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An audit of forest biosecurity arrangements and preparedness in Australia

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An audit of forest biosecurity arrangements and preparedness in Australia

Prepared for

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Executive Summary

Current biosecurity arrangements for plantation forestry are poorly defined, at least relative to other plant-based industries. Serious pest and disease outbreaks in forestry are relatively rare events. Preparedness for rare events is difficult. Part of the difficulty stems from the competing views of managers and stakeholders. This project sought to directly capture alternative views concerning the key objectives of plantation forest biosecurity, alternative strategies for achieving those objectives, and ultimately recommend preferred actions that might be broadly supported by stakeholders.

Information and views were captured as follows:

- A position paper was written to explore the current systems and structures for responding to an incursion of an emergency plant pest (EPP) especially in forestry and the history to the development of these structures.
- A list was made of 190 possible different types of stakeholders in forest biosecurity including a wide range of representatives across the forestry sector, Commonwealth and State Biosecurity /Quarantine agencies, Plant Health Australia and environmental organisations. People were approached for face-to face interviews or asked to undertake an on-line survey. The survey solicited opinions on the weaknesses and threats to forest biosecurity.
- The position paper and survey responses were used to inform participants in a workshop was hosted and facilitated by the Australian Centre of Excellence for Risk Analysis. Participants were limited but represented a cross section of interested parties; researchers, state and private commercial foresters, timber organisations, government biosecurity managers and those responsible for policy decisions in biosecurity. A 'structured' decision-making approach to promote mutual understanding of different perspectives and to progress a collective recommendation for strategies to improve forest biosecurity.

The outcomes from the workshop were used as a basis to draft a list of strategic actions required to improve forest biosecurity in Australia and to be implemented over the next 2-5 years. These top two priority non-research actions are as follows:

1. The forest sector is only a (minor) part of the national plant biosecurity system that is under development within Australia and cannot take for granted that its interests will be well considered in the decision making process. There is a need for a national body for forest health and biosecurity (such as an expanded Research Working Group 7) with revised membership and terms of reference to empower this group and represented in the national arena by a dedicated officer.
2. The move towards 'one biosecurity' and inclusion of forest biosecurity under the PHA/PLANTPLAN system may have encouraged some components of the plantation timber industry to view non-participation as an acceptable risk i.e. within a generic framework concerns of the industry will be accommodated without the need for financial investment from the industry. There is an urgent need to demonstrate the benefits of industry investment in biosecurity or the potential costs of non-participation. This can be achieved by characterising the economic and social costs and benefits of a co-operative approach to Forest Biosecurity.

Research priorities were identified as research to support cost benefit analyses; investigating the effects of changed environmental conditions on forest biosecurity; pathway analysis for functional pest guilds. Integration of this research within a CRC would also permit the effective development and extension of this research as well as providing training urgently required to maintain forest biosecurity and health expertise.

Table of Contents

Executive Summary i
Introduction 3
Methodology 4
Results 10
Summarising the existing framework/processes for responding to an Emergency Plant Pest (EPP) in plantation forestry 10
Survey of opinions and information related to forest biosecurity preparedness (March – August 2010) 12
Workshop meeting of forest biosecurity stakeholders: strategic actions required to improve forest biosecurity 14
Discussion 17
Representation of the plantation forestry industry in national biosecurity arrangements 18
Awareness of forest biosecurity issues by the plantation forest industry 18
Towards the improvement of forest biosecurity 19
Engaging the forest industry in biosecurity 20
Conclusions and Recommendations 25
References 29
Acknowledgements 32
Researcher's Disclaimer 33
Appendix 1: Survey questions and biosecurity issues addressed 34
Appendix 2: List of Forest Biosecurity workshop participants 41
Appendix 3: Structured decision-making and alternative strategies identified by participants in workshop 42
Appendix 4: Existing and emerging framework and processes for responding to and Emergency Plant Pest (EPP) in plantation forestry 44
Introduction 45
Ministerial and Subsidiary Committee Structures 47
Pest Response Agreements Relevant to Forests and Forestry 51
Summary of Plant Plan 54
Phases of response 55
Control centres 58
Decision-making bodies 60
Communication 60
Plantation Industry Biosecurity Plan (PTIBP) 60
The Generic Incursion Management Plan (GIMP) versus Plant Plan 61
Conclusions 63
References 64
Appendix 4A: Plant Health Australia (PHA) 65
Appendix 4B: A Summary of the Plantation Timber Industry Biosecurity Plan 66
Appendix 4C: The Beale Report 79
Appendix 5: Survey of perceived forestry biosecurity strengths and weaknesses 84
Appendix 6: Round 2 assessments of each group at the Biosecurity Workshop 104

Introduction

Intensified global trade and altered approaches to biosecurity have increased the need for the capacity to mount an effective incursion response. The most recent review of forest biosecurity arrangements in Australia was undertaken 11 years ago by Gadgil (2000a and b). This resulted in a Generic Incursion Management Plan (GIMP) and a set of recommendations to provide the framework, capacity and funding to adequately respond to incursions of exotic pests of concern to forestry.

Changes in government approaches to biosecurity have seen the GIMP expanded to processes for biosecurity such as PLANTPLAN, a pest response plan which is applicable to all plant industries. Under PLANTPLAN, the main agencies involved in responding to incursions are Commonwealth and State government primary industry agencies.

Plant biosecurity in Australia depends on the co-operation and coordinated functioning between State and Commonwealth government departments, and relevant industries. Historically, forestry has not been as well integrated with these agencies as have agriculture and horticulture. The arrangements under PLANTPLAN apply to those plant industries that are signatories to the Emergency Plant Pest Response Deed (EPPRD). The Australian Plantation, Products and Paper Industry Council (A3P), in association with Australian Forest Growers, has been a member of Plant Health Australia since 2004/05 but have not become a signatory to the EPPRD. This means there is high uncertainty regarding any response to a potential Emergency Plant Pest (EPP) affecting this sector, despite the development of a forestry industry biosecurity plan and several contingency plans for EPPs potentially affecting this industry.

Operational implementation of responses could be hampered by the complex issues of private and public ownership of plantations; the divide between environmental and commercial interests in native forests; ambiguous cost-sharing arrangements these generate; and the often fragmented communication pathways between health specialists, forest owners and biosecurity agencies. Research Working Group 7 (RWG7) contains the body of forest health expertise in Australia and has historically provided a bridge between the forest and agricultural sectors from the perspective of biosecurity. RWG7 collectively contains the body of expertise regarding forest health management and through their international networks are most abreast of emerging pests and pathogens of potential concern to forestry. This expertise delivers an annual national status report of forests pests and diseases, including current and emerging threats. In addition, RWG 7 membership are at the coal face of operational forestry enabling forest biosecurity to be considered within the continuum of overall forest health management and not as a separate activity.

The forest industry is concerned that forest biosecurity be on a consistent footing with other industries in respect to biosecurity. Although this has been achieved in part for plantation timber industry by the release of the Plantation Timber Industry Biosecurity Plan there are still acknowledged gaps e.g. the risk posed by packing material, the monitoring of high risk areas in respect to forest pests, the technical capacity in forest biosecurity, the quarantine regulations between Australian states in respect to wood commodities and germplasm. This project was set up to undertake a

comprehensive audit and gap analysis of Australia's current arrangements to respond to a forest biosecurity threat in the commercial sector, and recommend actions to address identified weaknesses in forest biosecurity. The outputs to be delivered are:

1. Summary of the existing processes in plantation forestry for responding to an Emergency Plant Pest (EPP)
2. Assessment of the operational preparedness of the plantation sector to take all required action under existing generic EPP response mechanisms.
3. List of strategic actions required to improve forest biosecurity in Australia and to be implemented over the next 2-5 years.

Methodology

The forest biosecurity audit was carried out by 5 major exercises;

1) A document was written to explore the current systems and structures for responding to an incursion of an EPP and the history to the development of these structures. Information was obtained by reference to published literature, on-line information prepared by the Commonwealth and by personal communication with various stakeholders in forest biosecurity. The document served as a repository of relevant information for the project and to establish those issues which could impinge upon effective forest biosecurity preparedness.

2) A list was made of 190 possible stakeholders or interested parties in forest biosecurity preparedness including a wide range of representatives across the forestry sector, Commonwealth and State Biosecurity /Quarantine agencies, Plant Health Australia and environmental organisations. A small number of stakeholders were involved in formulating questions to gauge the current opinions and knowledge in respect to forest biosecurity preparedness focusing on the plantation timber sector. The questions are given in Appendix 1 and were in part based upon the position paper presented in the previous section of this report. They were a mix of qualitative open ended questions and questions requiring a ranking in terms of response. The responses were analysed in a qualitative and quantitative manner. People were approached for face-to face interviews or asked to undertake an on-line survey. There were 91 respondents to the on-line survey, though only 58 of these completed the survey. Each participant got a different set of questions (15-30) according to their biosecurity role. Of the 33 who did not complete the survey, 19 completed at least half of the designated questions. Ten face-to-face interviews were conducted. Discussions were held with certain of those who did not complete the survey. Meeting of forest biosecurity stakeholders: strategic actions required to improve forest biosecurity.

3) A two day meeting held in September 2010 at the Australian Centre of Excellence for Risk Analysis and facilitated by Dr Terry Walshe. This workshop explored ways in which forest biosecurity can be improved within the plantation sector. Participants were limited to 25 but were selected to represent a broad range of interested parties in forest biosecurity. The participants are listed in Appendix 2 and were given the position paper and survey results to examine prior to the workshop. For the purposes of the meeting a hypothetical scenario was explored, whereby $0.5M is set aside each year for five years to fund a biosecurity strategy for plantation forestry. That is, a total budget of $2.5M is available for allocation.

The task of the meeting was to identify a preferred strategy for investing this $2.5 million.

While this scenario is hypothetical, it is not unreasonable to think that stakeholders could co-ordinate and commit to this level of funding if a worthy and broadly supported strategy were to be identified. It was assumed that funding would be sourced 50% from the private sector and 50% from the public sector (i.e. Commonwealth and State government biosecurity organisations).
Planning for incursion events is difficult. Part of the difficulty stems from the competing views of managers and stakeholders. This meeting sought to directly capture alternative views concerning the key objectives of plantation forest biosecurity, alternative strategies for achieving those objectives, and ultimately recommend preferred actions that might be broadly supported by stakeholders.

In framing the problem to be addressed by the meeting the following were considered beyond the scope of deliberations:

i) Native forest-based timber production
ii) Timber in service
iii) Co-contributions from other potentially affected stakeholders (e.g. nursery industry, non-timber forest-based industries, tourism).

A 'structured' decision-making approach was adopted to promote mutual understanding of different perspectives and to progress a collective recommendation. This structured approach relies on clear articulation of objectives. The following objectives were identified:

i) Minimise impacts on profitability
ii) Maximise immunity for public conservation values
iii) Maximise immunity for public recreation and amenity
iv) Maximise social acceptability
v) Maximise biosecurity capability
vi) Minimise costs of implementation

Alternatives are candidate actions. The cost of implementing any one strategy (comprising a suite of actions) is constrained by the (hypothetical) $2.5M budget. Initially the workshop canvassed alternatives that ignored this constraint. Some details of the ensuing discussion which assisted in developing precise methodology for the workshop are recorded in Appendix 3.

It was recognised that a $2.5M budget over five years would provide limited *direct* opportunity to progress objectives outlined for the workshop. Recognising budgetary constraints, the meeting focussed on identification of actions that could enhance biosecurity capability and an assessment of their merit. Candidate actions are listed in Table 1.

The merit of any candidate action will be perceived differently by individual stakeholders. To explore differences in perspectives we asked participants to assess actions according to the *likelihood* they could be successfully implemented and the positive *consequences* that would flow from their implementation. Both likelihood and consequence were assessed on an ordinal five point scale, using the

risk matrix approach underpinning the Australian Standard for risk management (Standards Australia 2004).

The matrix is shown in Table 2. This approach is a subjective qualitative translation of formal decision theory's assessment of decision-making under uncertainty, whereby an alternative is assessed according to (Savage 1954; Hastie and Dawes 2010),

Expected utility = probability × utility.

Table 1. Candidate actions identified by participants as potential means for enhancing forest biosecurity capability.

TRAINING
1. Best Management Practice forest surveillance (in parallel with certification); use of BioSIRT (a Biosecurity Surveillance, Incident, Response and Tracing software application)
2. Contribute to development of tertiary/TAFE programs in biosecurity
AWARENESS
3. Join biosecurity community engagement networks
4. Characterise costs and benefits of co-operative approach to Biosecurity (public and private interests in plantation forestry - cost-sharing; beneficiary analysis)
REPRESENTATION & RELATIONSHIPS
5. Contribute to CRC research bids (i.e. CRC Plant National Biosecurity and CRC Forestry)
6. Research Working Group 7 – negotiate revised Terms of Reference with key stakeholders (direct line to Plant Health Committee)
o Strengthen alignment and linkages between business-specific biosecurity plans and industry-wide/government plans via a dedicated officer
o Plug into parallel government strategies that could assist in biosecurity awareness, operation and research e.g. in Climate Change, Natural Resource Management, CMAs etc via NBC
o Representation on committees responsible for diagnostics and surveillance to address Biosecurity preparedness
o Revise Plantation Timber Industry Biosecurity Management Plan (PTIBMP) ; incl. Identification of research priorities under PTIBMP; Review and update capability assessment of high risk pests
OTHER
7. Prepare a Discussion Paper on Interaction with environment sector (and other non-forest products interests) – Who pays? Beneficiaries? Use paper in committee structures and other networks
8. Incident response 'exercises' – incl. broad range of organisations
9. Scanning and biosecurity intelligence; invest in new technologies; contribute to ABIN (Australian Biosecurity Intelligence Network – a forestry community site)
10. Invest in screening programs (leverage investment of others); including those overseas where applicable
11. Encourage industry support for signing the Deed
o Sign Deed
o Develop competencies under Deed arrangements
12. Identify mechanism to fund responsibilities under the Deed

Table 2. Benefit analysis matrix. Adapted from Standards Australia (2004). Action assessments providing benefit scores ≥ 9 were interpreted as vague priorities and those with scores ≥ 15 clear priorities.

Likelihood		**Consequence**				
		None	Insignificant	Minor	Moderate	Major
		(1)	**(2)**	**(3)**	**(4)**	**(5)**
A Almost certain	**(5)**	5	10	15	20	25
B Likely	**(4)**	4	8	12	16	20
C Moderately likely	**(3)**	3	6	9	12	15
D Unlikely	**(2)**	2	4	6	8	10
E Rare	**(1)**	1	2	3	4	5

Likelihood
A (almost certain): expected to occur in most circumstances (> 80% chance of successful implementation).
B (likely): will probably occur in most circumstances (eg., 50 – 80 % chance of successful implementation).
C (moderate): may very well succeed if circumstances are favourable (eg., 25 - 50% chance of success).
D (unlikely): could succeed if circumstances assist (eg. 5 – 25% chance of success)
E (rare): unlikely to succeed (eg., < 5% chance).
Consequence
1 (None): No gain in biosecurity competency.
2 (Insignificant): Small gains but insufficient to justify funding support.
3 (Minor): Material improvement in capacity to manage biosecurity risks.
4 (Moderate): Solid gains through co-ordinated action.
5 (Major): Outstanding gains in efficiency through co-ordination.

Risk analysis is usually concerned with the downside of uncertainty so that consequences are associated with *dis*utility. Here we are concerned with the upside of investment in alternative actions aimed at enhancing capability. So the matrix of likelihood and consequence might more appropriately be considered a benefit analysis matrix rather than a risk matrix.

Subjective assessment of risks and benefits is prey to language-based ambiguity and motivational biases (Burgman 2005). To buffer against these frailties two rounds of assessment were conducted, which included extensive discussion of interpretation and preliminary results at the conclusion of the first round.

Participants made assessments in five groups (Table 3). Groups compared their results using Spearman's rank correlation coefficient to identify the extent of divergence between pairs of groups in the perceived benefits of candidate actions. Where groups tend to agree, coefficients will approach +1. Negative values indicate opposing views, and a value of zero for a rank correlation indicates random ordering of actions between two groups.

Table 3. Assessment of candidate actions was undertaken by five groups coarsely representative of different sectoral interests in forest biosecurity.

Group	Participants
Government biosecurity - policy	John Hannay Kevin Cooper Suzy Perry Nick Collettt Mike Cole
Government biosecurity – technical experts	Angus Carnegie Christine Stone Simon Lawson Glen Kile
Government commercial forestry	Andrew Lyon Charlma Phillips Tim Wardlaw
Private commercial forestry	Gavin Matthews Ian Ravenswood Marie Connett Stephen Elms Michael Ramsden
Researcher	Caroline Mohammed Chris Beadle Morag Glen Francisco Tovar

Where there was substantial divergence, groups with differing views and the members of those groups then interrogated each other to elicit the rationale for likelihood and consequence ratings. Discussion focused on language-based ambiguities in the interpretation of actions and causal understanding of their likelihoods and consequences. Based on this discussion the five groups then revisited their ratings of likelihood and consequence scoring (Round 2).

Disagreement within groups was accommodated by allowing an interval for assessment of likelihood and consequence (e.g 3 - 5) rather than a single point estimate. Results report the full range of opinions. The merit of any candidate action was categorised according to benefit scores:

- Benefit scores ≥ 15: clear priority for implementation
- Benefit scores 9 - 14: vague priority (moderate perceived merit in implementation).
- Risk scores < 9: Low priority (negligible merit).

The meeting sought to identify actions that were unanimously supported by all five groups, where support was defined as a benefit score ≥ 9 (clear or vague priority).

4) One of the main outcomes from the September 2010 workshop reviewing the findings of the FWPA-funded forest biosecurity audit was the need to articulate and quantify the costs and benefits of current forest biosecurity investment before decisions on future investment could be made in a structured way. While there is a general acknowledgement of the threat posed by pests and diseases to commercial forests, there is little information to assist individual forest owners and managers in understanding the risks to their estates and how much investment can be justified in managing those risks. Therefore before formulating recommendations to improve forest biosecurity in Australia it was deemed necessary to review the costs and benefits of biosecurity measures for forest pests and pathogens in Australia by reference to specific case studies. This review is presented as part of the discussion.

5) A final two day workshop was held with project participants, Dr Mike Cole as a steering committee member and Marie Connett, Research and Development Manager of Elders to represent plantation forest industry. This workshop drafted recommendations for the improvement of forest biosecurity.

Results

Summarising the existing framework/processes for responding to an Emergency Plant Pest (EPP) in plantation forestry

A review of forest biosecurity arrangements in Australia was undertaken 11 years ago by Gadgil (2000) to provide the framework, capacity and funding to adequately respond to incursions of exotic pests of concern to forestry. *Responding to Incursions: A Generic Incursion Management Plan for Forest Pests and Diseases* (Gadgil, 2000a), colloquially referred to as the GIMP proposed a framework that relied heavily on the then Forest Health Committee and co-operation among various agencies. Specific cooperative arrangements were also proposed and recommended in an accompanying report *A Preparatory Report on Current Arrangements for Management of Incursions of Exotic Pathogens and Invertebrate Pests Affecting Australian Commercial, Conservation and Amenity Forests and Forest Products* (Gadgil, 2000b). Under the GIMP, the Forest Health Committee was the decision-making body that determined what response, if any, was to be undertaken to any new pest or pathogen affecting forests. Since GIMP, significant changes in overall approaches to biosecurity and in forestry representation have occurred.

The points relevant to forest biosecurity and highlighted by the position paper (Appendix 4) were:

1) Plant biosecurity in Australia depends on the co-operation and coordinated functioning between State and Commonwealth government departments, and relevant industries. The Intergovernmental Agreement on Biosecurity (IGAB) is an Agreement between the Commonwealth of Australia, state and territory governments to strengthen the national biosecurity system. This agreement is aimed at strengthening the collaborative approach between the Commonwealth of Australia (the Commonwealth), state and territory governments (the Parties) to address Australia's broad range of biosecurity issues which include pest response. It is meant to clarify roles and responsibilities and avoid duplication of effort.
2) The Ministerial Committee structures relevant to biosecurity are outlined in Figures 1 to 3 of Appendix 5. This structure is in a state of flux. Currently
    a) The former Primary Industries Health Committee (PIHC) has now been absorbed into the National Biosecurity Committee (NBC) (Figure 3). The NBC reports to both PISC and the Natural Resource Management Standing Committee. The NBC includes representatives of Commonwealth and State environment departments as well as primary industry departments.
    b) The Forest Health Committee, previously reporting to the Forestry Standing Committee was dissolved in 2004. The Forestry Standing Committee was renamed the Forestry and Forest Products Committee (FFPC) and now reports to the Primary Industries Standing Committee (PISC) (Figure 1). Research Working Group (RWG) 7 (Forest Health) is a working group of the Research Priorities Coordination Committee (RPCC), a sub-committee of the FFPC.
    c) Plant Health Committee (Figure 2) is chaired by the CPPO (Chief Plant Protection Officer, Commonwealth DAFF) and contains representatives from each of the State departments of primary industry and agriculture, as well as Plant Health Australia, CSIRO and three observers, one each from the Co-

operative Research Centre for Plant National Biosecurity (CRCPNB), NZ Ministry of Agriculture and Forestry (MAF) and the Australian Plague Locust Commission. There is one forestry representative in Plant Health Committee, a member of Research Priorities Co-ordination Committee, endorsed by the Forestry and Forest Products Committee (FFPC; Figure 1). Plant Health Committee has three sub-committees (Figure 2). The Sub-committee for Plant Health Diagnostic Standards includes a representative of RPCC (RWG) 7 (Forest Health). The Domestic Quarantine and Market Access Working Group does not include a forestry representative.

3) A national co-ordinating body for plant biosecurity - Plant Health Australia (PHA) – was established in 2000. PHA's function is to:
   a) Assist plant industries in developing industry biosecurity plans;
   b) Liaise between governments and industries, particularly in respect to cost-sharing arrangements; and
   c) Foster training and capacity-building for diagnostics and incursion management.
4) PHA developed PLANTPLAN, the document which specifies roles and responsibilities for management of EPPs affecting Australian plant industries. Some of the recommendations by Gadgil in GIMP were expanded to processes for biosecurity such as PLANTPLAN, a pest response plan which is applicable to all plant industries. Under PLANTPLAN, the main agencies involved in responding to incursions are Commonwealth and State government primary industry agencies. PLANTPLAN also provides guidelines for categorisation of pests, which determines the proportion of government:industry funding for emergency responses. This can be 100% government (Category 1), 80:20 government:industry (Category 2), 50:50 (Category 3) or 20:80 (Category 4) depending on the perceived public:private benefit of eradication. PHA assisted the plantation timber industry to develop an industry biosecurity plan but this plan is currently out of date and needs revision.
5) The arrangements under PLANTPLAN apply to those plant industries that are signatories to the Emergency Plant Pest Response Deed (EPPRD). Forestry is not as well integrated with the national biosecurity framework as are agriculture and horticulture. The Australian Plantation, Products and Paper Industry Council (A3P), in association with Australian Forest Growers, have been a member of Plant Health Australia since 2004/05 but have not become a signatory to the EPPRD. This means there is high uncertainty regarding any response to a potential Emergency Plant Pest (EPP) affecting this sector, despite the development of a forestry industry biosecurity plan and several contingency plans for EPPs potentially affecting this industry. This high uncertainty of response was clear in the recent incursion of a rust of myrtaceous plant species into NSW in 2010. This is a pathogen which can act as a plantation industry pest, a native logged forest pest, a pest for another primary industry (in this case the cut flower and nursery industry) and also as an environmental pest. Forestry was not consulted as part of the Consultative Committee for an EPP during the eradication phase of the incursion response.
6) There are several factors of factors which are to be considered in the decision as to whether the plantation timber industry signs the deed;
   a) The majority of Australia's plantation resource (80-90%) is owned and/or managed by some 15-20 major "growers". The capacity of these growers in terms of forest biosecurity and their corporate reporting responsibilities differ

significantly from the much larger numbers of relatively small producers which constitute the majority of producers in the other plant industries covered by the EPPRD.

b) The plantation timber industry's crop, trees principally of the genera *Pinus* and *Eucalyptus*, are present widely in the urban, rural and natural environment and it is therefore difficult to separate the interests and responsibilities of the interested parties in plant health management with respect to trees. Cost sharing agreements are complex when trees could be negatively impacted by;
   i) pests shared with conservation forests
   ii) pests shared with timber in service
   iii) pests shared with garden and nursery industry
   iv) forest biosecurity risks created by other industries
c) Most State governments are major plantation owners and managers in their own right via their forestry government trading enterprises. They would therefore have dual roles in the management and cost sharing aspects of the EPPRD if it were to be signed by the plantation timber industry.
d) Plantation timber differs from other plant crops because its major product, structural timber, remains in use and potentially subject to pest infestation for many decades after it is harvested and sold to the end-user.
e) The EPPRD only deals with situations where it is agreed that an Emergency Plant Pest can be eradicated and it is cost effective to do so. It does not cover the containment and management of a pest if/when it is decided that it cannot be eradicated or it is not cost effective to do so.
f) It is obligatory that the signing the EPPRD be accompanied by the establishment of a levy-raising mechanism to fund any commitment which the industry may incur under the EPPRD (i.e. the industry share of the cost of eradicating an emergency plan pest). The Government Such a levy mechanism will only be supported by the government if an industry can demonstrate very strong support from its members.

Survey of opinions and information related to forest biosecurity preparedness (March – August 2010)

The survey responses are briefly summarized in this section; full details are given in Appendix 5.

