NSW Government
DEPARTMENT OF NATURAL RESOURCES

Science and Information Board

December 2005

Clearing/thinning of native vegetation known as invasive native scrub under the *Native Vegetation Act 2003*

Collation of Discussion Paper submissions and responses from the Invasive Native Scrub Team

PRODUCTION DRAFT 19/04/06

Published by Department of Natural Resources (DNR) in 2006. Department of Environment, Climate Change and Water now manages Native Vegetation Act and associated responsibilities. See www.environment.nsw.gov.au.

Clearing/thinning of native vegetation known as invasive native scrub under the Native Vegetation Act 2003

www.naturalresources.nsw.gov.au

Publication number NR 06_026

ISBN 0 7347 5695 X

Printed on Elemental Chlorine Free (ECF) pulp, harvested from sustainable managed plantations and forests

Science and Information Board

December 2005

Clearing/thinning of native vegetation known as invasive native scrub under the *Native Vegetation Act 2003*

Collation of Discussion Paper submissions and responses from the Invasive Native Scrub Team

PRODUCTION DRAFT 19/04/06

White Cypress Pine *(Callitris glaucophylla)* an invasive native scrub species of western slopes and plains

Contents

Foreword

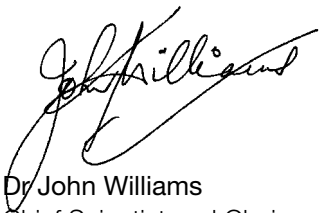
DURING THE CONSULTATION PROCESS preceding the introduction of the *Native Vegetation Act 2003*, the NSW Government through the-then Department of Infrastructure, Planning and Natural Resources undertook a comprehensive public consultation process. Part of this process involved the release of a Discussion Paper from the Department's Science and Information Board (SIB), *Clearing/Thinning of native vegetation known as invasive native scrub under the Native Vegetation Act 2003*. A working group was also established to develop the Invasive Native Scrub module of the new computer program which would guide the implementation of the Act, the Property Vegetation Plan Developer.

This document is a thorough review of the numerous submissions received by the SIB on the invasive scrub issue throughout the consultation process. It is the result of substantial contributions by the many people who made written submissions and who participated in public meetings held throughout NSW in early 2005, as well as the efforts of the members of the team. The document provides information on the Invasive Native Scrub module and the considerations which were taken into account during its development, flowing from responses to the initial discussion paper.

The Science and Information Board (SIB) has been established as an independent peer review body, to ensure that the current NSW Department of Natural Resources is backed by world class science and information for natural resource management. In addition, the Board provides the mechanism for enabling consistency in science and knowledge needs across the Department in order to deliver important, whole-of-landscape results. Members of the SIB include leading scientists and practitioners in a wide range of natural resource sciences encompassing the biophysical, economic and social science disciplines.

This document is an example of how reviewing the science has enabled the Board to demonstrate that the Department is using the best available science when dealing with natural resource management issues. The SIB have reviewed the submissions and resulting document. As Chair of the SIB, I regard the document as an accurate representation of the submissions to the SIB Discussion Paper released in December 2004 and of the responses of the Invasive Native Scrub Working Group in developing the Invasive Native Scrub module.

I would like to express my appreciation to those who took the time and care to make submissions on this matter, to Dr Denis Saunders for his leadership, and to the members of the INS Working Group for the effort they made to build the Invasive Native Scrub Module of the Property Vegetation Plan Developer.



Dr John Williams
Chief Scientist and Chair,
NSW Department of Natural Resources Science and Information Board

Glossary

Basal area: the accumulated area of tree trunks (usually measured at breast height, or 1.2 m) on a site. A means of measuring the degree to which trees dominate a site.

Blade-plough: a heavy-duty plough designed for cultivation of areas of woody weeds.

Crocodiling: a technique for woody weed control that uses a large hollow slotted roller which is filled with grass seed and towed behind a tractor, crushing the woody shrubs whilst spreading seeds of pasture grasses.

Grubbing: a technique for selective removal of individual woody shrubs (or small clumps) using a small excavation tool mounted on a tractor.

Invasive Native Scrub: is defined as;

1. a species that invades plant communities where it has not been known to occur previously OR a species that regenerates densely following natural or artificial disturbance,

   and

2. the invasion and/or dense regeneration of the species results in change of structure and/or composition of a vegetation community,

   and

3. the species is within its natural geographic range or distribution. (INS Team, April 2005).

Non-target species: plant species other than INS species. Limits are prescribed for the amount of non-target species permitted to be cleared as an incidental consequence of INS management.

Paddock scale removal: non-selective clearing of vegetation in an area (by mechanical means such blading, chaining or rolling).

Spot treatment: selective clearing of individual plants (generally using manual techniques such as herbicide application) of INS species. Numbers of INS plants may be required to be retained depending on the species being treated, the location, and the nature of the vegetation.

Abstract

A DISCUSSION PAPER 'Clearing/thinning of native vegetation known as invasive native scrub under the *Native Vegetation Act 2003*' was released for public comment by the Science and Information Board (SIB) of the Department of Infrastructure Planning and Natural Resources now Department of Natural Resources in December 2004. Forty-nine written submissions were received mainly from farmers or farmer organisations, particularly from the western and central areas of NSW. Comments were also received from public meetings held throughout NSW in early 2005.

These submissions, together with other materials and advice, were considered by a team of experts from the SIB, Catchment Management Authorities, and the Department of Environment and Conservation in developing a process for assessing proposals to clear Invasive Native Scrub (INS). The proposed process includes an INS module within the Property Vegetation Planning (PVP) Developer. The module allows INS to be assessed without use of the other modules within the PVP Developer. It is designed to ensure that permitted activities will meet the "improve or maintain" environmental outcomes test as required by the Act. Objectives of the INS team included: to develop an assessment process that is simple, flexible and robust and delivers a mosaic of vegetation "states" across the landscape.

In assessing an INS proposal the module considers the identity of the species, its behaviour and the ecological and physical environment of the application. It provides for management options such as burning, single plant treatments and paddock scale treatments. Prescriptions include specified limits for: the proportion of the vegetation to be treated; contiguous area of treatment; extent of disturbance of soil surface; introduction of non-indigenous species; diameter of plants to be cleared; maximum slope; density of stems under 20 cm diameter to be retained within treated area; frequency of treatment; and, proportion of incidental clearing of non-target, non invasive native species. Setting aside areas of native vegetation as offsets, as required by other PVP assessment processes, is not required for INS.

Introduction

IN 2002 THE NSW GOVERNMENT commissioned the Native Vegetation Reform Implementation Group (NVRIG), chaired by the Hon Ian Sinclair, to develop a native vegetation reform package to bring an end to broadscale clearing, reward farmers for managing native vegetation and restoring degraded landscapes, and provide local communities with a major stake in the process. NVRIG proposed three new Acts, now gazetted, that significantly changed the legislative base for native vegetation management in NSW. These were:

- The *Native Vegetation Act 2003* to end broadscale clearing and promote the restoration of degraded landscapes,
- The Catchment Management Authorities Act 2003 to put into local hands, the power to control rural investment in natural resources, and
- The Natural Resources Commission Act 2003 to ensure State-wide standards are applied to clearing.

