming a castle-in-moat structure, which today provides an ideal setting for sports fields. The remaining volcanic features are considered to be of national importance.
- ◆ 150 WIRI LAVA CAVE which is 280m in length is unique as it is the only Auckland example embodying several features in their most perfect form. These are smooth, gas-flazed rock surfaces, lava stalactites, circular tube gas vents, ridging on the floors and contraction gaps at the base of walls. The cave is considered to be of international importance.
- ☒ 160 THE TAMAKI ESTUARY is a regionally important wildlife habitat. It is a large river estuary where considerable areas of intertidal flats have accumulated and a sand-shell spit (Tahuna-Torea, see below) has built up near the entrance. There are a number of other roosting sites (notably Pakuranga Creek Roost and the Tamaki River East Roost), which are used by hundreds of wading birds which feed in the estuary. Intertidal banks (such as the

Tamaki East Bank) contain extensive beds of shellfish and are important feeding grounds for these birds.

- ◆ There are also a number of geological features of note along the banks of the estuary. At one point is a small geological exposure of *rhyolitic co-ignimbritic accretionary lapilli* from the Taupo Volcanic Zone, which is exposed as a thin bed near the base of an eroded low sea cliff. The site is considered to be nationally important. The Waiouru Tuff Mound has an indistinct, crater-like depression about 300m in diameter. The crater is breached to the SW by tidal creeks and has an 8m terrace along the Tamaki River. It is one of the oldest members of the Auckland volcanic field, and is considered to be regionally important.

- ◆ 160a TAHUNA-TOREA (GLENDOWIE SANDSPIT). 'The gathering place of the oystercatcher.' A large stable depositional feature probably dating back to the Pleistocene, it is in dynamic equilibrium (in its natural state) with subtle changes occurring in response to wind, wave and tidal action. Recent excavation and dumping at the proximal end may change this balance.

- ⊗ ○ The estuarine area behind the spit has been dammed and developed by the Tamaki Estuary Protection Society, as a brackish pond for feeding and roosting birds. A freshwater wetland has also been developed as a breeding and feeding area. The area provides an interesting complex of marine, intertidal, freshwater and terrestrial habitats for a wide range of birds. It has added value because of its proximity to, and ready access for, a large number of people.

Birds which frequent the area include the South Island pied oystercatcher, pied stilt, godwit, knot, turnstone, golden plover, banded dotterel, New Zealand dotterel, wrybill, black-backed gulls, red-billed gulls, caspian terns, pied shags and little shags; white-faced heron and blue reef heron also feed on the tidal flats.

The grey warbler, fantail, silvereye,

and kingfisher along with numerous introduced species can be heard if not seen while walking along the spit. The pipit visits in the winter, the shining cuckoo in the spring.

- Along the sandspit there are several patches of the native shore convolvulus (*Calystegia soldanella*), and springy mattress-like native pohuehue (*Muehlenbeckia complexa*), and the ribbonwood (*Plagianthus divaricatus*). The salt marsh at Tahuna-Torea is found on the seaward margins of mangrove communities and is essentially unmodified, consisting of glasswort (*Sarcocornia quinqueflora*), salt-meadow primula (*Samolus repens*), starry-flowered Selliera radicans, sea rush (*Juncus maritimus*) and the jointed rush (*Leptocarpus simplex*).

Impounded within the brackish pond of the estuary are a series of low-lying banks stabilised with rushes which are believed to be pre-European fish traps. These unique features deserve protection from siltation flooding and vegetation change.

- ⊗ □ 161 MANGEMANGEROA, TURANGA AND WAIKOPUA are tidal creeks flowing into one large bay, which has a complex of intertidal mud, sand and shell banks. The intertidal banks are a very rich feeding ground and important mid-tide roost for many hundreds of a variety of international migratory and New Zealand endemic wading birds, including a number of threatened species. Large shellbanks at various locations at creek mouths, behind the beach, or near Motukaraka Island are or have been used as high tide roosts by these birds and a variety of other coastal bird species.