The following issues were identified by survey respondents as the <u>weakest link in forest biosecurity preparedness</u> (in decreasing order by the number of respondents who raised the issue):

- Lack of integration/ engagement of forest sector with mainstream biosecurity administration and lack of clear division of responsibilities
- Lack or inadequacy of surveillance/early detection
- Decline or lack of forest health capacity/capability
- Forestry sector is not a signatory to the Emergency Plant Pest Response Deed (EPPRD)
- State and federal biosecurity sector (inc. decision-makers such as the Consultative Committee for an Emergency Plant Pest (CCEPP)) are agri-centric
- Preparedness planning and communications planning

- Increased volume of imports/exports
- Lack of biosecurity awareness/engagement in the environmental sector and lack of clear division of responsibilities
- Poor communication and education
- Lack of training in biosecurity awareness for operational staff
- Size and diversity of forest vegetation types and tenure
- Funding constraints and lack of clarity regarding funding

The following biosecurity threats to forestry were the most frequently identified by survey respondents (in decreasing order by the number of respondents who raised the issue):

- Pest incursions, unspecified
- Myrtle rust/guava rust/eucalyptus rust
- International movement of people, trade, esp. in nursery material, border controls
- Lack of surveillance capacity, capability and investment
- Apathy/lack of focus and/or support from forest industries. Evasion of responsibilities among diverse land managers
- Lack of forest health capacity and capability
- Decision makers not grasping the national significance of forest biosecurity, low priority given to forest biosecurity by agricultural-focussed agencies
- Asian Gypsy Moth or other such polyphagous insects
- Delays in implementing emergency responses

While most state forestry representatives and forest health experts have been made aware of the reporting procedures required under PLANTPLAN, in some cases this has been only after a breach of the system. Some private plantation industries have previous experience with the current biosecurity arrangements, but others remain in complete ignorance.

Perceived systemic deficiencies in capacity to respond to a forest Emergency Plant Pest (EPP) include (in order of importance);

- Forest health expertise is limited
- Disconnects between forestry sector, biosecurity agencies and environmental agencies
- Appropriate levels of funding are not available

Just over half of the respondents rated the previous management of response to a forest EPP as poor (those this was clearly influenced by the recent myrtaceous rust incursion in NSW). Attitude to management was strongly linked to profile; biosecurity agencies thought the response as being well managed while those more involved in the forest industry held a more negative opinion. Perceived deficiencies in previous responses include (in order of importance);

- Slow response and apparent inability to make tough decisions
- Lack of staff and resources

- Poor communications
- Low priority accorded to forest and/or environmental threats
- Lack of consultation with affected industries
- Failure to follow existing plans - including PLANTPLAN and contingency plans
- Failure to sign the EPPRD
- A lack of standard diagnostic tests

Workshop meeting of forest biosecurity stakeholders: strategic actions required to improve forest biosecurity

The Round 2 assessments in the perceived benefits of candidate actions for each group are shown in Appendix 6. All Pairwise Spearman's rank correlations in the ordering of candidate actions after Round 2 are reported in Table 4. C orrelations were positive, although they varied considerably in their magnitude. Discussions after Round 1 (results not shown) generally lead to substantial improvement in the level of consensus between groups.

Table 4. Pairwise correlations in the rank ordering of perceived merit of actions.

	Researchers	Private commercial	Government commercial	Technical experts	Policy makers
Researchers	-	0.84	0.64	0.68	0.46
Private commercial		-	0.65	0.88	0.33
Government commercial			-	0.45	0.55
Technical experts				-	0.31

Figure 1 shows the range of benefit scores after Round 2. Based on average mid-point scores, the three highest rated actions were

- Action 6: RWG7 – negotiate revised Terms of Reference with key stakeholders
- Action 4 : Characterise costs and benefits of co-operative approach to biosecurity
- Action 11: Encourage industry support for signing the Deed

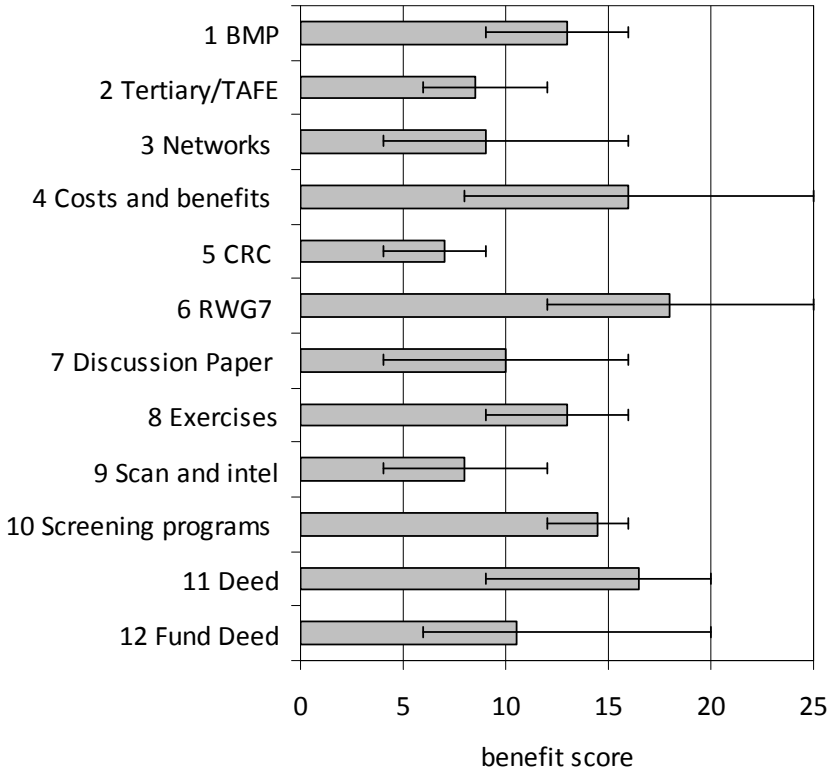

Figure 1. The range of benefit scores for the 12 candidate actions. Bars indicate the average of groups' midpoint scores. Upper bounds are the maxima of group maxima. Lower bounds are minima of minima. The numbering of actions corresponds to the listing in Table 1.

Table 5. Clear (●) and vague (○) priorities of each group.

Group	**Priority**	**Actions**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Researchers	*clear priority*				●				●		●		
	vague priority	○				○	○					○	
Private commercial	*clear priority*	●			●		●	●			●	●	
	vague priority								○				
Government commercial	*clear priority*	●		●	●		●		●		●	●	
	vague priority		○										○
Technical	*clear priority*				●		●	●				●	
	vague priority	○							○	○	○		
Policy	*clear priority*	●		●			●		●		●	●	●
	vague priority		○			○		○		○			

Mid-point scores do not account for dissenting views. In Table 5 the clear and vague priorities of each group are collated according to the lower bound of benefit score intervals. That is, lower bounds encompass the most pessimistic views of all members

of a group. Based on these results the following five actions were unanimously supported:

Action 1: Best Management Practice forest surveillance
Action 6: RWG7 – negotiate revised Terms of Reference with key stakeholders
Action 8: Incident response 'exercises'
Action 10: Invest in screening programs
Action 11: Encourage industry support for signing the Deed

We also note that Action 4 (characterise costs and benefits of co-operative approach to biosecurity) had very broad support, being a clear priority of four of the five groups. For the remaining group (Policy) the lower bound of the benefit score was 8, only marginally below the cut-off for 'vague' priority. The upper bound for the Policy group was 12 (see Appendix 6).

In summary the workshop achieved broad consensus in candidate actions for the improvement of biosecurity through the structured decision making approach. This is a considerable achievement considering the disparate forestry interests present.

Discussion

The full continuum of biosecurity activities spans pre-border activities that reduce the risk of incursion by exotic pests and pathogens not present in Australia through to pests and pathogens, both native and exotic that are established and widespread in Australia (Figure 2). Primary responsibility for the management of biosecurity risks pre- and at-border resides with the Commonwealth government, while responsibility for established pests and pathogens (both localised or widespread) is transferred to the states and private sector. Eradication, while the responsibility of the Commonwealth government is managed collaboratively with both jurisdictional and affected industry sectors. This review has focussed on preparedness for exotic pests (blue in Figure 2) but recommendations to improve forest biosecurity will be relevant to the full continuum of biosecurity activities.

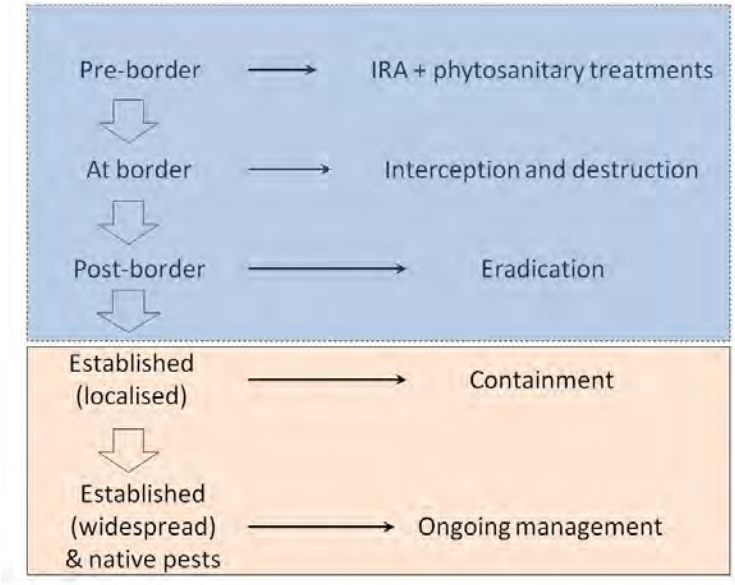

Figure 2. Schematic of the biosecurity continuum and associate management intervention. Those components of the continuum in the light blue box reflect pests and pathogens that have yet to establish where costs are shared between government (public) and commercial sectors, while components in the pink box are exotic pests and pathogens that have established or native pests where costs for management are largely borne by land owners (both public and private).

Plantation forestry does have problems unique to its sector. Trees are planted and exposed to risk for many years before harvest and remuneration. Trees could be negatively impacted by pests shared with conservation forests, pests shared with timber in service, pests shared with garden and nursery industry, forest biosecurity risks created by other industries or urban trees. In particular, the close proximity of production forests to conservation forests in Australia leaves both plantation and native production forests vulnerable to pest incursions that may commence in native non-production forests. Conservation forest managers may consider that a response to

an incursion of an EPP is not warranted or it may even be illegal, e.g. in World Heritage Areas.

Representation of the plantation forestry industry in national biosecurity arrangements

Forest health, previously represented by its own committee in the governance structures, has been relegated to a single representative on a committee at a similar level (PHC). The forestry industry is represented in PHA via the membership of a single industry organisation, A3P which is an associate member of PHA but has not signed the EPPRD.

Serious consideration should be given to the adequacy of forestry representation in national biosecurity arrangements across the urban, rural and natural environments. The administration of production forests, and especially plantations, is increasingly separated from management of conservation forests, and both sectors have been accustomed to operate independently of the state agencies now responsible for overall plant biosecurity. The establishment and maintenance of the appropriate linkages to ensure that forest biosecurity is adequately represented in the NBC and treated with an appropriate level of consideration in the Environmental Biosecurity Committee (EBC) should be important. Such linkages should theoretically be facilitated by the National Environmental Biosecurity Response Agreement but the fate of this body is uncertain.

It was stated by representatives from national and state biosecurity agencies that forest industry members' views are given a high degree of consideration, despite being outnumbered by government representatives on relevant biosecurity committees. However specific strategies must be put into place to enhance an effective integration of forestry with state and national one biosecurity arrangements while recognising that forest biosecurity is unique and often requires special consideration. At the same time, specialist forest health expertise, particularly in state forestry departments, has declined. This means that while greater communication and increased interaction between the forest industry and biosecurity agencies is required at the same time as the capacity to do this is decreasing. The survey clealry illustrated the ad-hoc nature of biosecurity understanding, knowledge, processes established and communication pathways especially to national biosecurity systems.

Awareness of forest biosecurity issues by the plantation forest industry

Although several of the representatives from national and state biosecurity agencies had not actually read the Plantation Timber Industry Biosecurity Plan, forestry pests were recognised as important in the States where the host trees are of commercial significance. The majority of the pathogens and insects listed as biosecurity concerns by respondents to the survey are described in the Plantation Timber Industry Biosecurity Plan. However this plan, as shown by the position paper, is very much out of date. State diagnostic laboratories generally rely on specialist forest health expertise outside of their own agencies, however as previously mentioned the

majority of respondents considered that forest health capacity has significantly reduced in recent years.

Many state and private forestry companies have a forest health officer or someone charged with investigating reports of damage to forest and/plantations, though only about half of the companies surveyed have a biosecurity plan. Most state and private forestry companies conduct regular surveillance though, in many cases, this is a component or by-product of other operations. A large number of companies do not provide biosecurity training or awareness material to operational staff. Reports of damage are usually investigated and if a pest is causing severe damage, it will, in most cases, be referred to some-one with contacts in the biosecurity system but this process may not be rapid. Understanding of biosecurity risks has usually developed over years or decades, in an ad hoc fashion rather than by any specific training. Most industry respondents consider biosecurity to be of high or moderate concern to their companies.

Towards the improvement of forest biosecurity

From answers to the survey it is clear that many of the recommendations made after the previous review of forest biosecurity (Gadgil 2000) are not working for forestry. The responsibility for implementing such recommendations was not then and still is not clear. As an example one of the GIMP recommendations was the implementation of port and hazard site surveillance. The responses to questions about port and hazard site surveillance indicate a lack of co-ordination among the different agencies, with each assuming that some-one else is doing it.

However there is a possible way forward. In the final 20 minutes of the biosecurity workshop, the following points were raised:

- The meeting noted that implementation of the unanimously supported priorities (Table 5) identified at the workshop would amount to a substantial success story for the diverse interests and stakeholders involved in forest biosecurity. Such a success story could mobilise further support.
- A revamped RWG7 which is empowered to carry out effective communication and establish linkages between the industry and national biosecurity systems and networks. A formation of such a body would enable the details of implementation to be identified, especially ‘who’ and ‘how’. Some of the priorities identified can piggy-back on existing investments.

In summary, the move towards ‘one biosecurity’ and inclusion of forest biosecurity under the PHA/PLANTPLAN system may have encouraged some components of the plantation timber industry to view non-participation as an acceptable risk i.e. within a generic framework concerns of the industry will be accommodated without the need for financial investment from the industry. The forest sector is only a (minor) part of the greater plant biosecurity system that is under development within Australia and cannot take for granted that its interests will be well considered in the decision making process. Notwithstanding the primary responsibilities of governments for those components of the biosecurity continuum targeting exotic pests and pathogens not yet established, industry sectors must be engaged at these higher levels of the biosecurity continuum, principally through effective membership of Plant Health

Australia (PHA). Industry engagement at these higher levels of the biosecurity continuum should be delivered through industry biosecurity plans that are enabled through Emergency Plant Pest Response Deeds.

Engaging the forest industry in biosecurity

There is an urgent need to demonstrate the benefits of industry investment in biosecurity or the potential costs of non-participation in order to engage industry and, alongside genetic screening for resistance, is one of the principal areas of future research in forest biosecurity and health. Forest biosecurity risks are manifold: exotic pests and pathogens not yet established in Australia; pests and pathogens (both native and exotic) established in Australia but occupying only a portion of their range (of suitable sites); and, established pests and pathogens that are widespread throughout their range of suitable sites. Calculating the full costs and benefits of biosecurity for many forest pests and pathogens is complex because of the multiple values impacted by many forest pests and pathogens. However, for the purpose of investment by the forest industry sector it is only necessary to consider the costs and benefits associated with impacts on commercial values. For commercial forest owners the aim is relatively straightforward: to minimise the input costs so that the wood produced at harvest yields an acceptable profit. Not only should each input decision provide a net financial benefit but the accumulated inputs through the rotation should cost less than the harvest value of the trees.

Costs and benefits from forest biosecurity occur throughout the biosecurity continuum shown in Figure 2. Table 6 lists the range of costs and benefits across this continuum. For pests and pathogens not yet established in Australia benefits accrue both from the value of crop losses averted (i.e. losses that would have occurred if a particular pest or pathogen was present) and the value of markets that are accessible because of the absence of particular pests or pathogens. The latter benefit only occurs if the presence of particular pests or pathogens in other countries restricts their access to markets in which we compete. There are few examples in the forestry sector where the value of market access has been attempted (one example is Turner et al. 2004a) and the relevance of this benefit to the sector remains largely hypothetical.

The value of losses averted for forest pests and pathogens not yet established in Australia has only been calculated for pine pitch canker, *Fusarium circinatum*, (Cook and Matheson 2008). In their analysis Cook and Matheson predicted benefits of $13M could accrue over time from delaying the entry and spread of the pathogen by as little as two years. Beare et al. (2005), using data from Gadgil et al. (2003), calculated that an annual investment of up to $260K in border controls would be justified if it reduced the risk of pitch canker incursions from 40% to 30%.

Whilst pine pitch canker is a significant threat to Australia's plantation pine estate it is but one of many offshore pest and pathogen threats. A biosecurity system that manages threats via their pathways will provide accumulated benefit through the averted losses from a multitude of threats. There has been no analysis of such aggregated benefits in an Australian context. Turner et al. (2004b) have attempted such an analysis for New Zealand. Using historical data of border interceptions, pest establishment rates, eradication costs and post-establishment impacts they calculated

the benefit:cost ratio of 147:1 from an annual investment of $NZ3.5M in forest biosecurity research. However, that analysis included amenity as well as commercial values and the results were found to be very sensitive to the estimated value of the urban forests. In a more recent analysis, Brockerhoff et al. (2010) calculated more modest benefit:cost ratios of between 2:1 and 8:1, although that analysis only considered the benefit of investment in eradication of new incursions.

A feature of the New Zealand analysis of the benefits from investment in biosecurity against exotic pests is the availability of relevant empirical data such as interception frequency versus establishment rates for exotic pests (Brockerhoff et al. 2006). In addition they have quantified some of the improvements that can be achieved from investment in research such as detection efficiency (Bulman et al. 1999), which is a critical factor affecting the cost of eradication campaigns (Brockerhoff et al. 2010). Comparable data are not available in Australia although the some components, e.g. efficient hazard site surveys, are similarly relevant in the Australian context.

Costs	**Benefits**
Exotic pests / pathogens not established	
• Maintain intelligence networks (emerging threats, changed threat status)	• Value of losses averted • Value of market access
• Maintain planning structures and processes (Pest Risk Analysis, industry biosecurity planning, contingency planning)	• Value of losses averted • Value of market access
• Quarantine operations	• Value of losses averted • Value of market access
• Surveillance	• Value of losses averted • Value of market access • Reduced costs of eradication from early detection
• Diagnosis	• Value of losses averted • Value of market access • Reduced costs of eradication from early and accurate diagnosis
• Eradication	• Value of losses averted • Value of market access
Established pests and pathogens	
• Surveillance and diagnostics	• Value of losses averted • Value of market access
• Containment to restrict spread	• Value of losses averted • Value of market access
• Direct crop losses (reduced quantity / quality of wood) due to pest / pathogen	
• Market-access restrictions	
• Research to develop or refine ways of managing pest / pathogen	
• Managing pest / pathogen	• Value of losses averted through management

Table 6. Summary of the main costs and corresponding benefits associated with specific biosecurity activities

Most routine investment in biosecurity by the commercial forestry sector is to manage the risks of exotic pests and pathogens that have become established as well as native pests and pathogens. While the number of established and native pests and pathogens which could impact on commercial values is large, only a small subset has sufficiently severe recurrent impacts as to require routine management (Wardlaw 2008). The first decision forest owners need to make is whether the impacts of a pest / pathogen are sufficiently severe to warrant management to reduce those impacts.

Madden (1975) provided an early example of impact assessment in Australia when he monitored mortality through a *Sirex noctilio* outbreak in a *P. radiata* plantation. In the most severely affected sections, mortality reached 80% with an annual mortality rate of 20% at the height of the outbreak. In this case the considerable investment in research to develop the means of managing *Sirex* was not based on a formal cost:benefit analysis. That was probably a reflection of an era when plantations were predominantly government-owned and research had a high public-good component. Notwithstanding, the dramatic impact of an unmanaged *Sirex* outbreak posed a significant threat to the viability of Australia's developing softwood plantation estate. Research provided an effective management strategy for *Sirex* using a combination of silviculture and biological control. No calculations have been made to determine what benefits have accrued from the averted losses that *Sirex* management has provided during the past 30-40 years. However, lapses in management, as occurred in the Green Triangle during the late 1980's, provide some insight into the quantum of losses that could have occurred in the absence of management. In that case, surveys in 1986 found mortality from *Sirex* to have rapidly built up in a large number of plantations (Haugen 1990) but control did not commence until the following year by which stage 1.8 million trees had been killed. Despite spending in excess of $1.3M to contain the 1987 Green Triangle Sirex outbreak (Haugen and Underdown 1990), eventual losses from the death of around five million trees between 1987-89 was estimated to have been $10-12M (Cole 2003).

The introduction into Australia in the mid to late 1990's of the Monterey pine aphid, *Essigella californica*, resulted in widespread defoliation in affected *P. radiata* plantations throughout southeastern Australia. May and Carlyle (2003) calculated a loss in wood volume due to defoliation over the three years following the first appearance of *Essigella* in the Green Triangle to be 230,000m^3 valued at $6.9M. Using national data, May (2004) calculated the total annual losses from defoliation by *Essigella* to be 570,000m^3 valued at $21M. Based on those data May (2004) showed investment in research and development for a biological control would, if successful, provide a net present value benefit of $15M (@7.5% IRR) over 30 years. In 2010, after several years of research to select and screen a candidate biological control agent the parasitic wasp *Diaeretus essigellae* (Kimber et al. 2010) was approved for release in Australia to control *E. californica*. At about the same time HVP Plantations announced the operational deployment of aphid-resistant lines of *P. radiata* (Sasse et al. 2009).

Occasionally, but fortunately rarely, pests and pathogens emerge so quickly that catastrophic damage occurs before any management intervention (if available) can be done. This was the case in 2010 when Elders made the decision to write-off their 23,000 ha central Queensland eucalypt plantation assets (valued $133M less land value) because of Kirramyces leaf disease (http://www.abc.net.au/rural/qld/content/2010/05/s2888913.htm accessed 26th December 2010). The pathogen, *K. viscidus*, a suspected native species that had migrated from hosts in native forests, was first detected only 4-5 years previously (Andjik et al. 2007).

At the lowest (operational) level (*sensu* Wardlaw 2008), management of individual outbreaks / epidemics based on action responses triggered by threshold levels of economic injury have been developed for two forest pests and pathogens in the Australasian region – Dothistroma needle blight (van der Pas et al 1984) and the Tasmanian eucalypt leaf beetle, *Paropsisterna bimaculata* (Candy 1999). A review of the operational implementation of the integrated pest management program (IPM) for the Tasmanian eucalypt leaf beetle (Wardlaw et al. 2010) calculated that substantial net financial benefits accrue annually. Wardlaw (2003) proposed a management strategy for minimising losses to future sawlogs from thinned native forests due to wood decay based on predicted economic injury levels. However, the effectiveness of that strategy remains to be demonstrated operationally (Wardlaw, unpublished data). At the strategic / tactical levels (*sensu* Wardlaw 2008), Kube and Wardlaw (2002a) developed a strategy for management to reduce the impact of spring needle cast (SNC) of *Pinus radiata* using silviculture and breeding for resistance. That strategy predicted a significant improvement in the financial outcomes, compared with the status quo, for *P. radiata* growing on moderate and high SNC-risk sites (Kube and Wardlaw 2002a). As the screening to select *P. radiata* families showing resistance to SNC had already been completed (Kube and Wardlaw 2002b), the strategy was adopted.

The above documented case studies of our current understanding of the costs and benefits of biosecurity across the full spectrum of threats: from offshore threats not yet present in Australia to pests and pathogens that are established (or native), widespread, and subject to ongoing management. Each case study provides an example of methods that calculate the costs and / or benefits of individual components outlined in Table 1. Such an exercise provides a degree of confidence that most decisions for investment in forest biosecurity have been made on the basis of providing net benefit. However, the picture is far from complete.

The ongoing management of established pests and pathogens is the most tangible evidence for forest owners of the benefits (if any) of their direct investment in biosecurity. However, an overall measure of the net benefits (if any) from the investment in management of key established pests and pathogens (cost of management versus value of losses averted) is largely lacking. Wardlaw et al. (2010) provide one of the rare examples of where such an exercise has been attempted. A high priority should be given to calculating the net benefit from management of other keys established pests and pathogens. Importantly such examples should aim to include strategic / tactical approaches to management such as the deployment of resistant genotypes (e.g. spring needle cast in Tasmania, *Essigella* in Victoria).

Another aspect in the management of established pests and pathogens is how we identify and rank which pests and pathogens pose the greatest threat to commercial values. This requires an integration of risk (likelihood of an asset being affected) and consequence (quantum of losses the asset suffers). Such a framework of understanding underpins not just which established pests / pathogens we should be managing but also in objectively quantifying the magnitude of threats not yet established. Pinkard et al. (2010) used historical records of *Mycosphaerella* leaf disease (MLD) epidemics to develop a spatio-temporal bioclimatic niche model to map the predicted risk of MLD epidemics. When combined with empirical data on growth impacts this approach provides an objective measure of the threat to commercial values (e.g. Wardlaw 2010). Such an approach would help calibrate qualitative risk assessments that are currently used to rate the risk of offshore threats.

The above discussion about the current state of understanding of costs and benefits of biosecurity investment has also highlighted the paucity of data on the component costs of biosecurity activities currently to prevent the incursion of offshore threats. The approach used by Turner et al. (2004b) provides an example of a modular approach to quantifying the benefits provided by discrete components of biosecurity investment. Importantly that study provided estimates of the quantum gains that can be achieved by investment to strengthen particular biosecurity activities, e.g. hazard site surveillance. Such an exercise would assist in determining where the greatest benefits from investment to strengthen biosecurity may be made and would be a certain way to engage the forest industry in biosecurity.

Conclusions and Recommendations

To conclude it is necessary to briefly recapitulate the context for these recommendations. This context was consistently highlighted by all activities undertaken by the audit.

There is a complexity of ownership that is different in forestry in comparison to agricultural industries. Consensus is therefore required across disparate groups of stakeholders and biosecurity threats can be shared across commercial, natural and urban environments, growers and processors. The knowledge, awareness and processes around forest biosecurity evolved in State forestry organisations. The industry has now come under much more private ownership and at the moment there is an extremely variable engagement of the Australian plantation forest industry in biosecurity. This lack of engagement may have been worsened by the perceived inadequate response to the 2010 incursion of myrtaceous rust into NSW and which influenced many of the industry responses to the survey. In the end the rust has spread widely and it will be up those impacted by this rust to pay for its management (indeed whether this is those involved with conservation or commercial forestry).