The Native Vegetation Act 2003 requires that clearing of any native vegetation (other than for limited purposes) must improve or maintain environmental outcomes. A Property Vegetation Plan (PVP) Developer, with modules for salinity, water quality, soil degradation, biodiversity and threatened species, was developed to assess native vegetation management proposals against the environmental outcomes test.

Invasive native scrub is defined as:

1. a species that invades plant communities where it has not been known to occur previously OR a species that regenerates densely following natural or artificial disturbance,

   and

2. the invasion and/or dense regeneration of the species results in change of structure and/or composition of a vegetation community,

   and

3. the species is within its natural geographic range or distribution.
   (INS Team, April 2005).

Because invasive native scrub is much more extensive and/or much denser than its previous natural condition, clearing it in certain circumstances, and under certain conditions, can improve or maintain environmental outcomes in its own right. This means that proposals to manage invasive native scrub cannot be assessed under the Native Vegetation Act 2003 in the same manner as proposals to clear other native vegetation.

In December 2004, DIPNR's Science and Information Board (SIB) released a Discussion Paper for public comment entitled, 'Clearing/thinning of native vegetation known as invasive native scrub under the Native Vegetation Act 2003'. Submissions were received on the Discussion Paper between January and March 2005. During January 2005, members of the SIB, Catchment Management Authorities (CMAs), and the Government, held public meetings throughout the State to discuss a proposed assessment process for invasive native scrub. A team (attachment 1) was formed to develop an INS assessment process taking into account responses to the Discussion Paper, other public comment and expert knowledge.

The INS team adopted the following principles in their deliberations:

- any management of invasive native scrub approved under the INS assessment process must meet the 'improve or maintain' environmental outcomes test,
- the assessment process should be as flexible as possible to ensure decisions reflect local conditions,
- the desired aim of INS assessment is the management/rehabilitation of native vegetation and creation of a mosaic of vegetation community "states" across the landscape, and
- the assessment process will be simple but robust (ie not be a barrier to good vegetation management).

Features of the assessment process (Figure 1) developed by the INS team include:

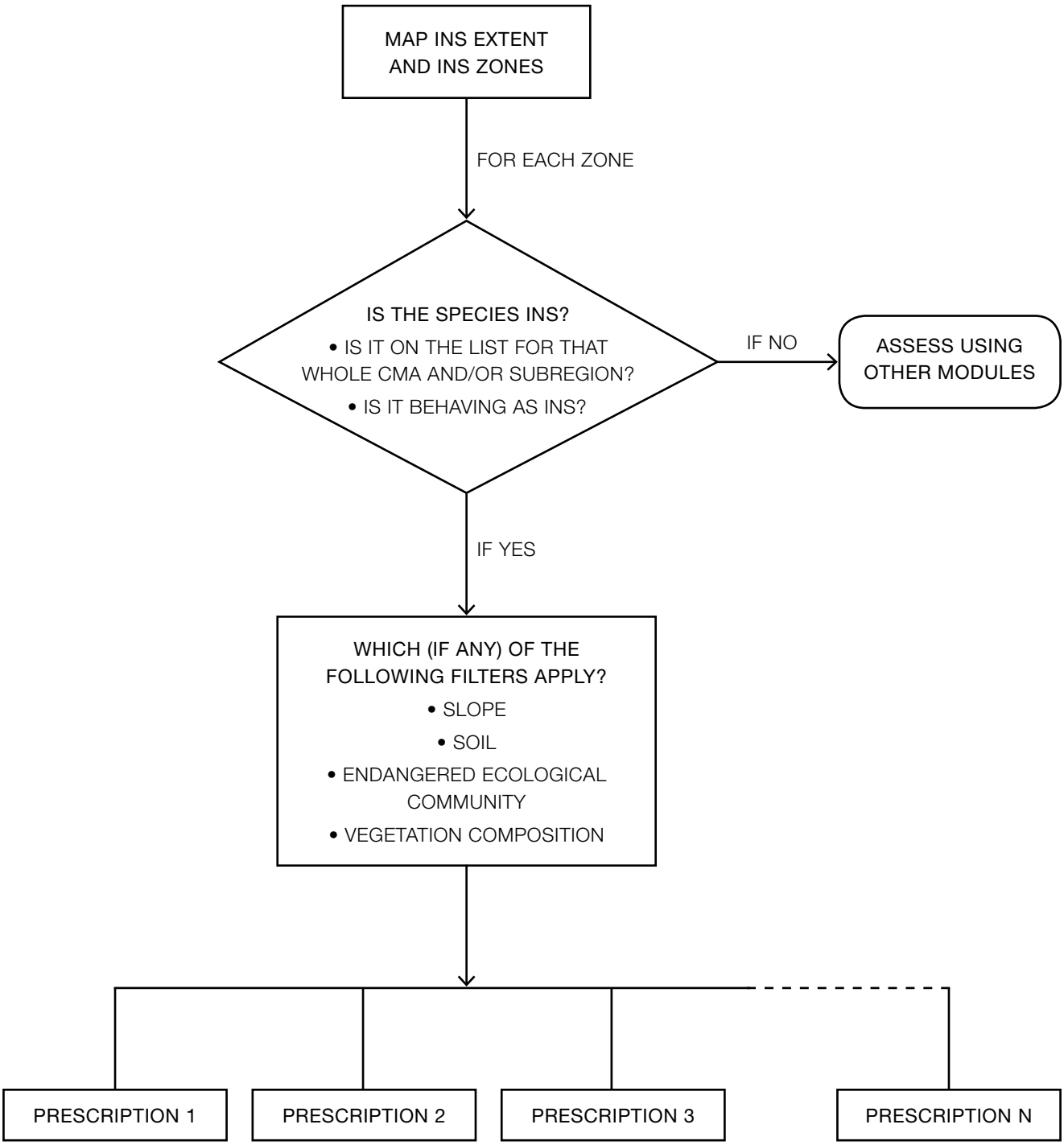
- a means of identifying invasive native plant species that takes local community knowledge into account (input through CMAs),
- a set of management options (including burning, spot treatment of individual plants and paddock scale removal) to provide flexibility for individual farmers in managing invasive native species,
- prescriptions for each management option to ensure that 'improve or maintain' environmental outcomes requirements are met. Prescriptions include for example: the proportion of the total area over which particular management options can be applied, and the maximum contiguous area of treatment,
- the prescriptions have been developed using a risk-weighted approach with more conservative limits applied to management options with potentially higher impacts or risks, and
- filters to ensure that management options are appropriate for the environmental conditions, eg. the existence of steep slopes, highly erodible soil, or a vegetation type that has been listed as an endangered ecological community.