In the shelter of the shellbanks and the creeks grow areas of mangroves and saltmarsh, some of it judged to be the best in the Hunua ecological district. There are two major gradations from saline vegetation into terrestrial vegetation. One is from mangroves into the coastal ponga and taraire and kowhai forests. The second grades from mangroves into saltmarsh into coastal shrublands on islands in the Turanga Creek. The saline vegetation

- fringing the creeks provides high quality habitat for threatened secretive coastal fringe birds, particularly where it abuts terrestrial vegetation, which provides shelter for the birds at high tide and potential nesting sites.
- 163 CLEVEDON-MARAETAI HILLS. A large stand of native forest is found in this area. The pre-European vegetation cover probably consisted of two major forest community types: kauri-hard beech and podocarp-broadleaf. Over the last 100 years the area has been burned and logged. Today kauri is dominant in many parts and regeneration is good. Many seedling species can be found such as tanekaha, rewarewa, kohekohe, taraire, rimu, miro, and totara. Over 100 native vascular plants are found in the area. The chief botanical value lies in the large amount of hard beech (*Nothofagus truncata*) contained both in more or less pure stands and mixed with kauri. The kauri-beech forest type is nationally rare and considerable regeneration which has occurred over the last 100 years, with growth rates comparable to those kauri on the same site, seem likely to ensure the persistence of the kauri-hard beech forest in the area. There is a varied and abundant native insect and bird life.
- ☒◆ 165 MOTUKOREA (BROWNS ISLAND) is the relic of a much larger structure created when sea levels were low and the harbour dry land. Remnants of a very large tuff cone are preserved in the north eastern ridge and cliffs.
- The scoria mound is a complex of coalescing cones, while the associated lava field is now beneath the sea. The New Zealand dotterel breeds here. Two or three pairs of black-backed gulls nest on the island. Reef herons and variable oystercatchers have been sighted. The island is administered by the Department of Conservation, and the volcanic features are considered to be of international importance.
- ☒◆ 167 RANGITOTO ISLAND is of international significance as a volcanic landform because each stage, from the initial colonisation of raw basalt and scoria to the formation of scrub to immature forest, can be seen. It is the youngest and largest of the Auckland volcanoes having been active at least within the last 400 years. The greater part of the island is a low dome built up by successions of basaltic lava flows, surmounted by a cluster of scoria mounds and cones, the last built of which has a deep central crater. The lava field contains no soil in the usual sense of the word, although rich, fine, dark powder is accumulating in the fissures. Yet, more than 200 species of native ferns and flowering plants grow on the island. Dominant among the trees is pohutukawa; kohekohe, mangeao, puriri, rewarewa, rata, puka, five-finger and manuka are also found. There are knee-deep growths of kidney fern and nearly a score of orchids. There are many mosses and lichens and, in winter and spring, a blue-green algae.
- Birds found on the island include fantail, hawk, silvereye, grey warbler, blue reef heron, caspian tern, kingfisher, pipit, white-faced heron and nests of the little blue penguin. There are a number of breeding colonies of black-backed gull scattered in the bare lava. Black-backed gulls obtain only a small proportion of their food from traditional feeding areas on tidal flats. In the past, over 10,000 gulls migrated daily from Rangitoto to feed on rubbish tips throughout the urban area. However, the improvement of rubbish disposal techniques in Auckland has resulted in a reduction in the number of black-backed gulls on the island.
- This island which is part of the Hauraki Gulf Maritime Park is close to the mainland and readily accessible by many who live there. It provides sheltered anchorage, swimming, fishing, walking, bird watching and opportunities for general nature study. Rangitoto Island is a conspicuous and important landmark which is visible from many parts of the Region and contributes much to Auckland's natural setting.

