ADVICE ON COASTAL INTEGRATED FORESTRY OPERATIONS APPROVAL REMAKE

NATURAL RESOURCES COMMISSION

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NSW GOVERNMENT

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List of acronyms

DBHOB	Diameter at breast height over bark
DoI	Department of Industry
DPC	Department of Premier and Cabinet
DSHOB	Diameter at stump height over bark
EPA	Environment Protection Authority
FCNSW	Forestry Corporation of New South Wales
GPS	Global Positioning Systems
IFOA	Integrated Forestry Operations Approval
LiDAR	Light Detection and Ranging
LLA	Local Landscape Area
NARCliM	NSW and ACT Regional Climate Modelling
OEH	Office of Environment and Heritage

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1 Executive summary

The NSW Government has recently re-committed to a sustainable and viable native forestry through the *NSW Forestry Industry Roadmap 2016*. A key first step in modernising NSW's current regulatory approach for native forestry is the development of a new Coastal Integrated Forestry Operations Approval (the Coastal IFOA).

The NSW Government intends that the Coastal IFOA be developed through a best practice, outcomes-based approach to improve clarity and enforceability, while reducing costs associated with implementation and compliance. In addition, Government has made two commitments – that the Coastal IFOA will result in:

- no net change to wood supply
- no erosion of environmental values.

Initial negotiation of the settings to be included in the new IFOA began in June 2013. The Environment Protection Authority (EPA) and Forestry Corporation of NSW (FCNSW) have agreed on a range of prescriptions, many of which represent significant improvements in operational efficiency and regulatory practice without erosion of environmental values. However, negotiations stalled around a set of outstanding settings and issues that remain unresolved.

The Premier has asked the Commission to review outstanding settings for the new Coastal IFOA, and advise the Minister for the Environment and the Minister for Primary Industries on the extent to which the proposed settings would, or would not, deliver on the Government's twin commitments. If it is not considered possible to meet the commitments, the Commission is to provide options for how to balance or reduce the impacts on environmental values or wood supply.

In undertaking this review, the Commission has worked with independent ecology and forestry experts to inform its advice, and engaged with FCNSW, EPA, the Office of Environment and Heritage (OEH), the Department of Industry (DoI) and the Department of Premier and Cabinet (DPC).

During the review, the Commission was challenged by the limitations of the existing monitoring arrangements for evaluating the performance and effectiveness of the existing IFOAs. Despite some progress via the IFOA trial, there is a limited or contested evidence base to inform IFOA decision making. Where the Commission encountered knowledge gaps and uncertainty, we relied on expert advice and judgement to identify appropriate solutions to the outstanding issues. However, we advise that going forward, Government should adopt an adaptive management approach to address these knowledge gaps and support continual improvement over time.

1.1 Summary of findings

The IFOA approach is good practice

The Commission considers that the Government's intended outcomes-based approach to the Coastal IFOA reflects current best practice. The agreed multi-scale landscape approach, with enhanced protections for threatened species at a range of spatial scales, will build on existing IFOA environment protections and complement the conservation reserve system.

The agreed and recommended settings are an improvement compared with current practices

The Commission has developed a suite of recommended settings that we consider go closest to meeting the Government's Coastal IFOA objectives and commitments at a state scale. The recommended settings combine with the agreed settings to form an integrated package that represents a significant improvement in operational efficiency, enforceability of environment protections and regulatory efficiency compared to current IFOA settings and current harvesting practice.

The new arrangements allow for intensive harvesting in some parts of the forest landscape to meet the regeneration requirements of preferred timber species (primarily blackbutt) and to increase efficiency in wood supply. This provision for intensive management is offset by increased forest protection at the landscape scale and retention of permanent habitat clumps and other threatened species protection measures within the harvested areas.

We advise that some of the recommended settings require greater EPA involvement in the development of guidance materials and transitional arrangements on some settings as the new IFOA is finalised and implemented. A collaborative, proactive approach involving both the EPA and FCNSW in situations where outcomes are not yet precisely defined is likely to deliver better regulatory and environmental outcomes than a process focused on contested definitions and retrospective penalties for infringements.

The commitments around wood supply and environmental values are not mutually achievable

Following analysis of the expected cumulative impact of the agreed and recommended settings, the Commission has determined that **it is not possible to meet the Government's commitments around both environmental values and wood supply**. In addition, a range of external factors outside of the IFOA settings affect the ability to meet the commitments both now and into the future, such as emerging threats from climate change and changing fire regimes.

The agreed and proposed settings are designed to not erode environment values. All settings have been assessed as posing a low to moderate risk to environmental values, which is considered manageable with the proposed improvements to the regulatory framework. Settings providing for maximum harvest thresholds at multiple scales, the permanent protection of vegetation in clumps and koala protections are key advances in environment protection.

