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Encouraging Private Biodiversity - Incentives for Biodiversity Conservation on Private Land

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TREASURY WORKING PAPER

00/25

Encouraging Private Biodiversity – Incentives for Biodiversity Conservation on Private Land

Peter Clough, NZIER

ABSTRACT

This report provides a literature review on the practical experience of measures in other countries with a similar legal background to New Zealand to give economic incentive to biodiversity conservation on private land. It examines the strengths and weaknesses of the measures and draws out their relevance to New Zealand. The measures identified can be broadly characterised as conservation management agreements and fixed period contracts between conservation agencies and individual landholders over defined areas of land; purchase of partial interests in land; purchase of freehold interest in land and subsequent management by a conservation agency or voluntary body; restricting landholder development rights and allowing them to trade residual entitlements; and establishing proprietary rights in wildlife products.

It identifies some incentive measures not currently used in New Zealand that could be adapted for application here, such as the European Environmentally Sensitive Area (ESA) schemes, or the US Conservation Reserve Program (CRP). Such schemes have the distinct characteristic of offering on-going incentives, and an ability to change land use practices over a wider countryside than discrete reserve areas.

Many of the incentive schemes reviewed (e.g. covenants, land purchase) effectively create new reserves set aside from damaging activities. But in the context of New Zealand's biodiversity, land set aside in this manner will not revert to natural biodiversity without provision for on-going management.

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The literature reviewed said little about the effectiveness of particular incentive schemes in enhancing biodiversity, beyond noting their participation rates. It reports on areas covered, land-cover conserved, and involvement of land-owners but gives little indication of what would have resulted in the absence of the incentives.

This review also uncovered little detailed examination of the mechanisms for disbursing funds – lump sum grants, matching grants etc – which have different administrative and compliance costs, and different effects on the incentive created for leverage of private funds on public inputs.

Finally, while some landowners will volunteer sites for conservation with little encouragement or simple reimbursement of additional costs incurred for conservation, the opportunity costs of forgoing income may deter owners from offering the best sites for conservation purposes. Financial incentive instruments are not the only means of encouraging biodiversity and need to be seen in a wider policy context.

**Encouraging private biodiversity
Incentives for biodiversity conservation on private land**

Report to The Treasury

Prepared by Peter Clough

June 2000

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Preface

The New Zealand Institute of Economic Research (NZIER), based in Wellington, was founded in 1958 as a non-profit making trust to provide economic research and consultancy services. Best known for its long-established *Quarterly Survey of Business Opinion* and forecasting publications, *Quarterly Predictions* and the annual *Industry Outlook* with five-yearly projections for 25 sectors, the Institute also undertakes a wide range of consultancy activities for government and private organisations. It obtains most of its income from research contracts obtained in a competitive market and trades on its reputation for delivering quality analysis in the right form, and at the right time, for its clients. Quality assurance is provided on the Institute's work :

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3. by providing for peer review at various stages through a project by a senior staff member otherwise disinterested in the project;
4. and sometimes by external peer reviewers at the request of a client, although this usually entails additional cost.

Authorship

This report has been prepared at NZIER by Peter Clough and reviewed by Stephen Gale. The assistance of Mary-Ellen Fogarty at The Treasury in the literature search is gratefully acknowledged.

EXECUTIVE SUMMARY

This report provides a high level review of measures used in various countries to give economic incentive to biodiversity conservation on private land. Having surveyed literature on the practical experience of measures in place in other countries with a similar legal background to New Zealand, it examines their strengths and weaknesses and draws out their relevance to the circumstances of this country's biodiversity conservation.

Previous surveys of international experience by the OECD and others have identified a wide range of positive incentives, such as cost sharing, payments and tax concessions, and also negative incentives such as effluent charges, fines and permit schemes. Many of these disincentives have only an incidental effect on biodiversity and are primarily regulatory in nature. Positive incentives rely more on creating inducements for behavioural and management changes which improve biodiversity on private land, harnessing voluntary co-operation of landholders and requiring less effort to monitor and enforce the measures.

The measures identified in this survey can be broadly characterised as:

1. Conservation management agreements and fixed period contracts between conservation agencies and individual landholders over defined areas of land. These can be either customised to particular site needs, which tends to incur higher costs in negotiation and payments required; or standardised prescriptions of payments and actions across broad classes of landholding with similar land management characteristics.
2. Purchase of partial interests in land, such as easements or covenants, either directly off landowners or by purchase of land by conservation agencies and resale with covenants attached. These incur costs in negotiation, surveying and registering on land titles, and on continuous monitoring and enforcement of the provisions of the conservation interest.
3. Purchase of freehold interest in land and subsequent management by a conservation agency or voluntary body. This is costly in the sense of incurring most costs up front, but can be an effective way of securing the conservation interest long term. Grant-aiding voluntary bodies for such purchase is a way of leveraging private funding from any public taxpayer input.
4. Restricting landholder development rights and allowing them to trade residual entitlements. These measures are regulatory and incur marked implementation costs, but also reduce the allocative distortions and costs incurred in directing potentially damaging developments away from the most environmentally sensitive land.
5. Establishing proprietary rights in wildlife products. This creates markets for products jointly supplied with biodiversity, rather than for biodiversity itself. Although relatively costless to implement since rightholders police their own entitlements, in some circumstances it can be counter-productive to biodiversity conservation.

New Zealand already has established mechanisms corresponding to numbers 2, 3 and 4 in this list, although their consistency and effectiveness in application is unclear. Fish quota are an example of 5 and there has also been public debate about cultural harvest of wildlife by local Maori. Since biodiversity has public good characteristics, its protection requires a broader direction than can be provided by individual entitlements alone. An element missing from the literature surveyed is detailed examination of how the various individual incentive measures contribute to a coherent plan for biodiversity conservation.

The report identifies some incentive measures not currently used in New Zealand that may be applicable here. But their adaptation will require stripping away characteristics depending on their current context, and modifying their essential elements to local New Zealand conditions.

In particular, contractual arrangements such as the European Environmentally Sensitive Area (ESA) schemes, or the US Conservation Reserve Program (CRP), have evolved in the context of subsidised agriculture which adds to their cost, but similar instruments of tailored management agreements or standardised prescriptive measures could have application here, albeit at a lower level of incentive, and at a different level of government (regional or local), than in the current overseas schemes. Such schemes have the distinct characteristic of offering on-going incentives, and an ability to change land use practices over a wider countryside than discrete reserve areas.

Many of the incentive schemes reviewed (e.g. covenants, land purchase) effectively create new reserves set aside from damaging activities. But in the context of New Zealand's biodiversity, whose major threat is the recurring incursions of pests and predators, land set aside in this manner will not revert to natural biodiversity without provision for on-going management. This is an element missing from current incentive mechanisms such as covenants, which could be provided by contractual measures.

The literature reviewed said little about the effectiveness of particular incentive schemes in enhancing biodiversity, beyond noting their participation rates. This is because it is inherently difficult to define what would have happened in the absence of incentives, and there is little post-scheme monitoring reported. Although contractual schemes such as ESAs in Europe and the CRP in the USA attract high participation, they also pay some landowners who would have managed their land the same way without payments, and they may attract land of least value for agriculture rather than land of most value to biodiversity.

The literature review uncovered little detailed examination of the mechanisms for disbursing funds – lump sum grants, matching grants etc – which have different administrative and compliance costs, and different effects on the incentive created for leverage of private funds on public inputs. Further consideration of these mechanisms, the optimal rate of matching grants, and measures such as requiring landowners to bid for participation in assistance schemes could point to ways of improving the rationing of public funds and the efficiency of conservation enhancements gained as a result.

While some landowners will volunteer sites for conservation with little encouragement or simple reimbursement of additional costs incurred for conservation, the opportunity costs of forgoing income may deter owners from offering the best sites for conservation purposes. Although funding can be spread further if only reimbursing for additional costs incurred for conservation, securing critical habitats and sites may require compensating owners for the full costs they incur, including income forgone, either through purchase or contractual payments.

Financial incentive instruments are not the only means of encouraging biodiversity and need to be seen in a wider policy context. This includes ensuring the incentives are working in harmony with clearly articulated objectives, justifications and targets for biodiversity, and that they achieve agreement with landowners that the ends are worthwhile and the means are fair.

