SOCIAL AND SCIENTIFIC ASPECTS OF LAND CLEARING CONTROLS

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ABSTRACT

A brief history is given on the development of land for agriculture in Australia and the role of science in addressing the associated clearing of native vegetation. This identifies a change from vegetation clearing being determined by production to it becoming a political agenda. The associated changes in government administration and scientific research are illustrated using examples of implementations of NSW environmental legislation. Scientific research has been degraded with deficient science being used to justify restrictive controls on landholders. These controls have imposed costs on landholders and the community without reliable evidence that the suggested environmental benefits will be achieved. The discussion addresses the need to conduct sound basic research on native vegetation and to address environmental objectives by supporting land users rather than by imposing restrictive controls.

INTRODUCTION

The Channel 9 Sunday Program by Ross Coulthart, *The Great Land-clearing Myth*, raises public awareness to the land clearing issue similarly to his consideration of dryland salinity in the program *Salt Solution*. These issues are strongly linked as officially dryland salinity is said to be caused by land clearing. Moreover, both issues have been addressed assuming that landholders must be controlled if desired outcomes are to be achieved. Science has been used to promote ideological objectives that are being addressed by imposing restrictive controls on landholders (Tunstall 2005).

The appropriate means of achieving desired land use objectives is to provide support to those that manage the land and depend on it for their livelihood rather than subject them to repressive controls. This requirement applies even if the underpinning science is sound and is essential where it is not. There are two interrelated issues, why the penchant for control and why the use of deficient science? These are addressed in a forthcoming book by Tunstall currently titled *The politics of science: controlling the environmental agenda*. The section on Land Clearing from the book is presented below modified to increase the focus on land use compared with addressing the conduct of environmental research.

Some of the material has been presented elsewhere, as in the ERIC submission to *Landscape or Multi-farm Vegetation Plan Review* conducted by the NSW Natural Resources Commission (Tunstall 2006) and Tunstall 2005. Other relevant material on the ERIC web site addresses specific issues, such as factors controlling regeneration of trees in woodlands and the impact of land use on patterns of vegetation regeneration. This paper examines such information in a general social context.

A POTTED HISTORIC BACKGROUND

In the initial stages of European settlement of Australia the natural resources were mainly exploited in their natural form using livestock. Clearing was

restricted to highly selected areas with the fertility and rainfall to support crops. This was effective because tree densities were generally low and grass abundant. Sheep dominated because the non-perishable wool permitted transport to markets in the northern hemisphere. Clearing for cropping was restricted by the available technologies and human resources.

The main change in vegetation with grazing was an increase in woody plants (trees and shrubs) associated primarily with soil compaction but reinforced by other factors such as consumption of grasses by livestock and a reduction in fire frequency. Plains that were once open woodlands became densely treed. The suggested reduction in the number of trees in Australia with European settlement is potentially invalid because the increase in tree density could more than compensate for those removed. There are likely more trees than before but most are much smaller.

Clearing eventually became necessary for grazing as well as cropping because of the woody regrowth. Clearing was promoted by the woody vegetation making mustering difficult and providing a harbour for vermin, mainly native animals that competed with or killed livestock and damaged crops. The general attitude was that the only good tree was a dead tree.

Extensive clearing occurred by hand, particularly at the end of the gold rush when there was abundant cheap Chinese labour, but mechanisation in the early twentieth century made feasible the clearing of much larger areas. The expansion within regions was from the most to least productive areas. Western Australia and Queensland were the last governments to promote extensive clearing with schemes being operational in the 1960s.

The clearing arose from the application of technology by landholders but scientists were a party to it. The Queensland Government Botanist promoted the clearing of brigalow (*Acacia harpophylla*) and identified the best land. CSIRO scientists bred pasture plants to replace the native vegetation and sought ways of controlling the regrowth of brigalow and other native species.

The CSIRO Woodland Ecology Unit was formed in 1972 from a small nucleus of scientists investigating ways of controlling the regrowth of native woody plants in semi-arid grazing lands. At that time research on ‘woody weeds’ was also being conducted by CSIRO Rangelands Research out of Deniliquin and State agency scientists in NSW and Queensland.

Apart from shrubs invading woodlands and grasslands, woody regrowth following clearing in some regions was generally denser than the original intact native vegetation and this necessitating repeated clearing. One Woodland Ecology contract that ran during the period of the Vietnam War examined the most effective means of killing native trees (primarily *Eucalyptus populnea*, poplar or bimble box) and shrubs with what was effectively Agent Orange. Virtually all research was directed at the development of practical methods to control regrowth rather than to improve understanding of why it occurred. The main management tools investigated were chemicals, gazing and fire.

Through reorganisations CSIRO effectively ceased research on woody weeds by 1980 but some research continued in State agencies. The amount of research on woody weeds greatly decreased with much of the funding being redirected to addressing conservation. A recent shift in focus from investigating ecosystems to landscapes does not redress this loss as landscape analyses are typically limited by knowledge of the interactions between land uses and ecosystems.

