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**ENHANCING BIODIVERSITY PRESERVATION ON
PRIVATELY OWNED LAND:**

**AN ANALYSIS OF NEW ZEALAND'S POLICY
APPROACH**

A thesis presented in partial fulfilment
of the requirements for the degree of

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ABSTRACT

A large amount of New Zealand's critical remaining habitat for endemic species is located on private land. This research investigates the factors effecting the achievement of the government's response to the decline of New Zealand's indigenous biodiversity on private land. A central theme is that biodiversity policy proposed at central government level is diluted when actually implemented. Focus will be on landowner incentives to preserve native areas. Landowner incentives are seen as being important because economic agents are guided in their behaviour by the incentives made available to them. A case study approach is used to examine the application of the principal policy tools proposed in the government's response to biodiversity decline, and regional variations in policy implementation are considered. A survey is used to identify what incentives would be required for landowners to preserve their native areas.

The analysis suggests that the government's initiatives are not likely to achieve the desired result of 'no net loss' of biodiversity stipulated in biodiversity policy documents. Additional incentive measures are needed, particularly where larger areas of vegetation are concerned. The current voluntary approach favours individual landowners who already have a preference to conserve. Those who do not are excluded by the current policy approach, leaving large areas of native vegetation vulnerable to neglect or destruction. Many landowners will require financial incentives to help them change their current conservation preferences. Financial assistance will also enable larger areas of native vegetation to be actively preserved, as many landowners may not be able to afford preservation activities without assistance.

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CHAPTER ONE

INTRODUCTION

1.1 Research overview

The nations of the world agreed upon the text for an international convention promoting the conservation of global biological diversity in Rio de Janeiro in 1992. Since then more than 160 nations have ratified the agreement. The question arises as to how to give effect to this convention and its various undertakings. There are many questions that arise as to how to ensure that the lofty language of the Biodiversity Convention has some real effect at ground level. This research examines one aspect in the process of biodiversity policy implementation: the incentives of landowners to preserve biodiversity on privately owned land. This is an important area of research as landowners have control of what happens to much of New Zealand's biodiversity resources and are influenced by the incentives available to them.

Chapter one discusses the concept of biodiversity and the reasons for its accelerating decline. New Zealand's historical loss of its rare and vulnerable species is reviewed followed by New Zealand's commitments to the Convention on Biological Diversity. The chapter concludes with an outline of the research undertaken in the present study. Chapter two reviews the literature on the recent development of 'biodiversity' and discusses the context of the implementation of biodiversity policy literature on policy networks and interorganisational linkages. Chapter three describes New Zealand's 1984 Labour Government environmental reforms. Current policy implementation problems are identified and current government initiatives as a response to biodiversity decline are described. Chapter four describes the methodology that is employed to be able to analyse how the proposed biodiversity policy initiatives will effect landowners. It also includes how comparison is made between the incentives that regional councils offer nationally and a description of the survey approach to identify what would change landowner incentives to preserve biodiversity on their land. Chapter five identifies the incentives that are available to

the case study landowner and the implications for preservation and protection of the biodiversity case study site. Chapter six looks at national variation in current biodiversity policy and what implications this could have on the government's proposed policy position. Chapter seven discusses the results of the survey conducted to identify the incentives needed to change landowner preferences to conserve biodiversity. Chapter eight concludes with a discussion of the research findings and the implications these findings will have on the success of the *Biodiversity Strategy's* goal of 'no net loss' as initially specified. There is also discussion on the implications of the research results in the wider context of the preservation of the world's biodiversity resources. Finally policy recommendations are given which would encourage private landowners to conserve biodiversity.

1.2 Biological diversity

Biological diversity (biodiversity) describes the variety of all species on earth. Currently approximately 1.4 million living species of micro-organism, fungi, plants and animals have been recognised, described and named (Groombridge, 1992; Wilson, 1988). Most of these species are insects (950,000) and plants (250,000). On the basis of the current rate of discovery, it has been estimated that the number of undiscovered and undescribed species ranges from 10 million to more than 100 million species (Savage, 1995).

Biodiversity is a complex and all-embracing concept. It is common to address biodiversity at three hierarchical levels: species, genes and ecosystems (Yamin, 1995). A measure of the number of species present (species richness) at a given site is the most straightforward and usual measure of biodiversity; however, using species richness as a measure of biodiversity has limitations. Endemism and taxonomic diversity need to be taken into consideration. A species is endemic when it is restricted to a specific area. New Zealand has relatively low species richness but a high level of endemism, making it unique from other countries. Taxonomic diversity is how distinct species are from one another. Species that are very different from each other can be considered to contribute more to overall diversity than species that are similar to each other (OECD, 1996).

Genetic biodiversity is the sum of the information contained in the genes of plants, animals or micro-organisms. Each species is the product of a long evolutionary history, which over time has led to the storage of a large amount of information in the species genome about how to function in a specific environment (Savage, 1995). If a species becomes extinct, this 'storehouse' of genetic information is lost forever.

Ecosystem biodiversity relates to the variety of habitats, biotic communities and ecological processes in the biosphere as well as the diversity within ecosystems. The status and trends of ecosystem loss are difficult to evaluate because an ecosystem has no agreed definition. This makes biodiversity policy implementation difficult due to the uncertainty of what should be preserved to enable representative and important ecosystems to maintain their ecological functions. Uncertainty has also led to different estimates of ecosystem and habitat changes at both national and international level (OECD, 1996). Ecosystem biodiversity is important because it provides habitat for many indigenous species. Many of New Zealand's native plants and animals are reliant on specific habitats for their survival. If their habitat is destroyed and they cannot adapt to the landcover change, they will die out. Society incurs a great cost from species loss.

The most important role of biodiversity is to facilitate the ecosystem functions on which all life depends, including that of humans. If the diversity of life around us is destroyed we damage our own life support systems. We are provided with many valuable primary products from our ecosystem that are fundamental to our existence. Production of raw materials, purification of water and the cycling of nutrients are all services provided by our environment (Ministry for the Environment (MfE), 1998). Biodiversity also offers scientific and cultural values that make life more enjoyable. As Wilson (1988) wrote, 'one of the most damaging of punishments is to remove someone from natural sights and sounds. It is dehumanising'. Many people argue that biodiversity also has intrinsic value because it is valuable in itself and not valued simply for its uses (Des Jardins, 1997).

Biodiversity decline includes all those changes that reduce or simplify biological resources, from individuals to regions (Pearce & Moran, 1995). Species extinction is a natural evolutionary process related to habitat modification. Historically, whenever humans have altered their natural environment, habitat modification has resulted. It

is the unprecedented scale and speed of present species extinction caused by humankind that is of international concern (Savage, 1995). While it is impossible to quantify future rates of biodiversity loss with certainty, all estimates are disturbing. Conservative estimates are that extinction rates are presently three to four orders of magnitude greater than the natural rate (Wilson, 1988).

The many reasons for biodiversity loss can be roughly divided into proximate, underlying and fundamental causes (OECD Expert Group on Economic Aspects of Biodiversity, 1996). Each of these causes will be discussed in turn. The proximate causes of biodiversity loss include habitat destruction/modification, exploitation of wild species, introduction of exotic species, homogenisation of the species, pollution and global environmental change. The main proximate cause of biodiversity loss worldwide is land conversion. There is a trend from higher diversity land uses such as forestry to low diversity uses such as urban development. Natural habitats are becoming increasingly scarce. Evidence from island habitats indicates that the expansion of the human niche by various forms of conversion is geometrically related to extinctions (Pearce & Moran, 1995). Land cover changes have meant that habitats once left available for appropriation by other species have decreased. Many species are becoming displaced from their habitats and, with no place to go and often no mechanism to adapt their niche requirements, they subsequently become extinct.

Fundamental causes of biodiversity loss relate to those factors that are often thought to be beyond our control. These fundamental causes of biodiversity loss include population growth, consumption and production patterns. Such causes have a profound impact on the decisions that ultimately lead to the destruction of biodiversity. Underlying causes of biodiversity loss relate to our ability to reflect biodiversity values in markets and decisions made by governments. Underlying causes include market failure, policy and institutional failure and lack of information. Policy changes that reduce biodiversity loss should aim to address these fundamental and underlying causes as much as possible. Removing the underlying causes of a threat reduces the incentive for people to harm biodiversity by reducing the pressures that encourage people in that behaviour (Cunningham & Young, 1997).

The human population is increasing at a very rapid rate. The more people there are, the greater the impact on the environment. All people need resources such as food, water and shelter. Humans place a great deal of pressure on available space and subsequently displace the habitats of other living species. The impact of population pressure on the environment is not just related to the number of people, but their production and consumption patterns. International and national income inequality has a major impact on production and consumption patterns. It is said that much of the environmental degradation witnessed today is due primarily to two groups of people, the top billion richest and the bottom billion poorest (Sadik, 1991). In developed countries large amounts of resources are consumed per head of population, leading to an accelerated demand for natural resources; this demand is unsustainable. In many poorer countries people are often forced to destroy their environment just to survive. Global increases in per capita consumption of energy and natural resources in combination with unsustainable systems of agricultural and industrial production are driving habitat conversion and degradation worldwide (OECD, 1996).

1.3 The behaviour of individuals and governments

Factors that determine the behaviour of individuals and governments are considered by many as the ultimate driving force behind biodiversity loss. One of the main reasons for biodiversity loss is the underlying disparity between the private and social costs and benefits of biodiversity use and conservation (Dixon & Sherman, 1990; Perrings & Pearce, 1992). Economic incentives that prevail in a society can either encourage or discourage behaviour leading to the conservation of biological diversity. Market failure, policy and institutional failure and informational failure are the precursors that affect an individual's incentives. Incentive measures are discussed further in later chapters.

Market failure is often identified as a precursor for biodiversity loss. If markets fail to fully reflect biodiversity values, market failure occurs, often resulting in externalities. An externality occurs when the production or consumption decisions of one agent affect the utility of another agent in an unintended way (Perman et al., 1997). Because no market system exists for many offsite biodiversity resources

landowners have no incentive to preserve biodiversity on society's behalf. Biodiversity provides many benefits offsite or positive externalities that landowners can not receive financial benefit from through the market.

The concept of total economic value extends from the fact that resources may possess values quite independently of any use that humans make of them. Conceptually, total economic value of an environmental resource consists of its use value and non-use value. A use value is a value arising from an actual use made of a given resource. Use values are further divided into direct use values, which refer to actual uses such as fishing; indirect use values which refer to the benefits deriving from ecosystem functions such as a forest's function in protecting a watershed; and option values, which is a value approximating an individual's willingness to pay to safeguard an asset for the option of using it at a future date. Non-use values are usually divided between bequest values and existence values. The former measures the benefit accruing to any individual from the knowledge that others might benefit from a resource in the future. The latter are derived simply from the existence of a particular asset (Pearce & Moran, 1995).

Property rights are fundamental to biodiversity conservation since incentives to conserve or destroy biodiversity reflect the structure of the various rights that different agents have to the habitats and species involved. Property rights are important institutions, defining the boundaries of a landowners' socially sanctioned activities. Property rights are not static; they reflect the social and ethical values held by a society. Since societies values are in a constant state of flux, property rights continually change. Where ill-defined property rights exist, as in the case of biodiversity resources, this often results in externalities and thus market failure.

Policy and institution failures are being increasingly recognised as important factors that contribute to biodiversity loss. Policy failure occurs when the policy interventions necessary to correct market failures are not taken and also arises when government decisions or policies are themselves responsible for worsening allocation failures that lead to biodiversity loss (Noss & Cooperider, 1994). Historically in New Zealand agricultural subsidies encouraged farmers to produce agricultural output inefficiently at the expense of the environment. With the election of the fourth Labour Government in the early 1980s, these subsidies were removed

as the government moved to a more laissez-faire approach. The impacts of these subsidy policies are still visible on the landscape today.

The term 'institution' refers to the rules and conventions of society that facilitate coordination among people regarding their behaviour, and includes both formal and informal, governmental and non-governmental rules and conventions (Bromley, 1989; North, 1989). Institutional failure can occur where institutions are inadequately designed and are unable to adapt to meet changing conditions and requirements. Another reason for failure is when institutions do not coordinate with other institutions, both within and across levels. A third failure situation is when needed institutions do not exist.

Another issue influencing institutional capacity is the lack of available information. Lack of information as a cause of biodiversity loss is apparent at all institutional levels. There is a serious lack of data available today on the value of biodiversity and the benefits of avoiding biodiversity loss. This shortage of socio-economic information perpetuates a genuine lack of awareness of biodiversity's contribution to the wellbeing of society.

1.4 The New Zealand context

New Zealand has a distinctive evolutionary history. Its 80 million-year period in isolation from other landmasses resulted in the evolution of many unique and vulnerable biota and ecosystems. Many New Zealand species are endemic, meaning that they are not found anywhere else in the world. All of our indigenous terrestrial non-avian vertebrates are endemic, as are 90 percent of our insects and marine molluscs and 80 percent of our vascular plants. In contrast Great Britain, although similar in size to New Zealand, has one species of endemic plant and one species of endemic mammal (Holdaway, 1999).

New Zealand's long period of isolation ended when Polynesian mariners and their families settled here about 1,000 years ago (Irwin et al., 1990); however, dates for colonisation vary depending on what method of dating is used (Holdaway, 1996). The first settlers brought dogs, rats and half a dozen tropical plants (MfE, 1997). Native species felt the impact of humans almost immediately. Forests were set alight

and seals and birds were hunted. The most well-known extinction during this period was that of the moa, a large flightless bird up to three metres in height (Kiwi Conservation Club, 2002). The moa population prior to settlement has been estimated to have been between 100,000 to 500,000. Following settlement, 11 species of moa went into rapid decline, and extinction is thought to have occurred. Other bird species driven to extinction through human exploitation included the giant goshawk, the coot, crow and the giant Haast's eagle (MfE, 1997).

The remaining indigenous species were hit hard by the arrival of the Europeans, who brought with them more exotic species such as possums, pigs and goats. Further land clearance occurred, coinciding with the expansion of the agricultural trade. Since European settlement, 16 land birds have been driven to extinction, together with a native bat, one fish and many invertebrates and plants. More than half of the bird species that greeted the first humans colonising New Zealand are extinct (MfE, 1997). Exotic species preyed on and displaced many New Zealand plants and animals. New Zealand's flora and fauna had no mechanisms to help them cope with the foreign species that were brought. Within the next two decades New Zealand faces the probable loss of all species of kiwi except the browns on Stewart Island, the mainland populations of weka and kaka, and natural populations of yellowhead and the yellow-crowned parakeet (Holdaway, 1999). Holdaway (1999) appropriately calls the black robin, South island saddleback, little spotted kiwi, kakapo and takahe, whose populations only survive through delicate management, 'the living dead'.

New Zealand's history of mass extinction has lead New Zealand to have one of the worst records for biodiversity loss in the world. This is in part because exotic species have such devastating effects on indigenous populations and in part because of the clearance of large areas of land that contained indigenous species. Since human arrival, New Zealand has seen 63 percent of its land area converted into farms, exotic forests, settlements and roads (MfE, 2000b). At least 90 percent of former wetlands have been drained or degraded (MfE, 1994). A report on the state of New Zealand's environment presented in 1997 recognised biodiversity loss as New Zealand's most pervasive environmental issue (MfE, 1997); this illustrates the attention that this issue has recently received.

Today the most important proximate causes in New Zealand for biodiversity loss are habitat destruction/modification through the removal, fragmentation and degradation of ecosystems and the effects of introduced pests and weeds on New Zealand's indigenous biodiversity (MfE, 2000b). Habitat fragmentation is one of the greatest threats to biodiversity worldwide (Noss & Cooperider, 1994). Habitat fragmentation occurs when there is a reduction in the total amount of a habitat type in a landscape and the apportionment of the remaining habitat decreases into smaller, more isolated patches. Fragmentation usually results from land-cover change. Habitat fragmentation has a major influence on biodiversity. First, because remaining fragments represent only a sample of the original habitat, many species are eliminated and the populations of species that can be supported are less. The modified landscape in which fragments exist is often inhospitable to many native species, thus preventing normal movements and dispersal. Also, climatic influences and opportunistic predators and competitors penetrate fragments, decreasing the core area of suitable habitat; this is known as the 'edge effect' (OECD, 1996). In New Zealand there are many regions that only have remnants of their historical land-cover left. These areas require special management to preserve what biodiversity still remains.

Although New Zealand's conservation lands represent 30 percent of our total land area, it is usually situated in high country where biodiversity is low. Productive and biodiversity-rich lowland areas are poorly represented in the conservation estate. This has led to biodiversity on private land being eroded with few preservation initiatives. Privately owned land cannot be ignored when conserving biodiversity because it contains much of our country's most productive and ecologically important ecosystems. At present New Zealand has about 1.5 million hectares of indigenous forest and half a million hectares of inland wetlands outside of the public conservation lands. Substantial amounts of other important types of habitat, for example coastal wetlands and tussock-lands, are also found on private land.

New Zealand's reliance on agricultural produce as a source of income has had a large impact on biodiversity conservation. Native fauna and flora in general do not contribute directly to the economy. Almost all agriculture, forestry and horticulture, which form the most significant element of the New Zealand economy, are based

around introduced species. Aside from tourism and fisheries, indigenous biodiversity does not provide a significant direct contribution to the economy (New Zealand Government, 1997). It is therefore not in a market-oriented individual's interest to actively preserve biodiversity resources. This disparity between private and public interests must be corrected before any real headway in biodiversity conservation can be made. However this disparity may change due to landowner advocacy at a commercial level of maintaining a good environmental record and keeping New Zealand's 'clean green image'. As markets are become increasingly sensitive to our national environmental track record (MfE, 1997), production of agricultural products will have to follow increasingly strict environmental guidelines. At the current time New Zealand has a 'clean green image', but in reality there is no part of mainland New Zealand that is as it was when people first arrived (Holdaway, 1999). New Zealand does not have a green image because of wise natural resource management, but rather because of its small population.

1.5 New Zealand's biodiversity response and the research approach

As part of the Earth Summit hosted in Rio de Janeiro in 1992, the world's nations formulated a proposal called the Convention on Biological Diversity (CBD). There are three main objectives of the Convention: to conserve biological diversity, to sustainably use of its components and to fairly and equitably share the benefits arising out of the utilisation of genetic resources (CBD, 2001).

The Conference of the Parties is the governing body of the convention and advances implementation of the convention through the decisions it takes at periodic meetings (CBD, 2001). New Zealand ratified the CBD on 3 November 1993. Within the text of the Convention, the parties agreed to formulate national strategies and action plans and to integrate biodiversity activities into all relevant sectors. Article 11 provides that 'each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity'(CBD, 2001).

The New Zealand Biodiversity Strategy (hereafter referred to as the *Biodiversity Strategy*) was released in February 2000. Its overarching theme is to 'halt the decline' of New Zealand's indigenous biodiversity. Biodiversity on private land was identified as requiring additional attention due to private land management issues. Released at the end of 2001 the *Biodiversity on Private Land* document further specifies government policy for biodiversity preservation on private land based on a Ministerial Advisory's Committee's recommendations. Past government policies have emphasised the encouragement and empowerment of landowners to voluntarily protect and manage biodiversity on their land. At present New Zealand's approach to protection of natural heritage on private land is still largely voluntary. The government does, however, provide some direct assistance to the landowner to help cover the costs of protection and management (New Zealand Government, 1997). To achieve the government's policy goals as specified in the *Biodiversity Strategy* and *Biodiversity on Private Land* documents, it is important to make sure that biodiversity on private land is sustainably managed.

This research is intended to investigate the factors influencing the achievement of the government's response to the decline of New Zealand's indigenous biodiversity on private land. Landowner incentives to preserve biodiversity on private land is the focal point of analysis. It is acknowledged that there are factors other than incentives that influence the achievement of the government's initiatives to reduce biodiversity loss, but these are not part of this investigation. The definition of biodiversity for the purposes of this study is native vegetation and fauna that resides on privately owned land.

To illustrate the affects governmental policy has on landowners, a case study of wetland biodiversity conservation on privately owned farmland is used. The landowners' economic incentives and disincentives for preserving the wetland on a farm scale are studied in the Manawatu-Wanganui region. The actions that the government proposes towards biodiversity preservation are then critically analysed to assess the manner in which the landowner's incentives are likely to be affected.

The government's 'policy package' is discussed and potential areas of policy dilution from central government level to actual implementation are identified. Due to environmental policy differences across regions, comparisons are made between

policy approaches to biodiversity preservation of selected regional councils. By discussing the issue of biodiversity conservation with regional councils and the community, an appreciation for the regional issues that can influence the achievement of the government's response to biodiversity preservation is achieved. Incentives offered by the different regional councils are compared with those offered in the Manawatu-Wanganui region.

Policy changes that could influence landowners' incentives to preserve and maintain biodiversity on private land are also investigated through the use of a survey. Findings are analysed with possible impacts on the achievement of the government's response to biodiversity preservation being identified.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Three bodies of literature - the history of biodiversity, economic incentives and policy implementation - are seen as key foundations on which this research has emerged. The ecological consequences of biodiversity loss have aroused considerable interest during the past decade. Biodiversity loss is now considered one of the most serious problems threatening the world today. Increasingly, ecologists and economists have been asked to address this problem, resulting in the rise of biodiversity studies. As a result of these studies economic incentives have been recognised as being a valuable policy tool. They are increasingly advocated as a means by which to reduce the division between private and social costs towards preserving biodiversity. The way in which any policy is implemented is important if policy intentions are to be achieved. Incentive policies need to be clearly directed if they are going to have an effect at ground level. Policy implementation within the context of New Zealand is particularly important due to the independence that local government has with regard to regional biodiversity policy.

2.2 The history of biodiversity

There are several levels at which it is possible to discuss biodiversity. Two have historically dominated the literature: genetic and species diversity. In the 1980s ecologists began to focus on a third level, diversity of ecological functions. This reflects the growing recognition that species are important for two very different reasons. The first is the genetic properties, which make distinct species of direct value in both human consumption and production. This is the basis for the traditional focus on both species and genetic diversity. The second reason is that species are important for the functions they perform in generating ecological

services that are themselves of value to human society; that is, species also have indirect value through the ecological functions they perform (Perrings et al., 1995).