There are evident and understandable blocks to plantation forestry industry signing the EPPRD. The technical-policy biosecurity interface has shifted in Australia and there must be integration of past structures for forestry into the new biosecurity framework whatever the mechanism. The system is changing so rapidly that it is hard to know how to link into this framework. The emerging Research, Development and Extension Strategy for the Forest and Wood Products Sector may offer a completely different platform for RD and E arrangements and linkages. Operational preparedness is currently hampered by the lack of integration of technical expertise as well as reluctance by private companies to invest in biosecurity. There does not appear to be an appropriate model for integration of forestry into the national biosecurity system. However RWG7 with revised terms of reference and a wider membership could be a potential body responsible for integrating forestry into national biosecurity processes.

Recommendations for required improvements in biosecurity preparedness for the forest plantation sector are given below. These recommendations are presented against variables traditionally listed for biosecurity preparedness, the current state of preparedness is described and recommendations made for improvement. In most cases the recommendations have relevance across the whole biosecurity continuum as well as preparedness and across different forestry sectors, not just the commercial sector.

Recommendation 1
Biosecurity variable: Planning e.g. Industry Biosecurity Plan (IBP), pest specific contingency plans, and pathway analyses.
***State of preparedness*:** The development of existing plans has been ad hoc, not co-ordinated except for IBP which is currently out of date and not particularly well adopted by industry. All documents need updating, on-going review and greater promotion and availability to industry e.g. the eucalypt (myrtle rust) contingency plan could not be located on-line by most when required.
Improvements required: The IBP should include an examination of the risk associated with functional groups of pests, risk pathways as well as describing

specific pests. The IBP should be a repository of recommendations for base-line levels of biosecurity activities and also recommendations to guide research activities. A review of IBP should be included in the terms of reference for a revamped RWG7 (or another mechanism found to update the IBP). This is an activity that could be immediately funded by FWPA. The IBP should be kept up to date and a new, more interactive and available format set up with links to national biosecurity platforms such as PaDIL.

Recommendation 2
Biosecurity variable: Pest risk analyses (PRAs)
State of preparedness: Several PRAs have been done but these do not include cost benefit analyses (CBAs) in a format that will engage industry.
Improvements required: CBAs to engage industry and demonstrate benefits of biosecurity must be carried out (as they have been in New Zealand). An agency such as FWPA could be responsible for commissioning such CBAs and the research required to inform these CBAs.

Recommendation 3
Biosecurity variable: Surveillance
State of preparedness: Plantation health surveillance carried out by the plantation industry has a recognised weak capacity for early warning and detection of cryptic symptoms associated with biosecurity threats. The early detection of such threats is most likely to happen during the routine surveillance of high risk sites such as port environs. Hazard site surveillance is poorly funded and carried out by only 3 states. Only Gypsy Moth surveillance is carried out in all states.
Improvements required: This activity requires more than seed money. Support should be extended to all states. Blitz sentinel surveys for un-targeted pests are needed similar to surveys carried out in New Zealand. Industry-funded surveillance is required to complement government funded surveillance. Most importantly there should be an integration of forest health surveillance with emerging national biosecurity frameworks – BioSIRT, ABIN etc. An agency such as FWPA could fund activities associated with the identification of over-the-horizon threats to tie in and support improved surveillance activities.

Recommendation 4
Biosecurity variable: Diagnostics
State of preparedness: Multi-sectoral diagnostic facilities are being developed which must be utilised by forestry.
Improvements required: However it is important to maintain forestry triage capacity (i.e. the capacity to instigate alarm bells", to link into remote diagnostics). Many large companies have person(s) with forest health responsibilities but this is unlikely to happen for private forest growers. An active RWG7 could be one forum for maintaining access to forest triage capacity but specific expertise must be maintained as that within the current RWG7 is dwindling. FWPA could be responsible for forest biosecurity scholarships train young entrants into forest health and to ensure that this training is embedded within the national plant biosecurity systems. Alternatively this educational activity could be fostered within a new CRC Forestry bid.

Recommendation 5
Biosecurity variable: Organisational arrangements (i.e. the integration of forest biosecurity organisational arrangements with national arrangements).
State of preparedness: Such arrangements within the plantation forestry industry are in a state of flux, there appears a lack of consensus to the way forward. Industry is unwilling to sign to an open-ended commitment; timber in service poses issues for growers. A greater integration of forest industry bodies (NAAFI, AFG, and A3P) in biosecurity is required – there is no single voice for the industry.
Improvements required: The plantation forest sector needs either to sign DEED or negotiate alternative arrangements to allow full participation in national biosecurity platforms.

Recommendation 6
Biosecurity variable: Communication
State of preparedness: If RWG7 is going to be revised in nature and used as a body for communication it should be recognised that it is not (formally) well linked to other industry forest health organisations such as the Integrated Pest Management group based in WA and Sub-Tropical Forest Health Alliance based in Queensland. RWG7 is also not particularly well linked to industry bodies such as A3P although an industry rep from A3P sits on RWG7.
Improvements required
A national Forestry Biosecurity Officer or Facilitator is required to strengthen communications. This person would sit on RWG7 and promote forest health with biosecurity as a sub-component, extract maximum value from existing communication processes – e.g. forest health status reports (which need to be integrated into National Plant Health Status Reports). An agency such as FWPA could support the running of a revamped RWG7, provide funding for packaging status reports and ensure that national biosecurity arrangements including the IBP are rewritten for easy understanding by and communication to forestry stakeholders.

Recommendation 7
Biosecurity variable: Media
State of preparedness: Media release/response mechanisms for incursion response are good.
Improvements required: The use of media is only active and works during an incursion response. A more co-ordinated approach to distribution of material on over-the-horizon threats is needed and a funding source and mechanism to distribute this material is required.

Recommendation 8
Biosecurity variable: Trade response plan
State of preparedness: There are quarantine response/ restrictions at national/state/intrastate levels.
Improvements required: Effectiveness may vary among states but this is not an issue to be dealt with by this audit.

Recommendation 9
Biosecurity variable: Funding arrangements

State of preparedness: Funding arrangements for biosecurity are in place, theoretically but access to technical expertise depends heavily on in-kind participation. There is a reluctance of industry, including state-owned plantation companies, to contribute to biosecurity. There are internal organisational disconnects because of budget silos. The DEED is not signed therefore priority given to biosecurity is too low to overcome effort needed for negotiate cost sharing. Pest categorisation cannot be formalised until the DEED is signed. The current in-kind contributions of forest industry are grossly under-valued.
Improvements required: There should financial contributions from risk creators (such as the NZ model – including container levies). A model should be set up that forces a solution, e.g. FWPA levies both importers of timber products and growers. FWPA should investigate the possibility of voluntary contributions. FWPA could take appropriate actions (i.e. collate and distribute information re benefits of signing the DEED) to understand priorities that will lead to signing of DEED.

Recommendation 10
Biosecurity variable: Training
State of preparedness: Commercial forestry sector is underprepared for responding to forest incursions. Situational preparedness varies with company and there are inconsistent levels of enthusiasm for biosecurity among companies. PHA/biosecurity staff are strongly focussed on agricultural systems, not exposed to forestry. There is a distinct lack of opportunities for industry to participate in training exercises.
Improvements required: Access mainstream biosecurity training through stronger links with PHA such as could be achieved by the industry signing the DEED. As mentioned in Recommendation 6 there is an urgent need to appoint a National Forest Biosecurity Facilitator who could be embedded in a new RWG7 model. One of the priorities identified in the workshop was the need to participate in incident response workshop run by national biosecurity trainers. This is an activity that could be sponsored by FWPA in collaboration with DAFF.

Recommendation 11
Biosecurity variable: Biosecurity legislation
State of preparedness: Forestry industry is perceived as not being well serviced by certain legislation.
Improvements required: This is probably a false perception. Existing arrangements must be rewritten for easy understanding by forestry stakeholders as most do not have an understanding of current legislation and how this impacts upon forest biosecurity.

Recommendation 12
Biosecurity variable – Research, Development and Extension
State of preparedness: Research, Development and Extension as indicated by most of the recommendations listed above is ad-hoc and generally un-coordinated, carried out at different spectrums of the biosecurity continuum e.g. an ACIAR project to define protection systems by forest health experts; incursion scenario modelling by CSIRO modellers; generic biosecurity modelling by ACERA.
Improvements required:
The priority research detailed by workshops and surveys is to

- ✓ develop secure systems for responding to pest-specific incursions;

- ✓ support cost benefit analyses and engage industry in forest biosecurity; investigate the effects of changed environmental conditions;
- ✓ formulate industry relevant pest-risk assessments;
- ✓ carry out pathway analysis for functional pest guilds

RD and E might be better co-ordinated at a national level by embedding a revamped RWG7 within a new CRC structure. This would give a period of several years to develop national cohesion and communication in RD and E. Integration within a CRC would also permit the development and extension of research and provide the education training necessary for succession in forest biosecurity and health expertise.

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Researcher's Disclaimer

Many of the views expressed in this report are not necessarily those of the authors. The authors have reported these views and their recommendations for improving forest biosecurity in the plantation sector have been strongly influenced by these views.

Appendix 1: Survey questions and biosecurity issues addressed

APPD = Australian Plant Pest Database
EBC = Environmental Biosecurity Committee
EPP = Emergency Plant Pest
EPPRD = Emergency Plant Pest Response Deed
GIMP = Generic Incursion Management Plant
NBC = National Biosecurity Committee
PHC = Plant Health Committee
QAP = Quarantine Approved Premises

Category /Aim	**Questions**	**Biosecurity issue addressed**
1	What is your role in biosecurity?	Profile
2	How much does forest biosecurity impinge on this role?	Profile
4	What, in your view, is the weakest link in forest biosecurity preparedness? What, in your view, is the best method to redress this?	Level of understanding of structure and administration of biosecurity and how forest biosecurity is dealt with in those arrangements
3	What, in your view, is the greatest threat to forest biosecurity? What, in your view, is the best method to mitigate this threat?	Level of understanding of structure and administration of biosecurity and how forest biosecurity is dealt with in those arrangements
5	Where and at what organisational level do you consider there are deficiencies in capacity to respond to an EPP in the plantation forest sector?	Level of understanding of structure and administration of biosecurity and how forest biosecurity is dealt with in those arrangements
6	Given that government representatives outnumber industry representatives in a CCEPP, how significant are the views of industry representatives in reaching a response decision?	Level of understanding of structure and administration of biosecurity and how forest biosecurity is dealt with in those arrangements
7	Has forest health capacity reduced/increased/not changed in the last 10 years? What, in your opinion, has driven this change, if any?	Knowledge of, and access to, appropriate expertise
8	Does the current (or proposed) state legislation adequately cover interstate forestry related incursions? Are forestry and forest products, including timber, specifically addressed in the legislation ?	Detailed knowledge of State quarantine legislation
9	What were the last 3 forest/plantation samples that were referred to your organisation for diagnosis - host, suspected pest, location, date? What was the outcome? How many were EPPs?	Operation of PLANTPLAN
10	What were the last 3 forest/plantation samples that your organisation sent to a state agency for diagnosis - host, suspected pest, location, date? What was the outcome? How many were EPPs?	Operation of PLANTPLAN

11	For the last suspected forest EPP, how well did the EPP response system work?	Operation of PLANTPLAN Response to GIMP recommendation 10
12	What were the apparent gaps in response to a suspected EPP? (Forestry EPP if possible or horticultural if there has been no suspected forestry EPP). Have these gaps since been addressed?	Operation of PLANTPLAN Response to GIMP recommendation 10
13	If incursions of the following pairs of EPPs occurred at the same time, which would receive higher priority from your organisation? 1. Philippine fruit fly (*Bactrocera philippinensis*) and Asian Gypsy Moth (*Lymantria dispar*). 2. Pine Wood Nematode (*Bursaphelenchus* spp) and Potato Cyst Nematode (*Globodera rostochiensis*). 3. Mango Malformation (*Fusarium mangiferae*) and Pine Pitch Canker (*Fusarium circinatum*). 4. *Phytopthora ramorum* and *Phytophthora fragariae* var. fragariae. 5. Karnal Bunt (*Tilletia indica*) and guava rust/eucalyptus rust (*Puccinia psidi*i). 6. Pine Pitch Canker (*Fusarium circinatum*) and guava rust/eucalyptus rust (*Puccinia psidii*). 7. Black rot (*Guignardia bidwellii*) and Sudden Oak Death (*Phytophthora ramorum*). 8. Texas Root Rot (*Phymatotrichum omnivorum*) and AsIan Gypsy Moth (*Lymantria dispar*). 9. Asparagus rust (*Puccinia asparagi*) and guava rust/eucalyptus rust (*Puccinia psidii*). 10. Black Sigatoka (*Mycosphaerella fijiensis*) and Pine pitch Canker (*Fusarium circinatum*). Would answers to these questions alter if the forestry industry was a signatory to the EPPRD?	1. Forestry-sector involvement in Consultative Committee on Emergency Plant Pests 2. Effectiveness of PHA in representing sectoral interests 3. Consequence of industry signing EPPRD
14	Does the State maintain a source of funds for investigation into potential forest EPPs? Is this funding accessible by local forest health experts?	Adoption of GIMP recommendation 8g
14C	Should each State maintain a source of funds, which is accessible by local forest health experts, for investigation into potential forest EPPs?	Adoption of GIMP recommendation 8g
15	What specialist advice in forest pathology and forest entomology is available to quarantine inspectors?	Adoption of GIMP recommendation 2
16	Does your agency have adequate access to regional and national collections of forest pests and pathogens?	Adoption of GIMP recommendation 8e
17	Do you have access to and are forest pests adequately represented in APPD?	Adoption of GIMP recommendation 8e
18	Within your jurisdiction, how are biosecurity matters pertaining to specific sectors captured for consideration by committee (State Biosecurity committees, PHC, EBC, NBC)?	Specific knowledge of the jurisdictional structures and functions for biosecurity
19	Across sectors, are sector-specific biosecurity matters generally raised by technical experts or umbrella organisations for that sector?	Specific knowledge of the jurisdictional structures and functions for biosecurity

20	Within your jurisdiction, is there a group formally established to consider forest biosecurity issues (e.g. Forest Health Advisory Group)? If not what are the impediments (if any) for such a group to be established?	Adoption of GIMP recommendation 12
21	If there is an active FHAC in your state, who are its members and how often does it meet? What activities is it involved in?	Adoption of GIMP recommendation 12
22	Within your jurisdiction, does forest health expertise reside within the agency responsible for managing biosecurity? If not are there formal links between the agency administering biosecurity and the agency (ies) with forest health expertise?	Adoption of GIMP
23	What is the notification procedure for dealing with an unknown/undescribed specimen that the local forest health expert believes might be an endemic species before a formal determination is completed? Is there reliable communication system in place between the state CPPO and forest health experts?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
24	If forestry biosecurity is managed as a subcomponent of a larger primary industry biosecurity program, are the local forest health experts familiar with the elements of the larger system e.g. have access to databases and knowledge of the key policy and operational personnel and their responsibilities etc. ?	Adoption of GIMP recommendation 8e
25	If a forestry pest new to the state and possibly to Australia is suspected, who is the first contact?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans
26	Who would be the first contact for identification of a suspected bacterial pathogen affecting plantation trees?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans
27	Who would be the first contact for identification of a suspected viral pathogen affecting plantation trees?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans
28	Who would be the first contact for identification of a suspected phytoplasma affecting plantation trees?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans
29	Who would be the first contact for identification of causal agent for a new disease affecting plantation trees?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans
30	Who would be the first contact for a new disease of unknown cause affecting plantation trees?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans
31	Who would be the first contact for identification of a suspected fungal pathogen affecting plantation trees?	Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific

		contingency plans
32	Does your department have a liaison officer to investigate reports of damage to forests? Does your department have a forest biosecurity plan?	Integration of biosecurity into business risk management
33	Who, in your state, is responsible for investigating possible pest incursions in urban forests?	Familiarity with jurisdictional arrangements for biosecurity
34	Have you read the plantation timber IBP? Are you aware of any deficiencies in this document or new potential EPPs that it does not list?	Familiarity with Plantation Timber Industry Biosecurity Plan. Knowledge of key EPP's, including recently emerging pests
35	What are the top 5 diseases of biosecurity concern to the plantation forestry industry within your jurisdiction?	Knowledge of key EPP's, including recently emerging pests
36	What are the top 5 insect pests of biosecurity concern to the plantation forestry industry within your jurisdiction?	Knowledge of key EPP's, including recently emerging pests
37	What are the top 5 diseases of biosecurity concern to conservation forests within your jurisdiction?	Knowledge of key EPP's, including recently emerging pests
38	What are the top 5 insect pests of biosecurity concern to conservation forests within your jurisdiction?	Knowledge of key EPP's, including recently emerging pests
39	What method would you use to confirm diagnosis of suspected Pine Pitch Canker (*Fusarium circinatum*)? How long would this take for initial confirmation? For delimiting surveys etc, how many diagnostic samples could be handled in a week?	Detailed specialist knowledge of key EPP's, including recently emerging pests Familiarity with contingency plan. Understanding of diagnostic procedure in relation to capacity
40	What method would you use to confirm diagnosis of a suspected Daño Foliar del Pino (*Phytophthora pinifolia*)? How long would this take for initial confirmation? For delimiting surveys etc, how many diagnostic samples could be handled in a week?	Detailed specialist knowledge of key EPP's, including recently emerging pests Understanding of diagnostic procedure in relation to capacity
41	What method would you use to confirm diagnosis of suspected guava rust (*Puccinia psidii)*? How long would this take for initial confirmation? For delimiting surveys etc, how many diagnostic samples could be handled in a week?	Detailed specialist knowledge of key EPP's, including recently emerging pests Familiarity with contingency plan. Understanding of diagnostic procedure in relation to capacity
42	What method would you use to confirm diagnosis of a suspected Asian Gypsy Moth (*Lymantria dispar)*? How long would this take for initial confirmation? For delimiting surveys etc, how many diagnostic samples could be handled in a week?	Detailed specialist knowledge of key EPP's, including recently emerging pests Familiarity with contingency plan. Understanding of diagnostic procedure in relation to capacity
43	What method would you use to confirm diagnosis of a suspected Japanese Sawyer Beetle (*Monochamus alternatus*)? How long would this take for initial confirmation? For delimiting surveys etc, how many diagnostic samples could be handled in a week?	Detailed specialist knowledge of key EPP's, including recently emerging pests Understanding of diagnostic procedure in relation to capacity

44	What method would you use to confirm diagnosis of a suspected Pine Wilt nematode (*Bursaphelenchus xylophilus*)? How long would this take for initial confirmation? For delimiting surveys etc, how many diagnostic samples could be handled in a week?	Detailed specialist knowledge of key EPP's, including recently emerging pests Familiarity with contingency plan. Understanding of diagnostic procedure in relation to capacity
45A	Does your organisation mainatin diagnostic capacity? If yes, please describe.	Adoption of GIMP recommendation 8d. Diagnostic capacity
45	How many FTEs in fungal diagnostics in your organisation?	Adoption of GIMP recommendation 8d. Diagnostic capacity
46	How many FTEs in bacterial diagnostics in your organisation?	Adoption of GIMP recommendation 8d. Diagnostic capacity
47	How many FTEs in viral diagnostics in your organisation?	Adoption of GIMP recommendation 8d. Diagnostic capacity
48	How many FTEs in phytoplasma diagnostics in your organisation?	Adoption of GIMP recommendation 8d. Diagnostic capacity
49	How many FTEs in insect diagnostics in your organisation?	Adoption of GIMP recommendation 8d. Diagnostic capacity
50	How many FTEs are available in your organisation to conduct delimiting surveys for an EPP?	Surveillance capacity Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
51	Who from your or other organisations could participate in a CCEPP or SAP for Pine Pitch Canker (*Fusarium circinatum)*?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
52	Who from your or other organisations could participate in a CCEPP or SAP for *Phytophthora pinifolia*?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
53	Who from your or other organisations could participate in a CCEPP or SAP for *Puccinia psidii*?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
54	Who from your or other organisations could participate in a CCEPP or SAP for Asian Gypsy moth?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
55	Who from your or other organisations could participate in a CCEPP or SAP for Japanese Sawyer beetle (*Monochamus alternatus*)?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
56	Who from your or other organisations could participate in a CCEPP or SAP for Pine Wilt nematode (*Bursaphelenchus xylophilus)*?	Knowledge of jurisdictional arrangements. Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise
57	How often is each plantation surveyed for pests and diseases?	Level of integration of biosecurity into business risk management
58	How is the surveillance conducted?	Level of integration of biosecurity into business risk management

59	What records are kept of surveillance results?	Level of integration of biosecurity into business risk management
60	What triggers alarm bells for further investigation?	Level of integration of biosecurity into business risk management
61	What does that further investigation consist of?	Level of integration of biosecurity into business risk management
62	In what timeframe does this occur?	Level of integration of biosecurity into business risk management
63	What biosecurity training and/or awareness is provided to surveillance personnel?	Level of integration of biosecurity into business risk management
64	What biosecurity training and/or awareness material is provided to other plantation workers?	Level of integration of biosecurity into business risk management
65	Who, in your state, is responsible for carrying out pest detection surveys in the environs of ports and hazard sites?	Adoption of GIMP recommendation 3 and 8b
66	Has there been any analysis undertaken to justify/validate the sampling design and trapping methodology selected for the surveillance of ports of entry and urban areas for forestry pests i.e. what are the 'omission' rates (false negatives)? Have specific performance indicators for evaluating the effectiveness of the surveillance program been identified?	Scientifically-defensible systems
67	Is there any available data related to the risk of incursions associated with the operation of QAPs?	Scientifically-defensible systems
68	What sentinel plants are used in your state, i.e. what species and where located? What are the target pests and how often are sentinel plantings visited?	Adoption of GIMP recommendation
69	At what frequency are pest detection surveys carried out in the environs (5km radius) of all ports and hazard sites?	Adoption of GIMP recommendation 3 and 8b
70	With what frequency are pest detection surveys carried out in all forests in high risk zones (50 km radius of ports and hazard sites)?	Adoption of GIMP recommendation 4 and 8b
71	Are all imported timber and timber products examined for the presence of decay and sapstain, with infected material treated appropriately?	Adoption of GIMP recommendation 1
72	Do you understand what the components of a biosecurity system are? If so how, have you addressed them?	Knowledge of PlantPlan / Plantation Industry Biosecurity Plan and their integration into business risk management
73	Do you have an understanding of the biosecurity risks posed to your company? How was this understanding obtained?	Knowledge of PlantPlan / Plantation Industry Biosecurity Plan and their integration into business risk management
74	How important do you consider biosecurity is for your company - high, medium or low?	Knowledge of PlantPlan / Plantation Industry Biosecurity Plan and their integration into business risk management

75	Which, if any, of the practices listed below are included in your company's risk mitigation plan? Please provide details for each.	Knowledge of, and capacity to implement, the Plantation Industry Biosecurity Plan and their integration into business risk management
a	surveillance, awareness and training activities;	
b	exclusion activities (e.g. restricting movement of planting material and machinery);	
c	selection of appropriate planting materials and cultivars;	
d	destruction of plantation crop residues;	
e	control of vectors;	
f	control of alternative hosts and weeds;	
g	soil cultivation practices;	
h	post-harvest handling and log transport procedures;	
i	use of warning and information signs;	
j	use of dedicated equipment when working in high risk areas;	
k	restricting the use of high risk vehicles during high risk times;	
l	reporting suspect pests to appropriate authorities;	
m	inclusion of biosecurity in plantation management systems.	

Appendix 2: List of Forest Biosecurity workshop participants

Andrew Lyon Forest, Products Commission WA
*Angus Carnegie, Forest Health Research, Industry & Investment NSW
*Caroline Mohammed, University of Tasmania
Charlma Phillips, Forestry SA
Chris Beadle, CSIRO Ecosystems Science
Chris Lafferty, Forest and Wood Products Australia
*Christine Stone, Forest Health Research, Industry & Investment NSW
*David Smith, Biosecurity DPI Vic
*Francisco Tovar, Integrated Pest Management Group, WA
Gavin Matthews, A3P
Glen Kile, Plant Health Australia
Ian Ravenwood, Gunns Plantations Limited
John Hannay, Plant Health Policy Group, PIRSA (Primary Industries and Resources of South Australia)
Kevin Cooper, Incident Controller, Industry & Investment NSW
Marie Connett, Elders Forestry
*Michael Ramsden, Forestry Plantations Queensland Pty Limited Qld
Mike Cole, Office of the Chief Plant Protection Office, Department of Agriculture, Fisheries and Forestry
*Morag Glen, University of Tasmania
Nick Collett, Biosecurity DPI Vic
*Simon Lawson, Department of Employment, Economic Development and Innovation, Qld
Stephen Elms, Hancock Victorian Plantations
Suzy Perry, Plant Biosecurity, Department of Employment, Economic Development and Innovation, Qld
Terry Walshe (Facilitator), Australian Centre of Excellence for Risk Analysis, University of Melbourne.
*Tim Wardlaw, Forestry Tasmania
*Treena Burgess, Murdoch University

*Members of Research Working Group 7

Appendix 3: Structured decision-making and alternative strategies identified by participants in workshop

Most decisions involve (a) technical judgments concerning the performance of alternatives against objectives, and (b) personal (or organisational) judgments on the relative importance of each objective. Poor decision-making often arises from failure to disentangle these two key components. Structured decision-making seeks to harness the collective experience and insight of a group of experts and stakeholders, and to identify key areas where trade-offs or compromise are required.

If a bigger budget (substantially greater than the $2.5 M considered in this meeting) were made available to forest biosecurity then trade-offs among competing objectives becomes more important. Here we outline a preliminary sketch of how broader strategies aimed at improving forest biosecurity could be assessed using structured decision-making.

Objectives require specific attributes to describe the performance of alternatives to decision-makers. The meeting identified the objectives and attributes listed below.