CONTENTS

1. Aims and Introduction	1
1.1 Approach of study.....	1
1.2 The biodiversity policy setting	1
1.3 Applying a typology to incentive measures.....	3
2. Review of measures in various countries	5
2.1 New Zealand	5
2.2 Australia.....	6
2.3 Canada	7
2.4 USA.....	8
2.5 UK/European Union.....	9
2.6 Other incentive instruments.....	11
3. Experience with incentive measures	13
3.1 Criteria for analysing incentive measures	13
3.2 A typology of incentives for biodiversity	13
3.2.1 Awards, prizes and non-pecuniary recognition.....	13
3.2.2 Non-binding management agreement	13
3.2.3 Binding/contractual cost-sharing management agreement..	13
3.2.4 Binding/contractual standard payments	14
3.2.5 Capital grants for long term improvements	14
3.2.6 Purchase of easement, covenant or other partial interest in land title	15
3.2.7 Land purchase for public agency management	15
3.2.8 Land purchase and resale under restrictive covenant (revolving funds)	15
3.2.9 Grant aid for land purchase by conservation bodies.....	16
3.2.10 Tradeable development rights and mitigation obligations	16
3.2.11 Proprietary rights in wildlife	16
3.2.12 Tax concessions	17
4. Conclusions and implications for New Zealand	19
 Appendix A: Bibliography.....	 21
Appendix B: Characteristics of incentives.....	25

1. AIMS AND INTRODUCTION

This report provides a high level review of measures used in other countries to give incentive to biodiversity conservation on private land, drawing out their relevance and applicability to New Zealand. The intention is to inform the Treasury of up-to-date practical experience of incentives in use, with a preliminary indication of those most likely adaptable to New Zealand.

1.1 Approach of study

The research underlying this report included the following steps:

1. A review of literature of schemes in use in various countries.
2. Sorting the examples from the literature into a rough typology according to characteristics such as the instruments used, governance structures employed to monitor and control the schemes, and the context to which they have been applied (e.g. habitats or species).
3. Identifying reported successes and problems associated with each type of scheme.
4. Analysing the schemes against common criteria of effectiveness, efficiency and equity.
5. Comparing these schemes and contexts and identifying those with most apparent applicability to New Zealand settings.

The report also briefly considers characteristics of biodiversity policy and legislation and their effect on the design and feasibility of incentive schemes. The review focuses on the period since the OECD published its 1996 review, *Saving biological diversity – economic incentives*, and concentrates on those countries with a similar legal background to New Zealand based on English common law – principally Australia, Canada, the UK and the USA – although some schemes from other countries are referred to where informative about types of instrument.

1.2 The biodiversity policy setting

An initial question in examining incentives is what is the biodiversity policy framework within which to view incentive measures? This hinges on consideration of what is biodiversity; why conserve it; how much biodiversity to conserve and which measures to use.

a) What is biodiversity?

Biodiversity is the variety of life, and can be observed at a number of levels:

- Diversity of genetic material within living organisms;
- Diversity of species present within a particular territory;
- Diversity of natural communities of species and functioning ecosystems.

Since genetic variety is hard to observe, and the function of each individual species in healthy ecosystems is unknown, practical policy towards biodiversity conservation often focuses on providing habitats¹ for target species whose population size, movements and health are readily observable, to act as indicators of the variety retained at genetic and ecosystem levels.

¹ While in biological terms “habitat” refers strictly to the home of particular species, in this report it is used more loosely to describe a characteristic plant and animal community or ecosystem, more akin to the term “biotope”.

b) Why conserve biodiversity?

A short answer to this question is that NZ has committed to the 1992 Convention on Biological Diversity and other international agreements with similar intent. The implication of these international agreements is that NZ has a responsibility to conserve distinctive natural features that add to global biodiversity, and to accommodate those mobile species that migrate across national boundaries. This suggests a priority for the conservation of indigenous species, and for areas which contribute to the global network of habitats for migratory species.

Apart from international commitments it can be economically rational to conserve biodiversity because of its contributions to human well-being. These include:

- Current use value, reflecting the contribution made by biodiverse natural systems to such things as watershed management, nutrient cycling, providing the aesthetic backdrop to activities such as tourism, and a source of resources for extraction (e.g. fish), without which society would face greater costs or forgone opportunities.
- Option values, or the value of retention for future use, such as the possibility that species may hold as yet unrecognised cures for diseases.
- Existence values, or the social value of biodiversity for its own sake reflecting the regret felt when landscape elements, species or their habitats are irretrievably lost, whether motivated by aesthetic, cultural or ethical concerns for other species and future generations.

This utilitarian rationale widens the scope of biodiversity from simply conserving indigenous species. Ecosystems are often substantially modified by fishing, forestry and agriculture, and biodiversity can be extended to include domesticated and introduced species and semi-natural habitats which provide stability and resilience against shock.

Biodiversity conservation can be viewed as managing a region's biodiversity portfolio against risks to its integrity. The objective function may be defined as maximising the variety of ecosystems and constituent species, subject to a number of constraints, such as the resources available, or an imperative standard, such as no net loss of species or ecological systems across the territory. Elements at highest risk do not necessarily warrant the highest priority for conservation if there are adequate substitutes: for instance, resources spent on maintaining a species at the edge of its range may achieve greater conservation benefits by being redeployed to secure core habitat for another species. There may also be situations in which biodiversity conservation requires holding ecosystems at some transitional stage which, left to nature, would be succeeded by a different species mix. Biodiversity conservation is not a prescription for back to nature, and in some places semi-natural ecosystems may be the primary object.

c) How much biodiversity to conserve?

Since biodiversity conservation requires land and other resources, its conservation involves economic choices. In theory the optimal level of biodiversity is obtained by investing resources to the point where the marginal benefit obtained just equals the marginal cost incurred. But biodiversity has the non-rival, non-excludable characteristics of an economic public good, which means that private efforts on their own are unlikely to supply a socially optimal level of conservation, since many benefits cannot be appropriated by, and provide no return to, private suppliers. This means there is likely to be a need for public subscription and intervention, through taxpayer funding or regulatory measures.

Against this setting biodiversity policy requires a process for articulating goals, objectives and strategies for attaining a socially optimal level of conservation (determined through non-market means), and also measures in place to implement these strategies. Such measures may include

education and exhortation aimed at changing norms of behaviour in favour of conservation; regulating the use of resources so as to change behaviour away from those damaging to conservation; and taxpayer-provision of conservation through direct government supply or purchase of services from private resource owners. Incentives are primarily concerned with the last of these, although in practice no measures act in isolation, and even incentives have a demonstration and exhortation role.

A number of key resource use choices emerge in biodiversity policy.

- On reserve versus off-reserve conservation: reserves may offer the “best” biodiversity, but there is a risk of them becoming isolated fragments in a hostile surrounding countryside, which may need countering by more widespread measures (Adams et al 1994).
- Rarity versus representativeness: the balance between these two has profound resource use implications, but the theoretical economic guideline of equalising the marginal net benefits of each is often impractical to use.
- Best sites versus degraded sites: when the most biodiverse sites also have the highest opportunity cost from potential production, it may be more cost effective to secure lots of degraded sites than just a few of the best sites. But the presence of recurring threats like invasive pests means cost effectiveness must take account of on-going management.

d) Biodiversity in New Zealand

Biodiversity issues in NZ are characterised by:

- A high degree of endemism, i.e. species which have evolved to a form found nowhere else. This underpins the priority accorded to indigenous species (DOC & MfE 2000).
- Susceptibility to introduced pests and predators, due to evolution over long periods of isolation. This means it is insufficient to simply reserve areas and await their reversion to biological diversity; provision needs to be made for their on-going management.
- Areas currently under protected status are not a representative cross-section of NZ habitats, with a preponderance of upland and mountain territory with little value for alternative uses. This means conservation of representative biodiversity needs to look beyond the boundaries of currently reserved areas to secure lowland habitats with higher opportunity cost.

