

## Current ideas on ways to get long-term involvement in biodiversity maintenance

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### Abstract

Biodiversity conservation on private land is necessary to achieve public goals, but landholders are essentially free agents. Mechanisms for achieving conservation outcomes are expected to be effective in the long-term, with no loss of highly significant sites and a net gain at the landscape level. This is a tall order. A consideration of moral hazard and first mover problems reveals limitations in most mechanisms, especially when biodiversity assets are found on land with high-value alternative uses. Long-term management agreements that are adaptable and can be rolled over are the exception, but they require complementary regulatory mechanisms. Auction-type systems can lead to such agreements. Other mechanisms such as regulation, duty of care, voluntary schemes, land purchase, covenants, easements, education, capacity building, targeted incentives, whole-farm planning, and environmental management systems can help to achieve long-term objectives. The scope for these other instruments to have the desired outcomes varies with the mechanism, the value of the land, and whether the desired outcome is at a site or landscape level. Critical criteria such as cost-effectiveness and available budget are not considered here.

There are difficulties in achieving certain long-term outcomes if policies are directed only towards influencing landholders. Focusing policies on the external drivers of land-use change is also likely to indirectly influence conservation outcomes, in part by taking pressure off what the direct mechanisms have to achieve. This is consistent with the directions established in Victoria's Biodiversity Strategy.

### Keywords

agriculture, biodiversity conservation, conservation mechanisms, land use, private land

### Introduction

My aim in this paper is to outline mechanisms that might be used by conservation agencies to secure biodiversity assets on agricultural land in the face of possible land use changes over the long term. The problem addressed here is essentially that:

- biodiversity conservation on private land is necessary to achieve public goals
- landholders are essentially free agents
- land use changes that affect biodiversity outcomes will continue to occur
- most mechanisms in current use can be expected to deliver outcomes only in the short term, or are supporting mechanisms such as education.

In the Methods section, the scope of the paper is outlined and the approach taken to categorising mechanisms is outlined. The conditions for success are also explored; that is, what the instruments must achieve.

In the three following sections the range of instruments are outlined according to what aspect of the farm operating environment that they might influence. How the availability of high-value uses of the land could affect long-term conservation outcomes will be considered for each instrument. The capacity of an instrument to protect an individual site of high conservation value, and the ability of the instrument to deliver net gain outcomes at a landscape level, are addressed.

The concluding section draws together key points from the discussion of individual mechanisms.

## Method

### *Scope*

This paper deals only with those instruments that might be used to directly influence farmer behaviour. It does not consider measures taken to change institutional structures that govern how landholders operate, such as market systems or governmental arrangements.

The emphasis is primarily on biodiversity assets that are under the management or direct influence of individual farmers. The concern is not with off-site impacts where the actions of many farmers can collectively alter influence conservation outcomes, such as the condition of rivers. However, it is acknowledged that on-farm management by individuals can make a great deal of difference off-site; for example, conserving bushland may be important for a local wildlife corridor.

The mechanisms are not evaluated against all criteria that are important. Cost-effectiveness is clearly important (Stoneham et al., in these proceedings), but is not relevant to this paper.

Solutions are not matched to the causal factors influencing biodiversity outcomes. Economists usually focus on overcoming market failure, but questions of political economy are also relevant. Reeve (1992) argued that targeting the inputs to agriculture is central to achieving sustainability. Agricultural research has a powerful influence on the market signals received by farmers in the future, because it reduces costs and increases available products; thus agricultural research is an important area to consider in terms of both targeting appropriate research and reducing disincentives to biodiversity conservation.

Finally, the findings are relevant to conservation on all private land, but the focus is on agricultural land.

### *Categorising instruments*

For the purposes of this paper, policy mechanisms are categorised in terms of whether they are targeted at:

- directly protecting biodiversity assets (where the land remains in private ownership)
- land title and ownership of the property
- farm managers and the production system.

In part this follows Crosthwaite (1995, after Jacobs 1991), which distinguished different aspects of the operating environment to which policy mechanisms might be targeted.