It was not until the mid 1970s that the Australian Government removed the incentive for clearing of immediate full tax deductibility. It was several years later before the Queensland Government removed the mandatory requirement to clear a percentage of leasehold land each

year. The clearing targets were rarely met because landholders could not afford to. In some regions the woody regrowth outstripped the rate of clearing.

Some 25 years later the situation is that all native vegetation has been protected and the Australian Government has set targets for the States of no net change in the area of native vegetation. Scientists are now involved in justifying the objectives of no clearing of native vegetation, providing the means for policing, and supporting prosecutions. In less than a generation the role of the scientist has reversed. The sources of funds now result in their activities suppressing landholders rather than supporting them.

The above follows the transition from publicly funded science being directed to supporting land clearing to opposing it. However, even now public scientists involved in conservation are prepared to support land clearing in return for funds. A CSIRO report addressed the clearing of Mallee in SW NSW to identify how much vegetation could be cleared without significantly damaging the conservation of biota (Freudenberger et al. 1997). The scientific aspects of the report are addressed in a forthcoming book by Wayne Braithwaite that addresses conservation research in Australia so the comments below are restricted to process.

The conclusions in the CSIRO report were mainly based on remnant patches of Brazilian rainforest that have little applicability to the Australian Mallee environment. Moreover, the report identifies many issues that should be taken into account when providing such an assessment that were not. The provision of recommendations without taking account of all factors known to be important is negligent as well as being scientifically deficient.

The primary constraints over this period are tied to money. Governments initially promoted land clearing to increase agricultural production. However, they removed subsidies when most of the potential farming land had been cleared as the costs to governments of promoting land clearing became greater than the returns. Research was similarly dictated by funding with initial research investigating means of increasing production. The Australian Government then passed the costs onto the States.

The recent changes are also tied to money with the Australian Government using funding to direct actions by the States. However, the funds are directed at promoting a political agenda rather than increasing profitability or sustainability. Funds that once supported land users are now used to impose restrictive controls on land use without any assessment of the benefits.

USE OF SCIENCE TO PROMOTE A POLITICAL AGENDA

The Australian Government has provided funds to the States contingent on them achieving no net change in the area of native vegetation. This requirement has been based on an ideology that having more woody vegetation is in some way environmentally better but this belief has not be subject to appropriate scrutiny. The three environmental platforms are carbon sequestration, dryland salinity and conservation of native biota.

The situation with dryland salinity is as identified in the Channel 9 Sunday Program, *Salt Solution*. Large amounts of public funds have been expended addressing a problem that is nowhere near as large as indicated by alarmist predictions by public scientists, and the basic premise behind the predictions is demonstrably invalid (Tunstall & Gourlay 2006). The public scientists have got it wrong and the landholders now pay the price by way of restrictive controls that reduce their sustainability and profitability.

In some situations the controls have caused much greater environmental damage than could ever have arisen from salinity while not solving the problem, as with the drainage channels in

SE South Australia (http://usedrains.org.au). Construction of drains was occurring in the early 1990s under the control of the South Australia Drainage Board to drain wetlands that were core breeding environments for waterfowl such as the speckled duck. Conversion from a wetland drainage scheme to a salinity drainage scheme is identified as occurring in the early 1990s.

The situation with carbon sequestration is similarly clear cut. There is a potential for carbon sequestration if the carbon accumulated post 1990 is locked away in woody vegetation for 100 years but this effectively quarantines the land from productive agriculture. With forestry the carbon sequestration is marginal where trees are harvested. Further issues include the prospect of carbon losses through wildfire, and native vegetation clearing and bush thickening not having been accepted as items for inclusion in carbon budgets under the Kyoto Protocol[1]. While changes in native vegetation are important in carbon budgets for Australia they are of no consequence for Europe hence opinion is strongly divided as to their acceptance. However, carbon sequestration in soils under agriculture has been accepted as a valid item in national carbon budgets under the Kyoto Protocol and there is greater potential for sequestering carbon in agricultural soils than in vegetation. The relative merits of different strategies have yet to be thoroughly assessed but soil sequestration has the pronounced benefit of promoting agricultural production while also having a large potential to sequester carbon.

The conservation platform is most readily addressed by considering the promotion of the restrictive regulations on clearing by the Wilderness Society. The intention of some is to turn farmland into wilderness. However, looked at rationally conservation is strongly linked with fertility where the fertile lands were the first to be cleared. The main conservation issues with land clearing arise in areas that have long been cleared and are close to denser human populations. Moreover, improving conservation usually involves restoring fertility. Attempting to address conservation by imposing highly restrictive controls on farmers in western lands cannot address the key conservation issues. Controls based on assuming that they can will not be effective and they prevent the implementation of actions that could provide considerable benefit.

Funds from the Australian Government to the States to restrict land clearing were initially only used to support the bureaucracy of public administrators and scientists. Most of the recent funding also supports this bureaucracy with limited amounts being used to offset farmer expenditures on protective measures such as fencing. The funds have been used to increase restrictive controls over landholders and there has been no compensation for their losses.