1.3 Applying a typology to incentive measures

Instruments and incentives for biodiversity on private land fall into two groups. Positive incentives aim to encourage enhancement of biodiversity, effectively providing mechanisms by which the public purchases services like habitat restoration from private resource owners. Negative incentives, or disincentives, are designed to encourage curtailment of activities damaging to conservation. A further distinction amongst the negative incentive measures is between those instruments which aim to change individual landowner behaviour, and those which simply raise revenue through levies and charges, to be used for funding various types of environmental improvement scheme. These categories of incentive are not mutually exclusive: most schemes include a mix of instruments, such as payments for management agreements backed up by non-compliance penalties. Some examples are listed below (OECD 1996).

a) Positive incentives

- Cost sharing and management agreements
- Agricultural land retirement schemes
- Covenants and conservation easements

- Public or grant-aided land purchase
- Wild species management and enhancement schemes
- Wetland reserves
- Multilateral biodiversity aid transfers
- Positive incentives for customary cultivation of biodiversity
- Incentive payments for organic farming
- Taxation and fiscal relief
- Customary ownership/intellectual property

b) Disincentives

- User fees
- Water abstraction and discharge permits and charges
- Non-compliance fees and fines for damages
- Environmental liability
- Performance bonds
- Comprehensive oil pollution liability
- Planning gain/Compensatory and mitigation schemes for habitat replacement
- Tradeable development right
- Wetland mitigation banking
- Individual transferable quotas
- Air emission trading rights
- Effluent discharge and trading schemes
- Debt for nature swaps
- International franchise agreements
- Land purchase and resale under restrictive covenants

Many of the disincentives have only an incidental effect on biodiversity: effluent charges or liability for pollution may indirectly improve the environment in which biodiversity can flourish, but it would be difficult to draw a causative link between them. Disincentives are also regulatory in nature, and are not considered further in this report except to the extent that they provide a necessary corollary to positive incentives for biodiversity conservation. An exception is the group of disincentives which permit market creation: compensatory and mitigation schemes, tradable quotas and development rights. Although these are based on a restriction of private rights – a total allowable catch, total space available for development etc – that restriction creates positive opportunities to trade private entitlements so as to comply with the restriction in the least costly way (e.g. mitigation obligations may be met by buying improvements on existing sites). These market creation devices are covered in this report, where relevant to biodiversity enhancement.

2. REVIEW OF MEASURES IN VARIOUS COUNTRIES

2.1 New Zealand

a) Conservation in context

As a relatively recently developed country with an accelerated rate of settlement over the past 150 years, New Zealand still has a substantial proportion of land in Crown control, much of it accorded reserve status. It also has a relatively high proportion of species in decline or in threatened status, and a pervasive problem with pest species, which on one recent estimate costs the economy around \$800 million a year in combined damage and remedial measures (Bertram 1999). A biodiversity strategy calling for substantial increases in government funding, published at the end of 1999, recognised the need to extend biodiversity enhancement beyond the boundaries of reserve land onto private land. The Department of Conservation (DOC), government's chief advocate for biodiversity and manager of national parks and reserves, has a process for prioritising protected natural areas of national significance which extends beyond the current boundaries of the lands it administers. Regional councils and local territorial authorities (city and district councils) also have processes for recognising significant natural areas under section 6(c) of the Resource Management Act.

b) Incentive instruments

A number of positive incentive instruments for biodiversity on private land are currently in use around the country. Their consistency in application and co-ordination of prioritised habitat outcomes is unclear.

- Nature Heritage Fund: Set up in 1990 as the Forest Heritage Fund, this has now widened to include non-forest ecosystems, with the purpose of protecting the full range of natural diversity originally present in the New Zealand landscape by providing incentives for voluntary conservation. Administered by an independent committee and receiving annual allocations from government, it is a contestable fund which gives assistance to DOC, TLAs and sometimes other organisations for the purchase, covenanting or fencing of areas for biodiversity conservation. Over 100,000 hectares have been protected to date, principally through land purchase for addition to the DOC-administered public estate.
- Open space covenants: These are the principal mechanism of the QEII National Trust, and similar covenants administered by DOC or local councils can be established under the Reserves Act. The covenants restrict use of areas of private land so as to protect natural features, in return for which landowners may receive rating relief, 50% grant towards costs such as fencing and some pest control, and 100% grant covering the surveying and legal costs of registering the covenant on land title (under the QEIINT scheme). The QEIINT is funded partly by government annual allocation and partly out of private fund-raising. It is seen to be sympathetic towards farmers' needs, and is over-subscribed.
- Rates relief: The Rating Powers Act 1988 allows councils to set differential and special rates, distinguishing properties by various characteristics as to use. Section 1805 gives councils discretionary power to grant relief on properties containing natural, historic, or cultural features being voluntarily protected by the occupier (including areas covenanted under the QEIINT Act, the Reserves Act, the Conservation Act and Maori Affairs Act). How widespread, or consistently, these powers are used is unclear, but overall rates relief is likely to be modest because much eligible land is of low rateable value.

- **Financial contributions:** Section 108 of the Resource Management Act allows councils to collect financial contributions from developers in the form of money, land, works or services, as a condition for granting some forms of resource consent. A common example carried forward from earlier legislation in some districts is a “renewal subdivisions, intended to provide recreation and landscape amenities for the newly enhanced population. These act like a development levy, providing some disincentive to profligate land use and also funds for public uses with incidental benefit to biodiversity.
- **Tradable development rights:** Some councils now provide for transfer of restricted rights between urban properties (e.g. building height entitlements) and rural properties (density entitlements on subdivision). These can be used to divert developments away from significant natural areas and concentrate them in areas of less environmental sensitivity.
- **Other measures:** Some councils and charitable organisations have small funds for assisting farmers in fencing off significant natural areas under section 6(c) of the Resource Management Act. Councils may also waive consent application fees for activities aiding conservation, and some attach performance bonds as a condition of resource consents.

New Zealand has various biodiversity incentive measures either in place or mooted, but there is little indication of their coherent use towards common biodiversity goals. With many rating and development measures located at the territorial authority (district council) level, there is a risk of duplicating efforts towards protecting particular ecosystems in adjacent authorities when more might be achieved by co-ordinating and dividing efforts across the region. The legitimacy of some measures may be open to challenge because legislative requirements for instruments to be linked to a clear purpose in local plans have yet to be legally tested.

The use of these incentive measures may also be restricted by misconceptions about their economic implications, such as the belief that rates relief reduces overall rates take (Anon 1999). Since rating is a mechanism for recovering a council’s necessary expenditure on public services, granting relief to some properties redistributes rating liability, contracts the rating base and may require resetting of the standard rate struck, but it need not affect the overall level of rates revenue unless the previous rate was at the limit of what is legally permissible under the Act. The extent to which councils can afford to offer rates relief is affected by their districts’ rating capacities, which varies widely between urban and rural areas.

2.2 Australia

a) Conservation in context

Australia is a newly settled land with a federal system of government, resulting in diverse approaches and instruments in biodiversity policy. Despite this, development of a coherent policy towards biodiversity has been in train over the past decade, as testified by official documents towards the Convention on Biological Diversity, Australia’s National Strategy for the Conservation of Biological Diversity, the Intergovernmental Agreement on the Environment and the National Strategy for Ecologically Sustainable Development. Australia’s flora and fauna is “megadiverse”, displaying exceptional variety, but this is not reflected in conservation to date, with more than half the major biogeographic regions underrepresented in current reserves.

b) Incentive instruments

A range of positive incentive instruments for biodiversity on private land are currently in use in Australia, varying by state (Young et al 1996). Some examples are outlined below.

- **Non-binding management agreements:** A number of schemes, such as Land for Wildlife, use non-binding management agreements as a non-threatening way of encouraging

landowners by providing chiefly information on management of natural areas. Useful as an initial or short-term measure, very few of these agreements have yet proceeded to long term securing of site management through covenants or other measures (Bayfield 1999).

- Conservation Covenant Programme, Victoria: This programme, administered by a private trust and funded by state taxpayers, seeks to secure permanent protection of sites by creation of a covenant registered on the land title. Landowners receive payment covering both costs of conservation management and compensation for lost income. The scheme has had low uptake but is viewed as highly effective in securing conservation gain (OECD 1996).
- Heritage Agreements, South Australia: This scheme, administered by state government out of state taxpayer funds, seeks to secure permanent protection of sites by voluntary creation of easements registered on the land title, in exchange for a one-off payment covering mostly lost income. Although apparently well-targeted, its conservation effect has been questioned, since it has encountered landowners threatening clearance with the intention of receiving compensation, difficulty in servicing agreements scattered over wide areas, and difficulty in achieving landholder responsibility for on-going maintenance (Clairs & Young 1995).
- Conservation Area Scheme, South Australia: This scheme, administered by state government out of state taxpayer funds, seeks to secure medium term protection of sites by purchase of leases in exchange for recurring payments covering both forgone income and conservation management costs.
- Federal Save the Bush Programme: This federally-administered and funded scheme offers grants for biodiversity enhancement works on private land. The manner in which funds are disbursed, and hence the incentive faced by the landowner, are unclear from the literature.
- Revolving funds: These schemes, an example of which is provided by the Trust for Nature (Bayfield 1999), provide funds for the purchase of sites for resale with long term restrictions on subsequent use in the form of covenants. A variant on covenant creation by voluntary persuasion, such funds depend on the timing of suitable land coming on the market.