There are other systems for classifying policy mechanisms. Opschoor and Turner (1994) distinguished instruments by whether they influence the choices available, the costs and benefits of each choice, and perceptions about the choices. These are said to broadly correspond to regulation (and, I argue, capacity-building), market-based mechanisms, and moral suasion. Young et al. (1996) distinguished between instruments on the basis of their method of operation: motivational, voluntary, price-based, property-right, and regulatory. Economists also distinguish instruments by whether they are based on 'reward' or 'penalty'; applying the polluter-pays principle requires the use of penalty approaches where possible, but if this is not realistic then rewards may be necessary.

### *Conditions for success: what the instruments must achieve*

#### Meeting biodiversity objectives

The conditions for success of the policy mechanisms can be derived from Victoria's Biodiversity Strategy (NRE 1997). The Strategy established five key management objectives for biodiversity management in Victoria:

- There is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain, with the first target being no net loss by 2001.

- The ecological processes and the biodiversity dependent upon terrestrial, freshwater and marine environments are maintained and, where necessary, restored.
- The present diversity of species and ecological communities and their viability is maintained or improved across each bioregion.
- There is no further preventable decline in the viability of any rare species or of any rare ecological community.
- there is an increase in the viability of threatened species and ecological communities.

The nature conservation goals for private and leasehold land can be summarised as (a) protecting habitats of high conservation value, and (b) minimising negative on-site and off-site effects of land management, including agriculture, on other habitats and resources.

The Strategy goes on to establish management directions for meeting these objectives. In this paper, we are concerned with how particular mechanisms that might be used to directly influence farmer behaviour can contribute to meeting the objectives. The breadth of the management directions in the Strategy makes it clear that a combination of approaches is required.

#### Producing site-specific and aggregate landscape outcomes

Outcomes are important at two levels: site-specific, and aggregated across landscapes. For biodiversity assets of high conservation significance, no losses can be afforded, so long-term protection at all sites where those assets are found is important. For biodiversity assets of low conservation significance, the emphasis is on retention or net gain across the landscape; the loss of individual sites is not so important, provided that there is a net gain across the landscape in the long-term (NRE 2000).

The principles underlying how conservation significance is determined and how biodiversity assets should be treated is outlined in the Biodiversity Strategy and given more detail in the draft Vegetation Management Framework (NRE 2000).

#### Time period over which outcomes are required

For the purposes of this paper, 'long term' is defined as over 15 years. This roughly corresponds to an investment period; that is, the period after which major investments (e.g. sown pasture, fixed equipment) would be replaced. It is also half a generation, assuming a family farm is handed on to the next generation after 30 years.

'Medium term' is defined as 5 to 15 years. This is the period during which commitments about farm management that extend beyond one season might be expected to be reviewed if circumstances on the farm change. 'Short-term' is defined as less than 5 years.

These time horizons assume continuity of management. Sale of the property or a change of manager could radically change the situation.

In analysing the likely effectiveness of different policy instruments, judgements are made about the period over which they will be effective. These are qualitative judgments supported by argument rather than evidence. Others may arrive at very different assessments.

#### Value of land uses

Policy instruments must be applicable to all current or future land uses might be, no matter what the value of those uses will be. If the opportunity costs of retaining a site under management conditions that are beneficial to biodiversity are high, then *prima facie* pressures to change land use will be higher. It is important to note that high-value uses might emerge over time for marginal land for which there are few alternative uses at present.

In this paper I distinguish between land uses simply according to whether they are high-value or low-value.

#### Addressing moral hazard and first mover problems

Policy instruments, whether singly or in combination, must be capable of dealing with both moral hazard and first mover problems. These revolve around the likelihood that, at some stage in the future, it may not be in the interests of the landholder to continue to manage the site for

public purposes (Bowers 1999). Moral hazard involves the risk of the landholder changing management and blaming factors that are out of their control. First mover problems arise where circumstances change and landholders perceive and act on new opportunities for profit before the conservation agency knows of the potential risk or can prevent it. As a consequence of these two problems, regulations may be breached if it is sufficiently profitable to do so, and there will always be difficulty in setting penalties at a sufficiently high level to deter deliberate destruction (Bowers 1999).

Both moral hazard and first mover problems involve asymmetric access to information, which is a focus of the papers by Stoneham et al. and Strappazon et al. in these proceedings.

Recognising these problems is not to condemn landholders for being unethical. Rather, it is to recognise that behaviour is motivated by a complex set of factors, and value systems are only one factor influencing behaviour. Many people and organisations disregard regulations: consider the road rules, use of seat belts, fare evasion on public transport, corporate fraud and unsafe workplaces.

