CONSERVING BIODIVERSITY THROUGH COLLABORATIVE MANAGEMENT

AN INVESTIGATION OF INTERACTIONS BETWEEN ECOSYSTEMS AND SOCIETAL SYSTEMS AND THE WHANGAMARINO WETLAND

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Philosophy in Resource and Environmental Planning

Massey University, Palmerston North, New Zealand

Gerardus (Gerry) Henricus Anthonius Kessels

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Abstract

The notion of collaborative management is analysed as a method to achieve biological diversity conservation. This is explored primarily in the context of New Zealand's social, cultural and economic values and norms, and the influences of these human constructs on sensitive ecological systems, using the Whangamarino Wetland and its sub-catchment as a case study.

Collaborative management can be defined as a situation in which some or all of the relevant stakeholders in a protected area are involved in a substantial way in governance, management and monitoring activities. In the New Zealand context, collaborative management would need to involve an equal partnership between the Crown and tangata whenua at a governance level. At a management and monitoring level, all the relevant stakeholders (primarily including the local community, recreational and resource users, and mana whenua) would be involved in a process which specifies and guarantees their respective functions, rights and responsibilities with regard to the relevant ecosystem.

From the Naturalistic Inquiry research process employed, six propositional statements were developed from the data:

1. Multidisciplinary, integrated and interagency partnerships will enhance biodiversity conservation management decisions as well as promote more efficient, effective and relevant monitoring programmes.
2. Tangata whenua have a legitimate and equal status role to the Crown in the governance, management and monitoring of the Whangamarino Wetland.
3. Local communities and resource users are ready and willing to participate in a collaborative management approach to resource management issues within the Whangamarino sub-catchment.
4. Crown agencies understand what collaborative management entails but there are political, personal, institutional and capital barriers to implementation.
5. Skilled leadership, policy flexibility and a common vision amongst all parties involved will improve the quality of biodiversity conservation outcomes.
6. Incorporating local and indigenous knowledge, ideas and experience will produce better biodiversity conservation outcomes and monitoring processes, and build public trust and support for natural resource institutions.

Acknowledgements

I would like to thank the people of the land, my loyal friends at DoC and the councils, and those wise and 'grey eminence's' (truly meant in the most flattering way). You all took a great deal of precious time and effort to talk to me so passionately, truthfully and openly. Thank you, thank you, thank you.

To my supervisor, Peter Horsley, your guidance, encouragement, perseverance and friendship through to the end meant the pupil had the benefit of learning from a continually inspiring teacher.

Someone told me once that I was mad or stupid or both by tackling a 4 paper thesis while working, building a house and raising a son. Well it didn't take long for me to realise I was definitely stupid, and now that I have got to this stage I can assert that madness is not far from the surface. That same person told me that his thesis was a "labour of hatred". To be sure at times I have hated this expedition. But for me it has been a labour of love, not so much for the thesis itself, but because those closest to me gave me so much support and tolerance over what seems like such a long time, that it only could have come from love. Thanks so much to my partners in crime, Peter N. and Roger T. (what is it about crazy Irishmen who always seem to attach themselves to my life?). Thank you Mum and Dad for reminding me of my roots with the land. Thank you to my chief editors, Colin and Eleanor P., and of course any remaining errors are entirely my responsibility. Thank you Taio, my son, for giving me the confidence and optimism to carry on. Thank you Helen, my wife, for giving me all that I ever needed to finish.

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Chapter 1: Introduction

1.1 The Inquirer

This thesis concerns the management of a threatened ecosystem and emphasises the importance of local involvement in the preservation of its unique biodiversity. It examines present practices in the governance, management and monitoring of the study area – the Whangamarino Wetland, and assesses reasons for their current failure to reduce biodiversity loss. It proposes a greater involvement of tangata whenua and the local community in collaborative management strategies and looks toward the future sustainability and enhancement of this internationally recognised wetland.