Taxes in Australia, compounded by overlapping federal, state and local roles, have been identified as providing strong disincentive towards conservation: land held for conservation may produce no income against which to deduct expenses, yet still be liable for annual outgoings on income tax, land-tax and local rates, whereas the same land used for “productive purposes” would attract various allowances which result in significantly lower annual liability. New Zealand faces similar but less marked disincentives, due to the absence of land tax, and the possibility of receiving rates relief.

Australia appears to have been successful in motivating conservation on private land with relatively low financial incentives, through measures such as non-binding management agreements, easements and covenants. In part this may be due to a convergence of biodiversity and farm conservation measures: for instance, enhancing remnant trees may counteract the rate of salinity increase in dryland farmland (Beale 1997). Such happy coincidence between biodiversity and farm interests at the field level is less apparent in New Zealand where, with notable exceptions such as bovine Tb vector species, different pests afflict the farming and the biodiversity interests in the land.

2.3 Canada

a) Conservation in context

Transformed by European settlement over the past 400 years, Canada has a federal system of government and various approaches and instruments in biodiversity policy. Agriculture is moderately subsidised, raising the opportunity cost of private conservation. No information on the guiding principles for biodiversity policy in Canada has been uncovered in this search.

b) Incentive instruments

A large number of environmental improvement schemes on agricultural land have been identified (Agri-Food Canada 1997) but the manner in which they operate, and their incentive effect, is unclear. Schemes include such measures as tree planting, wetland restoration, game cover establishment and so on. Some examples of identifiable incentive instruments follow.

- **Permanent Prairie Cover Restoration Program:** A federal programme with the mixed objectives of reducing cereal production and restoring biodiverse ground cover, this entails the agriculture ministry offering annual payments covering both conservation management costs and forgone income compensation for 15 to 21-year contracts. The impact of the programme is blunted by inconsistent government policies towards agriculture, and would be improved if farm support were decoupled from agricultural output (IISD 1994). In 15 years the programme achievements have been modest, achieving uptake on 6% of eligible area.
- **Conservation covenants:** A number of provincial governments encourage conservation covenants being vested in registered conservation agencies, in exchange for tax concessions against income tax, estate tax and capital gains tax. The law in British Columbia was recently changed to broaden the range of covenantors to include non-profit organisations (NPOs) as well as government agencies.
- **Prairie CARE:** A federal programme funding non-profit organisations to purchase land for biodiversity conservation purposes, retaining and managing them on a permanent basis. Funding comes from both taxes and profits on sale of land surplus to conservation needs.

There appears to be widespread encouragement of conservation through tax concession in Canada, although the uptake rate and effectiveness is unclear from the material reviewed. Wider use of compensation is being considered through a proposed “Species at Risk Act”.

2.4 USA

a) Conservation in context

Transformed by European settlement over the past 400 years, the USA has a federal system of government and moderate to heavy intervention in some agricultural production lines. The guiding principles for biodiversity policy in USA come through legislation such as the Endangered Species Act, the North American Wetlands Conservation Act, and state and local statutes governing land use planning. The US Department of Agriculture and the Department of Interior Fish and Wildlife Service both run schemes affecting biodiversity on private land. There is a long tradition of voluntary conservation bodies such as the Nature Conservancy and Sierra Club directly managing some areas for conservation purposes.

b) Incentive instruments

A number of positive incentive instruments for biodiversity on private land are currently in use around the country.

- **Agricultural Set-aside Scheme:** A federal scheme for removing land from agricultural production, by offering standard payments compensating for income forgone through 10-year contracts, covering up to a specified percentage of each farm’s area. Widely regarded as attracting land of least value to agriculture rather than land of most value to biodiversity, it provides no long term security and has low conservation effectiveness.
- **Conservation Reserve Program (CRP):** A federal scheme for removing land from agricultural production and restoring grassland or forest cover. Landowners volunteer to enter 10-year contracts in return for annual payments, which cover both additional costs of restoration and compensation for income forgone. The scheme sets targets for participation

over specific periods, and invites farmers to “bid” for inclusion, selecting them according to modified cost effectiveness principles until the target area is achieved. Both administrators and bidders display learning behaviour over successive bidding rounds, so there is a risk of inefficient selections and over-payment in the initial years (Reichenfelder & Boggess 1988).

- **Wetlands Reserve Program:** Administered by the USDA since 1990, this aims to improve water quality and biodiversity through improved fish and wildfowl habitats. USDA pays 100% restoration costs on permanent conservation easements; 75% costs on 30-year easements; and restoration cost share agreements for a minimum of 10 years in which USDA pays 75% of restoration cost and owners receive no reimbursement for site use.
- **Wetlands Mitigation Banking:** A market creation device which requires restoration, creation or enhancement of other wetland areas in compensation for wetlands damaged by new developments. Essentially a development consent condition imposed by some state governments, it also provides opportunities for private landowners to voluntarily offer areas of their properties suitable for the wetland mitigation work, and provides a means of improving flood control and recreation space as well as habitat restoration (Lashley 1995).
- **Environmental Quality Incentives Program (EQIP):** Run by USDA since 1996, this is a voluntary programme providing incentives to farmers to make environmental improvements to farmland, involving the preparation of conservation plans and 5 to 10-year contracts for incentive payments and cost-sharing on installation of improvements. Priority areas include soil erosion, water quality, wetlands and wildlife habitat.
- **Conservation easements:** A number of states offer tax concessions to private landowners in exchange for easements created for the benefit of local community or conservation bodies. There is also federal income tax deductibility for assessed reductions in property value. The predominance of easements over more readily extinguished covenants, and the linkage to tax concessions, creates an emphasis on demonstrable permanence in land use change.
- **Endangered Species (ES) Act:** Administered by the Fish and Wildlife Service, the ES Act prohibits activities affecting endangered plants, animals and their habitats, and may require landowners to modify their use of areas deemed critical habitat. A constitutional prohibition against uncompensated government “takings” of property creates legal debate about whether actions under the Act constitute takings, or regulation for which no compensation is payable. Most ES Act interventions attract no compensation at present, which creates perverse incentives to conceal or destroy habitat before it is identified (Innes et al 1998).

The US displays a mix of long term property right adjustments, contractual payment schemes derived from agricultural policy, and uncompensated regulatory measures. It encourages widespread and scattered conservation management areas which, since the probability of success in reducing risks to biodiversity is a function of increasing number of sites under conservation management, may advance the cause of conservation at low apparent cost to government. But policy, and in particular the ES Act, has also been criticised for creating a dichotomy between species on threatened list and those that are not, and mechanisms which admit to a continuum of risk probabilities could improve consistency (Solow & Polasky 1999).

2.5 UK/European Union

a) Conservation in context

With virtually no land unaffected by human use in its long history of settlement, the focus of biodiversity conservation is on semi-natural landscapes on privately owned land. Much of it is used for farming which, for the past half century, has received subsidies favouring intensification to the detriment of nature conservation. The structure of conservation policy mechanisms in the UK was established soon after World War II, and comprises principally:

- The designation of Sites of Special Scientific Interest (SSSIs) by statutory conservation agencies², ranging from small discrete sites to extensive tracts covering several properties.
- The designation of National Parks, which are extensive tracts of privately owned and used countryside, with special funding and land use planning provisions favouring landscape, public access and nature conservation. Each is administered by a national park authority with members drawn predominantly from the constituent local councils.
- Statutory powers over land use planning held by local councils (territorial authorities), restricting private landholder rights through such measures as development control, green belts and tree preservation orders. National government offers advice on best practice in the form of Planning Policy Guidance Notes.

EU Directives have superimposed pan-European priorities since the 1980s, giving rise to new designated areas given effect through the SSSI mechanism. There has been increasingly explicit focus on biodiversity since the 1992 Earth Summit, expressed in the UK in the Biodiversity Action Plan (1995) which specified national targets for enhancing different habitat types, distributed around the country according to areas defined by their similarity in natural characteristics (similar to the ecological domains being developed in New Zealand).