It is likely that that moral hazard and first mover problems will be greater for some groups of landholders than others. In a study that categorised landholders according to likely approach to conservation, Down to Earth Research (2002) identified segments it called Stewards, Embattleds, Opportunists, Traditionalists and Unawares. Intuitively, moral hazard and first mover problems are more likely to arise in the dealings of conservation agencies with the Embattleds and Opportunists than with the Stewards.

### **Mechanisms used to directly protect biodiversity assets**

The following mechanisms are used to directly protect biodiversity assets, irrespective of the property on which they are situated or the managers.

- regulations
- community-based duty of care
- voluntary schemes
- long-term agreements.

Many other mechanisms are commonly used to help conserve particular biodiversity assets, or have been proposed. Some cannot be expected to have any long-term effect, while others are less important supporting mechanisms. Such mechanisms that seek to influence the costs and benefits of conservation management include one-off grants to landholders, tax provisions for capital expenditure, taxes and levies, rate reduction and tradeable entitlements. Others include support for voluntary groups and self-regulation. These will not be further considered in this paper.

#### *Background to the mechanisms*

Regulation seeks to directly control activities or to prescribe what can and cannot be done (Young et al. 1996). Notions of regulation are being redefined to encompass 'smart regulation', which involves self-regulation and social control (Gunningham and Grabosky 1998). Regulation can also be enabling.

A community-based duty of care defines, through the collective view of landholders in a region, what is as a 'reasonable and fair' standard of management (Binning & Young 1997, Industry Commission 1998, SCEH 2001). A duty of care can also be prescribed in law, in which case it is indistinguishable from regulation. In the case considered here, legislation supports the duty of care but does not prescribe the activities required to meet the duty. This may seem a 'weak' mechanism, but the Industry Commission proposal has many built-in checks that make it quite powerful and adaptable over time (Industry Commission 1998; see also Crosthwaite 2001). Bates (2001) and Gardner (1998) have outlined many issues that may limit the practicality of implementing a duty of care.

Voluntary programs already play a significant role. The Land for Wildlife scheme, which now operates nationally, offers recognition for the conservation efforts of those who join up as well as 'practical advice, technical information, training, support networks and opportunities for

volunteers' (NRE 2002a). In Victoria, the scheme now operates on properties with a total area of 560 000 hectares, of which 150 000 hectares is retained habitat or habitat under restoration (NRE 2002b).

Long-term agreements involve the landholder entering into an agreement for 10 to 15 years, and involve payments in return for performing conservation services. Such agreements have a long history in Europe (Colman et al. 1992, Lomas 1994). English Nature (2002) has recent information on the agreements designed to protect Sites of Special Scientific Interest (SSSIs) in England.

There are many different types of management agreements, and ways of reaching agreement. The SSSI agreements are individually negotiated. Another way is to base them on auction results. Auction systems such as Victoria's Bush Tender scheme involve landholders bidding the amount that they are prepared to accept for undertaking conservation actions and then signing a management agreement (Stoneham et al. 2000 and Stoneham et al. these proceedings). The second trial to take place later this year will involve long-term agreements, whereas the first only involved three-year agreements.

### *Assessment of these mechanisms*

In order to encompass the objectives of the Biodiversity Strategy, the effectiveness of each mechanism in achieving long-term outcomes is considered firstly for the management of individual sites and secondly for net gain at the landscape level. Other relevant criteria such as cost-effectiveness are not considered here.

### Effectiveness for individual conservation sites

In this section the four mechanisms are evaluated qualitatively for the length of time that they can be expected to be effective in securing biodiversity outcomes for individual sites of high conservation significance. Results are summarised in Table 1. The score is based on a judgement about the extent to which the mechanisms avoid moral hazard and first mover problems. A breakdown is made according to whether the site has or is likely to have high value alternative uses. The scoring is justified in the following discussion.

**Table 1** Direct protection mechanism by length of effect at site level, and by availability of high-value alternative land uses.