A recent case involving the first criminal prosecution in the NSW Land and Environment Court illustrates some consequences of this bureaucratic approach (NSW LEC 58-2004). A farmer was prosecuted for clearing native woody vegetation without a permit and this case was to be an example to others. The charge was withdrawn after several years in preparation and several weeks in court as the case was fatally compromised by the actions of personnel in the agency and a contracted consultancy company.

A principle from the consultancy company had provided a short report to the agency stating that extensive clearing had definitely occurred in specified paddocks over a particular period. However, a subsequent report by the company stated that there had been virtually no clearing in those paddocks over the same period. While the reports were claimed to have been independently produced by different company personnel it was effectively established under cross examination that one person had been involved in producing both reports. With the

[1] The significance relates to national abatement targets rather than carbon trading.

second report the company had responded to a request from an agency scientist to hurry up and provide the information they wanted.

This deceit was associated with technical and scientific deficiencies. The satellite image processing by the company designed to improve its spatial accuracy did the reverse. Imagery supplied with a spatial accuracy better than 20m contained errors of 70m after processing. The spatial analysis by an agency scientist in a Geographic Information System (GIS) produced results where common paddock boundaries did not coincide and different representations of common paddock corners differed by more than 100m. Despite this the agency scientist claimed his methods were the most accurate possible and that they allowed identification of clearing of individual trees. Change detection, which is used to detect clearing, depends critically on the ability to spatially match images for different dates.

The scientific deficiencies are of similar magnitude and consequence. The applicable NSW Native Vegetation Conservation Act (NVC Act) identified two types of native vegetation, woody and herbaceous. These were not mutually exclusive when without mutual exclusion arguments usually become circular. Without mutual exclusion the same parcel of land can be both woody and herbaceous native vegetation. In consequence a wheat field can be native woody vegetation because it contains a few native trees and an orchard can be native herbaceous vegetation because it contains native grasses and/or herbs in the understory. In this instance paddocks had been ploughed and cropped prior to the suggested tree clearing hence a wheat field was deemed to be native woody vegetation.

The density of trees required for an area to be regarded as woody vegetation is not specified in any act or regulation. The vegetation classification system generally cited was developed for intact native vegetation and has the lowest abundance of trees needed for an area to be classed as woody being 0.2% canopy cover (Walker & Hopkins in McDonald et al. 1984). This equates to around one large eucalypt tree per ten hectares. Ploughed paddocks with large isolated trees spaced more than 300m apart have been deemed to be woody vegetation by agency scientists. Specification of such a large spacing in defining a plant community is ecologically unsound as it does not provide for the interaction between components essential in ecosystems.

For the court case an agency scientist attempted to map the locations of every tree in a paddock and to determine which ones had been cleared. The dilemma this poses is that vegetation is a collective term and requires the existence of more than one plant, as in the definition of an ecosystem. As herbaceous and woody vegetation are separately addressed under the NVC Act the existence of woody vegetation requires the presence of at least two trees, and they should interact.

The agency scientist presented three estimates of the cleared area based on different interpretations of what constitutes woody vegetation. With the first the total area of the paddock, less exemptions, was considered to have been cleared if any trees in the paddock were cleared. With the second the cleared area was defined by corridors linking trees considered as having been cleared. With the third the cleared area was defined by the area of tree canopy assessed as having been removed. The methods gave very different estimates of clearing ranging from around 95% to 2.7% of the total paddock area.

Another agency scientist providing expert evidence based on traditional methods of vegetation description had the minimum level for mapping such woodlands as being 5% canopy cover. As the average canopy cover of trees in the paddocks was 2.7%, with this criterion none of the paddocks need have been mapped as representing woody vegetation. No indication was given as to which result should be considered correct.

The perceived need to undertake such disparate calculations evidences little understanding of what constitutes woody vegetation. Except for the traditional method the need for interaction between components was not addressed hence, while woody vegetation exists where there are trees, there is no understanding of where it starts or stops. One practical consequence of this deficient understanding is that any area containing a woody native plant is deemed to have conservation value. Another is that entire paddocks have been assessed as having been cleared when only a few trees have been removed.

Another implementation of the NVC Act further illustrates the scientific deficiencies. An area containing a monospecific stand of large eucalypts and a highly degraded herbaceous layer flogged by sheep and rabbits was identified by an agency scientific assessor as being vegetation that existed prior to the landing of Captain Cook in 1770. The distribution of the trees and herbaceous species on the hill was unrelated to the terrain.

Intact native vegetation on a nearby hill contained six species of eucalypts, a complex understory of shrubs, grasses and herbs, and vegetation patterns were related to topography. The suggested pre Captain Cook vegetation bore no relationship to any local natural native vegetation or to natural native vegetation elsewhere in Australia.