The purpose behind writing this report is to provide a public record of the conclusions reached by the INS team and a formal response to issues raised in the submissions to the Discussion Paper.

The report has three sections:

1. an overview of submissions received,
2. comments (and responses) on policy issues related to invasive native scrub and native vegetation generally, and
3. comments (and responses) to issues specific to the Discussion Paper.

Outline of PVP Developer invasive native scrub assessment process



Black Roly Poly *(Sclerolaena muricata)* a native shrub that can invaside woodlands and open areas on inland plains.

Overview of submissions

OF THE 49 SUBMISSIONS RECEIVED, 28 were concerning the western division, 15 concerning the central west areas, four State-wide submissions and two from the coastal areas. Most of the submissions were from farmers or organisations that support farmers. Several CMAs and DIPNR staff also submitted their comments. There was one combined submission from the "green" NGOs.

General comments on invasive native scrub and native vegetation policy

Background

A number of submissions commented on the causes for the spread of invasive native scrub and noted that it is also an issue in other countries including South Africa, and South and North America. Many comments related to the observed (and perceived) landscape changes that had resulted from native scrub invasion.

Response

There is ongoing debate about the nature of Australia's vegetation prior to European settlement (eg. Benson & Redpath, 1997). At the centre of the debate are arguments about the extent to which the landscape was open and park-like (as described in journals of many explorers and anecdotally by early settlers) or dominated by dense woodland and shrubland. There seems however to be no disputing that the landscape was a mix of both, and that the introduction of European farming practices has resulted in a shift in that mix (Noble 1997), a trend that has been repeated throughout the world (eg. Roques et. al., 2001; Van Auken, 2000; Hudak, 1999). The need to strive for a mosaic of landscape "states" is acknowledged as a key principle adopted by the INS team in its deliberations.

Environmental imperatives to manage invasive native scrub

It was argued by many submissions that invasive native scrub has negative impacts, including loss of production, loss of ground cover, increased soil erosion (and water quality problems), problems with stock management, reduced accessibility in these areas, increased predation, increased levels of non-domestic herbivores, lowered biodiversity and decreased viability. Others argued that overgrazing and inappropriate clearing, not woody weeds exacerbated erosion and that the tendency for woody weeds to grow on poor soil leads to the misconception that woody weeds accelerate soil erosion. These submissions argued that the reasons for INS encroachment were in fact the removal of perennial grasses through grazing and consequent reduced incidence of fires.

In one submission, it was argued that cropping as a method for controlling invasive species does not permit the re-establishment of mature (nesting) trees, and that as a consequence of inappropriate farming practices the biodiversity in the central

west areas of the state has been destroyed. Others argued that species diversity is devastated even more so by invasive native scrub and several stated that it should not be assumed that removal of this vegetation would in all cases have a negative impact on biodiversity, salinity, water quality or soil degradation. Others argued that it is necessary to substantiate whether effective control of invasive species produces significant environmental benefits.

Response

The INS team accepted that there is evidence of native scrub invasion causing adverse impacts on agricultural production (eg Williams et. al. 1999; Scanlon & Burrows 1990). Evidence of environmental impacts (either adverse or beneficial) is however less conclusive (Eldridge et al 2003). The INS team accepted however, that removal or reduction of invasive native species, in certain circumstances and under appropriate prescriptions could at least be environmentally benign, if not advantageous (ie would meet the "improve or maintain" environmental outcomes test).

Routine agricultural management activity (RAMA) and exemptions

The most frequent comment in all submissions was that invasive native scrub management should be a RAMA (exempt from full PVP assessment and the requirement to provide offsets). It was argued that limited exemptions should be allowed, for example 10% of a property or 400ha (whatever is the smallest or the two), where there is no change in land use. It was suggested that these exemptions could be State-wide or CMA/region specific. It was also argued that this RAMA should include control of invasive native scrub by fire but should not apply to larger scale cropping.

Experience with the Western Division, where in the 10 years since current exemptions were introduced only 2 properties have abused them, was put forward as an argument in support of a RAMA. It was further argued that the cultivation permit requirement under the Western Lands Act is adequate to control excessive clearing and that further regulation would be an unnecessary impediment to good land management. In support of this argument, it was pointed out that since regulations on clearing were introduced in the Western Division 1979, the area of invasive native scrub has increased. It was similarly argued that landholders and statutory bodies (such as the Wild Dog Destruction Board) that need to manage invasive native species (such as cypress pine) to control feral animals and noxious weeds (such as Lippia, *Phyla canescens*), should be exempted from regulations under the *Native Vegetation Act 2004*.

The submission from the combined environmental lobby groups opposed the development of an exemption from regulation in the form of a RAMA for clearing of invasive native scrub. They accepted that within strict limitations, management of invasive native scrub may be considered a special case separate from clearing of remnant vegetation under the *Native Vegetation Act 2003*. However, they cautioned that management of invasive native scrub must still be subject to regulation and the 'improve or maintain' environmental outcomes test, and that management of invasive native scrub through the PVP Developer cannot be allowed to turn into a clearing loophole.

Response

Introduction of a RAMA or other form of exemption for invasive native scrub management under the *Native Vegetation Act 2003* is a policy issue considered by the native vegetation reform stakeholders group (the PVP Steering Committee).

Clearing of native vegetation (including INS) that is regrowth, clearing as part of pest animal control, noxious weed control, for fences, building protection and the like and for the continuation of existing farming activities (but not when it is remnant vegetation), is all permitted without requiring approval. INS control under other circumstances is available only through assessment using the INS module or where that is inappropriate, using the four other modules.

Flexibility/variability

A number of submissions argued that because invasive species vary from region to region, the policy on invasive native scrub needs to be regional specific. It was suggested that at the least, the approach to regulation of invasive native species needs to make a distinction between the Western Division and the rest of NSW, due to its different history and the particular circumstances provided by regulation of land management under the Western Lands Act.

It was also proposed that regional flexibility should be permitted in the methods used to manage invasive native scrub to allow for climate variability, species-specific management, and a farmer's resources. It was suggested that CMAs should be responsible for developing regional best practice management guidelines.

Response

The INS module includes provision for listing of species by CMA and by sub-catchment (or Interim Biogeographic Regionalisation of Australia, IBRA region). It also provides for retained stem densities (for species and circumstances where thinning is prescribed) to be varied by CMAs. Management prescriptions in the module are focussed on outcomes rather than the methods used, to allow farmers flexibility in their choice of approach.

Property planning

A number of submissions argued that control of invasive native scrub should be viewed as part of 'whole of landscape' and property management planning rather than just as a vegetation clearing issue. It was suggested that to be effective, INS management needs to be integrated with other aspects of farm management as part of a property plan. It was also argued that invasive native scrub management should be viewed in a broader and longer-term context than the paddock scale and that a 'landscape management plan' is needed to deliver a balance of social, economic and environmental matters.