Long before the use of the postmodern term 'genetic diversity', population geneticists investigated heredity, genetic variability and their underlying mechanisms. From 1920 the Soviet plant geneticist Nicolai Ivanovitsch Vavilov investigated the origins of the diversity of local varieties and the genetic variability of cultivated plants. He described several geographical areas to be independent centres of origin of almost all crop species. Expeditions of Vavilov and other Soviet scientists were aimed at collecting and using this diversity of varieties for development and improvement of crops. The value of genetic variability at this time was oriented towards agricultural applications (Pottast, 1996).

While Vavilov investigated the geographical origins of cultivated plants and the varieties of old crop strains, almost at the same time the population geneticist Theodosius Dobzhansky emigrated from the Soviet Union to the US and developed what is now known as 'evolutionary genetics'. His 1937 book *Genetics and the Origins of Species*, one of the classic evolutionary biology texts, starts with a chapter on 'Organic Diversity – The extent of diversity', (Dobzhansky, 1982). This was the first synthesis of economic and ethical grounds to maintain genetic diversity. Later, in his landmark lecture 'Variation - the essence of life', Frankel (1970) drew attention to the loss of variety in crops and postulated the necessity of maintaining genetic variations in respect to human interests. According to Frankel, humankind has to take over the task of caring for continued biological evolution (Pottast, 1996). Today, methods and theories of genetics are used in the field of nature conservation and include; ex-situ conservation, analytical tools for preserving rare wild animals and plants in captivity and tools for in-situ conservation.

It is challenging to define a uniform unit of analysis for biodiversity. Reid et al. (1992) have commented that there is no clear consensus about how biodiversity should be measured. Indeed, debates on the measurement and cataloguing of biodiversity have filled a substantial part of the ecological literature since 1950. A measure of the number of species present is the most straightforward and usual measure of biodiversity.

The essential role of the profession of systematics in studies of biodiversity and conservation biology is the cataloguing of diversity – formal description, identification, and documentation and interpretation in the form of generalisations about relationships, biogeography and endemism. The systematics community (Ravin, 1980, 1988; Wilson, 1985, 1988) first called attention to the impending crisis of biodiversity loss and have played a primary role in documenting its progress. Current systematic knowledge is inadequate. There are two reasons that so much of our biota is not known: First, much of it has not yet been collected, studied, formally described and named; second, there may be multiple, morphologically similar species that are considered single species because of insufficient study. The former is certainly the case for many invertebrates, especially arthropods. Knowledge of species and their numbers is also not complete even for better-known taxa such as birds, mammals, fish, reptiles and amphibians (Eldredge, 1992). The systematics community stresses the importance of understanding present species. The recognition of species and the ability to name them are fundamental to systematics and essential for any study of behaviour, ecology, evolution, population biology and for many other disciplines (Savage, 1995).

Many different factors have been implicated in the control of speciation and extinction rates. Changes in these rates define patterns of diversification of species. These changes include intemporal and spatial changes in the diversity of the earth's biota and ecosystems (Eldredge & Cracraft 1980; Cracraft, 1985). Understanding the dynamics of factors that control these extinction and speciation rate changes is critical to developing a theory that explains how gradients of diversity are structured across space and time.

In recent times, with the threat of anthropogenic changes in the native landscapes, ecologists and conservation biologists often apply models of the species-area relationship to predict losses in biodiversity (Harris, 1984; Shafer, 1990; Brooks et al., 1997). The species-area relationship is one of ecology's few laws. According to a very broad consensus between ecologists, the pattern has two principal features: species richness of a given taxon increases with the area sampled, and the rate of increase slows for the larger islands or fragments of habitat. The species-area relationship has played an important role in explaining past and predicting future

changes in biodiversity. Although this relationship was probably known to early humans (Lomolino, 2001) it was not until the 1920s that Arrhenius (1921) and Gleason (1922) expressed this relationship in mathematical terms. Nearly all ecologists and biogeographers utilise the models developed by Arrhenius and Gleason.

The relationship between biodiversity and ecosystem functioning has only recently emerged as a central issue in ecological and environmental sciences. In 1981 a Conference on Biological Diversity was organised by the US Administration. Wilson (1992) states that Walter G. Rosen of the US Commission of Life Sciences brought up the term 'biodiversity' while initiating the 1986 National Forum on BioDiversity. It should be pointed out that 'BioDiversity' (with a capital 'D') in the conference title was still to be identified as a combination of two terms; however, the conference publications by Engl. (1988) and German (1992) display today's well-known spelling (Pottast, 1996).

The 1990 United Nations Conference for Environment and Development at Rio de Janeiro, Brazil, was a landmark event encouraging international acknowledgement of the need to maintain threatened (global) biodiversity. There seemed to be a consensus about the value of biodiversity and that it should be protected and maintained. Until that time, the literature dealing with biodiversity was mostly focusing on conservation, without addressing the important questions relating to the function of biodiversity, its mechanisms and change over both space and time scales (Solbrig et al., 1994). Most conservationists embraced ecosystem management for good reasons, namely dissatisfaction with approaches that were limited in scope to one or a few obvious species and a wish to protect natural resources as efficiently as possible (Grumbine, 1994; Alpert 1995; Brunner & Clark, 1997). Many advances have been made in describing the relationship between species diversity and ecosystem processes in identifying functionally important species and revealing underlying mechanisms.

Although intuitively appealing, ecosystem-based management as a 'holistic' alternative to species-based management is proving difficult to evaluate, much less apply (Stanley, 1995; Wilcove & Blair, 1995). There is uncertainty as to how results obtained in recent field trials scale up to landscape and regional levels and generalise

across ecosystem types and processes. A major future challenge is to determine how biodiversity dynamics, ecosystem processes and abiotic factors interact (Loreau et al., 2001). Authors have thusfar portrayed ecosystem management difficulties as deriving from inconsistencies in management goals, definitional shortcomings and a poor understanding of organisational requirements (Grumbine, 1990 & 1994; Angermeier & Karr, 1994).

The general lack of information and knowledge regarding biodiversity, as stated in the preamble of the CBD, further draws attention to the urgent need to develop scientific, technical and institutional capacities. The Convention states: 'We are aware of the general lack of information and knowledge regarding biological diversity and of the urgent need to develop scientific, technical and institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures'. Although there is a general lack of information about the world's biodiversity and its economic and ecological consequences, it is now widely recognised as an environmental matter of urgent global concern.

2.3 Economics, incentives and biodiversity

There are pervasive links between economics and the environment. A consensus appears to exist regarding the likelihood of market failure disrupting the efficient allocation of all environmental resources (Perman et al., 1997). The discipline of economics thus plays a very important role in understanding biodiversity loss and providing tools for its maintenance and protection. The economics of biodiversity have largely come from the field of natural resource economics that can be traced back to classical economists such as Smith, Malthus, Ricardo and Mill (Perman et al., 1997). Pearce and Moran (1995) have collated the economic aspects of biodiversity loss. They stress the importance of having to capture the total economic value of biodiversity in resource use decisions.

A vast array of policy instruments have been identified for biodiversity conservation. In principle, the objectives of biodiversity conservation might be achieved by either sanctions or incentives (Bowers, 1999). Sanctions are regulatory in nature and they include such policy instruments as environmental taxes. Sanctions conform to the widely held ethic of the 'polluter pays principle', that landholders

have a duty of care in conducting their economic activities. An incentive provokes people to modify their behaviour by giving positive encouragement to undertake conservation initiatives. In practice, due to information deficiencies and unspecified property rights, other policy instruments are used to achieve desired results. These can be categorised as voluntary, property right and informational instruments. Economic incentives are another policy instrument used in biodiversity conservation. Environmental groups and regulators have come to realise that the power of the market can be harnessed by economic incentive policies for the achievement of environmental goals. The change in attitude was triggered by recognition that the market can be turned into a powerful ally. Economic incentive approaches have been used in the United States and Europe since the mid-1970s (Tietenberg, 1990). The use of economic incentives to protect the environment is perhaps best known for the control of pollution. Many countries have adopted the 'polluter pays principle' and require industries to pay a tax based on the amount of pollutant emitted. This provides an incentive for industries to pollute less (Vorhies, 2001) by making their private costs more closely aligned with social costs.

In a 1988 International Union for Conservation of Nature (IUCN) book, *Economics and Biological Diversity: Developing and Using Economic Incentives to Conserve Biological Resources*, Jeffrey McNeely defined an incentive as:

Any inducement which is specifically intended to incite or motivate governments, local people, and international organisations to conserve biological diversity. Incentives are used to divert resources such as land, capital, and labour towards conserving biological resources and to facilitate the participation of certain groups or agents in work which will benefit these resources (Bagri & Vorhies, 1999).

The growing importance of economic incentives as a policy tool can be seen in its prominence during conference proceedings organised for the CBD. At the United Nations Conference on Environment and Development (UNCED) in 1992, the global community adopted Agenda 21, of which Chapter 15 addresses biological diversity and the CBD. This chapter stresses the need to 'take effective economic, social and other appropriate incentive measures to encourage the conservation of biological diversity and the sustainable use of biological resources' (CBD, 2002).

More than 165 countries have now ratified the CBD and agreed to Article 11 on incentive measures which reads: 'Each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity' (CBD, 2002). Two other CBD Articles focus on incentive measures. Article 20 calls on parties to provide 'financial support and incentives in respect of those national activities which are intended to achieve the objectives of the Convention'. Article 7 calls on parties to 'identify processes and categories which have or are likely to have significant adverse impacts' on biodiversity, which includes 'perverse' incentives, as previously discussed. As incentive measures are a crosscutting policy tool, they are explicitly or implicitly a predominant theme of most CBD deliberations.

Many case studies have been prompted by the OECD that have analysed the success of the conservation of certain natural areas with the introduction of various incentive measures. These case studies show success in the implementation of incentive measures in the preservation of biodiversity. Each case study has many site-specific variables, so general prescriptions are limited. Results from such studies are sometimes ambiguous because of the difficulties associated with measuring biodiversity.

From an Australian perspective, Binning and Young (1997) ask if a voluntary approach to biodiversity conservation is sufficient. They conclude that if the role of private land conservation needs to be significantly enhanced, then consideration will need to be given to mechanisms that encourage greater numbers of landholders to participate. The use of incentive measures is becoming increasingly popular in New Zealand, although a voluntary approach is still largely advocated. The *Biodiversity Strategy* has led to an increase in incentives available to private landowners, but as it is in its infancy there is yet to be any formative analysis undertaken. Also, since the timeframe of the *Biodiversity Strategy* is lengthy, summative analysis is inappropriate at this stage. The present study will add to the knowledge about the importance of incentive measures in the conservation of biodiversity within a New Zealand context.

2.4 Policy implementation

An effective method for the implementation of different policy instruments, including incentives, is crucial if desired environmental results are to be achieved. Little has been written about institutional and political deficiency as a cause of biodiversity loss. The lack of information about policy implementation hampers the effective and efficient use of policy instruments.

In 1973 Pressman and Wildavsky conducted the single-most important implementation study. It noted that policies are seldom, if ever, executed by a single autonomous organisation, or in a static environment, but are implemented by multiple actors in a constantly changing system (Pressman & Wildavsky, 1973). The complexity of policy implementation in a dynamic context requires understanding of interorganisational relations and policy networks. The academic literature about the implementation of public policy has expanded at an enormous rate since the 1970s (O' Toole, 1986) with the last decade seeing increased numbers of policy science followers (Klijn, 1996). There has been increased interest in the topic of implementation due to the difficult question of how to convert policy intention into action (O'Toole, 1983).

A large component of literature related to the implementation of public policy is that of policy networks. The concept of policy networks has roots in earlier bodies of literature of both interorganisational relations and the literature on subsystems and policy communities (Klijn, 1996). Policy network literature focuses on the analysis of institutional structures that are used to implement public policy. Many descriptions of the concept policy network exist, but one of the most popular is the one by Benson (1982), who described policy networks as 'a cluster of complex organisations connected to each other by resource dependencies and distinguished from other clusters or complexes by breaks in structure of resource dependencies'.

There are many questions that theorists of policy networks wish to answer; it is believed that a better understanding of how networks operate could lead to prescriptions of how to better achieve policy objectives. Policy network and interorganisational linkage literature uses the comparison of being able to write but not necessarily understanding the grammatical rules behind this social practice. Like

the linguist who makes explicit the grammar rules of language, social scientists hope to make explicit through the policy network and interorganisational field the social rules that people have created (Klijn et al., 1995). If patterns from implementation studies were identified, empirically based recommendations would therefore be able to be utilised and initiated (O'Toole, 1986). Multitudes of case studies have been undertaken in a variety of policy settings in an endeavour to identify how to improve policy networks.

Despite many policy implementation case studies and many attempted theoretical approaches in this area, there has been no real assimilation of findings (O'Toole & Montjoy, 1984). O'Toole states that 'there is no theory that commands general agreement; researchers continue to work from diverse theoretical perspectives and to employ different variables to make sense of their findings'. The literature on policy networks is often found to be contradictory. 'Some of the recommendations offered by analysts fly directly in the face of suggestions made by others' (O'Toole, 1986). As a result, to date there have been few policy recommendations that have actually been generated in the research literature on interorganisational implementation (O'Toole, 1986). Description of policy implementation is seen as far outweighing prescription. Policy networks between different locations and settings are so different in character that a policy that works for one location might be completely ineffective in another. Such problems are due to interorganisational implementation being sufficiently complex, and simple prescriptions developed as a result of a few case studies are bound to have limitations (O'Toole, 1986).

Increased co-ordination between organisations is frequently proposed as a solution to project and programme implementation problems (Brinkerhoff, 1996). Honadle and Cooper (1989) address co-ordination in terms of three types of linkage activity: information sharing, resource sharing and joint action in an attempt to strengthen local interorganisational networks. Information sharing refers to the practice of communication. Organisational actors can improve relations if they share the information on what they are doing and what they are going to do in the future. Resource-sharing occurs when the sharing of information is not adequate. Joint action involves two separate actors or organisations doing something together. Each may be using its own resources, but they have synchronised their actions so that they

complement and reinforce each other (Honadle & Cooper, 1989). The challenge lies in developing approaches where the actions of actors at each level are complementary and reinforce one another rather than being in conflict. This requires co-ordination and the development of co-operative partnerships (Binning & Young, 1997).

'Top-down' and 'bottom-up' approaches to policy implementation have been widely researched, including an assessment of the advantages and disadvantages to both approaches. Research focusing on bottom-down policy has studied decentralisation across a wide range of sectors and stresses the role of centre-periphery linkages in project implementation and service delivery (Leonard & Marshall, 1982; Rondinelli et al., 1984; Silverman, 1992). There is variance between top-down and bottom-up policy structure approaches. This has led to calls for this divergence to be corrected. This could be achieved by combining the findings of research and further exploring promising lines of inquiry that until now have been ignored (Sabatier, 1986; Burstein, 1991). Binning (2000) with respect to biodiversity policy sees the critical role of regional planning as balancing the need for scientific assessment, leadership and centralised planning from the 'top down' with strategies for engaging landholders and local communities from the 'bottom up'.

CHAPTER THREE

ENVIRONMENTAL LEGISLATION

3.1 New Zealand reforms

The New Zealand public sector grew in size and diversity throughout the beginning of the twentieth century (Gow, 1990). This resulted in a distinctive public service culture. Prior to the reforms there were over 800 territorial and special purpose authorities in New Zealand dealing with different aspects of local government. There were also at least 15 core statutes dealing with land, water, air, resource management, coastal areas, geothermal energy and mining. Other related laws and regulations numbered at least 300 (Gow, 1990). Gow (1990) comments that decision-makers and participants tended to focus on processes rather than outcomes.

The 1984 election of the Labour Government saw radical changes to the public sector. Restructuring programmes were implemented through the comprehensive reorganisation of government departments and other public service agencies. The local government commission schemes reduced over 800 authorities to 93, comprising of 13 regional councils and one hybrid council, which had both regional and district functions. There were also 79 district councils (Gow, 1990).

Central to the new ideology was the acceptance of the market as the co-ordinating mechanism of the economy (Cocklin, 1989). The government aspired to increase efficiency, make operations more transparent and increase performance accountability (Gow, 1990). One of the first things the new government did was remove the constraints affecting financial markets. It followed this with a progressive deregulation. Almost without exception, those who have studied the bureaucratic 'revolution' in New Zealand have come away favourably impressed. The experiment has been praised for its radicalism, boldness, coherence and innovative methods (Boston et al.,1996). The World Competitiveness Report in

1993 ranked New Zealand first for its quality of government (World Economic Forum, 1993).

3.2 Environmental policy change

Historically there were few rules governing land and water resource use in New Zealand; land and agricultural-generated environmental problems were perceived as minor issues. Between 1940 and the implementation of the Resource Management Act (RMA) in 1991, environmental legislation governing land use concentrated on river protection, flood control and soil erosion with little emphasis on agricultural sustainability (Memon, 1993). During the 1970s New Zealand became more concerned about the environment. Overseas influences were significant in generating increased awareness of human impacts on the environment. Overseas movements were supported by local environmental groups and highlighted the need for environmental action (Memon, 1993).

By the late 1970s the need for review and reappraisal of the institutional arrangements for environmental management and conservation was quite evident. In 1981 two major reviews were published, one by the Organisation for Economic Co-operation and Development (OECD) and the other by the Nature Conservation Council. These two reviews were to be the catalysts for the ensuing environmental reform in the mid-1980s (Cocklin, 1989). These reviews identified that the effectiveness of the environmental structure was fragmented and not subject to detailed scrutiny (OECD, 1981). Required improvements identified by the government included the 'need for improved co-ordination' (Cocklin, 1989).

The 1984 Labour Government and subsequent governments dramatically changed the institutional framework for environmental administration. At central government level changes were implemented by means of two key legislative enactments: the Environment Act 1986 and the Conservation Act 1987. The key agencies established in 1987 from these acts are the Ministry for the Environment (MfE), the Department of Conservation (DoC) and the office of Parliamentary Commissioner for the Environment (PCE). These agencies now have a major role in environmental administration at central government level. The Environment Act 1986 created the MfE and the office of the PCE, these two agencies operate in the context of the

objectives of the Act. The MfE sees itself as 'a neutral advocate of balance' within the government. This Ministry is expected to act as a counterbalance to the Treasury within the machinery of government. The PCE is essentially autonomous with the mandate to act as a watchdog over the environmental administrative system and to conduct inquiries on matters of particular environmental sensitivity (Memon, 1991).

The DoC was established under the Conservation Act 1987. The Act's primary objective is to promote the conservation of New Zealand's natural and historical resources. The Conservation Act takes a clear preservationist and protectionist stance. The DoC is an advocate of conservation values as well as a national heritage management agency, with specific 'hands-on' responsibilities for managing the Crown's conservation estate including national parks, wildlife sanctuaries and historic reserves.

The Local Government Amendment Act 1989 recognised the purposes of local government for the first time (Memon, 1991). It was anticipated that local government would be guided by the principles outlined in the Resource Management Act 1991 once drafted. The RMA is the principle legislation governing the use of New Zealand's land, air, water, ecosystems and built environment. The RMA's purpose is to promote sustainable management of our natural resources and is based on a very devolved framework (Jones et al., 1995). Although the RMA defines roles and responsibilities in respect to resource management at three levels of government (central, regional and local) an underlying assumption is that governing bodies that are closest to resources are the most appropriate to govern the use of those resources (Jones et al., 1995). It is the fundamental aim of the RMA to decentralise responsibility for resource management, taking responsibility from central government, excluding nationally significant issues and placing it firmly in the hands of local authorities. As a consequence local government now has major policy functions for environmental protection.

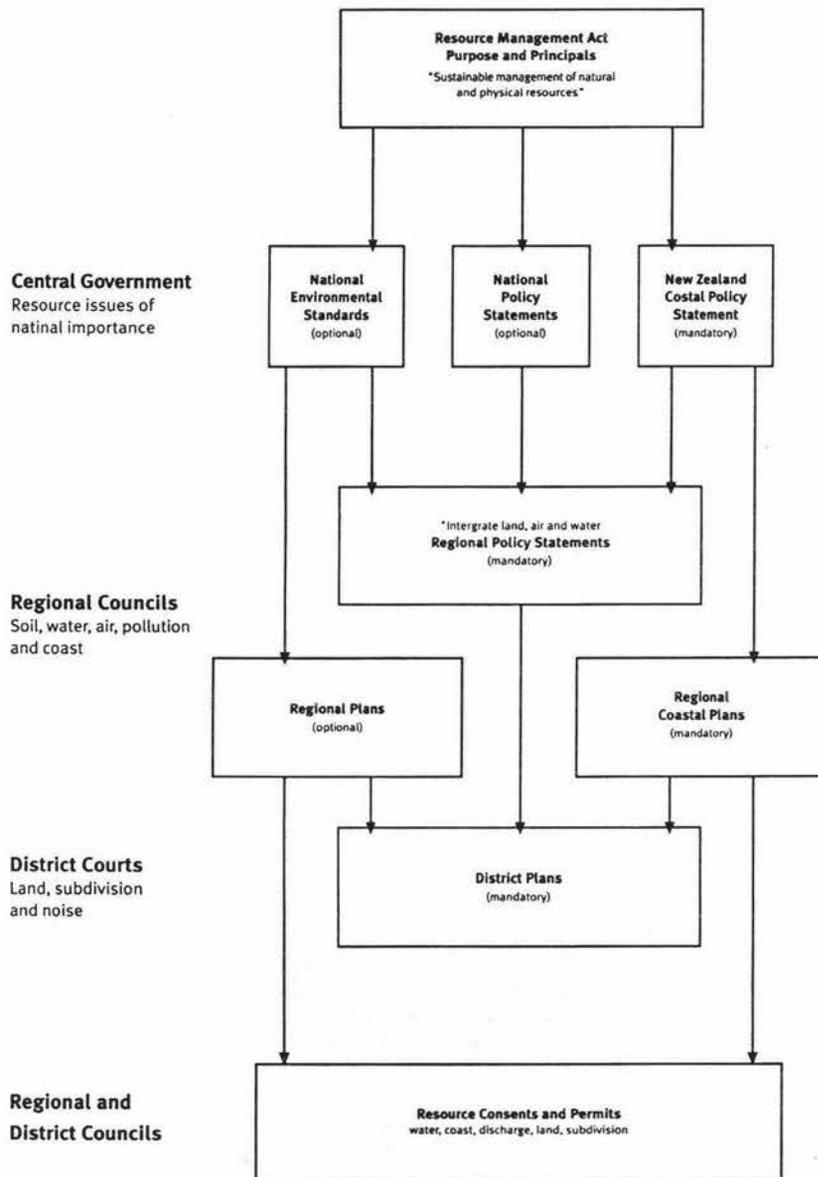
Although the RMA has revolutionised environmental policy in New Zealand, there are currently concerns over its effectiveness, especially with regards to biodiversity loss on private land. Ongoing declines in the abundance of indigenous species and in ecosystem health (MfE, 1997) raise questions about the systems and structures we have in place for delivering natural heritage conservation outcomes (Norton &

Cochrane, 2000). As a result of these policy problems the government is currently amending the RMA. The local Government and Environment Select Committee has finished considering the Resource Management Bill 1999 and reported back to Parliament with their recommendations in May 2001. These recommendations included giving regional councils and territorial authorities important new functions for biodiversity management and incorporating a definition for indigenous biodiversity into the Act. The Select Committee's recommendations are currently awaiting debate in the House and the final Amendment Act is not expected to come into force until early 2002.