The principal research methodology employed in this thesis is one of Naturalistic Inquiry, as first propagated by Lincoln and Guba in 1985. It is a qualitative, post-positivist approach, fully described in Chapter Three. A significant contribution of this current research is the recording of face-to-face interviews with over twenty people, representing tangata whenua, Crown administrators, adjacent landowners, major stakeholders and interest groups involved in various ways (some historical) with the Whangamarino Wetland.

One of the important axioms of naturalistic inquiry is that, unlike positivist approaches where the 'inquirer' and the 'object' of inquiry are discrete and separate from one another, both inquirer and object in reality interact to influence each other, and knower and known are inseparable. The first task of an inquirer then is to state their background in order to expose the 'baggage' they may carry in terms of their social, cultural and ethical values. Ultimately, these values will influence the interactions between the inquirer and the object of inquiry and hence influence the outcomes of the research.

As this is a personal exposition of the inquirer, it is appropriate that this is described in the personal tense. I am a Dutch immigrant, whose parents dairy farmed in the Waikato after arriving in the country. I obtained a Science degree in zoology and ecology from Massey University in 1987, and after some experience in adventure tourism, gained employment with the Department of Conservation (DoC) at the Mount Bruce Wildlife Reserve in 1989. Later it became apparent, after my first few months as a Department of Conservation officer (Protected Species – Hamilton Field Centre, Waikato Conservancy), that all was

not well with the way DoC managed many of the natural remnants vested with the Crown. An almost unbelievable lack of resources thwarted DoC's management attempts in trying to slow down, let alone maintain the line against biodiversity loss. This continual inability to do anything effective was extremely soul destroying. Added to this was the complete feeling of hostility toward DoC by landowners, District Council staff, hunters and almost anyone else directly involved in the natural environment. At times it felt as if we, the staff, were engaged in a holy war. And we knew we would win because DoC was right. This was no more apparent than when I was involved in the resource consent process to build a weir on the Whangamarino River in order to raise the water levels in the wetland itself. This is when I first realised that DoC may not have been so right, and the farmers may not have been so bad, or even so wrong. Shortly after I left DoC and began a career as a consultant environmental planner and ecologist, where I acted as an ecologist on both sides of the conservation fence. I found an independence, a variety of work and a realisation that there is very little 'black and white' in resource management. My experience was that the 'bad farmers' I had dealt with were in the main, reasonable people, who were genuinely concerned about the natural environment and wanted to be involved in helping to conserve it. Through Resource Management Act consultations I also met local Maori who I found to be extremely concerned about their natural resources and with a much wider and deeper understanding of local ecosystems than many academics. From these contacts, consolidated through my work in recent years with the Queen Elizabeth the Second National Trust, I realised that biodiversity conservation is not a task to be solved by science, technology, or the financing of big 'politically correct' projects alone. True biodiversity conservation must embrace the widest possible community of interest in preservation and enhancement projects. It is a challenge which must link people with ecology, people with people, and it must cross legal, cultural and socio-economic boundaries if we, as a country, are to slow biodiversity loss and begin to rebuild degraded ecosystems.

1.2 Thesis Aim and Objectives

1.2.1 Thesis Aim

The aim of this thesis is to explore collaborative management of protected natural areas as a method to achieve biological diversity conservation. This is explored primarily in the context of New Zealand's social, cultural and economic values and norms using the

Whangamarino Wetland and its sub-catchment as a case study. The process this research follows is represented as the flow chart in Figure 1.1.

1.2.2 Thesis Objectives

The objectives of this thesis are:

(1) To define and analyse the concepts of both biological diversity and collaborative management and establish the links between them.

(2) To analyse the present methods of conserving biodiversity and how collaborative management could be used to conserve biodiversity, particularly in a New Zealand wetland context.

