
PRESIDENTIAL ADDRESS: SCIENCE, LAND MANAGEMENT, AND ACCOUNTABILITY

Summary: Colonising humans, first Polynesians and then Europeans, greatly altered the pre-human landscapes and biota of New Zealand. Their actions arose from a combination of pioneering necessity and ignorance. The process of attrition continues, despite the lessons of history, the greater body of knowledge now available, and the worldwide statistics on environmental degradation.

For many years several Government Departments have been active in converting the natural environment to commercial ends, either by their own actions or by substantial financial support to private individuals. Their effects are seldom called to account because they internalise their decisions and deceive politicians with partial advice on policy formation.

Scientists are asked to be accountable for their work, but accountability can also be demanded of the people to whom scientists give their information and advice. In terms of land management, the ultimate measure for ecologists is the healthy functioning of those parts of the Gondwanaland heritage which are in trust to New Zealand. On those terms the administrators have failed, by consistently ignoring or perverting the scientific information and the advice given to them.

The public perception of nature conservation is not sufficient of itself without the more fundamental scientific values embodied in the Gondwanaland concept. The present re-organisation of Departments may help to allow scientific insights a much greater role in land management.

Keywords: Endangered biota; land use; development; conservation; Gondwanaland; science and politics.

History of land management in New Zealand

When European colonists came to New Zealand they found very little useable wildlife to provide a living, compared with what others had discovered in the forests and plains of North America, Australia and Africa. So they introduced livestock, game, predators and familiar animals and plants from their homelands (Thomson, 1922; Wodzicki, 1950). They didn't realise that what was already around them was rather special, though admittedly often cryptic and unspectacular. Still less did they realise how vulnerable it was to herbivorous and carnivorous mammals nor how much had already been lost.

The landscape was not particularly diverse or productive compared with the Europe that many had come from. Obviously it needed 'developing', even to be pleasant to live in let alone to be productive. This pioneering/colonising activity suited the needs of the time and reflected the spirit of the age.

What the Europeans did was superimposed on changes already wrought by the native people. Within the limits of their technology, the fire stick and the digging stick, Polynesians had greatly modified the New Zealand landscape and biota over 800 or so years. They had exterminated the moas, some of which were the largest birds ever to have existed on earth, and removed 32% of the original forest. Europeans in their turn destroyed a further 38% of

forest (Molloy *et al.*, 1980). Both races made their greatest impact in the lowlands where soil fertility and climate were best both for forests and for farming. It was also in the lowlands that the greatest diversity of the native flora and fauna was to be found. In that contest for fertile space, 85% of tall lowland forest was removed, to be replaced by greatly modified communities and landscapes.

It was imperative for the early colonists to establish an economically sustainable nation. Biogeography and biological conservation did not, and could not, enter into account and such concepts were scarcely being articulated even by the scientists of the day. As for international obligations, and concepts such as spaceship earth, sinking arks, Gondwanaland life-rafts - these were all a long time in the future. We can, then, forgive the early colonists for much of that destruction. Their actions sprang primarily from their immediate needs and perceptions, rather than those of biological science, and were conducted without the knowledge we have today.

We, their successors have more knowledge and also hindsight with which to judge what they bequeathed. But as we do so, we should also ask how we ourselves will fare when our record is likewise placed in the dock by our successors. We cannot, to anything like the same extent, plead ignorance. Today

we have a great deal of information about New Zealand species and communities, and many facts and theoretical constructs about biogeography, evolution, and the structure and functioning of ecosystems. Nor is our perspective now limited to New Zealand. Facts on the loss, reduction, simplification, and replacement of the world's ecosystems, and predictions for the future, are now documented very clearly (Myers, 1985).

Some world statistics and conclusions on diminishing biological resources (from Myers, 1985).

Forest losses

Madagascar has lost 90% of its forest

Ecuador has lost 50% of its forest

[New Zealand has lost 80% of its forest]

In the next few decades _ of plant families will vanish *and* so will many animals dependent on them

Worldwide, extinction rates are 400 times greater than the long-term average

Speciation is not fast enough to offset extinction losses

Evolution is "in suspense"

Parks become isolated like islands

If 10% of an original area is reserved, only 50% of species will be saved long-term

Even a 400 sq mile tropical forest reserve will lose _ to _ of species in a few thousand years

It is no longer an "eco-freak" phenomenon
- some Govern-ents are realising the danger.

