

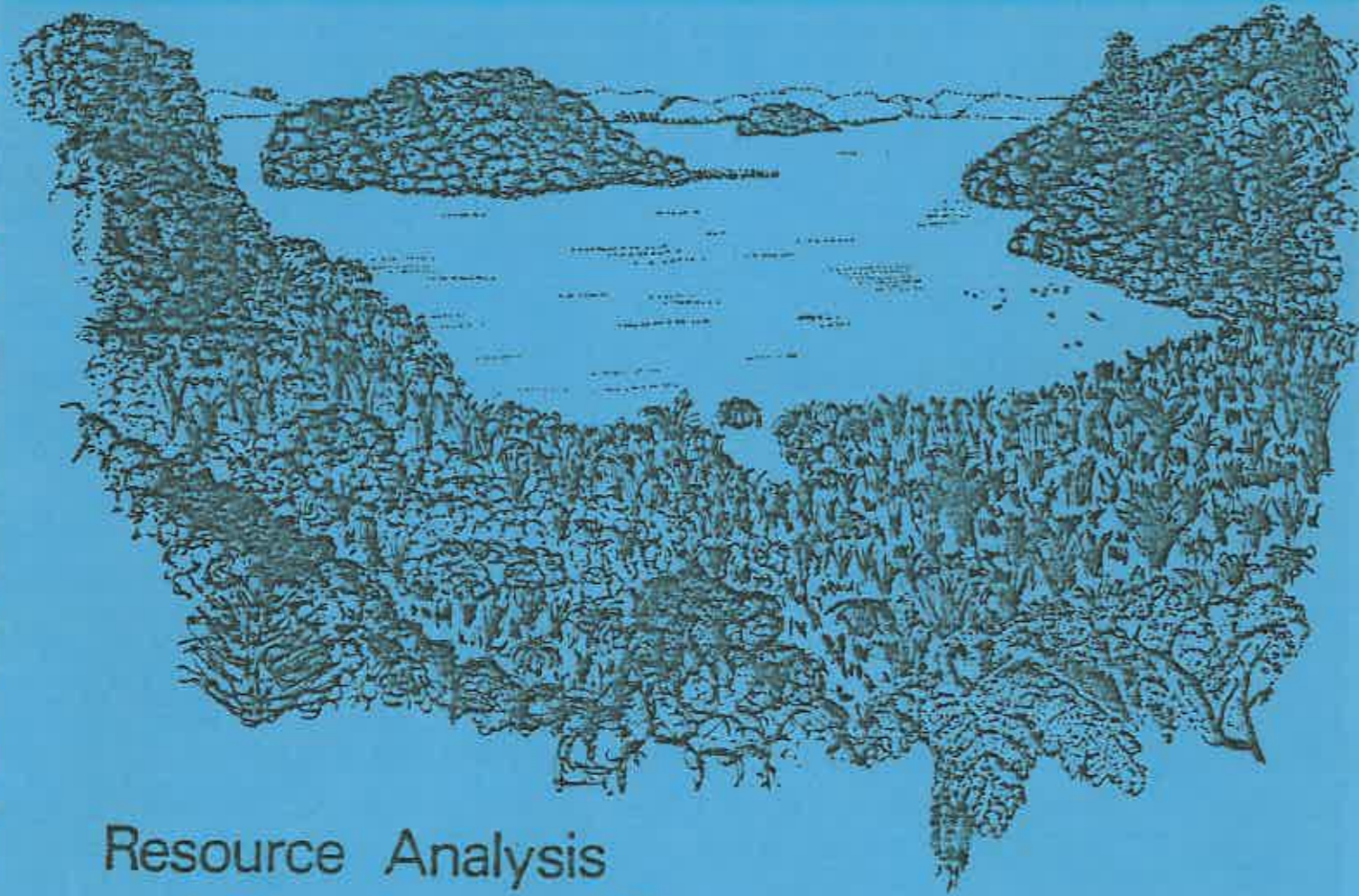
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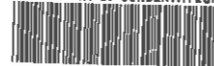
# Papaitonga Scenic Reserve



Resource Analysis  
and Development Plan

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ARC

March 1982



PAPAITONGA SCENIC RESERVE

Resource Analysis And  
Development Plan

This report was prepared by me to fulfil the requirements for Surveyor's Registration as set by the Survey Board. This is not a public document and circulation is limited to those immediately involved with Papaitonga Scenic Reserve.

M J Archbold  
Staff Surveyor

24 June 1982

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PREFACE

Resource Analysis and Development Report

This planning report will take the format of a management plan in presenting my background research, objectives, policies and proposals for development of Papaitonga Scenic Reserve. Although I am involved with the planning team in preparing a management plan for the reserve, this report will carry my own comments and recommendations for development. Therefore, any statements, objectives, policies and proposals for development will be subjective and will not necessarily be the views held by the Department of Lands and Survey.



Malcolm Archbold

I hereby certify that this scheme was prepared by me personally between October 1981 and January 1982.

Candidate

/ /

I certify that M J Archbold has researched, prepared and compiled this report under my supervision.

W A Kimber  
Senior Planning Surveyor (Acting)

/ /

(ii)

ACKNOWLEDGEMENTS

Mr K Davis	Water Resources Officer, Wellington Regional Council.
Mr W Deyine	Executive Officer, Land Management, Department of Lands and Survey, Wellington.
Mr W Kimber	Acting Senior Planning Surveyor, Department of Lands and Survey, Wellington.
Mr K Hosking	Senior Reserves Ranger, Department of Lands and Survey, Wellington.
Mr D Smith	Reserves Ranger, Department of Lands and Survey, Palmerston North.
Mr K Owen	Principal Wildlife Officer, (Environmental) Wildlife Service, Wellington.
Mr P McGrath	Draughting Officer, Planning Section, Department of Lands and Survey, Wellington.
Mr E O'Connor	Manawatu Catchment Board, Palmerston North.
Miss L Turner	Draughting Officer, Planning Section, Department of Lands and Survey, Wellington.
Miss C Gibbs	Typist, Department of Lands and Survey, Wellington.

Midway between the mountains and the deep,  
Secure from upland cold, from salt winds  
    keen,  
Bathed in sweet air and sunshine thou dost  
    keep.  
A golden mean.

Dark clouds may brood on yonder peaks and  
    spurs,  
Chill winds may chase the sea foam flake on  
    flake,  
But here is peace. Nought ruffles, nothing  
    stirs.  
The tranquil lake.

Look, while the sunset clings to yonder  
    range.  
Look, while the lake gleams silver in its  
    ray.  
And pray that through all beauty else may  
    change.  
This scene may stay.

Here the wild birds, from ancient coverts pressed,  
    May seek asylum by this silent mere;  
For through no other glade or wave give rest,  
They find it here.

Yet in this sacred wood no axe shall ring,  
    These winding shores shall sanctuary give,  
Where in cool thickets happy birds may sing,  
    And verdure live



*Long, Papaitonga, may thy ferns grows fair,  
Thy graceful toe-toe droop and sway,  
And never tree or bird know scathe or scare  
By Pember Bay.*

From "In Pember Bay, Papaitonga Lake"

Hon W Pember Reeves

Minister of Native Affairs

New Zealand February 8, 1895

## INTRODUCTION

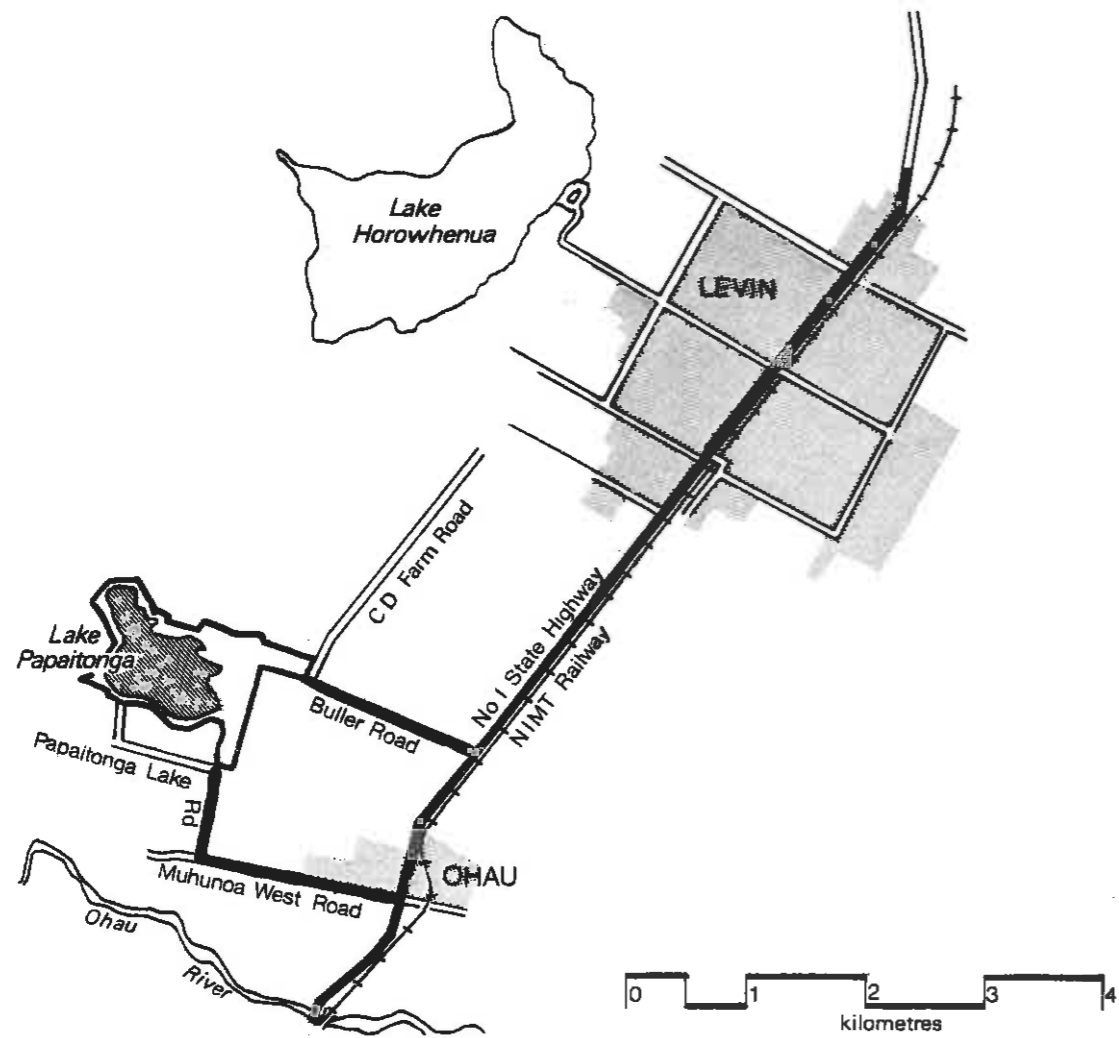
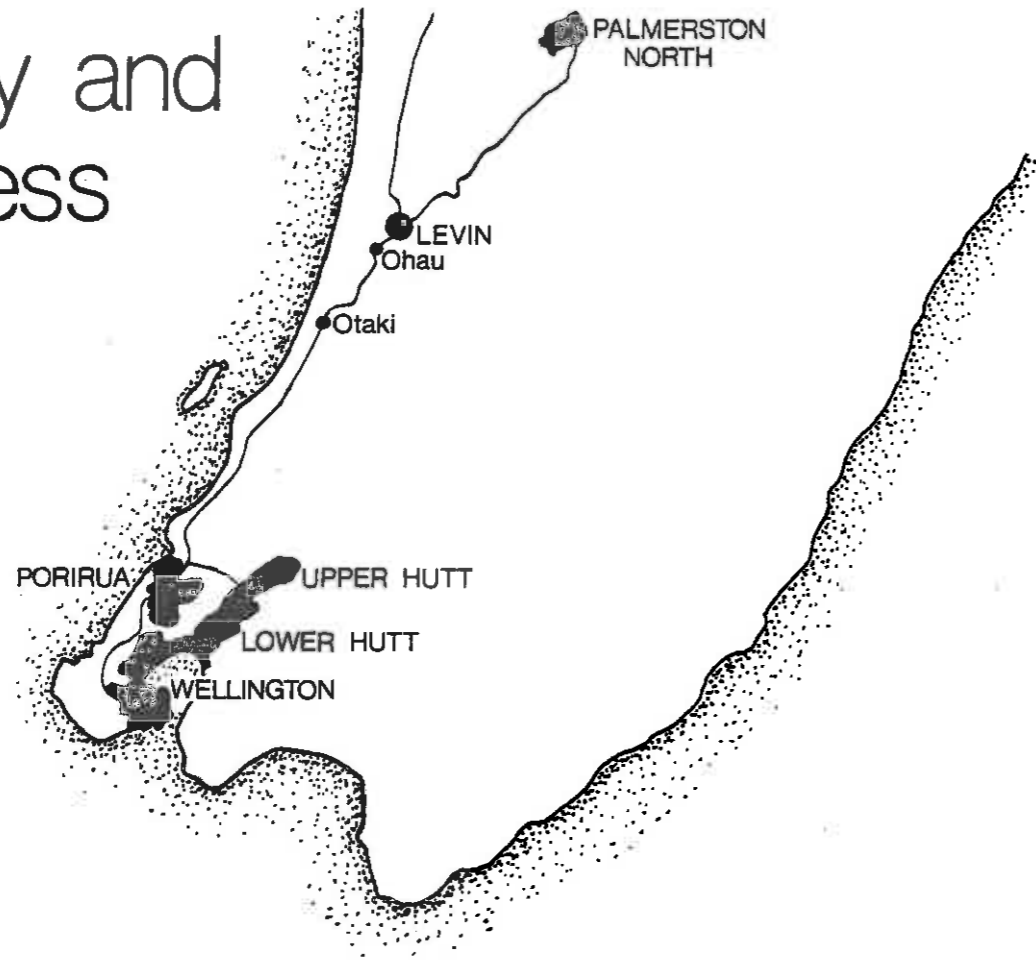
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### LOCALITY AND ACCESS

Papaitonga Scenic Reserve is located approximately 4 km west of State Highway No. 1, 10 km south west of Levin. Access is from both Buller Road and Papaitonga Lake Road, (see map overleaf). The lake itself is one of a series of naturally formed dune lakes present throughout the Wellington - Manawatu region. Lake Papaitonga has, over the past years, become regional significant as the only remaining lake surrounded by a large area of undisturbed native bush. This has resulted in the preservation of otherwise endangered flora, fauna and aquatic ecosystems.

The varied composition of the reserve, with its lake; islands, wildlife and native bush, together with its easy access, makes it a regionally popular scenic attraction.

# Locality and Access



## HISTORICAL BACKGROUND

Papaitonga Scenic Reserve over the years, has acquired considerable Maori and European history. In the early 1800's the Muaupoko had established a pa holding over 500 people on Motu Kiwi Island (then called Papaitonga) and as a measure of protection constructed the western island, Motu Ngarara (then called Parawharangi). In the 1820's an attempted assassination was made on Te Rauparaha's life but failed. Subsequently, Te Rauparaha returned with his Ngati Toa tribe and massacred the Muaupoko tribe.

In 1862, Sir Walter Buller, Ornithologist, acting as Sir George Grey's representative, attempted to purchase Lake Papaitonga (then called Lake Waiwiri) and the surrounding land from the Maoris. The Maoris did not want to sell their land so Sir George Grey later purchased Kawau Island.

In the 1880's the land was the subject of a Native Lands Court dispute but when resolved the boundary line along the southern edge of the lake had been established by Major Kemp as the Muaupoko's tribes southern boundary line. Major Kemp (Kepa Te Rangihiwiriui) was a chief of the Muaupoko tribe of Horowhenua. In later years, Sir Walter Buller acquired the lake and surrounding land from Major Kemp with the intention of preserving all the area around the lake for future generations. He introduced several bird species from England that, in 1920 were fairly well established. The reserve and surrounding Horowhenua area were the subject of the Horowhenua Commission, set up in 1897, to investigate the whole question of land title in the Horowhenua area.

In 1901, 11,4981 hectares of native bush, north east of the lake, was reserved from Crown land for the purpose of preservation. Later in 1930, this area was gazetted scenic reserve and has been known as Lake Papaitonga Scenic Reserve.

Since the 1920's the Government has recognised the need for the preservation of this area, and has negotiated with each successive owner of the lake and bush. In 1973 the Horowhenua County Council, in reviewing their District Scheme, designated the lake and surrounding bush area as Proposed Scenic Reserve.

In 1980 and 1981 purchase arrangements were finalised with D H Murray and B Freston respectively. The lake and surrounding bush will now be amalgamated with the existing Scenic Reserve (11,491 hectares) to the north east. The two combined scenic reserves will be known as Papaitonga Scenic Reserve.

LEGAL DESCRIPTION

Papaitonga Scenic Reserve is the amalgamation of Part 14 ML 839, Part 86 Horowhenua Settlement, Part 61, Horowhenua Settlement (existing scenic reserve) and Closed Road. See attached plan

Once the land transfer plans have been deposited, a new complete appellation will be given. The total area of the reserve is 114 hectares (subject to final survey).

Pt 86

Horowhenua Settlement

70

1 DP 26627

DP 4

G6  
Horowhenua  
Pt XI B41  
South

3

1 DP 2463

Waiwiri Stream

Right of Way

1A  
ML 3057

Waiwiri East

7

2A  
ML 1776

8

2C  
ML 1776

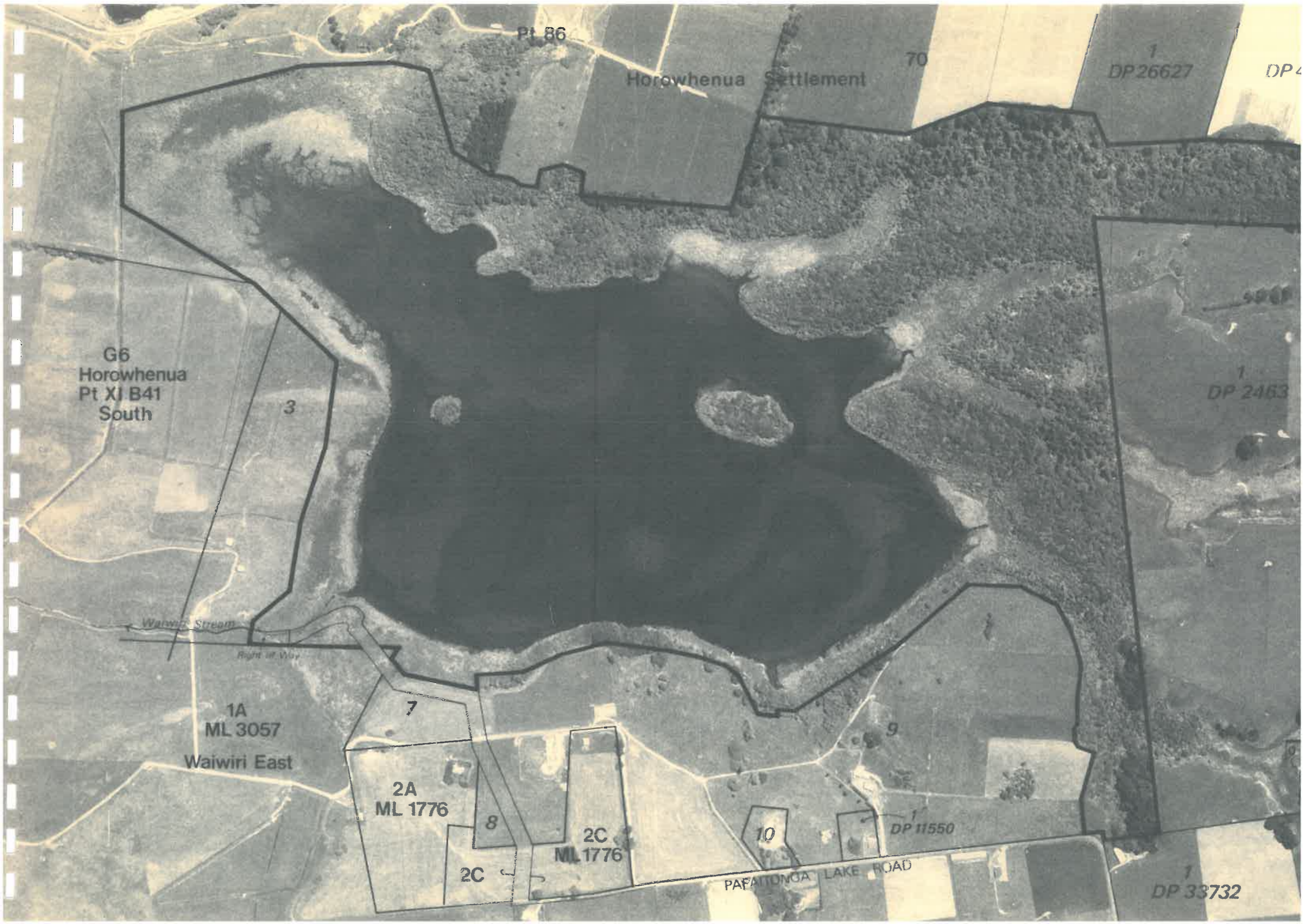
2C

10

DP 11550

PAFAITONGA LAKE ROAD

1 DP 33732



#### MANAGEMENT PLANNING

The Reserves Act 1977 has laid down the statutory requirements for the provision of management plans. Previous to that management plans were merely a guide to decision making; and held no statutory powers.