Objective	**Attribute**
Minimise impacts on profitability	Timber productivity (MAI × quality)
Maximise immunity for public conservation values	% of taxa adversely affected
Maximise immunity for public recreation and amenity	Loss of cover × area
Maximise social acceptability	Number of complaints
Maximise capability	FTEs in forest health (operational and experts)
Minimise costs of implementation	$

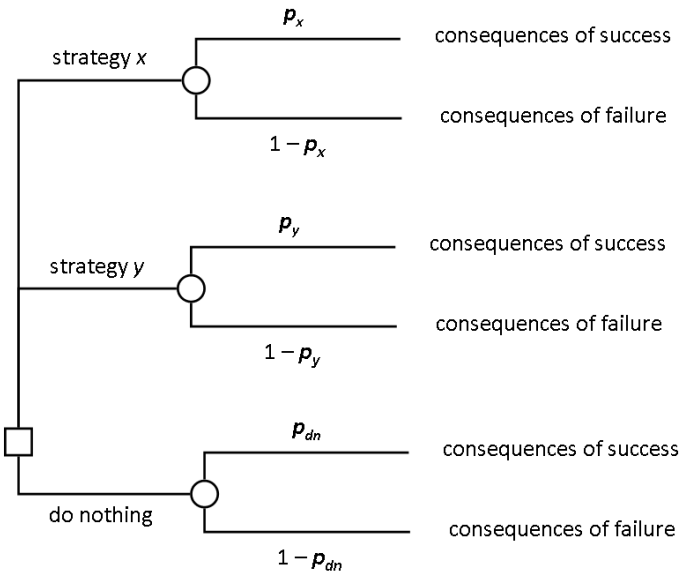
Alternative strategies that were identified by the meeting included:

- Emphasise preparedness (prevent pest establishment and spread through investment in diagnostics and surveillance)
- Adapt and live with risks (invest in genetic resistance and control measures)
- Characterise costs and benefits to gain a greater understanding of who should pay and to what extent
- Intelligence, communication and representation (invest in capacity in entomology and mycology, seek efficiencies in building on existing Biosecurity arrangements)
- Training and awareness (traditional and non-traditional; industry and community)
- Blue sky research
- Representation and networking (including NRM committee and organisational structures, and better involvement of environmental interests).
- Do nothing (more)

The merit of each alternative needs to be assessed according to the probability it will be successfully implemented, and the consequences that arise from success (or

failure) in implementation. The consequences are multi-attribute, implying trade-offs among the objectives identified above.

The figure below shows a decision tree. On the left is a choice point, indicated by a square,
□, where a decision-maker chooses a course of action (strategy *x* or strategy *y* or do nothing in this simple example). The lines trace outcomes arising from each choice. Events that are beyond the decision-maker's absolute control are indicated by a circle, ○, representing chance outcomes. While the outcomes are uncertain, we can ascribe a subjective estimate to the chance of things spilling one way or another. At the end of each branch of the tree are consequences that capture the performance of alternative strategies under different objectives. The *expected* consequences arising from any course of action weighs outcomes according to the chance they will indeed materialise (i.e. p_x, p_y and p_{dn} and their complements).



This simple example illustrates how structured decision-making can bring greater clarity to strategic planning through considered integration of technical judgments (e.g. prospects for success, the consequential performance of alternatives) and social judgments (trade-offs among objectives).

Appendix 4: Existing and emerging framework and processes for responding to and Emergency Plant Pest (EPP) in plantation forestry

Executive Summary
Intensified global trade and altered approaches to biosecurity have increased the need for the capacity to mount an effective incursion response. The most recent review of forest biosecurity arrangements in Australia was undertaken 10 years ago by Gadgil (2000). This resulted in a Generic Incursion Management Plan (GIMP) and a set of recommendations to provide the framework, capacity and funding to adequately respond to incursions of exotic pests of concern to forestry. Since that time, representation of forestry and forest health in Ministerial committees has been reduced. Secondly, changes in government approaches to biosecurity have seen the GIMP expanded to processes for biosecurity such as PLANTPLAN, a pest response plan which is applicable to all plant industries. Under PLANTPLAN, the main agencies involved in responding to incursions are Commonwealth and State government primary industry agencies.

Plant biosecurity in Australia depends on the co-operation and coordinated functioning between State and Commonwealth government departments, and relevant industries. Historically, forestry has not been as well integrated with these agencies as have agriculture and horticulture. The arrangements under PLANTPLAN apply to those plant industries that are signatories to the Emergency Plant Pest Response Deed (EPPRD). A3P, in association with Australian Forest Growers, has been a member of Plant Health Australia since 2004/05 but have not become a signatory to the EPPRD. This means there is high uncertainty regarding any response to a potential Emergency Plant Pest (EPP) affecting this sector, despite the development of a forestry industry biosecurity plan and several contingency plans for EPPs potentially affecting this industry.

This document explores the current systems and structures for responding to an incursion of an emergency plant pest (EPP) and the history to the development of these structures.

Introduction

Responding to Incursions: A Generic Incursion Management Plan for Forest Pests and Diseases (Gadgil, 2000a), colloquially referred to as the GIMP proposed a framework that relied heavily on the then Forest Health Committee and co-operation among various agencies. Specific cooperative arrangements were also proposed and recommended in an accompanying report *A Preparatory Report on Current Arrangements for Management of Incursions of Exotic Pathogens and Invertebrate Pests Affecting Australian Commercial, Conservation and Amenity Forests and Forest Products* (Gadgil, 2000b). Under the GIMP, the Forest Health Committee was the decision-making body that determined what response, if any, was to be undertaken to any new pest or pathogen affecting forests. Some of the recommendations by Gadgil were adopted but, since then, significant changes in overall approaches to biosecurity and in forestry representation have occurred. The Forest Health Committee was disbanded in 2004.

A recent review of the Australian biosecurity system, the Beale Report (2008), emphasised the need to facilitate the safe movement of animals, plants, people and cargo. With intensifying world trade and movement of people, the likelihood of introducing exotic pests has increased. Traditionally there has been a heavy emphasis on quarantine to prevent the introduction of unwanted plant pests. The Beale report stated that as zero risk of introduction was unattainable, risks must be managed. This implies that the capacity to mount a response to incursions of EPPs is needed, with the response based on risk-return analyses. The aim of the Beale report recommendations is the development of a seamless biosecurity system that fully involves all participants working pre-border, border and post-border, as captured in the slogan "One Biosecurity: a working partnership". Integration of the Commonwealth's biosecurity activities in a dedicated statutory agency – the National Biosecurity Authority – will provide the necessary co-ordination and focus on managing biosecurity risks.
A national co-ordinating body for plant biosecurity - Plant Health Australia (PHA) – was established in 2000. PHA's function is to:

- Assist plant industries in developing industry biosecurity plans;
- Liaise between governments and industries, particularly in respect to cost-sharing arrangements; and
- Foster training and capacity-building for diagnostics and incursion management.

PHA developed PLANTPLAN, the document which specifies roles and responsibilities for management of EPPs affecting Australian plant industries. PLANTPLAN also provides guidelines for categorisation of pests, which determines the proportion of government:industry funding for emergency responses. This can be 100% government (Category 1), 80:20 government:industry (Category 2), 50:50 (Category 3) or 20:80 (Category 4) depending on the perceived public:private benefit of eradication. PHA assisted the plantation timber industry to develop an industry biosecurity plan.
As part of its response to the Beale Review, the Australian government has developed and is negotiating a draft Intergovernmental Agreement on Biosecurity (IGAB). This draft agreement aims to strengthen the working partnership between governments,

broadly identifies their roles and responsibilities. It outlines the priority areas for collaborative effort to improve the national biosecurity system.

There has been the appointment of an interim Inspector General of Biosecurity and the establishment of a skills based Biosecurity Advisory Council (January 2010). Biosecurity functions across the Department of Agriculture, Fisheries and Forestry (DAFF) have been consolidated into the Biosecurity Services Group; i.e. Biosecurity Australia (BA), the Australian Quarantine Inspection Service (AQIS), and the Office of the Chief Plant Protection Officer (OCPPO). At State level, the departments responsible for primary industry (Table 1) are the main agencies responsible for biosecurity including forest biosecurity.

Appendix 4: Table 1. The departments responsible for primary industry in each state and territory

State/Territory	**Government Department**
ACT	ACT Department of Territory and Municipal Services
NSW	Industry & Investment, NSW
NT	Department of Primary Industry, Fisheries and Mines
Qld	Department of Employment, Economic Development and Innovation
SA	Primary Industries and Resources SA
Tas	Department of Primary Industries, Parks, Water and Environment
Vic	Department of Primary Industries
WA	Department of Agriculture and Food

Ministerial and Subsidiary Committee Structures

The Ministerial Committee structures relevant to biosecurity are outlined in Figures 1 to 3. The former Primary Industries Health Committee (PIHC) has now been absorbed into the National Biosecurity Committee (NBC) (Figure 3). The NBC reports to both PISC and the Natural Resource Management Standing Committee. The NBC includes representatives of Commonwealth and State environment departments as well as primary industry departments.

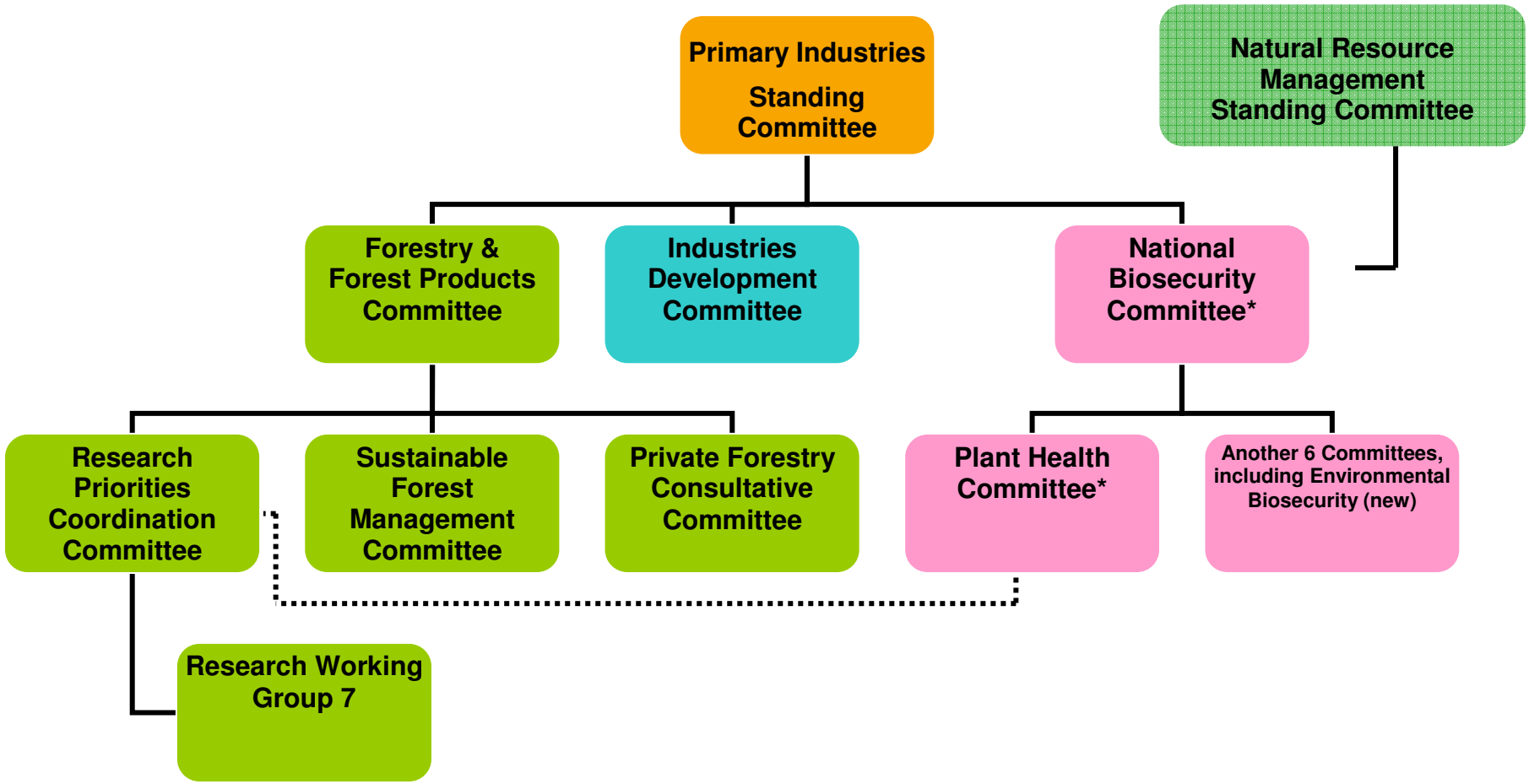
The Forest Health Committee, previously reporting to the Forestry Standing Committee has been dissolved. The Forestry Standing Committee was renamed the Forestry and Forest Products Committee (FFPC) and now reports to the Primary Industries Standing Committee (PISC) (Figure 1). Research Working Group (RWG) 7 (Forest Health) is a working group of the Research Priorities Coordination Committee (RPCC), a sub-committee of the FFPC.

Plant Health Committee (Figure 2) is chaired by the CPPO (Chief Plant Protection Officer, Commonwealth DAFF) and contains representatives from each of the State departments of primary industry and agriculture, as well as Plant Health Australia, CSIRO and three observers, one each from the Co-operative Research Centre for Plant National Biosecurity (CRCPNB), NZ Ministry of Agriculture and Forestry (MAF) and the Australian Plague Locust Commission. There is one forestry representative in Plant Health Committee, a member of Research Priorities Co-ordination Committee, endorsed by the Forestry and Forest Products Committee (FFPC; Figure 1). Plant Health Committee has three sub-committees (Figure 2). The Sub-committee for Plant Health Diagnostic Standards includes a representative of RPCC (RWG) 7 (Forest Health). The Domestic Quarantine and Market Access Working Group does not include a forestry representative.

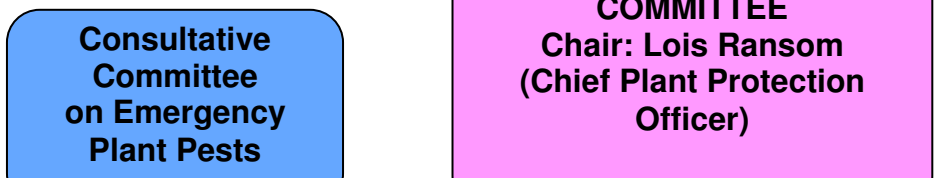
In summary, forest health, previously represented by its own committee in the governance structures, has been relegated to a single representative on a committee at a similar level (PHC). Due the recent retirement of the forest representative on the PHC committee this membership was put under threat; the technical expertise, time available and necessary funding to carry out the duties required is severely limited.

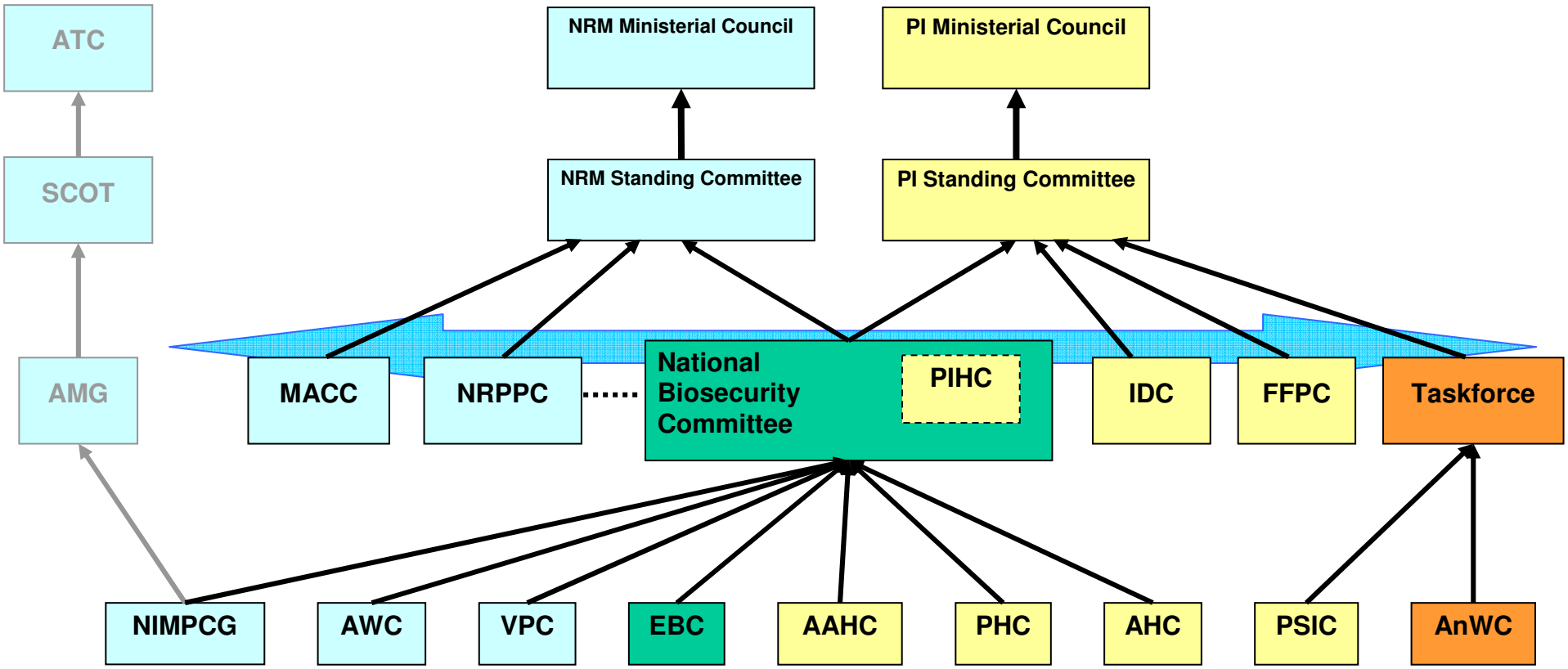
The close proximity of production forests to conservation forests in Australia leaves both plantation and native production forests vulnerable to pest incursions that may commence in native non-production forests. Conservation forest managers may consider that a response to an incursion of an EPP is not warranted or it may even be illegal, e.g. in World Heritage Areas. The administration of production forests, and especially plantations, is increasingly separated from management of conservation forests, and both sectors have been accustomed to operate independently of the state agencies now responsible for overall plant biosecurity.

The establishment and maintenance of the appropriate linkages to ensure that forest biosecurity is adequately represented in the NBC and treated with an appropriate level of consideration in the Environmental Biosecurity Committee is important. Such linkages should be facilitated by the National Environmental Biosecurity Response Agreement (see next section)



Appendix 4: Figure 1: Primary Industries Ministerial Council ***Plant Health Committee and the National Biosecurity Committee are expanded in Figures 2 and 3, respectively. The dotted line indicates the RPCC representative (endorsed by FFPC) on Plant Health C estry - both native and plantation forestry - on PHC. Research Working Group 7 contains the body of forest health expertise in Australia and has histori ltural sectors from the perspective of biosecurity.**




ATC
SCOT
AMG
NRM Ministerial Council
NRM Standing Committee
PI Ministerial Council
PI Standing Committee
MACC
NRPPC
National Biosecurity Committee
PIHC
IDC
FFPC
Taskforce
NIMPCG
AWC
VPC
EBC
AAHC
PHC
AHC
PSIC
AnWC

Appendix 4: Figure 3: National Biosecurity Committee (NBC) Structure. The NBC is the only committee answering to both the NRMSC and PISC. PIHC has been absorbed into the NBC. The NRPPC also has a representative on the NBC (dotted line).

Abbreviations: AAHC, Aquatic Animal Health Committee; AHC, Animal Health Committee; AMG, Australian Maritime Group; AnWC, Animal Welfare Committee; ATC, Australian Transport Council; AWC, Australian Weeds Committee; EBC, Environmental Biosecurity Committee (new); FFPC, Forestry and Forestry Products Committee; IDC, Industries Development Committee; MACC, Marine and Coastal Committee; NBC, National Biosecurity Committee (new); NIMPCG, National Introduced Marine Pest Coordination Group; NRM, Natural Resource Management; NRPPC, Natural Resource Policies and Program Committee; PHC, Plant Health Committee; PI, Primary Industries; PIHC, Primary Industries Health Committee; PISC, Primary Industries Standing Committee; PSIC, Product Safety and Integrity Committee; SCOT, Standing Committee on Transport; Taskforce, PISC/NRMSC transitional taskforce to deal with animal welfare & product safety & integrity issues, reporting to PISC (Sep 2007); TASMC, Tramp Ant Strategic Management Committee; VPC, Vertebrate Pest Committee.

Pest Response Agreements Relevant to Forests and Forestry

The Intergovernmental Agreement on Biosecurity (IGAB) is an emerging Agreement between the Commonwealth of Australia, state and territory governments to strengthen the national biosecurity system. This agreement is aimed at strengthening the collaborative approach between the Commonwealth of Australia (the Commonwealth), state and territory governments (the Parties) to address Australia's broad range of biosecurity issues which include pest response. It is meant to clarify roles and responsibilities and avoid duplication of effort.

The National Environmental Biosecurity Response Agreement (NEBRA) was endorsed by the PIMC on the 23rd April 2010 as the first deliverable under IGAB. This Emerging Agreement covers responses to nationally significant biosecurity incidents where there are predominantly public benefits or where the incident is not covered under currently existing arrangements in the primary production sector (i.e. the environment and social amenity sectors). As the responses covered by NEBRA are essentially for the public good, cost-sharing is to be generally between governments. Incidents that will have significant impact on primary production issues will be dealt with through the existing agreements for plants and animals.

The Emergency Plant Pest Response Deed (EPPRD) is a formal, legally binding agreement between PHA, the Commonwealth government, all State and Territory governments and national plant industry body signatories. The EPPRD covers the management and funding of responses to EPP incidents. Under the Emergency Plant Pest Response Deed (EPPRD), government and plant industry signatories share the costs of eradicating EPPs based on an assessment of the relative private and public benefits of eradication of the pest. The EPPRD is designed to ensure a rapid and effective response to any new EPP incursion. Owner reimbursement costs are covered by this agreement.

The key principles underpinning the EPPRD are:

- Immediate reporting of, and rapid response to, suspected EPP outbreaks;
- Incursions capable of being eradicated and/or contained;
- Cost beneficial to eradicate;
- Beneficiary contributes;
- Equitable sharing of financial burden;
- No one better or worse off as a result of reporting an incident;
- Certainty in funding and owner reimbursement costs;
- Certainty, consistency, integration and efficiency of structures and processes;
- Stakeholders who share the costs of incursion management to have a role in decision-making; note that industry stakeholders are usually out-numbered by state and Commonwealth government representatives in the CCEPP
- Accountability to stakeholders who fund incursion management; and
- Simplicity

The industry biosecurity planning process and expert advice have been used to determine an agreed list of categorised EPPs for inclusion in the EPPRD. These pests are assigned to one of four categories according to the extent to which eradication would benefit the public or private sector (Table 2).

When a decision is made to undertake an eradication campaign targeting a pest that has not been categorised, the costs will initially be shared on a 50:50 (Category 3) basis between

governments and industry until the pest is categorised by the Categorisation Group. The sharing of cost will then be adjusted from the time of categorisation. There will be no retrospective adjustment.

Commonwealth and State governments share public costs on a 50:50 basis. Where several State/Territory jurisdictions or several industries are affected, the relevant costs are divided on the basis of a three-year rolling average of the local value of production. The impact of the pest on each industry is also considered. Long-term containment or management costs are NOT included in cost sharing agreements.

Appendix 4: Table 2. Categorisation of EPPs for cost-sharing purposes

Category	**Description**	**Cost Sharing Public: Private**
1	Pest which, if not eradicated, would: Cause major environmental damage to natural ecosystems; and/or Potentially affect human health or cause a major nuisance to humans; and/or Cause significant damage to amenity flora; and Have relatively little impact on commercial crops. This category also covers situations where the pest has a very wide range of hosts including native flora and there is considerable uncertainty as to the relative impacts on the different crops.	100:0
2	Pest which, if not eradicated, would: Cause significant public losses either directly through serious loss of amenity, and/or environmental values and/or effects on households, or indirectly through very severe economic impacts on regions and the national economy; and Also impose major costs on the industries concerned so that these industries would significantly benefit from eradication.	80:20
3	Pest which, if not eradicated, would: Primarily harm the industries concerned but there would also be some significant public costs as well (that is, moderate public benefits from eradication). In this case the pest could adversely affect public amenities, households or the environment, and/or could have significant, though moderate trade implications and/or national and regional economic implications.	50:50
4	Pest which if not eradicated, would: Have little or no public cost implications and little or no impacts on natural ecosystems. The affected commercial industries would be adversely affected primarily through additional costs of production, through extra control costs or nuisance costs; and Generally there would be no significant trade issues that would affect national and regional economies.	20:80

A3P, in association with Australian Forest Growers, has been a member of Plant Health Australia since 2004/05 but the plantation timber industry has not become a signatory to the EPPRD. There are several factors of factors which are to be considered in the decision as to whether the plantation timber industry signs the deed;

- The majority of Australia's plantation resource (80-90%) is owned and/or managed by some 15-20 major "growers". The capacity of these growers in terms of forest biosecurity and their corporate reporting responsibilities differ significantly from the much larger numbers of relatively small producers which constitute the majority of producers in the other plant industries covered by the EPPRD.
- The plantation timber industry's crop, trees principally of the genera *Pinus* and *Eucalyptus*, are present widely in the urban, rural and natural environment and it is

therefore difficult to separate the interests and responsibilities of the interested parties in plant health management with respect to trees. Cost sharing agreements are complex when trees could be negatively impacted by;

- pests shared with conservation forests
- pests shared with timber in service
- pests shared with garden and nursery industry
- forest biosecurity risks created by other industries

- Most State governments are major plantation owners and managers in their own right via their forestry government trading enterprises. They would therefore have dual roles in the management and cost sharing aspects of the EPPRD if it were to be signed by the plantation timber industry.
- Plantation timber differs from other plant crops because its major product, structural timber, remains in use and potentially subject to pest infestation for many decades after it is harvested and sold to the end-user.
- The EPPRD only deals with situations where it is agreed that an Emergency Plant Pest can be eradicated and it is cost effective to do so. It does not cover the containment and management of a pest if/when it is decided that it cannot be eradicated or it is not cost effective to do so.
- It is obligatory that the signing the EPPRD be accompanied by the establishment of a levy-raising mechanism to fund any commitment which the industry may incur under the EPPRD (i.e. the industry share of the cost of eradicating an emergency plan pest). The Government Such a levy mechanism will only be supported by the government if an industry can demonstrate very strong support from its members.