It would be nice to say that with the advantage of the historical record and so much more knowledge, New Zealand is now making a better job of managing the land and its natural resources. But is that so?

Present land management

The detrimental impact of humans was well recognised and articulated by the time of the great naturalist Guthrie-Smith. He himself was not necessarily a pivotal figure, but certainly by the turn of the century the special nature of New Zealand's flora and fauna had been well expressed by people like him, and the loss it was suffering had become generally apparent. And in his generation, the first of the country's National Parks had been designated.

It is often said that New Zealand emerged from its colonial period richly endowed with parks and reserves for the conservation of its flora, fauna and landscapes. Somewhere between 10% and 12% of land area is usually quoted (Molloy *et al.*, 1980), but

this figure gives a sense of security which is not at all justified. Much of our park area is in the alpine and upland zone and would be reserved anyway to protect watersheds. It is fine scenery and good for recreation but is, biologically, much less rich than the lowlands below about 300 m. In the North Island, 57% of the land surface lies in th lowland zone yet the percentage area of our parks below 300 m is only 4.4%. Of the whole of the lowland zone of the North Island the amount which is in parks or reserves is only 1%, and that is mostly forest. In the South Island, short tussock grassland is very characteristic of much of the Otago landscape. Yet there are less than 2000 hectares of the original million or so in any form of reservation, and very little of it is unmodified. In other words, our parks and reserves system is not biologically representative; and although it appears to 'lock up' large areas, it consists almost entirely of land with recreational and scenic value rather than productive potential (Molloy *et al.*, 1980, Ch.4).

In this long, narTow, mountainous country, there is great diversity of topography, climate, soils, fertility and, hence, of biological expression. Although this diversity in a small compass is marketed as an attraction to tourists, it is not reflected in our system of reserved wild places. To be sure, there have been recent initiatives, such as the Protected Natural Areas Programme, to get more representativeness. They are to be applauded and encouraged but the hard fact remains that even a modest 10% regional representation will be impossible to achieve for such seemingly commonplace communities as puriri forest, kahikatea forest, totara forest, red tussock land, flax swamp, matagouri scrubland, dunelands and many types of wetlands. Quite apart from the continuing loss of local genetic variability in the flora, and of the fauna which is dependent on it, this often means an irreversible loss of scenic values.

It is easy to continue saying that all is bad. Not all is bad. We have an impressive register of Parks and Reserves (Department of Lands and Survey, 1984). These areas may not be representative but they constitute a sound starting point. A few other examples of cumulative good would be the removal of merino sheep from much South Island high country; the present efforts to create more high country reserves during the change from leasehold to freehold tenure; the many forest parks and ecological reserves; the wonderful work done by the Queen Elizabeth II Trust in the rural landscape; improved statutory safeguards and impact reporting; the fact that there is a Red Data Book chronicling the parlous state of our fauna and flora; embryonic conventions on wetlands;

the establishment of a Biological Resources Centre; and the beginnings of a Protected Natural Areas Programme.

One could ask, therefore, and a bemused lay public does, if there really is cause for concern nowadays or whether ecologists complain simply out of habit and perversity. Unfortunately the public sees only the conservation battles rather than the principles behind them. There are many accounts of these battles and, although I will describe some by way of illustration, my main purpose is to explore why they are still being fought, and so often lost.