However, it is likely that the recommended settings will have a negative localised impact on wood supply of some preferred species. In particular, the Commission has identified two individual settings that pose a significant constraint to wood supply: (1) koala protections; and (2) improved knowledge of areas where permanent harvesting is excluded due to threatened ecological communities. Taken together, these two settings are likely to have a material effect on the operation of specific mills due to reduced supply from certain supply zones, and related reductions in availability of key species such a tallowwood and spotted gum.

The risks to wood supply identified in this report should be considered in the context of ongoing trends in tenure change and the broader wood supply issues already affecting the NSW North Coast native forestry industry following the outcomes of Project 2023. In mid-2015, the Commission advised government on the risks associated with the species-specific contract and five year contract extension provided to Boral as part of the high quality wood supply quota buyback on the North Coast. Any further restrictions on wood supply brought about by the Coastal IFOA, particularly those that reduce access to key species, are likely to significantly exacerbate existing North Coast supply issues and potentially impact mill viability.

Government can consider a range of options to address the commitments

The Commission has identified a range of potential options for Government to address the current issues around the commitments:

1 reassessing the intent and wording of the commitments to provide greater clarity and acknowledge local impacts

2 understanding the balance between values to clarify objectives and to provide a sound basis for any potential trade-offs

3 reviewing wood supply agreements to adjust for supply impacts from the Coastal IFOA

4 applying alternative approaches outside of the IFOA, such as one or more of the following:

- initiating a steep slopes trial
- adjusting boundaries or transferring management of high conservation areas into the reserve system
- reviewing threatened ecological community listings.

5 Implementing active intervention and management to achieve desired outcomes and manage risks, such as:

- rehabilitating degraded public land with silvicultural techniques on all public tenures
- thinning to reduce impacts on water availability, stand vigour and enhancing environmental outcomes
- allowing more dynamic tenure boundaries to adapt to changing climate
- artificially relocating timber tree species to more favourable climates ('assisted migration)
- engineering artificial tree hollows
- deploying more drought / disturbance tolerant species or selective species for environmental outcomes (for example, Tallowwood species for Koalas)
- reducing losses of trees due to insects and diseases through sanitation harvests.

A business-as-usual approach will not achieve the Government's broader IFOA objectives

While the Commission found the intent and broad objectives of the Coastal IFOA remake reflect good practice, there are concerns about how well they are being realised during the development process. In particular, we have observed that a focus on settings at the operational scale has resulted in limited development of the supporting regulatory framework and practice guidance that sits between the strategic objectives and operational scale prescriptions.

One of the Government's Coastal IFOA remake objectives is to deliver a contemporary regulatory framework that is fit for purpose. To achieve this, a genuine cultural shift is needed to support a more outcomes and risk-focused approach that allows for adaptation as current uncertainties and contested issues are reduced. The Commission has identified the following areas for improvement:

1 **institutional arrangements and roles** – improving clarity around the role of OEH and DoI Forestry in setting policy direction

2 **outcome statements** – developed collaboratively and used to refocus and guide the Coastal IFOA at a strategic level

3 **engagement, collaboration and education** – including collaborative development of operational guidance and planning protocols, and on-going training and learning for operators, contractors and regulators

4 **greater use of technology** - adoption of new information and communication technology to improve decision making and reduce costs

5 **flexible use of risk-based regulatory approaches** – allowing low risk activities to be managed under guidelines and codes of practice rather than prescriptions, and prioritising and addressing breaches on the basis of their potential impacts

6 **monitoring, evaluation, reporting and improvement framework** - designed to report against the outcome statements in order to support evidence based decision making, allow Government to measure performance and enable continuous improvement in the future

7 **development of a landscape modelling system** – to better understand environmental outcomes in order to inform decision making

8 **independent oversight and tracking** - periodic independent evaluation of forestry activities to improve trust and transparency, and an annual forum, or 'check-point' to consider relevant performance information and help resolve any issues in order to and maintain the momentum of implementing the new Coastal IFOA and delivering a contemporary regulatory regime

9 **reporting and public engagement** – working together to streamline reporting, while also providing more timely and relevant information to stakeholders and decision makers

It is likely that the improvements outlined above will require some additional resourcing. While the extent of the investment required is not yet clear, the Commission is confident that a modest investment will deliver significant dividends in the form of reduced regulatory, compliance and legal costs.

1.2 Next steps

The Commission advises that the Government undertake the following in order to finalise the IFOA remake:

1 **Adopt the Commission's recommended settings and approaches** – implement the agreed and recommended settings, including recommended transition arrangements, supported by an adaptive management approach, transparent annual reporting of progress, and a comprehensive review of the Coastal IFOA five years after implementation commences

2 **Reframe the commitments and consider trade-offs and prioritisation at the strategic level** – clarify the realistic local implications and trade-offs inherent in achieving the goals and objectives for native forestry and the IFOA

3 **Explore alternative solutions to meet the commitments** – consider pursuing alternative options outside the IFOA settings that may better achieve the Government's goals and objectives for maintaining wood supply and environmental values (for example a steep slopes trial; boundary adjustment or management transfer of high conservation areas; review of threatened ecological community listings)

4 **Improve the supporting regulatory framework** – address current gaps and risks in the overall regulatory framework, for instance: overarching outcomes statements and arrangements for collaboration and planning; monitoring, evaluation, reporting and

improvement frameworks; and adaptive management processes to build trust, transparency and reduce uncertainty.