Summary of Plant Plan

Underpinning the EPPRD is PLANTPLAN (2009), the agreed technical response plan used by jurisdictions and industry in responding to an EPP incursion. It provides nationally consistent guidelines for response procedures under the EPPRD, outlining the phases of an incursion (investigation, alert, operational and stand down), as well as the key roles and responsibilities of industry and government during each of these phases. The GIMP (Gadgil, 2000) was one of the documents consulted in the formulation of PLANTPLAN. The plantation forestry industry is not currently a signatory to the EPPRD.

PLANTPLAN provides the foundation on which all industry-specific biosecurity plans rest. The purpose of PLANTPLAN is to:

- Provide policy and guidelines for the consistent management of EPP incursions by appropriately trained personnel in each State/Territory;
- Provide coherence of emergency response plans;
- Provide compatibility of operation and procedures between the Commonwealth and State/Territory governments and industry;
- Improve the technical validity of underlying assumptions in the development of strategies to respond to EPP incursions;
- Provide a focus for training personnel in operational response procedures;
- Provide guidelines for the development of standard operating procedures for personnel involved in response management.

The various Plant Protection Acts in the States/Territories provide powers for emergency containment and eradication actions, enabling staff of State and Territory agriculture departments to:

- Enter properties to survey for an emergency pest; inspect and take samples of plants or plant products;
- Establish and maintain quarantine zones;
- Restrict movement of plants, plant products, equipment, vehicles and other potential sources of contamination;
- Issue orders for the destruction of infested plant material; and
- Require owners of affected premises to implement quarantine or pest eradication measures.

However, few State and Territory governments have specific powers under their plant health legislation to:

- Control or eradicate exotic pests in national parks, world heritage areas or aboriginal land;
- Establish *immediately* quarantine measures to contain or eradicate an EPP;
- Destroy healthy plants or to establish buffer zones to prevent the spread of a pest outbreak.

The training program aims to establish a consistent national response to EPP incursions, by:

- Developing specific information and providing it to industry and governments on their roles and responsibilities as a member of the following committees under PLANTPLAN:
  - National Management Group and
  - Consultative Committee on Emergency Plant Pests
- Developing specific information for the training of industry liaison coordinators /officers for their important role in working with government and representing their industry members during an emergency plant pest incursion;
- Establishing and developing the competencies needed to meet the roles that government staff involved in control centre activities will need to undertake in managing an incursion; and
- Developing basic biosecurity awareness/preparedness information.

Phases of response

Responses to EPPs are divided into four phases – Investigation, Alert, Operational and Stand-down, though these phases may overlap. The Investigation Phase begins with the reporting of a suspected EPP and culminates with the formation of a Consultative Committee on Emergency Plant Pests (CCEPP) (Table 3). The State agency identifies the suspect pest. Detailed guidelines for handling and movement of diagnostic samples are provided in PLANTPLAN. A datasheet is also provided by PLATPLAN to ensure recording of all required details, including location of the infected premises (IP), host details and movements of people, plant germplasm or product and machinery.

During the alert phase, diagnosis is confirmed by two independent laboratories, and an incursion declared (Table 4). PLANTPLAN provides guidelines for handling of diagnostic samples to ensure integrity of the chain-of-evidence. The feasibility and cost/benefit of eradication is considered, a response plan prepared by the CCEPP and recommendations made to the National Management Group (NMG). Precautionary measures may be implemented at the infected premises (IP) to restrict movement of vehicles, machinery and plant material or products, and to establish buffer zones around the IP. Delimiting surveys, trace backs and trace forwards may be commenced to allow definition of the control area (CA) and restricted area (RA).

During the Operational Phase, the responsibility for implementation of the Response Plan is borne by the lead agency(ies) in the affected State(s)/Territory(ies) (Table 5). On entering the Operational Phase the State/Territory Pest Control Headquarters (SPCHQ) will be set up within the Lead Agency(s) to manage the EPP Response. The SPCHQ will evolve from the investigation team and will usually involve the investigation team members plus other members, as necessary. A Local Pest Control Centre (LPCC) will be set up to manage operational activities in the RA. During small scale emergencies the duties of the LPCC may be subsumed by the SPCHQ. A checklist of tasks for the CPHM, SPCHQ Director and the LPCC Controller are provided in PLANTPLAN.

Co-ordination of approvals for the use of imported chemicals, the acquisition and importation of chemicals and the training of personnel in the use of chemicals, are also responsibilities of the Lead Agency. The eradication campaign is subject to external reviews by the Scientific Advisory Panel (SAP).

Appendix 4: Table 3. Actions taken during the Investigation Phase (person/agency responsible)

State functions	National functions	Industry functions
Report suspect pest (Plant Health Officer, grower, agronomist, researcher, member of the public)		Report suspect pest (grower, agronomist)
Identify pest (diagnostic team)		
Notify CPHM (diagnostic team)		
Notify CPPO of detection (CPHM)		
Advise Property Owner (CPHM)	Notify other states/territories (CPHMs, peak industry body(s), PHC, DQMAWG and BA/AQIS, CPPO)	
Complete Incursion Incident Report (Lead Agency(ies))	Convene CCEPP (CPPO)	Attend CCEPP meeting (nominated representative and technical representative)

AQIS – Australian Quarantine Inspection Service; BA – Biosecurity Australia; CCEPP – Consultative Committee on Emergency Plant Pests; CPHM – Chief Plant Health Manager; CPPO – Chief Plant Protection Officer; DQMAWG – Domestic Quarantine and Market Access Working Group; PHC – Plant Health Committee

Appendix 4: Table 4. Actions taken during the Alert Phase (person or agency responsible for the action)

State functions	National functions	Industry functions
Confirm pest identity (diagnostic team/ international specialists)	Confirm pest identity (OCPPO)	
Adoption of precautionary measures – state-wide (Lead Agency(ies) CPHM)	Adoption of precautionary measures – nationally (DQMAWG)	
Delimiting surveys (Lead Agency(ies))	Advise NMG (CPPO)	
Identify chemical strategies (Lead Agency(ies))	Convene CCEPP (CCEPP)	
Communicate results, declare incursion (Lead Agency(ies) CPHM)	Declare incursion (OCPPO)	Declare incursion (peak industry body(ies))
	Investigate feasibility of eradication (CCEPP)	
	Cost/benefit analysis (CCEPP)	
Prepare EPP Response Plan (Lead Agency(ies))	Prepare EPP Response Plan (CCEPP)	
	Recommendation to NMG (CCEPP)	
	Authorise eradication, approve EPP Response Plan and cost sharing arrangements (NMG)	

CCEPP – Consultative Committee on Emergency Plant Pests; CPHM – Chief Plant Health Manager; CPPO – Chief Plant Protection Officer; DQMAWG – Domestic Quarantine and Market Access Working Group; NMG – National Management Group; OCPPO – Office of the Chief Plant Protection Officer; PHC – Plant Health Committee.

Appendix 4: Table 5. Actions taken during the Operational Phase (person or agency responsible for the action)

State functions	National functions	Industry functions
Communicate response strategy to property owner (CPHM)	Communicate response (CPPO)	Communicate response (peak industry body(ies))
Implement EPP Response Plan (Lead Agency(ies))		Implement EPP Response Plan – publicity and awareness (peak industry body(ies) assist in implementation of agreed communication strategy)
Provide regular reports and updates to CCEPP (Lead Agency(ies))	Evaluate eradicate on campaign progress – report to NMG (CCEPP)	
Down-size response activities as appropriate (Lead Agency(ies))	Endorse successful eradication/recommend termination of Response Plan (CCEPP)	
	Recommendation to NMG (CCEPP)	
	Decision on eradication/ termination (NMG)	

CCEPP – Consultative Committee on Emergency Plant Pests; CPHM – Chief Plant Health Manager; CPPO – Chief Plant Protection Officer.

The Stand-down Phase commences if the Investigation or Alert Phases fail to confirm the presence of an EPP, or as a result of a successful eradication or when eradication has been declared not cost beneficial. This phase includes a review of intra- and inter-state quarantine, notification of trading partners and preparation of financial audits (Table 6).

Appendix 4: Table 6. Actions taken during the Stand-down Phase (person or agency responsible for the action)

State functions	National functions	Industry functions
Prepare report for CCEPP and DQMAWG seeking agreement that eradication has been successful (Lead Agency(ies))	Accept recommendation from CCEPP and declare successful eradication (NMG)	
Review intra- and interstate quarantine arrangements (DQMAWG/Lead Agency(ies))		
	Notify trading partners (BA/AQIS)	
Provide records of expenditure and reports to PHA (Lead Agency(ies))		
Incident debrief (Lead Agency(ies))	Incident debrief (CPPO)	

AQIS – Australian Quarantine Inspection Service; BA – Biosecurity Australia; CCEPP – Consultative Committee on Emergency Plant Pests; CPPO – Chief Plant Protection Officer; DQMAWG – Domestic Quarantine and Market Access Working Group; NMG – National Management Group

Control centres

Three control centres are involved in the management of an EPP response. These are the National Pest Control Headquarters (NPCHQ), the State/Territory Pest Control Headquarters (SPCHQ) and the Local Pest Control Centre (LPCC). Management structures for these control centres are outlined in PLANTPLAN. Job cards are also provided for key roles in PLANTPLAN.

NPCHQ – The Department of Agriculture, Fisheries and Forestry (DAFF) is the lead Australian Government agency with respect to the management of emergencies involving plant, animal or aquatic animal diseases or pests, animal welfare or introduced marine pests. DAFF's main roles are to:

- Convene, chair and provide the secretariat support of CCEPP (CPPO/OCPPO);
- Meet Australia's international reporting obligations, particularly to affected trading partners;
- Coordinate trace forward of exported plants or plant products and trace back of imported plants or plant products;
- Provide technical briefings and other information to trading partners as part of trade negotiations and addressing market access issues;
- Contribute to media communications;
- Provide policy advice to the state/territory Lead Agency(ies) on national or international issues;
- Provide input to cost sharing arrangements;
- Liaise with other Australian Government agencies that are impacted by or who can assist during an emergency;
- Revise and impose quarantine arrangements;
- Invoke Australian Government legislation (e.g. Quarantine Act 1908) when necessary to assist with EPP eradication operations in States and Territories; and
- Coordinate responses with relevant industry groups.

The SPCHQ is the emergency operations centre for the state/territory-wide coordination of all EPP operations. The primary roles of the SPCHQ are to:

- Secure financial arrangements and ensure administrative support is provided;
- Define financial, regulatory and other delegations;
- Determine, implement and coordinate State/Territory-wide EPP emergency control policies and strategies;
- Develop an EPP Response Plan;
- Through the CPHM, liaise with the CCEPP, the Australian Government, State and Territory authorities and relevant plant industries;
- Brief the department's executive management and relevant ministers;
- Coordinate pest investigation, tracings, surveillance and movement controls in the CA and elsewhere throughout the state/territory;
- Notify CCEPP of trace backs and trace forwards to other jurisdictions;
- Liaise with State/Territory Emergency Management organisations;
- Implement legal arrangements and ensure that all legal requirements are met;

- Approve tasks not delegated to the LPCC, such as confirmation of new Infected Premises (IP) and approval to destroy plants;
- Ensure effective information flows between the LPCC and field operations;
- Provide information State/Territory-wide to the public and groups with special information needs;
- Coordinate technical advice to support operations;
- In conjunction with other agencies, assist with relief, recovery and community support activities;
- Liaise with emergency services at State/Territory level;
- Ensure adequate State/Territory records are kept;
- Respond to LPCC requests for resources;
- Monitor the effectiveness of the EPP Response; and
- Conduct a debrief of the EPP Response.

The LPCC is the main command, control and coordination centre for local field operations. The role of the LPCC Controller is to manage the control/eradication of the EPP within the LPCC area of responsibility. The LPCC will have the following objectives:

- Assist the SPCHQ to determine the source of the outbreak by tracing movements of suspect plants, vehicles and persons into the area during the appropriate period in relation to the lifecycle of the pest;
- Assist the SPCHQ to determine the extent of the outbreak by detecting all foci of infection;
- Eradicate or control all known outbreaks of the EPP as instructed by SPCHQ;
- Control the spread of an outbreak as instructed by the SPCHQ by (for example:
    1. Controlling the movement of plants, plant products, water, vehicles and persons into, within and out of its area of responsibility;
    2. Destroying plants and destroying or disinfecting plant products that may be infected or contaminated;
    3. Disinfecting vehicles, machinery and persons moving from and within the area;
    4. Tracing the movements of suspect plants and plant products, vehicles, machinery and persons from and within the area during the suspected infectious period;
    5. Establishing control of special risk enterprises (canneries, nurseries, plant breeding facilities)
    6. Engaging individuals involved in plant industries and the local media and seeking their assistance in implementing eradication measures.
- Establish cooperation with the affected industry and community;
- Accurately record all crops, assets and premises destroyed or damaged;
- Maintain receipts and records of all monies expended on the campaign.
- Maintain accurate records of human and physical resources and all activities and decisions;
- Implement appropriate local public relations and communications strategies within the LPCC area of responsibility; and
- Facilitate relief and recovery operations.

Decision-making bodies

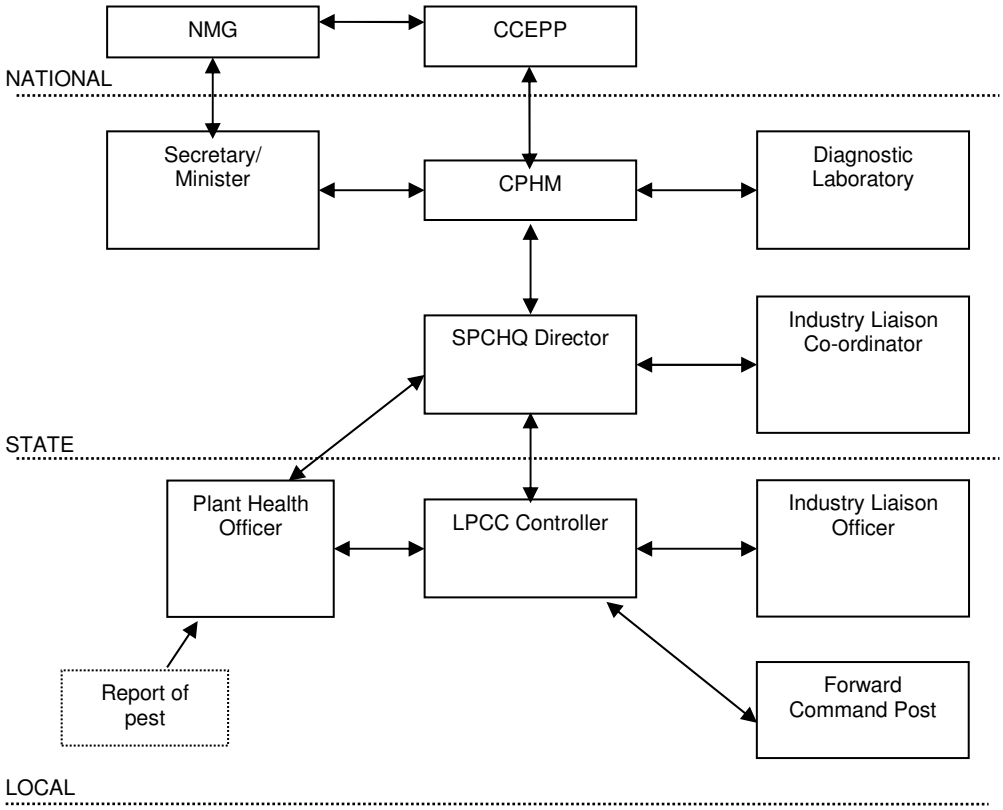
The National Management Group (NMG) is comprised of the secretary of DAFF, the CEO of affected State/Territory agencies, a representative of affected industry parties and the chairman of Plant Heath Australia (PHA). They receive advice from the Consultative Committee on Emergency Plant Pests (CCEPP). The CCEPP is chaired by the Chief Plant Protection Officer (CPPO) and includes the Chief Plant Health Manager (CPHM) of each State/Territory, representatives from BA, AQIS, PHA and relevant industry parties. Observers/resource persons may include those with relevant expertise. A Scientific Advisory Panel (SAP) may be appointed.

The Categorisation Group has an independent chair from PHA; an industry representative nominated by the Board of PHA; three technical experts, 1 nominated by Commonwealth, 1 by the State, and 1 by the affected industry party; a person with relevant economic expertise, nominated by the Chairman of PHA; and a nominee from each affected industry party.

Communication

Communication is the key to co-ordination of the many agencies, centres and committees involved in an EPP response. Lines of communication are specified in PLANTPLAN (Figure 4).

Figure 4: State/Territory chain of communication for coordination of an EPP response



Plantation Industry Biosecurity Plan (PTIBP)

The PTIBP (see Appendix 2) was developed with the co-operation of A3P, AFG, PHA and an Industry Biosecurity Group. Exotic pest threats are identified and pest risk reviews included. The PTIBP needs updating to include recent changes in relevant personnel and their contact

details. Pest risk analyses are needed for new pests affecting Australian plantation species that have been identified overseas in recent years, notably *Phytophthora pinifolia.* Updated lists of notifiable pests should be obtained, particularly for plant pathogens in WA. The status of *Puccinia psidii* as an exotic pest has changed.

The Generic Incursion Management Plan (GIMP) versus Plant Plan

As the GIMP was developed specifically for the forest industries, this section examines differences between the recommendations of the GIMP and its associated report on the then current arrangements for forestry and the current arrangements under PLANTPLAN, if the plantation industry were a signatory to the EPPRD.

The report accompanying the GIMP '*A Preparatory Report: Current Arrangements for Management of Incursions of Exotic Pathogens and Invertebrate Pests Affecting Australian Commercial, Conservation and Amenity Forests and Forest Products*' (Gadgil 2000b) put forward 12 recommendations considered necessary to enable the then current system to effectively conduct the management plan. These 12 recommendations are:

Section 1 of the GIMP: Quarantine

Recommendation 1: All timber and timber products should be examined for the presence of decay and sapstain and any infected material should be appropriately treated.

Recommendation 2: Specialist advice in forest pathology and forest entomology should be available to quarantine inspectors.

Section 2 of the GIMP: Detection of forest pests and pathogens

Recommendation 3: Pest detection surveys should be carried out in the environs (5 km radius) of all ports and hazard sites. The cost of the surveys should be shared between those who create the risk and the Commonwealth and State governments.

Recommendation 4: Pest detection surveys should be carried out in all forests in the "high risk" zone (50 km radius of ports and hazard sites). The cost should be shared between those who create the risk, the owners of surveyed forests and the Commonwealth and State governments.

Recommendation 5: Conservation forest managers should appoint liaison officers whose duty is to investigate reports of damage to the forests under their care.

Recommendation 6: The officers who carry out pest detection surveys in the environs of ports and hazard sites and the State forestry agency which employs forest health specialists should be responsible for investigating possible exotic pest incursions in the urban forests.

Recommendation 7: The question of compensation for action taken to eradicate an exotic pest or pathogen should be urgently settled.

Section 3 of the GIMP: Diagnosis and Identification of forest pests and pathogens.

Recommendation 8: A Plant Health Protection Unit (PHPU), with Territory responsibility for post-border quarantine activities, should be set up in every State and

The PHPUs should be responsible for the port and hazard site surveys and for surveys in forests within 50km of a port or hazard site.

Regional and National Collections of pests and pathogens, with specialist sections on forest pests and pathogens, should be available to the PHPUs.

The services of taxonomists, with expertise in plant pests and pathogens, including forest pests and pathogens, should be available to PHPUs.

Regional and National databases of plant pests and pathogens, including forest pests and pathogens, should be established.

The PHPU work should be contracted out to local agencies, such as State quarantine, agriculture and forestry agencies, with the required personnel and expertise.
The cost of the PHPUs should be shared between importers, overseas passengers, primary industries including forestry and the Commonwealth and State governments.

Section 4 of the GIMP: Response to incursions
Recommendation 9: Agreement should be reached on the appointment of Lead Agencies responsible for dealing with incursions in the various types of forests before an emergency occurs.
Recommendation 10: The legislative and policy constraints on any likely eradication action should be settled before an emergency occurs.
Recommendation 11: All States and Territories should be represented on the Forest Health Committee.
Recommendation 12: Forest Health Advisory Committees should be formed in all States and Territories.

The Forest Health Committee mentioned in R11 no longer exists. Forest Health Advisory Committees (R12) were established in most States, but the level of activity varies considerably and some may be considered as defunct.

The GIMP advocated that the now defunct Forest Health Committee, with advice from State and Territory Forest Health Advisory Committees, would determine the response decision. The composition of the Consultative Committee for Emergency Plant Pests (CCEPP) as detailed in PLANTPLAN varies from that of the Forest Pest Consultative Committee outlined in the GIMP. The Forest Pest Consultative Committee proposed in the GIMP, was chaired by the CPPO and included the chiefs of the State lead agency and State quarantine agency, at least three representatives of forest owners/managers, a State forest health specialist, a representative of the Local Authority Association and the officer-in-charge of eradication operations.
The current arrangement is for the CPPO to chair a CCEPP, for which membership also includes:

- Standing representatives of Commonwealth, State and Territory plant health agencies -
  - all state and territory CPHMs (or representative)
  - a representative (non-voting) from BA
  - a representative (non-voting) from AQIS
  - a representative (non-voting) from PHA
- Members representing relevant industry parties -
  - a representative, nominated in advance by the industry parties collectively, from an organisation that is a member of PHA
  - a technical representative nominated by the relevant industry(s)
  - members may be accompanied by advisers, but these will not have voting rights

Effectively this means that the state and territory CPHMs will always outnumber the industry representatives and one might question the safeguards in place to ensure an adequate voice for industry partners. It is not clear to what extent state CPHMs are required to consider the opinions of industry representatives before making their decision.

Under PLANTPLAN, the lead agency in any incursion response is the State Primary Industry department. In contrast, the GIMP suggested an MOU to identify the lead agency, which

could be a State forestry organisation, State conservation department or local government authority, depending on the type of forest in which the outbreak occurred. The State Primary Industry Departments have the nearest equivalent of such PHPUs (R8) and are the lead agencies responsible for dealing with incursions (R9). In response to an issue listed under R8 the Australian Plant Pest Database has been developed, allowing on-line interrogation of 19 reference collections. Reflecting the agricultural bias of the collections, forest pests are poorly represented.

There has been recent focus given by Australia's quarantine to processes to ensure the safe import of timber and wood products. Processes for quarantine timber inspections (R1) have been improved and generic surveillance of high risk zones (R3) is carried out. The Beale Review also placed more emphasis on post border surveillance. However there is little or no targeting of specific high risk forest zones (R4). This lack of emphasis on the surveillance of high risk zones specifically for forest pests is partly due to a) the steady dwindling of forest health expertise and b) the lack of time or funding for existing forest health expertise to carry out additional duties such as those suggested by R2, R4, R5 and R6. Biosecurity for conservation forests, National Parks and World Heritage Areas remains an issue (R5) although an agreement which should cover such forest pests (NEBRA) has been negotiated.

One of the urgent recommendations of GIMP (R7) was the prior determination of cost-sharing arrangements for incursion responses before the detection of an emergency plant pest (EPP). Under current arrangements, R7 is covered as part of the EPPRD process. The cost-sharing arrangements between government and the industry member are determined and agreed to by all parties by a pest categorization process (see Table 2). PHA has recently facilitated informed categorisation processes for four forestry EPPs. Prior knowledge of the likely categorisation of EPPs is a significant consideration for any industry before signing the EPPRD. Although A3P, in association with Australian Forest Growers, has been a member of Plant Health Australia since 2004/05 the plantation timber industry is not actually a signatory to the EPPRD.

Conclusions

The GIMP recommendations more specific to forestry were not adopted or did not operate well. The reality is that a more generic integrated, national approach to biosecurity for plant industries has been developed in the past decade, facilitated by the creation of PHA as an independent co-coordinating body.

At the same time, specialist forest health expertise, particularly in state forestry departments, has declined. This means that greater communication and increased interaction between the forest industry and biosecurity agencies is required at the same time as the capacity to do this is decreasing. Serious consideration should be given to the adequacy of forestry representation in the one biosecurity arrangements and strategies to enhance the effective integration of forestry with state and national one biosecurity arrangements.

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Appendix 4A: Plant Health Australia (PHA)

PHA is a national co-ordinating body for plant health in Australia that was established in 2000. It assists industry bodies in the preparation of biosecurity plans and works with government, industry and researchers to improve biosecurity policy and practice, particularly in surveillance and diagnostics, and to build capacity for responding to incursions of EPPs. A full description of Australia's plant biosecurity system is presented in the 'National Plant Health Status Report 2008/2009' available from Plant Health Australia's website.

PHA is funded by member levies and also obtains government and industry funding for specific projects. PHA is represented on PHC and the Sub-committee for Plant Health Diagnostic Standards.

PHA maintains the Pest Information Document Database (PIDD) and the Australian Plant Pest Database (APPD). PIDD is a freely accessible, on-line database of pest risk reviews, contingency plans, diagnostic protocols and fact sheets. Contingency plans relevant to forestry include Asian Gypsy Moth (*Lymantria dispar*), Sudden Oak Death (*Phytophthora ramorum),* Guava rust (*Puccinia psidii)* and Citrus Longicorn beetles (*Anoplophera chinensis*). APPD provides validated specimen records of insects and pathogens related to plant health from 19 reference collections throughout Australia.
On the 25th May 2010 PHA released its National Plant Health Strategy. This has been a project facilitated by PHA on behalf of Members that has sought to gather wide-scale input from stakeholders in the national plant health system. It lays out a blueprint for securing improvement in performance of the system and tackling the most pressing challenges that are being experienced now and which are expected to be faced over the next 10 years. This strategy highlights the human resources in decline. CSIRO (2008) estimate 50% of Australia's biosecurity diagnostic expertise will be lost by 2028. The strategy document also cites a recent review by Kruger (2009) which identified a number of short comings in many of the programs run by governments and industry aimed at engaging community stakeholders on biosecurity issues. These short coming of particular relevance to forest biosecurity include a lack of:

- coordination of biosecurity engagement activities
- effective collaboration and networking between government at all levels, industry and community groups
- trust between stakeholders at all levels, from government down to individuals
- inclusion of various stakeholders in engagement processes and practices
- identification of target groups
- two-way communication
- relevance of messages and activities to community needs, including appropriate
- communication of scientific knowledge to non-experts
- communication on pests and diseases that are difficult to identify
- face-to-face communication between biosecurity agencies and communities
- monitoring, feedback and evaluation of programs

Appendix 4B: A Summary of the Plantation Timber Industry Biosecurity Plan

NB: *This plan requires updating due to significant changes in state and national biosecurity systems, the forest industry, biosecurity and forest health personnel, and the status of specific biosecurity threats to forestry. Some of the outdated material has been omitted; some has been included in the summary and attention is in some cases drawn to the fact that updating is required.*

The Plantation Timber Industry Biosecurity Plan (PTIBP) version 1 2007 was developed by Plant Health Australia (PHA) in partnership with the Australian Plantation Products and Paper Industry Council (A3P), and all State and Territory governments. Future versions will involve further industry consultation with potential new Members which may broaden the scope of the Plan. The PTIBP can be downloaded free from the PHA website (http://www.planthealthaustralia.com.au/index.cfm?objectid=56547115-DBF6-1148-86F827B842E1265F).