<b>Mechanism</b>	<b>High-value alternative uses likely or uncertain</b>	<b>Limited alternative uses</b>
Long-term agreements	long term	long term
Regulation	short term	medium term
Duty of care	no certain effect	no certain effect
Voluntary scheme e.g. Land for Wildlife	short term	medium term

Only two of these mechanisms — regulation and duty of care, as defined above — can be said to apply to all conservation sites within a given geographic area (see more on these below). All the other mechanisms are based on voluntary participation and require agreement with landholders.

Voluntary-based mechanisms can have a wide reach (to all relevant sites within a given area) only with the use of additional (regulatory) mechanisms. Compulsory notification of intent to change management to the relevant public authority is one such mechanism, with approval conditional upon agreed action such as entry into a long-term management agreement. Such mechanisms are in force in relation to Sites of Special Scientific Interest in England (English Nature 2002). Compulsory notification is now required under planning schemes in some Victorian regions for developments such as laser grading for irrigation or for plantation establishment.

Subject to the above qualifications, and contrary to a widely held view, long-term agreements are the only one of these mechanisms that can be expected to deliver secure conservation outcomes in all circumstances. Bowers (1999) has argued that appropriately designed long-term agreements are the only mechanism that can overcome problems of moral hazard and first mover. This can be expected to occur if the landholder feels they have an inducement i.e. confidence that they will continue to be appropriately rewarded, given their circumstances and alternative uses to which they might put the land. Experience in Europe and economic theory suggest that the design of such agreements is critical to the outcomes. The agreement must be positive in the sense of giving the land manager responsibility for making decisions, rather than being overly prescriptive. In Europe since the early 1990s there has been a shift in emphasis from compensating to rewarding the landholder for active management (Webster and Fulton 1993). The process of rolling over from one agreement to the next is also important, and Young (1992) has argued that it should begin many years before the end of the current agreement.

Auction systems are treated here as a sub-set of long-term management agreements. They directly involve only a proportion of landholders with conservation sites, because they are competitive. A feature of auction systems are their information revelation role; landholders will reveal – and thus contribute to long-term protection of – sites of public interest on their properties that would otherwise not be known. Moreover, auction systems may have wider effects amongst non-participants or those who submit losing bids if they effectively create an option value such that the landholder takes planning decisions because they expect possible future benefit. The evaluation of the BushTender scheme, and its counterparts interstate, will be invaluable in determining what happens to conservation sites once the agreement ends. It is realistic to expect some owners of high value land to be tempted to convert to other land uses unless another agreement is signed or other mechanisms are in place.

Regulation can certainly be effective. For example, Victoria's Native Vegetation Retention system has been successful in dramatically reducing tree clearing. Regulation can also have an important complementary role, as in the requirement to notify intent to change management that was discussed earlier. However, partly because of moral hazard and first mover problems, regulation alone will not deliver certain outcomes, especially where land has high-value alternative uses. A further issue is the regulators' lack of knowledge about what might become high-value uses in the future. Although precise figures are not available, native grasslands in south-west Victoria and the Riverine Plain in Victoria have been lost since retention regulations were introduced, and this loss is continuing. Enforceability is important here: grasslands are not as obvious as treed landscapes and are often on high-value land. Apart from the prospect of being prosecuted, the size of penalties relative to income-earning opportunities is also relevant. The factors influencing the success of regulation have been explored elsewhere (Young et al. 1996, Gunningham and Grabosky 1998). Based on these factors, a judgment is made that regulation can be expected to be effective only in the short-term where there are high-value alternative uses. If the land uses are currently of limited value, regulation can be expected to be effective in the medium-term but not in the long-run, as high-value land uses may emerge.

A community-based duty of care involves a standard of management based on what is 'reasonable and fair' within the region. However, it is possible to envisage high-value conservation sites being irreversibly degraded under a duty of care, because the special management requirements of those sites are not being met. Many sites are unique, and conservation management would burden particular landholders more than most.

Schemes such as Land for Wildlife that provide conservation-minded landholders with opportunities to obtain support and recognition for their activities will succeed in many, but not all, cases in delivering long-term outcomes. Changing circumstances, changing belief systems and changing owners will mean that some conservation sites nominally protected under such schemes will almost certainly be degraded or destroyed over time, irrespective of the law. In conclusion, where there are high-value alternative uses, voluntary schemes cannot be expected to be effective beyond the short-term. Where land uses are of limited value, voluntary schemes

may have more success into the medium term and beyond, but only if new high-value land uses do not emerge.