There is a long tradition in UK of non-profit organisations (NPOs), such as the National Trust, the Royal Society for the Protection of Birds, and county naturalists trusts, giving practical effect to conservation by volunteering labour and funds to managing their own reserves.

b) Incentive instruments for biodiversity

Different incentive instruments for biodiversity on private land apply to different circumstances.

- Conservation agencies, national park authorities and local councils are empowered to negotiate management agreements with individual landholders, resulting in customised, targeted agreements covering actions and associated payments. This is the instrument most commonly used to protect SSSIs against potentially damaging operations, since the agencies are reluctant to undermine landowner goodwill with their alternative statutory powers of prohibition orders and compulsory purchase. Although the agencies would prefer to reimburse only positive actions rather than the landowner's forgone income from a less intensive production, some compensation for forgone income is often required to secure agreement. Management agreements have high transaction costs in the negotiation process, and also tend to have the highest costs per hectare treated, although since they are more targeted they are not necessarily the highest cost per property. They are more commonly used for protecting existing sites, and supplemented with other Wildlife Enhancement Schemes when improving degraded sites or creating new sites.
- Environmentally Sensitive Area (ESA) schemes are administered by the agriculture ministry as part of the agri-environmental policies which comprise about 5% of the total budgetary support to farmers under the EU's Common Agricultural Policy (CAP). These offer 10-year contracts for standard payments for actions to reduce farming intensity and enhance wildlife over defined areas of eligibility. Payments cover positive actions and forgone income, since the schemes aim to provide a competitive alternative to the return from subsidised farm output. The ESA schemes have high acceptance and take-up by farmers, and relatively unconstrained funding as part of the agri-environmental programme since 1992. They are particularly suited to areas where standardised remedies to common problems can be readily discerned, such as stocking rates in upland pastures or wet grazing

² This was previously performed throughout the UK by the Nature Conservancy Council, but since 1991 has been the responsibility of the separate agencies of English Nature, Scottish Natural Heritage and the Countryside Council for Wales. Catchment and pollution regulation, which affects biodiversity through water and riparian management, is performed by the Environment Agency in England and Wales and the Scottish Environmental Protection Agency.

lands management in areas such as the Norfolk Broads and Somerset Levels. A similar approach has been adopted in the Nitrate Sensitive Areas scheme. Pioneered in UK, ESAs are used in other EU countries, notably Germany, Denmark, France, Spain and Portugal.

- The Countryside Stewardship Scheme (CSS) is the *a la carte* version of the ESA, offering a menu of standardised payments for specific conservation works - so much per kilometre of hedgerow maintained to a certain standard etc. It is not confined to defined eligibility areas, but funding is constrained so only the best applicants are selected for the 10-year contracts. Piloted by the Countryside Commission, the statutory agency for landscape and public access, it has been available nationwide and administered by the agriculture ministry since 1997. It is popular with farmers and over-subscribed. Similar, more limited schemes include the Farm Woodland Premium Scheme.
- Various grants for capital works are available through the agriculture ministry, some of them limited to ESA districts, others more widely available. While many are aimed at landscape or access improvements, some have lasting biodiversity gains, such as pond restoration and small woodland establishment.
- Planning gain is the practice of making planning permission conditional on some remedial work being done elsewhere for the benefit of biodiversity. It is used by some local councils, although by its nature it is difficult to enumerate its extent or effects for conservation.

All these schemes are essentially contractual, securing farmers' commitment for the duration of the agreed payment period but with uncertain long term gains. More permanent options such as the acquisition of land, or securing of easements or covenants, appear to be used less often. This is possibly because of the greater impact they make on the agencies' limited annual budgets, but may also reflect other influences: crowding out of these options by the contractual schemes; landholders' reluctance to cede control because of misapprehensions about squatters' rights, and gypsy travellers; and restrictive interpretation of who may enforce covenants under English law.

A recognised drawback of site-based approaches to conservation policy is the sheer cost of trying to manage more than a small proportion of the country's total conservation resource in this manner. Intended partly as seed-beds from which species might colonise surrounding areas, many SSSIs continue to decline in quality, having become isolated fragments surrounded by an unreceptive countryside being shaped by agricultural policy and other economic forces (Adams et al 1994). Agri-environmental schemes have been devised partly in response to this perception. SSSI's cover about 7% of England's land area, agri-environment schemes add a further 3%, and the clearly identifiable area accorded some conservation status (after allowing for overlaps between the different mechanisms) is around 12%.

It may be significant that the wide acceptance of ESAs and CSS coincide with their mainstreaming within agricultural policy and their consolidation within the agriculture ministry. Management agreements and SSSI designation are reportedly resented by some farmers because of the implied threat of statutory powers underlying the negotiation process, and they may be prolonged by farmers holding out for more generous settlements. Government's signalled intention to legislate for a public right of access over unenclosed land, similar to that found in Scandinavia, is perhaps an indication that, at least regarding access, the experience with management agreements is viewed as unsatisfactory.

2.6 Other incentive instruments

The literature review uncovered some other instruments for biodiversity in other countries.

- Ecological Compensation Programme, Switzerland: This is a voluntary programme offering 20-year contracts for annual payments covering the cost of positive works for landscape

improvement, funded by federal taxpayers but administered by each Canton (state). It currently has low uptake but moderate effect on conservation (OECD 1996).

- **Park-Share Dividend Hypothecation, France:** This scheme aims to provide a recurring incentive to biodiversity by paying a dividend to landowners within national parks, drawn from hypothecated revenues collected by park authorities in entry fees, bed-night taxes and so on. Administered by local councils, it is considered to be highly effective in securing long term benefits (OECD 1999), although from the description of the mechanism the link between actions and payments is not clear and may be prone to free-riding.
- **Differential Land Use Tax, Germany:** Applied by Lander (state) governments as a charge on land developers, this is a compulsory “fine” for the damages presumed to flow from particular land uses, providing a long term and recurring disincentive against some land use changes. The tax schedule favours land uses retaining biodiversity, access and landscape.
- **Landcover Mitigation Scheme, Germany:** Various Lander and some city authorities employ mitigation schemes, in which all landcovers are “scored” according to ecological or landscape characteristics, and requiring reductions in score caused by developments such as roads, housing or mines to be made good by enhancements of score in other areas. The relative values implied by scores, and the monitoring of effectiveness, are contentious.
- **The UK’s landfill tax:** This tax, paid on waste deposited in landfills, includes a mechanism hypothecating revenue for environmental enhancements. Depositors earn credits against this tax by demonstrating equivalent contributions to accredited environmental improvement trusts. Some mining and construction companies (who produce spoil for dumping) are reputedly using this for habitat restoration, such as turning disused quarries into nature reserves, but there are serious concerns about the effectiveness of this scheme following public revelations earlier this year of widespread illegal dumping and the channelling of most funds through front companies of landfill operators rather than independent established environmental bodies.

3. EXPERIENCE WITH INCENTIVE MEASURES

3.1 Criteria for analysing incentive measures

Following Colman (1994), Young et al (1996) and James (1997) criteria which can be used to assess the success of incentive schemes in practice include the following.

- Effectiveness in achieving environmental objectives, in this case the achievement of some enhancement, or halt in the decline, of biodiversity measured in some form. This may include some assessment of the dependability or certainty of achieving desired objectives.
- Efficiency, as indicated by minimising resource input costs per unit of achievement. Due to the difficulty of valuing economic benefits of biodiversity, the most that is likely to be feasible is some indication of the cost-effectiveness of different schemes, taking account of administrative costs for those implementing them, compliance costs for those taking them up, resulting distortions in resource allocation and fiscal implications. This has both static and dynamic dimensions, reflecting the long term continuity of incentives.
- Equity, or the social justice associated with the schemes. Equity is a value judgement for which economics has no clearcut measures, but it can illustrate distributional impacts of schemes (e.g. who benefits from them), distinguishing their horizontal equity (equality of treatment for all) from their vertical equity (differential treatment).
- Community acceptance, reflected in such indicators as the willingness of targeted landowners to participate in the scheme, the necessity (or otherwise) to promote and police the scheme, and the willingness of non-participants to respect and voluntarily complement the scheme's intentions.
- Administrative feasibility depends on existing and proposed institutional structures, legislation and administrative procedures, and the avoidance of jurisdictional constraints and co-ordination problems with other policies.