The reason given for the identification of the vegetation as being pre Captain Cook was the size of the tree boles. The trees were identified as being very old when their age was calculated from the diameter of their trunks using an assumed annual growth increment. However, the growth increment used reflected general comment by foresters for forest grown trees in a different part of the State when the large size of the tree boles arose from low branching that occurs when trees develop in the open. The calculations of age were invalid as the trees were sparse regrowth following clearing. Despite this the highly degraded vegetation was still assigned high conservation value as the trees were said to provide roosting sites for birds and their ribbon bark habitat for insects.

The deficiencies in understanding and describing native vegetation are further illustrated by the listing of Coolibah – Black Box Woodland (*Eucalyptus coolabah, Eu. largiflorens*) of the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions as an endangered ecological community under the NSW Threatened Species Conservation Act 1995 (Anon. 2004). The vegetation community was not mapped for the determination so the issue is how to reliably recognise the community. Its identification in the determination is based on the occurrence of any one of the 80 plant species identified in the listing when plant communities are generally recognised by the presence of a characteristic assemblage of species. There is no consideration of spatial relationships such as abundance and proximity. Does a species have to be within a radius of 1, 5, 10, 20, 50, 100 or 1000m of the point in question to be taken into account?

With the description used neither Black Box nor Coolibah need be present for the community to exist. Other species that form distinctly different communities, such as *Eucalyptus populnea* (bimble box) and *Casuarina cristata* (belah), can be used to identify the community. *Eucalyptus camaldulensis* (river red gum) is included in the Coolibah - Black Box Woodland even though it forms a very distinct riparian community.

While the soil associated with the Black Box - Coolibah community was defined in a general manner identification of the community is based on plant species without reference to the soil. The only requirements are that one of the 80 listed plant species be present and that the site is located within the boundaries of the defined bio-regions.

The Coolibah - Black Box community cannot be reliably recognised by the definition given in the determination as there is no definitive discriminator. It is not even clear what it is not as the list of species used to define the community encompasses other distinct plant communities. In effect, the determination classes virtually all vegetation on the floodplains within the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions as being Coolibah - Black Box Woodland when it was only ever a minor component.

Criteria to be applied in enforcing the determination given by NPWS include:

- Trees present as a canopy with a non-native ground-layer
- Characteristic tree species absent as a result of past clearing or thinning and only other tree species and ground-layer present
- Overstory absent as a result of past clearing or thinning and only a ground-layer present.

With these criteria a wheat farm can be classified as being a Coolibah - Black Box Woodland if any of the specified trees occur at a cover even less than 0.2%. Also, a pasture can be classified a being a Coolibah - Black Box Woodland if any of the understory species given in the listing is present at an undefined density or cover. With these criteria the existing extent of Coolibah - Black Box Woodland is greater than in 1770. This creates a dilemma given that the justification for the listing is a greatly reduced extent of Coolibah - Black Box Woodland.

The determination was produced by an independent scientific committee. It is unclear what the scientific committee is independent from as in their positions virtually all would derive benefit from the promotion of conservation, directly or indirectly. Several were even agency personnel responsible for implementing the regulations, and the decision rested strongly on subjective comment by an agency scientist. There was no attempt to obtain a balanced view only to take the opportunity to force a particular point of view onto others.

The general approach being used is to identify as many discrete elements as possible so that at least one will come into play to justify protecting a patch of vegetation. Individual species are addressed wherever possible, as with the 80 in the listing of the Coolibah – Black Box Woodlands. Other suggested important attributes include litter, ribbon bark, tree hollows, roosting sites, surface stones, and recognition of remnant patches as stepping stones or corridors for the movement of wildlife. With more than 100 'important' attributes being defined at least one can usually be found that 'justifies' protecting any native vegetation.

The approach being applied in addressing vegetation clearing is the antithesis of what is addressed by ecology as ecology is about the relationships between elements. The whole is greater than the sum of the component parts thus ecology can only be addressed by analysis of the entire system. Irrational situations have arisen because scientists are regarding any potential component of a system as being important rather than evaluating the system as a whole. The NVC Act was intrinsically regional thus a focus on local details without regional context cannot address the intended requirements.

Current NSW Native Vegetation Act

The NVC Act was replaced by the Native Vegetation Act 2003 (NV Act) that is implemented via the Native Vegetation Regulation 2005 (NV Regulation) [2]. The main purpose of the NV Act is to eliminate broadscale clearing where the definition of broadscale clearing given is:

[2] The NSW native vegetation legislation and procedures used to address it are available on the web via http://www.nativevegetation.nsw.gov.au/index.html

For the purposes of this Act, ***broadscale clearing*** *of native vegetation means the clearing of any remnant native vegetation or protected regrowth.*

In the English language broadscale equates with large area but with the above definition it has no defined scale and can relate to a point as well as an area. The use of the term broadscale in the NV Act and Regulation is invalid and misleading. An inability to identify such a logical deficiency is significant but intent to create perceptions of extensive clearing to produce an emotive response in support of the NV Act is of greater consequence as it represents deceit.