3.3 New Zealand's policy structure

Institutional structures are the means whereby policy enacted on an international or national level is translated to ground level. Policies are considered successful if the centre's intentions are faithfully reflected in actions at the periphery (Levitt, 1980). The effectiveness of an institutional structure in getting policy objectives transposed as outcomes is important. New Zealand has a devolved policy system (refer Fig. 1). The rationale for devolution is that environmental planning should be carried out at the point where the required information is available and where the incentives to get the plan right are the greatest. Also it is recognised that issues relating to resource use, in terms of its environmental impact, vary according to locality. The policy challenge lies in developing approaches where the actions at each level of government are complementary and reinforce each other to reach biodiversity aims. Resources at central government level need to be disseminated to a regional level to enable implementation of policy. If the government is going to adopt an outcomes approach, primary responsibility for resolving biodiversity issues remains with regional and district councils (Binning, 2000).

Figure 1: Resource Management Act (Source: MfE, 1997)



In New Zealand, many ecologically significant areas lie outside the conservation estate. Preservation of these areas is crucial if we are to prevent important biodiversity resources being lost. It is impractical and unrealistic to secure these areas for conservation through government purchase. It is therefore critical that

landowners who have day-to-day management of biodiversity on private land become active stewards. Binning (2000) made the general statement 'that in the absence of active ongoing management many of the values of natural areas are being lost'.

To ensure the survival of New Zealand's indigenous biodiversity in quantities, distributions and at a quality that is ecologically sound, individual landowner responses will have to be well co-ordinated. If New Zealand is going to obtain the goal of 'no net loss', as optimistically specified in the government's biodiversity strategy, a formidable challenge has been set. Each landowner will have to preserve the biodiversity present on their land to enable the cumulative outcome of preventing further biodiversity loss.

New Zealand's current environmental management system has caused many policy implementation problems. The RMA is especially seen as creating tension. Sections 30 and 31 of the RMA, which relate to the functions of Regional and Territorial Authorities, do not include biodiversity preservation as a function that local government must undertake. Section 6c, 'The protection of significant indigenous vegetation and significant habitats of indigenous fauna', has been identified as creating confusion. Currently there are no set criteria available for the identification of significant natural areas. Also the Act provides little guidance for determining the appropriate degree of protection for areas deemed as significant. New Zealand's devolved system of environmental management creates conflict over what degree of control local government should have over biodiversity policy formation. Regional councils have discretion as to whether they use regulatory or non-regulatory measures. This has led to a variable response to biodiversity conservation. Experience has shown that some regional councils have done well in the task of biodiversity preservation and some have fallen short of expected results. Other policy issues include the need for clarification of the Forests Act and the Biosecurity Act. These policy problems are currently under government review; decisions are expected to be made in 2002.

A major point of contention is whether landowners should be paid to take action to conserve biodiversity. Some argue that the government has no obligation to pay people not to destroy a valuable public resource while others feel landowners that

retain habitats generate a public good for which they should be compensated. Historically landowners were encouraged through government subsidy to clear land for agricultural production. Due to our society becoming more environmentally aware, property rights have now changed to prevent such resource degradation. Many landowners feel that this interferes with their private property rights. New Zealand has a land title system that provides strong legally guaranteed property rights over land for private landowners. Those rights extend to all resources on or in the land with the exception of water, geothermal energy, most minerals and most wildlife, which are government-owned (New Zealand Government, 1997). Landowners feel that because they purchased land with the right to change land-cover that if the government now removes this entitlement they should be compensated for any resulting economic loss. In some countries transition payments are made to landowners that have important biodiversity resources on their land. These payments are not continuous, but encourage landowners to comply with new regulatory standards. Transition payments can be based on compensation for foregone land-use opportunities or on the basis of assisting in compliance with regulations.

3.4 Biodiversity documents

The government's response to declining biodiversity is set out in broad terms by the *Biodiversity Strategy* and the *Biodiversity on Private Land* documents. New Zealand has ratified the International Convention on Biological Diversity, and so has agreed to obligations that include the conservation of biodiversity. The development of the *Biodiversity Strategy* is being led by the DoC and the MfE. A draft of the Strategy was released for comment on 20 January 1999. After public consultation, the final Strategy was released in February 2000. It was written with the intention of creating a strategic framework for action by establishing national goals to 'turn the tide' on New Zealand's declining biodiversity. The Strategy's primary goal is:

(To)...maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments and do what else is necessary to maintain and restore viable populations of all

indigenous species and subspecies across their natural range and maintain their genetic diversity (MfE, 2000b).

The *Biodiversity Strategy* sets out national goals for conserving and sustainably using New Zealand's biodiversity. At a general level government agencies and organisations will be guided by the principles of the Strategy; however, it does not prescribe in detail how the actions specified are to be undertaken. The Strategy prioritises actions and identifies the key government organisations that will implement them. It deals with all threats to New Zealand's biodiversity across land, water and marine areas. The Strategy sets out priority actions for these environments across both private and public lands. The government wants to halt the decline in New Zealand's indigenous biodiversity and in places restore it within a 20-year time frame. A funding package of \$187 million will be spent over the next five years and will be directed towards achieving the goals of the Strategy (New Zealand Government, 2000).

The final report of the Ministerial Advisory Committee (MAC) entitled *Biodiversity and Private Land* was released in August 2000. This report responds in part to the release of the *Biodiversity Strategy*. The *Biodiversity and Private Land* report was written to specifically address the effects of private land management on biodiversity. The MAC was asked to also develop an 'agreed set of proposals that will lead to effective sustainable management of biodiversity outside the conservation estate'. The government responded to the MAC recommendations made in the *Biodiversity and Private Land* report by drawing several initiatives. Funds have been set aside from the *Biodiversity Strategy* funding package to implement a number of the initiatives. The recommendations made are in line with the actions specified in the *Biodiversity Strategy*.

Advice was also requested from the MAC on the possible content of a National Policy Statement (NPS) and on any other measures that may be necessary to resolve the issue of declining biodiversity on private land (MAC, 2000a). The purpose of an NPS is to state policies on matters of national significance that are relevant to achieving the purpose of the RMA. Local government planning documents such as regional plans cannot be inconsistent with an NPS (refer to Fig. 1). The reason that the MAC was asked to create an NPS for biodiversity was that 'there is a real fear

that New Zealand is experiencing policy failure' (MAC, 2000a). It has become evident that the provisions of the RMA are failing to protect significant indigenous species. The current policy failure is due to implementation difficulties associated with the RMA and problems with the RMA not adequately addressing biodiversity and its policy difficulties. In its final report the MAC recommended that the government 'Not proceed with a National Policy Statement at this time' (MAC, 2000b).

Despite MAC recommendations and public sentiment to not proceed with an NPS the government recently stated its intention, to develop a Proposed National Policy Statement for biodiversity under the RMA. Once proposed, the NPS will then be subject to a thorough process of public examination and consultation through a specially appointed independent Board of Inquiry, as required by the RMA. The Board of Inquiry process is now scheduled to run through the April–July period of 2002.

Some of the requirements specified in the NPS preliminary wording have yet to be determined. Key questions include whether the NPS should only provide policy guidance or whether it should direct councils over the use of rules, and if so, in what circumstances. The time frame that local authorities should have to achieve the provisions of the NPS is also being reviewed. Questions such as these are contentious because once written, local government is legally obliged to conform to the NPS prescriptions. The NPS is likely to emphasise that only areas that make the greatest contribution to indigenous biodiversity will be prioritised for preservation and protection. Drawing on positive biodiversity preservation initiatives currently undertaken, the NPS will be accompanied by guidance that will illustrate how best to implement biodiversity policy for local government (MfE, 2001).

Other government initiatives are set out in the *Biodiversity outside public conservation lands: the government response* written by the Ministry for the Environment (2000a). Initiatives include the creation of a Biodiversity Advisory Service for landowners which will raise awareness, encourage biodiversity conservation and provide advice (refer to Appendix 1). A Contestable Fund will be established to ensure that the service is put in place in the most efficient and effective way possible. The organisation responsible for delivery of the Fund will

vary regionally. The government organisation that is seen as being able to accomplish the task most effectively and efficiently will be chosen. Potential contenders include the Queen Elizabeth National Trust (QEII), the Landcare Trust, the DoC and regional and/or district councils or some combination of these agencies. A committee will be established to administer the Fund for the Biodiversity Advisory Service, comprising representatives from the existing funding bodies, local government, the MfE and the DoC. Funding for the Biodiversity Advisory Service will begin in the 2001/2002 financial year; \$3.6 million will be spent over four years.

Financial resources will also be provided for initiatives that improve the condition of biodiversity. The Condition Fund will be used to extend the base of community effort in biodiversity management. The Fund will be available for the management of biodiversity on private land and will be administered by the same committee that will allocate the biodiversity advisory committee service funding. Six and a half million dollars will be allocated over four years beginning in 2001/02.

Increased funding of 30.5 million over a five-year period from 2001 to 2006 will also be available for existing protection mechanisms such as the Nature Heritage Fund, Nga Whenua Rahui and the QE2 National Trust covenanting programme. The government will also contribute to pilot projects aimed at identifying and establishing effective local governance arrangements and approaches to enhancing community participation. Funding of this initiative has yet to be decided.

An outline of the government's response to biodiversity on private land is given in Table 1. Included are the policies that will effect the conservation of native bush and wetland areas on private land. The policies are separated into those that will effect the institutional structure, those that will increase the supply of information and those that will directly effect landowner incentives to preserve biodiversity.

Table 1: Priority government actions that affect indigenous biodiversity on privately owned land with special emphasis on wetlands

<p>Actions that will directly affect landowner incentives</p> <ul style="list-style-type: none"> ➤ Add important land to the DoC estate (BS 1.1b) ➤ Encourage and support the maintenance and protection of important representative habitats (BS 1.1c) ➤ Enhance funding mechanisms (BS 1.1e/PLD) ➤ Pest management (BS 1.3a) ➤ Increase planned recovery actions for threatened indigenous species (BS 1.5a) ➤ Restore and/or protect important natural habitats (BS 5.4a) ➤ Creation of a biodiversity advisory service (PLD) ➤ Fund for improving the condition of biodiversity (PLD) <p>Policy that affects interorganisational linkages</p> <ul style="list-style-type: none"> ➤ Creation of a National Policy Statement (BS1.1d/PLD) ➤ National guidance for freshwater biodiversity through NASWM and Sustainable Land Management Strategy (BS 2.1a) ➤ Incorporating priority actions into departmental planning (BS 6.1a) ➤ Implementation of a structure or mechanism to implement and monitor strategy actions (BS 6.1b) ➤ Develop and implement a co-ordinated research strategy (BS 9.1a) ➤ Accelerate biodiversity survey identification and assessment (BS 9.2b) ➤ Improve legislation (PLD) <p>Research and information provision</p> <ul style="list-style-type: none"> ➤ Information provision to individuals and community (BS 8.1a) ➤ Pest management research investment (BS 9.1b)

Key

- BS = *Biodiversity Strategy* (the numbers indicate to which theme the action belongs)
- PLD = *Biodiversity outside public conservation lands: the government response*

(the *Biodiversity Strategy* does not detail how actions should be implemented).

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The present study is divided into three stages. Stage one uses a case study to examine incentives available to landowners to preserve biodiversity on privately owned land and the likely impact of the *Biodiversity Strategy* policies on increasing incentives in the case study area. Stage two makes comparisons between the case study area, which is situated in the Manawatu-Wanganui region, and other regions nationally. This stage identifies if there are any social, cultural or policy differences that will influence the incentives available to landowners in different regions. Stage three uses a survey to examine landowner reactions to New Zealand government policies intended to preserve and maintain biodiversity on their land.

4.2 Stage one: Case study

Analysis of the *Biodiversity Strategy* and *Biodiversity on Private Land* documents is undertaken before the case study to assess which of the proposed government policies will alter landowner incentives. This provides identification of proposed changes to landowner incentives and what likely effect they will have on the case study site. Only policies that are associated with biodiversity on private land are included in this analysis. Policies are divided into those that would create institutional changes, those that would increase information relating to biodiversity and those that would directly affect the economic incentives offered to landowners (refer Table 1).

A case study is used to look at incentives currently available to landowners to preserve biodiversity. A description of the case study and its location are included in the following chapter. Taking into consideration the incentives that the government

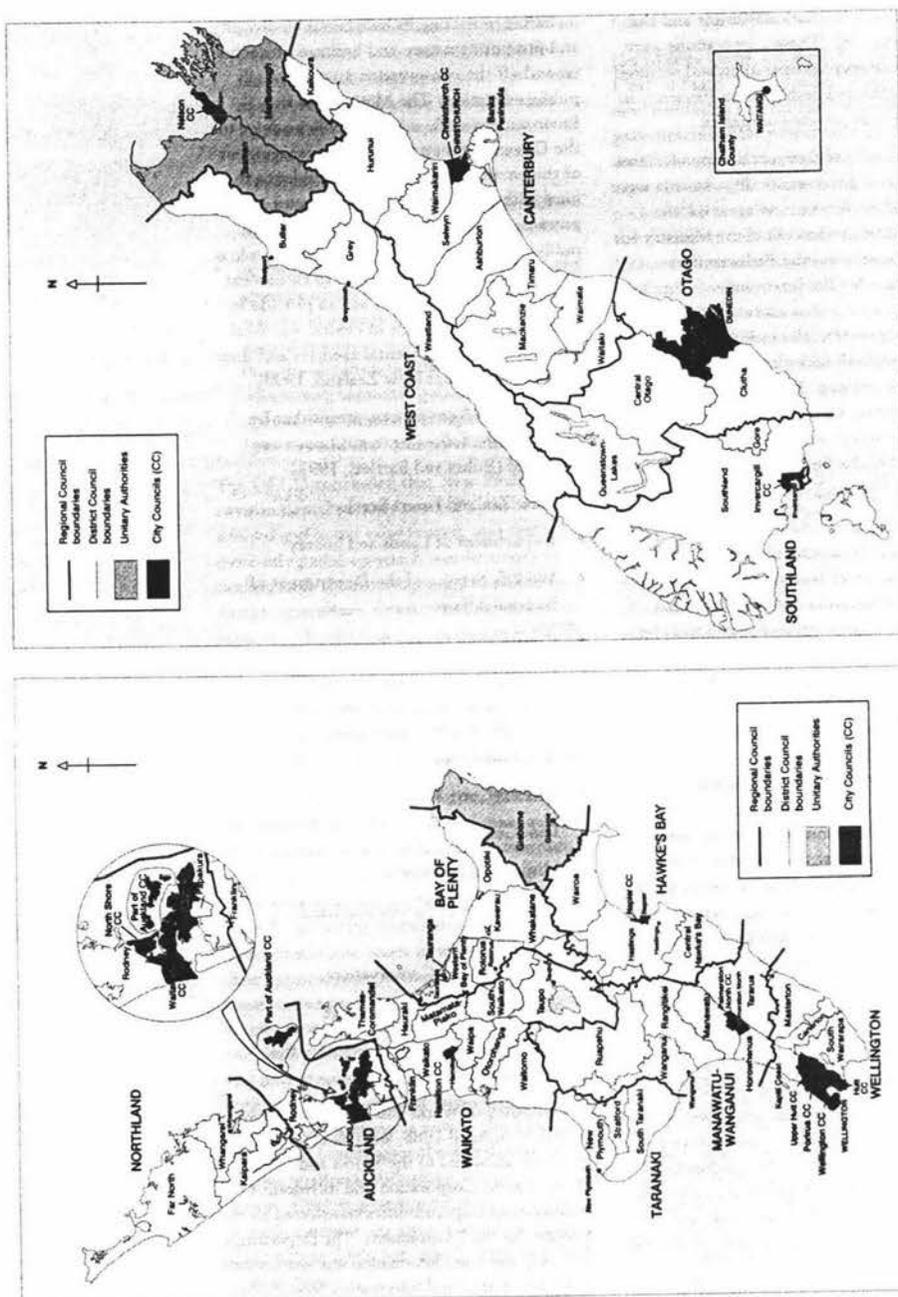
proposes, critical assessment is made as to what effect they will have on the preservation of biodiversity. The framework for the case study approach uses the basic structure of the OECD Working Paper entitled *Incentive Measures to Promote the Conservation and the Sustainable Use of Biodiversity: Framework for Case Studies* (OECD, 1997).

A description of the case study ecosystem is initially given to place in context the resultant study. This was achieved by several site visits. Species were identified during one of the site visits with the help of a Massey ecologist (refer Appendix 2). This is followed by the identification of the proximate causes and sources of pressure on the case study area. The impacts of these pressures on the species and ecosystem are examined. Actual and planned incentive measures for the preservation and maintenance of the wetland are identified. Incentives were identified by interviewing the case study landowners and staff from organisations providing preservation assistance. The most pertinent organisations that affect the case study are local government, the Department of Conservation, The QEII Trust and Fish and Game New Zealand. Stage one concludes with a synthesis for the case study with regard to the projected or actual effectiveness of the incentive measures currently implemented and the effect those proposed will have. Using the results of the case study generalisations are extended to all landowners. Landowners are divided into three categories, which reflects how conservation minded they are.

4.3 Stage two: Transferability of experience

Incentives offered by local government vary nationally. To take this into consideration other localities in New Zealand are visited to compare incentives offered and proposed by different regional councils. Only Regional councils are visited as they have the principal responsibility for the preservation of biodiversity on privately owned land. Localities visited outside of the Manawatu are the West Coast, Canterbury and Waikato regions (refer Fig. 2).

Figure 2: Map of New Zealand (Source MfE, 1997)



These localities represent the varying levels of incentive measures offered by local government. They also give a representative portrayal about the social and cultural

impediments encountered in the implementation of biodiversity policy on private land. Information about incentives offered is gained by informally interviewing relevant regional council staff. Landowners from the different regions are also informally interviewed to identify the social and cultural difficulties with the implementation of local government policies. Incentives offered and proposed by the different regional councils are recorded to allow comparison with those offered in the Manawatu-Wanganui region.

The question is asked if the current and proposed incentive measures that are going to be implemented are adequate to achieve the policy aims of government. Comparison with these other localities may assist the reader to generalise the results of the case study area.

4.4 Stage Three: Landowner incentives needed

It is important to see how landowners are likely to react to various policies in order to make some (as yet undecided) conclusions. Therefore investigation is undertaken into what needs to be done to increase landowner incentives up to the 'no net loss' policy of the *Biodiversity Strategy*. This is explored by personally surveying landowners with biodiversity resources present on their land and establishing what incentives they need to be given to protect and maintain that biodiversity.

Due to time and financial constraints, the survey is undertaken in the Horowhenua district. This district is chosen because it still has large areas of native vegetation remaining. Size is seen as an important factor to the questions asked. Thirty landowners that have the characteristic of having biodiversity present on their land in the form of native bush or wetlands were interviewed. To obtain a list of names and addresses for the survey, the Horowhenua District Council (HDC) 'Natural Habitat Inventory' and 'Significant Natural Areas Schedule' lists were used. The properties that appear on these lists are then personally visited and the landowners interviewed.

Section one of the survey begins by asking respondents to describe the characteristics of their farm, including information such as the size and current land uses. The survey then asks respondents about the characteristics of the native

vegetation on their property. Questions include what types of species are present and the size of the area of native vegetation. The threats to the native vegetation are also identified. Assessment is made of how conservation-oriented the landowner is. These questions are used to identify why the native vegetation is still present and the current environment it is maintained. This section allows analysis to be conducted to see if certain characteristics present have an influence on the incentives that would change landowners' conservation preferences.

Section two then establishes how likely landowners would be to conserve indigenous vegetation given different types of assistance. This ranges from no assistance to a one-off purchase of production rights at current production values. Incentives listed include those currently on offer by some government authorities and those that have been proposed in other countries. This section intends to identify whether it would be beneficial for the government to offer more significant and diverse incentives to landowners to preserve biodiversity on their land (refer Appendix 3).

CHAPTER FIVE

CASE STUDY

5.1 Introduction to wetlands

For this research a case study is used to identify the factors affecting the achievement of the actions proposed by the government to stop indigenous biodiversity decline. A specific wetland case study site has been chosen and will be used to identify real-life incentives and disincentives for preserving wetland biodiversity on privately owned land. A wetland was chosen in preference to forest areas because wetlands have complex biodiversity loss issues and are predominantly situated on privately owned land.

Providing landowners with incentives to preserve biodiversity is crucial because they are economic agents and are guided in their choices and behaviour by the incentives made available to them (Beal, 1997). With New Zealand's biodiversity resources on private land still declining due to human pressures, it is clear that the current incentives to maintain and actively manage biodiversity resources are inadequate. Landowner incentives need to be increased if we are going to enhance the preservation and maintenance of biodiversity on privately owned land.

The definition of a wetland given in the 1991 Resource Management Act is 'A collective term for permanently or intermittently wet areas, shallow water or land/water margins, that support a natural ecosystem of plants and animals that are adapted to living in wet conditions'. A common characteristic of all wetlands is the spatial relationship between groundwater, surface water and wetland vegetation.