Response

The Terms of Reference of the INS team were defined by the scope of the *Native Vegetation Act 2003*. This meant that the prescriptions contained in the INS module could only include matters pertaining to vegetation management and not, for example, landuse. The INS team took the broader geographic context into account by adopting as a principle the objective of a mosaic of vegetation across the landscape.

A PVP for the control of INS is considered to be a good starting point for landholders to move on to more comprehensive property management planning. In small part this is because an approved PVP also meets the assessment requirements of the *Threatened Species Conservation Act 1995*.

Policy Integration

A number of submissions argued that the issue of INS is greater than woody weeds, and needs to be considered as part of a broad policy approach to clearing and land management across the State, "a distinction should be made between the need to stop broadscale clearing of native vegetation and the need to control shrub invasion". A further argument was made that approvals to clear invasive native scrub need to be consistent with other plans including the CMAs' Catchment Action Plans.

It was also argued that the policy related to INS needed sufficient flexibility to adapt to different vegetation types, land uses and individual property management and to allow landholders to continue existing land use provided there were no new environmental impacts. It was suggested that there is a need for a state policy that makes the distinction between clearing for a change of land use and clearing for the maintenance of an existing land use, with a PVP required only for the former.

Response

The charter of the INS team is to review the literature, consider public submissions and provide technical advice. Integration of INS policy with other aspects of native vegetation and land management policy and legislation is undertaken by those reviewing this report.

All PVPs, including those for managing INS, require approval by the local CMA. That process requires consideration of the Catchment Action Plan for that CMA.

Incentives and compensation

A number of submissions supported the use of incentives (including tax breaks) to encourage invasive native scrub management and native vegetation conservation. It was argued that farmers who have had clearing applications rejected should be compensated at market value. Enterprise Conservation, where farmers are paid to manage portions of their holdings for conservation, was suggested as one model for providing incentives.

It was argued that in the Western Division, the high cost of clearing scrub and the relatively low returns for pasture improvement (except in restricted highly productive

areas) will naturally discourage excessive clearing, “the cost of clearing/thinning in low rainfall areas prevents large-scale clearing”. Some submissions suggested that Government should make funds available to the Western CMA to assist farmers with managing invasive native scrub.

It was also argued that regulation can act as a disincentive to people wishing to rehabilitate native vegetation, with the same level of assessment required regardless of the outcome, ie for clearing or for rehabilitation.

Response

Whilst it is not within the INS team’s brief to prescribe an approach to incentives it is acknowledged that it would be possible to use the INS module to allocate incentives in the same way that the other modules in the PVP Developer (biodiversity, water quality, soils and salinity) can, and are, intended to be used for this purpose.

Culture and indigenous considerations

A number of submissions pointed out that cultural issues and heritage sites need to be considered in INS management, “broadacre clearing should not be carried out in areas where indigenous cultural heritage may be damaged”.

It was suggested that advisory material needs to be available to encourage consideration of this issue and to outline how Aboriginal and non-Aboriginal cultural management and native vegetation can continue to be integrated under the new natural resource management reforms.

Response

Issues of indigenous and cultural values are not addressed through the proposed INS assessment process. This is the case for the whole Native Vegetation reforms, not just for the INS assessment process, as the “improve or maintain” environmental outcomes requirements for PVP approval specified in the *Native Vegetation Act 2003* are for water quality, biodiversity, soils and salinity, only.

Compliance

One submission highlighted the need for clarity in the roles and responsibilities of CMAs, DIPNR and farmers. Another pointed out that measuring the number of trees can be complex and that this has implications for successfully ensuring compliance.

Response

Roles and responsibilities and compliance issues such as this are not unique to the INS assessment process and are being addressed as part of the overall Native Vegetation reforms.

Using a ‘crocodile’ to control invasive native scrub near Fords Bridge in western New South Wales

Comments specific to the Discussion Paper

General

A number of submissions raised concerns that the temporal and spatial scale of the proposed INS assessment process were too restricted. From a temporal perspective comments included, "the Discussion Paper takes into account the immediate impacts and not the long-term benefits that may arise from a particular management action", and "there is no qualification of the time frame over which the environmental impacts are assessed". From a spatial perspective comments included: "the Discussion Paper focuses on management prescriptions rather than viewing management in the context of landscape and spelling out intended outcomes of management".

Other issues raised of a general nature included comments about the tone of the paper such as: "remove the vocabulary that puts native vegetation in a negative context", "remove unsupported connotations such as, ' there is a view in parts of the wheat-sheep belt that landscapes are more densely timbered than when settle by Europeans 150 years ago'", and, "the impacts of not managing invasive native scrub should be considered".

Questions were also raised about the intended outcome of the process, "what is the purpose of the Discussion Paper, is it leading to a Code of Practice?", and about the scope of the paper, "the paper should provide direction for an education package", "the Discussion Paper should include an evaluation of current best practice for maximising production and conservation outcomes", and "the paper glosses over important issues such as greenhouse mitigation".

There was also criticism that the approach proposed was overly prescriptive and too inflexible: "need to maintain flexibility to enable best management practice and evolving science to inform management decisions for improved environmental and productive outcomes", "the Discussion Paper reduces flexibility for landholders and reduces responsibilities", and "the Discussion Paper does not consider the Lower Murray-Darling local issues".

Response

The INS assessment process is regulated under the *Native Vegetation Act 2003* and as such any permitted or prescribed INS management is required to meet the "improve or maintain" environmental outcomes test. The stated intention of the Discussion Paper and the outcome of the deliberations of the INS team is an assessment process to regulate management of INS under the Act. This process will involve the inclusion of a module within the PVP Developer. The appropriate spatial and temporal scale for these is prescribed in the Act or Regulations. The process proposed by the INS team is a balance between simplicity, flexibility, and economy.

Scientific underpinning and applying existing knowledge

Some submissions criticised the discussion paper as being overly focussed on anecdotal information and perceptions rather than referring to published scientific research. It was argued that the substantial efforts of earlier work on the subject,

such as by the Woody Weeds Task Force, had been ignored. It was suggested that there was much to learn from previous attempts at studying, understanding and managing native scrub problems, such as:

a) Royal Commission 1901,
b) Report of the Inter-Departmental Committee on Scrub and Timber Regrowth in the Cobar Byrock District and other areas in the Western Division of NSW, February 1969,
c) "Poplar Box Symposium", Cobar 27-29 March 1979,
d) "The Delicate and Noxious Scrub", By James Noble 1997,
e) Draft Regional Plans by the Regional Vegetation Committees,
f) Woody Weeds Task Force,
g) West 2000 Board Study by Dani Ayers.

A number of submissions argued that historical information about what the landscape looked like prior to European settlement should be considered in the management and regulation of invasive native scrub. They pointed to the 1901 Royal Commission and subsequent reports that recognised woody weeds as a problem in the Western Division and bordering areas and that "early settlers reported that the west had an open parkland appearance". It was also argued that generalisations such as the above should be avoided since some vegetation in 1788 contained grassy groundcover while other vegetation was shrubby.