An example of where the most obvious lessons seem not to have been learned, is seen in the continuing pressure for introducing alien mammals. Mink have been successfully resisted, chinchillas are being officially evaluated now, alpacas are proposed, and there is a long list including freshwater fish and alligators. These introductions are promoted on commercial grounds, with scant official examination of the economic justification or of the possible consequences when the animals escape, as they invariably do. Animal health (i.e. of farm animals), not the security of native biota, is still the major consideration governing such introductions. Yet there is a huge literature on the sensitivity of the New Zealand flora and fauna to alien animals, and the country is a celebrated case-study of past misjudgements. There should by now be enough awareness amongst the administrators and politicians to resist on principle such proposals unless there is absolutely no question of risk. It seems quite unnecessary to argue each and every case on its individual merits from basic principles. New Zealand has the toughest agricultural quarantine regulations in the world to prevent contamination of its national herds and plants. Why cannot a similarly simple and strictly administered policy be applied to the introduction of alien biota for protecting what is left of the unique native flora and fauna?

A more complex example is the general topic of land and resource management. Here are a few examples, some of which will be amplified later. Native forest is still being removed even in the lowlands; wetlands are still being drained; land which is best suited to native forest or tussock is coerced into pasture or exotic forest; we have had a poorly funded Wildlife Service placed in a totally inappropriate non-scientific department and without even the computing facilities to manage its own survey data; research and management is fragmented; and there is administrative confusion because conservation and development compete within and between departments of state.

The tragedy of the forests is a familiar story which has received much public attention (Searle, 1975). What is not so well appreciated is the continuing loss of the 'minor' natural communities which also play a big part in preserving landscape and biota. Wetlands are a prime example. 90% of the wetland areas that existed in 1840 have now been removed - about 230,000 ha. Some regions retain only 1 % of their wetlands, and even those that remain are in peril because water table levels are disturbed by surrounding land uses. Because of these losses plants, waterfowl, swamp birds, and native frogs are listed as endangered locally or nationally (NWASCA, 1983). Yet in 1984 wetland draining received \$2.9 m in subsidies from government agencies (Royal Forest and Bird Protection Society, 1985).

In 1983 the Wildlife Service re-surveyed habitats in Northland that it had surveyed in 1978 (Anderson *et al.*, 1984). In that 5 year interval, forest and shrubland was reduced by 7.5%, freshwater wetland by 14.4%, and coastal/estuary areas by 1.8%. Two sites classed as "outstanding" in 1978, because they contained kiwi and native frogs, were reduced in area by 75%. A range of wetland sites classed as "high to outstanding", were reduced by 21%. In all, 43% of useful wildlife sites were reduced or lost over the 5 years. Most of the wetlands were lost through the activity of Catchment Boards subsidised by the central Government. These Northland areas happen to have been surveyed in some detail. The same trends are recognised in Waikato, Otago and Southland, even though actual statistics are not available.

Many of these statistics can be gleaned only from what the State agencies are doing, and it is almost impossible to assess numerically what is happening to land in private hands. Regrettably, in terms of national strategy, there is very little legislative power over what in our society is a sacred preserve -privately owned and Maori land. For example, in Hawkes Bay one private forestry company has in the last 5 years cleared for direct conversion to pines about 10,000 ha of tall, podocarp-beech forest containing relict kiwi populations. This is in a part of the country which has lost an enormous proportion of its woody vegetation and has scant representation in reserved tenure.

New Zealand is such a sophisticated and wealthy country that it should not be contributing in these varied ways to the world's statistics on environmental degradation. Our numerical contribution to those losses may not be very great in species and hectares, but qualitatively our contribution is very significant. In our own proportionate way we have exceeded the world trend in the loss of species and are doing little

to halt or to redress it. We know that much of the flora and fauna of New Zealand exists nowhere else; and that it cannot be re-established from a nearby continent as it can for our parental model, Great Britain. Yet we continue to squander it despite the historical lessons and the world's statistics to guide us. I will now explore the institutional systems and personal motives that make this possible, and indeed drive it.

Development incentives

Many private landowners can, and do, tend to behave as new pioneers towards the remaining bush and certainly towards scrubland, wetlands and many other bits of unproductive land on the property. This attitude is often based on an urge for subduing what is still seen to be 'wilderness' rather than on appropriate land use. To assist this there is the spray pack, aircraft, bulldozer, and chainsaw - a ready technology which tends to inculcate a short-term philosophy, rather than a long-term, sustained, one. The motto is "It can be done, therefore it shall be done". This may for a while be good business practice, but often it is not good biological or landscape practice. Business 'needs' (that is commercial fashion) can change overnight as indeed they are now doing; but the products of co-evolution between soil, climate, plants, and animals can not.