The first stage in the planning process requires the Minister of Lands under Section 16 of the Act to classify reserves in terms of specified categories according to their principal or primary purpose. Conservation of the reserve's natural and cultural features is the main concern for management, and under the 'scenic' classification, these values can be protected while permitting controlled public enjoyment. Therefore, the most appropriate classification for Papaitonga Reserve is 'scenic'.

Once the reserve classification has been decided, public notice is given of the Minister's intention and administering bodies are consulted where they have been appointed to control or manage the reserve. In this case, the Department of Lands and Survey.

Generally, the Reserves Act (Section 41) then requires every administering body, including the Crown, to prepare a management plan within five years.

Section 41 of the Act also requires that -

"The management plan shall provide for and ensure the enjoyment, maintenance, protection, and preservation,..... and the development ..... of the reserve for the purposes for which it is classified and ensure compliance with the principles set out, (in this case), Section 19 (Scenic Reserves)."

Section 19 basically sets out the primary objectives for the management of scenic reserves under the Reserves Act 1977. It states that -

- a) "... The indigenous flora and fauna, ecological associations, and natural environment and beauty shall as far as possible be preserved, and for this purpose, .... exotic flora and fauna shall as far as possible be exterminated.
- b) The public shall have freedom of entry and access to the reserve, .... subject to such conditions and restrictions as the administering body considers to be necessary for the protection and well-being of the reserve.
- c) To the extent compatible with the principal or primary purposes, .... open portions of the reserve may be developed for amenities and facilities where necessary to enable the public to obtain benefit and enjoyment from the reserve.

- d) Where historic, archaeological, geological, biological or other scientific features are present in the reserve, those features shall be managed and protected to the extent compatible with the principal or primary purpose of the reserve.
- e) To the extent compatible with the principal or primary purpose of the reserve, its value as a soil, water and forest conservation area shall be maintained."

The management planning process is therefore basically concerned with identifying objectives and policies to provide a framework against which to test decisions and thereby avoid undesired events. In other words, it is a planning process which influences or directs change towards a desired goal, and therefore seeks a better end result than that which might have occurred in an unplanned situation.

The management plan is seen as a 'tool', a working reference that is consulted each time a specific decision is made. The management plan does not preclude or foreclose ongoing judgement and decision-making. Instead it identifies the problem issues and sets those policies which are aimed at achieving the management objectives. It is a basis to assist reserve managers who are required to make current and future decisions to resolve problems and use conflicts, and as a framework against which new proposals can be considered.

The management plan is not the end of the process, but rather the beginning of implementation and the first reference - point for future decision-making. Continual reassessment and modification of the plan will be needed to meet the changing circumstances.



## NATURAL RESOURCES

### GEOLOGY

The relatively narrow plain along the southwest coast of the Wellington Province to the west of the Tararua Range has been formed by coastal progradation (building out with sand) derived from long-shore drift from the Rangitikei-Hanganui area. Coastal progradation has been the dominant process over the last 6,000 years when sea levels have been similar to that of the present day.

As the coast prograded the wind formed the sand into several well-defined sand dune units which were stabilised once a vegetation cover was established. Rivers with catchments in the Tararua Range flowed across the coastal plain and in the case of larger rivers such as the Ohau River deposited gravel, sand and silt fan deposits which are interbedded with the marine derived sand deposits.

Lake Papaitonga has formed in a depression behind the sand dunes where water from several sources has accumulated. Surface run-off from local drainage is a contributing water source. Springs also contribute water to the lake. These springs are formed where groundwater within the river fan deposits encounters less permeable sand and clay deposits. The westwards groundwater flow is impeded and as a result some groundwater flows to the surface to form springs at the boundaries of deposits of contrasting permeability.

Lake Papaitonga is basically a water table lake. The water level fluctuates in response to local rain and drainage, the flow of the Ohau River, and rainfall on fluvial deposits to the east of the coastal plain.

### SOILS

The soils on the higher terrace appear mainly to belong to the Levin series which are formed from about 1m of Ohakean loess over sand, with some grading to Shannon soils. There are local inclusions of Koputaroa soils. The Ohakean loess probably stopped accumulating 12,000 years ago and appears to be resting on Pleistocene "cold climate" sands. The local occurrence of Koputaroa sand is due to subsequent "duning" of coastal sand into very localised mounds over this Ohakean loess. Peat soils are found around the margin of the lake. The Levin soils under forest in the reserve near the Buller Road entrance are the only significant area of these important horticultural soils under an indigenous vegetation, still largely similar to that existing before the clearance of forest from the Horowhenua. Consequently the site is of importance to soil science.

CLIMATE

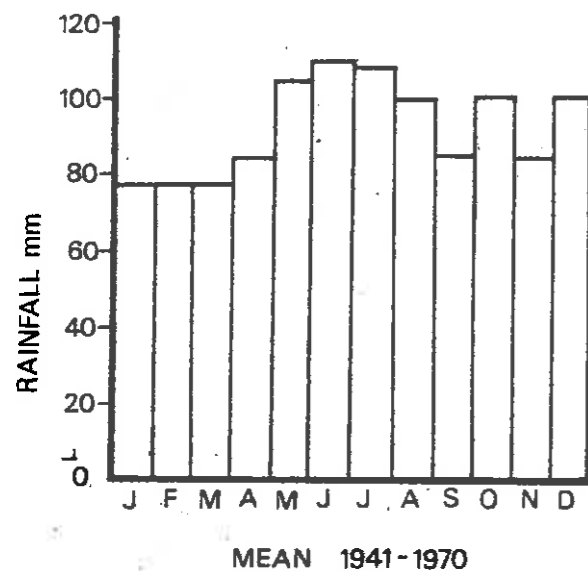
The climate of the Hōrowhenua region is classified as "warm temperate maritime (or humid mesothermal) without a marked dry season". The prevailing winds are west to north west, with relatively frequent gales. The mean annual rainfall, measured 3 km east of the reserve is 1095mm (43 in). The rainfall is reliable and evenly distributed throughout the year. The maximum intensity of short period rainfalls is lower in the lowland area than in many other parts of the country. Sunshine hours average 1897 pa compared with Nelson 2502 hours pa, Dunedin 1695 hours pa. One year in two a dry January and February can be expected. The drought of 1969-70 is probably the severest and most prolonged that has been recorded.

The following data has been collated at the Ministry of Agriculture and Fisheries Horticultural Research Station, Kimberly Road, Levin (Lat 40°39'5" Long 175°16' Height 46 metres) and describes the climate at Lake Papaitonga. The Horticultural Research Station is located 3 km east of the Scenic Reserve. Climatic data from the main centres has been included to provide comparisons.

# climate

TABLE 1

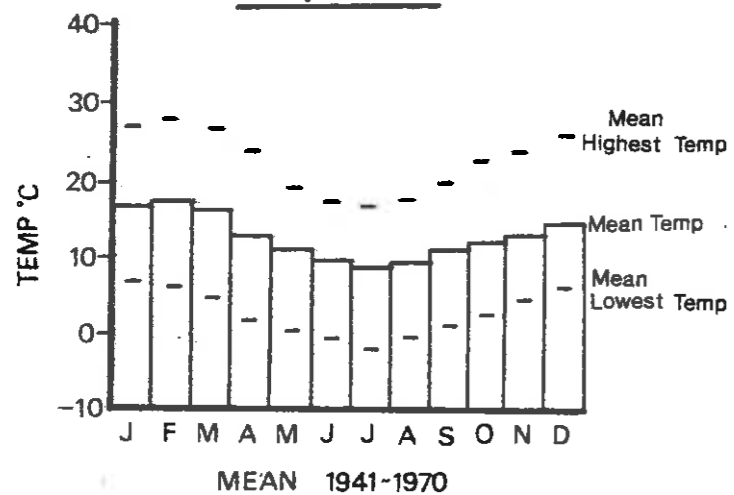
## Rainfall



### Comparisons (Mean Annual Rainfall)

Lake Papaitonga	1095 mm
Auckland	1268 mm
Wellington	1271 mm
Christchurch	658 mm
Dunedin	772 mm

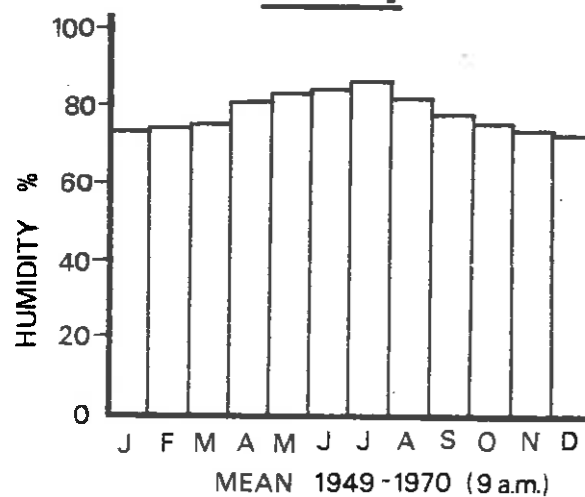
## Temperature



### Comparisons (Mean Annual Temp °C)

Lake Papaitonga	12.8
Auckland	18.6
Wellington	15.6
Christchurch	16.2
Dunedin	14.8

## Humidity



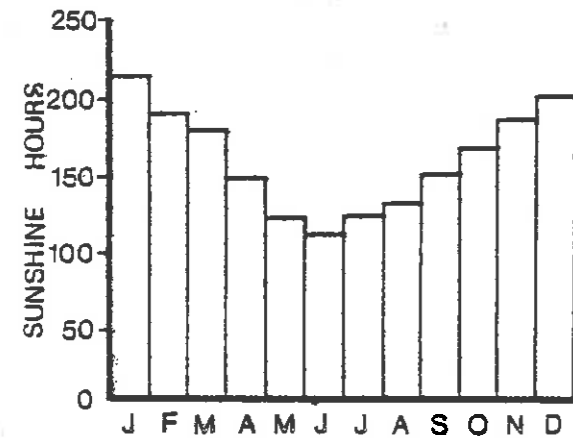
### Comparisons

Lake Papaitonga	79 %
Auckland	77 %
Wellington	81 %
Christchurch	77 %
Dunedin	74 %

# climate

TABLE 2

## Sunshine

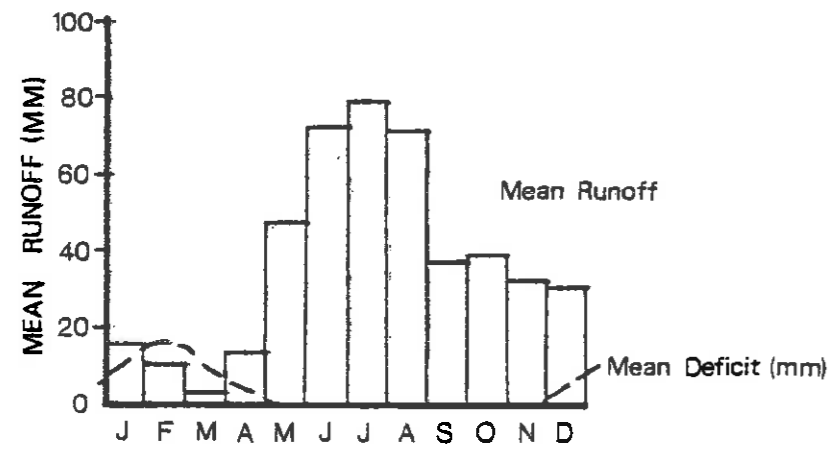


MEAN 1941-1970

Comparisons (hours p.a.)

Lake Papaitonga	1897
Auckland	2166
Wellington	2014
Nelson	2502
Christchurch	1985
Dunedin	1695

## Estimated Water Balance



MEAN 1949-1970

#### LANDSCAPE CHARACTER

Lake Papaitonga is set in a natural amphitheatre, being enclosed on the north and east side by a dense cover of bush running down to the lake edge, though in places the banks are quite high. On the southern side there is a natural sloping bank with scattered trees, while to the west there is open low lying swamp running towards the sandhills beyond.

Within the confines of the lake are two islands, the larger known as Motu Kiwi formerly Papaitonga (1.21 hectares) rises steeply from the water covered with native vegetation, while the smaller one of approximately 3,000 square metres (man-made) is known as Motu Ngarara, formerly Parawharangi. The lake itself is fed from several natural springs and a limited amount of run-off from the surrounding higher lands, but is relatively shallow with a rather muddy bottom. Depth will vary from 1-1½ metres depending upon outfall through the Waiwiri Stream in the south-western corner.

At present the lake is a refuge for hundreds of swans and ducks.

The lake is bound to the north and east by a coastland broadleaf forest comprising some quite large kahikateas, tawas, titoki, odd rimu, karakas, whitey wood together with a dense undergrowth of supplejacks and a variety of ferns. This area is mostly flat dropping down to the lake fringe, though broken by three gullies on the eastern boundary.

The swampland to the east of the land was once covered by a native white pine forest - mainly kahikatea.

#### VEGETATION

The lake environs in the southeast are covered by a secondary coastal mixed broadleaf forest association of which the dominant tall tree is tawa, accompanied by a fairly dense understorey of karaka and hangehange. The forest is generally in a good condition with ample evidence of tawa regeneration but the Buller Road section of the reserve was strongly invaded by sycamores during the 1950's and, more recently Clematis vitalba has been found.

In the southwest to northwest sector, where the lake margins has remained unfenced, indigenous forest is virtually absent and exposed to the prevailing nor'westerly winds.

There are scattered, narrow marginal lands of emergent vegetation (raupo and sedges) round the shoreline, particularly in parts where it is not steeply sloping, with a limiting water depth of about 1.5m. Raupo completely surrounds the two islands.

Swamps at the western end of the lake are most notable for bur-reed (Sparganium) and Epilobrium chionaxthum. The wet gullies at the eastern end of the reserve are notable for dense flax - Gahua xanthocarpa, with Gleicheria microphylla (only site in the Wellington - Manawatu area), toro (Myrsine salcina), Coprosma tenuicaulis - Syzygium (Engenia) maire-pukatea.

The number of genera in the submerged vegetation is limited and species of Potamogeton and Chara are dominant in scattered beds.

Paratrophis banksii, P. microphylla and Loranthus micranthus are locally rare plants found in the reserve, and an Asplenium hybrid species is also of scientific interest.

#### WILDLIFE

The open water of the lake and the surrounding wetland vegetation provide opportunities for shelter, feeding, resting, and breeding for a variety of water dependent birds. The terrestrial vegetation provides similar opportunities for a number of bird species not dependent upon the presence of wetlands, but nevertheless reliant upon the presence of bush (tree and shrub association).

While numerous bird species are found occupying the same habitats, most have specialised requirements and commonly use a particular part of the habitat.

For example, swan tend to avoid confined areas and feed in deeper water, while wading birds like the pied stilt feed in the wet margins and shallow waters. Each habitat therefore contains a number of bird species which use one or more parts of the habitat. Some species, however, use a number of sites, sometimes some distance apart or in other parts of the district or country, and in this manner obtain their total requirements for survival.

The birdlife recorded in the reserve is as follows -

#### 1. Waterbirds - absolutely protected under the Wildlife Act 1953

NZ Dabchick - present during winter months with up to 20 birds recorded in the past. Numbers fluctuate during year. Has bred on lake.

- Pied Shag - occasionally present in low numbers.
- Little Shag - occasionally present in low numbers.
- White-faced Heron - can be observed around margin of lake in low numbers. Nesting may occur within the bush areas of reserve.
- Australasian Bittern - present in low numbers. Breeding likely around the margins of lake. Relies heavily upon wetlands for its survival.
- Black Swan - in the past upwards of 450 birds or more have been recorded on lake at a time when the lake level was higher. Numbers today are much lower - less than 100. Swans marked with colour collars from Rotorua, Farewell Spit, Lake Wairarapa, and Hawkes Bay have been observed on the lake. Several pair breed around the margin of the lake. This being a recent occurrence. At present protected although status may change in future as open season for game bird hunting dictates.
- Spotless Crake - not recorded but is likely to frequent the dense swampland around the edges of the lake. Another wetland dwelling specialist.
- Paradise She?duck - occasionally recorded on lake and nearby farmland. In the past upwards of 50 birds were recorded on lake.
- Pied Stilt - present in low numbers on lake during low water level periods. May breed around margins of lake.
- Kingfisher - always present in low numbers. Often feeds over the water of the lake.
- Welcome Swallow - present in moderate numbers. Feeds extensively over waters of the lake and its margins.

2. Waterbirds that may be hunted subject to the Wildlife Act 1953

- Mallard - high numbers present (several hundred). Extensive use of the lake for feeding takes place. Some nesting, brood rearing and moulting occurs.
- Grey Duck - found in low numbers with some breeding likely.
- NZ Shoveler - present in low numbers. Some breeding may take place.
- Pukeko - present in moderate numbers. Breeding takes place around the margins of the lake.

3. Other birdlife found in the reserve

a) Absolutely protected

Silvereye (bush)  
Greywarbler (bush)  
North Island Fantail (bush)

b) Unprotected

- Black shag - always present in low numbers usually feeding or resting.
- Harrier Hawk - present in low numbers with breeding likely in reserve.
- White-backed Magpie - (bush and farmland nearby)
- Song Thrush - (bush)
- Starling - (bush)
- Blackbird - (bush)
- Goldfinch - (bush)
- Redpoll - (bush)
- Greenfinch - (bush)
- Chaffinch - (bush)
- Yellowhammer - (bush)
- Skylark - (farmland)

NOTE - This species list is not exhaustive and further studies will add to this list.



The Australasian Bittern and Spotless Crake are two wetland dwelling species which there is some concern about, as their habitat is shrinking due to land draining. These species are not common anywhere in the region. NZ Dobchick are also uncommon nationally, and the lake helps to maintain local populations.

#### Management Considerations Concerning Wildlife

1. Commercial eeling took place with private access rights granted by D H Murray (former part owner of the lake). In acquiring land from Mr Murray for reserve purposes the Crown agreed to the following conditions -
  - a) Vendor to have exclusive access rights for commercial eeling for a period of 10 years from 1 September 1980, with no more than 38 tonne to be taken in that period (Section 50(1) Reserves Act and the Fisheries Act apply).
  - b) Vendor to have exclusive waterfowl hunting rights over the lake for his family and invitees but to be exercised only from parts of the lake shore and island (see plan) and with a 6-gun limit. This right to run only for so long as the vendor retains ownership of the adjoining land or otherwise to terminate on 31 August 2015. Archaeological features on Motu Ngarara are not to be disturbed. The Wildlife Act 1953 applies.