#### Effectiveness at the landscape scale

Regulation can provide a 'base' level of protection at a landscape level. A key condition is enforceability, and where this is difficult the regulation must be accepted as legitimate and fair by the majority of those it affects (Young et al. 1996, Gunningham & Grabosky 1998). Victoria's experience with Native Vegetation Retention has provided something of a base level of protection. Statewide clearance rates of native vegetation on private land fell from approximately 10,700 hectares per year between 1972 and 1987 to approximately 2,500 hectares per year between 1990 to 1995 (NRE 2000). Regulation will not however prevent an overall decline in quality of biodiversity assets, whether due to legitimate use, neglect or mismanagement. Regulation will also not prevent incremental 'chewing away' of biodiversity assets – an issue that becomes very important for vegetation classes that are threatened with extinction.

A duty of care can provide for a baseline level of management, and can thus play a limited role in preventing and to some extent arresting a decline in quality of biodiversity assets across the landscape. The role will be limited because in many cases where threatened species and vegetation classes are involved, the burden of management will fall on relatively few land managers. The duty of care is not likely to address this.

An expanding set of voluntary schemes such as Land for Wildlife can play a positive role in conserving biodiversity at a landscape level – provided more land enters the schemes rather than leaves them, and that there is also a net gain in the overall quality of management. Factors influencing the prospects for such schemes include: how well the schemes are run and how adaptive they are to changing reasons for participation and in who participates, changing material circumstances of participants within a landscape, and changing landholder values and attitudes (which are influenced by political and social currents).

While long-term agreements may have an important contribution to make, they are not an immediate panacea. Such agreements are in use in Europe where there is a tradition of large payments to landholders. Sites of Special Scientific Interest in England are the equivalent of what is defined as high conservation value sites in this paper. The SSSI system has been in place for many years. There are some 26 000 'owners and occupiers' of these sites, many of whom are private landholders (English Nature 2002). Agreements have been signed with only a proportion of these landholders; so even that country is a long way off establishing a fully secure system. Moreover, it is estimated that 'about 30% require a change of management to bring them into favourable condition' (English Nature 2002).

Agreements based on auctions can be expected to deliver net gain outcomes at a landscape level, provided the scheme continues over time for any given landscape or is integrated with other mechanisms that can generate long-term outcomes.

#### **Mechanisms directed at land title and ownership of the property**

The following mechanisms are used to influence how biodiversity assets are managed by targeting property rights and ownership. These mechanisms include:

- land purchase by public bodies
- land purchase by conservation-minded people or organisations
- voluntary covenants
- easements with compensation.

Other such mechanisms that are not considered here include land swaps, incentives to encourage gifts of land (Binning and Young 1999), giving rights to third parties such as land care groups (Crosthwaite 2001), and a requirement for certification about the condition of natural resources when land is sold.

### *Background to these mechanisms*

Purchasing land of conservation significance for the public estate is often regarded as the best means of protecting the ‘jewels in the crown’. In Australia a government aim is that each ecosystem is represented in the public estate, based on the principles of ‘comprehensiveness, adequacy and representativeness’. For ecosystems that have special management requirements, e.g. periodic low-level disturbance, leasing or agistment arrangements may be used.

Apart from public ownership and management, which is generally accepted as the most secure means from a nature conservation viewpoint, changing who owns private land is potentially an effective means of securing nature conservation goals for the long-term. As Hodge (1991, p. 382) explained:

Most environmental policies seek to influence or constrain the behaviour of existing land owners or producers on the assumption that their interests and objectives differ from those of the wider public. An alternative approach is to seek in the longer term to promote the types of land owners whose objectives match most closely the wider public concerns.

There are now several organisations operating at national level that buy land for conservation reasons. Australian Bush Heritage Fund, Birds Australia and Earth Sanctuaries are examples. These organisations take donations, subscriptions or shares from the public. Many land purchases for conservation are made by individuals.

Landholders can preserve the nature conservation values of their land in perpetuity by specifying maintenance of these values in covenants on property titles. In Victoria, Trust for Nature ([www.tfn.org.au](http://www.tfn.org.au)) provides property owners with a mechanism to place a covenant on their property, which permanently binds the owner to the conditions of the covenant. The Trust has also established a revolving fund with a small capital base to buy, covenant and resell land.