5 **Convene an independently facilitated annual IFOA forum** - consider tasking the Commission to convene an annual forum involving the policy, regulatory and operational agencies involved in native forestry to transparently track the operation of the new IFOA in its first five years. An independently facilitated annual forum between the agencies could help resolve any issues, maintain momentum and prepare for the planned five year review.

2 Setting the context

Key points:

1 The Government sees the Coastal IFOA as an opportunity to deliver a contemporary regulatory framework that is efficient, outcomes based, enforceable and reflects modern best-practice regulation. Key objectives are to reduce the costs of implementation and compliance and improve the clarity and enforceability of the IFOA conditions. The Government has committed that the Coastal IFOA will meet these objectives with no net change to wood supply, and no erosion of environmental values.

2 Expert advice obtained by the Commission acknowledges that the Government's approach reflects current best practice. The multi-scale approach will complement the existing environment protections derived from the reserve system by providing enhanced protections for threatened species across a hierarchy of spatial scales. It will also reduce planning and operating costs, and improve flexibility and access to timber resources in some areas.

3 Good progress has been made across a range of agreed settings that will deliver improved environmental outcomes and more efficient and effective regulation compared with current arrangements.

4 The Commission has been asked to provide advice on outstanding settings, and the extent to which the Government's commitments around wood supply and environmental outcomes can be met. We have also been asked to make recommendations on trade-offs that the NSW government could consider to deliver the commitments, or to limit the shortfall in delivering them, including describing any impacts on each commitment from the trade-off proposed.

2.1 Drivers and opportunities for the Coastal IFOA remake

The NSW Government has recently re-committed to a sustainable and viable native forestry industry that continues to support regional economies and delivers social and environmental benefits. The NSW Government's *NSW Forestry Industry Roadmap 2016* (the Roadmap) outlines a triple bottom line approach, including modernising the current regulatory approach to the state's forestry industry and protecting environmental values.[1]

The development of a new Coastal IFOA is a key first step identified within the Roadmap. IFOAs are established under the *Forestry Act 2012* and set out the terms and conditions under which all forestry operations in a region may occur. These approvals integrate various aspects of environmental planning and assessment regulation, including licencing requirements under the *Protection of the Environment Operations Act 1997*, the *Threatened Species Conservation Act 1995* and the *Fisheries Management Act 1994*. Prescriptions within the IFOAs are also used to ensure that state forests deliver Ecologically Sustainable Forest Management (ESFM) and contribute to the Comprehensive, Adequate and Representative (CAR) reserve system, as required under Regional Forest Agreements[2] and NSW Forest Agreements[3].

There are currently four IFOAs covering coastal NSW (Upper North East, Lower North East, Southern and Eden regions), which were originally developed between 1999 and 2003 (**Figure 1**).

1 NSW Government (2016), *NSW Forestry Industry Roadmap*, Sydney NSW

2 Joint agreements between the NSW and Australian Governments committing to the ecologically sustainable management of Australia's native forests, balancing conservation and the long-term stability of forest industries.

3 Agreed basis for long-term forest use and management in NSW, including the maintenance of environmental, social and economic values.