Quite apart from the technology there are advisory services and many financial and fiscal support systems to help individuals to 'develop' marginal land. Farmers and forestry companies have long had the benefit of incentives and loans, administered through departments of state such as Lands and Survey, Forest Service, Ministry of Agriculture and Fisheries, and Rural Bank. Between 1978 and 1982 the Rural Bank disbursed \$7.7 m for 'developing' 30,361 ha of bush; and in the same period some 367,000 ha of scrub and brush weed was cleared, and over 500,000 ha of open country (92% of it was South Island tussock) was drained, ploughed and sown (McSweeney, 1984). Some of the financial incentives for this activity had the most extraordinarily benign terms for the borrower. For example, the Land Development Encouragement Loans (LDELs which have been discontinued), were effectively interest-free and only half of the capital sum had to be repaid if the landowner completed the development 'satisfactorily' (pers. comm. Rural Bank, 1985).

I am not arguing against capital support to establish and maintain land-based industries. But I am saying that a time has to come for questioning

whether continuing 'development' is appropriate in terms of good land use, or compatible with conservation of distinctive natural landscapes and communities. On quite different grounds a recent Treasury Discussion Paper said:

"It is often claimed that it is in the national interest to get more young farmers onto the land, and concessionary settlement loans and/or stock loans for landless farmers are seen as a convenient way of achieving this. *The benefits of settling more young farmers on farms are often not stated explicitly.* However, it seems that the perceived benefits include increases in efficiency, giving young farmers the access to farm ownership that they are 'entitled' to, and a notion that society as a whole derives some benefit from a certain number of young farmers each year settling on a farm or having access to farm ownership. The same assumptions do not seem to be made however, in respect of assistance to most other sectors of the economy where small businesses operate." (N.Z. Treasury, 1984) (My italics).

If agricultural benefits are not stated explicitly, then nor are the costs to present and future Society of the lost natural biota and landscape.

Some of the land being developed by today's neo-pioneers is so marginal that it is being cleared for the third time round and the economic return, in real unsubsidised terms, must be illusory. In many areas, again using Hawkes Bay as an example, this woody vegetation (often scrubland) represents the last extensive refuges on lowland hill country for native communities. Work by my group in Ecology Division is showing that even this disparaged scrub has great value for native animals, and enormous potential if left to develop through to forest. The truth of this is illustrated on Kapiti Island. Early in the century it was predominantly farmland and scrub. Today Kapiti is a wild sanctuary where endangered birds are liberated into the developing forest.

In my view, several generations of scientists have now provided enough information about the history of the New Zealand natural environment and biota for the process of impoverishment to be stopped. However, it is continued and fostered, not just by private landholders driven by an understandable, if outmoded, personal pioneering challenge, but by Departments of State. These include Forest Service, Lands and Survey, Rural Bank, Ministry of Agriculture and Fisheries, and Department of Scientific and Industrial Research. They are all,

actively or tacitly, maintaining the impetus of the assault on the New Zealand natural environment and the philosophy implicit in that. Their actions help to sustain what I would call 'the colonial imperative'. These departments are led by educated, technically competent people who have generally spent their careers alongside professional opinion and advancing knowledge. As public servants they claim to be the servants of politicians. Yet clearly, they are not simply servants obediently implementing policies laid down by politicians, but are the very advisers to successive, untutored, politicians on the values and perspectives that should underlie these policies. Is it therefore to the politicians or to their advisers that the charge must be addressed?

Conservation philosophy and advocacy

Imagine if a committee had sat in about 1850 to plan the course of the country's land development, and had issued the following management plan:

"This country must be developed to make it productive and worth living in. To achieve that we will clear away 85% of the lowland forest, drain 90% of the wetlands, and introduce some interesting mammals even at the risk of them eating out the vegetation and preying on the native birds, lizards, and invertebrates. We will burn and graze the tussock grasslands, and run merinos on the mountains until the shingle is too loose even for them to climb. Most of this native forest may as well be replaced with overseas pine trees. For scenic purposes, and to keep a few of the more attractive animals, we will create parks and reserves but not at the sacrifice of any productive lowland country." And so one could go on.