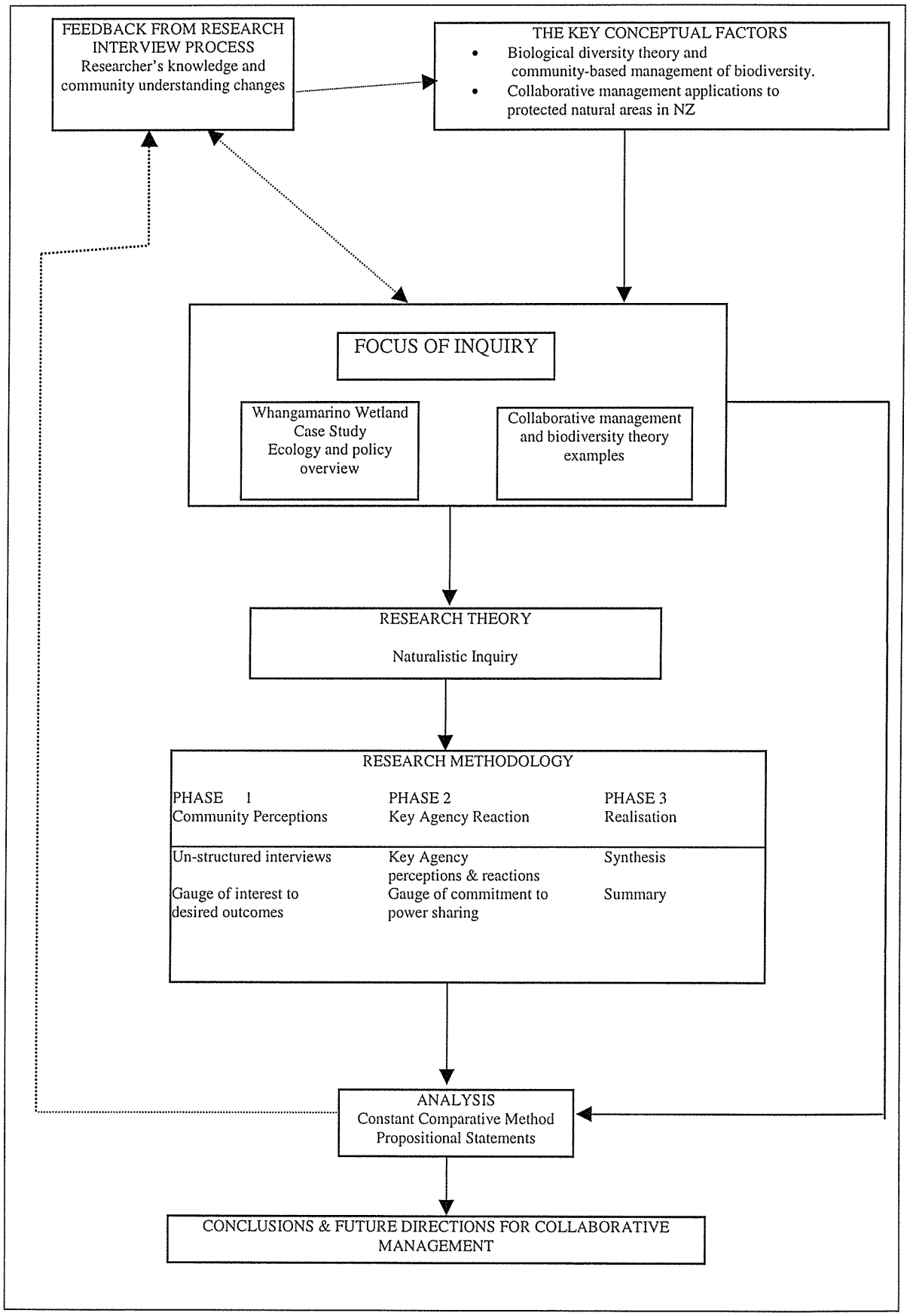
(3) To investigate the human interactions which have helped to shape the present ecological and social landscapes of the Whangamarino Wetland.