- ☒ 169 HAURAKI GULF and ISLANDS. The combination of warm climate, sheltered waters and numerous islands of the Hauraki Gulf makes it a unique marine recreational area and one of the most important amenities of the Auckland Region. Many of the smaller islands and the remote or inaccessible parts of the large islands play an important part in the preservation of native flora and fauna, and as such deserve protection. One of the most attractive features of the gulf islands is the cleanliness and clarity of their surrounding waters. The quality of the gulf's waters has enhanced their value for aquatic sports such as swimming, diving, fishing and boating. It has also fostered the rich marine life which supports the gulf's sea birds. Pipi, cockles and tuatua are still plentiful in the gulf; mussels and rock oysters have been greatly reduced in number due to over exploitation. It is important that the water quality of the Hauraki Gulf is protected.
- The wide range of values of the Hauraki Gulf and islands – ecological, scenic, recreational, cultural, spiritual, historical and economic – make it of regional and national importance.
- ☒○□ 186 TE MATUKU BAY is an estuarine area on the sheltered southern side of Waiheke Island. The extensive intertidal flats, shell banks, and low-lying islands offer a variety of habitats for a range of plant and animal communities. The extensive intertidal areas are a rich feeding ground for large numbers of international migratory and New Zealand endemic wading birds, including substantial numbers of a considerable variety of threatened species. These birds roost on the shell spit in the outer reaches of the bay at high tide, along with a variety of other coastal birds which feed in the waters of the bay. In the shelter of the upper reaches of the estuary there are extensive areas of mangroves and saltmarsh growing in association with terrestrial vegetation on the low-lying islands. The saline vegetation grades into the freshwater raupo wetland and kauri-tanekaha forest in the best such sequence on the island. The saline vegetation and associated freshwater vegetation provide high quality habitat for threatened swamp birds and secretive coastal fringe birds particularly where the wetlands abut terrestrial vegetation which provides shelter for the birds at high tide and potential nesting sites. This area is considered to be of national importance.
- ☒○ 187 AWAAROA BAY is an estuarine area on the sheltered southern side of Waiheke Island. There are extensive intertidal areas which are a feeding ground for a relatively large number of a variety of wading bird species. These birds roost on the associated shellbanks at high tide, along with a range of coastal birds which feed in the waters of the area. In the shelter of the upper reaches of the estuary there are substantial areas of mangroves and saltmarsh. The saline vegetation grades into the best freshwater raupo wetland on the island.
- ☒ 188 FRENCHMANS CAP is a nesting site of the blue reef heron which is threatened by competition with the more aggressive white-faced herons, an immigrant from Australia about 30 years ago. Black-backed gulls, white-fronted terns and a pair of caspian terns are also known to breed here. This important habitat deserves to be protected.
- ☒□ 191 PONUI ISLAND is a large privately owned island which has been farmed for many years. It is an attractive combination of pasture, native forest and unspoilt coastline with sheltered bays. There are dense stands of young kauri with some tanekaha, and in the valleys taraire, tawa and kohekohe are regenerating. Spotted shags and white-fronted terns roost north of Bryants Bay in the north east of Ponui. Around the headlands in the north west the pied shag, little shag and blue reef heron

are frequent visitors. Other birds found on the island include the pigeon, tui, kaka, North Island brown kiwi, spotless crane, bittern and pukeko. The island is a wildlife refuge.

- ☒☐ 201 The FIRTH OF THAMES, extending south from the Hauraki Gulf to the Hauraki Plains, is one of the three areas in the Auckland Region which is of national and international ornithological significance, attracting tens of thousands of birds each year from the South Island and from the arctic and subarctic regions. The east and west coasts of the Firth of Thames are very different: in the east the shore is steep and rocky; to the south and west the water is shallow and at low tide broad intertidal flats and many square miles of eutrophic ooze are exposed. The stretch of coast from Kaiaua to Miranda offers ideal conditions particularly for the wading birds. The shell banks which have built up over centuries are crowded with birds each day when tides are high. The Taramaire and Miranda shell banks are extremely popular roosting grounds for birds feeding on the extensive tidal flats and in the swampy paddocks: knots, wrybills, oystercatchers, godwits, pied stilts, red-billed gulls, black-backed gulls, white-fronted terns, caspian terns, turnstones, New Zealand dotterels, and black shags.