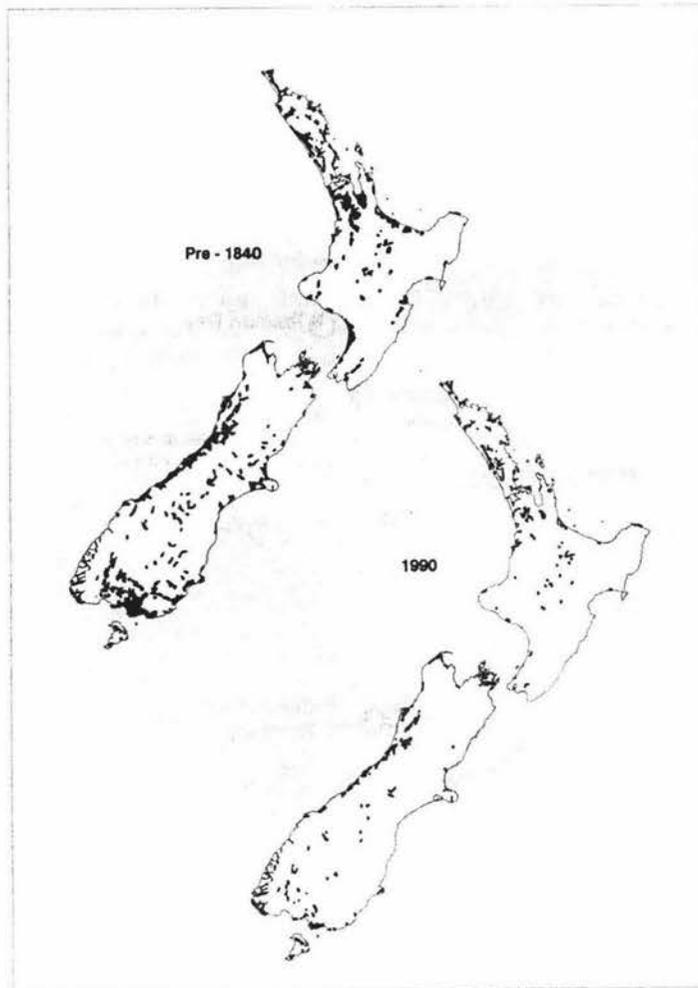
Wetlands are important due to their many use and non-use values. Use values include regulation of water flows by providing floodwater storage, nutrient cycling/storage and related pollution control and providing recreational values for shooters, fishermen and naturalists. Wetlands to many people are also aesthetically

pleasing, contributing to the character of the landscape. Wetlands are important ecosystems, adding greatly to biodiversity. Wetlands provide water and other primary means upon which countless species of plants and animals depend for survival. They support high concentrations of birds, mammals, reptiles, amphibians, fish and invertebrate species; they are also important storehouses for plant genetic material (Controller and Auditor General, 2001). Wetlands are among the world's most productive environments. 'When estimating the value of the world's ecosystem services, it is estimated that wetlands are 75% more valuable than lakes and rivers, 15 times more valuable than forests, and 64 times more valuable than grassland and rangeland' (Costanza et al., 1997).

Historically, the functions wetlands perform were poorly understood. Wetlands were often seen as wastelands with little or no use value. This often resulted in them being destroyed for what seemed at the time a more valuable alternative. Most of New Zealand's wetlands have been drained or dredged for conversion to agricultural use. 'Drainage became a major cultural activity like the bush clearance a symbol of the 'great work' of turning New Zealand into an economically productive land' (New Zealand Commission for the Environment, 1986). Wetlands were also drained for flood control and creation of hydro-electricity reservoirs, mostly between 1920 and 1980.

Historical land use changes have resulted in a 90% loss of New Zealand's original wetlands (Cromarty, 1996). For example, between 1954 and 1976, surveys by the former Wildlife Service found that 263,000 hectares of wetland were lost at a rate of nearly 12,000 hectares per year (MfE, 1997). There are large regional variations in the distribution of the remaining 10%. The size and type of individual wetlands also varies markedly. Although some span thousands of hectares, most are only a few hectares (MfE, 1997) (refer Fig. 3).

Figure 3: The decline of New Zealand's freshwater wetlands, inferred by soil type (Source: MfE, 1997, from Landcare Research)



Source: Landcare Research

A vegetation remnant is a survivor from a biological community, most of which has disappeared. Vegetation remnants possess two important characteristics: they are of small size and comprise only a small fraction of the area of their vegetation type that existed in the past. In most cases this means that the remnants of a particular type are few in number, and without active management they are not sustainable in the long run (Bowers, 1999). Active management includes maintenance activities such as pest and weed control.

Wetlands are predominantly situated on privately owned lowland areas. These lowland areas are largely not included under the conservation estate. Lowland areas are characteristically fertile and popular for agricultural use. The continuance of wetland loss can be attributed to the pressures of agricultural use. New Zealand wetlands continue to be degraded by drainage, earthworks, discharges of contaminants into waterways, weed and pest infestations, stock grazing, loss of riparian vegetation and channelling of waterways. Drainage in particular is a significant cause of wetland loss. Preventing wetland loss due to this activity is difficult because wetland boundaries are difficult to define. There is often a gradual transition from the inner wetland out to the surrounding dryland. Water tables are part of an interconnected system, so altering them outside the wetland's perimeter can affect water levels.

Even though our wetland resources are considered valuable by society today they continue to diminish in extent and quality; this results in a loss of benefit to society. In the past many wetland areas were converted into agricultural lands. This may have been in society's best interest at the time because they were abundant and the returns from agricultural use were high relative to the economic benefits that wetlands provided. Today our wetland resources are minimal. A resource is considered to be scarce if a resource is valuable but is limited in availability. If a market exists for a good the more scarce the good is the more valuable it becomes. Even though wetland resources are valuable to society and scarce, due to market failure there is no economic incentive to persuade agents to behave in a way other than treating the resource as unlimited or a free good. Wetlands provide many important ecological functions, but even if these functions are seen as benefiting society, functions in themselves do not necessarily result in economic value. Economic values are anthropocentric in nature. The many ecological functions that wetlands perform may not necessarily be seen to have economic value if demand does not exist for their goods and services (Turner & Jones, 1991); for example, there is no economic demand for wetland nutrient cycling/storage.

Wetlands perform many functions that provide benefits offsite that resource owners are unable to appropriate. One of the offsite benefits is providing habitat for New Zealand's indigenous species. Many people do not visit a specific wetland, but gain

existence value from the knowledge that these resources are being maintained for future generations. Landowners that have wetland areas on their property cannot charge for the positive externalities that are generated. Since there is in general no income-generating capacity for wetlands and currently no way of charging society for the benefits they receive from the preservation of wetland biodiversity, there is no incentive to preserve the wetland on society's behalf. Lack of perceived economic value is the reason why many wetlands are converted into pasture or not given adequate attention to preserve and maintain their ecological functions, thus resulting in a net loss to society. Policy failure can also be seen as contributing to wetland loss.

5.2 New Zealand wetland policy

There have been many developments in wetland policy in New Zealand. Unfortunately these policy attempts have fallen short of adequate protection for wetland resources. A Controller and Auditor General report (2001) found 'no national level policy direction on freshwater wetlands, other than the insufficient and rather dated 1986 Wetlands Management Policy'.

The 1986 Wetland's Management Policy was intended to indicate that in broad terms the government regards the protection of representative important wetlands as being desirable. This does not bind the government to any course of action or justify restrictions on the actions of the private sector. General principles of preservation and protection of wetlands were focused on rather than pragmatic national level directions on priorities, targets, standards and roles.

The Convention on Wetlands of International Importance – the Ramsar Convention – is an intergovernmental treaty adopted in 1971 in the Iranian city of Ramsar. New Zealand signed and ratified the Convention in 1976. The convention's mission is 'the conservation and wise use of wetlands by national action and international cooperation as a means to achieving sustainable development throughout the world' (Ramsar, 1994).

Contracting parties commit themselves to the following obligations:

- The party must designate at least one site that meets the Ramsar criteria for inclusion in the List of Wetlands of International Importance (the Ramsar List), and ensure the maintenance of the ecological character of each Ramsar site. Countries are also expected to include in the List as many wetlands that meet the criteria as possible. As of 1 March 2000, the List included 1,021 wetlands with a surface area of 75 million ha. Listed sites do not necessarily require protected area status, provided their ecological character is maintained through a wise use management approach;
- The party must include wetland conservation within their national land-use planning; so as to promote the wise use of all wetlands within their territory. They must also establish nature reserves on wetlands, and promote training in wetland research, management and wardening;
- Parties are obliged to consult with other Parties about the implementation of the Convention, especially with regard to transfrontier wetlands, shared water systems, shared species and development projects affecting wetlands (Ramsar, 1994).

New Zealand did not enact additional legislation to implement the Ramsar Convention because existing legislation was considered adequate. New Zealand has five wetlands listed: Farewell Spit, Waituna Lagoon, Kopuatai Peat Dome, Whangamarino Wetland and Firth of Thames Tidal Estuary. DoC is the administrative authority in charge, designated as responsible for implementing the terms of the convention. New Zealand is struggling to preserve its five recognised Ramsar sites as well as other wetland areas, especially those located on privately owned land. Unfortunately the conclusion from the Controller and Auditor General report (2001) is that New Zealand's policies and legislative measures for wetlands do not appear to have been successful in meeting the desired outcome of the Ramsar Convention.

Various government organisations such as the DoC and local government have intervened and provided some incentives to owners of wetlands to help them preserve and maintain wetland resources in recognition of the positive externalities

they provide society. Since New Zealand is still losing its wetlands and they continue to be degraded, these current measures are seen as inadequate. The *Biodiversity Strategy* and related documents have proposed actions to further enhance landowner incentives to preserve and maintain privately owned wetlands. This case study looks at the proposed actions and analyses their effect on landowner incentives and how this impacts on wetland preservation in New Zealand.

5.3 Case study site description

The site chosen for the case study is Omanuka Lagoon (refer Appendix 4), which is situated in the Manawatu sand dune country – a region whose wetlands once spanned thousands of hectares. The Manawatu-Wanganui Region covers a land area of 22,179 square kilometres in the lower central North Island (Manawatu-Wanganui Regional Council, 2001a). The population of the Manawatu-Wanganui region was 220,000 at the 2001 census (Statistics New Zealand, 2002). The major urban settlements are Palmerston North and Wanganui. Since colonisation, agriculture has always been the core activity of the regional economy. Prior to European settlement, there were extensive wetlands and forests covering half the Manawatu region. Today only eight percent of the region's original wetlands remain (John, 1997) and in general only remnants of the original forest cover.

Taylor (2000) compared a sample of 11 wetlands in the Manawatu-Wanganui Region using aerial photographs from 1968 and 1995. The wetlands chosen were all dune country wetlands. Overall between 1968 and 1995 there has been a reduction in the open water area of these wetlands of 30%.

Situated on privately owned farmland, Omanuka Lagoon is about 50 acres in size. The lagoon provides habitat for a small number of rare or declining bird species such as fernbirds, dabchicks, bitterns and marsh crakes. The lagoon has many native plant species present, although like other wetlands in the area it has been greatly modified by drainage and the ingress of alien plants and animals. Despite its drastic changes, the lagoon is now considered one of the best of those remaining. The lagoon is not identified as a priority area by the Department of Conservation, but is listed in the Manawatu District Plan as a Category A site that confers the highest level of protection to it.

Location

The lagoon is located 40°20'S, 175°19'E in dune country on the Manawatu coast about, 30km west of Palmerston North, North Island.

Physical Features

The wetland area consists of a shallow lake (lagoon) surrounded by swamp and ephemeral wetlands. Ephemeral wetlands are those in which water lies on the surface for only part of the year (Ogle, 1997). The wetland area is around 20 hectares (about 50 acres). The water in the lagoon comes from the surrounding catchment area. There is one outlet drain on the southern side halfway down the length of the lagoon, which controls the amount of water in the lagoon. For instance, if the outlet drain were deeper, the lagoon would become shallower. The outlet drain is used to alleviate flooding of surrounding land in winter. Nutrients enter the wetland from surrounding agricultural land runoff.

Climate

The climate is one of warm summers and mild winters. The mean annual rainfall is 940mm, falling mostly in the winter months. Summer droughts are common, and are reflected in the rise and fall of the water level. (Cromarty, 1996)

Vegetation

Aquatic vegetation is minimal with species such as Common Duckweed (*Lemna minor*) and Pacific azolla, (*Azolla filiculoides*). Shallow water and nutrient runoff from surrounding farmland provide ideal growing conditions for Raupo (*Typha orientalis Pres*), which has now proliferated. Around the lagoon margins is *Eleocharis sphacelata* a native sedge. Also found around the lagoon margins is the endemic sedge *Carex secta*. Moving out slightly further from the water's edge is New Zealand flax, (*Phormium tenax*) and many cabbage trees (*Cordyline australis*) and *Carex Virgata*, an endemic tussock. Scattered shrubs such as Toetoe (*Cortaderia Richardi*) and Pohuehue (*Muehlenbeckia complexa*), and patches of willow are along the southern side of the lagoon, as well as radiata pine (refer to Appendix 2).

Noteworthy fauna

Rare species present include fernbirds, dabchicks, bitterns and marsh crakes. Once abundant at the wetland but now only occasionally seen are the brown teal (*Anas aucklandica chlorotis*) and grey duck (*Anas s. superciliosa*). Paradise ducks, pukekoes and the New Zealand shoveler also inhabit the wetland. The aggressive mallard duck is now prominent after displacing many native duck species.

5.4 Causes of pressure on Omanuka Lagoon

The greatest single threat to the wetland is the possibility of it being drained. Drainage would entail enlarging the width and depth of the out-flowing drain. This would take a bulldozer approximately one day's work, so with minimal cost the wetland area would become grazeable pasture. The ease of drainage is clear when looking at surrounding land that is in agricultural production. If the district was not constantly drained it would revert back to wetland.

Other significant threats are the exotic species present at Omanuka Lagoon that are displacing native plants and animals. Due to nutrient enrichment from runoff from surrounding farmland, raupo has spread, reducing the amount of open water. Willows are displacing other native plant species. Raupo, willows and other exotic plants need to be controlled to keep an adequate area of open water and the surrounding native vegetation from being disturbed. Exotic species need to be managed, but it is not necessary or practical to achieve total eradication of most alien species. Some native ducks are being displaced by the aggressive mallards which compete for nesting sites and food. Pests such as mustelids and cats also negatively impact bird-life.

Although the wetland is fenced, stock have access to the wetland at certain times during the year. Grazing stock trample the perimeter of the wetland, causing the pugging of soil in winter; consequently many plants die. Stock also supply unwanted nutrients to the surrounding land and directly to the wetland if they are grazing around the perimeter. Pollutant runoff from surrounding farmland also enters the wetland, creating unwanted plant life.

5.5 Incentives and disincentives for preserving the wetland

The owners have four choices when deciding the fate of the wetland area on their farm: to drain the wetland, to actively preserve the wetland, to leave the wetland unmanaged or place it under a covenant. These alternatives represent production versus preservation choices. Although there are legal constraints on the use of the wetland, these choices are all possible outcomes. An examination of the incentives and disincentives the landowners face to preserve their wetland area can prove instructive in determining how others in a similar situation may react.

Local government, the Department of Conservation, Fish and Game New Zealand (F&GNZ), QEII Trust and the Nature Heritage Fund are the main organisations that provide incentives to landowners to preserve native vegetation. First, the incentives and disincentives that the landowners face are examined, followed by the influence these organisations have on the landowners.

Left in its present undrained state the largest direct benefit to the owners would be the waterfowl shooting that currently takes place. It is difficult to place a value on the benefit that the landowners receive from duck shooting. A 1988 survey conducted by Nugent showed that respondents that held firearms licences reported spending an average of \$851 each on hunting in 1988 (gross expenditure). This is about \$1,110 in today's dollars, giving a rough minimum estimate that can be placed on the value of gamebird hunting for the landowners. Aesthetic benefit is also gained from the wetland. This is the benefit that is gained from the beauty of the wetland area.

Omanuka Lagoon could easily be put into agricultural production, if the area is drained, it could provide additional acres for agricultural production. The surrounding land, which was originally wetland, was transformed after drainage into prime coastal dairy country. If the wetland were drained it would be used for dairy production. The local dairy company has classified the district as 'Manawatu sands country'. Milk solids are on average 325 kilograms per cow for this district (Kiwi Co-operative Dairies Limited, 2000). The payout this season (June 2001-2002) is \$5.20 per kg of milk solids (Fonterra Co-operative Group, 2002). The landowners run on average one cow per acre. If the wetland area is drained, they could

potentially graze an additional 50 cows. Using Dexcel profit watch data it is established that a profit of approximately \$56,000 annually (refer Appendix 5) could be gained from the 50 acres of land if it were put into dairy production. The capitalised production value for this area of land is \$1,120,000. The discount rate of 5% used to obtain this figure is the mean annual real 10-year secondary market government bond rate for December 1994 to December 2001 (Reserve Bank of New Zealand, 2002).

Under the Resource Management Act all water is vested in the Crown, regardless of what land it is flowing over or through, and nothing can be done to natural water unless a special provision is made or a resource consent is given (Aldridge, 2002). If someone wants to divert water from a waterway, then a permit must be obtained. Where an application to divert water is granted by the Manawatu-Wanganui Regional Council and this results in the water levels of a wetland to decline below naturally occurring levels, conditions are put in place that a permit holder must meet to ensure the lowering of the water levels are not environmentally detrimental. The Regional Council also has an objective to preserve the natural character of wetlands and their margins and protect their ecological, cultural, intrinsic and amenity values from inappropriate use and development (Manawatu-Wanganui Regional Council, 1998). The Manawatu District Council policies must be consistent with these of the Regional Council, so they also promote such policies. Information provision for biodiversity is also a function of the Regional Council.

Regulation from the regional plan would apply if the landowners were to lower the water level of Omanuka Lagoon. At present there is no monitoring scheme in place for wetland quality. The Regional Council is reliant on public awareness leading to complaints if a wetland is being adversely affected. If no complaints are lodged then the Regional Council would not be aware of any changes that may have occurred. The problem is magnified if wetlands are situated in remote locations, because only landowners will see damage to a wetland. Some consents are gained for diversion of water from wetlands, but there are no monitoring procedures in place to ensure that consented activities do not adversely effect the ecological functions of the wetland. There have been no prosecutions to date in the Manawatu-Wanganui region for the

diversion of water from wetlands, although drainage throughout the area has occurred (A. Harris, personal communication, 20 September 2000).

Drainage of the wetland is illegal but since there is no monitoring or prosecutions undertaken there is nothing stopping the landowner from draining the wetland. This especially applies the surrounding ephemeral wetlands, which are still considered by the Regional Council to be areas of boggy land. Wetland areas continue to diminish in size and extent throughout the Manawatu region, (Taylor, 2000) therefore the current measures that are being undertaken by local government are seen as inadequate. A profit of near 60,000 annually provides a huge incentive for the landowner to drain the wetland, the case study landowner has decided not to drain the wetland but there are many landowners that if in the same situation and could receive a profit of 60,000 annually they and were not conservation minded there is nothing stopping them from drainage.

5.6 Incentives offered by government organisations

Historically, biodiversity conservation has indirectly benefited from work that has been undertaken for other specific resource management goals, such as soil conservation. Funding for biodiversity projects came in the form of spin-off benefits from other areas of resource management. Only recently has there been an attempt by central and local government to specifically preserve 'biodiversity' values. This shift in policy has led to the identification of specific policy goals and programmes to meet biodiversity ends. It has also led to specific biodiversity incentive funding now being accepted in its own right. This shift can be seen as reflecting increasing public concern over our loss of biodiversity resources.

The Manawatu-Wanganui Regional Council provides an animal pest control service for rabbits, rooks, goats and possums. Ratepayer-funded operations for possums and goats are targeted at protecting High Value Conservation Areas (HVCAs). The Council has identified 240 HVCAs, totalling 32,500 hectares. The Council also offers a user pays pest control service for possums, rabbits and goats in areas not targeted for ratepayer funding, although this has yet to be requested by any landowner. The budget for the Regional Pest Management Strategy work in 2000 was \$642,000. The Regional Council has also adopted an implementation policy to

assist the landowners with possum control if they agree to retire HVCA's from grazing (Manawatu-Wanganui Regional Council, 2000). Omanuka has not been identified as an HVCA.

The Manawatu-Wanganui Regional Council has specific Environmental Grants available to 'help take care of the land' (Manawatu-Wanganui Regional Council, 2001b). Environmental Grants are allocated to protect and enhance natural habitats, where typically 25% to 50% of the costs can be met. Fencing is an example of the type of cost that can be covered by the Grant. The Council makes provision for up to \$300,000 per year towards Environmental Grant Projects. A sum of \$240,000 is available for individual projects and a sum of \$60,000 is available for community projects. For the eight years prior to 2000, the budgeted Environmental Grant Fund was underspent every year (Manawatu-Wanganui Regional Council, 2002). This year (2002) the Fund has been oversubscribed. The Council received 310 applications for the Individual Fund, asking for a total of \$565,000. This increase could reflect changing community awareness about environmental issues (Manawatu-Wanganui Regional Council, 2002).

In October 1998 the Heritage Incentive Strategy was adopted by the Manawatu District Council. The Strategy has four parts: heritage incentives grants, rates remission, policy heritage awards and possible council purchase of heritage places. These parts are all included in the combined fund to be called the 'Heritage Improvements Fund'. The total funding available for these projects is \$73,000. Assistance can be received for bush remnants, wetlands and other significant natural areas through 'Heritage Incentive Grants'. Monetary grants help pay for fencing and retirement of bush remnants. The Community Funding Subcommittee would deal with such applications. In general, assistance is considered if the area is identified in the Proposed Manawatu District Plan. A greater amount of assistance is available for the more important sites. For example, places that are listed as Category A under the District Plan receive more assistance than those listed under Category B. Up to \$500 can be received for a significant natural area listed in Category A. Omanuka Lagoon is classified as Category A, so it would be eligible for up to a \$500 contribution (Manawatu District Council, 1998). The policy for the Heritage Incentive Strategy is in place, but funding has not been publicised so the programme is not yet

operational. The Manawatu District Council plans to continue support for the Heritage Incentive Strategy (P. McHardy, personal communication, 7 July, 2001).