Response

The INS team includes a range of technical experts familiar with these sources and others. Recommendations of the INS team took into account existing knowledge (documented or anecdotal) wherever relevant.

Economic and social considerations

Many submissions were concerned that the Discussion Paper failed to adequately consider social and economic issues. Comments included: "the economic, social and environmental values of regrowth vegetation should be more fully evaluated in the Discussion Paper", "the *Native Vegetation Regulation 2004* and the INS Discussion Paper do not consider the social and economic impacts on individual landholders or farming communities in the assessment and decision making process", "there should be an account for economic costs/benefits inherent in land management activities undertaken in these landscapes", and "the Productivity Commission found restrictions of land use had serious economic effects on landholders".

A related issue raised was that of equity, "the Discussion Paper does not broach the issue of equity between farmers who have already cleared and those who are yet to develop".

Response

The *Native Vegetation Act 2003*, requires that the removal of native vegetation (including INS) demonstrate "improve or maintain" against the four environmental outcomes: water quality, biodiversity, soil degradation and salinity. It is not possible to consider trade-offs between socio-economic and environmental values (including equity) in the current legislation.

Definitions and naming

A number of submissions commented on inconsistencies in terminology and in the definition of INS. Comments included: "(there is a) need for consistency in naming, ie woody weeds versus invasive native scrub versus invasive species", "(there is a) need (for) correct and consistent naming of invasive native scrub species through out the Discussion Paper", "(there is a) need for a scientific definition of 'remnant vegetation'", "'Contiguous broadscale clearing' needs to be clearly defined and the maximum size of 'contiguous' area needs to be specified", "it is difficult to determine 'natural state'", and "the definition for 'clearing' does not relay the intention to relate clearing to change of land use", and "(there is a) need to define "spot treatment", ie is it chemical or mechanical".

The definition of 'regrowth' was of particular concern, "The definition of 'regrowth' needs to be legally and practically robust, unambiguous and easily understood by diverse stakeholders." It was argued that clarification was required to confirm that listed invasive species, which have germinated since 1983, are exempt from clearing controls under the Native Vegetation Act. A revised definition was suggested, "vegetation that has grown since 1983 in the Western Division is classified as regrowth and does not require government approval to clear under the new Act". It was further argued by one submission that in the Western Division, regrowth should include all vegetation that has grown since 1950 because of the escalated increase in area affected by invasion during the last 50 years.

The definition of invasive native scrub was also an issue, with submissions asking: "who defines 'invasive native scrub'", and "the definition of INS is not clear in the Discussion Paper", and suggesting that "Invasive native scrub should be defined by characteristics and effects rather than species names."

Response

The INS team has developed a definition of INS. This definition has been circulated widely for comment and discussion. Other technical terms used in the INS assessment process will be clearly defined in the Assessment Methodology, and definitions of terms will be provided in the Operational Manual and in the PVP Agreement.

Regrowth is defined in the Act and this report does not propose any change to that definition. A fact sheet on regrowth was released at commencement of the Act. It addresses the issue of clearing of INS that is regrowth.

Invasive native scrub species

There were two broad "schools of thought" in submissions on INS species listing. One school argued that it was inappropriate to have a list as almost all native species will at times and under certain circumstances behave as INS. It was suggested that areas of invasive native scrub should be defined through botanical surveys rather than by description of species listing. The other school of thought supported listing of species, generally arguing for lists to be CMA, sub-catchment or even finer scale specific. A number of submissions nominated particular species to be added to the list including the comment that "the woody weeds that are exempt in the current legislation (in the Western Division) should be carried over into the new act".

It was also argued that the process should allow CMAs to add species to the list or remove them as circumstances changed. It was also argued that CMAs should have the authority to nominate species that may be managed under an exemption. One submission argued for the listing of vegetation communities rather than individual species.

Response

The INS team has recommended a process for listing of individual INS species. This process relies on species being nominated by CMAs at whole CMA or sub-regional level. The species list is contained within the EOAM. Amendment of the EOAM requires consideration by the Natural Resources Commission and approval by the Ministers.

Spot treatment invasive native scrub removal and thinning

A number of submissions argued against the use of spot treatment or thinning. This was based on the grounds of:

- impracticality, for example in the Western Division where INS are extensive and property areas large (the average size of a property is 50,000 ha),
- ineffectiveness, "any retained individuals of INS will act as a seed source for recolonising", "spot treatment is not an effective method in controlling the scrub in areas where invasive native scrub is advanced", or
- scientific validity, "what is the scientific basis behind the thinning? There is little or no evidence that thinning of regrowth will have an environmental benefit".

Others argued that spot treatment is the best method for controlling invasive native scrub because it creates least disturbance through thinning to a benchmark level.

Many submissions commented on density benchmarks for thinning, suggesting that the retention rates listed in the Discussion Paper were too high, "recommended stem densities would out-compete most groundcover species", "Western Division science and knowledge suggests that thinning numbers quoted are too large to allow optimum growth of groundcover", and "White Cypress Pine should be thinned at around 6-8 m spacings (initially) then logged when stem size allows". Others argued

that the density benchmarks should be varied with locality as well as with vegetation type or species in accordance with climate and soil type, “Australias variable climate resulting in a variable landscape, makes it difficult to set a State-wide target for specific species”, and “protocol for thinning needs to be reviewed and where necessary amended to allow for variation according to region, species and land systems”. One CMA suggested that benchmarks should be set by an expert panel that includes local knowledge and others supported the use of local knowledge or historical information.

Several submissions commented on the use of stem counts as a measure of density, suggesting that ‘basal area’ is a more valid and simpler measure to use. A number also questioned the use or prescribed stem sizes for retention, “(the) maximum DBH should be 40 cm”, “there should be no size limit, especially for pine”, and argued that measuring individual stem diameter is impractical across large areas.

A number of submissions also questioned the proposed restrictions to the proportion of the property permitted to be treated using spot treatment or thinning. The combined Green NGOs submission argued for a total limit of 25% of the scrub-affected areas on a property permitted to be treated by mechanical, chemical or other means and another submission proposed that up to 30% of property may be managed (thinned) for grazing, with mature trees for nesting remaining. Landholders argued for higher limits, eg in the Western Division areas that can be thinned should be increased from 50% to at least 75% and others proposed that thinning should be permitted on up to 85% of the property in contiguous areas of 400ha maximum. Some landholders also argued that spot treatment at low levels be permitted under an exemption or RAMA, “spot treatment should be considered a RAMA and not require a PVP”, and “approval assessed by PVP if greater than 75%”. “It is not practical for each (spot treatment) activity requiring a PVP, most of the land is remnant and therefore mapping is too time-consuming”.

One submission suggested the condition of ‘no ground disturbance’ for spot treatment be changed to ‘minimal disturbance’ to permit small-scale mechanical removal such as “grubbing” and several others stated that complete removal should be permitted in conjunction with cultivation, leaving strips or clumps of vegetation.