There are also extensive salt marshes and associated lagoons which form a vital part of the wading bird's habitat by providing shelter and food for many. Such areas should be protected from drainage, siltation and rubbish disposal. The short grass of the farm paddocks bordering the area is favoured by the banded dotterel and the New Zealand dotterel. The swamp areas also attract mallard ducks, pied stilts and herons. Approximately 50% of the bird species along the coast have increased in numbers since 1950; the remaining species have stayed nearly constant.

- ☐ Coastal indigenous scrub and cliff vegetation, pohutukawa, puriri, karaka and kowhai can be found between Matingarahi

and Miranda; remnants of coastal forest are occasionally encountered, with species of rewarewa, tanekaha, kauri, puriri and taraire.

- ☒ Commonly observed bird species in the Firth of Thames include the South Island pied oystercatcher, variable oystercatcher, New Zealand dotterel, wrybill, godwit, knot, turnstone, red-necked stint, black-backed gull, red-billed gull, caspian tern, white-fronted tern, curlew sandpiper, arctic skua, black shag, mallard duck, white-faced heron, banded dotterel, welcome swallow and pied stilt. Less common species are the black swan, grey teal, shoveller, banded rail, black stilt, little tern, bittern, mongolian dotterel, large sand dotterel, oriental dotterel, Asiatic whimbrel, Asiatic black-tailed godwit, terek sandpiper, pectoral sandpiper, broad-billed sandpiper, white-winged black tern, white heron, royal spoonbill, grey plover, little whimbrel and marsh sandpiper.

The study and protection of the birds of the area is the prime interest of the members of the Miranda Naturalist Trust which was formed in 1975. The trust has built bird observatories near Miranda Stream and the Taramaire Stream reserve. This trust also fosters the study of the vegetation, geology, marine ecology, zoology and archaeology of the area.

- ☐ 205 MATAITAI STATE FOREST is important as an example of the nationally rare kauri-hard beech association. Tawa forms the bulk of the canopy with scattered kauri, hard beech and tanekaha found throughout. Rimu and miro occur spasmodically. In other areas of the forest the canopy consists of manuka with groups of emergent kauri, tanekaha and hard beech.

This land is administered by the Department of Conservation.

- ◆○ 206 The HUNUA RANGES are a deeply dissected, upfaulted block of Jurassic siltstone, sandstone, and argillite of the Waiheke group (greywacke). The ranges are bounded on the west by the

Wairoa fault and the east by the Hauraki graben. To the south, the Mangatangi fault divides the ranges from the lower Waikato basin and in the north the block is partly truncated by the Clevedon splint fault. Mount Kohukohunui (688m) is the highest point in the ranges. These elevated, forest covered hills provide an important catchment area for Auckland's urban water supply. The reservoirs are now wildlife habitats, with the Upper Managatwhiri Reservoir of regional significance for its wildlife. Notable species using the lake and its margins include ducks, white-faced heron, black shag, little shag and bittern. The reservoirs also support native fish such as koaro, banded kokopu, long and short finned eels, as well as rainbow trout.

◆ The Hunua Falls, a waterfall with a 30 m drop, cascades over a basalt plug which has intruded through the Wairoa fault. It is considered to be regionally significant.

□ 207 INDIGENOUS FOREST OF THE HUNUA RANGES covers 20,000 hectares much of which is protected as a regional park considered of national and international importance. The major indigenous forest types are tawa-podocarp, kauri-hard beech-tanekaha, and taraire, with localised areas of coastal and montane scrub forest (Barton, 1972).

Tawa-podocarp forest occupies a wide range of sites totalling 75% of the entire forest area; the principal species is tawa with scattered emergent rimu, northern rata, kahikatea, totara and miro. Associated understorey species include rewarewa, hinau and pukatea, with kohekohe, usually with nikau and ponga becoming subdominant in drier areas. Kauri-hard beech-tanekaha forest species, in varying combinations, are dominant on the most of the ridge tops and drier land below 240m; hard beech tends to favour the cooler southern slopes, kauri the drier ridge tops and northern slopes, and tanekaha the more moist sites, being the most tolerant of

the three species and most widely spread. Subdominants include rewarewa, hinau, towai and *Cyathea dealbata*.