Biosecurity planning provides a mechanism for the plantation timber industry, government and other relevant stakeholders to actively determine pest threats, analyse the risks, and put in place procedures to:

- reduce the chance of pests reaching our borders, and
- minimise the threat if a pest incursion occurs.

The PTIBP contains 5 sections – 1. Introduction; 2. Threat identification, pest risk reviews and incursion management funding arrangements; 3. Risk mitigation plan; 4. Contingency plans and response management arrangements; and 5. Awareness material.

Section 1 provides a brief introduction to the timber plantation industry and to biosecurity concepts. It details the main species grown in Australian tree plantations, the area planted to each species, and the volume and value of annual production. This section requires updating as much has changed over the last years.

With the assistance of the A3P and Australian Forest Growers (AFG), an Industry Biosecurity Group (IBG), coordinated by PHA, was formed to work on the development of a national biosecurity plan for the plantation timber industry. The IBG included representatives from plantation timber industry companies and associations in each relevant State/Territory, as well as representatives from relevant State/Territory agriculture agencies, the Australian Government, and PHA (Table B1). The pre-border, border and post-border elements of the biosecurity continuum are outlined in Table B2**.**

A generic incursion management plan (GIMP) for the plant industries is shown in Figure B1. However, differences relevant to biosecurity exist between plantation forestry and most other plant industries. These include:

- the scale of most plantation operations,
- the high level of State Government plantation ownership,
- the life of the plantation crop,
- the widespread use/existence of the crop plants (trees) in the natural environment and the community and,
- the plantation industry's major product, wood, is subject to attack by plant pests throughout its serviceable life of up to many decades.

Table B1: Members of the Industry Biosecurity (needs updating)

Name	**Organisation**
Mr Neil Fisher	A3P
Mr Richard Stanton	A3P
Mr Warwick Ragg	Australian Forest Growers
Dr Charlma Phillips	ForestrySA
Mr Robert Eldridge	NSW Department of Primary Industries
Mr Richard Walker	NSW Department of Primary Industries
Mr Dick Bashford	Forestry Tasmania
Dr Caroline Mohammed	ENSIS Forest Biosecurity and Protection Australia *
Dr Darren Kriticos	ENSIS Forest Biosecurity and Protection New Zealand*
Mr Martin Fuller	Hancock Victorian Plantations
Mr Ian Smith	Department of Sustainability and Environment, Victoria
Mr Mark Ross	Biosecurity New Zealand
Mr Karol Andrzejewski	Department of Agriculture, Fisheries and Forestry – Australian Government
Dr Mike Cole	Department of Agriculture, Fisheries and Forestry – Australian Government
Mr Alan Seymour	Forest Products Commission, WA
Ms Emily Silberberg	Integrated Tree Cropping Ltd
Dr Cheryl Grgurinovic	Department of Agriculture, Fisheries and Forestry – Australian Government
Mr Stuart Smith	Department of Primary Industry, Fisheries and Mines, NT
Dr Ross Wylie	Department of Primary Industries and Fisheries, Qld
Dr Glen Kile	Forest and Wood Products Research and Development Corporation*
Mr Jack Simpson	Department of Agriculture, Fisheries and Forestry – Australian Government
Mr Rodney Turner	Plant Health Australia
Ms Debra Eaton	Plant Health Australia

* indicates affiliations that have changed since the IBP was developed.

Table B2: Industry biosecurity: a shared responsibility

<table>
<tr><th>PRE-BORDER</th><th>BORDER</th><th>POST-BORDER</th></tr>
<tr><td>Identifying exotic pest threats.</td><td>Implementing effective quarantine for people, machinery, plants, and goods.</td><td>Minimising risk of regional and property entry and establishment.</td></tr>
<tr><td>Managing quarantine risks offshore.</td><td rowspan="2">Establishing trapping and surveillance networks for pests that may bypass checkpoints.</td><td rowspan="2">Preparing for timely detection, containment to minimise spread (and where possible, aim for eradication) and rapid response to emergency pests.</td></tr>
<tr><td>Undertaking offshore research and development where pests are endemic.</td></tr>
<tr><td colspan="3">Achieved through effective partnerships between industry, government and the community</td></tr>
</table>

Section 2 deals with threat identification, pest risk reviews and Incursion-management funding arrangements. It provides guidelines for the identification and rating of biosecurity threats. Rating is based on the probabilities of entry, establishment and spread in Australia, the likely impacts on production and market access and the difficulty of control and/or eradication. Information on potential Emergency Plant Pests (EPPs) was collated from past records, existing industry protection plans, industry practice, experience and research (both local and overseas), public literature, economic models and specialist and expert judgement. Appendix 1 of the PTIBP provides Threat Summary Tables for 43 potential EPPs, including 26 invertebrates and 17 pathogens. Weeds have not been included in this version of the IBP but may be considered for future versions. Pests were ranked by RWG-7 and a priority list developed (Table B3).

In addition to those listed, the European house borer, *Hylotrupes bajulus*, is currently under active control in Western Australia. This borer primarily attacks softwood timbers including dead branches and stumps. It has entered Australia on several occasions but has been eradicated previously.

Guidelines for conducting Pest Risk Reviews are provided, largely following Biosecurity Australia (2001) but with slightly greater scope. The first requirement is to accurately identify the pest, usually to species level but broader or narrower definitions may be appropriate in some instances. In the latter case, distinction at a level below species must be supported by evidence. Likelihoods of entry, establishment and spread are estimated. Economic, environmental and social impacts are assessed individually and then combined with likely consequences at local to national scales to provide an impact score. Pest Risk Reviews for six of the potential EPPs are included in the IBP.

Funding Arrangements: An Emergency Plant Pest Response Deed (EPPRD) has been negotiated between the Australian Government and industry members of PHA that determines the source of funding for a response to an EPP. EPPs are categorised and costs shared between industry and government according to the relative impacts on commercial crops, natural ecosystems, amenity flora and human health (Table B4). The plantation industry, represented by A3P and AFG has not signed the Emergency Plant Pest Response Deed (EPPRD).

Table B3: Priority EPPs for the plantation timber industry. An asterisk indicates that a pest risk review is included in the appendix to this section of the IBP.

Common name	Scientific name	Primary Host	Comments
Pinewood nematode species complex*	*Bursaphelenchus* spp.	*Pinus* spp. (roots and stems)	Vectored by Japanese sawyer beetle
Subterranean termites*	*Coptotermes* spp.	Living and dead trees (woody parts), timber, paper.	Wooden packaging, containers and boats.
Powder post beetle*	*Lyctus africanus*	Hardwoods (sapwood of wide-pored hardwoods with >3% starch)	Frequent border interceptions.
Gypsy moth complex (including Autumn Gum Moth, AGM)	*Lymantria dispar*	Over 600 species, includes *Eucalyptus* and *P. radiata*	AQIS inspection regime (vessels visiting Russian far East in AGM flight season) needs to be extended to Japan, Korea and China.
Longhorn beetles*	*Monochamus* spp.	*Pinus* spp., spruce, fir; wood, fruits, pods, leaves and stems.	Three species, widespread through Asia, Europe and North America, are vectors of pine wood nematode.
Drywood longicorn beetle*	*Stromatium barbatum*	> 300 tree species, includes bamboos, wood in service.	Frequent border interceptions
Western gall rust*	*Endocronartium harknessii*	Two-needle pines (includes *P. radiata*); branches, stems, seedlings	Likely pathways include nursery stock, timber and wood packaging.
Pine pitch canker	*Fusarium circinatum*	Pines and Douglas Fir; trunks, branches, exposed roots and seedlings.	May be symptomless for an unknown period.
Sudden oak death	*Phytophthora ramorum*	Many species, stems, twigs, branches and leaves.	
Eucalyptus (guava) rust	*Puccinia psidii*	Many species of Myrtaceae, includes *Eucalyptus, Syzygium* and *Callistemon* species; leaves, shoots, young branches.	Regional engagement and strategies required.

Table B4: Categories of EPPs for funding of emergency responses.

Category	**Description**	**Funding Share**
Category 1: Very high public benefits	Pest which if not eradicated would: cause major environmental damage to natural ecosystems, and/or potentially affect human health or cause a major nuisance to humans, and/or cause significant damage to amenity flora, and/or have relatively little impact on commercial crops.	100% public funding
Category 2: High public benefits	Pest which if not eradicated would: cause significant public losses either directly or indirectly, and also impose major costs on the industries concerned.	80% public funding, 20% private funding
Category 3: Moderate public benefits	Pest which if not eradicated would: primarily harm the industries concerned but there would also be some significant public costs.	50% public funding, 50% private funding.
Category 4: Mostly if not wholly private benefits	Pest which if not eradicated would: have little or no public cost implications and little or no impacts on natural ecosystems. The affected industries would be affected primarily through additional costs of production, and there would be no significant trade issues that would affect national and regional economies.	80% private funding, 20% public funding

Categorisation of EPPs is the basis of the cost-sharing arrangement between industry and government. Signatories to the EPPRD may put forward exotic organisms for categorisation. Organisms that enter Australia but which have not been formally categorised will be treated as Category 3 (Table B4) until formally categorised. This task is performed by a Categorisation Group, which will include an independent chair from PHA, a standing representative of industry parties, three technical experts (one nominated by the Australian government, one by the States/Territory governments and one by plant industry), a nominee from each affected plant industry and a person with relevant economic expertise including social, trade and regional impact assessment. Where needed, advice may also be sought from a person with human health expertise or a conservation representative or any other member determined by the independent chair. A pest categorisation decision tree is included (Figure B2).

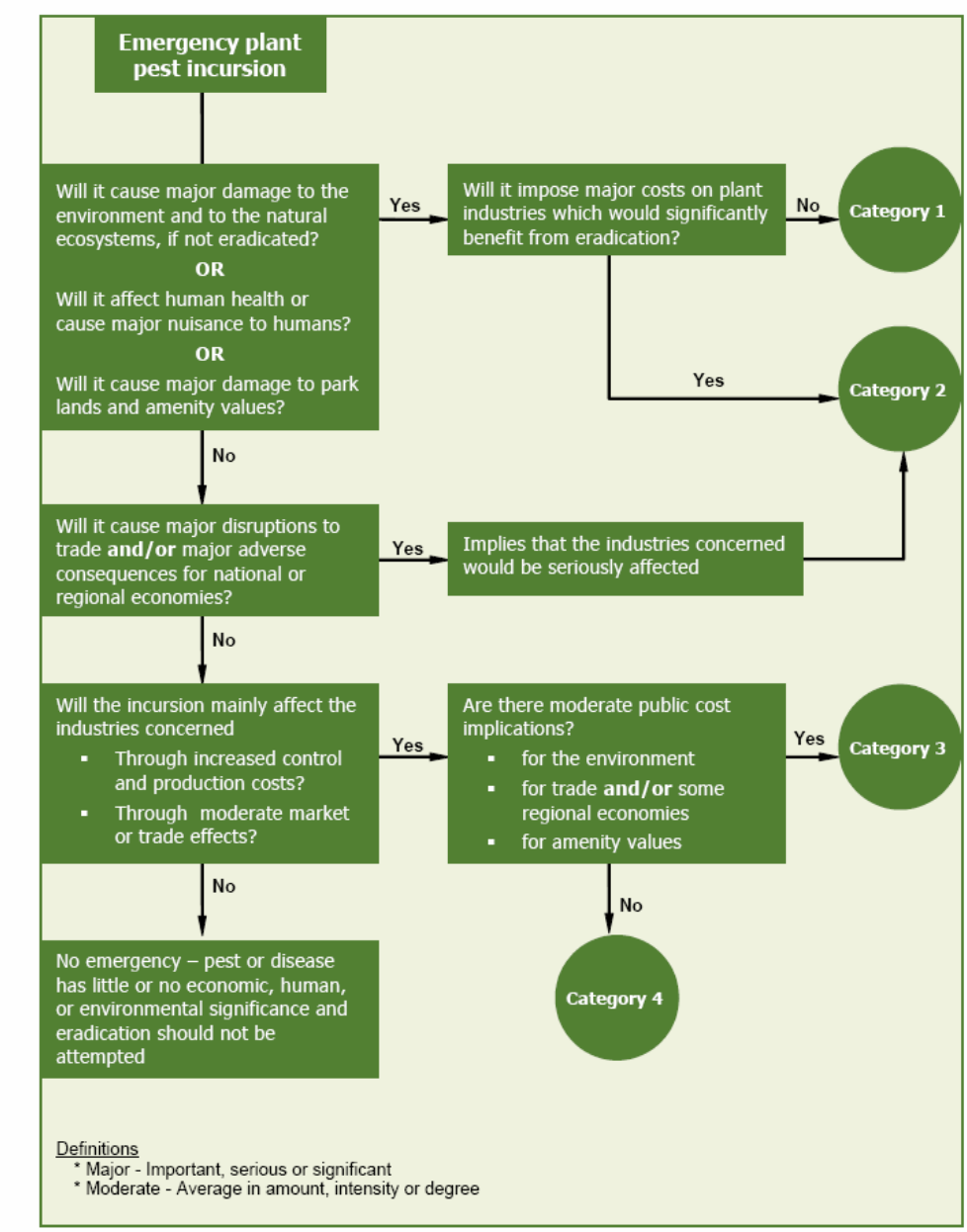

Figure B2: Decision tree for use by the Categorisation Group in categorisation of EPPs.
Section 3 is about risk mitigation planning at national, state and plantation level. Risk mitigation activities and the bodies responsible are listed (Table B5). Barrier quarantine should be implemented at national, state, regional, plantation estate and individual stand levels.

The Department of Agriculture, Fisheries and Forestry (DAFF) assumes responsibility at the national level. Biosecurity Australia (BA, a part of DAFF) conducts Import Risk Analyses to determine which products may enter Australia, and under which import conditions and also negotiates quarantine conditions for import of Australian animals and plants into other countries. National quarantine is administered by the Australian Quarantine and Inspection Service (AQIS, also within DAFF) at all international ports and in the Torres Strait. Importaton of germplasm (seed, cuttings, tissue cultures), nursery stock, sawn timber, roundwood, logs, manufactured wooden articles, other forest products as well as timber packaging and dunnage is regulated. Import requirements are provided in an online database,

ICON (www.aqis.gov.au/icon). More information is available at www.aqis.gov.au or by calling (02) 6272 3933 or 1800 020 504.

Table B5: Risk mitigation strategies and the agencies responsible for implementation.

Activity	**Responsibility**
Movement restrictons - national	Australian government
Movement restrictons - state	State and Territory governments
Movement restrictons - regional	State and Territory governments
Selection and preparation of appropriate planting material	Australian government, State and Territory governments, industry and growers.
Selecting appropriate cultivars	State and Territory governments*, industry and growers.
Use of chemical controls	Industry – drawing on advice from government and non-government research agencies
Control of vectors	Industry – drawing on advice from government and non-government research agencies
Control of alternative hosts and weeds	Industry – drawing on advice from government and non-government research agencies
Destruction of harvest residue	Industry – drawing on advice from government and non-government research agencies
Neglected timber plantation stands and trials	Government and industry
Transport procedures for timber products and planting material	Industry – drawing on advice from government and non-government research agencies
Use of warning and information signs for biosecurity awareness	Industry
Use of dedicated equipment in high risk areas	Industry, state and territory governments
Restricting the use of high risk vehicles during high risk times	Industry
Reporting suspect pests to appropriate authorities	Industry/growers
Including biosecurity in plantation management systems, environment management systems and sustainable forest management certification schemes	Industry
Silvicultural practices – thinning, maintaining nutrition, reducing competition, etc.	Industry
National surveillance programs	Australian government, industry (national associations)
State surveillance programs	State and Territory governments, industry/growers
Individual grower surveillance activities	Industry/growers

*Victoria is currently the only state with legislation (the Plant Health and Plant Products Act 1995) that provides the ability to restrict plant varieties grown in control areas.

Each of the States and Territories has quarantine legislation to control the importation of plant material and to manage agreed pests if an incursion occurs (Table B6). Specific pest threats are regularly reviewed and updated by the Domestic Quarantine and Market Access Working Group (DQMAWG). Movement of logs, unprocessed sawn timber, seedlings, seed and other tree parts interstate requires a permit from the appropriate State authority (Table B6). State quarantine manuals for interstate and inter-regional movement of plant materials are available on the websites of each state authority. Further advice can be obtained by calling the State or Territory agriculture agency or the Quarantine Domestic Hotline on 1800 084 881.

Table B6: Controls on interstate and inter-regional movement of trees. Asterisk indicates legislation under review (in 2006) that may subsequently have been replaced.

State	Legislation	Administering Authority
ACT	Plant Diseases Act 2002	Department of Territory and Municipal Services http://www.environment.act.gov.au/
NSW	Plant Diseases Act 1924	NSW Department of Primary Industries http://www.dpi.nsw.gov.au/
NT	Plant Diseases Control Act	Department of Primary Industries, Fisheries and Mines http://www.nt.gov.au/dpifm/
Qld	Plant Protection Act 1999; Diseases in Timber Act 1975*; Diseases in Timber Regulation 1997*	Department of Primary Industries and Fisheries, Queensland http://www.dpi.qld.gov.au/
SA	Fruit and Plant Protection Act 1992	Primary Industries and Resources, South Australia http://www.pir.sa.gov.au/
Tas	Plant Quarantine Act 1997	Department of Primary Industries and Water, Tasmania http://www.dpiw.tas.gov.au/
Vic	Plant Health and Plant Products Act 1995	Victorian Department of Primary Industries http://www.dse.vic.gov.au/
WA	Plant Diseases Act 1914 and Regulations 1989, Agriculture and related Resources Protection Act 1976 (Biosecurity and Agriculture Management Act 2007)	Department of Agriculture and Food, Western Australia http://www.agric.wa.gov.au

Current quarantine legislations provide the basis for regulating movement of forest products between regions within a State. Permits may be required from the appropriate authority (Table B6).

In Queensland, the Timber Utilisation and Marketing Act controls the sale and use of lyctid-susceptible timber. Restrictions are also in place that limit the movement of *Pinus* species bark outside of the designated pest quarantine area for *Ips grandicollis* (five-spined bark beetle).

There are no intrastate restrictions in SA, though individual companies have internal standard practices. *Pinus* spp. plants imported into SA must be accompanied by a Plant Health certificate, or equivalent, declaring freedom from *Dothistroma* needle blight.
WA currently restricts movement of pine wood into and out of the designated restricted movement zone for European House Borer. These restrictions are detailed in the Agriculture and Related resources protection (European House Borer) Regulations 2006.
Even where a specific risk has not been identified, exclusion activities mitigate potential spread of undetected pests.

Surveillance, awareness and training are important risk mitigation activities as early detection will increase chances of successful eradication and reduce costs of management programs. Health surveys of timber plantations are required to support claims of area freedom under the World Trade Organisation's SPS agreement, though no international standards exist for structured pest surveys. Surveillance may be targeted towards specific pests, or non-targeted. Industry personnel can provide effective general surveillance as part of their normal activities, if they are aware of what to look for and of reporting procedures. Promoting community

awareness and reporting should also be encouraged. Awareness activities range from posters and information sheets to field days and professional courses. Such programs should include reporting procedures for unusual symptoms.

AQIS, as part of the Northern Australian Quarantine Strategy (NAQS) surveys the northern coast of Australia, offshore islands and neighbouring countries for exotic pests that may have bypassed quarantine services at ports. State level surveillance depends on co-operation of all stakeholder groups. Each State has its own program of plantation surveillance (Table B7). Lists of the notfiable pests for each state are included (Tables B8, B9), though the notifiable pathogen list for WA was under review at the time of compilation and will be added to a later version of the IBP. Some states have a rather short list of notifiable pests but additional pests are targetted for surveillance e.g. Victoria surveys for Asian longicorn beetle though this is not on their list of notifiable pests and Queensland surveys for *Eucalyptus* rust though this is not listed as a notifiable pest in Queensland.

Grower responsibilities include implementation of surveillance on properties, maintaining records of surveillance, attending training and providing awareness training to staff, reporting of suspect pests and ensuring identification materials and sampling kits are available to staff. Industry representative groups may contribute to many of these activities. A biosecurity checklist of nine questions for plantation owners and managers is included.
Suspected exotic plant pests should be reported immediately to the Exotic Plant Pest Hotline on 1800 084 881. Material should not be moved or collected before receiving advice from the relevant State/Territory department. For ”notifiable pests”, there is a legal obligation to notify the Chief Plant Health Manager in the relevant State/Territory.

Table B7: Plantation surveillance programs in each State/Territory.

State	Surveillance Program
ACT	Annual surveillance and control program for *Sirex noctilio* wasp is also used to monitor forest health.
NSW	Annual surveys by NSW DPI. The *Sirex* nematode biological control program is monitored annually by tree traps. A pheromone trap program for Asian Gypsy moth is maintained by DPI. Urban Hazard Site Surveillance program is under review.
NT	No information available.
Qld	Hazard site surveillance program targeting bark beetles, longicorn beetles, siricid wood wasps, ambrosia beetles, Asian gypsy moth and Eucalyptus rust. Sentinel plantings of *Pinus caribaea, Swietenia macrophylla, Toona ciliata, Endospermum medullosum, Santalum* sp., *Psidium guajava, Eucalyptus* spp., *Erythrina variegata* to target foliar pests of pine, whitewood, sandalwood, Mahogany shoot borer, Eucalyptus rust and *Erythrina* gall wasp. Pest and disease surveillance of exotic *Pinus* spp. by QGC and FPQ, including trap tree program for *Sirex.*
SA	Border (WA) surveillance for European house borer. Annual surveillance and control program for *Sirex* wasp is also used to monitor forest health, followed up by ground crews if alerted to other health problems.
Tas	Urban Hazard Site Surveillance for exotic timber pests for 6 months each year at all international ports and airports. Sentinel trees at ports and airports. Annual monitoring of all softwood plantations for *Sirex* using static traps and trap trees.
Vic	Hazard site surveillance program targeting Asian longhorn beetle, Asian gypsy moth, drywood longicorn beetle, Eucalyptus rust, European house borer, European spruce bark beetle, Pine pitch canker, Powderpost beetle and *Phytophthora ramorum.*
WA	FPC maintains surveillance for *Sirex* using trap trees. Surveillance and eradication of European house borer. FPC and industry carry out general health surveys rather than targeted surveys for exotic

	pests.

Table B9: List of notifiable pests (invertebrates) for each State.

Pest	Latin name	NSW	NT	QLD	SA	TAS	VIC	WA
Puriri moth	*Aenetus virescens*							Y
Wireworm	*Agriotes lineatus*							Y
Turnip moth	*Agrotis segetum*							Y
Asian longicorn beetle	*Anoplophora glabripennis*							Y
Mulberry longhorn beetle	*Apriona germari*							Y
Soyabean leafroller	*Archips micaceanus*							Y
European leafroller	*Archips rosana*							Y
Burnt pine longhorn beetle	*Arhopalus ferus*							Y
Burnt pine longicorns	*Arhopalus ferus tristis*						Y	
Carnation tortrix	*Cacoecimorpha pronubana*							Y
West Indian dry wood termite	*Calotermes pseudobrevis*							Y
Florida wax scale	*Ceroplastes floridensis*							Y
Tortoise wax scale	*Ceroplastes japonicas*							Y
Citrus locust	*Chondracris rosea*							Y
	Clisiocampa astriata							Y
Formosan termite	*Coptotermes formosanus*		Y				Y	
Dry wood termite	*Cryptotermes brevis*		Y	Y				Y
Drywood termite	*Cryptotermes domesticus*							Y
Chestnut weeveil	*Curculio elephas*							Y
	Curculio orientalis							Y
Chestnut moth	*Cydia fagiglandana*							Y
Chestnut tortrix moth	*Cydia splendana*							Y
Mountain pine beetle	*Dendroctonus ponderosae*						Y	
Red turpentine beetle	*Dendroctonus valens*							Y
Oystershell scale	*Diaspidiotus ostreaeformis*							Y
white scale	*Diaspis lanatus*							Y
Wheat thrips	*Haplothrips tritici*							Y
Powder post beetle	*Heterobostrychus aequalis*						Y	
African black beetle	*Heteronychus arator*					Y		
White grub	*Holotrichia serrata*							Y
European house borer	*Hylotrupes bajulus*	Y	Y			Y	Y	Y
American white moth	*Hyphantria cunea*							Y
Golden dust weevil	*Hypomeces squamosus*							Y
Tropical nut borer	*Hypothenemus obscures*							Y
Western drywood termite	*Incisitermes minor*							Y
Five-spined bark beetle	*Ips grandicolis*			Y				
Eight-toothed bark beetle	*Ips typographus*						Y	
Fig oystershell scale	*Lepidosaphes conchiformis*							Y
June beetle	*Leucopholis irrorata*							Y
Tarnished plant bug	*Lygus lineolaris*							Y
Gypsy moth	*Lymantria dispar*						Y	Y
Nun moth	*Lymantria monacha*							
Forest tent caterpillar	*Malacosoma disstria*						Y	
Lackey moth	*Malacosoma neustria*							Y
Kalotermitid	*Microtermes obesi*							Y
Oriental pear moth	*Monema (Miresa) flavescens*							Y

Table B9 cont.: List of notifiable pests (invertebrates) for each State.