In South Australia, easements that permanently remove a ‘farmer’s environmental damage rights’ (Young 1990) have been used. Where clearing of native vegetation was refused on the basis of scientific recommendations, landholders were able to receive assistance equivalent to the expected drop in land value if they attached to the title a heritage agreement. The distinction between covenant and easement (Young et al. 1996) is somewhat technical, but for the purposes of this discussion the easement involves the purchase of rights, whereas such rights are given up freely under a covenant.

### *Assessment of these mechanisms*

#### Effectiveness for individual conservation sites

In this section the four mechanisms related to property rights and ownership are evaluated qualitatively for the length of time that they can be expected to be effective in securing biodiversity outcomes for individual sites of high conservation significance. The results are summarised in Table 2. The mechanisms are scored qualitatively for the length of time that they can be expected to be effective in securing biodiversity outcomes given the problems of first mover and moral hazard. A breakdown is made according to whether the site has or is likely to have high value alternative uses. The scoring is justified in the following discussion.

Table 2. Title and property ownership mechanism by length of effect at site level, and by availability of high value alternative land uses

<b>Mechanism</b>	<b>High-value alternative uses likely or uncertain</b>	<b>Limited alternative uses</b>
Land purchase by public bodies	long term	long term
Land purchase by conservation-minded people or companies	medium term	medium term
Voluntary covenants	medium term	medium term
Easements with compensation	medium term	medium term

In the long term only land purchase by public bodies, or management agreements as discussed in section 3, can be expected to deliver secure conservation outcomes on high-value sites. This judgment on land purchase is conditional and presumes that planning for long-term management is part of the purchase decision. Land purchase may not achieve the desired outcome in the following circumstances (John Bowers, pers comm):

- The agency may not have access to the appropriate management skills.
- The agency may not have the requisite knowledge.
- The agency's objectives may not be fully aligned with those of biodiversity conservation.
- The agency may be captured by sectional interests and it may be financially constrained because it cannot deliver the objectives efficiently at acceptable cost.

Where income-earning opportunities are limited, other mechanisms directed at property ownership are also likely to be effective in the medium-term. None are certain in the long-term because of the chance, however slim, of the opportunity costs of retaining the land in beneficial use greatly increasing.

In justifying the expectation that the remaining three mechanisms can be expected to secure conservation outcomes at least into the medium-term, it is unlikely that the 'conservation-mindedness' that leads to land purchase or signing a covenant will wear off within 10 years, even if owners are under extreme financial hardship. It is also reasonable to expect that the real value of the compensation package will still be meaningful after 10 years, provided it was initially based on estimates of income foregone that were accepted by the farming community.

Where net profits from changing land use *might* be high, it is more difficult to predict how landowners will respond in the long term, even if they have purchased the land with conservation in mind or applied a voluntary covenant. It is likely that *some* high conservation value sites will be lost with irreversible effects on threatened species and ecological communities, even if these effects are not significant at the landscape scale. If, after a long period, the land owner who has received compensation in return for an easement on the property title feels that the compensation was inadequate to cover *current* foregone profits, then they may well break that easement if they feel they can get away with it or pay only a small penalty. Such a tendency could feasibly become widespread once a few landowners breach the terms of their easements, and the responsible authority is slow to respond.

#### Effectiveness at the landscape scale

Land purchase and covenants can be highly effective in securing conservation outcomes on individual properties. However, the landscape-level effects are likely to be limited. Historical experience is that relatively few properties have been purchased or covenanted.

Acquiring easements with compensation in the South Australian case had significant landscape effects; it was reported in 1997 that 550 000 ha were covered by Heritage Agreements (Binning & Young 1997).

### **Supporting mechanisms**

Two categories of supporting mechanisms are covered. Influencing landholders' understanding, attitudes and capacity is considered on the basis that this will influence how they go about managing conservation areas. Influencing the farm production system is considered because the area of conservation interest sits within the whole farm system, and is not independent of it.

#### *Education and capacity building*

The following mechanisms are used to influence the managers, rather than the site itself or ownership issues. The following will be examined:

- education and information provision
- capacity-building.