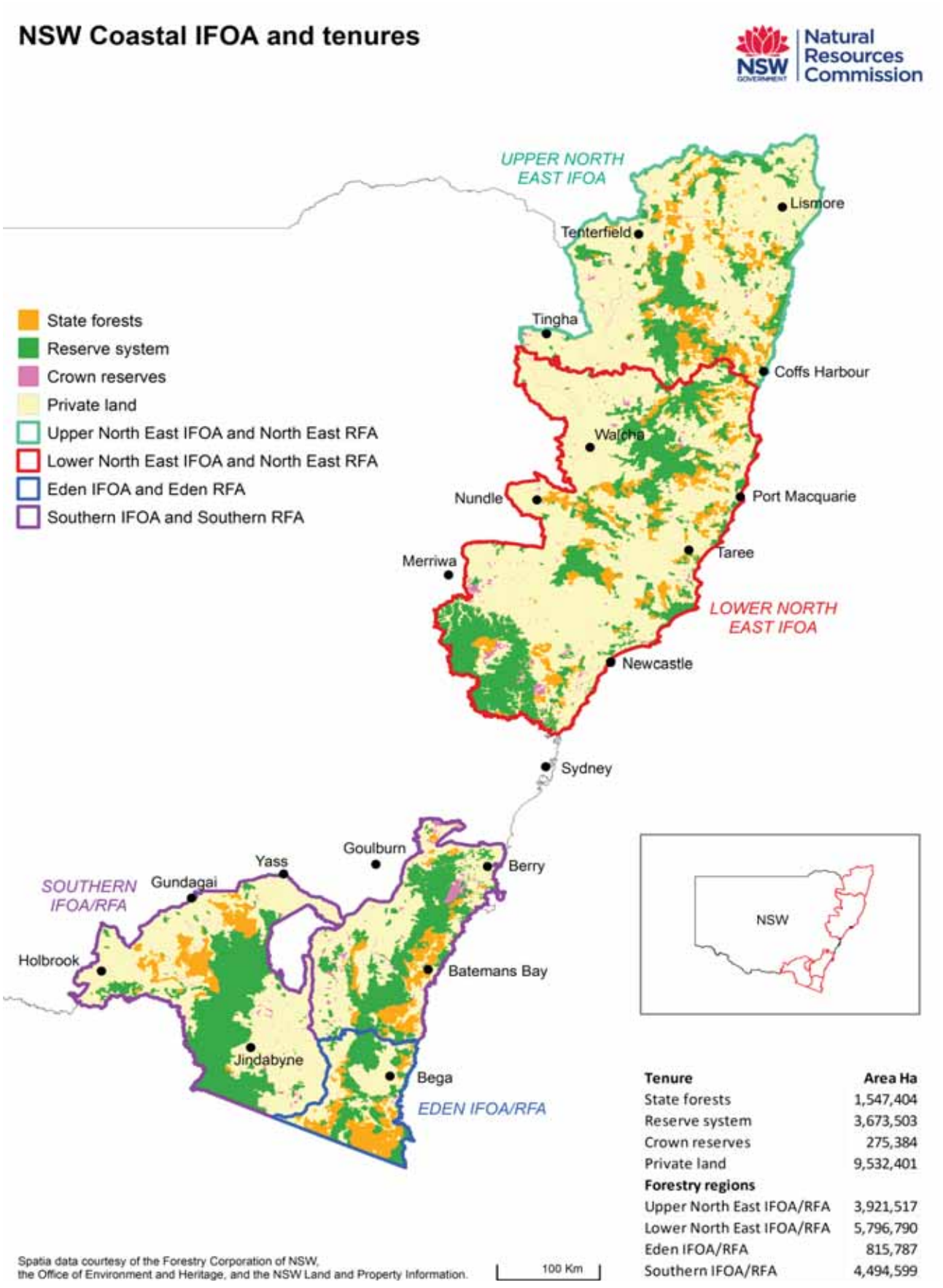


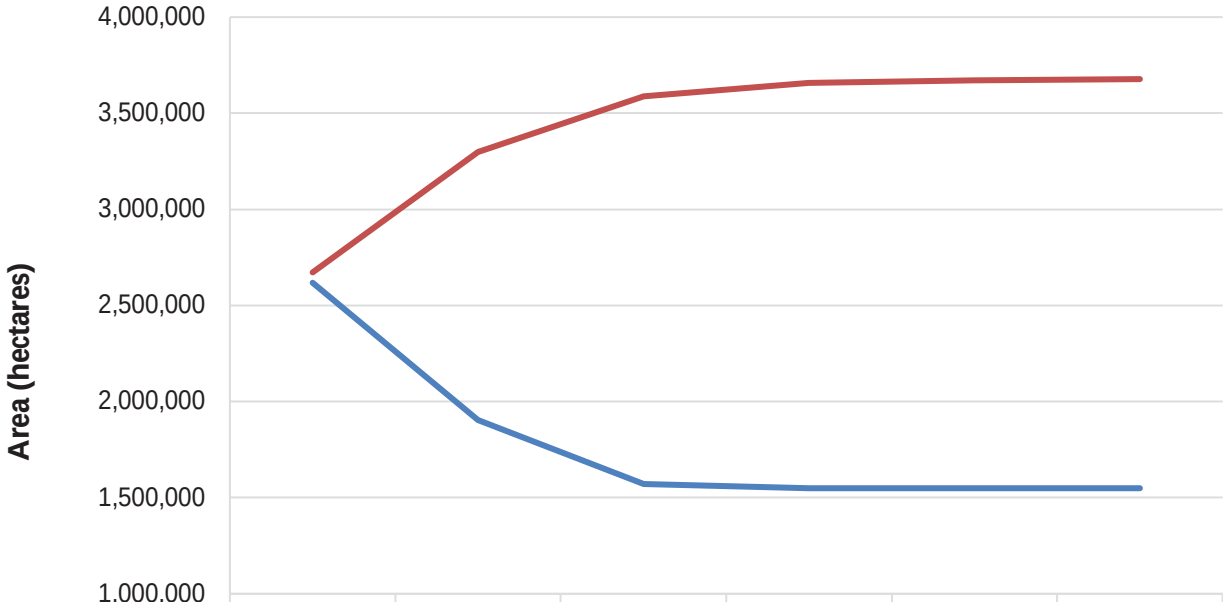
Figure 1: Location of coastal IFOAs, state forests and the reserve system
(Note that Crown Reserves can include lands that are harvested for timber. However, these are the exception, with many crown land reserves contributing multiple outcomes such as conservation and cultural heritage)