I like to think that such a declaration would have caused outrage or at least misgivings; and an uncompromising stand against anything so extreme. Yet, as we have seen above, that has been the *de facto* policy, practised not as one gross act but by degrees over the last 150 years. New Zealanders are still destroying and reducing the remnants of the native landscape and biota, denying the validity of a rational decision to stop it, and giving it social respectability with institutionalised financial support. Because it has been done and is still being done, piecemeal, by a variety of public and private agencies, it proceeds largely unperceived. No wonder then that the belated sense of outrage and uncompromising stand shown today by action groups are interpreted as utterly unreasonable. Ironically, a cause that goes back

before the birth of the nation, and which should attract widespread sympathy and support is often misunderstood, misrepresented and discredited.

Although it is the action groups that attract well deserved attention, some of the best scientists in New Zealand have also argued for many years that the attrition of native biota should be halted. Prominent among many have been the two Knights of conservation, Sir Charles Fleming and the late Sir Robert Falla; and Professor John Salmon. They have between them produced many articles and speeches to professional colleagues, administrators, politicians, and lay public. Sir Robert, defender of the great wetland areas of New Zealand (Falla, 1975) failed to prevent the huge losses to them over his lifetime or since. Fleming, in a plea for the forests, wrote his essay "Mammon on the Mamaku" (Fleming, 1969). Yet we look at the Mamaku and other lowland native forest areas today, and lament what is still happening to them, both aesthetically and scientifically in the name of commerce. Salmon (1960) in his book 'Heritage Destroyed' described the many sacrifices that farming, hydro development and industry were bringing. Falla, Fleming and Salmon spoke as experienced, internationally respected scientists. They were eloquent advocates and well connected in the professional and political spectrum. But against unheeding institutions even they failed to divert the colonial imperative in the overall management of the New Zealand landscape and biota.

Professional scientists are not the only ones to plead. The resilient advocacy of interest groups, like the Royal Forest and Bird Protection Society, Native Forest Action Council, and Coalition for Open Government will be a matter for pride when history comes to be written. They have occupied a very special place in bringing information to the public without the intercession, indeed often despite the intercession, of departmental heads. Their advocacy has stimulated some of the thinking in the new Ministry of the Environment and the concept of a Nature Conservancy (State Services Commission, 1985).

Conservation is of course only one end of the spectrum of options in land management. Ecologists must acknowledge that many people are enthusiastic about continued land development even if they themselves are not. We tend to see, and deplore, the loss of native biota that follows in its train rather than applaud the supposed or real economic returns. But to sharpen the issue I would like to ask the rather irreligious question of whether conservation of biota, native or otherwise, matters anyway and if so why.

Despite the losses of huge areas of natural vegetation, many species, and countless individual animals and plants, New Zealand has not suffered an ecological catastrophe. We manage to live quite well without huias, the Stephens Island wren, native thrush, and moas; and I've no doubt at all that the nation would soldier on bravely without black robins, takahe, kokako, kakapo, yellowheads, little spotted kiwi, kaka beak, native brooms, kauri, kahikatea, and a good deal more (see Appendix 1 for scientific names). Does it matter then, in terms of human life support systems? Probably not or at least, not yet in any measurable sense. Does it therefore matter on other grounds? I do not know of any clinching argument among the many, but I suggest that almost everyone to some degree would say "yes". They would use as their grounds matters to do with variety, the human spirit, some sort of vaguely articulated responsibility to other forms of life, and international obligation to make sure that the world maintains biological diversity.