Pest	**Latin name**	**NSW**	**NT**	**QLD**	**SA**	**TAS**	**VIC**	**WA**
Spider mite	*Oligonychus biharensis*							Y
Winter moth	*Operophtera brumata*							Y
European tussock moth	*Orgyia antiqua*							Y
White spotted tussock moth	*Orgyia thyellina*							Y
Rough strawberry weevil	*Otiorhynchus rugosostriatus*							Y
Black vine weevil	*Otiorhynchus sulcatus*							Y
Cherry brown tortrix	*Pandemis cerasana*							Y
European fruit lecanium scale	*Parthenolecanium corni*							Y
Meadow froghopper	*Philaenus spumarius*							Y
Carnation moth	*Platynota stultana*							Y
	Polyphylla laticollis							Y
Japanese beetle	*Popillia japonica*							Y
Peach white scale	*Pseudaulacaspis pentagona*							Y
Peach white scale	*Pseudaulacaspis pentagona*							Y
Citrophilus mealybug	*Pseudococcus calceolariae*							Y
Downey snowline mealybug	*Rastrococcus iceryoides*							Y
Black vine thrips	*Retithrips syriacus*							Y
Elm bark beetle	*Scilytus multistriatus*					Y		
Sirex wasp	*Sirex noctilio*			Y				Y
Cotton leafworm	*Spodoptera littoralis*							Y
Dry wood longicorn beetle	*Stromatium barbatum*						Y	
Wood wasp	*Uroceras gigas*						Y	
Hoop pine weevil	*Vanapa oberthuri*						Y	
Dagger nematode	*Xiphinema* spp.					Y		
Ambrosia beetle	*Xyleborus dispar*							Y
Wood leopard moth	*Zeuzera pyrina*							Y
Variegated grasshopper	*Zonocerus variegates*							Y

Table B10: Notifiable pathogens for each state, except WA. The list of notifiable pathogens for WA was being reviewed at the time of compilation of the IBP and was to be added later.

Pest	Latin name	NSW	NT	QLD	SA	TAS	VIC
Armillaria root rot	*Armillaria mellea*						Y
Oak wilt	*Ceratocystis fagacearum*						Y
Dutch elm disease	*Ceratocystis ulmi*	Y					
Eucalyptus stem canker	*Coniothyrium zuluense*						Y
Pine rusts	*Cronartium* spp.						Y
Chestnut blight	*Cryphonectria parasitica*	Y					Y
Root rot	*Cylindrocladium scoparium*						Y
Needle blight	*Dothistroma pini*				Y		
Western gall rust	*Endocronartium harknessii*						Y
Pine rusts	*Endocronartium* spp.						Y
	Fomes spp.					Y	
Pitch canker	*Fusarium circinatum*						Y
	Ganoderma applanatum					Y	
Scleroderris canker	*Gremmeniella abietina*						Y
Annosus root and butt rot	*Heterobasidion annosum*						Y
Blue gum mycosphaerella	*Mycosphaerella juvenis*						Y
European canker	*Nectria galligena*						Y
Dutch elm disease	*Ophiostoma himal-ulmi*						Y
Dutch elm disease	*Ophiostoma novo-ulmi subsp americana*						Y
Dutch elm disease	*Ophiostoma novo-ulmi subsp novo-ulmi*						Y
Dutch elm disease	*Ophiostoma ulmi*						Y
Black stain root disease	*Ophiostoma wageneri*						Y
	Phytophthora fallax						Y
	Phytophthora gonapodyides					Y	
Phytophthora rot	*Phytophthora kernoviae*						Y
Sudden oak death	*Phytophthora ramorum*	Y					Y
	Phytophthora spp.,						Y
Eucalyptus rust	*Puccinia psidii*						Y
Casuarina blister bark	*Trichosporum vesiculosum*						Y

For **Section 4** which describes contingency plans and response management, PLANTPLAN is the overarching document used for detailing general procedures, management structures and information flow for dealing with incursions of EPPs. The current (legal) copy of PLANTPLAN is available from the PHA website (www.planthealthaustralia.com.au/plantplan). The Generic Incursion Management Plan (GIMP) for the Australian Forest Sector (Gadgil, 2000) was consulted in the development of PLANTPLAN.

A3P will be the key industry contact point in the event of a pest incursion affecting the plantation timber industry and will be responsible for industry communications and media relations. Contacts for counselling support and financial counselling services are provided for each state.

Information sources (most are freely available internet resources) are listed for 33 pests identified as priority pests for the plantation timber industry. Fact sheets are included for Eucalyptus rust (*Puccinia psidii)*, Asian gypsy moth (*Lymantia dispar)*, Pine pitch canker (*Fusarium circinatum)* and Sudden Oak Death (*Phytophthora ramorum).*

1. In the past there has been no formal notification required for a species that we believe to be an endemic. BQ would now like to report on these, particularly if it is a new record or new location. The communication channels with the CPPO are reasonably good and improving.
2. SARDI has a reference insect collection as does the state museum. There is good communication between the forest health expert and these organisations and Biosecurity SA.
3. the notificaiton procedure is outline in Plant Plan. Because Tasmania is small and the CPPO is well known there are unlikely to be any problems in notification.
4. Plant Quarantine Act specifies that any suspected threats be reported to the Inspector,, but I don't know who he/she is but presume is a DPIPWE officer.
5. No formal notification links for unknown / undescribed specimens. We spend little time attempting diagnosis of putative pathogens so discovery of unknown / undescribed specimens will get little chance of discovery unless damage is significant.
6. Suspect specimens are communicated to the State Chief Plant Protection Officer when results are confirmed.
7. There is no formal communication process for this situation

Appendix 4C: The Beale Report

A major review of biosecurity was undertaken in 2008, with the panel's findings and recommendations tabled as the Beale Report (http://www.quarantinebiosecurityreview.gov.au/report_to_the_minister_for_agriculture_fisheries_and_forestry , accessed 10/03/08). This report recommended a restructuring of the Commonwealth biosecurity agencies, a seamless integration of state and federal agencies, and greater federal funding; both for everyday functioning and to provide the IT infrastructure required for the integration of agencies and improved auditing. Biosecurity agencies are consequently undergoing a period of re-organisation. A brief summary of the recommendations is provided here.

At the heart of the Panel's recommendations is the reiteration and strengthening of the three core principles enunciated in the Nairn Report:

- the importance of having an integrated biosecurity continuum involving risk assessment and monitoring, surveillance and response pre-border, at the border and post-border;
- risk assessment reflecting scientific evidence and rigorous analysis; and
- shared responsibility, between the Commonwealth and state governments, and between businesses and the general community.

The aim of the recommendations is the development of a seamless biosecurity system that fully involves all participants pre-, border and post-border, with the slogan 'One Biosecurity: a working partnership'. Integration of the Commonwealth's biosecurity activities in a dedicated statutory agency – the National Biosecurity Authority – will provide the necessary co-ordination and focus on managing biosecurity risks. The recommendations are based on the principle that zero biosecurity risk is unattainable and undesirable. The primary objective must be the safe movement of animals, plants, people and cargo to and from Australia with the emphasis on managed risk, not zero risk. Strategies should be based on risk-return. Some pest and disease incursions are inevitable and must be managed. This implies a need for the capacity to mount an effective response to incursions of pest and diseases.

The Constitutional powers of the Commonwealth allow for greater responsibility than that which is currently assumed. It is proposed that the Commonwealth should extend its role beyond border security and form a more integrated partnership with the states. Areas in which the Commonwealth is anticipated to play a greater role are:

- enforcing import permit decisions across all states
- developing traceability schemes for imported plant and animal matter
- managing emergency responses where sensible
- harmonising biosecurity requirements for interstate trade
- information sharing between jurisdictions.
- Increased resources are needed for pre-border risk management and post-border monitoring, surveillance and management of national priority exotic pests and diseases.

The panel concluded that current organisational structures are sub-optimal and do not support a clear role for the Australian Government or Parliament. They recommended a re-structuring, with the establishment of an independent statutory authority, the National Biosecurity

Authority (NBA), to assume the functions currently undertaken by AQIS, BA, part of PIAPH, OCVO and OCPPO (Table C1 and Figure C1). This would preferably be established under the *Financial Management and Accountability Act 1997.* The Minister responsible would not have the power to influence the process or outcome of an individual Biosecurity Import Risk Analysis, but would be empowered to set the Appropriate Level of Protection. Under the proposed model, the head of the NBA, the Director of Biosecurity, would also be a member of the National Biosecurity Commission, an expert decision-making panel of 7-9 members that would undertake Biosecurity Import Risk Analyses, supported by staff from the NBA. Another new statutory appointment, the Inspector General of Biosecurity, with administrative support from DAFF, would report directly to the Minister and be responsible for audits and reviews of the National Biosecurity Authority.

The replacement of the Quarantine and Exports Advisory Council with a Biosecurity Advisory Council was also proposed, with a broader remit reflecting the move from quarantine to biosecurity. Membership would be non-representative, expertise-based and drawn from Commonwealth and state governments, business and non-government organisations.

New legislation, replacing the *Quarantine Act 1908* is recommended, to draw on the full range of the Commonwealth's Constitutional powers and overcome significant problems with the current, outdated legislation. The new Act should be developed in parallel with the negotiation of the new National Agreement on Biosecurity with the states.

Table C1. Proposed functional arrangements

National Biosecurity Commission (includes Director of Biosecurity)	**National Biosecurity Authority**	**Inspector General of Biosecurity**	**Department of Agriculture, Fisheries and Forestry**

Biosecurity Import Risk Analyses and Biosecurity Import Policy Determinations Determinations on state biosecurity controls Determine priorities for Biosecurity Import Risk Analyses Biosecurity policy advice generally Decisions and advice on the Authority's internal audit program	Support for the Commission including in its conduct of Biosecurity Import Risk Analyses and development of Biosecurity Import Policy Determinations Administer Biosecurity Act (including import permit decisions, pre-border and border functions) Export certification Monitoring and surveillance for national priority exotic pests and diseases Emergency response coordination Education and awareness raising	Statutory appointment Independent systems audits of National Biosecurity Authority functions	Non-technical trade and market access negotiations (drawing on technical support from the Authority as needed) PIAPH functions not transferred to the Authority Administrative support for Inspector General of Biosecurity

The establishment of AHA and PHA is recognised as integral to Australia's biosecurity success, in brokering legally binding agreements for sharing of costs and responsibilities in the management of exotic pests and disease. The panel strongly recommended that all industries should be involved in cost-sharing agreements and cautioned against governments socialising the costs associated with emergency responses, or unilaterally accepting risks and responsibilities that should be shared with businesses.

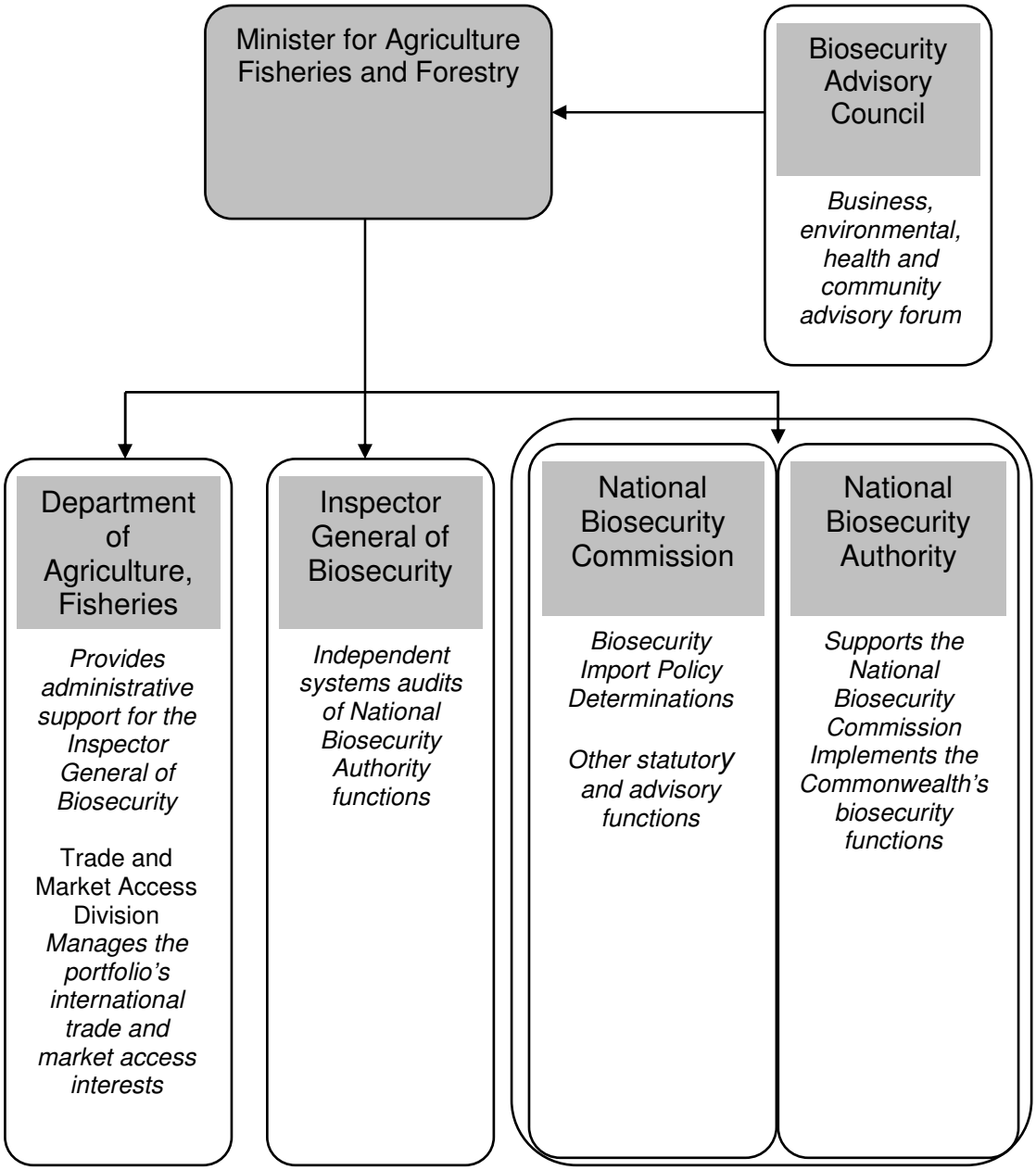

Figure C1: Proposed organisational structure.

It was recognised that environments, both terrestrial and aquatic, have received lower priority than agriculture in the past. The panel concluded that a greater effort is required in these areas.

Greater deterrents and improved education and awareness were recommended to reduce infringements of biosecurity laws. A competent investigative and prosecutorial arm is required for the NBA. Greater emphasis on higher risk areas such as individuals and businesses in peri-urban areas and travellers prior to departing for Australia was advised. Reduced rates of inspection for exemplary practices were also suggested.

Risk management needs to be backed by reliable, constantly updated, strategic intelligence. The NBA should incorporate a strategic intelligence gathering unit that provides information on border interceptions. It should also establish a post-border monitoring and surveillance

program for national priority exotic pests and diseases. This should incorporate and extend NAQS and include surveillance at risk areas around international airports and seaports. A comprehensive system of tracing imported goods is required.

A biosecurity course should be developed and incorporated into the curricula of relevant degrees. This course should be adapted for and delivered to all NBA staff. Better co-ordination of research efforts is also required.

Under-resourcing of agencies was obvious to the panel, which recommended a funding increase of ~$260 million per year. This should be sourced from business through cost recovery and taxpayers through the Commonwealth budget, including the Passenger Movement Charge. The general principle should be that Australians who use or consume high risk, high regulatory cost imports, pay for those costs and exporters who earn income from foreign markets as a consequence of Australian government regulatory services should pay for them. Cost recovery administration should be streamlined. The NBA should consult with business groups and present a cost recovery package to the Minister that includes servicing of infrastructure, principally IT systems.

Each member country of the WTO is entitled to set its own Appropriate Level of Protection. In practice, Australia's definition is not clear and has contributed to a great deal of confusion. This was seen to be the responsibility of the Minister, who should also have the capacity to make Guidelines for the conduct of Biosecurity Import Risk Analyses. Consultation with the states and more widely is advised for both of these processes.

Recommendations regarding the BIRA process include: enhancing the assessment of the consequences of incursions as opposed to their likelihood; including the use of economic analysis in their assessments and strengthening the role of the Eminent Scientists Group. To clear the backlog of market access requests, the NBC should have a capacity to place the onus on the proponent to prepare risk analysis material to an appropriate standard.

Overall, the Beale report recommendations are aimed at streamlining the organisational structures responsible for biosecurity, promoting greater transparency and facilitating co-operation among state and Commonwealth governments and industry. A reliance on more appropriate risk-return analyses and clearer definition of the Ministerial role are also advised.

Appendix 5: Survey of perceived forestry biosecurity strengths and weaknesses

Details of the forest biosecurity survey are given in this appendix.

Survey respondents
People were approached for face-to face interviews or asked to undertake an on-line survey. Each participant got a different set of questions (15-30) (see Appendix 1). These were a mix of qualitative open ended questions and questions requiring a ranking in terms of response. The responses were analysed in a qualitative and quantitative manner.
There were 101 respondents to the survey; 10 face-to-face interviewees and 91 on-line survey participants (see Table 1), though only 58 of these 91 on-line respondents completed the entire set of survey questions. Of the 33 participants who did not fully complete the questionnaire, 13 only filled in the first question (role) and one person filled in the first question and another two multiple choice questions. The remaining 19 completed at least half of the questions.

Appendix 5: Table 1: The number of survey respondents categorised by role.

	Category/Role	Number of interviewees and on-line respondents*
1.	Plant health manager or biosecurity personnel	12
2.	Diagnostic Laboratory Manager	3
3.	Diagnostician	5
4.	Surveillance	0
5.	Quarantine	5
6.	Forest Health	14
7.	State forestry	13
8.	Environmental or conservation organisation	9
9.	Private forestry or other industry	22
10.	Biosecurity policy	12
11.	Other	5

*Although no respondents are categorised as having a surveillance role at least 5 people categorised as role 6 (Forest Health) are also responsible for forest surveillance activities

The detailed responses to the survey are presented for each section of the survey:

Section 1: Level of understanding of structure and administration of biosecurity and how forest biosecurity is dealt with in those arrangements (Qs 3-6)

Appendix 5: Table 2. The most frequently cited issues given as the weakest link in forest biosecurity, broken down according to the role of the respondent.

	***Role of respondent**										
Weakest Link	1	2	3	4	5	6	7	8	9	10	11
Lack of integration/ engagement of forest sector with mainstream biosecurity administration and lack of clear division of responsibilities (16)	7				1	3	2	1	1	1	
Lack or inadequacy of surveillance/early detection (11)		1			1	4	1	1	1	1	1
Decline or lack of forest health capacity/capability (8)	4					1			1	1	1
Forestry sector is not a signatory to the EPPRD (8)	3					1	1			3	
State and federal biosecurity sector (inc. decision-makers such as CCEPP) is composed almost entirely of people with agricultural backgrounds (5)						2	1		2		
Preparedness planning and communications planning (5)					1	2		1	1		
Imports/exports (4)									2	2	
Lack of biosecurity awareness/engagement in the NRM sector and lack of clear division of responsibilities (3)						1	1			1	
Communication and education (3)									3		
Lack of training in biosecurity awareness for operational staff (3)							1		2		
Unsure or didn't answer		1	1		1	1	3	4	3	2	1

*Roles are: 1, Plant health manager or biosecurity personnel; 2, Diagnostic Laboratory Manager; 3. Diagnostician; 4, Surveillance; 5, Quarantine; 6, Forest Health; 7, State forestry; 8, Environmental or conservation organisation; 9, Private forestry or other industry; 10, Biosecurity policy; 11, Other.

Appendix 5: Table 3. The most frequently cited greatest threats to forest biosecurity, broken down according to the role of the respondent.

	Role of respondent*										
Threat	1	2	3	4	5	6	7	8	9	10	11
Pest incursions, unspecified (14)		1					3	1	8		1
Myrtle rust/guava rust/eucalyptus rust (9)	1					1	1		3	2	1
International movement of people, trade, esp. in nursery material, border controls (9)						2	2	1	2	2	
Lack of surveillance capacity, capability and investment (6)						2	1	1	2		
Apathy/lack of focus and/or support from forest industries. Evasion of responsibilities among diverse land managers (5)	2				1	1	1				
Lack of forest health capacity and capability (5)			1			1	1		2		
Decision makers not grasping the national significance of forest biosecurity, low priority given to forest biosecurity by agricultural-focussed agencies (4)			1			1	1			1	
Gypsy moth or other polyphagous insects (4)			1			1	1				1
Delays in implementing emergency responses (4)						2	2				
Sudden oak death (3)	1				1					1	
Lack of vigilance and early reporting by plantation managers (3)					1	1			1		
Lack of integration/ engagement of forest sector with mainstream biosecurity administration and lack of clear division of responsibilities (2)	2										
Unsure/ not answered	0	1	2		2	0	3	3	3	2	

*Roles are: 1, Plant health manager or biosecurity personnel; 2, Diagnostic Laboratory Manager; 3. Diagnostician; 4, Surveillance; 5, Quarantine; 6, Forest Health; 7, State forestry; 8, Environmental or conservation organisation; 9, Private forestry or other industry; 10, Biosecurity policy; 11, Other.

Appendix 5: Table 4. Most frequently cited deficiencies in current system of EPP response, as perceived by different roles in the biosecurity and forest management sectors.

	Role										
	1	2	3	4	5	6	7	8	9	10	11
Deficiencies at all (or most) levels (14)	2					3	1		5	3	
Forest health expertise (9)	3		1			3					2
Diagnostics									1		
Disconnect between forestry sector, biosecurity agencies and environmental agencies (6)	2					2			1	1	
Funding to carry out recommended actions (5)	1					1	1		1	1	
Operational capacity (3)			1			1			1		
Grower, including state and private forestry companies (3)							1		1		1
Forest sector not a signatory to the EPPRD (3)	2					1					
Unsure/not answered	2	1	1		5	1	3	8	3	3	1

*Roles are: 1, Plant health manager or biosecurity personnel; 2, Diagnostic Laboratory Manager; 3. Diagnostician; 4, Surveillance; 5, Quarantine; 6, Forest Health; 7, State forestry; 8, Environmental or conservation organisation; 9, Private forestry or other industry; 10, Biosecurity policy; 11, Other.

Appendix 5: Table 5. Responses to Question 6* - How significant is the role of industry members in CCEPP?

	Role	
Significance	**Plant Health Manager**	**Other**
High	7	1
Medium	2	2
Low		1
Not at all		

*Question only asked of Plant Health managers and those with a role specified as “Other”.

Section 2: Knowledge of, and access to, appropriate expertise (Question 7)

Forest Health expertise has significantly declined (Tables 6a and b).

Appendix 5: Table 6a. Responses to whether forest health capacity has reduced/increased/not changed in the last 10 years, according to respondent's role.

Role of respondent*	Increased	Decreased	No change
1	1	8	
2			
3			
5			
6		13	
7	1	6	1
8			
9	1	12	4
10			
11	1	3	

Appendix 5: Table 6b. Responses to question about if forest health capacity has reduced/increased/not changed in the last 10 years, classed according to respondent's state.

State of respondent	Increased	Decreased	No change
NSW	1	4	
NT		1	
Qld		9	
SA	1	1	
Tas	2	6	2
Vic	1	8	
WA	1	8	3
Federal/ACT		5	

*Roles are: 1, Plant health manager or biosecurity personnel; 2, Diagnostic Laboratory Manager; 3. Diagnostician; 4, Surveillance; 5, Quarantine; 6, Forest Health; 7, State forestry; 8, Environmental or conservation organisation; 9, Private forestry or other industry; 10, Biosecurity policy; 11, Other.

Section 3: Detailed knowledge of State Quarantine Legislation (Q8)

Appendix 5: Table 7. Broad consensus of answers to question 8 (*Does the current (or proposed) state legislation adequately cover interstate forestry related incursions? Are forestry and forest products, including timber, specifically addressed in the legislation?*)

State	Legislation adequate?	Forest products specifically addressed?
ACT		
NSW	Y	N
NT		
Qld	Y	Y
SA	Y	Y
Tas	Y	N
Vic	Y	?
WA		
Commonwealth	Y	Inconsistent among states

Section 4: Operation of PlantPlan (Questions 9-12)

As only two state diagnostic laboratory managers completed the on-line survey, it is difficult to compare corresponding responses. However it is apparent that, for most states, diagnostic services for the plantation/forestry sector are conducted independently of state biosecurity services. Exceptions include Queensland, which lacks a plant health diagnostic laboratory per se, but the forest health team of DEEDI are linked into the state biosecurity organisation, and Tasmania, where Forestry Tasmania's forest health team are also well integrated with the state biosecurity system. Victoria and WA are more reliant on diagnosticians in universities. For at least some pest groups, there appears to be a strong reliance on retired entomologists for accurate diagnosis.

Appendix 5: Table 8. Responses to question 11 (*For the last suspected forest EPP, how well did the EPP response system work?*).

Role of respondent*	Good	Medium	Poor	Not at all
1		6	3	
5		1	2	
6		5	3	2
7	1	1	4	
9		3	6	3
11		2	2	
Total	1	18	20	5

*Roles are: 1, Plant health manager or biosecurity personnel; 2, Diagnostic Laboratory Manager; 3. Diagnostician; 4, Surveillance; 5, Quarantine; 6, Forest Health; 7, State forestry; 8, Environmental or conservation organisation; 9, Private forestry or other industry; 10, Biosecurity policy; 11, Other.

Appendix 5: Table 9. Responses to question 11 (*For the last suspected forest EPP, how well did the EPP response system work?*) classed according to respondent's state.

State of respondent	High	Medium	Low	Not at all
NSW		1	3	
NT		1		
Qld		3	4	1
SA		1		
Tas	1	1	3	1
Vic		4	3	1
WA			3	2
Federal/ACT		4	3	

Appendix 5: Table 10. The most frequently observed gaps in EPP response as perceived by people in different roles in the biosecurity and forestry sectors.