The District Council must ensure that its policy objectives are in line with the Manawatu-Wanganui Regional Council. The District Plan must not be inconsistent with the Regional Policy statement. The District Council has identified Significant Natural Areas in its District Plan. The Council's policy is to ensure that the important natural features and ecosystems are protected and enhanced. The District Council in general employs a voluntary approach to biodiversity conservation; however, monitoring is undertaken for resource consents. If an activity that needs a resource consent is detrimental to a site that is identified as a significant natural area, then consent for the proposal could be refused or conditions could be imposed on the consent to help avoid, remedy or mitigate the effect of the proposal (P. McHardy, personal communication, 7 July 2001).

DoC is the government agency with primary responsibility for the conservation and advocacy for New Zealand's indigenous biodiversity. The Department's conservation responsibilities are largely focused on public land. Responsibilities that relate to private land are the general promotion of biodiversity management and the securing of areas that represent the full range of natural diversity on private land by providing incentives for voluntary protection. If an area has been identified by DoC as a Recommended Area for Protection (RAP), it is given a higher ranking of ecological significance (V. Nicholls, personal communication 29 October 2001).

The Nature Heritage Fund and Nga Whenua Rahui are independent funding organisations that support DoC projects. The Nature Heritage Fund helps meet the cost of protecting areas of high ecological value by providing contestable finance for projects that protect ecosystems. Nga Whenua Rahui is a similar fund specifically designed to protect indigenous biodiversity on Maori land. Both funds provide financial assistance and can negotiate the purchase of areas in need of protection for its clients. Both funds can also contribute to purchases made by local authorities or other agencies prepared to manage protected areas as reserves under the Reserves Act 1977, although many do not utilise the fund due to lack of capacity. Where landowners want to protect natural areas but not relinquish title, these areas are covenanted. Assistance with pest and weed control may be agreed to for covenanted

areas. Land titles of covenanted areas stay with the landowner. Monitoring is undertaken annually to ensure that covenanted areas are being properly maintained and landowners are happy with agreements.

In effect, the Nature Heritage Fund and Nga Whenua Rahui are the bank for DoC's work on private land (D. Ravine, personal communication, 29 October 2000). If there is an area that DoC would like preserved, it must apply to the Nature Heritage Fund or Nga Whenua Rahui for funds. Both funds help meet preservation costs such as fencing, survey and legal costs for protection. Usually up to 50% of costs will be provided for a project. RAPs automatically gain support for funding applications and other areas are considered on their merits. Omanuka Lagoon is not considered as a RAP (D. Ravine, personal communication, 29 October 2001); this decreases its chance for protection.

As a result of the *Biodiversity Strategy* there has been a large increase in funding to the Department of Conservation. A lot of this money has gone into jobs that could not be done in the past such as weed control and researching rare plants and animals. Nga Whenua Rahui and the Nature Heritage Fund have both received increases in funding to improve their effectiveness. This allows more areas to be protected.

Fish and Game New Zealand (F&GNZ) is the New Zealand Government agency responsible for managing freshwater sportfish fisheries and gamebird hunting. Many waterfowl species have habitats in New Zealand's wetlands and F&GNZ are committed to preserving as many wetland areas as possible. The Game Bird Habitat Trust is a subsidiary of F&GNZ, administered as a separate entity by Board members appointed from F&GNZ. The New Zealand Game Bird Habitat Trust Fund was established to help preserve wetlands. F&GNZ have introduced a New Zealand Habitat Stamp programme based on the very successful USA Duck Stamp programme. The Trust Fund gets no government funding, but takes two dollars off every gamebird licence for the purchase of a stamp. Nationally, approximately \$50,000 was raised in 1999/2000. Gamebird hunting is the only hunting for which by law you must have a licence (P. Taylor, personal communication, 25 April 2002). If an individual wants to help protect a wetland, they can either make an application to the Board themselves or enlist the help of F&GNZ to help them with an application. The Board meets annually to decide how to allocate the money

generated, with funds prioritised to the most important projects. Money goes primarily to fencing and earthworks and is also used for planting native trees and spraying to control invasive species or overgrowth of raupo (P. Taylor, personal communication, 20 November 2000).

The Queen Elizabeth II National Trust (QEII Trust) is responsible under the Queen Elizabeth II National Trust Act 1977 for providing, protecting and enhancing open space that is important due to aesthetic, cultural, recreational, scientific or social values. The QEII Trust has registered 1,000 open space covenants, protecting over 40,000 hectares of land (QEII National Trust, 2002).

Open space covenants are the means by which privately owned open spaces are protected. Land subject to a covenant does not become the property of the QEII Trust. Covenants are registered against the title and are binding on the present and subsequent owners or leaseholders, usually in perpetuity. A covenant document defines the area to be covenanted, states the purpose of the protection and sets out activities that can and cannot be carried out in the covenant's area. The owner agrees, unless prior arrangement with the QEII Trust have been made, not to do things that would alter the appearance or condition of the land. The covenant document also specifies responsibilities for maintaining fencing and conditions of public access. Management of the area under covenant remains the responsibility of the leaseholder or owner. Management advice and assistance services are offered by the QEII Trust. The landholder is visited approximately every two years to discuss management of the covenant.

Lack of available funds has meant that the QEII Trust cannot meet the demand of landowners wanting to protect 'open space'. Additional funding has been received as a result of the *Biodiversity Strategy* in addition to the current operating revenue of approximately 2.8 million. This additional funding is likely to provide a conservation return.

When deciding which types of open spaces should get priority, consideration is given to whether that type of ecosystem is well represented in protected areas already. Wetlands usually receive high priority for covenant protection. Fencing is

usually required around wetland areas to stop damage from stock, etc. Survey and legal costs are provided for as well as 50% of the owners' overall costs.

The cost of fencing is a major expenditure of many preservation projects. Ten dollars a meter is the average fencing cost for a standard fence design; timber posts at 3 to 4 meter spacings, and 6 to 8 wires with attached battens (Taranaki Regional Council, 2002). Fencing costs can be used as an indicator of costs landowners incur when undertaking preservation projects of varying size. The cost of fencing 10 acres of native vegetation is \$8,900 and the cost of 20 acres is \$11,450. If 50% of costs are met by an environmental organisations this still leaves a landowner with a cost of \$4,450 to fence a 10 acres of native vegetation and \$5,725 for a 20 acres. These figures illustrate the large cost incurred when preserving native areas.

5.7 Effects of incentives offered on the case study site

The case study wetland is currently maintained for gamebird hunting and aesthetic benefits. Gamebird hunting and aesthetic benefits do not provide many incentives to undertake maintenance for conservation purposes. The control of raupo to ensure a large water area is the only maintenance undertaken. The preservation of an area for gamebird hunting is very different to preserving an area for conservation reasons. For instance there is no reason to preserve native plants in preference to exotic.

The landowners actively manage the level of the water in the wetland by draining in periods of high rainfall. The outflow drain is also made deeper at certain times of the year to alleviate flooding. Drainage of this sort, even if only seasonal, determines the extent of the wetland. Seasonal drainage has an especially large impact on surrounding ephemeral wetlands. Ephemeral wetlands are very vulnerable to decline because they are areas that can be easily put into production. No information has been disseminated to the case study landowners to improve the knowledge about ephemeral wetlands.

The case study landowners are aware of restrictions that are present in relation to the diversion of water. No monitoring of wetlands is undertaken in the Manawatu-Wanganui region by local government, so even if wetlands are altered or degraded no authority would be aware of any modification. If it were established through a

public complaint that the case study wetland had been drained or degraded it is unlikely that any legal action would be taken, so regulation has very little impact on land use decisions.

The land the wetland is situated on represents a huge opportunity cost to the landowner. The gamebird hunting and aesthetic benefits seem small when compared to the foregone profit production would bring. The case study landowner has chosen to maintain the wetland, but at an opportunity cost of approximately \$60,000 annually. The total funding available for the possible provision of incentives by the organisations identified is small. If the case study landowners were to undertake a preservation project in all incentive funding scenarios the case study landowners still have to pay for at least 50% of preservation costs. This represents a large financial cost.

The proposed government initiative of providing an Advisory Service and Condition Fund will be beneficial, as this will provide advice and funding for preservation and maintenance activities. The amount of money that has been allocated to the Advisory Service and Condition Fund is small when it is considered that these amounts will be divided between the 12 regions. It will depend on how the funding is prioritised if Omanuka lagoon receives any benefit from this initiative.

Increasing the funding available for the QEII Trust, Nature Heritage Fund and Nga Whenua Rahui will not affect the case study site as the landowner is reluctant to lose control of the area.

5.8 Implications of case study findings

The incentives offered by government authorities identified help encourage landowners to conserve natural areas. Usually up to half of the financial costs of preserving an area are provided. Landowner preferences towards preserving areas of bush and wetland vary considerably. This research identifies three types of landowner with varying conservation preferences: landowners that are strong conservationists, those that are casual conservationists and landowners that are non-conservationists.

Landowners who are strong conservationists receive the largest private benefit from native areas of bush and wetland, including aesthetic and recreational benefits. Strong conservationists are most likely to personally spend the necessary funds and labour required to preserve and maintain an area. They are most likely to undertake active conservation of their areas of indigenous vegetation regardless of whether they receive additional incentives. At present this group of landowners is using much of the incentive funding available for biodiversity projects. This is because they are active in establishing what funding assistance they are eligible for. This uses up scarce funding available for the provision of incentive measures. The proposed government initiatives of providing an Advisory Service, Condition Fund and increasing the funding available to increase the extent of formally protected areas will be utilised widely by strong conservationists, even though they may undertake preservation activities voluntarily. Strong conservationist preferences toward preserving biodiversity could be harnessed by information provision, which would inform landowners on the most appropriate conservation techniques.

Landowners that are casual conservationists have moderate preferences towards preservation of areas of biodiversity. Many neither actively manage nor destroy bush and wetland areas although lack of active management, often results in such areas being degraded. Many casual conservationists, when asked in the survey conducted (refer Chapter seven) why the native area on their land still exists, replied that 'it just was' and they had not really thought about preservation. The provision of incentives to this group of people would be the determinant of whether an area is preserved, left to be degraded or removed entirely. Casual conservationists probably would not actively seek information and financial support; therefore it is important that information about available funding be disseminated widely to include casual conservationists.

Current incentive provisions provided by government organisations of usually up to 50% of a projects cost leaves a large financial deficit that a landowner must augment. Many casual conservationists would not find the provision of up to 50% of costs sufficient to warrant the financial outlay of at least the other 50% that they themselves must provide. Labour costs are usually not included in the financial contribution made by the organisations, and this could further discourage

landowners, who again may not receive sufficient benefit from the preservation project to justify the labour time spent. Landowners with larger areas to conserve could also be financially constrained from carrying out a preservation project. The larger an area, the more expensive it is to conserve, the amount of labour hours also increase with size. Such incentive policies effectively discriminate against the preservation of larger wetland and bush areas. Arguably, these are the areas with the greatest conservation benefit. Many landowners do not receive adequate benefit from the preservation of wetland and bush areas to justify the financial outlay of preserving an area. Casual conservationists could be encouraged to conserve an area if a higher percentage of financial assistance was offered especially where larger areas of bush and wetland are concerned.

The proposed Biodiversity Advisory Service could potentially be very beneficial for casual conservationists in raising awareness, encouraging biodiversity conservation and practical advice. The Service once formed will need to be proactive about their services. If they rely on landowners actively seeking help this initiative may not encompass casual conservationists. The proposed Condition Fund also needs to be actively advocated to landowners. The money that has been allocated to the Condition Fund seems small when divided between 12 regions. The Fund will have ground level impacts but depending on its allocation method will be constrained by landowners still having to personally pay for much of the preservation costs. Funding for increasing formally protected areas will have a ground level impact.

General observations suggest there are a small yet significant proportion of landowners who are non-conservationists. If a wetland or bush area were situated on potentially productive and financially viable land, a non-conservationist would convert the area into production. Regulation exists to prevent conversion but, as mentioned earlier, little monitoring is undertaken and there are few prosecutions. Non-conservationists receive little, if any, personal benefit from areas of native vegetation and therefore have few or no personal incentives to preserve an area. Ephemeral wetlands are especially vulnerable to decline in such situations. In general, incentives available from the government organisations identified do not cater for this group of people. Usually non-conservationists are at the bottom of the

funding priority list. This is because the incentive grants available require significant landowner support both financially and time-wise.

Areas of native bush and wetland owned by non-conservationists are very vulnerable to decline. It is not known how many landowners are in this category and therefore how much land is vulnerable to loss. The enforcement of regulation for the destruction and loss of native areas is currently inadequate. If the benefits from placing an area under production outweigh the costs, then a non-conservationist landowner is likely to convert or degrade, aware that even if caught, prosecution is unlikely. The proposed government incentives offered will not change current non-conservationist actions.

The Government initiatives to stop biodiversity loss that affect landowner incentives on private land are a good start to making it more attractive for landowners to actively preserve areas of native vegetation. But the government's current and proposed policy is very reliant on landowners being not only supportive but actively involved in preservation and incurring personal expense. Where large areas of native bush/wetland are concerned, the provision of up to 50% of costs still leaves a potentially prohibitive cost to the landowner. If New Zealand takes a non-regulatory approach to biodiversity management then incentives need to be offered to make it in landowners' interests to conserve.

CHAPTER 6

REGIONAL COMPARISON

6.1 The West Coast

The West Coast region extends over a distance of 600km from Kahurangi Point in the north to Awarua in the south. It is bounded in the east by the Southern Alps and in the west by the Tasman Sea. The West Coast has a land area of 23,000 square kilometres. By area it is the third-largest region in New Zealand. Two-thirds of the region is mountainous and three-quarters of the land area consists of indigenous vegetation. The indigenous forest is characterised by podocarp, beech or other hardwoods. Wetland vegetation in the form of bogs and swamps is well represented on the West Coast (West Coast Regional Council, 2000). Native birds found in the forest include the owl, New Zealand falcon, native pigeon, tui, bellbird, silver eye, grey warbler, rifleman, robin, tom-tit, fantails, the flightless weka and kiwi. Native species of fish include native eels, smelt, bullies, torrent fish and of course whitebait (Grey District Council, 1999). The Crown administers a total of 91% of the region's land. This includes both Department of Conservation land (Ministry of Forestry, 1994) and former Timberland areas of indigenous forest.

The West Coast economy has historically been based on the utilisation of the region's natural resources, notably gold, timber and coal. According to the 2001 census, the resident population of the West Coast region was 30,303 (Statistics New Zealand, 2002). The West Coast has a relatively high unemployment rate and low socio-economic status. Due to only private land being rateable and the large amount of public land, only a small amount of the land area is fully or partly rateable. Due to the small rateable area, West Coast residents on the basis of regional rates paid per head of population are the highest rated in the country (West Coast Regional Council, 2000).

Of the West Coast's indigenous forest, 12.5% is situated on private land (Grey District Council, 1999). Evidence indicates that there is little removal of the indigenous forest taking place. This is partly due to the steepness of the slopes and the requirements of the Forest Amendment Act 1993 (Grey District Council, 1999), which regulates the milling of indigenous timber. There is also a strong conservation ethic that has been adopted by many farmers. Many West Coasters feel that areas of significant biodiversity on private land are only there because landowners have historically chosen to care for them.

Despite the conservation ethic held by West Coast landowners, pressures on biodiversity are still present. Pests and predators such as possums are seen as the biggest threat to biodiversity. Possums, as well as being predators of bird nests, have significantly modified most of the rata-kamati forests on the central West Coast. Other pressures on biodiversity include grazing effects of stock. Land development activities such as farming, forestry and mining also have a major impact on indigenous vegetation in some localities. There is also some evidence that pakihi is burned for grazing (West Coast Regional Council, 2000).

Protecting native vegetation on the Coast is a contentious issue. Many landowners see themselves as conservationists, but do not want to be told what to do by 'city folk' that do not understand the local issues of the West Coast. Since 91% of the region's land is under government control at present, West Coast people feel that this is more than adequate protection of the region's 'significant' biodiversity values. When regulatory controls are placed on private property, such as not being able to fell trees, many landowners see their land as being locked up. West Coast people feel that pests and weeds have the largest negative impact on biodiversity. Human impacts are not seen as needing regulatory control as they are not a priority threat.

The West Coast Regional Council does not offer any incentives to landowners to preserve biodiversity on private land. Funding is a major problem with other priority issues competing for funds (T. Morrison, personal communication, 14 November 2001). It is felt by West Coast local government that since 91% of the West Coast land area is locked up under Crown ownership, significant areas of vegetation are already being amply preserved (Grey District Council, 1999).

Currently the Regional Council takes a non-regulatory approach to controlling biodiversity. However, regional plans require resource consents for activities such as drainage of wetlands and earthworks. On any given resource consent application if an action affects significant areas of biodiversity, special expertise is brought in to look at the issue. Potentially negative effects on biodiversity are assessed through this process. Monitoring is undertaken for resource consents but staff shortages means that it is difficult to keep pace with demand. There is no pro-active service to regulate or monitor biodiversity resources on private land, although there is a complaint service run by the Regional Council. The general public can report negative effects on biodiversity, which are subsequently acted upon.

Identification of Significant Natural Areas (SNA) outside the conservation estate started about two years ago. This database uses satellite data imagery to identify vegetation areas and types. An ecologist was then employed to groundtruth trial areas. There was one trial area in each district to establish what vegetation is present. Funding for the Significant Natural Area project came from the national Sustainable Land Management Fund.

The West Coast Regional Council does not anticipate changing the biodiversity policies currently undertaken. The Regional Council is awaiting anticipated biodiversity provisions such as the NPS as this may require them to alter or change their planning documents. If the NPS requires specific measures to be taken, the West Coast Regional Council is obliged to follow suit. They feel if this happens it will have a negative impact on the work that they have recently undertaken in identifying the biodiversity resources that are situated on the West Coast. It is also thought that any regulatory approach that may be stipulated will have a negative effect on the relationship between local government and the public (T. Morrison, personal communication, 14 November 2001). It is also feared that landowners might remove areas of bush and wetland in anticipation of harsher regulatory controls. Such landowner reaction occurred when the Forests Act was amended in 1993.

6.2 Canterbury

Canterbury has the largest land area of all the regions in New Zealand. It extends from the Clarence River Catchment in the north to the Waitaki River in the south, from the coast in the east to the Main Divide in the west. Canterbury has a very diverse environment. This consists of the Kaikoura area, Banks Peninsula, the Canterbury Plains, Hill country, Intermontane Basins, High Country and Alpine areas. The estimated Canterbury population in 1996 was 494,700 (Statistics New Zealand, 2002).

Farming is currently the primary economic activity of the region. Historically pastoralists occupied areas close to the coast; in North Canterbury, on Banks Peninsula and inland from Timaru. The last large holding was taken up in 1864. Cattle were run on most stations. In 1851 there were 1,400 head of cattle in Canterbury. Forty years later this total had reached 82,058. By 1879 there were 1,525 flocks of sheep in the Canterbury district and they contained 3,252,964 animals, or 28% of the national total. Much of the tussock land on the plains had been ploughed and fenced by 1880. Burning was widely practised from the earliest days of European settlement to promote palatable new shoots (Cant & Kirkpatrick, 2001).

Over the last 20 years land use on the plains has intensified and diversified, with a trend from traditional mixed sheep and cropping farms to irrigated agriculture, particularly intensive dairy units and specialist crops such as corn and grapes. The combined pressures of past and present land use and the spreading of pests and weeds has resulted in significant changes in indigenous habitat and the loss of indigenous species.

Due to the historical use of the land there has been a transformation from forest and shrublands to tall tussock, short tussock or flat leafed species. Wetland areas have also been reduced significantly. Although greatly modified, Canterbury is still an important contributor to biodiversity. It encompasses alpine bogs, native grasslands, beech and podocarp forests, braided and spring-fed rivers, high-country and coastal lakes and wetlands, bays, harbours and estuaries. Several high country species

endemic to Canterbury, including the kahi (black stilt), scree skink and some of the native brooms, are now classified as threatened.

Humans are still impacting on biodiversity. Of particular concern are the effects of earthworks and vegetation clearance and the use of fire in the high country to ensure new pasture. DoC administers nearly 20% of Canterbury's land, alpine areas and native forests as the main areas protected by the conservation estate. Other habitats situated on private land such as indigenous grasslands, foothill and lowland forests and wetlands remain vulnerable to decline.

Environment Canterbury, the trade name of the Canterbury Regional Council has yet to establish an inventory of sites that are significant for biodiversity. The Regional Council formulated a proposed plan about two years ago, but the ecology and heritage chapter was never acted upon. In the interim district councils in the Canterbury constituency individually went out and began identifying areas of significant vegetation. Attempts to protect special habitats, ecosystems and landscapes in the district plans resulted in considerable rural indignation and concern, claiming a removal of property rights and denial of the right to farm. At the centre of this have been proposals to control land use in order to protect areas with special values. In some districts the issue has been fuelled by inadequate consultation with the rural community and the use of outdated data to identify special sites. The most heated opposition arose in the constituencies of Banks Peninsula and the Hurunui district.

Environment Canterbury does not feel it would be politic to repeat the process of identifying significant sites throughout the region. It is thought that this would create extreme negative impacts on the relationships between local government and landowners (F. Sullivan, personal communication, 13 November 2001). The Regional Council is currently concentrating on supporting initiatives that are already under way. In the future the Canterbury Regional Council hopes to identify areas of significant vegetation and significant habitats of indigenous fauna in conjunction with other agencies and individuals (F. Sullivan, personal communication, 13 November 2001)

Another important regional issue is the retirement of high country lands. High country lands were historically regarded as wastelands because of their unsuitability for agricultural use. Lessees of high-country pastoral lands have historically had secure but very constrained rights of use (limited to grazing), ownership of 'improvements' and trespass rights. Freeholding of pastoral leases is barred by statute. The Crown as landlord retains underlying ownership of the natural character of the land, of other resources and discretion to permit new uses and to regulate pastoral activities. Over the last 15 years the outstanding natural and recreational character of much of the high country has been recognised by government. For several decades it has been government policy to destock and then remove from leasehold Class VIII and severely eroded Class VII lands (lands considered unsuitable for grazing). The Crown Pastoral Land Act was passed by Parliament in 1998. Its main intention was to free up pastoral leases for free holding. Run holders are now able to freehold part of their land in return for surrendering certain tracts of land that are unsuitable for grazing or have high conservation values to the conservation estate (Public Access New Zealand Inc, 2001). Retirement of high-country land has meant that grazing pressures in tussock high country have been reduced.