Education and information provision refers to the various extension approaches used by public agencies to convey information to landholders. A great variety of such approaches have

emerged in recent years, building on principles of ‘learning by doing’, ‘learning by seeing’ and group dynamics. The Land for Wildlife scheme, Greening Australia, and Trust for Nature all provide education and information to landholders. The Living Systems project ([www.nre.vic.gov.au](http://www.nre.vic.gov.au)) makes biodiversity information available for the use of other extension officers and programs, whether or not they are specifically concerned with biodiversity.

Education and information can play an important role in influencing land manager behaviour. Hands-on information is particularly valuable. This is described by landholders with a stewardship ethic as the most important way of learning (Down to Earth Research 2002). The experience of hearing a botanist or zoologist explain what they can see on the land that you have known in a different way for many years can transform a landholder’s understanding and behaviour. Likewise, participating with other landholders in a field day about managing a particular habitat such as grasslands or wetlands can be influential. However, such approaches are likely to only reach certain types of landholders — the Stewards and possibly some of the Embattleds but not necessarily the Opportunists, Traditionalists or Unawares, using the categorisation of Down to Earth Research (2002). Moreover, even for those landholders to whom such approaches will appeal, there are no guarantees in the long-term if the owner can profit significantly by managing a site differently. Consequently, education is likely to have greater long-term effect for sites where there are few alternative uses.

Capacity-building involves building the capacity of the land managers to manage for biodiversity conservation as well as other farm goals. It can mean the difference between having the resources (physical, financial, management) to manage some areas for conservation, and not having them. Crosthwaite (2000) argues for its importance, but as a supporting mechanism, not in its own right. Capacity-building can play an important role by making it easier for landholders to accommodate conservation management within their business plans. However, as with education there are no guarantees that this will have an effect in the long term. Such initiatives are also likely to appeal to only parts of the landholder population.

Drawing on recent economics literature, three important aspects of the behaviour of firms are important in considering the capacity of landholders to manage for biodiversity in the context of their overall property management:

- discovery or creation of opportunities, and taking advantage of and anticipating new situations (Langlois 1986, Littlechild 1986)
- significance of routine (good and bad habits) in maintaining stability and success of the organisation (Nelson and Winter 1982)
- capabilities and competences available to the firm (Foss 1997, Loasby 1998), including co-ordination skills, effectiveness in the use of time, adaptability and how managers learn from their experiences.

From these considerations it is possible to identify four broad areas to which public assistance might be directed: creating opportunities, developing business skills, increasing capabilities and competences, and providing a network of support. These are consistent with recent directions in Australian agricultural and resource policy, in which a great emphasis is placed on these matters.

It may be worthwhile targeting the public assistance directed at improving farm management to landholders with significant biodiversity assets.

### *Changing the farm production system*

Several mechanisms can be used to influence the farm management system, and indirectly the conservation site itself. The following will be examined:

- incentives to change management elsewhere on the farm
- whole-farm planning
- environmental management systems
- taxes and levies on inputs, production or waste; these are not discussed further (Crosthwaite 1995).

In some circumstances, incentive grants that are now available for conservation management (or, more broadly, natural resource management) might be better directed to changing practices across the whole farm or creating new investment opportunities. This is an important consideration, because how conservation sites are managed will depend in part on the management of other parts of the farm. From a whole-farm perspective, the conservation site is just one more resource to be managed in order to meet the overall goals of the landholders. Numbers and type of stock on the farm, available feed supply in each paddock at any given time, proximity of paddocks to each other, and time available to move stock may all influence the management of the conservation site. Likewise, timing and frequency of weed spraying on a conservation site is likely to be related to weed spraying elsewhere on the property. Having the resources available to adopt new management of a conservation site will depend on farm goals, other demands on income, and investment opportunities elsewhere on the farm that might generate the cash flow to pay for conservation management. These questions have been explored in detail elsewhere (Crosthwaite and Malcolm 2000, Crosthwaite 2000). Further investigation is required into the delivery of such incentives as one-off payments, as part of long-term management agreements, and as part of auction systems.

Whole-farm planning has been actively promoted in Victoria for at least 20 years. It can take various forms, some of which may be more conducive to substantive change than others. If done in conjunction with a review of farm goals and available resources, it offers the opportunity to firmly integrate biodiversity management into farm management. As Lowe et al. (these proceedings) outline, efforts are being made to integrate biodiversity into programs such as Farmbis. While planning is important, this should not be over-emphasised relative to improving the capabilities and competences of landholders.