Taraire, with associated puriri and rewarewa, forms an almost continuous canopy over limited areas, mainly in the north and usually on warmer areas of easier topography; kohekohe with nikau and *Cyathea dealbata* form the understorey with a sparse ground cover and notably little taraire regeneration.

The montane scrub forest is characterised by species not seen below 610m: hutu, toi, horopito and a large number of epiphytes; other species, notably *Hebe macrocarpa*, raukawa, *Blechnum discolor*, wheki and pepperwood, appear to be more abundant here than at low altitudes.

□ The threatened endemic frog (*Leiopelma hochstetteri*), the green gecko (*Naultinus elegans*) and a large variety of native land snails are some of the animals found here. Both the rare short-tailed bat (*Mystacina tuberculata*) and the long-tailed bat (*Chalinolobus tuberculatus*) have been sighted in the past, however no recent sightings have been made. These two species of bat are the only native land mammals in New Zealand. The area of distribution of these animals is very much less than it was 100 years ago, mainly due to loss of habitat.

□ A number of threatened and uncommon plants are known from the Hunua Ranges, such as king fern, *Marattia salicina* which now has the IUCN status of Vulnerable. A small remnant colony of the regionally rare mountain cabbage tree (*Cordyline indivisa*) was found near the summit of Kohukohunui. The communities of montane scrub and kauri-hard beech forests are uncommon occurrences within the Region. A number of plants found in the Hunuas are at or near their geographical limit, including: *Blechnum colensoi*, *Pseudowintera colorata* and *Ascarina lucida*.

□ The diverse forest types of the ranges provide important habitats for a number of bird species, especially pigeon, tui, grey warbler, fantail, silvereve, kingfisher, morepork, pipit, shining cuckoo, and harrier. Kaka and long-tailed cuckoo are frequent visitors. The regionally rare tomtit is present in fluctuating numbers (which upsurged from 1971-1978) and the bellbird which was reduced in number and is now believed to be spreading (Greene, ARC Parks). A small community of the endangered kokako remain in the ranges, and is considered to be the largest viable mainland population in the Auckland and Northland regions.

□ The regeneration of the dominant species in the Hunua Ranges has in the past been considered inadequate, mainly because of the high level of noxious animal infestation during the past 100 years, which has only recently been reduced. Other contributing factors may be the depleted bird populations which adversely affect seed dispersal, and the suspected high rat population resulting in seed destruction, especially of podocarps. Now that control work is underway, it is believed that regeneration trends will improve.

□ 214 KIRK'S BUSH in Papakura. Impressive remnants of the now rare taraire dominated forest. The interior is of cathedral-like splendour. Nearby in the smaller Butterworth's Bush are probably the most magnificent taraire in the south Auckland area.

216 to 219

THE NATURAL VALUES OF THE MANUKAU HARBOUR

THE MANUKAU HARBOUR is the second largest estuarine area on the west coast of the North Island and has a great expanse of intertidal areas, providing one of the most important habitats in New Zealand for wading birds including migratory species. Because of the large

number of both individuals (up to 50,000 birds at one time) and the variety of bird species which traditionally use the harbour, the natural values of the Harbour are considered to be of international significance. There is some evidence to suggest that the Manukau Harbour may be a major gathering place of migrants in the Auckland area prior to departure to the Northern Hemisphere. Regular large-scale movement occurs within the Region between the Manukau and Kaipara harbours and the Firth of Thames