The NSW Government has found the current IFOAs have not achieved their original purpose and need to be replaced. They are difficult to understand and implement, and the conditions lack clarity and enforceability. Further, the current IFOAs are process-focused and have not allowed forestry operations to keep pace with changes in technology, timber harvesting practices and best regulatory practice.[4]

There have also been issues identified with the effectiveness of harvesting approaches specified within the IFOAs, particularly with the use of Australian Group Selection practices on the North Coast. FCNSW moved away from Australian Group Selection because of greater regeneration outcomes and efficiencies from intense regeneration harvesting. These issues have led to practice changes that were not formally codified under the existing IFOA and are the subject of ongoing dispute between EPA and FCNSW.

The Commission's review of native forestry practices in other jurisdictions found that the NSW IFOAs and accompanying licenses differ in structure from other Australian jurisdictions, and are more onerous and challenging to implement cost-effectively. Further, the perceived complexity within the IFOAs creates the potential for ambiguity regarding the intent of the regulatory framework.

In addition, since the current IFOAs were first implemented in 1999-2003 there have been broader shifts in public land policy that have had significant implications for native forestry and the IFOAs. In particular, the Icons decision resulted in expansion of the permanent conservation reserve system through the transfer of state forests. In total, over 350,000 hectares of state forests in the Coastal IFOA area have been added to the conservation reserve system since the end of 1999, with most transfers occurring on the NSW South Coast (**Figure 2**). The reserve system is an important element in the multi-scale landscape approach that underpins the new Coastal IFOA (**Section 2.3**).



	Pre-1995	1995-1999	2000-2004	2005-2009	2010-2014	2015-2016
State forests	2,618,131	1,903,361	1,569,582	1,549,346	1,549,346	1,549,346
Parks estate	2,672,057	3,298,207	3,589,402	3,657,599	3,672,449	3,677,587

Figure 2: Change in tenure in the Coastal IFOA region since 1995

4 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW

The transfers of native forested lands into the conservation reserve system following the Icon decision delivered increased environment protections across coastal NSW. At the time of the transfers, their impact on wood supply was mitigated by the amendment of the IFOA provisions to reduce the area of some 'buffers on buffers' around streams. As a result, the transfers were considered by the then Government to be wood supply-neutral.

However, in recent years there has been increasing pressure to deliver against agreed contracts, particularly on the North Coast. In 2013, the NSW Government responded to supply concerns by initiating a buyback of approximately 50,000 cubic metres per year of high quality sawlog quota on the North Coast from Boral, including at least 40,000 cubic metres per year of high quality Blackbutt quota. Government has more recently explored further issues related to resource security and sustainability affecting non-Boral high quality log customers in the North Coast IFOA region. The current supply issues are expected to increase in future as the impact of climate change places additional stress on native forests, increasing the risks to forest health and both conservation and production objectives.[5]

In light of the identified issues with the current IFOAs, in 2013 the NSW Government committed to remaking the four existing IFOAs into a single Coastal IFOA via an outcomes based approach. The four existing IFOAs are being consolidated into one to improve the consistency of requirements and implementation across the coastal forest estate.

The Coastal IFOA remake is a chance for Government to recognise innovation in best regulatory practice, incorporate advances in technology, respond to the impacts of a changing climate, and deliver a contemporary regulatory framework that is fit for purpose. Further, the remake provides an opportunity to improve the cost effectiveness of IFOA implementation and compliance.

The Coastal IFOA remake also precedes the expected review and replacement processes for other key agreements governing native forestry in NSW that are due to expire in the coming years, including NSW Forest Agreements and Regional Forest Agreements as outlined in **Figure 3**. Implementation of an up-to-date, effective Coastal IFOA would be a positive step ahead of the commencement of replacement processes.

5 Beaumont, L. J., Pitman, A., Perkins, S., Zimmermann, N. E. & Yoccoz, N. G. (2011), Impacts of climate change on the world 's most exceptional ecoregions. *Proc. Natl. Acad. Sci. U. S. A.* **108,** 2306–2311.
Kearney, M. R., Wintle, B. A. & Porter, W. P. (2010), Correlative and mechanistic models of species distribution provide congruent forecasts under climate change. *Conserv. Lett.* **3,** 203–213.
Pitman, A. J., Narisma, G. T. & McAneney, J. (2007), The impact of climate change on the risk of forest and grassland fires in Australia. *Clim. Change* **84,** 383–401.