(4) To gauge the underlying historical, political, social, recreational, economic, spiritual and cultural values of the local community within the Whangamarino Wetland sub-catchment that may represent bridges or barriers to implementing a co-management approach to biodiversity conservation.

(5) To use appropriate qualitative research methods to identify existing processes of community involvement and co-ordination that are used by Waikato Regional Council, Franklin District Council, Waikato District Council, Fish and Game Council and the Department of Conservation within the Whangamarino Wetland sub-catchment to address the management issues facing the wetland.

(6) To suggest processes and pathways, which could be followed by managers and key stakeholders to improve existing biodiversity conservation management practices for the Whangamarino Wetland.

Figure 1.1 Summary of Thesis Design and Methodology



1.3 The Case Study Area

1.3.1 Location of the Whangamarino Wetland

The Whangamarino Wetland is situated in the lower Waikato River Basin of the North Island, New Zealand, 62 kilometres (km) south of Auckland (Figure 1.1). It is located at $37^0$18' South, $175^0$07' East. The wetland occupies approximately 103 km^2, making it the second largest freshwater wetland in the North Island.

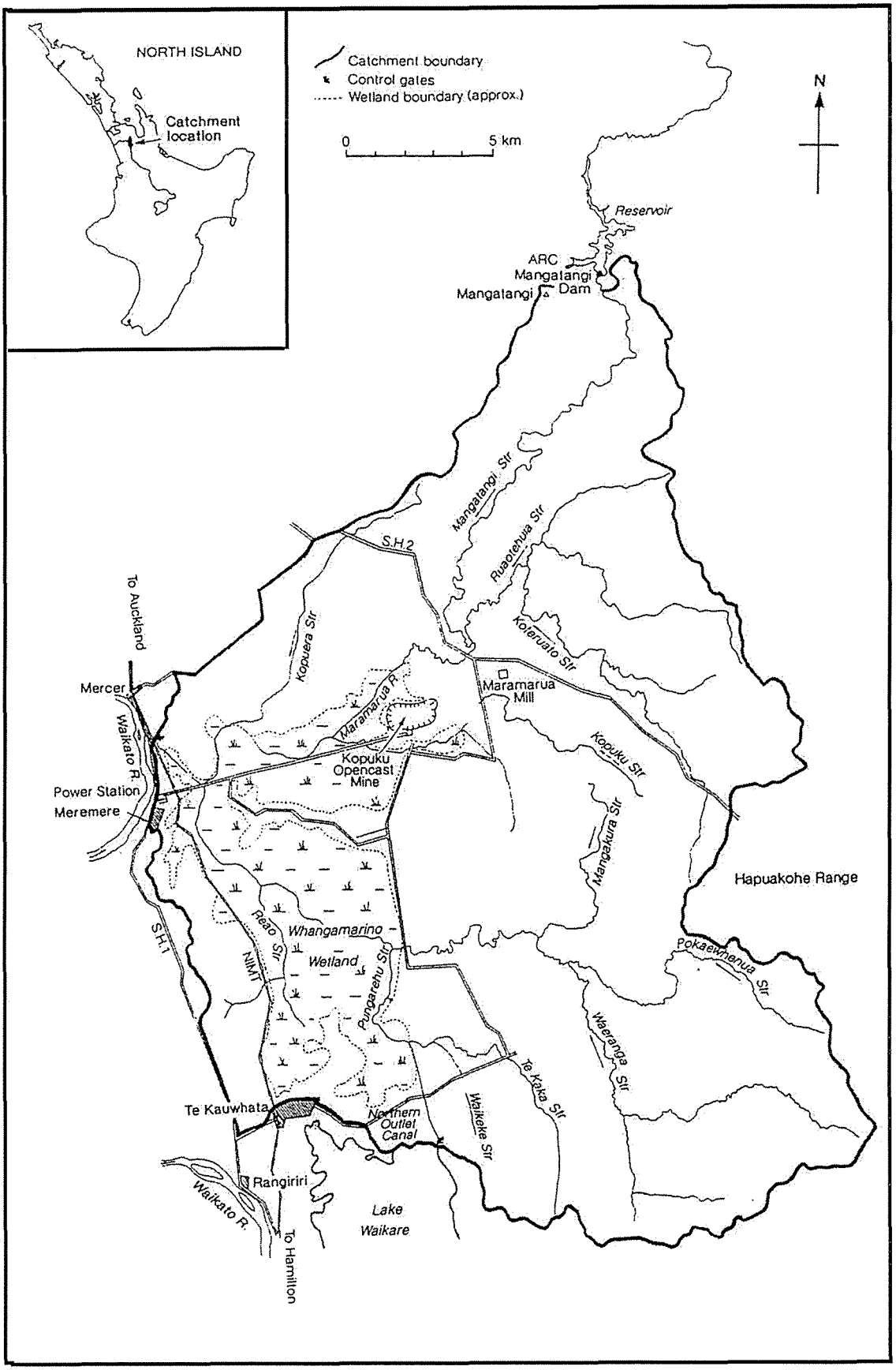
1.3.2 Topography & Geology

The Whangamarino Wetland is only 7.15 metres (m) above sea level at its highest point. It contains four river and streams, all being tributaries of the Waikato River. The major drainage course is the Whangamarino River. These tributaries flood over the swamp land during flood periods and prolonged high rainfall events, resulting in a wetted area that is much more extensive than that found during summer (Story, 1991).

Whangamarino is contained within three large shallow basins. They are bounded to the east by the Maugaroa Fault and to the west by a range of low hills from Te Kauwhata to Meremere. Outcrops of sediments form the base of low hills and rises within the wetlands. The three, relatively flat basins are drained by the Maramarua, Whangamarino and Reao Streams. The expanse is divided by the Island Block rise, which rises to some 20m above the wetland (DoC, 1989).