The argument for a conservation ethic is thus very much a mixture of aesthetic appeal, which has some public acceptance; of scientific values, which are largely arcane to the general public; and 'degree'. To my mind the key lies in the concept of the ancient Gondwanaland supercontinent of which present-day New Zealand is a remnant. But even that is largely a value judgement, by people with scientific training. The case states that Gondwanaland is a unique evolutionary treasure entrusted to New Zealand to preserve as biological history for today's world and future generations. Unfortunately it is not cultural history yet because New Zealanders have been too preoccupied with modifying their heritage to develop an affinity with it. Gondwanaland is not 'of us', whether Pakeha or Maori, in the way that Stonehenge, the Aztec temples, the Dead Sea scrolls, the Taj Mahal are 'of us' in the sense of national and world culture. New Zealand is in fact slowly being shaped into the image of other lands, and its visible fauna is already largely alien. Many of the new landscapes are attractive aesthetically, but biologically they are greatly diminished. To many people, untutored in the original riches, conservation starts from today's impoverished condition.

The process of replacement with deer, pines, gum trees, and trout, provides a congenial and much more diverse environment for many people than pre-human New Zealand would have done. Consequently the case for preserving the remaining indigenous biological diversity has to be couched essentially in scientific terms. That diversity which the delighted tourist

preserves as a frozen image within a camera, is in fact the outcome of continuous, dynamic processes. As a civilised society we should ensure that those subtle processes and their products continue in their diverse situations so as to perpetuate the legacy of representative landscapes and biota. But clearly scientists have failed to make their arguments prevail to such an extent that future generations will not even have enough of that legacy left to exercise options over it.

By and large, natural areas are set aside only if a case is made why they should not be converted to a productive use. Is it too much to ask at this stage in the reduction of original values, that the remaining natural areas be now considered sacrosanct except for the most compelling reasons? That single step would send a bold signal acknowledging the legacy of an ancient flora, fauna, and landscape which, as is the way with legacies, we should guard for passing on. It would bespeak an accountability to the future which has been wanting in the past. But who is accountable today?

Accounting and Accountability

Public Service scientists are being exhorted to make research more accountable in terms of benefits to Society. Increasingly this call is couched in cost-benefit terms involving money-making ventures or savings of overseas funds. These measures of scientific accountability may in the short term suit the purpose of allocating money and manpower for some projects. But many scientists question their appropriateness for supporting the basic, long-term, ecological studies that are indispensable, for wise, balanced, land management.

Accountability need not, and should not, be a one-way process. Scientists can also ask for some accountability from the people to whom they supply hard-won information and advice for managing the natural environment. The problem is to find an appropriate set of values and terminology.

Accounting terminology has features which are instructive for ecologists even though it belongs to another discipline. In trying to compare profit and loss by *our* measures on *our* balance sheet there is a choice of values depending on the local, regional, national and international context. But in every balance sheet there is ultimately a 'bottom line'. In a company or national exchequer that bottom line reflects the health, well-being, and future operating prospects of the whole suite of operations. That may have to be our way of thinking too, for the suite of capital resources and processes embodied in the

operation that I will call 'Gondwanaland Incorporated'. I use that couplet to emphasise a comprehensive concern for the healthy operation of the whole range of native plant communities, native animal habitats, and landscapes. Somehow it is necessary to get the environmental account sheet into balance with the necessary business of earning a living from land.

The managers of an orthodox company have to be quite uncompromising on the company's behalf because shareholders would throw them out if they were not. Thus they are not going to advocate Gondwanaland values even if they have some inkling of them. Ecologists have to do it and be just as firm and uncompromising in that advocacy as accountants are for their commercial values. The compromises to development ethics have all been made over the past 150 years or so. Further compromises are simply not justified. After all, Gondwanaland shareholders include the citizens of tomorrow, not just the subscribers to a company scrip looking for a dividend this year.

It is also essential to recognise that scientists are not only advising on managing the healthy parts of the natural estate, but trying to drag whole parts of it out of the red that are in deep biological trouble. This remedial work applies not just to saving species, like the black robin, but to whole communities on which those species depend. Indeed, successes like the black robin, wonderful though they are, disguise more fundamental problems. Saving a species is fine but unless it has a place in which to live, and we know what its needs are, it and its companions, are ultimately doomed in the wild. Such successes also foster the belief that other organisms can be saved at the brink, and that we need not worry about them or their habitat until they reach it.