Procedural Issues

The ERIC submission to Landscape or Multi-farm Vegetation Plan Review (Tunstall 2006) identifies procedural and scientific deficiencies of the implementation of the NV Act. The main procedural issues are:

- The first objective of the NV Act, *to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State* is explicitly not considered in its implementation via the NV Regulations.
- The definition of native vegetation includes native plants in household gardens and the NV Regulation explicitly identifies that they are subject to the Act. Technically the NV Act should be enforced for lawns and gardens in all towns and cities throughout NSW but in practice it is only used to increase controls on farmers.
- The classifications of the vegetation in the reference databases and the vegetation mapping on individual landholdings are central to implementation and the NV Regulation explicitly states that these cannot be questioned by anyone. Moreover, implementation is achieved using a black box computer based 'expert' system where the methods cannot be questioned by landholders. The reference information, methods and results are deemed to be correct by definition. The process is completely controlled by public administrators and scientists and landholders have no rights other than to decide which options presented are regarded as being suitable, if any. There is no right of redress even by way of the courts as it has been explicitly excluded.
- The NV Act has been used to promote personal beliefs, as illustrated by the leaking of departmental information on the extent of clearing. Misrepresentation has been combined with the leaks to promote an agenda, as with all suggested clearing being presented as being due to farmers when considerable clearing occurs for urban and industrial development. Also, there is no consideration of regeneration when this could be greater than clearing, and no mention of Australian Bureau of Statistics data that show the extent of farmland declining since at least 1990. The amount of farmland has been decreasing and the amount of native vegetation on farms increasing. Highly selective presentation of usually incorrect information on clearing has been used to promote personal beliefs, status and position.

This situation is diametrically opposed to the requirement given by the committee that developed the NV Act that the implementation should be based on mutual trust between farmers, environmentalists, governments, and the wider community. Given the dictation and control there is no basis for the development or existence of trust. Farmers are being asked to trust agency personnel that are imposing restrictive regulations according to their assessments that cannot be questioned. The process is highly bureaucratic to the point of being completely authoritarian.

Scientific Issues

The main scientific issues relate to considerations of:

- what constitutes vegetation,
- the use of vegetation to address a range of environmental issues such as water quality,
- sustainability, and
- the use of a computer based black box expert system to make assessments.

PVP Developer

The NV Act is implemented via Property Vegetation Plans (PVP) produced using the PVP Developer. The PVP Developer incorporates an expert system that uses a decision logic based on nested indices. The process does not incorporate basic elements of the scientific method, such as testing, and so is not 'scientific'. The process is claimed to be objective but the decision rules represent subjective judgments. Rules of thumb are built on rules of thumb and are combined in a largely arbitrary way with other rules of thumb to come up with something that some think they can rationally interpret.

The use of rules of thumb is illustrated by water quality which is addressed by the use of exclusion zones scaled according to stream order. The surrounding terrain, soils, and land use are not considered even though they are known to be of consequence. Water quality isn't addressed by way of water quality and the assessment is combined with other subjective assessments, such as a soil impact assessment based on general considerations such as land capability zones. Any objectivity disappears well before the information is assessed using the PVP Developer.

All elements of the implementation in the PVP Developer appear to contain such deficiencies. Examination of the derivation of the information in the reference databases identifies that it was collected for broad planning purposes. It is now being used for evaluations on individual landholdings where it has little if any applicability. The situation is as arises with statistical analyses where, even when the generalisations are valid, the results cannot be reliably applied to any individual circumstance. Much of the information in the databases has little if any applicability to individual landholdings.

The basic precept with implementation using the PVP Developer is that the science is correct and all effort has therefore been expended in developing a practical tool. The PVP Developer is technology rather than science where there is no basis for evaluating the applicability or effectiveness of the technology in delivering the suggested benefits.

Identification of Distinct Vegetation Types

A key scientific issue with the approach being used is that vegetation is treated in the same manner as species. That is, there are the notions that:

1. There are distinct forms of native vegetation as usually arises with plant species.
2. The distinct forms of native vegetation are essentially invariant over time.
3. A particular environment naturally only supports one form of vegetation

None of these assumptions is valid. The notion that there are distinct forms of vegetation has arisen because there are usually marked differences between plant communities in different positions in the landscape. Indeed, the arrangement of different plant communities in the landscape forms the basis for the Land Systems and other approaches to landscape mapping. However, the basic precept behind the Land Systems method has never been properly tested

and the reliability of extrapolations from local observations to regions is largely unknown. Where this issue has been investigated the indications are that native vegetation varies gradationally in response to gradations in the environment (McIntosh 1967, Whittaker1978).

The premise that the current native vegetation resembles that at 1770 appears sometimes to be reasonable but often is not. In some situations the vegetation has dramatically changed with the nature of change mainly being an increase in the amount of woody vegetation. Many areas that were previously grasslands and open woodland are now variously shrublands, shrub woodlands and dense woodlands. The vegetation has changed and will continue to do so as change is an inevitable part of all natural systems, particularly biological systems.