A prominent topographical feature of the northern part of the wetland is a causeway, some 30m wide, which was constructed across the wetland between 1950 and 1958 in order to transport coal to the Meremere Power Station. Pylons span this 11km causeway, and stand out from the surrounding low peat bog vegetation.

Figure 1.2 Location of the Whangamarino Wetland and Associated Catchment



1.3.3 The Creation of the Whangamarino

The Waikato River, on emerging from the Karapiro Gorge, built a huge fan across the floor of the Lower Waikato basin out toward the Waikato Estuary over thousands of years during the Quaternary Era. The river adopted many different courses down the fan during this period. The subsequent building of sand and gravel levees changed the existing drainage of the basin, and gave rise to a wide range of wetlands. The most recent Taupo eruption of 186 A.D. brought huge floods of pumice slurry down the river and many lakes were formed by pumice levees blocking off local drainage patterns downstream. Additionally, the expansive Waikato Estuary was totally filled in by the volcanic debris to form a huge freshwater wetland (Stephenson, 1986).

The Whangamarino Wetland and Lake Waikere was formed in the aftermath of these cataclysmic volcanic events in the centre of the North Island as the gradual meanderings of the Waikato River found a path to the sea. Subsequent events, e.g. peat formation, began to expand and alter the Wetland – filling in hollows in the latter part of the last glacial period until the present form was developed (Storey, 1991). The Whangamarino Wetland is now a complex mosaic of swamp and peat bog, while the Waikato River still has a large bearing on its hydrology (Stephenson, 1986).

1.3.4 Flora

The vegetation of the Whangamarino Wetland can be divided into two major communities – peat bog and mineralised swamp. In general the peat bog vegetation is found in the central portions of the wetland, while the swamp vegetation is found on the margins near the major streams and rivers (DoC, 1989).