An overview survey of the type reported here is not able to reach definitive conclusions on how the various incentives perform under these criteria. However, an attempt has been made in the Appendix B Table to identify characteristics of the various schemes, and some narrative comment on their strengths and weaknesses is outlined below.

3.2 A typology of incentives for biodiversity

3.2.1 Awards, prizes and non-pecuniary recognition

These measures have been identified in Australia, and probably exist elsewhere. The price of praise can be cheap, but the continuing incentive effect of awards is difficult to determine. Such schemes may be better oriented to acknowledging period-to-period improvements rather than judging the best conservation land management at a point in time.

3.2.2 Non-binding management agreement

Non-binding management agreements have been identified in Australia, but there are probably other examples of informal undertakings between landowners and agencies acting in this way.

3.2.3 Binding/contractual cost-sharing management agreement

Examples of these agreements are the SSSI management agreements, the Conservation Reserve Program, Prairie Cover Program and Farm Set-aside schemes. All provide a measure of

protection over a defined contract period, but with unfettered use rights reverting to landowners at the end of this period. Negotiating customised agreements has high transaction costs, and may be prolonged due to landholder hold-out for higher remuneration, or simply resistance to regulatory underpinnings. The bidding process of the CRP alleviates some of these problems. Auctions yield higher benefits than fixed rate payment schemes by overcoming information asymmetry and rent seeking by landowners, but at the expense of high transaction costs for administrators and landowners (Latacx-Lohmann & Van der Hamsvoort 1998).

This approach has limitations in promoting varied habitat in the long term (Hodge 1996). Landholder requirements have to be capable of being defined in contracts and enforced. In practice these agreements tend to specify inputs and controls on activities rather than purchasing outputs and leaving landholders free to find their least cost options. There is no guarantee that any conservation benefits will be maintained beyond the contract period. And emphasising individual contracts undermines the possibility of managing large tracts in an ecologically coherent way – e.g. over whole catchments or wildlife corridors (Hanley et al 1999).

3.2.4 Binding/contractual standard payments

Examples of these payment schemes are the ESA and CSS schemes in the UK and EU, which offer standard medium term contracts in return for prescribed restrictions on use rights and/or actions for positive habitat improvement. By offering standard payments, some of the ESA payments will be captured as rent to non-marginal participants (Colman 1994). The simpler the ESA scheme (i.e. lower tier) and less positive enhancement expected of the farmer, the greater the proportion of transfer payments retained as rent to the farmer. For the majority enrolled in ESA schemes, costs incurred have been less than payments received, and payments are made to landholders such as the National Trust who would probably manage land in much the same way without payment. Except where arable has been converted to grassland, the conservation gain is difficult to discern and the counterfactual difficult to define. This loose targeting means available funds are spread less widely, and could result in some crowding out of other, more permanent options (e.g. conservation easements). That environmental benefit has not been maximised and some farms have benefited disproportionately is reinforced by Wilson (1997), who found farm size to be the most important factor in ESA participation, noting that schemes originally targeted farms with large areas of overstocked semi-natural rough grazing, overlooking as ineligible farms with small but important habitats. ESAs have been associated with small positive employment effects in their local area, including off-farm jobs.

ESAs are widely recognised as too costly to be emulated in Australia and New Zealand (Bayfield 1999). However, it is important not to dismiss the mechanism on the basis of the form of its current implementation. As products of EU agricultural policy, ESAs are costly because, in offering an alternative to subsidised product prices, they have to compensate for forgone income. This condition does not apply to New Zealand, raising the question of whether standardised incentives for prescribed actions over specific areas is a mechanism with application here. It may be an option worth examining further, for example, in encouraging pro-conservation management of riparian strips.

3.2.5 Capital grants for long term improvements

Various countries offer grant schemes to farmers for capital and other works to enhance the countryside, by planting small broad-leaved woodlands, restoring ponds, laying hedges, involving standard payments of so much per hectare, or a fixed percentage of the total cost incurred. These provide a medium term benefit, but no long term security, to biodiversity gains.

3.2.6 Purchase of easement, covenant or other partial interest in land title

These mechanisms are widely used in Canada and the USA, where they are often associated with tax concessions, and in Australia and New Zealand, but apparently less so in the UK. Easements are derived from land law and tend to run with the land, whereas covenants have evolved from contract law and attach to individuals, and are hence more easily extinguished. A covenant is a legally binding restriction of land for the benefit of an adjacent landowner, but legislation in each country has enabled local authorities, national park authorities and recognised voluntary conservation bodies to act as covenantee for land on behalf of society even without holding adjacent land. The covenantee monitors and enforces compliance by the farmer/covenantor. Positive covenants, which require particular actions, are difficult to transmit to future owners, so from a conservation viewpoint, restrictive covenants are more important. In the USA easements predominate, since tax concessions are conditional on a permanent measure.

These instruments offer savings in acquisition costs over direct purchase, but have long run costs associated with division of ownership rights between grantor (landowner) and conservator which creates the possibility of legal conflict in the future - a set of contingencies which must be addressed at the outset via the easement contract. Easements rely on the ability of the conservator to ensure the terms are appropriately defined and satisfied, and the contract's terms determine both the quality of conservation and the costs of ensuring long run compliance. Compared with direct ownership, easements face higher monitoring and enforcement costs.

Easements tend to be perpetual rather than short term, to avoid the considerable costs of repeated negotiations. But in the USA this raises problems in setting an appropriate valuation of easements, which reflects the difference in property value with and without it. Discounted cash flow approaches founder on the subjectivity of assessing the future value in the absence of the easement, particularly the value of future development and when it will occur. Comparison of property valuations falls down because easements are particular to individual circumstances and sites, and exist in thin markets: aside from government and NPOs there are few buyers for easements, and once created they rarely change hands. Many NPOs are gifted easements, and government procurement alone does not create a true market for easements. These valuation problems imply considerable risk of over-payment for easements (Boyd et al 1999).

3.2.7 Land purchase for public agency management

Although not strictly an incentive for biodiversity on *private* land, public ownership is an option for securing the biodiversity interest in private land used in all countries surveyed. Ownership and management by statutory bodies with good track records is the most secure way of pursuing conservation policy, and not necessarily the most expensive: in the UK it is competitive with ESAs and management agreements, for while costs of these contractual arrangements tend to rise, the rental accruing to owned land reduces the present value cost of public purchase with each passing year (Colman 1994). From a Treasury standpoint even more efficient would be grant-aid to a voluntary NPO to purchase the land, since only a portion of the purchase price would be met by the public purse. But the opportunity to buy land only arises infrequently and may be subject to hold-out by the landowners. Efficiency requires that it should equally be possible to sell land whose conservation value declines as climate and other environmental conditions change, but public sentiment and statutory reservation processes often impede this.

3.2.8 Land purchase and resale under restrictive covenant (revolving funds)

The principal example of this mechanism is the revolving fund operated by the Australian Trust for Nature. As a mechanism for creating a conservation covenant, it may suffer less transaction

cost than negotiating an agreement with a landowner, and avoid some risk of hold-out by the owner. But it carries with it the risk of failing to find a sympathetic purchaser for future management. As with direct purchase, it relies on suitable land coming onto the market.

3.2.9 Grant aid for land purchase by conservation bodies

The literature review uncovered various funds engaged in grant-aiding voluntary conservation bodies, although with little detail of their disbursement arrangements. An attraction of this option is that public funding can obtain leverage from the fund-raising capacity of enthusiastic volunteers, and should have a lower fiscal cost relative to direct land purchase. The full economic cost is less clear-cut if value is attached to the volunteer time and effort; and while it can be argued that volunteers willingly bear that cost, it is still an opportunity cost in that with less demand on their time for conservation, they would engage in other worthwhile activities.

Re-creating a habitat or protecting a rare habitat against external pressures may require a more proactive form of environmental management, bringing different skills to bear, than is possible to expect of farmers as a by-product of their farming. This reinforces the advantages of land acquisition and operation by specialist agency or NPO, perhaps granted aid for land purchase and tax-relief. As landowner an NPO would be residual claimant on flows from the land, with its own incentive to maximise the non-monetary value of conservation obtained. It should require less detailed monitoring than a conventional landowner, and in the long term has incentive to achieve cost-effective conservation management. An NPO may also be more flexible and less bureaucratic than a government agency, and hence able to respond in more timely fashion to emerging opportunities and threats (Hodge 1996).

3.2.10 Tradeable development rights and mitigation obligations

Examples of these instruments are the wetlands mitigation schemes in USA, the landcover mitigation in Germany and planning gain requirements of UK local authorities. Local councils in New Zealand have similar requirements on some new developments.