These issues are considered in more detail in the ERIC submission on Landscape Vegetation Plans (Tunstall 2006) and by Tunstall (1987) but they have essentially been ignored in research and applications in Australia since the mid 1970s. The Australian Government then terminated work on natural resource mapping in CSIRO as it was deemed to be the responsibility of the States. The research on natural resource mapping that later developed in CSIRO arose because of technological developments with satellite imagery and has largely focused on the technology. There has been little consideration of what information is required and what it means except when addressing commercial applications such as forestry and crops. For conservation in particular, technologies are being used to produce results that have uncertain relevance to the issues they are used to address.

The practical outcome of the deficient conceptual foundation is that results largely reflect the view of the beholder. With Land Systems mapping the results for adjoining surveys rarely coincide despite all surveys effectively containing the same number of Land Systems[3]. The same applies with vegetation maps produced by different personnel even where the same methods are used. These uncertainties are compounded by the use of different methods as occurs between States and organisations. Understanding the relativities between different results requires greater knowledge and understanding than is needed to produce a result.

There is nothing in any of the estimates of the environmental value of native vegetation in the PVP Developer that can be said to have a sound foundation in science and the approach used is known to have low reliability. However, as there is no tangible objective specified other than to increase the extent of native vegetation, and as agency personnel have complete control of the implementation, the method can continue to be presented as improving environmental outcomes with little fear of there being contradictory evidence from anyone other than the farmers that are affected.

Using native vegetation to improve the environment

The addressing of environmental outcomes of land use through the protection of native vegetation, as is being attempted with the NV Act, could be regarded as being perverse, pragmatic, or philanthropic. The philanthropic perception incorporates the unrealistic view that all environmental problems can be solved by restoring the native vegetation. Someone has to pay for the lost production and remediation thus those promoting this approach are being philanthropic, but with other people's money. This approach is inherently unsustainable as production is decreased and funds for the remediation must derive from other sources.

The pragmatism arises through accepting that, compared with soils and water, changes to vegetation can be visually apparent even if they are poorly characterised and understood. People think they understand what the differences and changes in vegetation mean, and a sense

[3] This relates to the technical constraint of colour separation when printing maps.

of good feeling is promoted by the use of emotive comments such as 'eliminating broadscale clearing'. By addressing vegetation we can do something that promotes a warm feeling even if we can't show any tangible changes other than having more native vegetation.

The perversity arises because most of the environmental impacts considered adverse by the community cannot be redressed simply by increasing the amount of native vegetation. The community depends upon agricultural production to survive and broad scale agriculture is where most environmental gains can be made. Most gains are to be made in improving the environmental outcomes of land use under agriculture where this involves improving production as well as the environment. Nibbling at the edges by penalising part of a minority group in farmers may appear to have low political risk but is environmentally invalid, scientifically absurd and socially unacceptable.

Sustainability

There is nothing in the implementation of the NV Act that evaluates whether the suggested environmental benefits are achieved. In lacking tangible deliverables by way of environmental outcomes there is no basis for addressing the requirement for continuous improvement in performance other than in the implementation of a process for increasing the amount of native vegetation.

The current NV Act implementation is inherently unsustainable as it depends on the continued provision of public funds where there is no financial return. A process that is funded by the benefits it provides to landholders is the only sustainable system.

Logically and in practice the addressing of conservation issues, such as native vegetation, cannot be divorced from productive use of the land. There is sufficient information and experience to know that the desired gains can be achieved. For example, an appreciable number of farmers have demonstrated improvements to productivity and the environment through practices that improve the soil, particularly the level of soil organic matter. The environmental benefits include increased native vegetation and wildlife and a reduced need for chemical applications to address fertility, weeds and pathogens. However, as some of these involve direct drilling of crops into native pastures they are threatened by the current implementation of the NV Act.

The Wentworth Group

The Wentworth Group of Concerned scientists illustrates the significance of science in promoting an environmental agenda. For land clearing their Blueprint for a Living Continent (Cullen et al. 2002) uses results from Australian Greenhouse Office (AGO) presented in a report by the Australia Bureau of Statistics (ABS 2002).

The ABS results are identified as deriving from the Australian Greenhouse Office (AGO) *National Greenhouse Gas Inventory 2001* (NGGI 2001) but this report does not now appear to be available on the AGO web site. The current relevant report is the *National Carbon Accounting System 2004* (NCAS 2004) which provides clearing results for the period 1988 to 2003. The results in the 2004 NCAS report (Fig. 1) differ from those given by the ABS for the NGGI 2001 (Fig. 2).

The Wentworth Group concludes that clearing is continuing to increase when the NCAS 2004 results show the reverse. While this is partly due to the provision of more recent results it is likely that the difference also arises because the AGO reanalysed all Landsat TM and ETM imagery, which covers the period 1988 to 2003. There are now two sets of results, one for the

period 1972 to 2000 and the other from 1988 to 2003. The differences between them can arise for several reasons but a key one is the implementation of a terrain correction for illumination angle in the reanalysis.