For an accountant, market forces, that is, current fashion, are often a guide to management, and the company diversifies or retrenches accordingly. Unfortunately, passing fashions are a poor guide to environmental management. When the fashion passes and regret sets in, it is difficult or impossible to diversify or reconstitute the degraded natural environment, however much we might lament its loss. If it is irredeemably gone, all we can do is lament. Unfortunately each generation begins that lament from where the last one left off, which is why it becomes crucially important to define the baseline. Only then can we hope to prevent successive generations from beginning their compromises where their predecessors ended theirs. A recent DSIR policy discussion document uses the following quotation

(Tisdale, 1981, in Troughton, 1986):

"...free markets will under-supply science and technology efforts in many fields, and misdirect their application from a social point of view."

That was written by an economist not a wild 'greenie', and is amply illustrated by the history of land management in New Zealand.

All of this implies that the management of, and research into, environmental structure and function, whether for strict nature conservation or for resource use, has to be accountable in terms other than short-term fashions and dollar returns. But that is possible only when there is consistent policy, a clear philosophy, a strong sense of biological heritage, and the concept of a legacy in trust for future generations. Because these are not common in individual perceptions, I would go so far as to say that they have to be imposed as communal wisdom on the individual so that values can be preserved while individuals and society catch up. The hopelessly misdirected question is often asked, "how much should be 'locked up' for the conservationists". The balance sheet already shows a 10-12% allocation of the national estate to reserves. Scientists know that this is false accounting because the biological representativeness of those reserves is all wrong. Nevertheless, such statistics have worked against the cause of securing a balanced Gondwanaland portfolio, because so much land appears to be 'locked up'. Till now it has been difficult to say how much more is needed because there has been no adequate framework for judgement. But now that there is a system of Ecological Regions, and a concept of 'representativeness', progress may be made.

In the comprehensive land-use study by Molloy *et al.*, (1980) (Chapter 4) it was stated that the decade 1980-1990 would be crucial in securing a representative system of reserved areas in this country.

Epilogue from Chapter 4, Molloy et al., (1980):

"It is now 140 years since European colonisation of New Zealand began. The harsh pioneering phase of 'land development at any cost' has already over-run its course; yet old habits die hard. For all future developments on all classes of land, the key questions must be:

- What are the biological qualities of this landscape?
- Is part of New Zealand's unique natural heritage being destroyed?
- If so, are the features adequately protected in existing parks and reserves?

Until these questions can be answered satisfactorily, and they can be answered with

appropriate deployment of resources, land development without regard to the biological consequences is no longer in the national interest. What is certain is that if the best examples, the 'key sites', for numerous threatened lowland and hill country ecosystems are not identified and reserved effectively within the next 10 years, the majority will be lost forever."

The Epilogue was put that bluntly, because of the growing pressures for diversification, intensification, and expansion in land use from entrepreneurial spirits, and market forces. That decade is more than half gone and what has been achieved? Great battles have been fought to save lowland forests such as Whirinaki, Pureora, Okarito, and Waitutu, but the astonishing thing is that those battles have been fought, not by the New Zealand Forest Service but largely against it. The Forest Service is a familiar target, but the custodians of wetlands and shrublands also have much to answer for. Millions of dollars have been poured into their 'development' not in the teeth of opposition by the Department of Lands and Survey, which is also responsible for the nation's parks and reserves system, but with the active support of its Fields Division. These attitudes and practices are hard to comprehend when so many scientists and others have pointed out the scarcity and the national, or even international, value of many of the sites concerned. One could cynically contrast the battles to save natural areas, and the resources for maintaining them, with the ease by which \$26 m could be dedicated in 1984 by the Department of Lands and Survey for developing marginal land. \$26 m would do much for a Protected Natural Areas Programme striving to survey and secure representative examples of the natural heritage before they vanish forever.