These measures are based on a regulatory restriction on land use rights, but in creating scarcity they create opportunities for private trades. An example might be a restriction on the amount of forest clearance allowed on a class of properties, so that those owners who wish to clear more would need to buy unused entitlements off other owners. Such measures may be expected to have similar characteristics to quota trading regimes (New Zealand fisheries, US sulphur emissions), which have substantial administrative and compliance costs in registering owners and keeping track of trades: overall, however, these regimes are regarded as reducing allocative distortions and lowering the overall cost of regulating natural resource use. Since local planning already creates a degree of development control over the conversion of rural land to urban uses, these measures could improve resource allocations and distribute benefits widely amongst affected landowners, with little additional restriction on owners' rights. However, these measures appear best suited to protecting existing habitat, face formidable monitoring difficulties in verifying the additional net gain from new habitat creation or enhancement, and do not provide on-going incentive to tackle recurring threats like invasive species.

3.2.11 Proprietary rights in wildlife

In common law wild things are free until captured or killed, at which point they become the property of the person on whose land they were caught, or the person who caught them where that right is delegated, waived or unenforceable (as when land ownership is ill-defined). Sovereign authorities have exercised prerogative to declare ownership of some wild species, such as swans and deer reserved for sport in medieval England, and a wider range of game

species under the 19th century Game Laws. A similar process emerged in countries settled by colonisation, but with different motivations: in North America, large mobile and often damaging species, such as wolves and rampaging caribou herds, were recognised as being beyond the capability of individual landowners to control, so responsibility and rights in them reverted to State governments (Lueck 1989). In the late 19th and 20th centuries sovereign prerogative began to be used in legislation to protect species and, more recently, their habitats.

Generally the law does not recognise entitlements to biodiversity itself, but only to individual components and resources, such as particular species and tangible properties. Thus, in trying to promote biodiversity as indicated by the presence of particular species, or certain mixes of species, there are no property rights in the interconnectivity which is the feature which knits biodiverse eco-systems together. Since biologists and ecologists are uncertain about the relative contribution of different individual components and functions towards the ecological resilience which lessens the risk of major ecosystem damage, it is not possible to precisely target an optimal mix of attributes for biodiversity, or establish legal principles to keep the mix optimal.

Property rights in species may improve the incentives for sustainable management and use of individual species and their habitats, but this mechanism can be selective and inconsistent with biodiversity. The strength of incentive depends on the market demand for individual species, so species seen to have low market value and/or to be competitive with more valued species may be neglected or persecuted in favour of higher value species. This is evident in the private freshwater fisheries in Britain, where preference for game species like trout and salmon has long encouraged removal of other fish from some waters; and also in the over-stocking of some private waters with species like carp, whose bottom-grubbing habits are destructive of plant life and ecological balance. Resource economics has demonstrated there can be conditions under which even a private resource owner may find it economically optimal to deplete a resource to exhaustion and invest the proceeds in higher yielding investment elsewhere. Private rights alone are insufficient to ensure biodiversity and need to be supplemented by other measures.

One further proprietary rights mechanism suggested for biodiversity is so-called biodiversity prospecting rights, under which private entitlements to any proprietary benefits derived from biodiversity (e.g. patents on drugs) are intended to motivate protection of habitat. To date, this has emphasised *ex situ* preservation in collections and gardens, but *in situ* conservation in natural areas is also important: the high level of cancer-combatting taxol in Pacific yew bark may be dependent on shade provided by old growth forest canopy and may be unachievable in yew tree plantations (Day & Frisvold 1993). However, because the probability of profitable benefits from any particular organism is very small and the investment risks large, even under favourable assumptions about the returns from pharmaceutical research, the private value of a marginal species, and by extension, the incentive to conserve the marginal hectare of threatened habitat, is modest (Simpson et al 1996). If the community values biological diversity, it should be actively seeking other alternatives for financing its conservation.

3.2.12 Tax concessions

Tax concessions are not a biodiversity incentive as such, but rather a means of payment used in the USA and Canada for creation of easements and covenants. In Australia taxes create adverse incentives for biodiversity; in New Zealand, rates relief is a local tax concession. The incentive of a tax concession is directly proportional to the tax liability of the landowner, and New Zealand lacks some of the taxes on capital gains, inheritance, and land which make concessions valuable in other countries. Making property value loss deductible against income tax, as in the USA, confers an incentive proportional to the taxpayer's marginal tax rate, in contrast to the flat

rebate across income bands conferred by a tax credit. Tax concessions provide very variable incentive across landholder types and could be poorly targeted for conservation needs.

4. CONCLUSIONS AND IMPLICATIONS FOR NEW ZEALAND

Enhancing biodiversity on private land could be achieved by regulation, raising the standard of care expected of landowners and occupiers towards the conservation interest in their land. But this is limited by the costs of monitoring and enforcement, and it may be more efficient to harness landholders' co-operation by creating economic incentives, signalling more fully the value of biological features on private land so they are viewed as assets rather than liabilities.

This report has identified a range of different incentive instruments used to encourage biodiversity conservation on private land. Broadly they can be characterised as:

1. Conservation management agreements and fixed period contracts between conservation agencies and individual landholders over defined areas of land.
2. Purchase of partial interests in land, such as easements or covenants, either directly from landowners, or by conservation agency purchase and resale with a covenant attached.
3. Purchase of freehold interest in land and subsequent management by a conservation agency or voluntary body.
4. Restricting landholder development rights and allowing them to trade residual entitlements.
5. Establishing proprietary rights in wildlife products.

New Zealand already has mechanisms corresponding to numbers 2, 3 and 4 in this list, although their consistency and effectiveness in application is unclear. Fish quota are an example of 5, and another example is the public debate about cultural harvest of wildlife by local Maori. The evidence from this survey is that extension of private market rights to things like wildlife harvest, patents for genetic resources, or exclusive rights to tourism in natural areas, does not eliminate the free-rider problems associated with biodiversity. Such rights create markets for products in joint supply with biodiversity, rather than a direct incentive for biodiversity itself: at best biodiversity is an incidental by-product of resulting economic activity, and in some cases private rights may reduce biodiversity by over-emphasising selective components of it.

Given acknowledged public good characteristics of biodiversity, its protection requires a broader direction than can be provided by individual rights alone, and the literature review indicates that some incentive instruments in use are poorly targeted for conservation purposes. An element missing from the literature surveyed here is detailed examination of how the various incentive instruments acting at the individual level contribute to a coherent plan for biodiversity conservation. There is a risk of individual incentives creating a rash of disconnected protected areas with limited resilience against the shocks which can wipe out components of biodiversity.

Many incentive schemes (e.g. covenants, land purchase) effectively create private reserves set aside from damaging activities, leaving unclear such questions as:

- how to achieve funding for on-going maintenance of these areas, an issue particularly important for New Zealand with its pervasive and recurring pest threat;
- how to raise the standard of biodiversity-friendliness of the wider countryside, so the private reserves do not become fragments isolated by hostile surroundings.

The voluntary nature of many of these schemes entails a degree of self-selection, depending on helping those who are predisposed towards conservation to achieve more. However, this alone will not ensure that the most important sites are brought under suitable management, and in

order to protect more critical sites some more costly measures may be required. A positive attitude towards habitat conservation cannot be relied upon as substitute for offering landholders economic incentives adequate to recompense both the market and non-market costs they incur for conservation (van Kooten & Schmitz 1992).

A crucial issue is whether incentives should simply reimburse landowners for the additional costs they incur in providing for biodiversity, or whether they need to compensate owners for the income they forgo by modifying use of their land. This relates to the ethical question of whether private landowners have a right to degrade habitats and need to be paid to stop, or whether there is a duty or standard of care towards conservation conferred by ownership, in which case the onus for meeting due standards rests with the owners. The conservation dollar would clearly go further if income forgone were not compensatable.

But the US debate over the Endangered Species Act illustrates that not paying compensation is inefficient since it creates perverse incentives to destroy biodiversity. It gives farmers no incentive to conserve habitat, or even disclose its existence, for fear that any subsequent takings will foreclose their options and reduce the value of their assets. Full compensation at market rates also sets up an incentive for excessive and early development, so as to enhance any compensation payable. The optimum is somewhere between the two. The inference is that a policy which never contemplates compensatory payments risks farmers being less forthcoming about their habitats, and the loss of some vital rare habitats. Some compensation may be necessary to secure the rarest and most critical habitats; and payments which do not compensate for forgone income only suffice for more readily substitutable sites of moderate significance.