Additional to the revised analysis, the NCAS 2004 results have been presented differently to the NGGI 2001 with deforestation being replaced by the categories conversion and reclearing. The new categorisation relates to the requirement under Kyoto that changes be anthropogenic. Logically the sum of conversion and reclearing should be the same as the prior category of deforestation[4].

There is no estimate of reforestation given with the NCAS 2004 results but reclearing is a component of reforestation, albeit offset in time. The reclearing rates ostensively identify woody regeneration that is recleared. As considerable regeneration is not recleared the actual rate of regeneration is likely higher than indicated by the rates of reclearing but there is no figure given in the NCAS 2004 report that unambiguously identifies regeneration.

While the reclearing category in the NCAS 2004 results represents a loss of cover of woody regrowth care is required in its interpretation as it need not involve clearing. The transition between forest and non-forest is highly fuzzy with the AGO method and there is no way of clearly identifying what this change means. The change can arise for many reasons such as loss of cover through fire, disease or drought, or differences in soil wetness, as well as clearing.

The conclusion from the NCAS 2004 results is that land clearing has been declining. If the reclearing is taken as providing a minimum estimate of woody regrowth, which is realistic, then the net level of clearing is below zero (Fig. 2). Regeneration is now exceeding clearing. If the 1972 – 1990 AGO land clearing results are accepted (Jones et al. 2004) then regeneration has been outstripping clearing by a factor of 2 over the last 30 years.

There are methodological reasons for limiting the reliance placed on the AGO results. For example, while insufficient detail is given to allow definitive conclusions, the deforestation figures given in the accuracy assessment of the 1972 – 2000 results (Jones et al. 2004) suggest that rates of clearing are around an order of magnitude greater than indicated in the NCAS 2004 report. The accuracy assessment addresses estimates of forest and non-forest land cover but not the accuracy of determination of deforestation and reforestation. No results have been presented that identify the reliability of the AGO results on clearing. There is also the issue that the AGO estimates are pixel based when virtually all other mapped information presented on vegetation has been polygon based. The significance of this difference depends on the application hence caution is needed when drawing conclusions.

The scientists in the Wentworth Group apparently do not have the expertise to adequately understand the meaning or reliability of the AGO results, and they did not make the effort to find out. The outcome has been the misuse of results to promote a viewpoint. However, the community is expected to accept the conclusions because of the status of the scientists.

Future Directions

Government expenditures on environmental research have decreased, as illustrated by CSIRO funding declining by at least 50% in real terms over the last 30 years. Also, of the available funds the proportion expended on research in CSIRO has declined due to growth in management and consultancy. Moreover, research has been redirected from supporting land

[4] While the term forest was previously used by the AGO when addressing clearing forestry is treated separately from land clearing in the NCAS. The new categorisation better addresses this division.

users to supporting government administrations. Such reductions and redirections inevitably degrade the research but they have been promoted by some scientists as it increases their funding and status. Moreover, it allows the use of position to promote personal agendas. Deficient science has increasingly been used to present beliefs as scientific fact.

The consequences additional to the degradation of science have been a large increase in repressive controls on farmers and an increase in costs to the community without there being reliable evidence that the suggested benefits have been delivered. Indeed, there are many examples where the suggested benefits have demonstrably not been delivered. The expenditures serve mainly to perpetuate the existing situation and hence become part of the problem.

The Australian Bureau of Agriculture and Resource Economics estimated that NSW vegetation legislation could cost the State economy $1.1 billion over 15 years (Elliston 2006) and identified the benefits of using incentives rather than regulation to achieve objectives. The social considerations of costs and whether environmental objectives should be achieved through control or support are at least now being raised. However, there is no indication that the deficiencies in knowledge and understanding of natural vegetation that have allowed the development of inappropriate controls will be addressed. Indeed, the indications are that controls will be increased largely because of the deficiencies in knowledge.

The notion of no net change in native vegetation is vague because native vegetation naturally changes. The simplistic response of estimating change through areas with little regard to what constitutes vegetation has produced adverse outcomes, particularly since administrators have attempted to achieve their objectives using repressive controls. The social and economic outcomes would be greatly enhanced by application of a supportive rather than restrictive approach, and by consideration of what constitutes native vegetation and what attributes are important. The development of basic science could greatly reduce spurious and ineffective responses.

Addressing dryland salinity, Tunstall suggests that the development of woody weeds largely reflects desertification arising through soil degradation (Tunstall & Gourlay 2006). From consideration of nutrient implications it is concluded that the land use impacts have resulted in a rapid decline in natural resources that normally occurs slowly in most Australian systems. The key issue is how to reverse the decline to the maximum extent possible. The requirement is not to progress the current situation by assuming objectives can be achieved through protection but to determine how land use and management can be conducted so as to improve the system.