The extent of waterfowl hunting rights is shown on the plan on page 30.

#### Waterfowl Hunting

Lake Papaitonga has traditionally, been a private hunting area for many years, open to the owners and their invitees. The lake exists in a locality where there is a fairly high demand for hunting positions due to public pressure.

Public hunting around nearby Lake Horowhenua is only allowed with the granted permission of the Lake's trustees and consequently this has increased public pressure to shoot on Lake Papaitonga."

The opinion of the Wildlife Service is that "there would be no real disadvantage in allowing the total lake area to be hunted."

Therefore, accepting this, I see no problem in allowing waterfowl hunting so long as administrative control was handed to the Wildlife Service. Any final decision must remain with the Department of Lands and Survey as controlling body of the reserve.

The following criteria should be taken into consideration by the Wildlife Service when assessing waterfowl hunting.

1. Identification of endangered wildlife species and habitats that may be in conflict with hunting.
2. Identification of sensitive areas within the reserve, eg large breeding areas, that may be damaged if disturbed.
3. Assessment of the number of hunting permits issued. This is to restrict the numbers to a level which the natural resources can sustain.
4. The restriction of hunting sites and locations may be necessary where sensitive areas have been identified or for the maintenance of public safety.
5. The strict enforcement of any permits issued during the season. This is very important as Levin township is only 10 km away and the lake is a haven for many wildlife species.

In conclusion, I would support the Wildlife Services views that waterfowl hunting be permitted over the whole lake, given that when the exclusive rights (to D H Murray) expire, the Wildlife Service undertake an appropriate waterfowl hunting assessment of the reserve.

#### Landsnails

Paryphantid snail (absolutely protected under the Wildlife Act 1953 as amended by the Wildlife Amendment Act 1980).

##### a) Powelliphanta traversi traversi

This subspecies can be found in the general locality of the Arawhata Road end of the reserve in secondary mixed broadleaf forest. The snails are restricted to the creekbeds and low-lying wet areas.

##### b) Powelliphanta traversi florida

This 'form', a darker variety of the type species, is generally found at the Buller Road end of the reserve with fair numbers of live ones found in wet gullies. Apparently, P traversi florida hybrids with P traversi traversi at the Buller Road end of the reserve. The mixing of these two forms is explained by the past changes in the course of the Ohau River. Evidence suggests strongly that the Ohau River once flowed at a considerable distance north of its present course, passing through Lake Horowhenua, which was the dammed-up remnant of an earlier course of the river in Pleistocene times (Adkin 1911). It seems evident that the Ohau River has formed a fluctuating barrier to the free dispersal of the snails of the coastal plain even when the area was in virgin forest and that the development north of the river culminated in the P traversi traversi form and that south of it in the P traversi florida form (Powell 1946).

These populations are very important scientifically for future research on hybridism, past geology (changes in Ohau River course) and conservation of snails (one of the best populations in Manawatu).

c) Rhytida greenwoodi greenwoodi

This snail species is found within the secondary mixed broadleaf forest within the reserve. This small, mostly light brown, snail is distributed over most of the North Island, south of Auckland (Powell 1976).

LIST OF LANDSNAILS POTENTIALLY IN PAPAITONGA RESERVE

1. Powelliphanta hochstettevi hochstettevi (Pfr) "forma traversi"
2. Rhytida greenwoodi (Gray) (1 & 2 BIG CARNIVORES RHYTIDIDAE)
3. Laoma mariae (Gray) )
4. Phrixgnathus n. sp. 59 )
5. Phrixgnathus phrynia (Hutton) )
6. Paralaoma caputspinulae (Reeve) ) PUNCTIDAE
7. Paralaoma n. sp. 29 )
8. Paralaoma lateuibilicata (Suter) )
9. Phrixgnathus ariel (Hutton) )
10. Therasia zelandiae (Gray) )
11. Phenacohelix giveni (Cumber) )
12. Phenacohelix rusticus (Suter) )
13. Phenacohelix pilula (Rue) )
14. Cavellia anguicula (Rue) ) CHAROBIDAE
15. Mocella efa (Pfr) )
16. Charopa bianca (Hutton) )
17. Cavellia buccinella (Rue) )
18. Cavellia serpentinula (Suter) )
19. Flammulena perdita (Hutton) )
- Laiuellidea (Tornatellinops) novoseelandica (Pfr) ACHATINELLIDAE

Drier fringes mostly : 6; 7; 8; 17; 18

Tree trunks : 9; 19

Larger litter heaps : 1; 2; 11; 12

Litter generalists : 5; 14; 15; 17; 18

Usually associated with clumped grasses a grand in clearings : 10; 13

Leaf axils of nikau and kiekie : 4; 16

## ARCHAEOLOGICAL SITES

All the archaeological evidence within the reserve refers to Maori habitation, occupation and activities. Following site surveys six main archaeological areas have been identified over the past three years by D Butts, Manawatu Museum. The following is a summary of his report on each site (refer to map, page 21).

### Motu Kiwi (Papaitonga) Island (1)

The topography of the island has been modified by terracing with the construction of Papaitonga Pa. This terracing is evident on all sides of the island though most extensive on the eastern end. A terrace just above the present water levels exists around the whole island. These terraces rise to a central platform.

Midden scatter is recorded over most of the surface with one large midden exposure on the south side of the island. Midden consists mainly of Hyridella menziesi, with some Amphidesma subtriangulatum.

Ovenstones and charcoal have been recorded both on the island and in the water around the edge of the island.

At the western end of the island there is a raised rim pit 2.90m x 2.60m.

### Motu Ngarara (Parawharangi) Island (2)

This island (man-made), has some terracing, with midden scatter over most areas with associated ovenstones. Shell species in midden material are the same as those recorded on Motu Kiwi.

### Southern Shore (3)

A number of shells and ovenstones have been recorded visible in a cutting for access to the lake shore. The midden has been destroyed by tree roots and erosion.

### Paopao roa Headland (4)

On the flat and side of the headland there is a surface scatter of freshwater mussel shells. There are possibly useful deposits under tree roots at the base of the terraces as well as on the top end of the spur. The shells are Hyridella menziesi.

### Kopuru Kainga (5)

Evidence in a number of small exposures of scattered, fragmentary Hyridella menziesi and ovenstone. Some scattered midden is also visible on the banks at the end of the spur. Investigation may well show that evidence is quite extensive under the existing surface cover.

### Northern Shore (C)

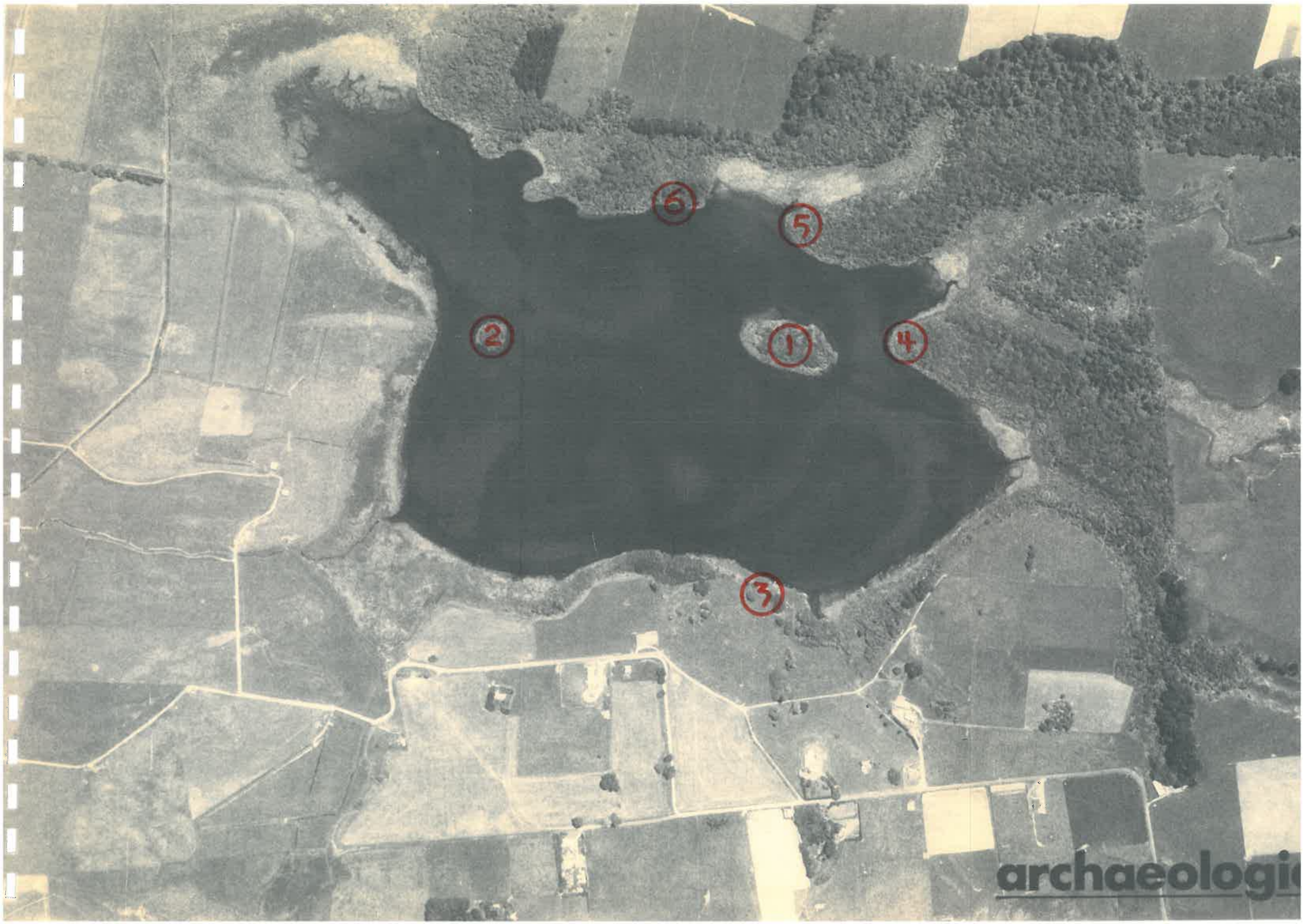
Surface scatterings of Hyridella menziesi shells, ovenstone, and fragmentary were found. Preliminary investigation suggests that there are not large amounts of midden in this area. However, these may be covered by forest litter and only detected by test pitting the area.

### Vulnerability and Access

Of all the sites surveyed, both islands are considered to have a very significant archaeological value and, therefore access should be kept to a minimum. D Butts, archaeologist, has suggested that Motu Ngarara (man-made) Island should be regarded as a national monument with public access by permit only, in the company of a ranger. Public access to Motu Kiwi Island should also be restricted to access by permit, but when necessary, access should be granted in preference to access to Motu Ngarara Island. Both islands are highly vulnerable to damage if free public access on foot were allowed.

The remaining archaeological sites are midden areas which may have other as yet unidentified cultural features associated. Public access to the areas involved, on foot, if directed by clearly constructed tracks would do little damage to these sites which are generally well covered by a tree litter soil.

I agree with D Butts that the island of Motu Ngarara is of national significance and that measures should be taken to preserve the historical and archaeological features of both islands. The restriction of access by the issuing of permits would be one way to decrease the existing vulnerability to disturbance and thereby preserve these visual features of Maoridom for future generations. Another way, although not as effective, is to prohibit all motor boating on the lake. This is detailed later.



2

6

5

1

4

3

HYDROLOGY

Over the past years there have been two analyses of the lake's hydrology. The first, undertaken in 1949 - 1950, was published in the Australian Journal of Marine and Fresh Water Reserves. This report surveyed and analysed among other, 15 lakes in the Wellington series. The experimental data was analysed and open to comparison with other lakes. No cause - effect relationships concerning the lake were discussed.

During 1974 - 1976, the staff of the Manawatu Catchment Board have performed several tests on the lake and the results listed below give a good indication of the lake hydrology. The table indicates the mean and range of the results found. Most sampling was undertaken about 10.30am.

<u>PARAMETER</u>	<u>UNITS</u>	<u>MEAN</u>	<u>RANGE</u>	<u>NO. OF OBSERVATIONS</u>
Chloride	g.m <sup>-3</sup>	39.5	37-46	6
Iron	mg.m <sup>-3</sup>	260	260	1
NG <sub>3</sub> -N	mg.m <sup>-3</sup>	100	0-230	12
NO <sub>3</sub> -N	mg.m <sup>-3</sup>	65.6	0-240	14
Soluble - P	mg.m <sup>-3</sup>	11.8	0-58	14
Total - P	mg.m <sup>-3</sup>	136	50-378	9
Faecal Coliforms	no./100ml	11**	2-79	6
B.O.D.	g.m <sup>-3</sup>	7.1	2.5-14/1	12

\*\* Logarithmic mean (base 10)

<u>PARAMETER</u>	<u>UNITS</u>	<u>MEAN</u>	<u>RANGE</u>	<u>NO. OF OBSERVATIONS</u>
Temp	°C	13.75	5.8-25	14
Oxygen	g.m <sup>-3</sup>	12	6.8-14/8	14
Secchi Disc*	m	0.67	0.35-0.9	8
pH	-	8.86	7.7-9.9	13
Suspended Solids	g.m <sup>-3</sup>	11	0.4-32.8	13
Conductivity	jumbo.cm <sup>-1</sup>	241	200-308	12
Alkalinity	g.m <sup>-3</sup>	95	70-119	6
Hardness	g.m <sup>-3</sup>	92	64-115	7

\* On 3 occasions, reading exceeded water depth.



#### Analysis of the Water Quality Data

An analysis of the lake water has revealed low levels of soluble phosphate and nitrate nutrients compared with other lakes in the Wellington region. This suggests that there is a limitation of the rate of oxygen production and absorption by phytoplankton. At this stage in the lake's ecological development, low nitrate and phosphorous levels have the beneficial effect of maintaining a natural balance within the lake's aquatic ecosystems. The reason being that, if sunlight, water, and carbon dioxide are available in abundance, the addition of surplus nitrogen or phosphorous, or both, could lead to overfertilisation of the lake water, thereby resulting in the rapid growth of various algae (eutrophication).

At present the lake is in a 'oligotrophic' (low nutrient-weed) state, as a result of the low level of biological production.

The reasons for these low nutrient levels could be explained by -

1. The notable absence of a sizeable urban population in the catchment area. There are less than twenty houses in the catchment area in comparison to the whole township of Levin in the catchment of Lake Horowhenua.
2. From New Zealand Forest Service research, it has been observed that undisturbed radiata pine forests conserve nitrogen and phosphorous. It is probably that the long standing indigenous vegetation surrounding the northern and eastern sides of the lake has provided a similar beneficial affect to the lake. This existing vegetation surrounds 60% of the lake.
3. Another suggestion for the low nutrient level is that up to 50% of the water entering the lake does so by nutrient free natural springs. Although no flow quantities have been measured, a visual inspection of the inlet streams, in the gullies to the east, indicate that the surface water run-off into the lake is somewhat less than the two outlets; Waiwiri Stream and an open drain at the northwest end of the lake.

#### Temperature and Depth

Due to the shallow nature of the lake and the solar heating effect, the temperatures recorded were quite high. With a range of 6°C-25°C, a maximum depth of approximately 2.5 metres, and a low level of biological production the lake would probably not support an introduced fish colony.

The combined results for the oxygen, pH and Secchi disc are average compared with other lakes in the Wellington-Manawatu region. The suspended solids are negligible and the

conductivity and alkalinity are typical of the surface run-off in this part of the country. The hardness figure of  $92\text{gm}^{-3}$  gives an indication that there is a low content of Sodium and Potassium present and that the hardness is caused by the presence of Calcium Bicarbonate and Magnesium Bicarbonate, implying there are little ions in solution.

As the depth of the lake does not exceed two metres, thermal stratification does not occur.

Faecal Coliforms and Biochemical Oxygen Demand (BOD) are the two most common methods for measuring the amount of water pollution.

When Faecal Coliforms (intestinal bacteria, especially of the genus *Eschenchia*, found in feces) are found in large numbers, they indicate that pathogens are probably present as well; conversely their absence is a good, although not perfect, indication that pathogens are absent.

Drinking water standards specify that the most probable number shall not exceed 1 coliform organism/100 millilitres of water. Standards recommended for water contact recreational activities specify that the most probable number of faecal coliforms shall not exceed 2,000 per 100 millilitres. The log mean value obtained for the lake was 11 faecal coliforms/100 millilitres.

Biochemical Oxygen Demand (BOD) refers to the quantity of oxygen required by bacteria to oxidize organic waste aerobically to carbon dioxide in water. Domestic sewerage typically has a BOD of around 200 milligrams of oxygen per litre while industrial waste may reach several thousand milligrams per litre. A BOD value obtained for the lake water was 7.1 milligrams per litre.

In a report by E White for the Officials Committee on Eutrophication 1976, seventy two NZ Lakes were assessed using the following four parameters.

1. transparency as measured by the Secchi disc,
2. the extent of dissolved oxygen depletion in bottom waters,
3. the extent of algal bloom development,
4. the extent of macrophyte weed development, both emerged and submerged, in the littoral region.

In the assessment of Lake Trophic Conditions, Lake Papaitonga ranked 38 out of 72 lakes, scoring 8 penalty points, the maximum penalty points being 18.

In comparison other lakes were -

Lake Taupo	1
Foxton No. 1	9
Lake Horowhenua	14
Lake Rotorua	15
Lake Tutira	17

In the overall assessment, Lake Papaitonga ranked 30 out of the 72 lakes, scoring 8 penalty points out of a maximum 24.

Comparisons in overall assessment -

Lake Taupo	1
Foxton No. 1	13
Lake Horowhenua	19
Lake Rotorua	15
Lake Tutira	23

Overall, the lake in its present state is in a good condition compared with other lakes in the Wellington-Manawatu district.

Lake Papaitonga is a lake with many ecological, scenic and historical features that, if damaged or destroyed, would take decades to replace, if at all.

The lake in its present condition is, average, 2-3 metres deep with a muddy-silty layer of approximately 1-1.5 metres deep. Weed that is common to most rivers and lakes filamentous alga spirogyra (a seasonal alga), has been observed on the bed of the lake with fleeting strands occurring in the water. At this stage it is not a problem.

However, if active recreation such as motor boats or yachting were re-introduced, several problems are likely to occur.

1. There is a strong possibility that additional types of lake and river weed will be transported from other aquatic environments. A number of years ago, the presence of certain weed varieties were noticed that were not previously in the lake. During the 1960's the lake was used for motor boat regattas and it is possible that microscopic alga could have been transported on boat hulls, propeller shafts and in the bilges. Severe examples of this type of weed introduction have occurred in the Rotorua Lakes region.
2. The bow wave from motor boats could cause damage to wildlife nesting places around the lake shore as well as to fish and eels.

3. Hydrocarbon emissions as a result of incomplete combustion from motor boats can result in unnecessary impurities in the lake. Exhaust emissions from motor boats are often directly into the water and, as a result, tetraethyl lead would be introduced into the lake water. This is one of the most toxic leads and will remain in the water for a long term. The most serious consequence is that tetraethyl lead is readily taken up by plant and animal life.

In addition to the impact of machinery on the lake water, concentrated human activity around the lake edge could also lead to problems. It is highly probable that nutrients such as nitrogen and phosphorous are present in the muddy bottom in an anaerobic insoluble state. Any concentrated disturbance and stirring of the mud could create aerobic conditions in which these nutrients may become present in a soluble state.

This could then result in overfertilisation of the water and lead to alge "blooms" similar to those which occur several years ago.

With the lake in its present state there are no existing conditions that need special protection. With future monitoring of the lake conditions, appropriate management decisions should be made with reference to the National Water Conservation Order, explained next section, and relevant policies.

#### LAKE DRAINAGE AND ADJACENT LAND USE

There are two main outlets at the western end of the lake. The main outlet, the Waiwiri Stream, flows from the southwest corner of the lake through adjacent farmland and discharges directly into the sea. In 1950, the Manawatu Catchment Board upgraded the Waiwiri Stream channel to a point 500m from the lake to assist the drainage of Reporoa Swamp. This caused the lake to be maintained at its then level of 9.5 metres above Mean High Water at Waikawa Beach.