The Environmental Enhancement Fund is an Environment Canterbury initiative that has been established for the purpose of recognising, encouraging and assisting voluntary projects that protect and enhance Canterbury's indigenous biodiversity. There are two categories that people can apply for: the recognition of a site and a contestable fund. The Environmental Enhancement Fund provides grants up to a maximum of \$5,000 annually for each project. The financial assistance is usually no more than 50% of a project's total costs. The Fund is allocated both to those that have very significant areas of vegetation and those that have smaller areas but are enthusiastic preservationists. 2001 is the first year that Environment Canterbury has had the Fund operational. The Environmental Enhancement Fund annually provides \$100,000 for conservation initiatives. Environment Canterbury had applications to the tune of \$350,000 in 2001. They are currently at the stage of deciding on the allocation of the Fund's money. In the future it is hoped that the Environmental Enhancement Fund will increase to \$150,000 per year and possibly more into the future (F. Sullivan, personal communication, 13 November, 2001).

The Regional Council also established a Resource Management Award. This Award was first operational in 1991. The Resource Management Award was established to promote sustainable management of natural and physical resources in the region. There are four categories of the Award: community/interest groups, commercial/industrial, professional/institutional and individuals. Awards are presented every second year.

The Canterbury Regional Council incorporates the use of regulation to some extent in its policy documents. The *Land and Vegetation Management Plan for Earthworks and Vegetation Clearance on the Kaikoura East Coast* and *The Land and Vegetation Management Plan for Earthworks and Vegetation Clearance for the Port Hills* are concerned in part with the protection of biodiversity values (Canterbury Regional Council, 1997a,b). They attempt to ensure that earthworks and vegetation clearance do not adversely affect the outstanding natural features or landscape areas of significant indigenous vegetation and significant habitats of indigenous fauna, mahinga kai areas or sites of importance to tangata whenua. As well as promoting sustainable land use, controls have been placed on earthworks and vegetation clearance. A consent must be gained if the intended activity is listed as a discretionary or non-complying activity. The *Proposed Land and Vegetation Management Regional Plan Land Management Fires on the Canterbury Hill and High Country* includes in its objectives that when burning is used as a land management tool areas of natural character are preserved (Canterbury Regional Council, 2000). Outstanding natural features or landscape, areas of significant habitats of indigenous fauna, heritage values and the habitats of fish are protected within policy documents.

The principle reason for controlling earthworks, vegetation clearance and burning is that the alternatives used in the past, such as education and voluntary codes of practice, have not proved sufficient on their own to ensure sustainable management. The Canterbury Regional Council feels that there needs to be a combination of voluntary and regulatory control methods employed to prevent adverse effects on the environment (Canterbury Regional Council, 1997a). Activities that are controlled activities or discretionary activities as specified in the regional plans are monitored

for compliance. However monitoring is a relatively low priority for the Council (F. Sullivan, personal communication, 13 November 2001).

6.3 The Waikato Region

The Waikato Region is the fourth-largest region in New Zealand. Situated in the central North Island, it covers a land area of approximately 25,000 square kilometres. In 1996, 350,125 people lived in the Waikato region. The Waikato economy is very dependent on agriculture, forestry, mining, energy and construction (Environment Waikato, 2000). The Waikato Region can be divided into four distinct topographical areas characterised by four different landscapes: The Taupo Volcanic Zone, Waikato Lowlands, Hauraki Plains and the Western and Central Hill Country and Eastern Ranges. There are no specific cultural or social issues in the Waikato at a regional level that affect biodiversity resources, resulting in a relatively good working relationship between Council workers and landowners.

Before European settlement, substantial areas of vegetation were already modified. Approximately 54% of the total area was in primary forest, 41% in fire-induced scrub, shrubland, and secondary forest, and 5% in wetland (Leathwick et al., 1995). Higher, wetter or less accessible areas consisted of mature kauri, beech or podocarp forest. Native dune vegetation was found on the coast and there were vast freshwater wetlands near the Lower Waikato River and Hauraki Plains. After the Land Wars of the 1860s, European settlers cleared and developed the land. From the 1880s, dairy farming was the main agricultural activity in the Waipa and Waikato areas. By the early 1900s most of the hill country was developed for farming. Native timber was logged north and west of Lake Taupo.

Today the Waikato region has 26% of its original native vegetation remaining. Native forest covers 20% of the region. Scrub, wetland, dune, geothermal and tussock vegetation make up the remaining native vegetation cover. Most of today's native vegetation occurs in hill country. In the lowland areas of the Waikato Region, only 18% of pre-European vegetation is left. Variation in the distribution of indigenous vegetation in relation to ecological districts is very marked. Some ecological districts are still dominated by indigenous vegetation e.g. Thames, Te Aroha, North Taranaki and Kainanana. In others the elimination of indigenous

vegetation has almost been complete, e.g. Hamilton, Hinuera, Waipa, Atiamuri and Kaingaroa. Areas dominated by intensive agricultural use have had the most clearance occur (Leathwick et al., 1995).

In the Waikato Region, 80% of the remaining stands of native vegetation are remnants of ten hectares or less. However, these remnants are important because some vegetation types, such as Kahikatea forest, remain only in small fragments. Forests that are not protected from stock continue to deteriorate under grazing pressure. Large areas of wetlands have been drained and converted to agriculture. Less than 10% of the indigenous wetlands of the Waikato Region remain (Environment Waikato, 2000).

Although agriculture has had a dramatic impact on the Waikato environment, there are still many endemic species including the Achey's frog, the Te Aroha and Moehau stag beetles, the Mercury Island tusked weta and the Mahoenui giant weta. Around 270,000ha of native vegetation in the Waikato Region, 45% of the total, is protected under the public conservation estate.

The main threats to the biodiversity resources left remaining include the effects of introduced pests, stock grazing and habitat loss. At present almost 75% of the Waikato's native forest is susceptible to damage from possums. Rats also have a devastating effect on forest species. There is little clearance of native forest but scrub and regenerating bush is often cleared for agricultural purposes. Some remnant areas have grazing pressure from lack of protection. In times of low feed and bad weather, stock are pressured to penetrate the vegetation that in many cases is not fenced. Drainage of wetlands is also an issue, especially ephemeral wetlands. Wetland areas are subject to a large number of threats within the region such as peat mining, development and modification of farmland, reclamation, lowering of water tables and stock access (Environment Waikato, 2000). Peat lakes are easily damaged by the over-drainage of neighbouring land.

Environment Waikato's Environmental Initiatives Fund assists organisations, agencies and individuals with environmental projects. The Fund provides a one-off grant to projects that directly enhance and/or benefit the environment or provide environmental education. There is a maximum of \$240,000 allocated to the Fund

each year with up to \$40,000 available for any one project. It is usual for Environment Waikato to contribute a third of the cost of a project, anywhere from \$2,000 to \$11,000. Any sized area of indigenous vegetation or wetland is considered for funding. A Farm Environment Award is also presented annually by the Farm Environment Award Trust with support from Environment Waikato and a number of farming industry sponsors. The purpose of the Award is to encourage sustainable agricultural practices.

Environment Waikato supports a number of initiatives that educate landowners about biodiversity and how to preserve and maintain it. The Sustainable Agricultural Education Strategy is a framework for farmers learning about the environment. The Strategy identifies the most important resource management issues for farmer education, prioritises them and proposes ideas to promote sustainable agriculture. The manual *A guide for owners and managers*, published in June 2000, contains guidelines on how to monitor the health of native forest areas in New Zealand. Plant and animal pests, native birds and invertebrates and vegetation health are included in the manual. Other educational initiatives include an environmental education group, provision of factsheets, stalls at field days, a website, media releases and advocacy through landcare groups.

Environment Waikato has identified 150 Key Ecological Sites in the Coromandel/Franklin and Waikato Districts. The Key Ecological Sites programme originated because of the need to co-ordinate pest control for the suppression of TB. Areas have been groundtruthed to ensure that they exist and are recorded accurately. At the time visits occurred landowners were not given management guidelines as there were none written. Environment Waikato is now looking at going back to visit the identified sites to provide management guidelines. However, many landowners have been told about the assistance available from the Regional Council to help maintain these areas. Many Key Ecological Sites are not fenced and therefore remain vulnerable to grazing stock. Environment Waikato is approaching the landowners of some of the 150 Key Ecological Sites to form partnerships to protect their bush or wetland areas. This protection includes control of plant and animal pests and fencing to exclude stock. When these Sites receive funding, a comprehensive management plan will be put in place. Environment Waikato has a

separate budget for Key Ecological Sites under the Environmental Initiatives Fund. Key Ecological Sites still receive the same amount of funding compared to other sites, but they have a more comprehensive management plan drawn up to ensure preservation of the area (K. Brightwell, P. Brown, C. Denyer, personal communication, 27 November 2001).

The majority of possum control activities are carried out in the southern half of the region. To correct this disparity, Environment Waikato supports four large community-initiated possum control schemes involving almost 169 landowners and covering 46,000 hectares. Two similar schemes involving 140 landowners and 16,000 hectares are currently being developed. Under these schemes Environment Waikato carries out initial possum control in large or inaccessible areas. The Regional Council offers 100% of the cost for the initial eradication of possums. A maintenance plan is then drawn up between the landowner and Environment Waikato; where the landowner agrees to carry out maintenance control to keep possum numbers low. Monitoring is undertaken to ensure that the landowner is doing what is specified in the plan. Fines are usually given if the landowner does not perform to what is agreed. Information and assistance are provided to landowners that are legally obliged to control environmental plant pests on their property. Over the last five years Environment Waikato and DoC carried out possum control operations targeting 45% of 'at-risk forested areas' (K. Brightwell, P. Brown, C. Denyer, personal communication, 27 November 2001).

The Waikato Regional Council uses both regulatory and non-regulatory methods to protect biodiversity. Native timber milling is restricted to sustainable harvest under the Forest Amendment Act 1993. Resource consents are required to clear any type of vegetation greater than one hectare within the West Coast or Waikato River catchments. Since the early 1990s Environment Waikato has granted consent to clear at least 1,060 hectares of native vegetation (mostly manuka scrub). In the Waikato Regional Plan, soil disturbance, roading, tracking and vegetation destruction are outlined controls on vegetation clearance. Environment Waikato also works with community groups and other management agencies to protect peat lakes by setting water levels for them. Environment Waikato monitors changes in the amount of vegetation cover and freshwater wetland in the Waikato region using

information from satellite photographs that make up the Land Cover Database. Most of the current data was collected in February and March 1996. Data for the Coromandel Peninsula and lower Hauraki Plains was collected in November 1994.

Environment Waikato has appointed a biodiversity advocacy manager and has set up a biodiversity team across the organisation. This team is looking at developing action plans to ensure that internal projects that Environment Waikato undertake consider the impacts on biodiversity. After this has been achieved, it is then hoped that organisational linkages throughout the community will be strengthened (K. Brightwell, P. Brown, C. Denyer, pers. comm., 27 November 2001).

6.4 Comparison

There are many geographical and ecological differences among the regions. The West Coast Region has large expanses of native vegetation compared with the other regions. The ratings base for the regions was also variable. Since the West Coast has a small population, the West Coast Regional Council has few funds available for conserving biodiversity and consequently no incentives are offered. Other localities have a larger ratings base which helps with providing finance with incentive projects.

The regional councils all have very different social conditions surrounding the protection of biodiversity. From the West Coast and Canterbury experience it is seen as important to have landowner co-operation when designing policy that will ultimately affect the property rights of landowners. Many landowners were adamant that they would not comply with involuntary restrictions placed on their land. This usually stemmed from their reluctance to being told what to do by government. The degree of regulatory control also varied regionally.

The Waikato Regional Council offers the most comprehensive assistance for landowners because there are funds available and in general a good relationship exists between the Council and landowners. Also there is maintenance assistance for preserving natural areas, which is pertinent to ensuring remnant survival. The incentives offered by the regional councils identified did not exceed more than 50% of the costs of a project.

It would make a difference to the incentives available if the case study was situated elsewhere. If in the Waikato region it would receive the largest incentives and support; if on the West Coast no regional council assistance would be offered. Omanuka Lagoon would probably not be considered very significant on the West Coast due to there being many other wetlands in better condition. The case study landowner could be influenced by the different degrees of incentives offered. Regardless of where the case study is situated, the landowners still have to contribute 50% or more towards the cost of preservation.

6.5 Discussion

Future plans by the majority of the regional councils vary only slightly from what is happening at present. The proposed National Policy Statement, when implemented, is not likely to have a significant impact on the preservation of biodiversity on private land. There are so many regional differences, both geographically and socially, that any prescriptions will have to be written in a very broad and general way to be all-inclusive. Such general prescriptions lack the ability to have any real effect as they filter through political and financial constraints at the regional level. Further, most of the regional councils already fit the guidelines of the proposed National Policy Statement. Politically, councils are reluctant to act with vigour in biodiversity conservation. If regional councils do have to change their current approach to biodiversity preservation, they fear this will have a negative impact on public relations. For instance, if regulatory approaches are made mandatory then the councils fear that this will alienate landowners. Unintended backlashes can also occur as a result of landowners ability to act pre-emptively to expected new regulations. When the Forests Act was implemented, many landowners' with large areas of native forest went out and milled large areas before the law was finalised. Many fear that such a situation could occur again if landowners are required to change their current approaches to biodiversity conservation.

The financial constraints are clear. Those councils with the most important and greatest amount of potential conservation land have the smallest rates base from which to fund biodiversity conservation (Binning, 2000). Most programs in New Zealand only have very modest funds available for incentives. Many of the funds

emphasise the need to fence off areas to prevent stock access. This is a crucial first step, but this action needs to be followed by area maintenance such as weed and pest control. If areas are not maintained they will deteriorate, especially if they are smaller remnant areas. It is important that areas are actively managed and enhanced if they are not going to eventually disappear.

CHAPTER SEVEN

SURVEY

7.1 Introduction

This section explores what would be required to change landowners' incentives to preserve and maintain biodiversity on their land up to the level specified in the *Biodiversity Strategy*. This was achieved by personally surveying 30 landowners. First the survey asked respondents to describe the characteristics of their farm and bush/wetland area. It was then established whether various incentives would induce landowners to improve their area of bush/wetland. The incentives hypothetically offered were intended to gauge what types of incentives would induce landowners to change their conservation preferences to allow for the conservation of bush and wetland that has been recognised as significant for biodiversity preservation. Incentives ranged from no assistance to the foregone opportunity cost of a native area if it were put into production. Landowners were asked about such incentives regarding their bush/wetland area using a five point rating scale. The scale included the options of do nothing, maintain area at current state, improve slightly, improve moderately and improve a lot.

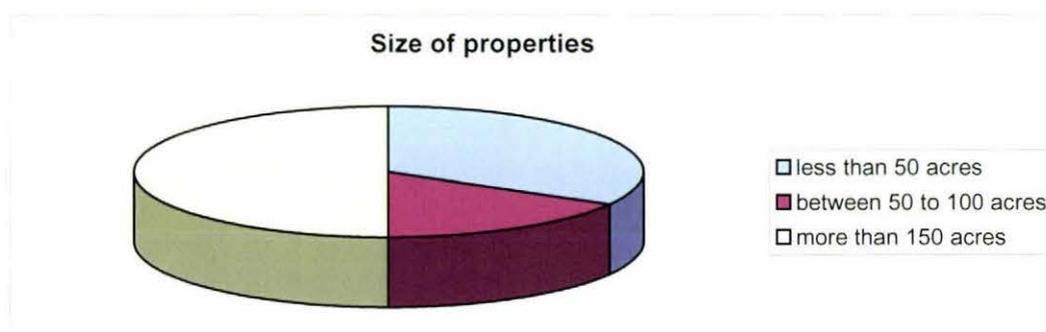
Respondents to the survey all owned land in the Horowhenua district, which is situated in the Manawatu-Wanganui region. The sample of landowners used in the survey had the characteristic of having either wetland or bush areas on their property. To obtain a list of names and addresses for the survey, the Horowhenua District Council (HDC) 'Natural Habitat Inventory' and 'Significant Natural Areas Schedule' were used. Listings on both schedules are voluntary. If a landowner did not want to have their bush/wetland area included in the schedules, these areas were excluded.

Using the list of addresses provided by the HDC schedules landowners were randomly chosen. Surveying was conducted during the months of February and March 2002 until thirty responses were obtained. Of the landowners visited, 15 were not home. These 15 people were all revisited at a later date. Two property owners when revisited were home and consequently answered the survey. Three houses that were visited had incorrect addresses and were therefore excluded from the sample. Seven landowners visited could not answer the survey at that time, but arrangements were made for the survey to be conducted at a later date. Four landowners visited did not want to participate. Of the landowners that were home when visited, 88% answered the survey either at that time or at a later date.

7.2 Characteristics of the native areas surveyed

The size and land uses of the properties identified were variable. Of the people interviewed, 33% had properties less than 50 acres in size. Seventeen percent of landowners had property sizes ranging between 50 and 100 acres and 50% of landowners had properties over 150 acres (refer Fig. 4). The sizes of the properties ranged from 4.1 acres to 2,963 acres. The most prominent land use of the properties was dairy and or grazing (83%). Of the landowners interviewed, 13% had lifestyle properties. Other land uses included forestry, deer and punga farming. All the respondents were the owners of the land on which the native area occurred. Two landowners had leased additional land for their farming operations.

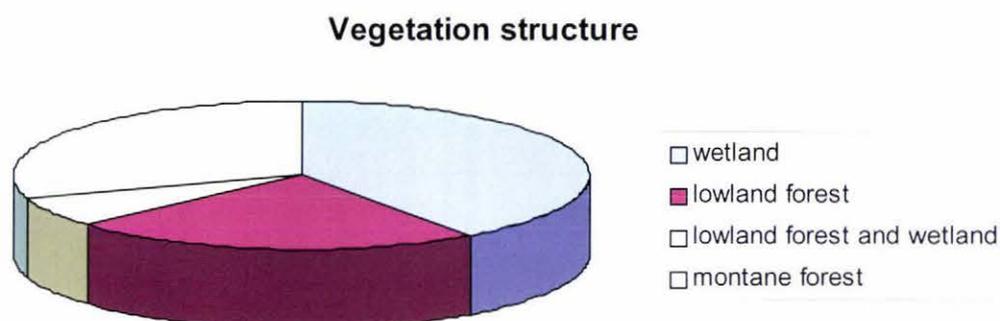
Figure 4:



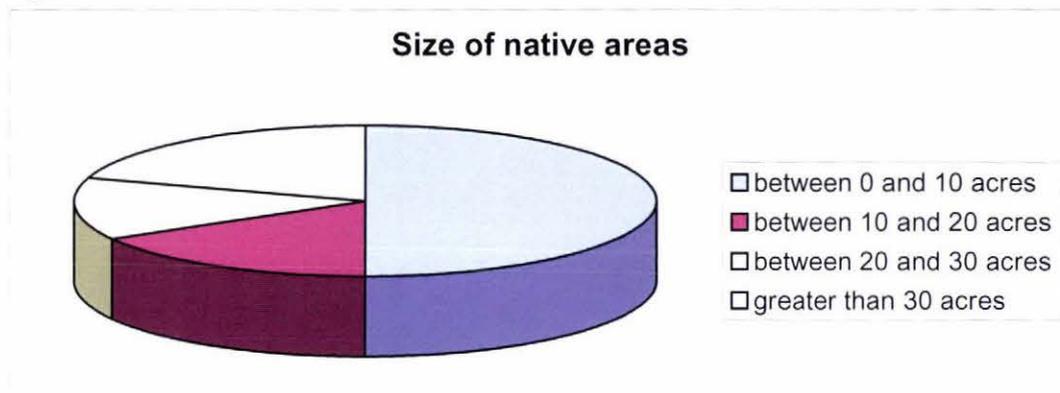
To enable analysis, the native vegetation structures that existed on the properties were divided into wetland, montane forest and lowland forest. The areas of wetland

or bush identified had very variant characteristics. Of the landowners interviewed, 40% had wetland areas which ranged in size from half an acre to 80 acres. Thirty percent of the landowners surveyed had lowland forest which ranged in size from three-quarters of an acre to 20 acres. Seven percent had areas that consisted of both lowland forest and wetland areas, which ranged between 10 and 20 acres. Twenty-three percent of landowners had montane forest ranging in size from 2 acres to 2,716 acres (refer Fig. 5). The types of fauna and flora identified in the native areas were also variant. Some areas contained a regionally endemic snail species, while others provided habitat for a broad range of native species that are considered more abundant.

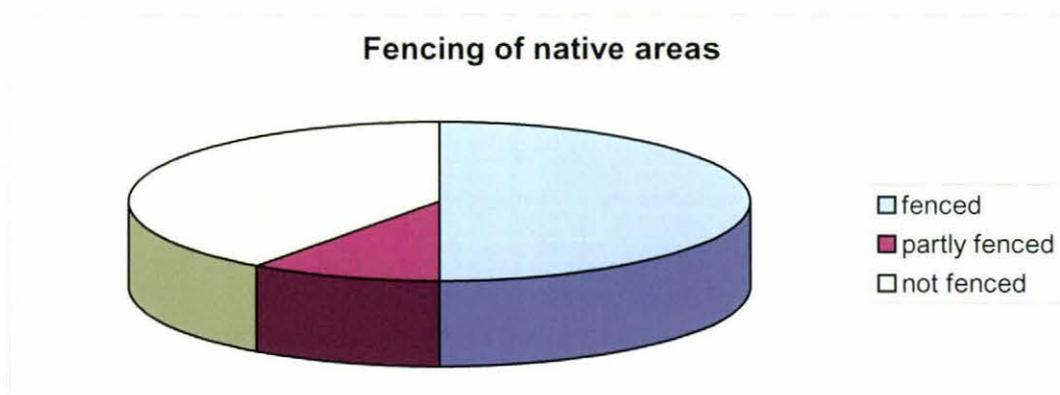
Figure 5:



In general, montane forest areas contained the largest quantities of native vegetation. This is due to montane forest usually being on land that is steep and inaccessible. Lowland native areas were usually remnants. This is due to these areas being situated on productive land and therefore facing pressure from agricultural uses. Overall half the people interviewed owned native areas less than 10 acres in size, 17% between 10 and 20 acres, 13% between 20 and 30 acres and 20% had areas greater than 30 acres (refer Fig. 6).