The basic requirements in addressing sustainable productive land use and conservation of biota are the same as for addressing dryland salinity. Many examples of partial solutions exist and there are numerous options that can be tailored to economic as well as the biophysical constraints (Tunstall & Gourlay 2006). However, these options have yet to be effectively explored due to the prevailing mindset that invokes the notion that landholders must be controlled and land use restricted if desired environmental outcomes are to be achieved.

The knee jerk reaction of imposing prohibitions has never been successful in societies. Moreover, the simplistic approach of addressing environmental issues through restrictive zonings has not worked, as exemplified by acid rain and global warming. The desired objectives will never be achieved through administrators imposing restrictive controls. To be effective the remediations must be directed at supporting the land users.

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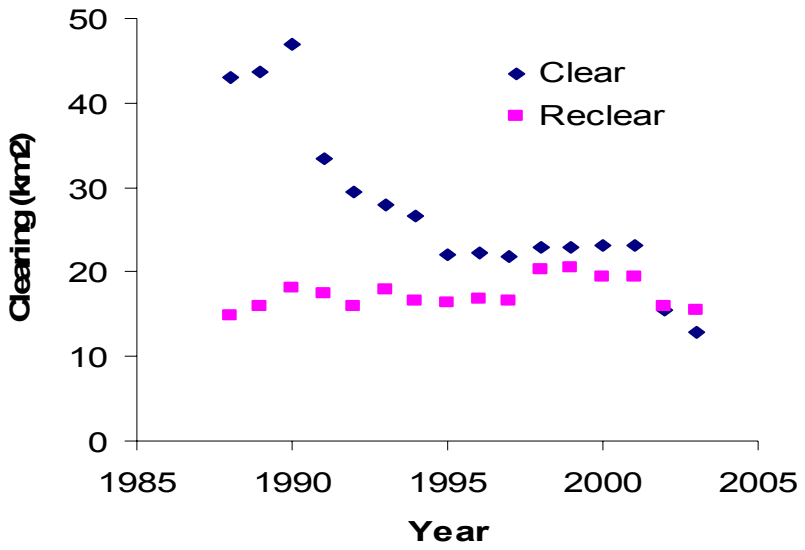

Fig 1. National clearing from 1988 to 2002. Data from AGO NCAS 2004.
Clear is clearing of suggested intact vegetation (conversion).
Reclear (reclearing) is loss of cover of suggested regrowth.
While annual data are given the estimates were obtained for intervals of 2 or 3 years.

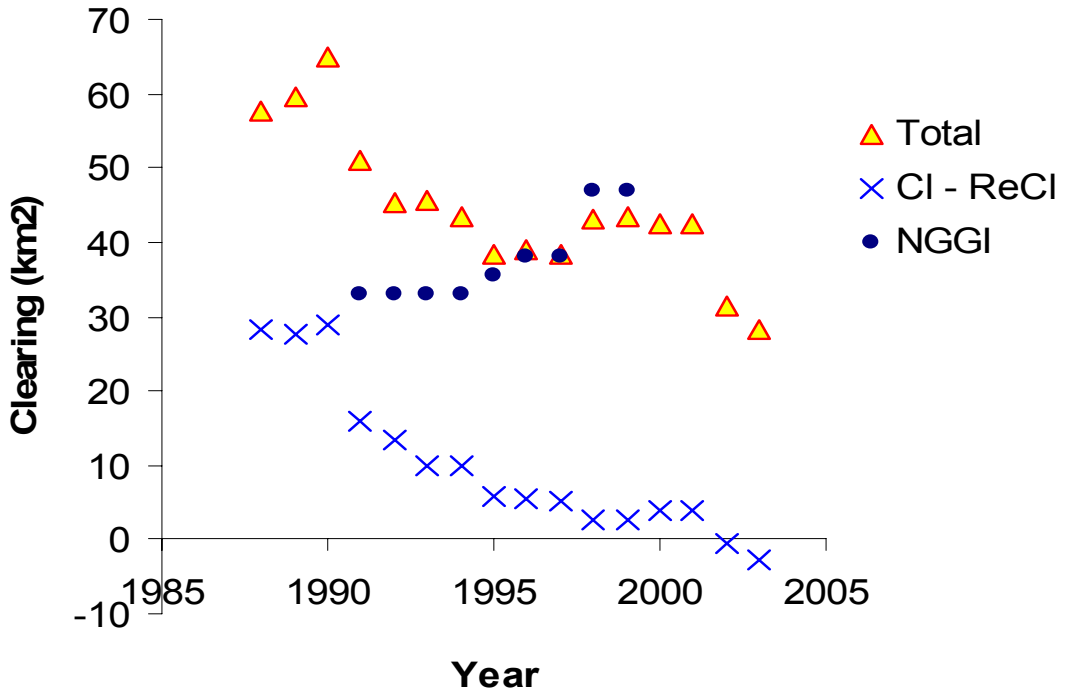

Fig 2. National clearing from 1988 to 2002. Data from AGO NCAS 2004. NGGI data from ABS 2002
Total = Clearing (conversion) + reclearing
Cl – ReCl is the difference between clearing (conversion) and reclearing