During the 1970's a drain was cut through the Marokura Swamp on the northwest arm of the lake and discharges approximately the same volume of water from the lake as the natural Waiwiri Stream outlet. There is also a non-functional weir on the Waiwiri Stream within the reserve.

There has been no granting of water rights to date by the Manawatu Catchment Board for direct abstraction of water from the lake nor any right to discharge into the lake. The closest bore used for irrigation is 400 metres from the northwest end of the lake. The Board considers land drainage and abstraction of underground water will increase as land use around the reserve intensifies. At present the minimum level required for the ecological safety of the lake's flora and fauna and for scenery preservation is unknown.

There are various types of land uses adjacent to the reserve, ranging from market gardening to dairy farming (see plan). The reserve is only partly fenced from adjoining farm land and extensive replacement and new boundary fencing is urgently required.

Portions of the gullies east of the eastern boundary of the reserve are privately owned and retain some indigenous swamp vegetation which is unlikely to be further disturbed. The last remnants of Reporoa Swamp behind the western shore have recently been drained and cattle grazing is intensifying. The reserve is otherwise surrounded by farm land.

The land to the southwest of the reserve is undeveloped wetland under Maori ownership.

#### Water and Soil Conservation Amendment 1981

Under the above Amendment, effective from 1 April 1982 the Minister of Lands, under Section 20A, may apply to the Minister of Works and Development, for a National Water Conservation Order in respect of Lake Papaitonga, its inlets and outlets.

This will mean that Lake Papaitonga is - "to be preserved as far as possible in its natural state, or the outstanding wild, scenic or other natural characteristics, or the outstanding recreational, fisheries, wildlife habitats, scientific, or other features of the ..... lake..... to be protected".

The conservation order may provide for -

- a) "The retention in its natural state of the quantity, rate of flow, or level of natural water in .... the lake ...., because of its wild, scenic, or other natural characteristics or because of the value of the water for recreational, fisheries, wildlife habitats, or other purposes.
- b) The quantity, rate of flow or level of natural water to be retained in .... the lake .... for scenic, recreational, fisheries, wildlife habitats, or other purposes.
- c) The maximum and minimum levels to be sought or permitted for the natural water in a lake ....."

The effects of a national conservation order are -

1. Any order may impose conditions, restrictions, and prohibitions on the power of Regional Water Boards and the Authority to grant any water rights.
2. Any order shall not affect any right in respect of natural water granted or authorised before the order was made.
3. Every body and person shall have to recognise the conditions, restrictions and prohibitions of any order.  
eg. Regional and United Councils, local authorities, etc will have to take into account the contents of any order in preparing, reviewing and administering any regional, district or maritime planning schemes.

The making of a conservation order over Lake Papaitonga gives the Department of Lands and Survey, as advisor to the Minister of Lands, more power to control, monitor and exercise planning decisions over the lake.

Previously the Department of Lands and Survey could only manage the scenic reserve, under the Reserves Act 1977. Now, with this amendment, the Department has the power to administer the body of water within the reserve.

I would recommend that the Department of Lands and Survey apply for a National Water Conservation Order for Lake Papaitonga. In my opinion, Lake Papaitonga forfills the criteria required to meet the needs of a National Water Conservation Order so that the lake being an integral part of the reserve, is preserved and maintained, as far as possible, in its natural state.

#### MANAGEMENT CONSIDERATIONS

The lake had two owners (separate titles) before acquisition by the Crown and so was not a "private water" in terms of the Fisheries Act 1908. Commercial eeling took place with private access rights granted by one of the former owners (D H Murray).

In acquiring land from Mr Murray for reserve purposes the Crown agreed to the following conditions -

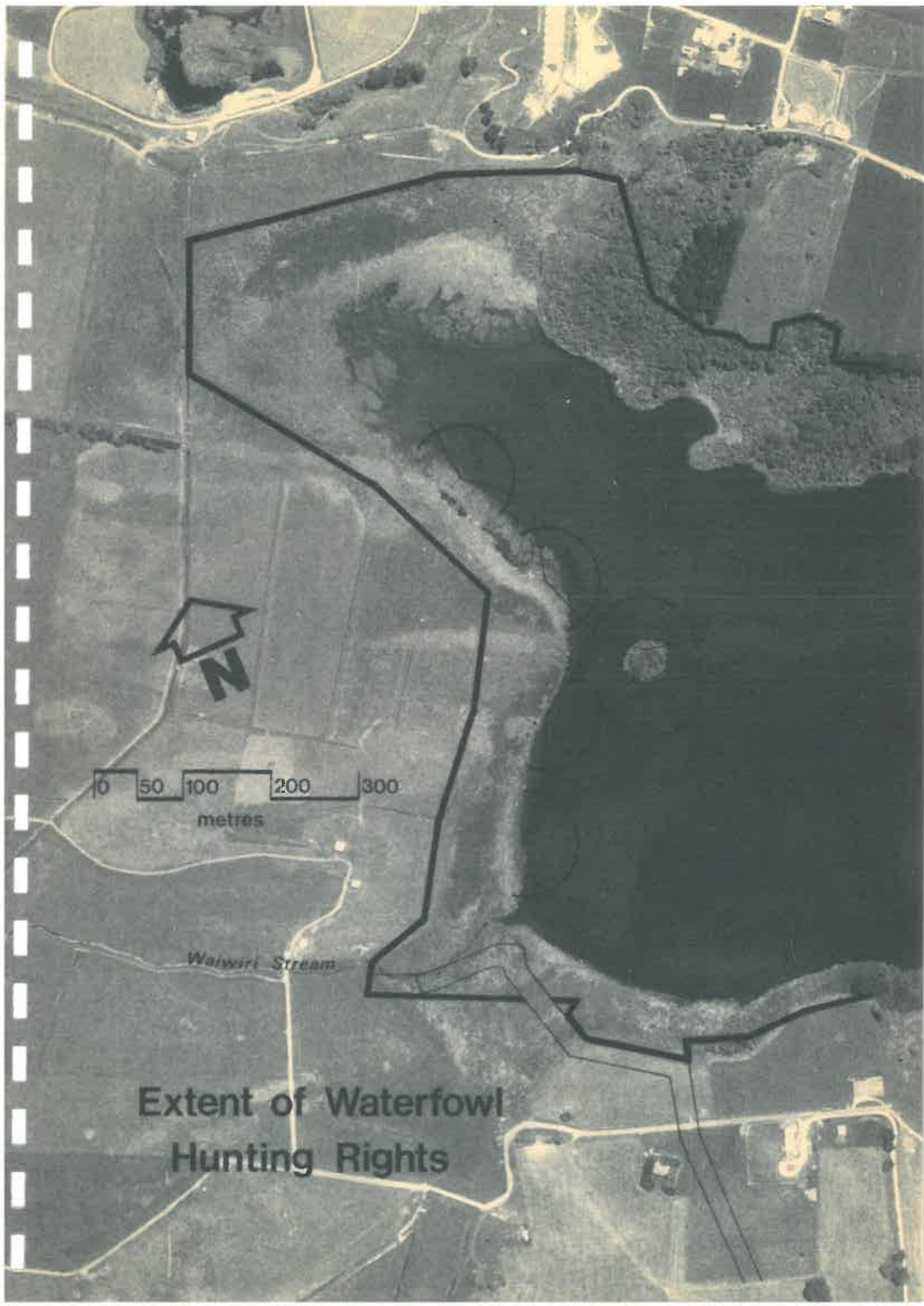
- a) Vendor to have exclusive access rights for commercial eeling for a period of 10 years from 1 September 1980, with no more than 38 tonne to be taken in that period (Section 50(1) Reserves Act and the Fisheries Act apply).
- b) Vendor to have exclusive waterfowl hunting rights over the lake for his family and invitees but to be exercised only from parts of the lake shore and island (see plan) and with a 6-gun limit. This right to run only for so long as the vendor retains ownership of the adjoining land or otherwise to terminate on 31 August 2015. Archeological features on Motu Ngarara are not to be disturbed. The Wildlife Act 1953 applies.
- c) Vendor to have exclusive possession by lease-back of part of the southern shore line (see plan) for a term of 21 years from 1 September 1980. This licence to be personal to the vendor and to terminate in the event of the adjoining land changing hands or on the vendor's death.
- d) The unformed northward leg of Papaitonga Lake Road to remain as road and a right of way be granted by the Crown over part of the acquisition area to preserve legal access between two parts of the vendor's farm (see plan).

The Crown has also agreed to grant a Right of Way over the former road area (Buller Road extension) adjacent to Lot 1 DP 2463 to the owner of that Lot.

The lake is not considered to be "Navigable" and is not therefore subject to the Harbours Act 1950.

#### District Scheme

In 1973 the Horowhenua County Council designated Lake Papaitonga and surrounding bush as Proposed Scenic Reserve. As seen on the attached plan all the land adjacent to the reserve, except to the west is zoned Rural Intensive Agriculture. The sand dune, swamp land to the west is zoned Rural General Farming. This area is also subject to flooding, ponding and severe land drainage problems. In addition a Proposed Motorway designation covers the adjacent farm-land northwest of the reserve.



**Extent of Waterfowl  
Hunting Rights**




0 50 100 200 300  
metres



*Waiwiri Stream*



**DISTRICT SCHEME**

-  Rural Intensive Agriculture
-  Rural General Farming
-  Proposed Motorway



SUMMARY

One of the essential management requirements is to maintain lake levels which do not affect land snail populations or archaeological sites detrimentally but nevertheless allow a suitable habitat for waterbird populations and fish (especially indigenous species). These levels must also not detract from the exceptional scenic qualities of the reserve nor the use of surrounding private land. Public use must be constrained to protect the natural and cultural values of the reserve, some of which are of national importance. Other management considerations pose shorter term constraints on some public uses but the locality affords alternative outdoor recreational opportunities.

## MANAGEMENT OBJECTIVES AND POLICIES

### MANAGEMENT OBJECTIVES

These objectives provide the basic long-term aims for the future management of Papaitonga as a scenic reserve.

- a) To protect and preserve the indigenous flora and fauna, ecological associations, natural environment and beauty which give Papaitonga its special qualities and value.
- b) To allow and provide for public access and encourage public enjoyment and passive use of the reserve to the extent compatible with the first objective.
- c) To manage and protect, to the extent compatible with the first objective, historic, archaeological, geological, biological and other scientific features in the reserve.
- d) To maintain the value of the reserve, to the extent compatible with the first objective, as a soil, water and forest conservation area.
- e) To preserve the character of the lake shore and protect it from unnecessary development.

### MANAGEMENT POLICIES

The management policies form a frame-work of constraints which act as guidelines to regulate individual management decisions so that any decisions made are compatible with the long term aims of management (ie. the management objectives). The management policies are therefore related to specific management problems and issues and reflect the intent of the management objectives.

Any problems which arise will be evaluated with reference to the policy statements and where problems arise for which there are no relevant policies, new policies will need to be formulated on the same basis as present policies. It will also be necessary to review the management policies from time to time, to ensure the management plan remains relevant to contemporary conditions and issues.

#### Administration and Management

Papaitonga Scenic Reserve consists of -

Lake	61.80 hectares
Scenic Bush	35 hectares
Islands	1.30 hectares

The land to be managed varies in width around the lake, with the majority of the bush at the north and eastern ends of the reserve.

Purchase arrangements have concluded with the two owners holding parts of the lake and a declaration of reserve status has been made over the lake, islands, surrounding native bush and swamp areas.

While this report is designed to cover the scenic reserve, one must not lose sight of the fact that the ecological processes of the lake and bush are, in many ways, dependent upon the surrounding farm land and in particular, the lake catchment area.

#### POLICY

ADMINISTRATION AND CONTROL OF PAPAITONGA SCENIC RESERVE AS DESCRIBED IN THE LEGAL DESCRIPTION, SHALL BE THE RESPONSIBILITY OF THE COMMISSIONER OF CROWN LANDS, WELLINGTON DISTRICT OFFICE, IN ACCORDANCE WITH THE PROVISIONS OF THE RESERVES ACT 1977.

#### Implementation

The Department has a Reserves Ranger stationed in Wanganui who will manage the reserve.

#### SCENIC VALUE

Lake Papaitonga and its surrounding bush has been recognised for years as one of the most attractive landscapes within the southern half of the North Island. Indeed, the name Papaitonga means "Beauty of the South". Since as early as the 1870's this land has been reserved from any development and kept, as much as possible, in its natural state.

#### POLICY

TO PROTECT AND PRESERVE THE INTEGRITY OF THE NATURAL FEATURES AND LANDSCAPE THAT GIVE THE RESERVE ITS UNIQUE SCENIC CHARACTER.

#### Implementation

The controlling of development within the reserve and the restriction of certain types of recreational uses will help to implement this policy. In addition the prohibiting of adjacent land uses that are not compatible with the scenic reserve, for example, through District Scheme controls.

#### WATER LEVELS AND QUALITY

##### POLICY

TO MAINTAIN THE HIGHEST POSSIBLE LEVEL AND QUALITY OF WATER IN THE LAKE NECESSARY FOR THE PRESERVATION OF SCENERY, INDIGENOUS PLANTS AND ANIMALS, WHICH IS ALSO CONSISTENT WITH THE DRAINAGE OF THE ADJACENT FARM LAND.

Implementation

Apply for a water conservation order under the Water and Soil Conservation Act 1967 to be made for the lake because of its scenic and other natural characteristics and its value for wild-life habitats. Cooperate with the Manawatu Regional Water Board and the National Water and Soil Conservation Authority in fixing the maximum and minimum levels to be sought and permitted under the order and in preserving the water quality. The installation of new weir on the Waiwiri Stream and control of drainage through the Marokura Swamp may be necessary.

POLICY

TO MAINTAIN THE LAKE AS A NATURAL RESERVOIR TO THE EXTENT COMPATIBLE WITH ITS PRINCIPAL VALUES.

Explanation

The lake plays a significant part in local drainage and is the source of the Waiwiri Stream. It therefore has soil and water conservation values.

Implementation

Seek provision for conditions and restrictions on water right applications affecting the lake as part of the water conservation order to control the quantity and quality of inflow, outflow and abstraction to the best advantage of the community as a whole.

SENSITIVE OR SCIENTIFIC AREAS

POLICY

TO PROTECT AND PRESERVE SCIENTIFICALLY VALUABLE OR SENSITIVE AREAS WITHIN THE RESERVE AND TO DISCOURAGE PUBLIC USE OF THESE AREAS.

Explanation

This applies to the western and northern parts of the reserve and, in particular, to the islands.

Implementation

Where ready access is available, public attention should be diverted elsewhere by competing attractions, signs, barriers etc, as appropriate.

## WATER CLASSIFICATION

### POLICY

TO LIAISE WITH THE MANAWATU CATCHMENT BOARD TO ESTABLISH AND MAINTAIN AN APPROPRIATE WATER QUALITY CLASSIFICATION FOR THE AREA (PURSUANT TO THE WATER AND SOIL CONSERVATION ACT 1967).

### Implementation

An approach should be made to the Manawatu Catchment Board to undertake random sampling and analysis of the lake water, testing for nutrients, temperature, turnover time etc. If possible a "Redox potential" test should be carried out to determine the oxidation - reduction potential.

In addition, cores samples of mud should be analysed for particle size and nutrients. Particle size determination may give an indication as to whether the muddy lake bottom is either run-off silt and sediment from the eastern catchment, or wind blown sands from the coastal dune country as a result of the prevailing westerly winds; or a combination of both.

A detailed bathymetric survey of the lake should also be undertaken to determine the present lake depths. The only survey was taken in 1949.

## MOTU KIWI (PAPAITONGA) AND MOTU NGARARA (PARAWHARANGI) ISLANDS

Both islands in the lake are fine examples of Maori history. Motu Kiwi (the larger island) was once the site of Papaitonga Pa, accommodating over 500 of the Muaupoko tribe. Motu Ngarara, the smaller island, is artificial and was built by the Muaupoko tribe for defence purposes. Soil, ferns, "nigger heads" and branches were carried from the shore by canoes and dumped within a circle of stakes. Both islands today have a thick, healthy cover of native bush. When comparing early photographs of the islands, 1930's, the vegetation on both islands has almost doubled in height. In addition, Motu Kiwi could possibly contain examples of certain types of flora and fauna unique to the island and the surrounding region.

### POLICY

TO PROTECT MOTU KIWI AND MOTU NGARARA FROM ANY ADVERSE ACTIONS THAT MAY NOT BE IN KEEPING WITH THE MANAGEMENT OBJECTIVES.

#### Implementation

Access to both islands should be prohibited, except for issued permits. A study should be undertaken to determine if the islands contain any unique or rare flora or fauna. The isolated nature of the islands could make it an ideal place for the establishment of rare or endangered plants, given their compatibility with the existing environment.

#### HISTORIC VALUE

Papaitonga Scenic Reserve has a considerable Maori and European history which includes a number of pa sites, paketa (food store-house) site, canoe landing site, etc. The lake was also the scene of a great tribal battle involving Te Rauparaha (see Appendix).

#### POLICY

TO LIAISE WITH THE HISTORIC PLACES TRUST, MANAWATU MUSEUM, AND THE HOROWHENUA HISTORICAL SOCIETY IN THE PROTECTION AND CONSERVATION OF ANY HISTORIC AND ARCHEOLOGICAL FEATURES IDENTIFIED IN THE RESERVE.

#### Implementation

Prevent public attention being drawn to those sites with any archeological significance and divert and encourage the general public to use the facilities provided by the Department.

#### PLACE NAMES

#### POLICY

TO ASCERTAIN AND USE THE CORRECT MAORI PLACE NAMES WHEN REFERRING TO FEATURES WITHIN THE RESERVE.

#### Explanation

Names in common usage such as "Lake Papaitonga", "Motu Kiwi" and "Motu Ngarara" are of European origin. It is appropriate to name the reserve after the main Pa but otherwise in reserve interpretation to preserve the earlier Maori place names of Lake Waiwiri and the islands Papaitonga and Papawaerangi.

#### Implementation

Support the Ngati Kikopiri Marae Committee and Ngati Pareraukawa Maori Committee in an application to the New Zealand Geographic Board to officially change these place names.

## WILDLIFE

Due to the nature of the size of Lake Papaitonga in comparison to other bodies of water within the Horowhenua region, the wetland wildlife in the reserve is of great significance. Land draining in the surrounding Horowhenua region has reduced considerably the amount of wetlands available to be used by all of the wildlife species present.

Lake Papaitonga is an important area of habitat for those water birds with distinct patterns of movement or migration. Research shows that species such as NZ Dabchick, black swan, and shoveler duck are very mobile with birds from the Horowhenua district being recorded in other regions. Thus the reserve contributes to supporting wildlife which may spread beyond the immediate region to other parts of the country.

The quality of the wetland is a key factor in the welfare of the wetland wildlife, although for several species, the adjoining terrestrial vegetation can also be of importance. One of the essential management requirements within the reserve is the extent to which the existing water level can be maintained for water birds yet not effect the land snail populations. It is essential to protect the land snail populations in the low lying swamp forest vegetation adjoining the lake. Any maintenance of lake levels for water birds should take cognizance of this goal but nevertheless maintain a suitable level for water bird populations as well.

## POLICY

TO PROTECT AND ENHANCE THE ENVIRONS OF LAKE PAPAITONGA  
FOR THE PURPOSE OF WILDLIFE HABITAT AND REFUGE.

## Implementation

Recreational water activities other than controlled duck shooting on the lake should be prohibited and the general public should be diverted away from sensitive fauna areas. For example, diversions could be made through -

1. Well defined tracks.
2. Public knowledge of look-out areas.
3. Public awareness of punishable offensives eg. removal of any fauna from the reserve.
4. Public knowledge of certain features, eg bird watching hides.

Any decisions concerning the lake water and wildlife within the reserve should be made with the approval of the Wildlife Service, Department of Internal Affairs.