The reason is that water depths and fluctuations do not solely determine the distribution of plant communities within a wetland, the availability of nutrients being another important factor. A combination of available nutrients and water depth determines what plant species grow within a specific region (Mitsch & Gosselink, 1993). Different plant communities will develop in nutrient rich areas (eutrophic) compared to nutrient poor areas (oligotrophic) (Blackett, 1996). Wetlands are assigned trophic status based on the plant species present (Moore *et al*, 1989; Tiner, 1993). In some cases, the water source itself will determine trophic status (Johnson and Brooke, 1989).

Peat bogs are fed by rainwater only and are, therefore, termed ombrogenous. They are typically acidic, having a pH value less than five. They have a very low nutrient status as the anaerobic nature of the bog means little or no plant decomposition takes place, resulting in little or no nutrient release. As such they are also defined as oligotrophic. These bogs typically occur as a peat dome or 'blanket' bog and because water enters only through precipitation, seasonal water levels fluctuate very little. The dome is created because plant decomposition is less or nil in the centre of the bog compared to plant decomposition occurs on the edges, which decomposes more quickly.

The infertile wetlands of the Whangamarino Wetland are raised peat bogs. Characteristic plant species in these bogs include *Empodisma minus* (wire rush), *Gleichenia dicarpa, Sporodanthus traversii, Sphagnum crista, Leptospermum scoparium* (manuka) and various *Drosera* species, which utilise insects as an additional source of nutrients (Johnson & Brooke, 1989). These species all have relatively slow growth rates, a common feature of plants inhabiting oligotrophic wetlands (Moore *et al,* 1989).

Swamps on the other hand are supplied by ground and surface water and thus termed soligenous. They tend to have a pH value in excess of 5.5 and are very fertile. The areas they form in are usually concave, having formed in poorly drained hollows in river flood plains or around lakes and are periodically or permanently flooded from through-flowing streams. As a result swamps have wide seasonal fluctuations in water levels. These eutrophic or fertile wetlands, generally have a high influx of nutrients, high standing crops, and less biodiversity than their oligotrophic counterparts (Moore *et al,* 1989). Plant species which are typically found in the Whangamarino's eutrophic wetlands, include raupo (*Typha orientalis)*, flax (*Phormium tenax*), *Glyceria maxima, Eleocharis sphacelata, Azolla rubra* and willow (*Salix* species) (Blackett, 1996).

1.3.5 Fauna

Fifty-six species of bird have been recorded in the Whangamarino Wetland (Ogle and Cheyne, 1981). Waterfowl are the most abundant with an estimated 30-50,000 waterfowl using the wetland seasonally from late autumn to spring when water levels are highest. Mallard duck (*Anas platyrhynchos*), an introduced species, is the most abundant, while the indigenous grey duck (*Anas superciliosa*) is now confined to dense willow cover. The

endemic New Zealand shoveler duck (*Anas rhynchotis variegata*) is also a user as is the introduced black swan (*Cygnus atratus*). The endemic brown teal (*Anas aucklandica*) is still officially recorded as being present but has most likely been locally extinct for at least 10 years (*pers obs.*). Australasian bittern (*Botaurus stellaris poiciloptilus*) is widespread in the willow and open herbfield areas in and around the Whangamarino. Of a New Zealand population of about 1000, 200 –250 may dwell in the wetland. The most commonly heard bird within the peat bog and manuka margins is the endemic and widespread North Island fernbird (*Bowdleria punctata*), while the shyer and less common spotless crake (*Porzana tabuensis*), along with its even more reclusive cousin - marsh crake (*Porzana pusilla*), can very occasionally be heard along the swamp/peat bog margins (DoC, 1989).

In terms of mammals, possum are widespread. Ferret, stoat, weasel and cat are also present. Norway rat is common. Red deer have been found within the wetland from time to time and may now be established. Domestic livestock, especially cattle, graze portions of the mineralised swamp and edges of the peat bogs in the summer, depending on water levels and how hard they are pushed (DoC, 1989).