One could ask then who is listening to the advocates for Gondwanaland values. How much advocacy and of what type will impress those men in the upper levels of Departments who advise governments in formulating and implementing policy? Why are these men so resistant, to saving the 'last regional fragments of Gondwanaland Incorporated'? Such pointed criticisms are often met by a plea for reasonable compromise. But that sort of compromise is at the very heart of the formula of attrition which discounts expert advocacy, and translates it instead into land use practices which render any further courteous negotiations completely void because the value at issue has ceased to exist. In terms of accountability to the management of 'Gondwanaland Incorporated', the scientific community has over a long period maintained a good

record in giving the information, philosophy and guidelines. It is questionable whether the administrators have done so in return. The people in the upper levels of all the Departments listed above, have made victims alike of politicians and the public. They have held to outmoded policies and procedures when they should have led the evolution of them into public perceptions. Quiet attrition has continued, sanctioned by internal policy decisions and sanctified by the tradition of colonising practice. No true environmental cost-accounting has been possible because 'the books' were processed to reflect conventional Departmental wisdom. Public Service criticism of other Departments is muted and even suppressed. Only the pressure groups, with enormous dedication, have provided a real challenge. This may now change with the present upheaval in environmental administration. It will be traumatic for many but may be the only way to demonstrate the poor stewardship that they have exercised in the face of the huge body of expert advice that has been available to them for such a long time. The thinking required for the new departments should of itself herald a new accountability, because existing agencies which seek to preserve their established positions, are having to think about what they do and how they do it.

It is timely that the rethinking on environmental administration has come half way through the decade that has been described as crucial for New Zealand's natural environment. It would be tragic for that decade to pass away leaving another generation to cry yet again for action. Successive essays lamenting biological loss are not going to be a credit to New Zealand science or to New Zealand administrators unless they are translated into action for the future.

Coda

In this essay I have looked at history of land use, the advocacy for the protection of Gondwanaland values and the pressures against that, and where I think the problems lie. Other people, as I have indicated, have covered the same ground before, so why should one more lowly scientist enter the lists?

I want the *scientific* basis for managing the natural environment to be more generally accepted than it is in policy. The public acceptance of a nice healthy environment is not enough to save the more fundamental values of which we, as scientists, are aware. I am not being elitist. If theory and hard data from all over the world tell us that habitat fragmentation and reduction; loss of genetic flow; and species/area relationships, are pointing to biological

mediocrity for New Zealand in 50-100 years, then I believe we are obliged to press that scientific perception as a complement to the public perception of nature conservation. They may be esoteric topics but they are highly relevant. We are expected as professional scientists to have that sort of knowledge. We can either keep it to ourselves, or put it to work alongside the concepts and values of other professional disciplines and the lay public. Quite clearly I accept the second of these options, and believe that it must be done very firmly.

I also accept that the nation has to earn a living, and in so many ways is rather clever at it. But how much cleverer we would be to do not only that but to preserve the legacy of natural environment as well, with varied and distinctive landscapes and a wealth of viable native habitats. Our native biota is unlike anyone else's and it took upwards of 100 million years to get that way. Only we can give protective custody to our particular bit of ancient Gondwanaland. Our environmental administration should seek to conserve and preserve those uniquely distinctive features of New Zealand in all their diverse forms on the basis of the best available scientific information.

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Appendix I: *Scientific names of birds and plants mentioned in the text. Birds are from Kinsky, F.C. 1970. (Convenor). An annotated checklist of the birds of New Zealand. Wellington. A.H. & A. W. Reed. 99 pp. Plants from Allan, H.H. 1961. Flora of New Zealand. Vol. 1. Wellington, Government Printing Office. 1085 pp.*

Huia	<i>Heteralocha acutirostris</i>
Stephen Island Wren	<i>Xenicus lyalli</i>
Native thrush	<i>Turnagra capensis</i>
Moas	Order Dinornithiformes
Black robin	<i>Petroica traversi</i>
Takahe	<i>Notornis mantelli</i>
Kokako	<i>Calaeas cinerea</i>
Kakapo	<i>Strigops habroptilus</i>
Yellowhead	<i>Mohoua ochrocephala</i>
Little spotted kiwi	<i>Apteryx oweni</i>
Kaka beak	<i>Clianthus puniceus</i>
Native brooms	<i>Notospartium</i> spp.
Kauri	<i>Agathis australis</i>
Kahikatea	<i>Dacryocarpus dacrydioides</i>