ANIMALS

POLICY

TO PROHIBIT DOMESTIC ANIMALS, STOCK OR UNCONTROLLED PETS  
IN THE RESERVE AND AS FAR AS PRACTICABLE TO CONTROL OR  
EXTERMINATE INTRODUCED PESTS.

Explanation

Opossums in the reserve should be controlled. The use of hunting  
dogs will be necessary with duck shooting on the lake.

Stock should only be permitted in grassed, securely fenced parts of  
the reserve and stock-proof boundary fences round the reserve should  
otherwise be completed and maintained. Rat control would be  
beneficial to the Parythantid snails but is impractical in the long  
term.

With the exception of pet dogs kept on leashes, cats, horses and other  
pets should be prohibited.

Implementation

Encourage and permit private opossum trapping. Adopt appropriate  
bylaws. Complete fencing programme.

GAME AND FISH

POLICY

SUBJECT TO THE EXISTING RIGHTS AND AUTHORISATION BY THE  
MINISTER OF LANDS, TO PERMIT THE NON-COMMERCIAL HARVESTING  
OF GAME BIRDS, EELS AND INTRODUCED FISH BY THE PUBLIC.

Explanation

"Harvesting" assumes that the action permitted will not unduly  
deplete the number of any species, damage ecological associations  
or the values of the reserve and that the activity is only under-  
taken for sport and food.

Implementation

In respect to waterfowl hunting and the taking of eels this policy  
cannot be implemented until or unless certain exclusive rights are  
relinquished or expire (refer to page 26). The holder of these  
rights is not expected to change his attitude to traditional eeling  
by Maoris which will be allowed to continue subject as before to  
the Fisheries Act and now also to Section 50 of the Reserves Act.

#### REMOVAL OF FLORA AND FAUNA

Papaitonga Scenic Reserve is one of the few scenic reserves near Levin, that accommodated the paryphantid snail Powelliphanta traversi traversi. This is a particularly large snail, 3-4cm in size, and over the past 50 years collectors have amassed huge collections from the Levin area. It is ranked 13th of 41 species of Powelliphanta in terms of priorities for conservation and management. The colony is in no danger of extinction if the forest floor does not suffer from heavy public use resulting in disturbance of the litter and ground layer from trampling, predators (rats) and collectors.

#### POLICY

TO PROHIBIT THE REMOVAL, DAMAGE OR DESTRUCTION OF INDIGENOUS FLORA AND FAUNA FROM THE RESERVE, EXCEPT FOR THE PURPOSES PROVIDED FOR IN POLICY OR FOR PUBLIC SAFETY OR FOR APPROVED SCIENTIFIC OR EDUCATIONAL PURPOSES.

#### Explanation

Permission for removal of plants and animals must be sought from the Minister of Lands (Sections 42, 49 and 50 Reserves Act) and in the case of protected wildlife also from the Minister of Internal Affairs. Maori cultural arts and crafts are considered to be an "Educational purpose" in terms of this policy.

#### Implementation

Action applications for permission on their merits as they arise.

#### POLICY

TO REMOVE OR EXTERMINATE EXOTIC PLANTS NOT CONSIDERED TO HAVE SPECIAL VALUE OR UTILITY IN THE RESERVE.

#### Explanation

Except where the Minister of Lands otherwise determines exotic plants in a scenic reserve are as far as possible to be exterminated.

#### Implementation

The eradication of species likely to spread more widely in the reserve is to take precedence (eg. Clematis vitalba, sycamores) and thereafter annual inspections undertaken to ensure regrowth does not occur. Some exotic trees on the Buller Road access have amenity value and others on the bush edge have limited shelter value.

## RECREATION

### INTERPRETATION

It is important that the public are encouraged to appreciate the reserve by being informed and aware of its special values.

#### POLICY

TO PROVIDE INFORMATION OF INTEREST TO VISITORS, AND TO GENERATE A POSITIVE ATTITUDE TOWARDS PROTECTION AND CONSERVATION AMONGST USERS OF THE RESERVE AND TO ENCOURAGE APPRECIATION OF ITS FUNCTION AND QUALITIES.

#### Implementation

Information signs can be used at the entrance and throughout the reserve for the dissemination of information to the public and for interpretation of the natural and historical features in the reserve. The use of signs also provides a technique for diverting attention from sensitive areas and features.

### RECREATIONAL ACTIVITIES

Due to the nature, position and size of the reserve, passive recreational activities should be only permitted within the reserve.

#### POLICY

TO ALLOW ONLY LOW INTENSITY MAINLY PASSIVE RECREATIONAL ACTIVITIES IN THOSE AREAS BEST ABLE TO SUSTAIN PUBLIC USE, AND TO DISCOURAGE ACTIVITIES IN THOSE AREAS WHICH ARE SENSITIVE AND REQUIRE PROTECTION.

#### Explanation

Activities which can be encouraged include bird watching, appreciation of scenery, nature and historical studies, bush walking (along defined tracks), picnicking and controlled waterfowl hunting.

### BOATING

#### POLICY

TO PROHIBIT ALL TYPES OF MOTOR BOATING AND DISCOURAGE ALL OTHER TYPES OF BOATING ON LAKE PAPAITONGA.

#### Explanation

1. Uncontrolled access to the islands could result in damage to archaeological and historical sites.
2. The shallow and relatively deep muddy bottom to the lake could present a water safety problem to both inexperienced and competent boaters.

3. Facilities for the launching of boats and water craft are not available in the reserve which would result in people trespassing onto the adjoining land owner's farm.
4. As previously mentioned, boating could re-introduce aquatic weeds and stir up bottom sediments in shallow areas.
5. Disturbance of wildlife and their habitats could result as well as detract from the quality of the more passive recreational experience.

#### PROVISION OF FACILITIES

##### POLICY

TO PROVIDE AND MAINTAIN ONLY THOSE FACILITIES NECESSARY FOR THE RECREATIONAL USE AND MANAGEMENT OF THE RESERVE.

##### Explanation

Walking tracks are appropriate, to increase the visitor's appreciation and enjoyment of the reserve, with associated car parking and picnic areas. Facilities for boat access and launching are not appropriate.

##### Implementation

In site selection use the following criteria -

- a) direct use to specific routes,
- b) discourage use of environmentally sensitive areas,
- c) provide access to parts of the reserve which have highest scenic quality or interest,
- d) avoid damage to the reserve and undue disturbance of flora and fauna.

Both road frontages to the reserve have potential as staging areas for access and the headland east of Papaitonga Island as the destination for a track. All facilities should be consistent with the capacity and use of the reserve and their design and form, colour and materials should be compatible with its character and function.

#### RESEARCH AND MONITORING PROGRAMMES

##### POLICY

TO ENCOURAGE RESEARCH STUDIES AND MONITORING PROGRAMMES WHICH WILL BROADEN THE UNDERSTANDING OF THE ECOLOGY OF THE RESERVE AND ASSIST IN MANAGEMENT.

Explanation

Scientific monitoring of such things as lake water quality, lake level, wildlife etc, is desirable to determine if there are any adverse effects from non-environment factors, eg. artificially changed lake level, adjacent land uses, introduced wildlife.

Implementation

Liaise with the Wildlife Division, Department of Internal Affairs, Royal Forest and Bird Protection Society, Manawatu Catchment Board and other interested bodies who may wish to undertake research in the reserve. Research and monitoring programmes could be accommodated, but the techniques used must not detrimentally affect the native flora, fauna or other features of the reserve.

LIAISON WITH OTHER BODIES

POLICY

TO MAINTAIN LIAISON WITH THE MANAWATU CATCHMENT BOARD, HOROWHENUA COUNTY COUNCIL, THE NGATI KIKOPIRI MARAE COMMITTEE, MANAWATU MUSEUM, CENTRAL GOVERNMENT AGENCIES AND VOLUNTARY BODIES HAVING A SPECIAL INTEREST AND INVOLVEMENT IN THE MANAGEMENT OF THE RESERVE.

Explanation

Valuable information on the use and features of this natural resource is often obtained from interested groups and individuals. In addition, these bodies make valuable contributions to the management and well-being of the reserve.

## RESERVE DEVELOPMENT

### PRESENT AND PAST USE

Until 1981, Lake Papaitonga was under private ownership, being held in two titles, and thereby restricting public use. In the past the lake and surrounding bush have been the subject of both active and passive recreational uses. Throughout the past years several interested societies and groups, such as the Horowhenua Historical Society, Levin Native Flora Club have included the reserve in their day trips and outings; with interested people travelling from as far as Wellington.

In 1954, Mr D H Murray (Senior) gave his support to several motor boat regattas which were held at least once a year. As the lake was under private ownership, duck shooting rights were restricted to Mr Murray, Mr Preston, and their invited guests.

In the main, the general public have used the scenic reserve for passive recreation with off road parking available from Buller Road. Several random walking tracks have been formed through the bush from the Buller Road entrance but these only run for several hundred metres. There are no existing facilities in, or around, the reserve so most visitors have brought their own barbeques and picnics which are used in the cleared flat unformed area of Buller Road.

The Ngati-Kikopiri hapu of the Ngati Raukawa tribe have traditionally fished the lake and taken medicinal plants and other materials from the surrounding land with the owner's knowledge. These are now inconsistent with the scenic reserve classification except to the extent that indigenous specimens may be authorised by the Minister of Lands to be taken for educational purposes (Section 49 Reserves Act 1977). Also non-protected animals may be harvested with the Minister of Lands' consent where this does not threaten the preservation of any indigenous species in the reserve in perpetuity (Section 50 of the Act).

Visitors to the reserve are mainly from the Levin locality with interested groups occasionally travelling from Wellington, Palmerston North etc.

### RECREATIONAL DEVELOPMENT

In public submissions there has been outright support for development to be controlled so that natural, cultural and archaeological values are protected and preserves. Steps should therefore be taken to monitor the effects of public usage on the reserve and ensure that sensitive areas are not damaged or disturbed.

If these areas are identified to the general public and track access made available, these features could be exploited and ruined for future generations. Any track development must therefore by-pass sensitive areas and attract the visitors attention to other features such as; various fauna species, lake views, picnic areas etc.

Track development should be dependent on public usage. If during the public holidays, overwhelming numbers of people visit the reserve - it is better to have well defined tracks through areas of native bush than allow people to walk randomly through the native bush resulting in damage to young flora and fauna. It is for this reason that there are several stages of track development, depending on reserve usage (see development plan).

There is also support in the submissions for the hunting of game birds on the lake - Mallard, Grey Duck, New Zealand Shoveler and Pukeko - in season (mid-winter) by a set number of hunters related to stand (site) availability.

The owner of the land adjoining the southern and western boundary of the lake, Mr D H Murray, is quite adamant that he will not grant permission to groups and interested parties to cross his farm land to the reserve. He believes that adequate access is available to the reserve from the Buller Road entrance.

In considering the different stages I have intended to prohibit any facilities that may encourage use of the lake. I feel that any watercraft on the lake would jeopardise the isolated nature of both islands.

Fencing has become the top priority in the reserve development and those areas requiring immediate attention have already been identified.

#### Stage One (Refer to plan, page 44)

Stage One is intended to develop access from the Buller Road end of the reserve. At present off road parking is available in a 450 metre strip of unformed road. Trees along this unformed road gives sheltered, semi private areas suitable for picnics, barbeques etc.

At the end of the unformed road, a stile will be erected over a existing fence as entry to the reserve proper. It is intended to construct a walking track down the embankment, along a 70 metre board walk crossing the swamp, up the opposite bank and along the ridge to a look-out over the lake and islands. The bush along this ridge has been heavily grazed by cattle in the bush, but is showing good signs of regeneration. Consideration should be given to constructing an elevated wooden platform at the look-out to avoid tree climbing and the need to cut back trees to maintain a look-out.

This will obviously depend on public usage. This look-out has many advantages -

1. Elevated ground.
2. Difficult access to lake shore thereby minimising disturbance.
3. Relatively easy access.
4. Minor alterations to existing tracks.

The cover design is the view over the lake obtained from the look-out.

PRIORITY - HIGH

#### Stage Two

Stage Two would involve constructing a circular track starting and finishing at the Buller Road entrance to the reserve. The track would skirt around the southern edge of a large gully taking in many examples of fauna the reserve has to offer. In addition, it would immediately relieve access pressure on sensitive areas along the northern side of the lake eg. midden shell piles, colonies of landsnails, wetland areas.

The track would accommodate those people who are interested in studying the native bush more closely than obtaining views of the lake and bush from the look-out, suggested in Stage One.

PRIORITY - HIGH-MEDIUM

#### Stage Three

The development of Stage Three will mainly depend on the public intensity and usage of Stage One.

Stage Three will involve the construction of an off road car park for approximately 10-20 vehicles including a turning area. From the car park a track should be constructed along the side of the gully, through the native bush, crossing the stream twice and finishing on the flat grassed area overlooking the lake. The picnic area and look-out is elevated, approximately 10 metres, above the lake.

PRIORITY - MEDIUM

#### Stage Four

This stage involves the construction of either -

1. a track through the reserve bush and across a 60 metre wide swamp, or -



2. permission from the owner of the land south of the reserve for the public to walk around the edge of the bush and swamp.

Either way, the track will follow the southern shore line around to another elevated picnic/look-out area. This stage could point out features such as the 15 metre high kauri tree, site of Maori pataka (elevated food storehouse) etc. Bird watching hides could be constructed at various points around the lake shore or use made of the existing maimais.

Return access could be back along the track or alternatively, with the permission of the adjacent land owner, return access to Papaitonga Lake Road could be along an existing milk tanker road. This would avoid any possibilities of stock disturbance, fence damage etc.

PRIORITY - LOW

NOTE - The bird watching hides could be given an increased priority by incorporating them in Stages One or Two.

#### Stage Five

This stage would see a well defined walking track through the bush and swamp linking up the tracks developed in Stages One and Three.

The result would be a one way walk from Buller Road to Papaitonga Lake Road or vice versa. Interested sightseeing parties could be dropped off at one end and picked up at the other. As the track would involve some steep climbs up gully slopes, I would not envisage it being used by tourists but groups such as scouts, guides, school trips etc.

This stage would only be developed as a result of intensive public use of the reserve. As I stated before, it is better, in my opinion, to have well defined walking tracks through native bush, than to ignore public use in a hope that the general public will not venture into those areas without tracks. It has been shown in the past in many reserves that the construction of ample walking tracks is better than random and indiscriminate damage through public "bush bashing".

However, the availability of finance must be taken into consideration when planning walking track construction.



Waiwiri Stream

15 metre

30 metre

30 metre

PAPAITONGA LAKE ROAD

Pastoral and Horticultural Land Use Surrounding the Reserve  
and its Possible Affects

In this section, I have endeavoured to briefly identify some of the present and future affects, both positive and negative, of land use adjacent to Papaitonga Scenic Reserve. In addition, I have also tried to envisage possible trends of land use in the Horowhenua and the pressures that may cause a change or intensification of adjoining land use.

Present Use

Sixty percent of the land use adjoining the reserve is dairy farming, 25% sheep farming and 15% horticultural crops (see plan).

Dairy farming is comprised of two units, the southern unit, Mr Murray's, occupies all the land to the south and west of the reserve, and Mr Preston's unit occupying land north west of the reserve. The horticultural crops grown are wheat, barley and vegetables (cabbages, pumpkins).

Future Trends

During the past decade, and particularly over the past five years there has been a general increase in the amount of New Zealand's horticultural exports. This increased demand has allowed farmers to diversify or subdivide and sell economic horticultural units. This has been most evident in the Horowhenua region with the rapid increase in kiwifruit production.

Land east of a north-south line through the centre of the reserve, ie. fertile terrace land, that is presently under sheep and dairy production, could produce a better return with intensified horticultural cropping. The wetland/sand dune country west of the reserve will probably remain as pastoral dairy land.

Now that the lake and native bush will be preserved, and developed for passive public use, the adjacent farm land will increase in value over the years, particularly on the southern side which commands impressive views. This could then, in turn, result in increased pressure to subdivide the remaining farm land into small economic intensive land use blocks.

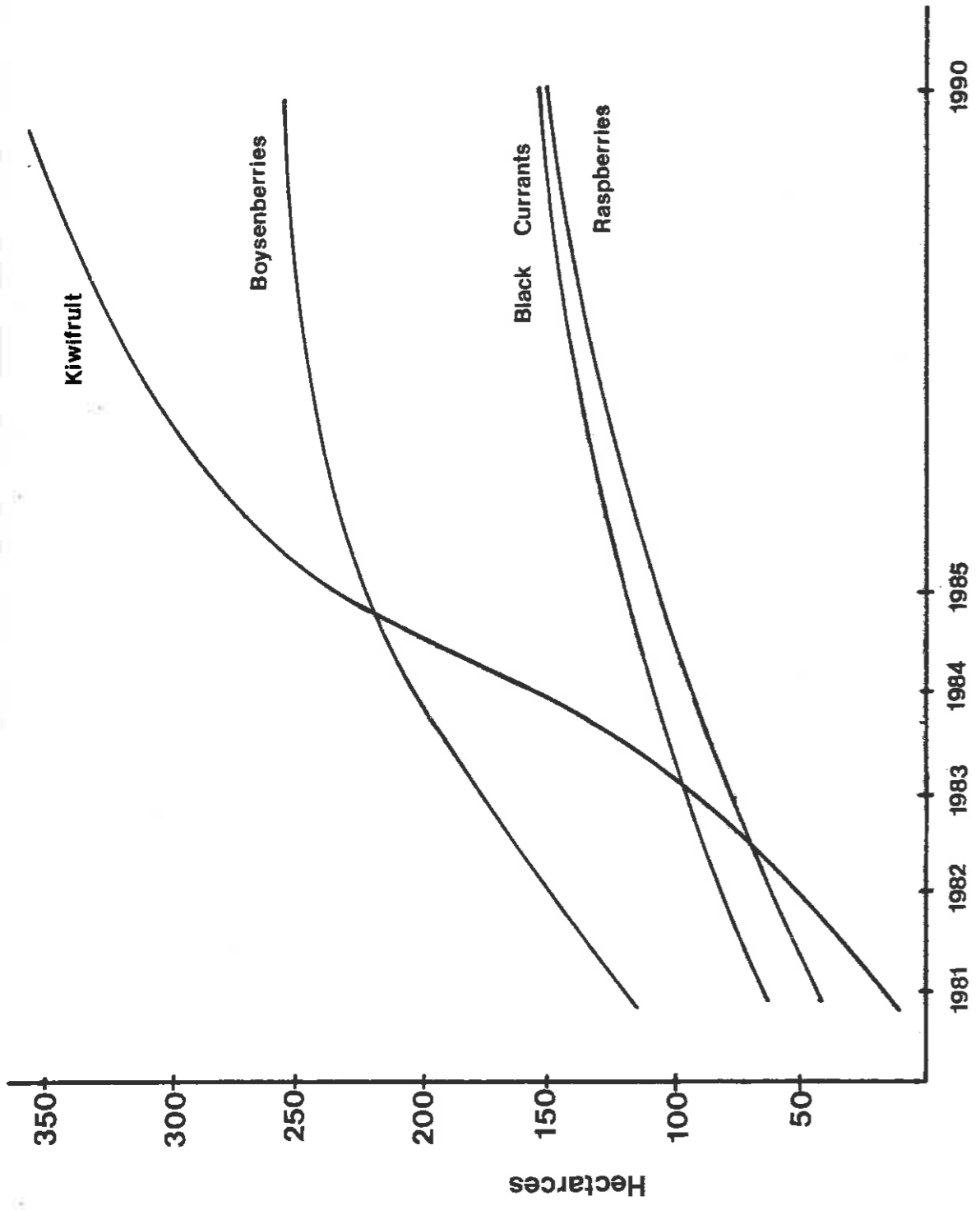
As a guideline the size of economic units are -

Market gardening	10-12 hectares
Berryfruit	6- 7 hectares
Kiwifruit	3- 4 <sub>2</sub> hectares
Glasshouse	1500m <sup>2</sup>

ADJACENT LAND USES

- DAIRY FARMING
- SHEEP FARMING
- CROPPING
- MARKET GARDENING





Predicted Horticultural Requirements  
(M.A.F figures 1981)

From the Ministry of Agriculture and Fisheries figures there appear to be a predicted slowing down of the expansion into berryfruit and more development of kiwifruit production. There will probably not be a move towards glasshouse cropping as it is very capital intensive and the cost of heating is economically high. The growing of outdoor flowers could expand in these climatic and soil conditions, given a favourable market. This could occur on the more sheltered northern side of the reserve. The areas used for market gardening seem to stay fairly static and there is no sign of this changing.