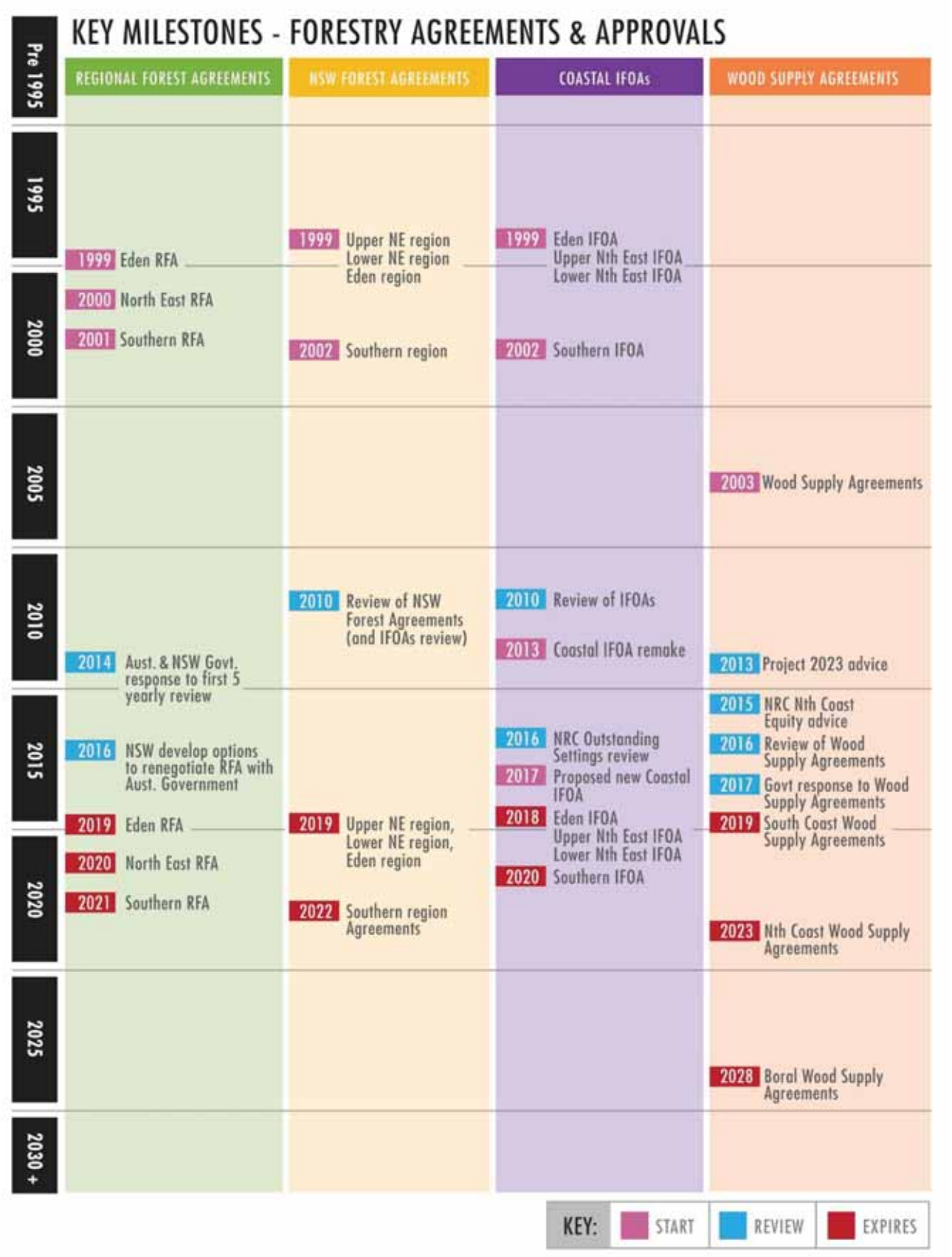


Figure 3: Key agreements governing native forestry

2.2 Government objectives and commitments

The new IFOA is intended to deliver a contemporary regulatory framework fit to meet the following objectives:

- reduce the costs associated with implementation and compliance
- improve clarity and enforceability of the IFOAs
- recognise innovations in best regulatory practice
- incorporate advances in technology.[6]

In addition, the Government has made two further commitments; that the new Coastal IFOA will result in:

- no net change to wood supply
- no erosion of environmental values.[7]

2.3 Progress and agreed settings

Initial negotiation of the approaches, conditions and settings to be included in the new IFOA began in June 2013. The EPA and FCNSW have agreed on final positions for major components of the IFOA prescriptions, many of which represent significant improvements in environment protections compared with current practices, and better efficiency, effectiveness and transparency compared with the current regulatory arrangements. These negotiations have been supported by an on-ground trial of potential approaches from July to September 2015.

The Coastal IFOA will adopt a landscape-based approach for protecting threatened species. This approach aims to retain important forest elements that are used by threatened species at a range of scales. The multi-scale approach builds on existing protections at the site scale, along with new protections at larger landscape scales, complementing the ongoing protection provided through the reserve system (**Figure 4**). In some instances, these protections replace current requirements for site specific threatened species surveys by routinely providing robust protections for habitat resources across the landscape, thus reducing the need for costly surveys. The IFOA settings and regulatory provisions at each scale are intended to be consistent and mutually reinforcing.