Aquatic fauna comprises of a number of invertebrates species (of which little is known), frogs and fish. Eighteen species of fish have been recorded in the wetland. Both the long-finned eel (*Anguilla dieffenbachii*) and short-finned eel (*Anguilla australis*) and are among the most common of the indigenous fish found within the river systems. The endemic black mudfish (*Neochanna diversus*) is found throughout the wetland in both the swamp and bog areas, in permanent and temporary waters. Koi carp (*Cyprinus carpio*), mosquito fish (*Gambusia affinis*), rudd (*Scardinius erythrophthalmus*) and bullhead catfish (*Ictalurus nebulosus*) appear to be the most widespread and common of the introduced fish, and are found predominantly in the rivers, streams or temporary flooded open water swampland (DoC, 1989).

1.3.6 Existing Management Regime and Use

About 8000 hectares (ha) of what can be termed 'wetland' exists today (DoC, 1996). Of this, 4960 ha is managed by DoC on behalf of the Crown – 360 ha of this are above the wetland margin and leased as pastoral land; 730 ha are owned by the Fish and Game Council and the rest is privately owned (DoC, 1989). The Crown owned wetland is managed as a Government Purpose Reserve - Wetland Management, under the Reserves

Act 1977. The Waikato Area Office of the Department of Conservation, under the Conservation Act 1987, administers it. The remaining remnants on the periphery of the protected wetlands are either managed for recreational gamebird hunting by the Fish and Game Council or are held in private ownership, usually unprotected and associated with pastoral farming activities.

Waterfowl hunting dominates public use of the Whangamarino Wetland. It has been estimated that some 700 hunters spend around 11,000 person days in the wetland each year preparing maimais, ponds and hunting. Several privately owned wetland areas are specifically managed for hunting of waterfowl, with overseas clients purchasing rights to hunt on these wetlands, although this pursuit is technically still illegal (Lawrie, *pers comm.*). Indigenous and exotic duck species and black swan are the main gamebirds hunted (DoC, 1989). At present fewer than 100 people per annum visit the area to specifically observe and study wetland fauna and flora (Roxburgh, *pers comm.*). Some recreational 'coarse' fishing occurs at the Whangamarino-Maramarua River confluence and, in particular, bow hunting of koi carp on the 'Rice Bowl' (located at the confluence of the Whangamarino River and the outlet of the Lake Waikere spillway cannel) appears to be an increasingly popular sport (*pers obs.*).

Two fulltime eel fishers and one part time koi carp/catfish fisher utilise fish stocks within the Whangamarino. More up to date data on quantities of fish removed were unable to be obtained due to commercial sensitivity and a lack of specific information for the Whangamarino (Pullan, *pers comm.*). However, in 1979 some 78 tonnes of eels were taken from the Whangamarino and Maramarua Rivers (DoC, 1989).

As a result of works undertaken as part of the Lower Waikato and Waipa Flood Control Scheme, natural flows from the Waikato River were confined and directed from Lake Waikere in the Whangamarino Wetland via a 4m wide canal and control gate structure. Thus a major role of the wetland is to act as a gigantic storage pond for floodwaters from the Waikato River. An additional control structure was built at the confluence of the Whangamarino River and the Waikato River to prevent reverse flow into the wetland during periods of high flow (Strachan, 1981).

1.3.7 Surrounding Landuse

Drainage and land clearance directly adjacent to the wetland have resulted in the majority of the land being converted to farmland, with dairy farming and cash cropping being the predominant agricultural activities. Associated hill country landuse within the catchment combines a mixture of indigenous vegetation (a large portion of which is the Hunua Water Supply Reserve), farmland (mainly dairy and sheep and beef) and plantation *Pinus radiata* forest (mostly within the Maramarua Forest). Coal mining is undertaken at two active open cast mines in the Kopuku Stream sub-catchment.