### Soils

Soil types are obviously the major factor in determining the commencement of any horticultural production. Soils to the north, east and southeast of the reserve are of the Kiwitea silt loam type and have the necessary fertility required for intensive cropping. The soil type to the west of the reserve is Omanuka loamy peat and is too wet to support any form of horticultural production.

There are quite a number of shallow bores in the region with the closest bore situated approximately 400 metres north west of the reserve. Irrigation of crops requires approximately 250,000 litres/hectare/week of water in mid summer. Horowhenua's driest months (January, February) affects market gardens, cereal crops and flower growing. Berryfruit ripen earlier, (November, December) so they do not require as much irrigation.

Eighty-eight percent of the farm land water used, including irrigation, is obtained from underground sources. A problem may arise that water taken from aquifers may alter the quantity of underground water supplying the lake, thereby affecting the lake level. However, as the Catchment Board have pointed out, the effects of abstraction from underground sources are extremely complex and it is quite possible that the lake may be sustained from aquifers unrelated to these bores. There is also the possibility that the lake is situated on the Ohau River shingle fan and that the river level controls the lake level.

### Effects of Increased Agriculture on Lake Water Quality

Agriculture brings about a deterioration in water principally by increasing concentrations of plant nutrients and sediment. Plant nutrients, specifically Phosphorous and Nitrogen, are undesirable because they may stimulate the growth of aquatic nuisance plants, while sediment, in addition to carrying nutrients, also renders water unsuitable for many other uses.

Pollutants are carried from agricultural land to lakes principally by surface run-off and subsurface run-off. Other sources are dust and rainfall. The amount of surface run-off and its sediment concentration is governed by rainfall energy, rain intensity, and the vegetative cover as well as rain duration, soil type and slope. Thus any heavy grazing, or cultivation, which reduces the vegetative cover in the lake's catchment, can be expected to increase surface run-off and sediment loss. The following figures give an indication of the phosphorous levels from surface water run-off.

Hay plots	0.02 kg/ha/yr
Oats	5 kg/ha/yr
Corn (in rotation)	8.4 kg/ha/yr
Corn (continuous)	18.2 kg/ha/yr
Fallow	33.15 kg/ha/yr

Therefore, there is a strong need for maintaining a good vegetation cover in the lake's catchment.

There is sufficient evidence from overseas studies to indicate that fertilisers are major potential sources of Phosphorous and Nitrogen to streams and lakes. It is not likely that fertiliser particles will enter the lake directly through truck spreading, but they may enter indirectly by surface run-off shortly after topdressing. There have been many research papers on the effect of fertiliser applications and water quality. Many environmentists believe fertiliser nutrients significantly contribute to eutrophic lakes, while others suggest the cause is the naturally high nutrient content of the soils. Whatever the case, more research is needed. Lake Papaitonga has the advantage that the indigenous bush and forest provide a 'buffer zone' between the main catchment area and the lake proper. The sheep unit in the main catchment of the lake is well established and intensification into cropping is unlikely.

Both dairy units discharge dairy shed wastes onto areas some distance from the lake. It is doubtful that significant nutrient enrichment of the lake water occurs, and it would be almost impossible to prove if this were the case. The discharge of all effluent into waterways is under the strict control of the Manawatu Catchment Board.

In addition, cattle also favour water areas and this behaviour is probably responsible for introducing large quantities of nutrients around the lake shore. Trampling could destroy or damage swamp vegetation around the lake shore and gullies thereby reducing its potential to trap nutrients.

It has been noted that soils on the higher terraces contain some mottling (indicating impedance of natural drainage). Any measures to create artificial drainage systems will effectively increase the permeability of a soil and thereby reduce surface run-off and sediment loss. This can only but help the water quality of Lake Papaitonga.

Any horticultural units developed adjacent to the reserve would have to undertake a spraying programme with insecticides and pesticides and may affect the bird and insect life on the fringe areas of the reserve. However, it could also be argued that bird and insect life in the reserve could benefit through the increased availability of food through horticultural crops.

In creating the scenic reserve classification, certain people, in their carelessness, may disturb stock or damage crops when trying to obtain access over adjacent farm land. In this respect the Department should provide clearly defined access and tracks to the reserve.

#### Summary

The extent to which land use affects water quality depends upon the intensity of the land use and on the nature of the receiving water.

White (1977) considers the intensity of the land use in much of New Zealand is sufficient to make lakes prone to cultural nutrient enrichment and that virtually all lowland lakes are affected. Only the upland lakes of the South Island, where the catchments are used for extensive rather than intensity grazing, are substantially free from the problem.

All of the considerations present are long term and it may well be several years or even decades before any possible effects are noticed. If present land uses continue in and around the reserve's catchment, no major land use problems will occur to the lake and surrounding bush.

It should be pointed out that in the past, extreme climatic conditions in the Levin region such as droughts, flooding, have caused more damage to the reserve area than any adjacent land use.

Given the appropriate land management policies and decisions concerning the surrounding land uses, Papaitonga Scenic Reserve will remain a reserve unique to the southern half of the North Island.

Given the present growth trends of agricultural and horticultural developments, the three major requirements I see as being necessary in the short-medium term are - (1) Application for a National Water Conservation Order; (2) The provision and maintenance of stock proof fencing; (3) Planting of a buffer strip of vegetation, where necessary, around the lake shore.

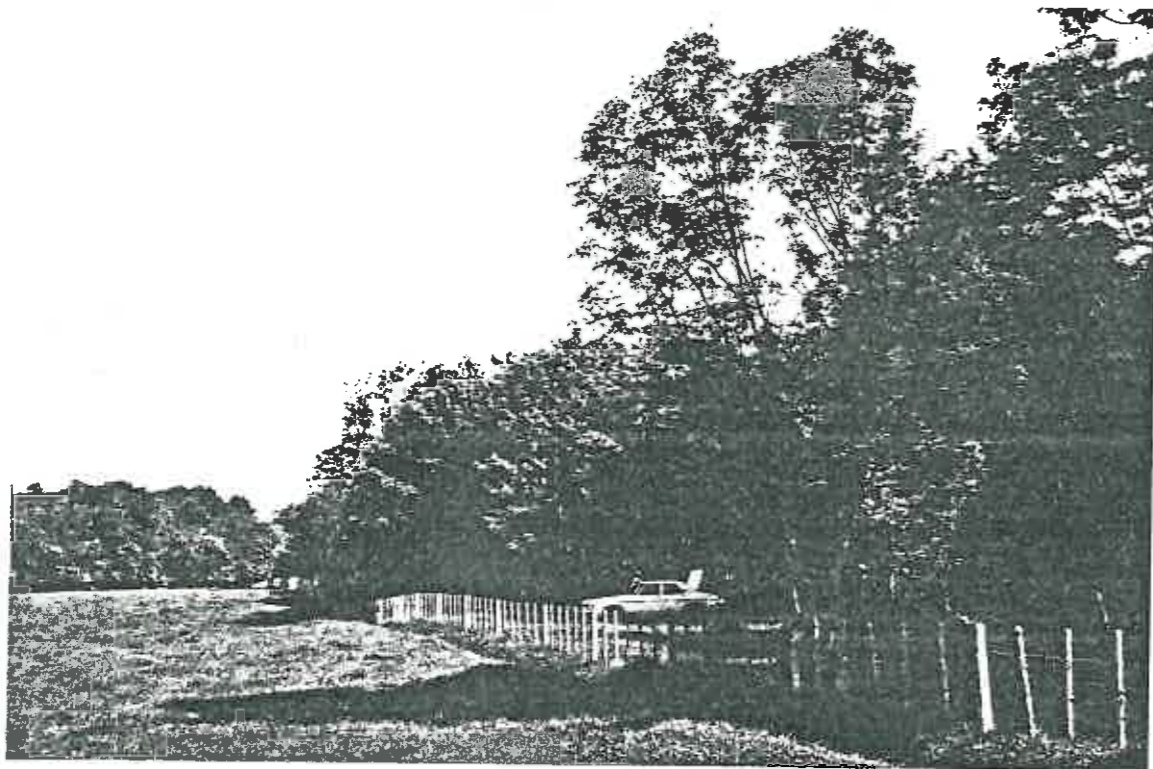




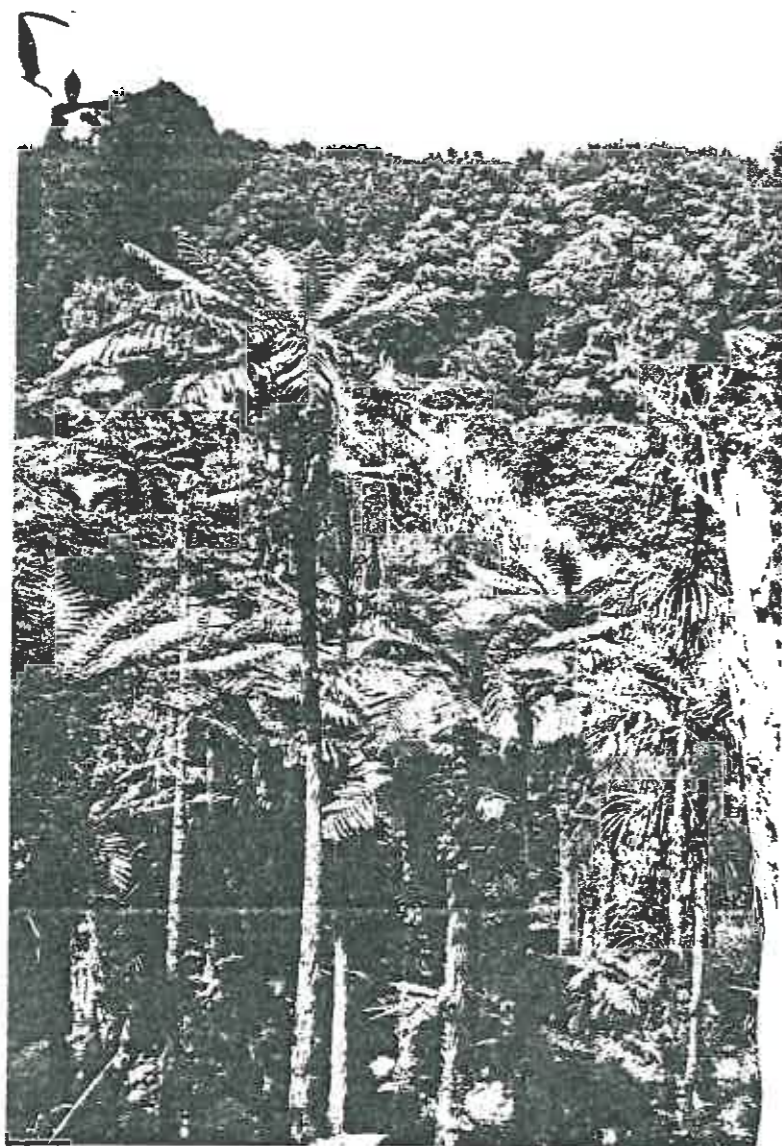
SOUTHERN LAKE SHORE FROM PICNIC AREA



LAKE AND ISLANDS FROM THE SAME PICNIC AREA



BULLER ROAD ENTRANCE - PICNIC AND CAR PARKING AREA



NATIVE BUSH WITHIN  
THE RESERVE

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APPENDIX I

HISTORY OF THE PAPAITONGA SCENIC RESERVE

About 1820, the Muaupoko tribe, the original land owners of Horowhenua, were established mainly around Lake Papaitonga, known then as Lake Waiwiri. For defence purposes, they had built a pa on Motu Kiwi (Island) with the number of inhabitants estimated to be more than 500. As well as using the island for defence purposes 'patakas' (elevated food houses) were erected around the island on long wooden posts protruding from the water. There are signs of these today.

As a result of the cramped conditions on Motu Kiwi (then called Papaitonga), the Muaupoko tribe built the smaller of the two islands, the one to the west. First of all, poles were driven in to define the extent of the proposed island. Great lumps of 'negro head' were bought from the shores and cased in between the poles. Then enormous quantities of 'kakahī' shells from refuse heaps were brought from the shore by canoes. Finally, many canoe loads of soil were thrown on top. Dry fern and negro heads were spread over the island and four residential whares erected. The island was given the name of Parawharangi.

In 1822, Te Rauparaha and his Ngati Toa tribe had ended their long migration from Kawhia in the north and settled near the Ohau River. The tribal land owners of the Horowhenua, the Muaupokos, having felt the force of the northern tribes, invited Te Rauparaha and his tribe for a feast at Lake Papaitonga. That night the Muaupoko, assisted by the Rangitanes from the Manawatu, killed most of the Ngati Toas. Te Rauparaha escaped to Kapiti Island, but his son and daughter were killed.

Te Rauparaha later returned with his armed followers and attacked the island pa and massacred the Muaupoko tribe. The remaining survivors fled to Hawkes Bay, but later returned to Horowhenua and settled near Lake Horowhenua under the grace of Chief Te Whatanui.

In 1879 it was the bold determination and decisive action of Kapa Rangi hiwi nui (Major Kemp), Chief of the Muaupoko tribe, that increased the acreage of the land given back to them by the Ngati Toa. By a threat of force of arms, Kemp overruled an impending adverse decision of the Native Land Court sitting at Foxton. Accompanied by Judge Rogan and other Native Land Court judges and officials, Major Kemp rode to the disputed land and set out the boundaries according to his own ideas. His new southern boundary ran in a direct line from the mouth of the Waiwiri Stream to the southerly peak of Nga Puke Turua (now Mt Dundas). These changes increased the Muaupoko territory (Horowhenua) from its former

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HISTORY OF THE PAPAITONGA SCENIC RESERVE

APPENDIX I

About 1820, the Muapoko tribe, the original land owners of Horowhenua, were established mainly around Lake Papatonga, known then as Lake Waitiri. For defence purposes, they had built a pa on Motu kiwi (Island) with the number of inhabitants estimated to be more than 500. As well as using the island for defence purposes 'patakas' (elevated food houses) were erected around the island on long wooden posts protruding from the water. There are signs of these today.

As a result of the cramped conditions on Motu kiwi (then called Papatonga), the Muapoko tribe built the smaller of the two islands, the one to the west. First of all, poles were driven in to define the extent of the proposed island. Great jumps of 'negro head' were bought from the shores and cased in between the poles. Then enormous quantities of 'kakahi' shells from refuse heaps were brought from the shore by canoes. Finally, many canoe loads of soil were thrown on top. Dry fern and negro heads were spread over the island and four residential whares erected. The island was given the name of Parawaharangi.

In 1822, Te Rauparaha and his Ngati Toa tribe had ended their long migration from Kawhia in the north and settled near the Ohau River. The tribal land owners of the Horowhenua, the Muapokos, having felt the force of the northern tribes, invited Te Rauparaha and his tribe for a feast at Lake Papatonga. That night the Muapoko, assisted by the Rangitane from the Manawatu, killed most of the Ngati Toas. Te Rauparaha escaped to Kapiti Island, but his son and daughter were killed.

Te Rauparaha later returned with his armed followers and attacked the island pa and massacred the Muapoko tribe. The remaining survivors fled to Hawkes Bay, but later returned to Horowhenua and settled near Lake Horowhenua under the grace of Chief Te Whatanui.

In 1879 it was the bold determination and decisive action of Kapa Rangihiri (Major Kemp), Chief of the Muapoko tribe, that increased the acreage of the land given back to them by the Ngati Toa. By a threat of force of arms, Kemp overruled an impending adverse decision of the Native Land Court sitting at Foxton. Accompanied by Judge Rogan and other Native Land Court judges and officials, Major Kemp rode to the disputed land and set out the boundaries according to his own ideas. His new southern boundary ran in a direct line from the mouth of the Waitiri Stream to the southerly peak of Nga Puke Turua (now Mt Dundas). These changes increased the Muapoko territory (Horowhenua) from its former

20,000 acres to 52,460 acres. "There was no question asked as to ownership, Kemp put in his pegs, and the Court, when it returned to Foxton, gave him the land he asked for."

Hence Papaitonga Scenic Reserve was now within the boundaries of the Horowhenua Block and under the 'ownership' of Major Kemp. Ownership in this context was later interpreted as 'sole trustee'.

In 1884, Sir Walter Butler obtained a 25 year lease of the Horowhenua Block 14 containing Papaitonga Scenic Reserve, from Major Kemp, Chief of the Mauapoko. Early in 1862, Sir Walter Butler acted as Sir George Grey's representative and attempted to purchase Lake Papaitonga and surrounding land from the Maoris.

In 1894, Major Kemp had several legal matters with the Native Land Courts and in order to obtain finance, mortgaged the land containing Papaitonga Scenic Reserve to Sir Walter Butler. As Major Kemp was unable to repay the mortgage Butler obtained an order from the Supreme Court to acquire the land including Lake Papaitonga. Butler faced much criticism from all quarters, including questions from the Bar of Parliament.

In 1897, a Royal Commission enquired into the mortgage and awarded Butler the original mortgage money plus interest; considerably less than the amount claimed. That year the block, containing the scenic reserve, was auctioned and purchased by Butler for 7,000 pounds, which was then a fairly reasonable price. Butler acquired Block 14 with the main intention of preserving all the area surrounding the lake for future generations to enjoy. He brought out with him from England, white swans, Egyptian and barnacle geese, Iceland sheld-ducks, mallards and other birds, and in 1895 it was stated that these birds were fairly well established.

In 1900 Sir Walter Butler subdivided Horowhenua Block 14 into many farms, but still retained a large area around the lake. He returned to London and died in 1906 with his son, Leo, occupying the farm.

In 1896 a one chain wide legal road was surveyed around two-thirds of the lake in addition to the road survey from the end of Papaitonga Lake Road to the southern shore of the lake. Neither of the roads have been formed or used for tracks.

In 1901 27.5186 hectares of native bush north of Butler Road was set apart as a reserve for the preservation of native bush under Section 236 Land Act 1892.

In the 1920's Sir Walter Butler's son offered the lake and property adjoining the existing reserve to the Crown for 7,000 pounds, but the Government of the day was not prepared to pay that price.



In 1929 16.1975 hectares were revoked and added to the Weraroa Experimental Farm (to the north) under Section 8 Reserves and Other Lands Disposal Act 1929.

In 1930 10.9012 hectares set apart as a scenic reserve under Section 4 Scenery Preservation Amendment Act 1926, in addition to the 3945m<sup>2</sup> of closed road.

In 1973 Horowhenua District Scheme designated the lake and surrounding bush as Proposed Scenic Reserve.