○☒ 216 Waders of the Manukau include the godwit, knot, turnstone, golden plover and other northern hemisphere migrants as well as the spoonbills from Australia. The variable oystercatcher, NZ and banded dotterel, wrybill (which are threatened), the black stilt (which is endangered) and the South Island pied oystercatcher are migrants from within New Zealand. In order to maintain the wader population, it is believed that preservation of major roosting areas is one of the most important factors (food supply appears to be adequate). Important wader roosting areas on the south Manukau harbour include the shell banks and adjoining pasture at Karaka (Kidd's Farm), Seagrove, Waipipi, Puhinui and Pollok Spit. At present there is no reserved land for birds on the south coast of the Manukau harbour and some measures are required to protect these areas as suitable roosts for birdlife. If public land access is to be provided to any of these areas, it should be planned so as to least disturb the features that provide the special interest. Protection of the intertidal sand and mud banks is also essential for the maintenance of the birdlife in the harbour. Of significance in this respect are Te Tau Bank East, which contains large numbers of shellfish, both edible and uncommon within the harbour, Karore off Ihumatao as well as those associated with the large roosting areas.

- ☒ 217 Wetlands (mangroves, salt marshes and eelgrass flats) at present cover less than 5% of the intertidal area of the Manukau Harbour. Areas of particular importance include:- Pahurehure inlet (217), notably Drury Creek, Whangamaire Stream, and Whangapouri Creeks; Taihiki River; Little and Big Muddy Creeks; the coastline around Awhitu Regional Park; and Ann's Creek all of which contain a large percentage of the wetlands in the harbour.
- ☒ Drury Creek is comprised of a variety of intertidal habitats ranging from sandy mud intertidal flats to current-exposed rocky reefs and a variety of saline vegetation. Healthy and often expanding areas of mangroves grow in the shelter of the Pahurehure Inlet, Whangamaire Stream, and Drury and Whangapouri Creeks and in the southern half of the Whangapouri Creek are notable eelgrass (*Zostera*) beds. Within the upper tidal reaches of Drury Creek there are a variety of marshes, grading from mangroves through to extensive areas of jointed rush-dominated saltmarsh, to freshwater vegetation in response to salinity changes. This same area is a migration pathway between marine and freshwater habitats for a number of different species of native freshwater fishes.
- ☒ 218 Also significant with respect to the diversity of life found in the harbour are the marine communities. Of particular note is the area west of Mako Point which is subjected to strong, cool lateral currents similar to those at Omanawanui on the opposite side of the harbour mouth. Consequently, this stretch of coast supports a diverse and rich marine fauna which shows open coast, harbour and southern affinities. The south head contrasts with the north because of the softer rocks and platform reefs which mean that the biota differs and is less diverse and abundant.
- ☒ 219 Extensive beds of *Zostera* (eelgrass) were once found on the south Manukau intertidal flats between Clarks Beach and Seagrove (219) (Henriques, 1978). These eelgrass beds have begun to reappear in the Seagrove area. Marine wetlands are particularly vulnerable ecosystems because the water discharge within them is only partial during each tidal cycle and wastes readily accumulate. The remaining wetlands of the Manukau Harbour need and warrant complete protection since they are indispensable to the estuarine biota and foreshore protection.
- 224 BIRDS OF AWHITU LAKES. The Awhitu peninsula, largely in pasture, has a series of lakes similar to those of the Kaipara south peninsula, supporting a diversity of wildlife including fernbirds, bitterns, banded rails, dabchicks, pukeko, black swans, shags and ducks. Spotless crakes are found in the raupo swamps around Awhitu and to the north of Waiuku Forest.
- ◆ 245 MIRANDA CHENIER PLAIN. Constructional and erosional morphologies of beach ridges and intertidal flats of the chenier plain (i.e., a beach ridge plain perched on a muddy substratum), Firth of Thames (Miranda to Whakatiwai), have enabled the determination of a sequence of past sea levels; radiocarbon dating of shell samples give a time/sea level curve which correlates favourably with transgressional periods recorded in Europe. The present rise in sea level is locally 20-23 cm per century, and may be a minor fluctuation in an otherwise stable sea (Schofield, 1960). The area is considered to be of national importance.