A multi-scale approach is common practice in Canada, the United States and Tasmania to ensure sufficient threatened species habitat is maintained during and after harvesting.[8] The ability for viable populations of threatened species to persist in an area is an important outcome of ecologically sustainable forest management and an indicator of the resilience of forest ecosystems following disturbances, including forestry activities.[9]

6 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW.
7 Ibid.
8 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW
9 Ibid.

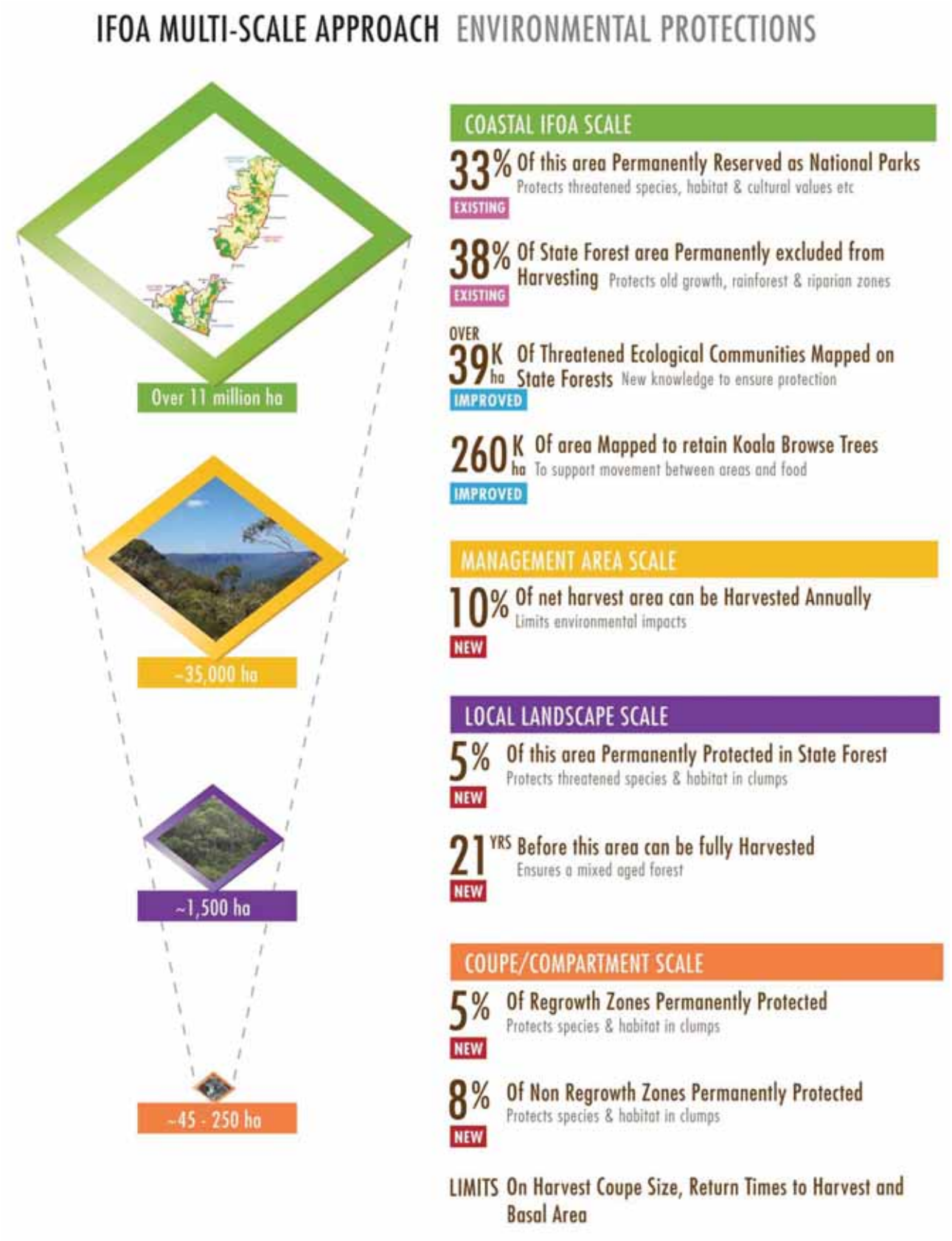


Figure 4: Environmental landscape protections under the IFOA's multi-scale approach

2.3.1 Specific settings

While not an exhaustive list of agreed settings, **Table 1** provides a summary of some key agreed settings and the expected benefits when compared with the provisions of the existing IFOAs. Importantly, many of the new, revised or replacement settings provide stronger protections delivering improved environmental outcomes as well as delivering operational efficiencies.