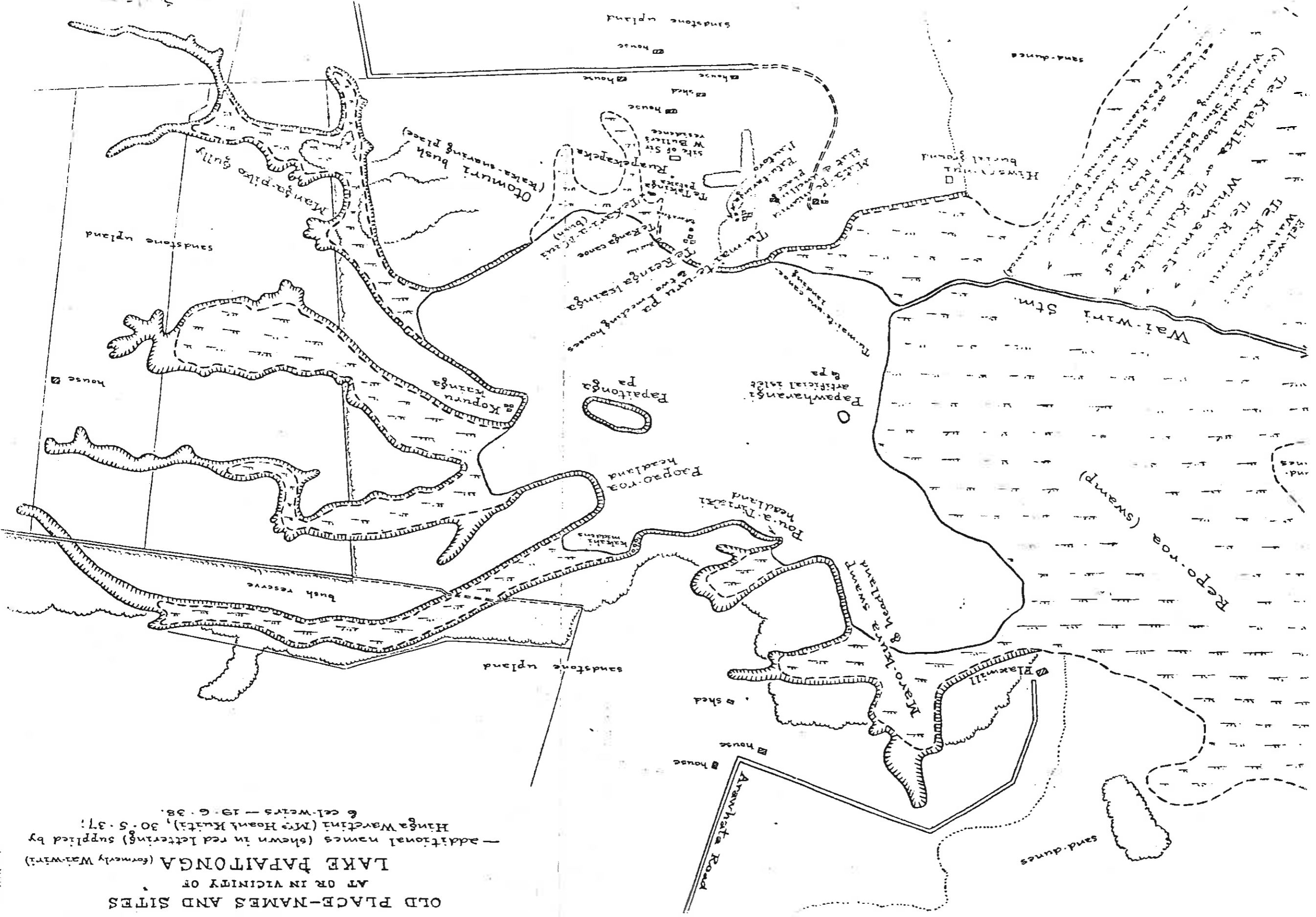
In 1980 the Crown acquired 110 hectares for addition to the existing scenic reserve at a price of \$365,000. The unformed legal road around the lake is to be resumed and added to the reserve, as well as the unformed extension of Bulier Road east of the intersection with C D Farm Road.

In 1981 the remaining portion of lake and adjoining swamp (7.28 hectares) at the north-west end of the lake was purchased.





**OLD PLACE-NAMES AND SITES  
AT OR IN VICINITY OF  
LAKE PAPAITONGA (formerly Wa-i-wini)**  
— additional names (shown in red lettering) supplied by  
Hanga Waretini (Mr Hoani Kuiti), 30.5.37;  
& col-weirs — 19.6.38.



The following list of Maori place names and explanations is an extract taken from, -

"Horowhenua, its Maori place names and their topographic and historical background."

by G L Adkin 1948

#### Kopuru Kaiinga (habitation place)

A former small settlement, apparently a few wharves situated on the end of the headland adjacent to the larger island.

Sir Walter Buller once said - "Stone chisels and other evidences of ancient occupation are often dug up on the island and on the camping ground (kopuru) of the older time just opposite to it."

A highly finished stone adze of phenomenal length, and with a sharp cutting edge in spite of its undoubted antiquity, was unearthed in the vicinity of the lake, and this relic, called by the Maoris "the sacred 'toki'" of Papaitonga. This is now in the Buller Collection, Dominion Museum. There is a tradition also of a beautiful mere pounamu (green jade club) lying hidden under the pellucid waters of the lake, having been lost from a canoe in one of the ancient fights.

#### Tu-mai-te-uru pa

A former village of the Ngati-Kikopiri Hapu, situated on the sandstone upland on the south side of Lake Papaitonga five or six chains (100-120 metres) back from the waters edge. The village was placed on a rounded ridge and its two carved houses, Patu-Takinga and Tautoro, stood on its eastern slope.

#### Tu-mai-te-uru canoe landing

The only known named canoe landing place on the shores of Lake Papaitonga. It was situated on the southern shore about 15 chains (300 metres) east of the Waitiri Stream outlet, at that spot the swamp margin of the lake is replaced by a steep bank of the sandstone upland. Tu-mai-te-uru landing was thus located on the first piece of solid ground accessible from the west, and was immediately below Tu-mai-te-uru Kaiinga.

#### Te Takinga Pataka (see attached photocopy)

This is the name given to a superbly carved building which formerly stood on the southern shore of Lake Papaitonga, but is now preserved in the Maori Hall of the Dominion Museum, Wellington. Originally, the pataka came from the Rotorua district and was erected at

#### OLD PLACE NAMES AND SITES

Papatonga after its acquisition by Sir W Butler. The pataka, complete with carved front, was in position in 1900 on a spot about 50 metres back from the south shore of the lake (now in the reserve).

Sir W Butler records that the carved porch was exhibited at the Colonial and Indian Exhibition held in England in 1886.

According to Hamilton "Te Takunga was built out of a large war canoe, which was drawn overland from Maketu, on the coast, to Rotorua Lake - a distance of 30 miles by Hongi Heke, the great Nga Puhi warrior, when he attacked Mokoia Island in Rotorua Lake in 1822.

#### Te Kari-a-Maui Bush

A name, said to have been given by Sir W Butler to a little piece of bush in front of his residence on the southern shore of Lake Papatonga. The name is hybrid - English - Maori - and means - "the garden of Maui". (Sir W Butler planted a kauri in this bush which now stands approximately 15 metres high).

#### Te Rua-peka peka

This is an authentic place name related by the Ngati-Kiripiri Chief - Waretini Tuainuku. Once during the times of the Maupoko inhabitation "Forty men twice stationed themselves a Te Rua-peka peka".

#### Otomuri Bush

This was a famous bird snaring place on the south-eastern side of the lake adjacent to the Manga-piko Gully. The name was recorded by Sir W Butler who described the place as a noted resort of the 'kaka' and stated that about 1900 there still remained a large 'rata' tree "from which hung remnants of the ancient vine ladders by which the kaka-snarers were accustomed to climb to their platform among the branches."

#### Hiwera-nui Burial Ground

One of the three Ngati-Kikopiri burial ground on the inner margin of the dune belt between Lake Papatonga and Mhunua West. Hiwera-nui is the most northerly of them and is situated on the northern end of a dune ridge overlooking Reporoa Swamp.

Pou-a-Tiriraki Headland  
The name means "the post of Tiriraki". Tiriraki was a Chief of the Muapoko tribe in days now remote.

Papatonga Island (Motu Kiri)

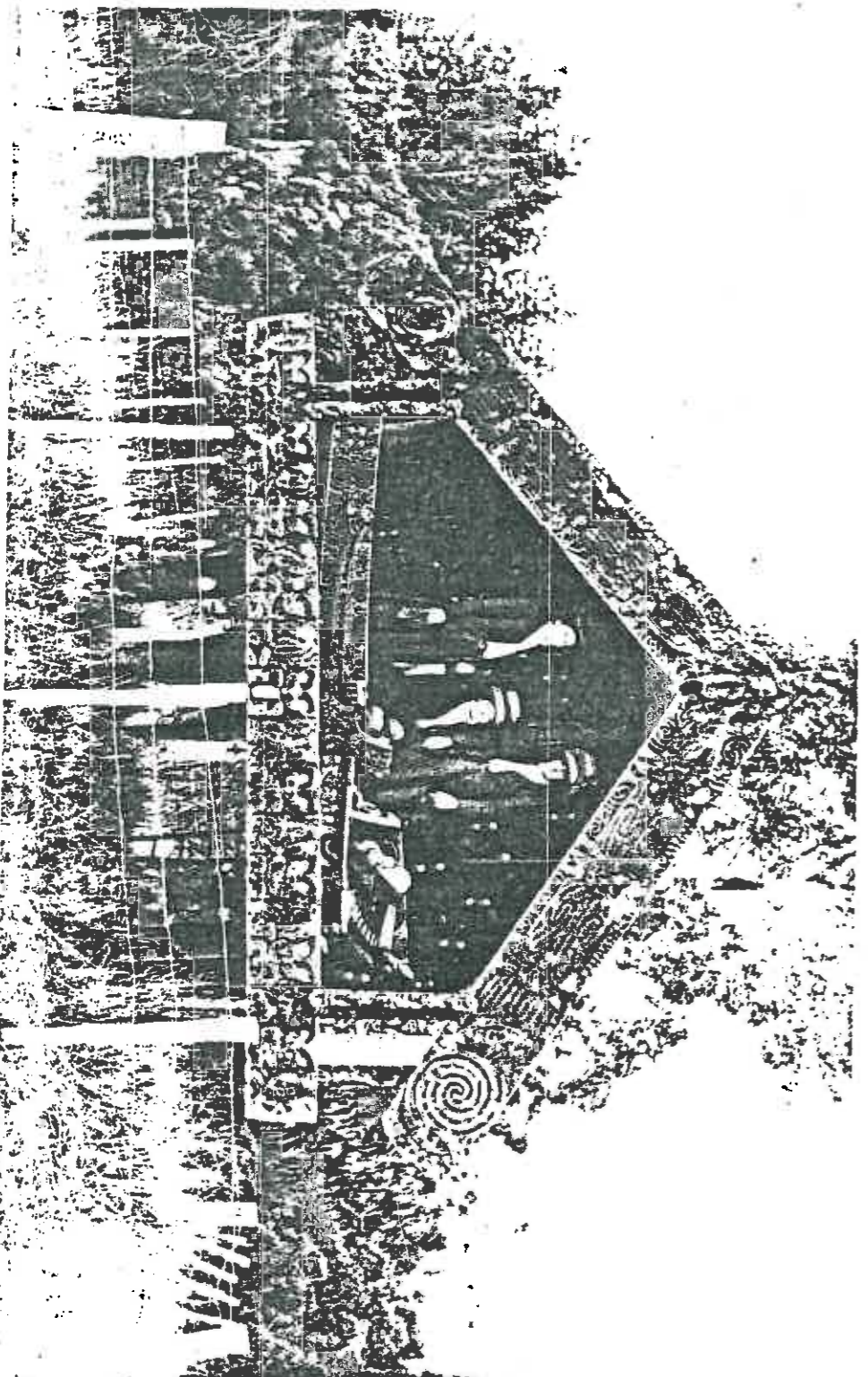
A former pa situated on an island in the lake now known by the same name. Originally, the pa was Papatonga and Lake Watiri, but Papatonga is now used.

Papaharangi Island Pa

The smaller of the two islands of Lake Papatonga. It is situated just off the swampy north western shore of the lake and is of artificial construction. The Muapoko people built it in a manner similar to their island pa on Lake Horowhenua and elsewhere, probably long before the advent of Te Rauparaha. Originally, it was of a comparatively small size, providing room for only four whare. In 1948 it was reported as an islet with the appearance of a little green clump of flax and trees floating on the surface of the lake.

Te Reinga Kainga

A former native village situated on the sandstone upland area overlooking the south shore of Lake Papatonga close to where the isolated totara still stands. This place was inhabited by some of the people of the Ngati-Kikopiri Hapu of the Ngati Ruakawa.



Te Takunga Pataka (storehouse) near southern lakeshore. Removed to National Museum during 1950's.

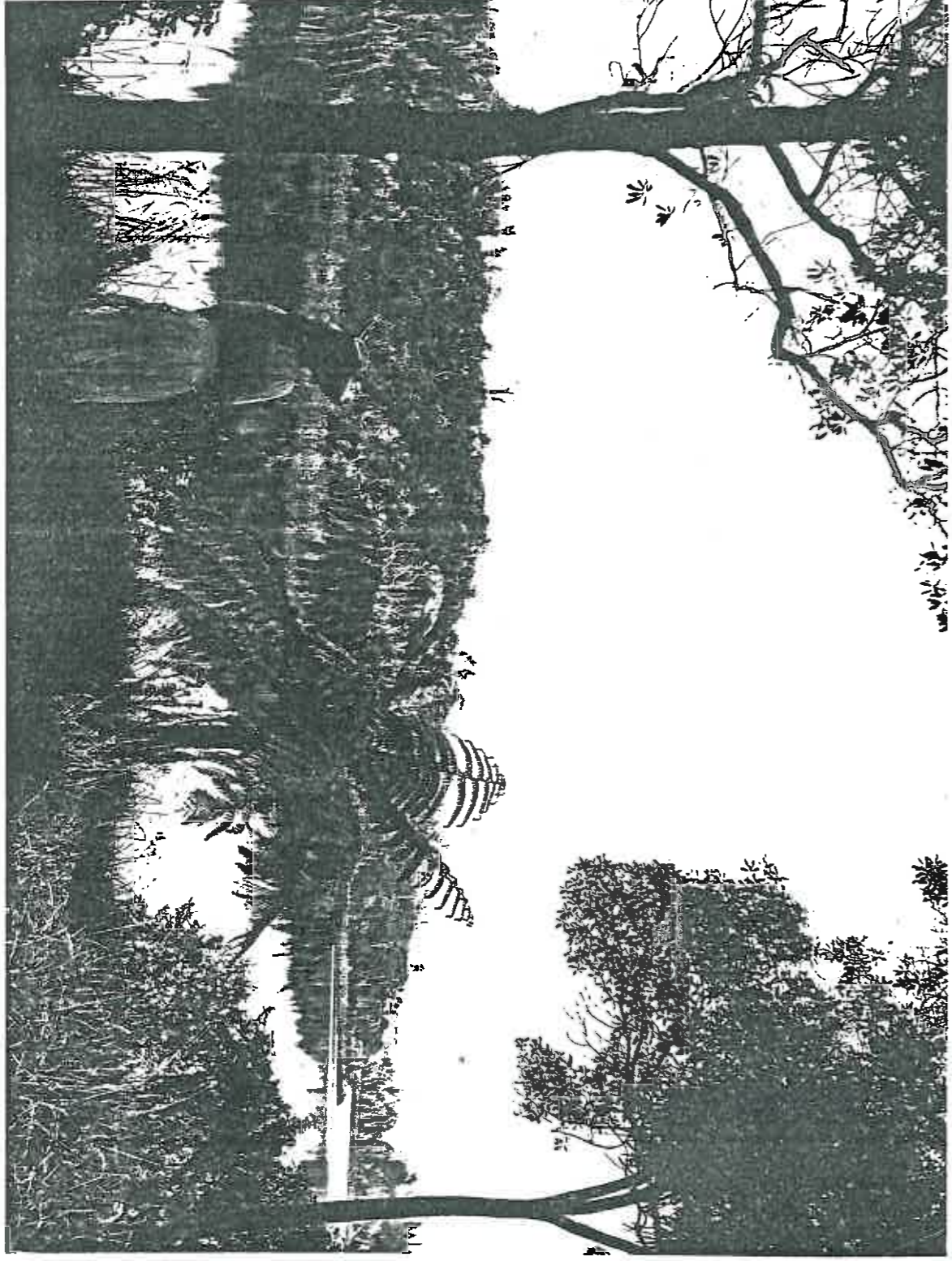




Otomuri on Papaitonga Lake with Group of Maoris

Unknown Artist

Oil on canvas in Rex Nan Kivell Collection - National Library of Australia.



View from northern side of Reserve looking south towards eastern lakeshore. Taken 1930's by D Adkin.

wounds and almost covering the body. This hand-instrument would be admirably adapted for such a purpose, and the severity of the cutting could be regulated at will.

APP. LXIX.—*The Story of Papaitonga; or, A Page of Maori History.*

By SIR WALTER L. BULLER, K.C.M.G., F.R.S.

[Read before the Wellington Philosophical Society, 21st February, 1892.]

SIXTY miles from Wellington by the Manawatu Railway, and less than two miles to the westward of that line, there is one of the prettiest bits of natural scenery in New Zealand. This is Papaitonga, so called from time immemorial, the name signifying "the beauty of the South." It is a lake of 125 acres in extent, with two exquisite islets covered with bright vegetation. On the north and north-east sides it is enclosed by a beautiful native forest, which presents a thick fringe of ferns and underwood along the water's edge; on the southern side there is open rising ground, with clearings in the forest beyond, showing the snow-covered ranges of the Tararua Mountains; whilst on the low-lying flat to the westward there is an outlet to the sea, about three miles distant, by the Waitiri Stream. Every part of it is historic ground, Papaitonga having been the scene of one of the most important of ancient Maori fights, and the little island which has given its name to the lake the principal battle-ground. To this day the island is a perfect necropolis of human bones, although concealed and protected by the dense growth of ever-green vegetation that now covers the site of the ancient pa. The original possessors of this picturesque lake—the Manuapoko—after being vanquished by Te Rauparaha and his armed followers, were driven out of the district, but a remnant was afterwards permitted to come back and settle at Howohenna, a little further to the north, which is still the home of the tribe. At Mūhunoā, near the Waitiri outlet, a small section of the Ngāihaukawa has for more than half a century been located, the principal surviving chief being Warehūi Tūanuku, a man of intelligence and excellent character. By a succession of events, to which it is not necessary to refer here, this charming place has come into my possession, and my two sons are living there.

It seems to me of importance that everything relating to

the early history of this land of our adoption should be carefully recorded and preserved for the student of the future. As an interesting episode in Maori history, and as forming a supplement to Mr. Travers's valuable paper on "The Life and Times of Te Rauparaha," which appeared in our Transactions,\* I have taken down (in Maori) from the lips of the resident chief the following narrative, for this is the story of Papaitonga as told by Warehūi Tūanuku:—

"Now, O friend, sit down on this rising ground, here in the sunlight, and let me tell you about Papaitonga, which has spread out before us. That name was given by the ancient Manuapoko people. The lake was called Waitiri. The Manuapoko pa was on the Island of Papaitonga. At that time there was no bush on the island, only some karaka-trees which had been planted by the residents close to the water's edge. But the island was completely filled with people, the inhabitants of the pa numbering four hundred twice told. All along the shores of the island, in the shallow places, posts were struck into the ground, and store-houses erected upon them.

"That other island yonder, the smaller one, was called Papāwharangi. It is an artificial one, having been made by human hands in the following manner: First of all poles were driven in to define the extent of the proposed island. Then great lumps of 'negro-head' were brought from the shore and cast into the water within the lines of the poles, and this was continued till a mound was formed level with the surface of the water. Then enormous quantities of *kakahi*-shells from the refuse-heaps were brought over and cast upon the platform of negro-heads; and after this many canoe-heads of soil were thrown on top. Then dry fern, and negro-heads, and all kinds of rubbish were spread over the surface, and lo! there was dry land in the midst of the waters. Upon the island so formed residential whares were erected—four of them. But owing to the encroachments of the water the island has become diminished in extent; formerly it extended out to where you see the raupe now growing. However, if you will take the trouble to look, you will find the boundary-poles still fixed there, with any number of skulls also, and dead men's bones.