Response

Spot treatment or thinning is one of a number of options for managing INS available to landholders within the module. The INS team consider spot treatment to be one of the least impacting options, being selective and involving limited soil disturbance, and hence recommeneded that it be the least restricted. Other options are made available for use in combination with or in place of, spot treatment depending on the circumstances. Higher impact options (such as mechanical paddock scale removal) are available only in circumstances with low risk of adverse environmental impacts whilst burning is permitted to be used everywhere that spot treatment is. Landholders are never restricted to spot treatment as the only management option available to them.

The stem density figures listed in the Discussion Paper were provided for illustration only. The INS module provides for stem densities to be listed by species, CMA (and CMA sub-region). The INS team has initially prescribed a density of 20 stems per hectare across the board and is consulting with CMAs in developing prescriptions for varying retained stem densities between species and areas. The INS team recognises that for some INS species (notably shrub and understorey species) it is appropriate that no lower limit be set. Minimum densities are prescribed for all other species however, except where they are occurring as part of a derived community, and would not normally be present.

The INS team considered that it was conceptually easier for a range of landholders to understand and apply prescribed retention levels set by numbers of stems within size classes rather than by basal area. The prescription does not require that retained stems be equally spaced, allowing landholders flexibility to clump retained stems if they choose.

The INS module presently specifies a maximum stem density for removal with spot treatment or thinning of 20cm for all species. This was selected by the INS team based on a review of recommendations of the previous Regional Vegetation Management Committees. Provision has been made for this to be varied by species, CMA (and sub-region), in future iterations of the module.

The proportion of the property permitted to be treated by spot treatment or thinning without groundcover disturbance is limited in the INS Module to 80%. In setting this figure, the INS team took into account the fact that INS are a natural component of the environment and hence their complete removal would not meet the “improve or maintain” environmental outcomes test. They also took into account the desirability of achieving a mosaic of vegetation structures in the landscape.

Spot treatment with limited ground disturbance (eg grubbing) is included as an option in the INS module.

Paddock scale invasive native scrub removal

The submissions generally either accepted or were supportive of the need for paddock scale removal as an INS management option, “an assessment methodology that specifically deals with paddock scale clearing of invasive native scrub is the best option for government”.

A number of submissions commented on proposed restrictions on the size of areas to be treated using paddock scale INS removal. Those that supported a limit generally agreed with the 400ha proposed. Others argued that in some areas, particularly the Western division, 400ha was much too small, “in the Western Division, limiting graziers to clearing no more than 400ha in one contiguous parcel is highly impractical where the average paddock size is 5000ha”, whilst others suggested that 400 ha without a windbreak was too large to provide connectivity in the landscape. There were some who suggested that no limit should be prescribed to allow for variation to suit local conditions and enterprise management and that restrictions on the area in which paddock-scale removal can be carried out should be

flexible within landscape guidelines.

Many submissions commented on the landscape design needs of INS management with support generally for a flexible approach that resulted in a mosaic of vegetation in various densities and structural forms, "(the aim should be a) mosaic of open, dense and intermediate vegetation". Several submissions were critical of prescriptions limiting the proportion of the property over which paddock scale treatment could be conducted, "(it is) not necessary to retain 50% if the activity is actually going to improve native vegetation", "50% is too high for people to afford", and "broadacre clearing of invasive native scrub should allow treatment on up to 100% of treatable land on the property". Others supported the concept of setting aside a proportion of the property (suggested 20%) to be managed for conservation.

Many submissions commented on the methods of paddock scale treatment. Most agreed that methods should not be prescribed, to allow flexibility depending on the need. One suggested that aerial spraying should be considered as a management option for controlling invasive native scrub. Some people discussed the methods they have used (including goats, stick raking, blade ploughing, crocodiling, chemicals, wire rope and chaining) and their pros and cons.

Others were critical of prescribed limits on the damage to non-INS species or large trees on the grounds of practicality "it is impractical to only allow broadacre clearing where the defined species represent more than 50% of the canopy", "it is unrealistic to expect anyone to accurately count the total number of trees to be removed". Others supported such limits on conservation grounds, "over clearing of non-target species needs to be addressed", and "a beneficial outcome could be achieved by retaining large remnant trees with hollows where they occur".

A number commented on the regulatory framework, "a PVP should be mandatory (for paddock scale removal)", and "in the Western Division, where broadscale clearing is proposed, applications should be subject to both a PVP developer process and a Western Lands Act cultivation consent".

Response

The importance of habitat connectivity for conservation of native plants and animals is well established in ecological science (eg Lindenmayer & Franklin, 2001; Bennett et. al., 2003). How this knowledge is utilised in managing INS depends upon the nature of the original vegetation, the extent of its modification and the current form of land management at both a paddock and landscape scale.

The INS team prescribed upper limits for contiguous areas to be treated using INS removal to ensure that habitat connectivity is maintained. General opinion is that 500 ha is a viable paddock size with contemporary farming methods.

Three approaches to paddock scale treatment are permitted by the INS module. The prescribed limits to the proportion of the property permitted to be treated differ with each. The baseline is set by the INS team's view of the proportion of the landscape that would naturally be INS, and the limits vary with the amount of ground disturbance of each approach and hence the expected time required for native vegetation to recover after treatment.

The techniques to be used are not prescribed or limited, farmers are permitted to use whatever techniques they choose provided they operate within the prescribed limits. Specific techniques are listed in the INS prescriptions for example only.

A level of incidental damage to non-INS species is permitted with paddock scale treatment in recognition of the scattered distribution of native plant species and the impracticalities of avoiding individual plants. Removal of unlimited areas of non-INS species under these prescriptions could not however be justified as meeting the "improve or maintain" environmental outcomes test.

Change of land use

The submissions generally supported the case that conversion of native vegetation (whether it be INS) to continuous cropping should be treated outside the INS assessment process, "permanent land use change must have full assessment".

Many submissions argued however, that some level of cropping is a requirement of effective INS management and that where the goal is restoration of native grassy woodlands it should still be deemed to meet the "improve or maintain" environmental outcomes test. Comments included, "many Western Division farmers consider clearing followed by cropping is the best method for turning invasive native scrubland to open woodland", "ploughing and chaining needs to be followed by at least 3 years of cropping", and "cultivation is part of the management for controlling the scrub and several cultivations are often needed for some species".

Others disputed this claim "cropping is part of the problem, not the solution", and "oppose the use of cropping as a method for managing invasive native scrub".

Those who supported cropping generally agreed that it should not be permanent. Comments included, "using a cultivation phase is beneficial for the environment if after 10 years the area is allowed to return to native pasture for an extended period", and "an effective management tool is cropping the cleared area for 1-3 years and then allow native perennial species to regenerate". It was also argued that in the Western Division, the cost of follow up clearing after initial clearing (ie 5 years later) is too great and therefore cropping is rarely a permanent land use. Some argued that the Native Vegetation Act 2003 should allow rotation from cultivation to native vegetation commenting that the words "permanent cropping" should be removed from the Discussion Paper and changed to "rotational cropping and pasture".