In considering the relevance and applicability of other incentive measures to New Zealand it is necessary to look beyond the experience of the schemes in their current context to their essential elements. Contractual arrangements, such as the European ESA schemes or the US CRP, have evolved in the context of subsidised agriculture which makes them very costly, but similar instruments of tailored management agreements or standardised prescriptive measures could have application here, albeit at a lower level of incentive than in the current overseas schemes.

These schemes have the distinct characteristics of offering on-going incentives (e.g. against pests) and incentive to change land use practices over a wider countryside than discrete sites. They may be loosely targeted and prone to create economic rent for landholders, but wider use of auctions to select applicants could counter this and increase cost-effectiveness of biodiversity provision, provided strategic bidding and high transaction costs in multiple sign-up auctions can be overcome (Latacz-Loman & van der Hamsvoort 1998).

The literature review has uncovered little detailed examination of the mechanisms for disbursing funds - lump sum grant, matching grant etc - which have different administrative and compliance costs, and differing effects on the incentive created and the leverage of private funds achieved by public input. The role of such mechanisms, and of auctioning participation in incentive schemes, for rationing funding and improving the efficiency of incentives, requires further consideration in designing and implementing such schemes.

Financial incentive instruments are not the only means of encouraging biodiversity and need to be seen in a wider policy context. This includes ensuring the incentives are working in harmony with clearly articulated objectives, justifications and targets for biodiversity, and that they achieve agreement with landowners that the ends are worthwhile and the means are fair.

APPENDIX A: BIBLIOGRAPHY

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APPENDIX B: CHARACTERISTICS OF INCENTIVES

In reviewing the literature on incentive measures in use in other countries, measures were distinguished on the basis of a number of key characteristics:

- Nature of incentive: charge, payment, fine, tradeable right, performance bond
- Purpose of incentive: primarily protecting biodiversity, access, landscape, historic sites, or a combination
- Whether participation is voluntary or compulsory
- Whether the incentive is a one-off/permanent transfer or annual/recurring payment
- Duration of agreements and contractual arrangements
- The entity which attracts incentive: areas, specific features, sites under conservation management
- What the incentive covers: positive actions for biodiversity, forgone income, or both
- The rate at which incentive payments are made: flat rate or variable/negotiated rate
- Administration of the incentive: agriculture ministry, conservation agency, private non-profit organisation or private other entity.
- Source of transfer payments: national taxes, local taxes, user pays, other
- Participant uptake and retention.

For most measures there was insufficient information to proceed very far with assessment against the criteria of effectiveness, efficiency, equity, acceptability and feasibility. Instead we provide an (admittedly judgemental) comparison of ten categories of incentive along a number of dimensions, as outlined below.

- Duration: whether the measure secures habitat in the short, medium or long term.
- Conservation effectiveness: whether it is tightly oriented and focused on biodiversity, or whether it has characteristics which detract from this.
- Creation of new interest: whether it is oriented to habitat improvement and extension, or rather retention of existing habitat.
- Timeliness: whether a measure can be brought into play quickly, or requires longer set up.
- Targetability: whether measures allows tailoring to specific needs, or just general incentive.
- Payment system: how much is paid, in what form, when and by whom.
- Cost of establishing: what transaction costs are caused by negotiation and legal registering.
- Cost of monitoring: what is the likelihood of the conservation requirements of measures being voluntarily complied with, readily observed, and capable of being enforced.
- Allocative incentives how do they influence behaviour towards nature conservation.
- Distributive effects: what is the level of transfers, and how widely are benefits received.
- Cost efficiency: what is the apparent efficiency in terms of output per unit input.
- Fiscal implications: how much of the incentive falls to national or local taxpayers.
- Community acceptance: are the schemes favoured or resented by landowners.

COMPARISON OF 10 CATEGORIES OF INCENTIVE MEASURE USED FOR BIODIVERSITY CONSERVATION														
Name	Examples	Duration	Conservation Effectiveness	Creation of new interest	Timeliness	Targetability	Payment system	Cost of establishing	Costs of monitoring	Allocative incentives	Distributive effects	Cost efficiency	Fiscal implications	Community acceptance
Non-binding management agreements	Australia	Short-medium term	Good stop-gap measure	Medium-high	Swift, subject to negotiations	Can be tailored precisely; but voluntary take-up softens it	Minimal, none or in-kind assistance	Low, given receptive landowners	Can be high and difficult to enforce	Low	Low or no transfer	High apparent efficiency; hidden private costs	Very low; facilitation costs and lower tax take	Acceptance among predisposed landowners
Binding/contractual management agreements	UK SSSIs	Medium term	Good subject to enforcement	Limited	Slowed by designation	Can be tailored precisely	Annual and lump sum	High through negotiation	Can be high	Moderate	Moderate transfer to best few sites	Low apparent efficiency offset by	Full taxpayer funding	Resentment at designation process
Binding/contractual standard payments by area	UK ESAs; Farm set aside	Medium term	Medium: misses best sites, covers low risk sites	Medium	Rapid once scheme in place	Voluntary take up softens targeting	Annual payments	Moderate once scheme is in place	Can be high; costly to monitor multiple-requirements	Moderate	Moderate transfer to more selected sites	High budgetary cost; low targeting of protection	Full taxpayer funding	Acceptance among farmers & landowners
Capital grants for long term improvements	UK Farm Woodland scheme	Medium-Long term	Medium: misses best sites, covers low risk sites	Medium	Rapid once scheme in place	Voluntary take up softens targeting	Lump sum	Moderate once scheme is in place	Moderate	Moderate	Moderate transfer to more selected sites	High budgetary cost; low targeting of protection	Full taxpayer funding and some owner input	Acceptance among farmers & landowners
Purchase of easement, covenant or other restriction on land title	US easements, Canadian covenants	Long term	Medium-High	High	Slowed by negotiation	Can be tailored precisely; but often donated less good sites	Lump sum cash and/or tax concessions	High through negotiation	Can be high and varying with the covenantee	High	Transfer to conservation interests	Efficient in establishment; maintenance more variable	NPO inputs & donations add leverage to taxpayer input	Acceptance among farmers & landowners
Land purchase and resale under restrictive covenant	Australian revolving funds	Long term	Medium-High	High	Depends partly on land coming on the market	Can be tailored precisely	Lump sum cash partly recovered on resale	Low-medium, depending on legal and survey costs	Can be high and varying with the covenantee	High	Transfer to conservation interests; some recouped later	Efficient in establishment; maintenance more variable	Full taxpayer liability eased by resale value	Acceptance by landowners, but purchasers may be limited
Grant aid for land purchase by conservation bodies		Long term	High likelihood of conservation management	Highly useful for enhancing biodiversity	Depends partly on land coming on the market	Can be tailored precisely	Lump sum cash	Low given effective land markets	Low, given NPO aims convergent with govt	High	Transfer to conservation interests; some private input	High efficiency if well managed	NPO inputs & donations add leverage to taxpayer input	Acceptance among farmers & landowners
Land purchase for public agency management	Ubiquitous	Long term	High likelihood of conservation management	Highly useful for enhancing biodiversity	Depends partly on land coming on the market	Can be targeted precisely	Lump sum plus on-going costs of management	Low given effective land markets	Low	High	Transfer to conservation interests	High efficiency if well managed	Full taxpayer funding	Acceptable if used in moderation
Tradable development rights and mitigation obligations	German land-cover scheme; US Wetlands mitigation	Long term	Medium likelihood of long term habitat conservation	Medium usefulness; new interest offset by damage	Depends on eligible devt coming on stream	Moderately targeted; long term management unclear	Payments by developers to recognised schemes	Low; set up by regulation	Moderate administrative, compliance & monitoring	Moderate	Costs of new development rise cf. re-development	Moderate efficiency; may be thin markets	Low fiscal requirements	Low-moderate; landowners rights restricted
Proprietary rights in wildlife	UK fish & game	Indefinite	Moderate & species-selective	Low; depends on market value	Low; subject to free riding	Low; private rights & social aims diverge	Owner can appropriate wildlife benefits	Low; set up by regulation	Low; owners enforce own rights	High, for the few species of market value	Economic rent to those given ownership	High	Low fiscal requirements	Low; favoured by owners but not by public