"The larger island of Papaitonga yonder was a scene of disaster in very ancient times, as far back as the time of Hingukaha. In that generation this island was visited with an epidemic which was very fatal. It spread all over the coast, and the skulls that are accumulated on Papaitonga show how deadly it was. But in spite of that visitation the people continued to live on the island, even down to the

coming of Te Rauparaha. At that time the actual residents numbered about six hundred, or perhaps seven hundred. But the people were more or less broken up, some being at Porotawhao, some at Horowhenua, some at Waikawa, and some at Waitana; so that the actual residents on Papatongā did not, perhaps, number more than four hundred. But here let me explain to you. This tribe—the Muanpoko—was at that period very much scattered. They were to be found at Manawatu, at Karokere, then lower down at Totara, and lower down again at Porotawhao and at Horowhenua; also at Waitiri, and, following down the coast, at Ohau, at Waikawa, at Waikahu, at Otaki, at Kaitiaki, at Waimoa, and right down to Waikanae, or even to Porirua on the further side. They were living in detached parties in all these places. When Te Rauparaha came into this district he was allowed to pass down the coast by way of Taranaki unmolested. The Ngatihawa and the Ngatiruanui agreed to let Te Rauparaha pass through in peace. And so he came on till he reached Wanganui, where Turua was paramount. Turua wanted to oppose the progress of Te Rauparaha, but he was powerless, because the great tribes of Taranaki had offered no opposition. So he was allowed to pass through Wanganui. Then he came to Horowhenua, and rested awhile. Thence he explored all the coast as far as Waikanae. From there he went on to Porirua, and even to Port Nicholson. Returning from there, he settled on the Island of Kapiti. He came in great force, having with him four hundred followers twice told, some of his people having remained behind at the North. Te Rauparaha's reason for selecting Kapiti as a home for himself and his tribe was because of its security from attack, as it was very unlikely that the tribes would cross the sea to molest him. He also knew that this would afford him a good outlook in case an enemy should be moving about in canoes.

"After he had established himself there, it occurred to Turua and Paetahi (chiefs of Wanganui) that they might be able to dislodge him, and they conspired with the chiefs of Muanpoko with that purpose. The Muanpoko sent emissaries to Waitarapa, to the Ngatikahungunu, to the Ngatihawa, and to the Rangitane. They all responded, and the people of Wanganui came down to join them. The total number of these forces numbered a thousand twice told. They manned their war-canoes, and made straight for Kapiti. It was now dusk. The Ngatitua saw them in the distance from Kapiti, but they thought it was only floating timber, for it was then getting dark. When the canoes reached Kapiti the invading force rested on the beach, whilst some remained in the canoes, all waiting for the hour of midnight. Then a dispute arose among the leaders—some were for delaying operations

till the morning-star arose, others were for assaulting during the night. Then a war-party to the number, perhaps, of five hundred started off to scale the cliff. Just as the advance guard reached the edge of the plateau a woman who came out of one of the houses detected the presence of an enemy approaching because she could hear the rumbling of voices. It arose in this manner: The foot of one of the scaling-party loosened a stone, which rolled down the cliff, punishing the heads of those who were below. Some laughed, and others protested, for they were much disconcerted by this boulder rolling downwards, and breaking the heads of those it came across. The men who were being punished by the descending boulder called out in protest, and the woman heard them. She rushed back into the house and gave the alarm to the Ngatitua. Instantly all the people were on the alert, buckling on their cartouche-boxes, and loading their guns. They poured out of their houses to find the war-party on the plateau, and the fight commenced at once. The bulk of the attacking force remained at the landing-place. The Ngatitua were armed with guns and powder. Their assailants had none. In face of the guns, what could they do with their native weapons, for their only arms were *pahi*, and *mere*, and *tewhaitawha*, and *kaata*, and *taiaka*? Of course they were utterly routed. The fugitives sprang over the cliff, and many perished. But now it was daylight, and the enemy could be seen. The whole force was now attacked by the Ngatihawa, and great was their defeat. They attempted to make their escape in the canoes, but they crowded into them in such haste and terror that many of them were capsize<sup>d</sup>, and numbers of people were drowned. A remnant escaped, and reached the mainland in safety. So ended the fight on Kapiti.

"Subsequently to this Te Rauparaha thought he would come over to the mainland and explore the country; so he came over to Waikawa. When the Muanpoko, who had now concentrated themselves at Horowhenua and at Waitiri, heard that he had come to Waitirawa they began to lay plans for killing him. They sent an invitation to Te Rauparaha to come to Waitiri, to this very place Papatongā, to receive a present of food—that is to say, for a feast of eels—these lakes, Horowhenua and Waitiri, being noted for eels. Te Rauparaha consented, and came with a party of about twenty. When he had arrived at Te Wi, near Ohau, the Muanpoko sent their messengers to inform the people at Horowhenua, also to the Rangitane, and to the Ngatihawa; and that very day, after nightfall, all the tribes assembled at Papatongā. Te Rauparaha had slept two nights at Te Wi when the Muanpoko brought their present of eels from Waitiri, saying that

another present of a similar kind was on its way from Horowhenua. This was a mere subterfuge to keep Te Rauparaha at Te Wi till the arrival of the attacking force. That night they came on in their full strength from Papaitonga, and located themselves near Te Wi. You have seen that clump of pukatea-trees on the side of the road leading to the coast; that was where the Mutaipoko collected. Te Wi, the place occupied by Te Rauparaha, was just beyond. Then disputes arose again among the chiefs: some were for attacking the party under cover of darkness; others advocated leaving it till daylight, so that some might escape. Ultimately it was agreed to make the attack at midnight. It was Ngerangi, a chief from Waiganui, who urged the night attack. So the attack was made; and when the people in the house heard the tramping of the feet of eight hundred men they rushed out in alarm. Some of the enemy had now come right up to the porch of the house. Then a voice was heard, "Up to the house, 'E Raha, e! ko te whakariki, ka hua." (O Raha, the war-party is upon you!); and there was a general commotion, the inmates of the house rushing out and taking part in the fray. Te Rauparaha's party had left their guns behind at Waikawa, and the attacking force had nothing but Maori weapons; so it was a hand-to-hand conflict. Then some would go back into the house, and others would come out to relieve them; and so the fighting went on in the dark. Just before the dawn one of the Mutaipoko was killed, and they succeeded in wounding one of the attacked, named Te Pora, with a spear. When the great war-party saw how stubborn was the resistance of Te Rauparaha and his twenty followers they decided to set fire to the whare. A fire-stick was applied, and very soon the place was in flames, and the land covered with smoke. Then Te Rauparaha tore open a corner of the house, and rushed by himself, under cover of the smoke, into the Waikawa Stream. Here he found his brother-in-law, Te Rakeherea, concealing himself, with a spear stuck in his back. Te Rauparaha pulled out the spear, and before the morning broke they had made good their escape. But it was now getting light, and these were the only two who left the place alive and reached Waikawa. Among the killed were two of Te Rauparaha's own children—a daughter named Te Uira and a son named Poaka. The Rauparaha was greatly incensed at this act of treachery towards him and his people, and very soon afterwards he sent an avenging war-party, who killed some Mutaipoko stragglers on the beach at Waitiri and at Horowhenua, and then returned to Kapiti. Then he sent messengers to the North, to Mungatantari, inviting the Ngatikaurahata, the Ngatiwhiwhi, and the Ngatihina to come down in a body to seek revenge for the

wrong that he had suffered. The Ngatikaurahata came from the North with the Ngatihina and Te Puhu, and on their way down they did some killing at Horowhenua; and, having carried all before them there, they came on and joined the Ngatihina at Kapiti. After them came the Ngatihina, who went right on to Otaki, where Te Rauparaha was now settled, because he knew that the tribes would rally round him. Then a war-party was formed, composed of Ngatihina, Ngatihata, and Ngatihama, and came on to Waitiri. Do you see that bare promontory on the island, yonder? At that time there was a large house standing on that point belonging to Takaro. The chiefs of the pa were Takaro, Paipai, and Te Kahutorangi. There were other chiefs besides, such as Warakihia and others. On the arrival of the war-party it broke up into divisions, all this being carried through in the daylight. Forty men twice told stationed themselves at Te Raupakepake, on the very spot where your sons' house now stands, for at that time it was all dense bush; and in the spot which you have now named 'Mau's Garden' thirty men twice told were stationed; and in the place yonder—Otomuri—which is now all cleared, twenty warriors twice told. Forty twice told crossed over to the other side of the creek; and so on in parties the bush was occupied all along the edge of the lake, even as far as Marokura, that point of bush yonder in the direction of the sea. The reason for this disposition of the attacking force was the uncertainty as to whether the fugitives would make for the hills, or for Horowhenua, or in some other direction. On this account it was deemed best to surround the lake. At this point here, just down below us, known as Tumanihuru, the landing-place for the canoes, ten men were stationed; but this was simply a piece of deceit, to put the people off their guard. My father's elder brother—Aperahama Te Ruru—was here, also Whakaturu—both chiefs of Ngatihina—with Porokoru Kapeho, Te Riru, and others. It was arranged that in the early morning these men should call to the people on the island to bring them a canoe. In the morning accordingly Te Ruru called to Kahurangi, 'E Kahu, e! Hooa mai te waka ki au Ko tou tangata tenoi' (O Kahu, bring a canoe over for me I am your man). The people heard, but were in no hurry to come. Then he called again, 'Hooa mai te waka ki a maua ko te tangata. Ko Te Ruru tenoi' (Send a canoe for me and your friend. Te Ruru is here). When Takaro heard this he said, 'Hooa te waka. Hooa atu, me te tiro ano ki uta' (Paddle the canoe over; but as you paddle keep a sharp lookout on shore). Then two men got into the canoe—Te Kahutorangi and Kokoha. As they paddled off Takaro ascended to the roof of his house and chanted a war-song, so as to apprise the men in the canoe that as soon as Te Ruru reached

the place he would kill him. By this time Te Ruru and Whakatuhi had taken off their clothes and were in the water, sitting concealed among the raupo flags. Whakatuhi was armed with a tomahawk; the other man had an *orewa*, or stone club. The canoe came on towards the landing-place, and on hearing it they detected the heads of the two men among the bulrushes. The man in the stern of the canoe called out to the other to shove out again. But Whakatuhi was too quick for them, and seizing the bows of the canoe, began to haul it in. The man at the bow standing up in the canoe dealt a blow at Whakatuhi's head with his paddle. He parried the blow with his tomahawk, and then struck at his assailant in return, as it were flinging the tomahawk at him. It was not a very long-handled tomahawk, but a rather short one, reaching to about the waist. It cleared the man's head open, and then fell into the water. It cleared the man's head overboard quite dead. When the man at the stern saw this he jumped into the water and dived, coming up again out there in a line with the Maori but standing yonder above the landing-place. Then the men on shore ran over to watch the landing-place, and they discovered the fugitive crouching low and making his way through the sedge and brushwood. Then Aperahama took the gun from Porokoru's hands, followed the man, and shot him; so there was an end of him also. As soon as the people in the pa heard the report of the gun they were on the alert; so also were the various sections of the war-party hiding in the bush. As soon as they heard it they were all astir. The Tipi at once swam out from Paopaeoro—that is the spot there opposite to us, where I made a clearing in 1883—I mean that point running out there in a line with the island. That spot was then, as now, covered with low bush, tawa, hinau, mapou, and other trees. Swimming out from that point, Te Tipi reached the island, and he kept firing his gun as he swam. This was one of the bravest warriors of the Ngatihua and Ngatihua. He had his cartridge-box around his neck; with his hands he kept reloading and firing his gun, whilst he used his legs for swimming. By the time Tipi reached the Papaitonga island the enemy had already fled, and were making for the shore in their canoes. However, he at once jumped into a canoe that had been left behind, and went in pursuit. When the canoes reached the shore the various sections of the war-party in the bush combined to attack them, and when they attempted to land at another point they were attacked again. Here and there a man who was swift of foot escaped, but the bulk were shot. All the chiefs were killed—Takare, Paipai, and all the other chiefs of the tribe. The dead numbered three hundred twice told, perhaps more, and included the women and children. As for

the few who escaped, some took refuge at Horowhenua, and others fled to the mountains.

"After the fall of Papaitonga the war-party went on to Horowhenua, where there was more killing. Driven from there, the Muanpoko fugitives crossed over to Wairua, and fled to the hills. Then the war-party returned to Papaitonga. What followed afterwards was according to Maori custom. Who would care to tell of it? When the bodies placed in the *kangis* were cooked they were caldressed, and formally handed over to the Ngatihua as payment for the children of Te Rauraha who had been treacherously killed by the Muanpoko. The uncooked meat was taken home and distributed as food for the tribe. But I have a horror of that part of the story. If you want to know about it ask the old men of the Ngatihua.—Ngahuka Turgie and the others. That is all."

[IN THE ORIGINAL.]

"Na, E hoa, e noho i konei, i runga i te hiwi nei, i te wahi manua, ka whakarongo ai ki taku korero.

"Ko Papaitonga tena e takoto mai na. Na o mua tangata na Muanpoko tena ingoa—ko Waiwiri te roto. He pa tena no Muanpoko. I reira ai kahore kau he ngaherere o taua motu, ko nga kataka anake, he mea whakatuhi i nga takataha o te wai. Engari, i kapi katoa tena motu i te tangata, ara, i to ratou pa, e wai rau topu nga tangata i roto. Ko waiho, ko nga wahi papaku o te roto, i poupona iho ki te raka, hei pataka iinga kai ma ratou.

"Ko tena motu i waho ra, ko te mea iti, ko Papawharangi te ingoa, he mea mahi tena na te tangata. He mea poupona a waho ki te raka kia rite ano ki te wahi i kua hei motu. Ka oi te poupona ka mauria mai nga pureirei i te ka whakanoho ki roto ki te wai i te takiwā ano o aua pou, ko rupeke nga pureirei ka teitei ake, ka tahi ka kawea mai ko nga kowhātanga kakahi, ka rukea ki runga. Ka mutu tena, ko nga one-one ka mauria atu i runga i te waka, ka rihirihiri ki runga, ka hoatu ano he rarauhe maroke, he pureirei, he aha he aha, na kua tuwhenuatia taua wahi. I maranga ano nga whare noho ki reira; e wai nga whare i tu ki runga ki taua motu. Engari, kua pau haere i te wai tena motu. I mae ai i te rawa ki te mutunga mai o nga raupo na. Oira, kei roira ano nga pou rawhito, kei te wai e mau ana, me nga whoua tangata, me nga ahanganga hoki, kei reira kei te wai e takoto ana.

"Ko Papaitonga na, he whoua pakekure, no mua noa atu, ara, no te pakekura i a Hingakaha. I era whakakupuranga i punga tena motu e te rawhurowha, mo nga iwi katoa hoki o

E05622 LEVIN

APRIL IX

LAT. 40 39S LONG. 175 16E HT. 46 M.

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

RAINFALL. MILLIMETRES  
HIGHEST MONTHLY/ANNUAL TOTAL  
NORMAL  
LOWEST MONTHLY/ANNUAL TOTAL

1949-1975 209 160 145 172 218 195 305 200 213 216 166 206 1400  
1941-1970 76 76 76 84 104 109 107 97 84 99 84 99 1095  
1949-1975 22 33 22 19 34 22 35 48 18 25 24 30 826

AVERAGE NUMBER OF DAYS WITH RAIN  
1.0 MILLIMETRES OR MORE  
MAXIMUM 1-DAY RAINFALL MM.

1949-1974 8 7 8 10 12 12 13 11 11 11 12 11 10 125  
1949-1975 71 78 82 47 76 50 68 49 41 55 46 68 82

ESTIMATED WATER BALANCE  
AVERAGE RUNOFF (MM)  
AVERAGE DEFICIT (MM)

1949-1970 15 8 13 8 13 46 71 79 69 36 38 30 28 436  
1949-1970 8 13 8 3 3 . . . . . 3 35

TEMPERATURE, DEGREES CELSIUS

HIGHEST MAXIMUM  
MEAN MONTHLY/ANNUAL MAXIMUM  
MEAN DAILY MAXIMUM

1949-1975 30.4 29.3 27.4 26.1 22.2 20.2 19.3 19.3 21.5 26.1 27.1 27.0 30.4  
1949-1975 26.0 26.7 25.6 22.1 19.4 17.2 16.0 16.7 19.1 20.8 22.3 24.3 27.4  
1949-1975 21.6 22.0 20.7 17.9 15.4 13.0 12.2 13.3 14.8 16.4 18.0 20.0 17.1

NORMAL

1941-1970 16.8 17.2 16.0 13.6 11.2 8.9 8.2 9.2 10.7 12.4 13.9 15.6 12.8

MEAN DAILY MINIMUM  
MEAN MONTHLY/ANNUAL MINIMUM  
LOWEST MINIMUM

1949-1975 12.7 13.0 11.9 9.5 7.3 5.2 4.2 4.2 6.9 8.0 10.2 11.6 8.9  
1949-1975 6.7 6.6 5.3 2.5 -0.6 -1.2 -0.4 1.1 2.5 3.3 5.4 -1.6  
1949-1975 4.2 3.4 1.2 -0.7 -1.5 -2.9 -2.7 -2.2 -1.0 -0.5 -0.8 2.8 -2.9

MEAN DAILY RANGE

1949-1975 8.9 9.0 8.8 8.4 8.1 7.8 8.0 8.1 7.9 7.8 7.8 8.4 8.2

MEAN DAILY GRASS MINIMUM

1949-1975 10.2 10.3 8.8 6.2 4.0 1.8 0.9 -1.9 3.6 5.9 7.6 9.1 5.9

DAYS WITH FROST

GROUND FROST AVERAGE  
FROST IN SCREEN AVERAGE

1971-1975 . . . . . 0.2 1.2 3.8 11.8 14.6 9.4 3.8 1.6 1.0 . . 47.4  
1971-1975 . . . . . 0.6 3.4 1.4 1.4 . . . . . 6.8

EARTH TEMPERATURES (DEGREES C)

AVERAGE AT 0.10 METRES  
AVERAGE AT 0.30 METRES  
AVERAGE AT 0.91 METRES

1949-1975 18.7 18.4 16.4 13.2 10.1 7.6 6.4 7.4 9.8 12.8 15.1 17.4 12.8  
1949-1975 19.9 20.0 18.5 15.6 12.6 10.0 8.5 9.3 11.4 13.8 16.1 18.3 14.5  
1960-1975 18.7 19.3 18.9 17.3 15.0 12.6 10.8 10.5 11.6 13.4 15.3 17.1 15.0

RELATIVE HUMIDITY (%)

AVERAGE AT 9 A.M.

1949-1970 73 75 76 81 83 85 86 82 78 76 74 75 79

VAPOUR PRESSURE (MB)

AVERAGE AT 9 A.M.

1949-1975 15.0 15.6 14.6 12.8 11.0 9.3 8.7 9.3 10.5 11.7 12.6 13.9 12.1

SUNSHINE. HOURS

HIGHEST

1955-1975 284 247 233 202 162 154 177 190 240 204 257 279 2054

NORMAL

1941-1970 212 189 176 149 123 107 122 135 149 161 176 197 1897

X OF POSSIBLE

1941-1970 48 51 48 47 42 41 43 44 44 41 42 44 45

LOWEST

1955-1975 142 148 112 112 83 74 59 91 97 104 110 143 1770

WIND

DAILY WIND RUN (KILOMETRES)

1954-1975 189 166 169 167 183 182 184 189 205 215 210 188 187

AVERAGE NO. OF DAYS WITH GUSTS 34 KNOTS OR MORE

1967-1970 1.3 0.8 1.3 2.5 2.5 2.5 1.5 1.8 2.3 5.8 3.8 1.8 27.9

GUSTS 52 KNOTS OR MORE

1967-1970 . . . . . 0.3 0.3 0.3 . . . . . 0.3 . . . . . 1.2

SPECIAL PHENOMENA

AVERAGE NO. OF DAYS WITH HAIL  
AVERAGE NO. OF DAYS WITH THUNDER

1971-1975 0.0 0.3 0.1 0.2 0.2 1.1 1.0 0.4 0.2 0.2 0.4 0.4 2.2  
1955-1975 . . . . . 0.4 0.8 0.9 0.4 0.7 0.4 0.7 0.4 0.4 0.7 0.4 2.1