It was also generally agreed that cropping should be restricted to only part of the property, "suggested cropping maximum of 50% per property", and "designated cropping paddocks not more than 50% of the property and limited to soils better than Class IV".

Response

The INS team has accepted the argument that short-term temporary cropping is, under some circumstances, an important component of effective INS management. Available scientific evidence suggests that in western NSW a high diversity of perennial grasses can establish in 5 years after cultivation (Robson, 1995; Nadolny, 1999) depending on follow-up rainfall. However, recovery will depend on the length and severity of cultivation. Repeated cultivation over an extended period (eg >10 years) has been demonstrated to result in reduced species richness, different vegetation compositions and reduced conservation value of the recovered native vegetation (Lewis, unpublished).

The INS assessment process permits cropping for 2 years in 10, in conjunction with paddock scale removal of INS where the objective is restoration of a native grassy woodland. Cropping is limited by the assessment process to 20% of the INS affected land on a property in recognition that vegetation treated in this way is not native for an extended period of time. However, if it can be demonstrated that INS areas previously treated under the PVP using cropping have been satisfactorily restored ie. for example, vegetative groundcover is more than 50% of the ground surface and comprises more than 75% native species, permission can be granted for treatment of additional INS areas. At any one time however, the area in a disturbed and unrestored condition due to INS management is never be permitted to exceed the prescribed maximum percent permitted for that option (eg 20% for cropping).

Cropping is also restricted by the assessment process to land where the erosion risk is low and where the soil depth is adequate (greater than 1m).

Maintenance

Several submissions argued the case for a form of exemption (or RAMA) for maintenance clearing, where the activity is restricted in extent and directed at maintaining an established continuing land use. Part of the case for this is the argument that one-off treatments of INS are not successful and farmers need to be encouraged to take an on-going approach integrating a range of management activities. “Control programs most likely to succeed in the long term are those with an integrated strategy taking into account techniques used, appropriate grazing/ cropping regimes, modification of fire regime and consideration of financial returns”.

Response

The Native Vegetation Act 2003 regulates management of native vegetation not land use outcomes. Native vegetation regrowth following clearing that has occurred since 1983 in the Western Division and since 1990 in the Central and Eastern Divisions, may be removed without assessment. Vegetation regrowth prior to these dates or following natural disturbance may not be removed without assessment and approval.

The INS module provides applicants with a set of options (varying depending on the circumstances) to apply, either individually or in combination. Extension literature and advice on the most effective combinations of techniques to manage INS will continue to be provided through CMAs, as will incentive funds under certain circumstances.

Burning

A number of the submissions recognised the contribution of changed fire regimes to INS problems and the role that burning may play as a management tool. One submission suggested that burning was the only viable tool for INS control in the Western Division. It was also suggested that control of invasive native scrub through burning should be considered a RAMA.

Several other landholder submissions commented however that they would not, or could not, use fire in their area. Reasons given included, loss of production and control difficulties with possible risk of spread.

A number of submissions commented on the inappropriateness of prescribing a "one size fits all" fire regime, pointing to the need for an opportunistic approach to fire in rangeland environments with their fickle rainfall.

Response

There is evidence of a relationship between altered fire regimes and native scrub invasion (eg Perrings & Walker, 1997), and burning has been demonstrated to be an economic means of invasive native scrub management (Burgess 1988; MacLeod & Ludwig 1991). Burning has been included as a management option in the INS module. It is the least restricted of the options, being permitted across 80% of the extent of INS on a property. CMA's will be supported to develop and provide advisory literature on best practice in their area for landholders wishing to use fire for INS control.

Buffers

Many of the landholder submissions argued against the retention of buffers on the basis that they act as seed sources for re-introduction of INS and other weeds, and as a refuge for feral animals. Others argued for narrower widths than proposed in the Discussion Paper (200 m) and for a more flexible approach to allow clumping or other variations to fit with the landscape. Suggestions included widths of 50 or 100 m and retention of 10% in clumps. Some landholders suggested that the area of buffer zones should be based on individual assessment at the discretion of each CMA. Some argued for scientific justification to explain how buffers will improve or maintain environmental outcomes.

A number of submissions also commented on the management of buffers, suggesting that riparian zones should be cleared of INS or thinned to re-establish ground cover for erosion control.

Response

The importance of riparian native vegetation for protection of water quality is undisputed (Prosser et al. 1999). The INS team has recommended that the width of vegetation to protect streams should be consistent with that prescribed for the Water Quality module. These vary from 20m to 100m, depending on the significance of the stream or wetland. The INS module permits INS management by spot treatment, thinning and burning in these areas and does not permit use of any mechanical techniques.

The INS module allows a flexible approach to the design of buffers between areas of paddock scale treatment. Paddock scale treatment is permitted in blocks of 500 ha of which 100 ha (or 20%) of native vegetation is to be retained. The spatial arrangement of these retained areas is not prescribed, they could be retained as a perimeter buffer or clumped. INS is permitted to be managed in the retained areas by burning, spot treatment or thinning.

Offsets

Concerns were raised in a number of submissions about the application of offsets to INS, "there should be no environmental trade offs or offsets for clearing invasive native scrub". It was argued that offsets were not relevant in the Western Division because of the high amount of native vegetation in the division, which makes it difficult to have offsets from clearing. Several CMA submissions commented that offsets were consistent with their approach to clearing.

Response

The INS assessment process does not require that offsets be identified. The "improve or maintain" environmental outcomes test is deemed to be met by management within the prescriptions provided by the INS module.

Assessment of threatened species

A number of submissions commented that the invasion of other native vegetation by INS was a threat to native flora and fauna of that other vegetation and that accordingly management to reduce INS and restore vegetation to its original condition should, by definition, be considered to "maintain or improve" threatened species. It was argued that a process of balancing the harm to species dependant on INS by its removal against the benefit to species dependant on the vegetation type that INS had replaced, by its restoration, would show that INS management is of net benefit to threatened species.

Response

Studies have shown that INS provides habitat for a range of native flora and fauna including some threatened species (Ayers et al 2001, Thomson and Eldridge, in review).

The INS assessment process contains no additional requirement to provide for threatened species beyond the prescriptions developed to promote habitat connectivity. INS management as permitted by the INS module, is deemed to meet the needs of threatened species conservation in these circumstances.

It should be noted in this regard that the INS module of the PVP Developer stands alone. Where a proposal is eligible to be considered by the INS module, assessment is not required by any of the other four modules in the PVP Developer.

Monitoring and ongoing research

A number of submissions acknowledged the limitations in current scientific understanding to support the INS assessment (particularly in demonstrating "maintain or improve"). One submissions argued for more research on vegetation communities sensitive to fire and another pointed out that the Rangeland Assessment Program includes 265 sites which have been observed since 1989 and should help inform development of the INS prescriptions. It was argued that the implementation of the INS assessment process needs to be monitored and reviewed and that Government needs to invest in research and extension to encourage control of native vegetation invasion.