Environmental management systems provide an internationally recognised means for landholders to review their environmental activities. If outcomes such as biodiversity conservation are to be secured, performance standards are important (Anderson et al. 2001, Mech and Young 2001). The capacity of EMS systems to incorporate biodiversity are being tested in Victoria now (Lowe et al. 2001, Ridley 2001). Seymour et al. (these proceedings) present the results of one approach; others are being trialled in Gippsland and south-western Victoria. Stoneham et al. (these proceedings) are concerned about aspects of such approaches.

Whole-farm planning provides a formal means for determining how a particular parcel of land is to be managed in the context of the whole property. Conservation outcomes are more likely to be secured if the planning exercise includes a consideration of farm goals and an evaluation of the financial and risk elements of the plan. Such a planning exercise is likely to provide for the protection of conservation values, at least into the medium term on sites where there are few alternative uses. If whole-farm planning includes the elements listed above, then sites on high-value land are also likely to be protected beyond the short term.

Like the other mechanisms considered in this section, environmental management systems offer no certainty, but some promise. They are equivalent to a whole-farm planning exercise in the range of considerations that are taken into account, with the addition of external expectations about how the environment will be managed. There will also be large gains for biodiversity over the long term if the incorporation of biodiversity into these systems proves successful and widespread, and if such systems change market signals over the long term and deliver a clear market advantage. However, there are likely to be industries and farming types for which environmental management systems do not provide a market advantage. The resources required to enter into and maintain an environmental management system may also mean that significant numbers of landholders do not participate.

## Discussion

Much is being asked of the instruments that have been discussed in this paper. The requirement is for a mechanism or set of mechanisms that will ensure that sites of conservation value are protected in the long term — perhaps four generations hence. The outcome must be certain at the individual site level and the landscape level.

Land purchase is a partial option only because the public purse is limited, and sites of public interest are likely to come onto the market infrequently.

Sites on private land that are now recognised as being of high conservation significance will require protection and, most likely, active management into the long-term. This is the expectation of the *Flora and Fauna Guarantee Act 1988*, while Victoria's Biodiversity Strategy requires net gain outcomes and no loss of significant biodiversity assets. We should have confidence that these sites will still be there in 100 years without any loss of conservation values. Hopefully, other sites will by then be of equal value, although the nature of restoration is that this cannot be assured in advance.

Analysing the issues in terms of moral hazard and first mover problems is helpful. It focuses attention on what landholders, as essentially free agents, might do that is contrary to the public interest. This is quite daunting given the long period over which a small set of actions by the landholder might quickly lead to irreversible losses. Public agencies cannot be eternally vigilant. This means that self-governing systems are needed to ensure that the right outcomes result.

While regulation has its place, it does not address moral hazard and first mover problems *per se*. Devolved regulation, as through a regionally defined duty of care, cannot deliver more than what is 'reasonable and fair' across a set of landholders – it does not account for sites that require extra attention and care.

There are many practical issues to resolve before long-term management agreements become a realistic option, noting that Bowers (1999) argued that only they have sufficient flexibility to accommodate new information and changing expectations. Victoria is just now experimenting with a system that involves management agreements (the BushTender trial). How this program will evolve is unclear, although hopes are high.

So there are few instruments available that currently 'guarantee' long-term outcomes, especially for land where there are likely to be alternative high value uses. Nevertheless some have potential and there are many other instruments that can play a valuable supporting role. One risk with the approach of using multiple instruments is that irreversible losses continue to occur because particular sites of conservation value fall through the cracks between the mechanisms.

In this context it is very important to understand the macro-level drivers of land use change, and to identify policy options and institutional arrangements that directly address these drivers. Much land use change that affects sites of conservation significance can be expected over the next 100 years. Some of this land use change will be for good and some for the bad as far as biodiversity is concerned. Relevant drivers relate to the operation of the markets landholders participate in — commodity and input markets, research and development, finance and skills — and to the role of government via taxes, services and provision of infrastructure. If this approach is successful, it will take some of the burden away from the mechanisms that operate at property or site level.

## Acknowledgements

Thanks to Quentin Farmar-Bowers, Michael Crowe and John Bowers for their comments on early drafts.

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