	Role of respondent*										
Apparent gap	1	2	3	4	5	6	7	8	9	10	11
Slow response and apparent inability to make tough decisions - pass the parcel	1	1	1		1	3			4		
Lack of staff and resources			1		2	1	1				
Poor communications						2			1		
Low priority accorded to forest and/or environmental threats							1		2		
Lack of consultation with affected industries						2			1		
Failure to follow existing plans - including PLANTPLAN and contingency plans									2		
Failure to sign the EPPRD	1					1					
A lack of standard diagnostic tests		1				1					

*Roles are: 1, Plant health manager or biosecurity personnel; 2, Diagnostic Laboratory Manager; 3. Diagnostician; 4, Surveillance; 5, Quarantine; 6, Forest Health; 7, State forestry; 8, Environmental or conservation organisation; 9, Private forestry or other industry; 10, Biosecurity policy; 11, Other.

Section 5: Effectiveness of Plant Health Committee in representing sectoral interests (question 13)

Respondents were asked to rank the priority of responses to a various forestry pests and diseases compared to agricultural biosecurity threats. Would answers to these questions alter if the forestry industry was a signatory to the EPPRD?

A mixture of responses was received, most likely depending on the relative importance of affected crops in each state. The seriousness of most of the forestry pests was recognised,

though Karnal Bunt of wheat was accorded highest priority by the majority of respondents. It was also noted that, in practice, co-occurring incursions have been and would be accorded the appropriate level of attention without detracting from the response to the other.

There was divided opinion about the effect of forestry signing the EPPRD, though most respondents indicated that the inclusion of a forestry voice in decision-making processes would contribute to better outcomes for forestry and that a response funded under the EPPRD is highly likely to result in better outcomes than one that is not.

Section 6: Adoption of GIMP recommendations (Questions 14-17, 20-22, 65, 68-71)

South Australia is the only state that maintains such a source of funds for investigation into potential forest EPPs, though other states make funds available as needed.

A variety of opinions were put forward about whether each State should maintain a source of funds, ranging from 'The maintenance of such funds is a good idea and should be implemented for all sectors, not just forestry' to 'Given the large number of priorities across all plant health issues, it would be hard to argue the need for a forest health fund above the need for other issues'. One respondent suggested that private forest industry could also contribute to such a fund. Funding is clearly an issue that can lead to critical delays in responding to incursions and the matter appears to have been a stalemate for at least a decade. Three very different responses were given to the question *"What specialist advice in forest pathology and forest entomology is available to quarantine inspectors*". One indicated that an extensive network of scientists is available; another indicated that the availability of forest specialists is rapidly declining; the third did not consider that regulatory services need 'interfering outside scientists'.

Of the two diagnostic laboratory managers that responded to the question "*Does your agency have adequate access to regional and national collections of forest pests and pathogens?"* one response was positive, the other negative. Diagnosticians were similarly split, whereas most forest health respondents (WG7 members) considered that they have adequate access to local collections at least. A lack of access to specimens of exotic threats, a loss of taxonomic experts and the need for a database of 'experts' were all issues that were mentioned.

The APPD appears to be rarely utilised by forest health workers so most could not say whether the inclusion of forest pests was adequate. One respondent indicated that the records of forest pests in APPD are somewhat limited, another mentioned the usefulness of a different database maintained by the CRC Forestry (how widely available is this database?).

Groups in various States have been formally established to consider issues of forest biosecurity but the process by which these groups operate is very different (as is their effectiveness). Biosecurity Victoria is planning to establish a committee to co-ordinate forest biosecurity issues across all forest ownership groups. Tasmania established a Forest Health Advisory Group (FHAG) a decade or so ago but this lapsed as the terms of reference were too restricted to be useful, currently forest health representatives are included in the biosecurity technical group and the state biosecurity committee. South Australia has recently formed Biosecurity SA.). The Sub-tropical Forest Health Alliance is an informal substitute in Queensland. The forest health surveillance team in NSW is expected to consider forest biosecurity issues. WA also established a FHAG several years ago but it has not met for a few years. It currently has an Industry Pest Management Group concerned with insect pests in

private *Eucalyptus globulus* plantations. Main impediments to establishing these groups are time, money, management support and the diversity of forest tenure.

At the federal level, forest health expertise is located within the biosecurity agency, but this is not the case in most states, where forest health expertise is accessed through a mix of formal and informal linkages. In some cases, these linkages may need strengthening. There is also some reliance upon expertise of people who are now retired.

Pest detection surveys in the environs of ports and hazard sites are done by states and territories. In some cases these may be part funded by the Australian government. There are some surveys undertaken as part of quarantine approve premises requirements and there may be opportunity to better target these actions.

Respondents were not aware of any sentinel plantings. There was little knowledge of what frequency pest detection surveys are carried out in the environs (5km radius) of all ports and hazard sites. NSW conducts surveys at intervals of 6-12 months; one respondent from DAFF indicated surveys are conducted every 3-6 months!

Three different responses were received to a question about whether all imported timber and timber products are examined for the presence of decay and sapstain, with infected material treated appropriately; one yes, one no and the third 'Depending on the accompanying documentation and source of timber but generally most timber imports are examined for the presence of decay and sapstain. If detected the timber is typically treated, re-exported or destroyed.'

Section 7: Specific knowledge of the jurisdictional structures and functions for biosecurity (Questions 18, 19, 23)

A question about how biosecurity matters pertaining to specific sectors are captured for consideration by committee (State Biosecurity committees, PHC, EBC, NBC) was poorly understood. Most respondents considered the relationships among the different committees, rather than how an issue might get to committee level in the first place. RWG7 was mentioned as a sub-committee with particular responsibility for raising forest biosecurity issues, though this does not extend to environmental or conservation forests. PHA, industry and research groups, including research arms of state and territory departments, were also suggested as possible conduits. Tasmania has a biosecurity technical group with members from all sectors, including forestry that reports to the state biosecurity committee.

The overwhelming majority of respondents, both from industry and biosecurity organisations considered that issues are most frequently raised by technical experts. Umbrella organisations are also seen to have a role, but usually after advice from a technical expert.

The question was asked if local forest health experts are familiar with the elements of the larger state and national biosecurity systems e.g. have access to databases and knowledge of the key policy and operational personnel and their responsibilities. The most positive responses came from plant health managers and forest health experts in Tasmania. Elsewhere, and particularly from the viewpoint of private industry, there are clear gaps in communication and understanding of roles and responsibilities.

Section 8: Knowledge of the functional operation of (i) PLANTPLAN, (ii) Plantation Timber Industry Biosecurity Plan, (iii) specific contingency plans (Questions 25-31)

Most forest health experts and state forestry representatives are aware of the reporting requirements as outlined in PLANTPLAN. Private industry representatives were less aware, with less than half indicating that they would contact their state biosecurity organisation or the plant pest hotline. Others would contact forest health experts in state forestry organisations or universities, while some admitted that they did not know who to contact.

Section 9: Integration of biosecurity into business risk management. Qs 32, 57-64, 71-75

Most industry respondents indicated that there was an officer to investigate damage reports (Table 12), however nearly half of the respondents stated that their organisations did not have a biosecurity plan. Forestry Tasmania is the only state forestry organisation with a liaison officer and a biosecurity plan. Conservation forest managers generally have neither in place for forestry. There was marked variation in the responses from the state and private forestry companies about their biosecurity processes indicating that none of these processes appear standard and in most cases are not integrated into the wider national biosecurity network (Tables 12a and 12b).

Appendix 5: Table 11. Responses to question 32 from industry respondents: (*Does your department have a liaison officer to investigate reports of damage to forests? Does your department have a forest biosecurity plan?*)

Company	Liaison officer	Biosecurity plan
Qld 1	Y	Y
Qld 2	Y	Y
Qld 3	Y	N
Tas 1	Y	Health monitoring plan
Tas 2	Y	Local emergency response plan and procedures
Tas 3	N	N
Vic 1	Y	N
Vic 2	Y	Y
Vic 3	Y	Y
WA 1	N	N
WA 2	Damage is investigated	N
WA 3	N	N
WA 4	Y	Y
WA 5	N	N
SA/Vic/WA	Y	Y

Appendix 5: Table 12a. Responses to questions 57-59 (frequency and methods of surveillance and record retention) from state forestry organisations

State	Frequency	Methods	Records retained
NSW	1-2 years	Aerial, followed up by on-ground	Aerial maps saved digitally and linked to database. Report prepared for each region.
TAS	Annual	Aerial and ground	Comprehensive records at coupe level
WA	At least annual	By operational staff (not a formal health survey)	Uncertain

Appendix 5: Table 12b. Responses to questions 57-59 (frequency and methods of surveillance and follow-up) received from private forestry companies.

Company	Frequency	Methods	Records retained
QLD 1	Annual	Three-stage system - aerial, vehicular, on foot.	Data-based, all correspondence and reports filed.
WA 1	2-4 years	During routine assessments	Not recorded
QLD 2	2 years	Ground-based	Site-specific reports, GPS records, images
QLD 3	2-3 months	Looking for symptoms, following a checklist	Checklists
TAS 2	2 years	Aerial and ground	Reports, photos
TAS 3	6 months	Aerial and ground	GPS records, survey plans, reports.
TAS 4	2 years	Aerial and ground	Forest health notes
VIC 2	120 plots annually (from 420)	Plots examined, plus drive-by and follow up of staff damage reports	Annual report
VIC/SA/WA	Depends on age, time of year and risk profile	Field surveys, plot measurement, insect trapping	Insect counts, field reports, actions taken
VIC et al	6 months, more in first year	Following forms and SOPs based on advice from state agencies and IPMG	Information management system registers. Highlights also mentioned in bi-weekly teleconferences
WA 2	Weekly to monthly in the first year, then quarterly, then annually	General plantation inspection	Visits recorded, reports and actions registered
WA 3	n/a	Drive by	Inspection note
WA 6	Quarterly in early years	By operational staff	Pest and disease incidence notes
WA 7	Quarterly then 6	Observed from fire-	Completed forms

	monthly	breaks	filed

Appendix 5: Table 13. Responses to questions 60-62 from state forestry organisations (Table 13a) and private forestry companies (Table 13b) about what triggers alarm bells, what happens next and in what time frame

Table 13a

State	Alarm bells	Further investigation	Time-frame
NSW	Disorders detected by routine or ad-hoc sampling	Inspection by pathologist or entomologist	A few weeks
TAS	Potential biosecurity risk	Ground survey, sampling, identification.	Days
WA	Noticeable damage	Samples sent to more knowledgeable staff or DAFWA	Several weeks

Table 13b

Company	Alarm bells	Further investigation	Time-frame
QLD 1	Advice from plantation health officer. Organism is new or matches one on an alert list. Widespread damage.	Rapid identification, advice from colleagues, notification of BQ, movement restrictions (if needed)	Hours to days
QLD 2	Plantation health officer advice or request from other staff.	Inspections, samples, diagnosis	Depends on severity, next day if urgent.
QLD 3	Degree and extent of damage	Identification, consider control measures	A week or two
TAS 2	Symptoms of tree death or decline	Sample and identify	1 to 2 weeks
TAS 3	Increased disease or insect activity, unusual symptoms	Sample, survey the extent of damage	Immediately
TAS 4	Observation of poor tree health	Contact experts	ASAP
VIC 2	New pest, current or potential damage	Identify organism, assess spread potential, consider control options and costs	1 to 4 weeks
VIC/SA/WA	Unidentified pest & disease, population numbers, a threatening disease or pest identified	Identification, if a new disease	Depends on severity, may be immediately
VIC et al	Greater than usual damage, stem damage, growth compromised	Literature review, sampling, advice	2 weeks
WA 2	Damage exceeds certain thresholds	Treatment if possible	ASAP
WA 3	Unknown pests causing more than 20% defoliation	Call some-one	Days
WA 6	Visible damage of greater than normal extent	Sampling of pest, review by R&D personnel, senior operational staff, and IMDP scientist	ASAP
WA 7	Reports of deaths, poor tree health.	A more detailed inspection by the responsible forester.	Less than a week

Eight state forestry representatives did not complete question 72 about knowledge of the components of a biosecurity system. The four who did, responded positively (Table 14). Of the private forestry representatives, 6 did not complete this question, five responded negatively, one was unsure and one expressed the need for more training in this area. The remaining responses are tabulated (Table 15).

Appendix 5: Table 14. State forestry responses to question 72 (*Do you understand what the components of a biosecurity system are? If so how, have you addressed them?*)

State	Understand?	How addressed
NSW	Yes	n/a
Qld	Yes	As per guidelines from Biosecurity Queensland
Tas	n/a	Through a forest management system, record keeping, regular forest health surveillance and reporting.
WA	Yes	Not addressed

Appendix 5: Table 15. Industry responses to question 72 (*Do you understand what the components of a biosecurity system are? If so how, have you addressed them?*)

Company	Understand?	How addressed
Qld 1	Yes	We assisted formulate the RWG7 Biosecurity Forest exotic pest species target list. We ensure we stay familiar with these organisms and information re recent detections and movements. We watch and exchange information with various agencies associated or undertaking surveillance or biosecurity type tasks (information received is not always forthcoming). Undertake regular surveys as well as targeted surveys when exotics detected elsewhere.
Qld 2	n/a	Surveillance & detection – in-sourced ID – in-sourced / outsourced as needed Response - usually in-sourced Monitoring & review – in-sourced
Tas 1	Yes	policies, procedures
Vic 1	n/a	Prevention - quarantine in high risk areas such as nurseries Preparedness - annual monitoring and training Response - engaged health surveillance expertise to advise in these areas
WA 1	Not exactly	but I'd imagine that we are addressing most of them through the production of plant health manuals, routine surveillance of forest health, staff training etc.
Garden & Nursery Industry Association	Yes	Through a structured industry plan including: 1. An Industry Biosecurity Plan. 2. An on-farm biosecurity program 3. Industry Awareness program

Appendix 5: Table 16a. State forestry responses to question 73 (*Do you have an understanding of the biosecurity risks posed to your company? How was this understanding obtained?*)

State	Response
NSW	Yes, from twenty five years experience working in forest health R&D.
Qld	Yes. Through basic training and notifications via Biosecurity Qld.
Tasmania	Expert advice from in-house and external specialists
WA	Yes, through my involvement in Research Working Group 7 (forest health)
WA	Not an area I'm involved in day-to-day...

Appendix 5: Table 16b. Private forestry answers to question 73 (*Do you have an understanding of the biosecurity risks posed to your company? How was this understanding obtained?*)

Company	Response
Qld 1	Yes. Long standing association and funder of various Government and University agencies associated with pests and diseases affecting Forestry. Originally had own research section - technical services division. Now have a Plantation Development and Innovation section covering nutrition, plantation health etc.
WA	Only a little
Qld 2	Generally yes. Obtained via discussions with / presentations by forest health experts inside / external to company.
Qld 3	To some extent. What does concern me is the lack of government support to control some serious biosecurity threats where the landholder foots the entire bill.
Tas 1	Through reading
Tas 2	Yes, surveillance over a number of years, kept up with general information
Tas 3	Only in a broad sense
Vic 1	Yes - engaged health surveillance expertise to advise in these areas
Vic 2	Literature, listening to experts at conferences and science meetings
WA	Not a very good one
WA	Yes, participation in industry fora
WA	I think so. Attendance at meetings, circulated information, experience.
WA	Yes. The understanding is obtained from a wide range of sources such as industry associations (NAFI and FIFWA), IPMG, state government departments such as DAFWA, DEC and FPC etc,
Nursery and Garden Industry Association	Yes

Five respondents from state forestry placed a high importance on biosecurity; two considered it of low importance. In private forestry, responses were seven as high importance, six medium and two low.

Appendix 5: Table 17. Practices included in risk mitigation plans of state and private forestry companies.

	State			**Private**		
Activity	*Yes*	*No*	*Not answered*	*Yes*	*No*	*Not answered*
Surveillance	4	0	6	13	0	7
Awareness and training activities	3	0	6	9	0	7
Exclusion activities (e.g. restricting movement of planting material and machinery)	4	0	6	12*	1	7
Selection of appropriate planting materials and cultivars	2	1	7	10	0	10
Destruction of plantation crop residues	0	2	8	3	2	15
Control of vectors;	2	0	8	3	5	12
Control of alternative hosts and weeds;	#	0	6	5-6 (if economic)	1	13
Soil cultivation	1	0	9	3	1	9
Post-harvest handling and log transport procedures	2	0	8	2	4	14
Warning and information signs	1	3	6	6	1	13
Use of dedicated equipment when working in high risk areas	2	0	8	3	3	14
Restricting the use of high risk vehicles during high risk times	2	0	8	5	4	11
Reporting suspect pests to appropriate authorities	5	0	5	12	0	8
Including biosecurity in plantation management systems	3	0	7	10	0	10

*Two of the yes answers were qualified, i.e. in nurseries only
#The four responses were either ‘unsure’ or ‘not applicable’

Section 10: Familiarity with jurisdictional arrangements for biosecurity (Question 33)

Victoria and South Australia seem to be the only states where responsibility for urban forest biosecurity lies unambiguously with a single state department, Biosecurity Victoria and PIRSA Biosecurity, respectively.

Section 11: Familiarity with Plantation Timber Industry Biosecurity Plan (Question 34).

The plantation timber IBP has been read by most plant health managers and forest health experts. Of the four state forestry representatives, two had read the IBP; only one of the five conservation forest representatives had read it. Five of the 16 private industry representatives had read the plan, and a sixth was downloading it after finding out about its existence during this survey.

The need for revision of the IBP was mentioned by several respondents. Other deficiencies noted were:

- numerous unspecified herbivores
- the focus on specific pests rather than pathways, which would allow more targeted surveillance for early detection of incursions
- Lack of integration with conservation forest and urban forest biosecurity planning and responses
- The presence of specific threats that impact on forestry in IBPs of other sectors

Most of the industry respondents did not consider themselves capable of assessing the deficiencies of the plan, though one commented that it is not used by anybody, which, if true, would be a major deficiency.

Section 12: Knowledge of key EPPs, including recently emerging pests (Questions 35-38).

There was some, but variable, knowledge in this area (Tables 18-20).

Appendix 5: Table 18. The most frequently cited diseases of biosecurity concern to plantation forestry

	***Role of respondent**										
Pathogen	1	2	3	5	6	7	8	9	10	11	Total
Guava rust/Eucalyptus rust/Myrtle rust/ *Puccinia psidii*	5	2	3	1	7	2		9	3	1	33
Pine pitch canker/ *Fusarium*	4	1	1	1	6	1		6	3	1	24
Phytophthora spp., including *P. ramorum, P. pinifolia, P. kernovii, P. cinnamomi*	4		1	1	6	3		6	3		24
Western gall rust	1	1		1	3			3	2		11
Pine wilt nematode/ *Bursaphelenchus*		1	1	1	4	1			1		9
Mycosphaerella spp. inc. *M. juvenis*					1			3			4
Chestnut blight/ *Cryphonectria parasitica*		1		1					1		3
Armillaria spp.					1			2			3
Spike disease of sandalwood								2			2
Dothistroma								2			2

Appendix 5: Table 19. The insect pests of greatest biosecurity concern to plantation forests

	*Role of respondent										
Pest	1	2	3	5	6	7	8	9	10	11	Total
Asian gypsy moth/ *Lymantria dispar*	5	3	1	1	8	2		7	2	1	30
Longhorn/Longicorn beetles	2		1	2	7	1		1	2		16
Mountain pine beetle, *Dendroctonus* spp.	1				3			1	1		6
Sirex spp.	1		1		1	2		3	1	1	10
Pine wilt nematode	1				2	2		2	1		8
Bark beetles, *Ips* spp.			1		1	1		4			7
Termites	2		1	1				1	2		7
Sawyer beetles/ *Monochamus* spp.	2				3			1			5
European house borer	1	1		1				1			4

Appendix 5: Table 20. The pathogens/diseases of biosecurity concern to conservation forests.

	Role of respondent*			
Pathogen	1	8	10	Total
Guava rust/Eucalyptus rust/Myrtle rust/ *Puccinia psidii*	4	4	2	10
Phytophthora spp., including *P. ramorum, P. pinifolia, P. kernovii, P. cinnamomi*	3	4		7
Armillaria spp.	1	1		2
Heterobasidion annosum	1	1		2
Mycosphaerella juvenis		1		1
Myrtle wilt		1		1
Casuarina blister bark, *Subramanianospora vesiculosa*		1		1

*Roles are: 1, Plant health manager or biosecurity personnel; 8, Environmental or conservation organisation; 10, Biosecurity policy.

Section 13: Detailed specialist knowledge of key EPPs, including recently emerging pests; familiarity with contingency plan, understanding of diagnostic procedure in relation to capacity (Questions 39-44).

Few responses were obtained from diagnostic laboratory managers and diagnosticians indicating a lack of knowledge in this area. The responses for *Phytophthora pinifolia* and *Puccinia psidii* were the same as for *Fusarium circinatum* (Table 21), except that Lab 1 was not aware of the correct standard method for diagnosis of *Puccinia psidii.* The responses for *Monochamus alternatus* were the same as for *Lymantria dispar*.

Appendix 5: Table 21. Survey responses for questions 39-44 about specialist knowledge of EPPs

Pest	Diagnostic method	Time for initial diagnosis	Throughput (samples per week)
Fusarium circinatum (Lab 1)	Follow standard methods, generally isolation before morphological and molecular.		100/day
Fusarium circinatum (Lab 2)	Morphological and molecular	2-4 weeks	10-20
Fusarium circinatum (Lab 3)	Isolation to confirm *Fusarium,* then send interstate	1 week	50
Fusarium circinatum (Lab 4)	Don't know		
Lymantria dispar (Lab 1)	Send to insectary		
Lymantria dispar (Lab 2)	Morphological	Minutes	Hundreds
Lymantria dispar (Lab 3)	DNA barcoding plus morphology	Depends on life-stage and condition	30
Lymantria dispar (Lab 4)	Morphological, DNA barcoding if necessary	Depends on life-stage	Not part of role
Bursaphelenchus xylophilus (Lab 1)	Method needs clarification		
Bursaphelenchus xylophilus (Lab 2)	Unsure, refer PaDIL		
Bursaphelenchus xylophilus (Lab 3)	Morphological, extract then send to pathologist	Depends on whether extracting from wood or beetle.	Not part of role

Section 14: Adoption of GIMP recommendation (to increase diagnostic capacity in forestry) (Questions 45-49).

Questions pertaining to this section were poorly answered or not answered at all indicating a lack of knowledge and expertise of diagnostics for forest biosecurity.

Section 15: Functional linkages between those agencies with biosecurity responsibility and those with forest health expertise (Questions 50-56)

There appeared to be the ability to call upon staff to conduct delimiting surveys in the case of an incursion (see Table 22). However the survey responses indicated that people who could

be invited to participate in a CCEPP or SAP for 6 different pests were extremely limited and usually the same people for different pests, often people who are at the end of their careers.

Appendix 5: Table 22. Potential availability of FTEs to conduct delimiting surveys

State	State government	State Forestry	Private forestry
ACT			
NSW	Several hundred		
NT			
Qld	ns	5.7	6
SA		Many, if required	Up to 10
Tas	6	2.5	3
Vic	20 (150-200 short term)		2-12
WA			8-19

Section 16: Scientifically-defensible systems (Questions 66, 67)
These questions were poorly answered and indicated a low level of knowledge.

Appendix 6: Round 2 assessments of each group at the Biosecurity Workshop

Researchers

Action	Likelihood	Consequence	Benefit score	Rank
1. BMP	3-4	3	9-12	6
2. Tertiary/TAFE	4	2-3	8-12	7
3. Networks	2	2	4	11.5
4. Costs and benefits	3	4	12	4
5. CRC	3	3	9	8
6. RWG7	4	3-4	12-16	1
7. Discussion Paper	2	2-3	4-6	10
8. Exercises	3	4	12	4
9. Scanning and intelligence	2	2	4	11.5
10. Screening programs	3	4	12	4
11. Deed	3-4	3-4	9-16	2
12. Fund Deed	2-3	3-4	6-12	9

Private commercial

Action	Likelihood	Consequence	Benefit score	Rank
1. BMP	5	3	15	5
2. Tertiary/TAFE	2-3	3	6-9	8
3. Networks	2	3	6	10.5
4. Costs and benefits	4	4	16	2.5
5. CRC	2	3	6	10.5
6. RWG7	4	4	16	2.5
7. Discussion Paper	4	3	12	6
8. Exercises	3	3	9	7
9. Scanning and intelligence	2	3	6	10.5
10. Screening programs	4	4	16	2.5
11. Deed	4	4	16	2.5
12. Fund Deed	2	3	6	10.5

Government commercial

Action	Likelihood	Consequence	Benefit score	Rank
1. BMP	3	4	12	7
2. Tertiary/TAFE	3	3	9	9
3. Networks	4	4	16	4
4. Costs and benefits	5	5	25	1.5
5. CRC	2	2	4	12
6. RWG7	5	5	25	1.5
7. Discussion Paper	4	2	8	10.5
8. Exercises	4	4	16	4
9. Scanning and intelligence	4	2	8	10.5
10. Screening programs	4	4	16	4
11. Deed	3	5	15	6
12. Fund Deed	2	5	10	8

Technical

Action	Likelihood	Consequence	Benefit score	Rank
1. BMP	4	3	12	7
2. Tertiary/TAFE	4	2-3	8-12	9
3. Networks	2	2-3	4-6	11.5
4. Costs and benefits	4	4	16	3.5
5. CRC	2	2-3	4-6	11.5
6. RWG7	5	4	20	1.5
7. Discussion Paper	4	4	16	3.5
8. Exercises	3	4	12	7
9. Scanning and intelligence	4	3	12	7
10. Screening programs	4	3-4	12-16	5
11. Deed	5	4	20	1.5
12. Fund Deed	2	4	8	10

Policy

Action	Likelihood	Consequence	Benefit score	Rank
1. BMP	4	4	16	5.5
2. Tertiary/TAFE	3	3	9	11
3. Networks	4	4	16	5.5
4. Costs and benefits	2-3	4	8-12	9
5. CRC	3	3	9	11
6. RWG7	5	3-4	15-20	2
7. Discussion Paper	3	3	9	11
8. Exercises	4	4	16	5.5
9. Scanning and intelligence	3	4	12	8
10. Screening programs	4	4	16	5.5
11. Deed	3-4	5	15-20	2
12. Fund Deed	3-4	5	15-20	2