Figure 6:

Overall, 50% of the bush and wetland areas identified were fenced and 10% were partly fenced, although some of the fenced areas still had stock access (refer Fig. 7). Of the 12 wetland areas that were identified, five were fenced and five were not fenced, although one of the unfenced areas did not have stock access. Two of the wetland areas were partly fenced and had some stock access. Of the nine lowland forest areas, eight were fenced although three of the fenced areas still allowed stock access. One was partly fenced with some stock access. Both areas with both wetland and lowland forest were fenced. All seven montane forest areas were not fenced, although two of these areas did not have stock access due to the geographic characteristics of the property.

Figure 7:

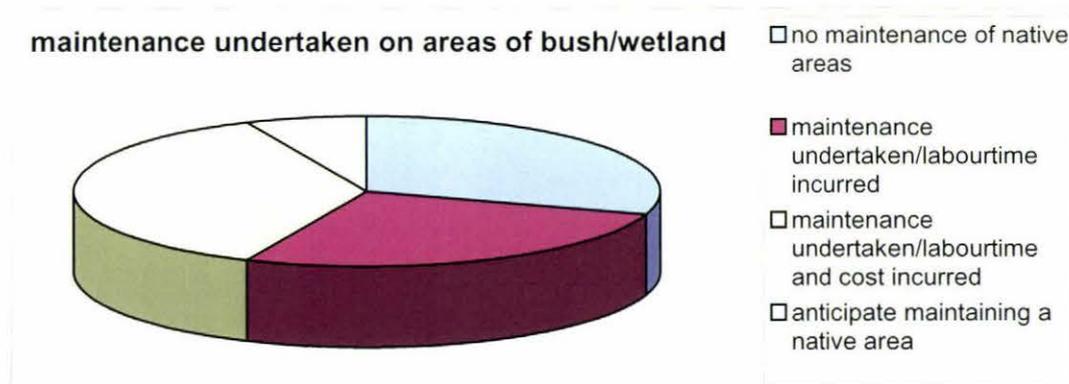
All areas with the exception of one wetland had pest and weed problems identified. Possums were the predominant pests for forest areas while excessive raupo was the predominant weed problem for wetland areas. Many landowners saw possums as the primary threat to their bush areas.

Nearly half (47%) of the landowners interviewed gained no benefit, other than aesthetic and conservation benefits, from preserving the bush/wetland areas. Twenty percent of the landowners interviewed received some benefit from duck-shooting and 13% received hunting benefits from forest areas. Other benefits recognised were leisure, education, research, tourism, punga farming and honey for beehives.

Of the landowners surveyed, 30% did not carry out any maintenance on their areas of bush/wetland. Twenty-seven percent spent time carrying out maintenance without incurring expenses. Many of the landowners that spent only time made minimal improvements in preservation and or maintenance of their areas of bush and wetland; for example, many landowners occasionally shot the odd possum, which would have only resulted in a small conservation benefit.

Thirty-seven percent of landowners spent both time and money when carrying out maintenance. Of the 11 landowners (37%) that incurred maintenance costs, seven spent between \$0 - \$2,500 and four spent between \$2,500 - \$ 5,000. Two of the landowners interviewed anticipated undertaking preservation projects but had not started at the time interviewed, and one of these landowners anticipated spending over \$10,000 (refer Fig. 8).

Figure 8:



Ninety percent of the bush/wetland areas were situated on land that had production potential. Conservation was the principal reason given why the bush/wetland areas still existed and had been not put into productive use. Forty-seven percent of landowners cited conservation as the only reason that land had not been converted, 17% cited conservation reasons and that the native area was too expensive to

remove, 13% cited conservation and sporting reasons. Other reasons included that the land had family ties, that conversion was not economically viable and the land had covenant agreements.

Ninety-seven percent of the native areas identified had no covenant agreements on them, although 27% were recognised on the HDC 'Significant Natural Areas Schedule'. Bush and wetland areas listed on the Schedule have more stringent rules relating to their preservation than other natural areas identified. One of the 30 native areas surveyed had a QEII covenant upon it. Ninety-three percent of the landowners interviewed to date had not been provided with any information or assistance by any government authority. One person had received a Manawatu-Wanganui Regional Council 'Environmental Enhancement Fund' and one person was currently negotiating to receive one.

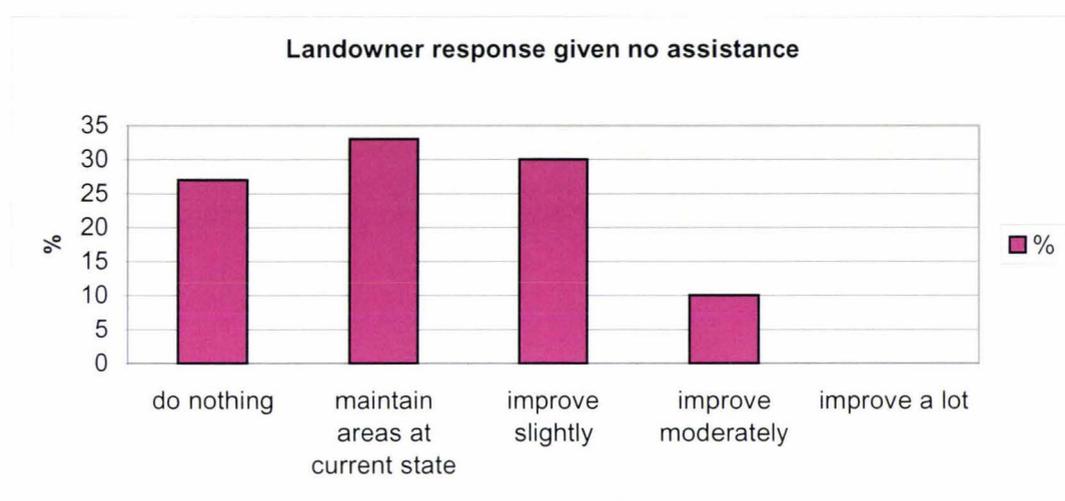
All the landowners interviewed had very different circumstances surrounding the preservation of their area of bush/wetland. The size of the area was seen as having a large impact on how a landowner maintained and managed an area. If an area were small, maintenance such as weeding and pest control could be more easily undertaken than if the area was large. One landowner of a large montane forest wanted to improve their forest area, but the cost of possum control for such a large area proved to be prohibitive. Most of the landowners received little benefit from native areas; the predominant reason that many still exist is conservation reasons. Conservation reasons alone in general were not sufficient for the landowners to undertake the maintenance activities which would allow for the native areas to be maintained and preserved. Many of the landowners thought that the maintenance activities undertaken did more than they actually did. Many of the native areas had stock access, which is very detrimental to native areas. There was a general lack of information about the importance of native areas, what was detrimental to their quality and what should be done to help improve them.

7.3 Incentives and their impact on landowner preferences

Given no assistance, which is the present reality for most landowners in the Horowhenua District, 27% of landowners would do nothing to improve their area of bush/wetland. Thirty-three percent of landowners would maintain their areas in their

current states. Thirty percent of landowners would improve their areas slightly, and 10% would improve moderately (refer Fig. 9). The respondents' ratings of what they would be likely to do given various incentives were dependent on how the landowner perceived the impact of their maintenance activities on the area of bush/wetland. For instance, some landowners thought that a small amount of weeding would maintain their bush/wetland area. This bias of landowners thinking that their maintenance activities improved the area more than it did in reality suggests that the native areas would not improve as much as was recorded.

Figure 9:



Twenty percent of the landowners interviewed would consider putting their bush/wetland area under a covenant. This 20% thought that a covenant would improve their bush/wetland areas to varying degrees. Many landowners were unsure about the ownership and control of an area if placed under a covenant. Most landowners wanted to maintain control of their land in order to carry out a full range of land use activities and therefore would not consider placing their native area under a covenant.

Forty-three percent of landowners thought that if they were provided with information about the biodiversity values present in their bush/wetland areas that this would encourage them to improve their native areas to varying degrees. Many landowners knew that their knowledge of their native area was limited and that they required information to guide them with preservation projects. Most of the landowners surveyed would not actively seek information, but would welcome any

information if supplied. Sixty percent of landowners thought that if training courses were provided on conservation techniques that this would encourage them to improve their area to varying degrees. Many landowners were unsure about what they could do to improve their native areas, but were open to practical suggestions if offered.

Thirty percent of landowners thought that if an award programme were established that recognised outstanding preservation projects that this would entice them to improve their bush/wetland areas to varying degrees. Thirty-seven percent of landowners thought that the provision of a landcare group with which to discuss environmental issues would encourage them to improve their bush/wetland areas.

Eighty percent of landowners thought that the provision of government-funded pest and weed control would improve their bush/wetland areas. Possum control was seen by many as most important in the preservation of their native areas. Larger areas of montane bush were thought to improve by the greatest margin if the government undertook pest control.

Sixty-seven percent of landowners thought that no rates on the areas of native vegetation would encourage them to improve their bush/wetland areas. Many landowners with small areas of bush/wetland (under 10 acres) did not think that rate relief would make much difference. Landowners with large areas to preserve would benefit the most from no rates. One landowner suggested that if there were no rates, any saving could potentially be spent on the maintenance of an area.

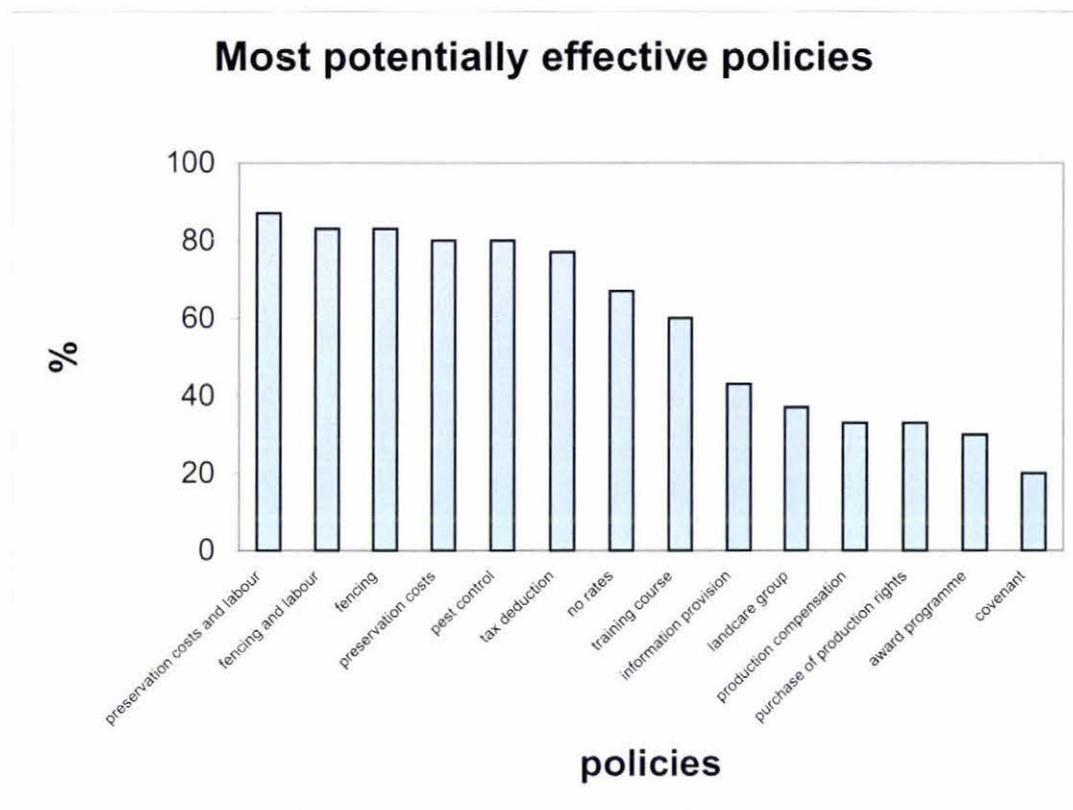
There were 12 native areas that had stock access and were either not fenced or only partly fenced. Eighty-three percent of these landowners replied that fencing costs paid for by government would encourage them to improve their areas of bush/wetland. Four of the 10 landowners that would like to receive fencing assistance would improve their bush/wetland area to a higher level if labour costs, were included. There appeared to be no relationship between the size of an area and the landowner's willingness to improve their native area if labour costs were provided. With the inclusion of labour costs the two landowners who responded that their area would not be improved by the offer of fencing would still not undertake fencing.

Eighty percent of landowners thought that funding from government for a preservation project would improve their area of bush/wetland. Eighty-seven percent of landowners thought that funding and labour for a preservation project would improve their bush/wetland area. Seventy-seven percent of landowners said that tax deductions in return for preserving and maintaining their area of bush/wetland would encourage them to improve their area of bush/wetland to varying degrees.

Thirty-three percent of landowners said that the payment of foregone production costs would help them to improve their bush/wetland area to varying degrees. The same eight (33%) landowners that saw foregone production costs improving their bush/wetland area saw annual compensation of loss of production as improving their areas of bush/wetland to varying degrees. Most landowners surveyed were hesitant about answering the question about foregone production rights because they were unsure if control of their land would be lost. The size of native areas did not appear to influence the responses to this question.

Fig. 10 shows the results of the survey diagrammatically. The results show that the provision of preservation costs and labour would be the most effective incentive if provided. The provision of fencing costs, pest control, tax deductions and no rates on native areas also would be effective if implemented in providing a large conservation outcome. Training courses, information provision, landcare groups, production compensation, the purchase of production rights and award programmes were less favoured. In general Fig. 10 shows that landowners preferred incentive policies that financially helped them to preserve their native areas. There is little difference between the first six policies preferred and the last four.

Figure 10:



7.4 Conclusions

Most landowners receive no benefit from their native area. Most of the landowners interviewed were preserving their areas of bush and wetland for conservation purposes, but did not have sufficient information and/or incentives available to them to preserve their bush/wetland in perpetuity. Most of the bush/wetland areas received little or no maintenance, and such areas are vulnerable to decline. If more incentives were offered directly to landowners, there would be an increase in preservation activity. Most of the landowners surveyed did not want payment for foregone opportunity cost of production, they just wanted incentive payments to enable the preservation of the native areas. This situation could differ with the location of native areas - for instance, West Coast landowners with vast areas of native bush/wetland might require foregone opportunity cost payments.

In general, the more incentives offered, the more landowners would improve their bush/wetland areas. At present the preservation of native areas is of secondary

importance to other day-to-day farm activities. If information and incentives were offered to landowners, this would increase interest in the bush/wetland areas and alter landowner preferences in favour of preservation. The most responsive potential incentives were if costs were paid for a preservation project and fencing costs for those areas that are unfenced.

Figure 10 shows that the government's plans to rely on largely voluntary preservation of native areas is unlikely to succeed. Surveyed Landowners wanted financial assistance to help with preservation costs and pest control. Many landowners would be reluctant to spend time and money preserving native areas with the last four policies identified. Landcare groups and award programs are currently offered as incentives by many regional councils. These policies are unfortunately not going to provide a large conservation return.

At present, landowners in the Horowhenua region are not getting offered information or assistance to help with the preservation and maintenance of their bush/wetland areas, a situation similar to many councils throughout New Zealand. Funds are available on a regional basis, such as the 'Environmental Enhancement Fund', but these are reliant on the notification of interest by the landowner. A lot of the landowners surveyed have not and will not actively seek information and assistance for their native area because preservation is not a priority matter. If information and assistance are not offered, then they would not ask for it. Most landowners surveyed did not know what preservation incentives they were entitled to at both a district and regional level. An information kit similar to that of 'Incentives available to assist private landowners to manage their wetlands for sustainability and conservation' (Bennett et al., 2002), which is currently being worked on under contract to Environment Australia, would be beneficial. This information kit includes details of why wetlands are important, incentive options available from both central and local government, information sources, conservation covenants and case studies of different incentives offered in practice. A similar information kit could be sent to all landowners with areas of bush and wetland on their land.

The comment most often made by landowners was that they wanted to maintain control of their native areas. Many landowners would not place an area under a

covenant, citing concerns about control and ownership. This is a concern, because the government is relying on a largely voluntary approach to preservation.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

8.1 Summary

Stage one of this research examines incentives available to landowners to preserve biodiversity on privately owned land and the effects of government policy on increasing these incentives. Three types of landowners are identified: strong conservationists, casual conservationists and non-conservationists. Through the use of a Manawatu-Wanganui case study, it is revealed that landowners receive little private benefit from preserving bush and wetland areas, although this depends on how conservation orientated they are. The more conservation-oriented they are, the more benefit they will receive. Through the case study, it is identified that usually up to half of the financial costs of preserving an area may be provided for by conservation organisations offering preservation incentives. Strong conservationists are considered most likely to take up assistance offered because they are the most active in establishing available assistance. Casual conservationists are indifferent to preserving their area of native bush/wetland. Many casual conservationists would not find the offer of up to 50 percent cost abatement sufficient to warrant the financial outlay that they themselves must provide. As labour costs are not provided by the organisations providing incentives, this could also be a deterrent to preservation. Where large areas of native bush/wetland are concerned, the provision of up to 50% of costs still leaves a potentially prohibitive cost to the landowner. The current incentives are probably inadequate for non-conservationists to change their land use preferences to become more conservation oriented. Since regulations are not monitored or enforced, non-conservationists might continue to degrade or destroy areas of bush/wetland. The proposed government initiatives are seen as being a good start to making it more attractive for landowners to actively preserve biodiversity, but more incentives will have to be offered if landowners are to maintain their areas of native vegetation. New Zealand landowners need to be active

stewards if bush and wetland areas are to be preserved. The current incentives and the ones proposed by government are reliant on landowners being not only supportive, but actively involved in preservation and incurring large personal expense. Additional incentives are needed to make it in a landowner's interest to actively maintain biodiversity.

Stage two makes comparison with the incentives available in the Manawatu-Wanganui region to those offered nationally. The West Coast, Canterbury and Waikato regions were visited and comparison made. All the regional councils visited have very different geographical, social and economic conditions surrounding the protection of biodiversity. Incentives offered also varied from none in some localities to being quite comprehensive in others. The incentives offered by the regional councils identified did not exceed 50% of the costs of a preservation project, which was similar to the Manawatu-Wanganui region. All regional councils identified were going to make few policy changes in the future with regards to incentive policies. Many will carry on with current approaches and in some cases expand funds available for landowner incentive grants. Most of the regional councils identified did not monitor or enforce rules pertaining to land uses affecting biodiversity. Their role in controlling negative landuse impacts on biodiversity needs to be strengthened if we are to prevent further habitat destruction. Many landowners of biodiversity areas are not aware of the regulations that surround their bush/wetland. Landowners need to be educated so they understand what they can and cannot do. There should be a focus on monitoring outcomes and maintaining minimum standards. Where regulation does not exist, it should be implemented so there is recourse in law. The proposed National Policy Statement when implemented is not seen as having a major impact on the preservation of biodiversity on private land. There are many regional differences; any prescriptions will have to be broadly written to be all-inclusive. Such general prescriptions will lose their effectiveness. Interorganisational breakdown between central government and the policy approach taken by some regional councils in regions with conflicting national and local interests need correction.

Section three uses a survey to examine the potential effects of policies on landowners' incentives to preserve and maintain biodiversity on their land. Most landowners surveyed receive little or no benefit from their native area; consequently,

most areas received little or no maintenance and such areas are vulnerable to decline. The survey clearly showed that the more incentives offered, the more landowners would undertake conservation activities to improve their native areas. Most of the landowners surveyed did not want payment for foregone opportunity costs of their area, only financial assistance to enable the preservation of the area, although this finding could differ in other regions. Many landowners surveyed would not actively seek assistance for preservation, but would accept it if it were offered. Many of the landowners surveyed would not consider placing their native area under a covenant, as they are unwilling to relinquish control over their land.

8.2 Limitations and areas for future research

This research has attempted to predict the likely outcome of the government's policy towards biodiversity with respect to privately owned land at the ground level. The factors affecting policy successes are also identified. The conclusions reached are based on the evidence obtained from the case study, regional comparison and survey. Since the *Biodiversity Strategy* is in its infancy, there is yet to be any formative analysis undertaken. Also, since the timeframe of the *Biodiversity Strategy* is lengthy, summative analysis has not been undertaken. This research has given the most likely result of the Strategy given the information available; further research is necessary to enable comparison of findings on the likely affect of the Strategy.

Time and financial constraints limit the scope of the case study. Only the main organisations that provided incentives are included. The case study is based on a wetland case study that may have different issues surrounding it than bush areas. A larger study of ground-level effects of biodiversity policy could lead to a more outcomes-based approach to policy implementation. More case studies of individual landowner incentives and disincentives to preserving native areas could be instructive in determining appropriate policy responses to biodiversity loss. The reasons behind landuse and management practices that impact on biodiversity could be further investigated.

In section two it would have been beneficial if all regions had been visited to be all-inclusive of the issues; although the regional councils that were chosen are considered representative. More research into what regional and district councils are

doing for biodiversity at present and what they intend to do into the future is an important area for further research as this will ultimately determine if biodiversity policy on private land will succeed. A study of the interorganizational linkages that currently exist and how co-ordination can be improved would improve the enacting of national policy.

A limitation of the survey is its small size. It would have been beneficial if the survey had been larger but because of time and financial constraints this was not possible. Each landowner surveyed has different circumstances surrounding the preservation of their bush/wetland areas. Due to circumstances being so variable, improvement is a relative value that is reliant on how the landowner views the quality of their bush/wetland area and also how they see their maintenance activities impacting the improvement of an area. If the survey had been larger, it might have been possible to group landowners according to bush/wetland quality and how much preservation improvement is required.

An extension of the survey would be beneficial in identifying the incentives needed to change landowner preferences to become more conservation oriented. Incentives that provide the best conservation returns could be identified. Such findings would enable government to identify incentives that will have the largest ground-level effect when offered.