1.3.8 Conservation Significance

The Whangamarino is listed as a Wetland of International Significance under the Ramsar Declaration (IUCN, 1996). Only four other wetlands in New Zealand share this listing. Cromarty & Scott (1996) summarise the reasons why the Whangamarino is of such international ecological significance:

> "Whangamarino Wetland is an outstanding example of a wetland characteristic of its region; it is the second largest bog and swamp complex in the North Island of New Zealand.
>
> 1. Whangamarino Wetland supports appreciable numbers of threatened plants and animals, including eight [threatened] plants; *Corybas carseii* [the only known location of this plant on the planet, (Roxburgh, *pers comm.*)], *Lycopodium serpentinum*, *Utricularia laterifolia*, *U. australis*, *U. novae-zelandiae*, *Cyclosorus interruptus*, *Myriophyllum robustum* and *Prosophyllum aff. patens*, two birds, Australasian bittern and brown teal [most likely to be now locally extinct], and at least one fish – black mudfish.
> 2. Whangamarino Wetland is more diverse botanically than any other large lowland peatland in the North Island, and its oligotrophic portions have a combination of very specialised plants which no longer occur in the Waikato Region or beyond. This diversity gives it an ability to support a wide range of regional rare communities.
> 3. Whangamarino Wetland supports a large number of species of plants and animals that are endemic to New Zealand. The wetland is one of the remaining strongholds for two endemic plants to New Zealand, *Corybas carseii* and *Myriophyllum robustum*, and for the black mudfish.
> 4. Whangamarino Wetland regularly supports over 20,000 waterfowl.
> 5. Whangamarino Wetland regularly supports approximately 20% of the New Zealand population of bittern (including 20% of the breeding pairs), 7% of the New Zealand population of black swan, and 5% of the New Zealand population of grey teal (*Anas gracilis*). These are 1988 figures. Numbers are likely to be somewhat reduced, as a lowering of water levels in the subsequent period has resulted in reduced habitat for wildlife. However, reinstatement of water levels was planned for 1993."

1.3.9 Key Management Issues

The Department of Conservation and the Fish and Game Council consider that the major management issues faced by the Whangamarino Wetland faces can be summarised as:

- maintaining and enhancing the biodiversity and ecological integrity of the unique and fragile wetland communities;
- protection of rare, endangered or vulnerable species of plants and animals;
- maintaining and restoring natural water level fluctuations;
- checking the spread of exotic plant and animal pests;
- maintaining or enhancing the water quality of the catchment which feeds the wetland;
- controlling the effects of browsing ungulates on sensitive wetland plan communities;
- management of a large gamebird population , including enhancement of its habitat;
- control of recreational hunters activities within the wetland, such as maimai construction, policing of bag limits and firearm safety;
- providing facilities for a range of recreational activities, such as fishing, boating, bird watching , walking and educational studies; and
- controlling the commercial use of the resources within the wetland, such as eeling and commercial koi carp fishing (DoC, 1989; DoC, 1996; Teal, *pers comm.*).

1.4 Thesis Organisation

Chapter One has introduced the Whangamarino Case Study and outlines the aim and objectives of the thesis. Chapter Two explores the link between biological diversity conservation and collaborative management, culminating in a brief overview of how New Zealand's conservation and resource management legislation relate to wetland biodiversity conservation. Chapter Three describes the theoretical basis for Naturalistic Inquiry as the principal research method. It then details the research approach and interview methods and focus. Chapter Four is an expansion of the key management issues stated in Section 1.3.7, using the information gained from the interview process. Chapter Five postulates six 'propositional statements' or bridges and barriers to the implementation of collaborative management as a means to conserve biodiversity within the Whangamarino Wetland. Chapter Six summarises the main findings of the research and reflects on some of the issues discussed in Chapter Five. It then offers paths toward future governance, management and monitoring regimes within the wetland.

Figure 1.3 The 'Causeway' as Viewed from Island Block Road – The main Northern entrance to the Whangamarino Wetland

Figure 1.4 Typical Vegetation of Whangamarino Peat Bog - Umbrella fern (*Gleichenia dicarpa*) and the 'restiad' wire rush (*Empodisma minus*)