Response

The INS team has proposed that implementation of the INS assessment process be monitored continuously with a review of the operation of the module to commence within 3 months of its activation. It has also recommended that resources be committed to further investigations to address key knowledge gaps for INS management as part of this process.

Conclusions

COMMENTS CONTAINED IN ALL submissions have been considered by the INS team in developing their proposed assessment process. In general the comments reflected widespread support for the broad approach adopted in the INS assessment process.

Many of the matters raised have been incorporated directly into the design of the INS assessment process. These included, for instance, provisions for localised decision-making in the listing of species and retained stem density prescriptions by CMA and sub-region. They also included provision for a wider range of management options and for options to be combined and integrated.

Other matters were noted by the INS team, but not included because they could not be demonstrated to meet the "improve or maintain" environmental outcomes test. These included proposals such as having no limit applied to the extent of treatment or to the frequency and duration of cropping.

Those that were beyond the brief of the INS team have been referred to appropriate forums. These include for instance, the introduction of a RAMA, and variation of the definition of regrowth within the new Act, which are being considered by the Minister in the context of the overall Vegetation Reform process.

The INS Team has acknowledged the need to continue to refine the INS assessment process after its operational roll-out. It has proposed:

- formal monitoring, review and improvement,
- strategic investment to address key knowledge gaps such as: quantification of environmental outcomes from the management options to provide quantitative evidence for the "improve or maintain" environmental outcomes test and to refine prescriptions.

Ongoing consultation with CMAs, landholders, and other stakeholders is an essential component of these actions.

References

Ayers, D., Melville, G., Szigethy-Gyula, J., Read, D., Rees, R., and Atkinson, A., (2001) Woody Weeds and Biodiversity in Western New South Wales. WEST 2000, Dubbo, NSW.

Bennett, A., van der Ree, R. and Gilmore, D. (2003) Gap-crossing by gliding marsupials: thresholds for use of isolated woodland patches in an agricultural landscape. Page 34 in: ESA Ecology 2003 Conference: Abstracts, Oliver, I., Kristiansen, P., and Silberbauer, L. (eds) University of New England, Armidale, Australia.

Benson, J.S. and Redpath, P.A. (1997) The nature of pre-European native vegetation in south-eastern Australia: a critique of Ryan, D.G. Ryan, J.R. and Starr, B.J. (1995) The Australian landscape – observations of explorers and early settlers. *Cunninhamia* 5, 285–328.

Burgess, D.M.N. (1988) The economics of prescribed burning for shrub control in the semi-arid woodlands of north-west New South Wales. *Australian Rangeland Journal*. 10, 48–59.

Eldridge, D.J., Wilson, B.R., and Oliver, I., (2003) Regrowth and soil erosion in the semi-arid woodlands of New South Wales: A report to the Native Vegetation Advisory Council. Centre for Natural Resources, Department of Land and Water Conservation, NSW.

Hudak, A.T. (1999) Rangeland Mismanagement in South Africa: Failure to Apply Ecological Knowledge. Human Ecology, Vol 27, No 1, p 55–77

Lewis, T. (unpublished) Management for conservation of plant diversity in grassland communities of the Moree Plains, New South Wales. PhD thesis, University of New England, Armidale.

Lindenmayer D.B., and Franklin J.F. (2002) *Conserving Forest Biodiversity: A Comprehensive Multi-scaled Approach*. Island Press, Washington.

MacLeod, N.D. and Ludwig, J.A. (1991) Using BURNECON to evaluate the economics of fire management in semi-arid woodlands, eastern Australia. Journal of Environmental Management 17, 151–162.

Nadolny, C. (1999) Effects of past cultivation history on biodiversity values in grasslands of the North-west flood plans of NSW. Progress Report. Centre for Natural Resources, Department of Land and Water Conservation, NSW.

Noble, J. (1997) The Delicate and Noxious Scrub: CSIRO studies on native tree and shrub proliferation in the semi-arid woodlands of Eastern Australia. CSIRO, Canberra.

Perrings, C. and Walker, B., (1997) Biodiversity, resilience and the control of ecological-economic systems: the case for fire-driven rangelands. Ecological Economics 22, 73–83.

Prosser, I., Bunn, S., Mosich, T., Ogden, R., and Karssie, S. (1999) The delivery of sediment and nutrients to streams, In: Lovett, S., and Price, P. (eds) Riparian Land Management Technical Guidelines, Volume One: Principles of Sound Management, LWRRDC, Canberra.

Robson, A.D. (1995) The effects of grazing exclusion and blade-ploughing on semi-arid woodland vegetation in north-western New South Wales over 30 months. Australian Rangeland Journal, 17, 111–127.

Roques, K.G., O'Connor, T.G., and Watkinson, A.R. (2001) Dynamics of shrub encroachment in an African savanna: relative influences of fire, herbivory, rainfall and density dependence. Journal of Applied Ecology 38, 268–280.

Scanlan J.C. and Burrows W.H. (1990) Woody overstorey impact on herbaceous understorey in *Eucalyptus* spp. Communities in central Queensland. *Australian Journal of Ecology* 15 191–197.

Thompson, W.A. and Eldridge, D.J. (in review) Plant cover and composition in relation to density of Callitris glaucophylla (white cypress pine) along a rainfall gradient in eastern Australia. *Australian Journal of Botany* (in review).

Van Auken, O.W. (2000) Shrub Invasions of North American Semiarid Grasslands. Annu. Rev. Ecol. Syst. 31:197–215.

Williams, D. G., Wallace, P., McKeon, G. M., Hall, W., Katjiua, M. and Abel, N. (1999) Effects of Trees on Native Pasture Production on the Southern Tablands A report for the RIRDC/LWRRDC/FWPRDC Joint Venture Agroforestry Program. RIRDC Publication No 99/165, Canberra.

Appendix 1 – Membership of the INS team

Dr Denis Saunders, Chair of Team and member of the DIPNR Science and Information Board;

Daryl Green, General Manager Western Catchment Management Authority;

Karen Kneipp, Western Catchment Management Authority;

Tim Ferraro, General Manager Central West Catchment Management Authority;

Carolyn Raine, Central West Catchment Management Authority;

Dr Sue Briggs, NSW Department of Environment and Conservation;

Gary Howling, NSW Department of Environment and Conservation (until April 2005)

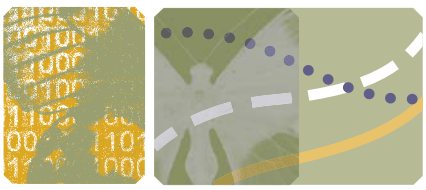
Kevin Roberts, NSW Department of Environment and Conservation (from April 2005);

Phillip Norman, Department of Infrastructure Planning and Natural Resources; and

Daryl Lawrence, Department of Infrastructure Planning and Natural Resources (until May 2005).

NSW Government
DEPARTMENT OF NATURAL RESOURCES

Science and Information Board



PRODUCTION DRAFT 19/04/06