8.3 Conclusions

If New Zealand is to halt the decline in biodiversity, it is important to preserve not only that found within the conservation estate but also on private land. There is much debate over how much and in what circumstances landowners should be paid to take action to conserve biodiversity. Some argue that the government has no obligation to pay people not to destroy a valuable public resource, while others feel that landowners that retain habitats generate a public good that should be compensated. A distinction can be drawn between landowners having a 'duty of care' for sustainable land management and providing a non-marketable 'public conservation service'. Landowners must bear some responsibility for biodiversity management but if policy-makers are to make ground-level improvements in preserving biodiversity on private land, the economic and social factors that are driving land-use and management practices must be corrected. Currently there is a

critical gap in providing incentives to share the cost of biodiversity management with private landowners. Many landowners receive no or little private benefit from conserving bush and wetland areas, but the conservation of such areas generates significant public benefit. If we are to preserve biodiversity, more incentives have to be offered in recognition of the public conservation service that is provided. Also, if New Zealand is to have even a modest improvement in its biodiversity preservation, then landowner preferences will have to be altered to become more conservation-oriented. In some circumstances, landowners with large areas of native vegetation simply cannot afford the cost of protecting and maintaining native areas without additional public support. The New Zealand Government's policy response to biodiversity loss is set out in the *Biodiversity Strategy* and *Biodiversity and Private Land* document. The policies identified that result in providing ground-level incentives for landowners account for only a small number of the policies outlined. There should be a greater focus on incentives and ground-level outcomes if any biodiversity policy is to be successful.

In conclusion, the government's response to biodiversity decline is a good start, but more incentives must be offered if landowners are to maintain their areas of native vegetation. The potency of government policy at central government level is not being transposed at ground level. This especially applies to landowners who are not conservation-minded or have large areas to conserve. In New Zealand, it is particularly important to gain landowner support because active maintenance is necessary. If New Zealand takes a non-regulatory approach to biodiversity management, then incentives must be offered to make it in the landowners' interests to conserve.

At an international level, a similar situation can be observed where poorer countries with large storehouses of biodiversity are not benefiting from biodiversity and so do not have adequate incentives to preserve it. At an international level, those who benefit from biodiversity must find some way of increasing landowner incentives if the decline of the world's biodiversity resources is going to be halted.

8.4 Recommendations

At both central and local government level there is a need to develop biodiversity policy that is outcome focused. Once a level is set for the quantity and quality of

biodiversity to be preserved, policy needs to reflect this intent. More research is needed into what affect specific policies will have on biodiversity.

The *Biodiversity Strategy* was written in response to the commitments made under the Convention on Biological Diversity. The Strategy should not only reflect the commitment on paper; there needs to be commitment in practice to achieving the goal of stopping biodiversity decline.

At present, funding for biodiversity does not correlate to the amount of biodiversity resources a region has. An area such as the West Coast, which contains large tracts of native vegetation, has minimal funding available for preservation projects. National funding initiatives need to take the distribution of biodiversity into consideration.

The proposed National Policy Statement (NPS) is not likely to have a significant impact on the preservation on private land. Focus should be made on guidance for local government on how best to enact biodiversity policy on private land.

At a regional level, a strengthening of relationships between local government and landowners is needed. Local government needs to become more active in landowner education. The majority of surveyed landowners are not aware of regulations that relate to areas of bush and wetland. Local government should provide landowners with clear information over what they can and can't do. Information should be provided to all landowners who have been recognised to have important biodiversity values on their land. Publications should include what landowners can do to help preserve their areas and what incentives they are entitled to by environmental organisations to help them preserve their areas. Relying on landowners to actively seek information about their wetland and bush areas will only attract landowners who are already strong conservationists.

Regulations to prevent biodiversity loss should be clearly defined and enforceable. Voluntary protection of biodiversity undertaken by some councils results in there being no recourse in law if a landowner blatantly destroys biodiversity values. Regulations should be monitored to ensure compliance.

Organisations that have provided landowners with preservation incentives in the past have done well in providing ground level results for biodiversity preservation.

Organisations that provide incentive grants to landowners should take into consideration the size of an area to be preserved. Provision on a percentage basis indirectly discriminates against landowners with larger areas to preserve. Providing assistance to casual conservationists should be prioritised, this might be the difference between an area being preserved and being left to degrade.

Overall there should be more financial assistance provided to landowners that have native areas on their land that need preserving. Funding should be concentrated on landowners that are casual conservationists as this will result in the largest conservation return.

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APPENDIX 1

Biodiversity outside public conservation lands: the Government's response

background

New Zealand's biodiversity is unique. Our network of public conservation lands is critical to protecting indigenous biodiversity. Other land, including much private land, also retains natural areas and habitats. Many types of areas are not well represented on public conservation lands, such as lowland and coastal forest remnants, lowland grasslands and wetlands. Some of these areas are formally protected while others are maintained by the day-to-day management decisions of landowners. However others remain at risk.

Despite the relatively large land area either formally or informally protected, our indigenous biodiversity is in decline. We need to increase our efforts on public conservation lands and we need to encourage and support more private landowners to be more biodiversity-aware in the way they manage land. In many ways, the skill and commitment of landowners is the key to the future of New Zealand's biodiversity outside public conservation lands.

The Government's response to the decline in biodiversity is set out, in broad terms, in the New Zealand Biodiversity Strategy, released in March 2000. At that time, a separate ministerial advisory committee was established to investigate and advise on how we can best achieve effective and sustainable management of biodiversity outside public conservation lands, on land such as farms, Maori land, urban backyards and council reserves.

The Ministerial Advisory Committee published a preliminary report called '*Bio-what?*' then consulted extensively and invited public submissions on that report. It completed its final report, including recommendations for action, in September 2000. The final report provides us with a framework to think about land management and conservation.

The Government responded to the report by drawing up the initiatives outlined below. Funds have been set aside in the New Zealand Biodiversity Strategy funding package, announced in the 2000/01 Budget, to implement a number of the initiatives.

The package of initiatives

Partnership is the key to the success of the initiatives in this package. Current partnerships between landowners, central and local government and the other groups and organisations involved in managing biodiversity need to be strengthened and new partnerships established if we are to make progress. Through these partnerships we can encourage and support more landowners make the transition to biodiversity-friendly land management.

At a central government level, both the Ministry for the Environment and the Department of Conservation are involved in implementing the package.

1.

a biodiversity advisory service

Experience has shown that where landowners have the knowledge and resources to deal with biodiversity issues, significant gains in biodiversity protection can be achieved. However, if landowners don't know what is at stake, and how biodiversity can be cost-effectively protected, the decline is likely to continue.

The Government is committed to the creation of a biodiversity advisory service for landowners to raise awareness, encourage biodiversity conservation, and to provide practical advice. A contestable fund will be established to ensure that the service is put in place in the most efficient and effective way possible. There will be regional variation in the way the fund is delivered, though this should

encourage collaboration between those who already provide advice and information on biodiversity and help to encourage integration with existing advisory programmes. Potential contenders include the QEII National Trust, the Landcare Trust, the Department of Conservation and regional and/or district councils – or some combination of these agencies.

A committee will be established to administer the fund for the advisory service, comprising representatives from the existing funding bodies (Nature Heritage Fund, Nga Whenua Rahui, QEII National Trust), local government, the Ministry for the Environment and the Department of Conservation.

The biodiversity advisory service will be funded through the \$3.6 million (over four years) that was set aside in the New Zealand Biodiversity Strategy funding package for education and advice.

Biodiversity Strategy funding spread for advisory service (GST inclusive)

2000/01	2001/02	2002/03	2003/04	2004/05	Total
0	\$404,000	\$811,000	\$1.001m	\$1.337m	\$3.6m

Note – this funding spread may be subject to change

2.

a fund aimed at improving the condition of biodiversity

Incentives and financial assistance play a critical role in encouraging landowners to conserve biodiversity, as well as leveraging local government activity in biodiversity management.

For over two decades central government has been providing funding to increase the extent of areas in formal protection. However, very little central government financial assistance has been available for ongoing management on privately owned land, such as pest and weed control, fencing and restoration projects. Very often the biggest threat to biodiversity comes from management challenges and not from deliberate destruction.

The provision of a new "condition fund" recognises this risk. It will seek to broaden the base of community effort in biodiversity management and will make specific provision for proposals by local government for local and regional programmes.

The same committee that will allocate the biodiversity advisory service funding will also allocate the condition fund.

The condition fund will be funded through the \$6.5 million (over four years) that was allocated in the New Zealand Biodiversity Strategy funding package for improving the condition of biodiversity on private land.

Biodiversity Strategy funding spread for the condition fund (GST inclusive)

2000/01	2001/02	2002/03	2003/04	2004/05	Total
0	\$250,000	\$1.5m	\$1.969m	\$2.813m	\$6.5m

Note – this funding spread may be subject to change



3.

Increased funding for existing protection mechanisms

The existing national programmes to assist landowners and increase the extent of formally protected areas are the Nature Heritage Fund, Nga Whenua Rahui, and the QEII National Trust covenanting programme. These three programmes are complementary and have all proven to be successful means of protecting biodiversity. However, their effectiveness has been restricted by a funding shortage.

The New Zealand Biodiversity Strategy funding package has set aside \$30.5 million over the five years to 2004/2005 to increase funding for these programmes.

Biodiversity Strategy funding spread for existing protection mechanisms (GST inclusive)

2000/01	2001/02	2002/03	2003/04	2004/05	Total
\$2.215m	\$3.14m	\$5.155m	\$8.875m	\$11.125m	\$30.5m

Note – this funding spread may be subject to change

4.

Enhancing capacity in local government by supporting pilot projects

The Government sees local government as a key player in addressing biodiversity issues outside public conservation lands. Local government already has core functions under the Resource Management Act, the Biosecurity Act and the Reserves Act.

To assist local government with these functions and to build an effective partnership, the Government is committed to enhancing local government capacity, and helping them to build capacity in their communities. It will do so by contributing to local government pilot projects aimed at establishing effective local governance arrangements and approaches to enhancing community participation.

(Other elements in the package may also contribute to enhancing capacity in local government.)

Local Government New Zealand has been invited to submit a proposal for a three-year funding programme beginning in 2000/2001.

5.

A national policy statement under the Resource Management Act

The Resource Management Act provides for the development of national policy statements (NPS) and requires that regional and district council policies must "not be inconsistent" with them. Also, when councils consider applications for resource consent they must "have regard" to any NPS.

The Government will develop an NPS on biodiversity in partnership with local government. This will be the first NPS of its kind. The New Zealand Coastal Policy Statement is also an NPS but is mandatory under the Act and has been in place since 1994.

The NPS will provide guidance on how councils should take account of biodiversity in exercising their Resource Management Act functions. The NPS will provide a national policy framework that emphasises the importance of biodiversity but will be sufficiently broad to allow the exercise of discretion by councils in determining the most appropriate and effective means to achieve the outcomes.

The Ministerial Advisory Committee consulted widely on an NPS and specific drafting was discussed. Many submitters took the opportunity to comment on this in submissions. The next stage of drafting will continue a consultative approach. Work will begin, by way of a joint central/local government drafting group, in the first half of 2001. Wider consultation and input from key interested groups, including landowner representatives, will form an integral part of this process.

Funding for an NPS and associated guidance was provided in the 2000/2001 budget.

6.
Clarification
in legislation of
the role of local
government in
biodiversity
conservation

While local government has functions directly relevant to biodiversity conservation, there are some matters of detail where the extent of responsibility is not clear. The Government will clarify the lead role of regional councils and the important role of territorial authorities in biodiversity conservation by amending the Resource Management Act.

The Government is also committed to further investigating biodiversity matters and the role of local government in the context of other policy processes already underway. This includes the Local Government Act review and the development of a national biosecurity strategy.

7.
a commitment
to further work
on governance
structures

A wide range of public and private organisations are currently involved in biodiversity and private land issues, projects and programmes. At present there is no specific coordination mechanism for these parties to share information, set priorities and coordinate actions.

The Government will investigate how to better coordinate action across levels of government.

further
information

Copies of the Ministerial Advisory Committee's preliminary report '*Bio-what?*', the summary of submissions received on *Bio-what?*, and the Committee's final report are available from the Ministry for the Environment's web site at www.mfe.govt.nz/about/publications.htm, or contact publications by calling (04) 917 7493, or email publications@mfe.govt.nz

For more information please contact Laura Hogg, Resource Management Group, phone (04) 917 7400.

Photographs courtesy of the QEII National Trust.



APPENDIX 2

Omanuka Lagoon plant species list

Scientific Name	Common Name	
<i>Alisma plantago-aquatica</i>	Water plantain	
<i>Azolla filiculoides</i>	Pacific azolla	native
<i>Bidens frondosa</i>	Beggars' tick	
<i>Blechnum minus</i>	Swamp kiokio	native
<i>Callitriche petriei</i>	Starwort	
<i>Calystegia sepium</i>	Pink bindweed	
<i>Carex maorica</i>	Sedge	
<i>Carex secta</i>	Niggerhead	endemic
<i>Carex virgata</i>	Swamp sedge	endemic
<i>Coprosma propinqua</i>	Mingimingi	endemic
<i>Coprosma tenuicaulis</i>	Swamp coposma	
<i>Cordyline australis</i>	Cabbage tree	native
<i>Cortaderia richardii</i>	Toetoe	endemic
<i>Cotula coronopifolia</i>	Bachelors' button	
<i>Cyperus ustulatus</i>	Giant umbrella sedge	endemic
<i>Dactylis glomerata</i>	Cocksfoot	
<i>Eleocharis actua</i>	Sharp spike sedge	
<i>Eleocharis sphacelata</i>	Bamboo spike sedge	native
<i>Epilobium pallidiflorum</i>	Swamp willowherb	
<i>Festuca arundinacea</i>	Tall fescue	
<i>Glyceria declinata</i>	Floating sweet grass	
<i>Glyceria fluitans</i>	Floating sweet grass	
<i>Gnaphalium involucratum</i>	Creeping cudweed	native
<i>Holcus lanatus</i>	Yorkshire fog	
<i>Hypolepis ambigua</i>	Brownsey or Chinnock	
<i>Juncus bufonius</i>	Toadrush	
<i>Juncus effusus</i>	Soft rush	

<i>Juncus pallidus</i>	Giant rush or leafless rush	native
<i>Isolepis prolifer</i>	Three square	
<i>Lemna minor</i>	Common duckweed	
<i>Limosella lineata</i>	Mudwort	
<i>Lotus peclunculatus</i>	Lotus	
<i>Lupinus luteus</i>	Yellow lupin	
<i>Lythrum hyssopifolia</i>	Hyssop loosestrife	
<i>Muehlenbeckia complexia</i>	Pohuehue	native
<i>Myosotis laxa</i>	Water forget-me-not	
<i>Myriophyllum propinquum</i>	Common water milfoil	
<i>Olearia</i>	Tree daisy	native
<i>Olearia virgata</i>	Twiggy tree daisy	
<i>Phormium tenax</i>	New Zealand flax	native
<i>Pinus radiata</i>	Radiata pine	
<i>Plantago major</i>	Broad-leaved plantain	
<i>Polygonum persicaria</i>	Willow weed	
<i>Potamogeton cheesemanii</i>	Red pondweed	native
<i>Potentilla anserinoides</i>	Silverweed	endemic
<i>Ranunculus</i>	Buttercup	
<i>Ranunculus sceleratus</i>	Celery-leaved buttercup	
<i>Ranunculus trichophyllus</i>	Water buttercup	
<i>Rorippa sylvestris</i>	Creeping yellow cress	
<i>Schoenoplectus (pugens or validus)</i>	Three square or lake clubrush	
<i>Stellaria media</i>	Chickweed	
<i>Typha orientalis Pres</i>	Raupo	native
<i>Ulmus</i>	Elm	
<i>Veronica anagallis-aquatica</i>	Water speedwell	
<i>Zantedeschia</i>	Arum lily	

(The species list is not all inclusive but does contain most plants of interest)

APPENDIX 3

Survey

Enhancing biodiversity preservation on privately owned land: An analysis of New Zealand's policy approach

Information Sheet

Hi my name is Helen Lane; I am currently undertaking a master's thesis at Massey University under the supervision of Dr Robert Alexander. Both our contact details are as below.

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This research investigates the factors affecting the success of the government's response to the decline of New Zealand's indigenous biodiversity on private land. The word biodiversity is used to describe areas of native bush and wetland. Part of this research determines how effective potential policy instruments may be in changing landowner incentives to preserve and maintain biodiversity on their land.

This survey will contribute to this research by establishing what assistance would be required for landowners to preserve and maintain native vegetation. If you participate in this survey the characteristics of your native bush or wetland will be discussed and incentives identified that would help you to preserve or maintain the area. This survey will take approximately 20 minutes to complete.

Your name was obtained from a District Council database. The information you give and any resulting publications from this survey is confidential. Survey information will only be used for the purposes of this research. No participant will be personally identified in the reporting of results and once used, the survey responses will be destroyed. I am not affiliated with any government organisation.

As a potential participant, your rights include:

- to decline to participate;
- to refuse to answer any particular questions;
- to withdraw from the study at any time;
- to ask any questions about the study at any time during participation;
- to provide information on the understanding that your name will not be used; and
- to be given access to a summary of the findings of the study when it is concluded.

Thank you, for your time and co-operation

**Enhancing biodiversity preservation on privately owned land:
An analysis of New Zealand's policy approach**

Consent Form

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researcher on the understanding that my name will not be used without my permission. (The information will only be used for this research and publications arising from this research project and no individual will be identified in the results).

I agree to participate in this study under the conditions set out in the Information Sheet.

Signed:.....

Name:.....

Date:.....

7. Is the bush/wetland fenced? circle
YES/NO
8. Do stock have access to the bush/wetland? YES/NO
9. If there are any weed or pest problems what are they?

10. Do you undertake any maintenance on the area of native bush/wetland?
Tick
- | | | | |
|---------------------------|---|---|--|
| Fencing | [|] | |
| Pest Control | [|] | |
| Planting of native plants | [|] | |
| Other, please specify | | | |
- _____
11. If you undertake maintenance how much do you spend annually?

12. How would you rate the current environmental quality of the bush/wetland area?
circle
Poor/Good/ Excellent
13. Is the native area used for anything other than for preservation purposes?
circle
- | | |
|-----------------------|--------|
| Duck shooting | YES/NO |
| Tourism | YES/NO |
| Hunting | YES/NO |
| Other, please specify | |
- _____
14. Is the stand of trees, bush or wetland on land that could be used for production?
YES/NO
15. Which of these reasons have prevented the conversion of this land to date?
 For example: tick
- | | | | |
|---------------------------|---|---|--|
| ➤ Conservation reasons | [|] | |
| ➤ Covenant agreement | [|] | |
| ➤ Sporting reasons | [|] | |
| ➤ Too expensive to remove | [|] | |
| ➤ Legal reasons | [|] | |

➤ **Other, please specify**

16. Is the area protected under a covenant or other type of conservation agreement?

circle
YES/NO

a) If yes, what type of covenant?

17. What regulations or agreements if any, control the use of your indigenous vegetation other than the Regional and District plans?

18. Do regulatory controls affect your land use decisions?

YES/NO

a) If yes, what would you do differently in their absence?

19. Have you been approached by any government authorities i.e. Department of Conservation or Regional Council that have offered to provide assistance or information to help maintain your native bush for conservation purposes.

circle
YES/NO

a) Assistance/information?

b) If yes, what type of assistance/information was offered?

c) Did you accept the assistance/information that was offered?

YES/NO

d) If yes, under what terms and conditions?

20. How conservation orientated would you rate yourself?

- B. Assistance to place under a covenant, survey and legal costs paid for.**
rating _____
- C. Information about the biodiversity present on your farm.**
rating _____
- D. Biodiversity training courses, practical knowledge on conservation techniques.**
rating _____
- E. Environmental award programme which identifies and rewards preservation projects.**
rating _____
- F. A Landcare group to be able to discuss environmental issues with others.**
rating _____
- G. Government to pay for and carry out pest control.**
rating _____
- H. No rates on the area of native vegetation.**
rating _____
- I. Fencing materials paid for by government.**
rating _____
- J. 100% of fencing costs including labour paid for by government.**
rating _____
- K. One off grant (to pay for cost of materials) for preservation project.**
rating _____
- L. One off grant to pay for cost of materials and labour costs for preservation project.**
rating _____
- M. Tax deductions in return for preserving biodiversity on land.**
rating _____
- N. One off purchase of production rights with prices based on current production values.**
rating _____

O. Annual compensation of loss of production if you enter into an agreement to manage and improve bush/wetland area for conservation goals.

rating _____

25. Would you like to receive a copy of the results of this survey when they are completed?

**Circle
YES/NO**

26. Any other comments on the issue of preserving biodiversity on private land?

--

APPENDIX 4

Omanuka Lagoon



APPENDIX 5

Foregone profit

Annual Profit for 50 acre case study area

Income – Expenses = Profit

\$597,572 - \$263011 = 334,561

(profit is divided by 6 as only 50 cows could be milked on the area)

2001 Horowhenua Area Dexcel Profit Watch Analysis for Owner Operator 20km of less from the coast

Average Payout \$/kg MS	5.23
Eff Dairy Ha	113
Maximum Cows Milked	304
Total Milksoilds	103637

FINANCIAL ANALYSIS	
Number of Farms in Group Average	6
Dairy Season Ending	2001
Dairy Farm Income	
Milk Payments	541886
Cow Sales	28662
Other Stock Sales	27673
Stock Purch's	3042
Other Dairy Income	2393
Total Dairy Income	597572
Dairy farm Expenses	
Cow Costs	
Wages	29245
Labour Adjustment	45019
Animal Health	16334
Herd Improv't	10167
Farm Dairy	6644
Electricity (Dairy Shed & Water)	6064
Electricity (irrigation)	0
Feed Costs	
Supplements Made	14814
Supplements Purchased	23303

Grazing Off: Weaners & Yearlings	25425
Grazing Off: wintering Cows	3200
Land Costs	
Crop & Regrassing	5263
Freight	1729
Fertiliser	36393
Weed & Pest	2690
Repair & Maintain	23860
Overheads	
Vehicles	15502
Admin	10910
Standing Charges	25707
RunOff lease	1037
RunOff Adjustment	1979
Other Expenses	1944
Total Farm Expenses	263011
Depreciation	20209

(Source Dexcel Limited. Hamilton)