Tree retention and threatened species protections areas will be retained within clumps to provide habitat for fauna including hollows. These clumps will be permanently attached to specific habitat features and excluded from harvest, rather than being re-determined at each harvest event. The clumps will streamline a range of existing protections for threatened species, flora, fauna and habitat types into a single prescription, making planning and compliance more efficient. The area protected in clumps is in addition to the 38 percent of the existing state forest estate already permanently excluded from harvesting in the Coastal IFOA region.

The Coastal IFOA also includes a harvest limit of up to 2,200 hectares per year for regeneration harvesting in intensive harvest zones on the north coast.

Compared to the existing IFOA provisions, the agreed settings also provide operational efficiencies and cost savings for FCNSW for instance through reduced threatened species surveys. The settings also make the provisions more transparent and enforceable. The agreed settings also codify intensive harvesting for the first time, which provides improved regeneration outcomes for timber.

The new arrangements allow for intensive harvesting in some parts of the forest landscape to meet the regeneration requirements of preferred timber species (primarily blackbutt) and to increase efficiency in wood supply. This provision for intensive management is offset by increased forest protection at the landscape scale and retention of permanent habitat clumps and other threatened species protection measures within the harvested areas.

Table 1: Summary of key agreed approaches or settings and expected benefits

Agreed approach or setting		Expected benefits
Maximum limits on harvesting: ▪ A total of 10 percent of Net Harvest Area can be subject to mixed intensive and selective harvesting in a Management Area per year (with intensive harvesting capped at 5 percent in a management area per year) ▪ 2,200 total hectares per year can be subject to intensive harvesting in the regrowth zone of the North Coast	New settings	▪ Introduces landscape scale protections to limit intensive harvesting for the first time (intensive harvesting has been practiced since 2007 but has not previously been codified) ▪ Removed redundant threatened species protections measures, reduced surveys and reduced costs for FCNSW

Agreed approach or setting		Expected benefits
Clumps and hollow trees will be mapped and permanently retained and excluded from harvesting	New settings	▪ Environmental outcomes are improved when trees are retained as clumps rather than as individuals at the coupe scale ▪ Protections are permanent, unlike the temporary provisions in existing IFOAs ▪ Removed redundant threatened species protections measures, reduced surveys and reduced costs for FCNSW ▪ Mapped features to enable operational and regulatory efficiencies
Retained basal area (trees) in selective harvesting zones must be dispersed across the harvest area – cannot be grouped in one area	New and revised settings	▪ Clearer definition of selective harvesting at the coupe scale, removes ambiguity present in current IFOA.
The exclusion of harvesting from all areas of: ▪ mapped wetlands, unmapped wetlands and major water storages ▪ mapped old growth forest ▪ mapped rainforest ▪ identified heath and scrub ▪ ridge and headwater habitats	Existing settings	▪ Maintains environment protections and outcomes ▪ Mapped features to enable operational and regulatory efficiencies
Other exclusion zones: ▪ to protect bird nests and roosts ▪ on dams and streams to protect threatened frogs ▪ to protect bat roosts and flying-fox camps ▪ to protect threatened plants, mapped threatened species habitat, and certain survey driven threatened species habitat	Existing settings	▪ Maintains environment protections and threatened species outcomes ▪ Mapped features to enable operational and regulatory efficiencies
Stream protection network made up of exclusion zones on streams and associated ground protection zones	Existing settings	▪ Maintains environment protections and outcomes ▪ Mapped features to enable operational and regulatory efficiencies

Perhaps the most significant improvement relates to the shift towards threatened species protections being delivered by permanently protected vegetation clumps.

While it is acknowledged there will be short term impacts on local flora and fauna at the coupe scale as habitat is removed for timber, the clumps will provide for permanent retention of key habitat structures (such as trees and decayed logs) in the post-harvest forest.[10] The retention of

10 Lindenmayer, D.B., Franklin, J.F., Lõhmus, A., Baker, S.C., Bauhus, J., Beese, W., Brodie, A., Kiehl, B., Kouki, J., Pastur, G.M. and Messier, C., (2012). A major shift to the retention approach for forestry can help resolve some global forest sustainability issues. *Conservation Letters*, *5*(6), pp.421-431.

clumps mimics the forest structures that remain standing following natural disturbance events, and help maintain the continuity of structural and compositional diversity at the coupe level, thus playing an important role in the recovery of forest ecosystem function and biological diversity.[11] Clumps also provide improved environmental outcomes through reduced tree mortality compared with retention of individual trees.

The approach within the Coastal IFOA aligns with a retention forestry approach, which has the explicit ecological goal of maintaining a greater diversity of forest-dependent species, habitats and structural legacies from the pre-harvest forest into the harvested and regenerating stand.[12] An increased focus on what to retain, as opposed to what to harvest, is expected to deliver improved conservation outcomes.[13] Outcomes of this new practice should be appropriately monitored and evaluated (for example, using a before-after-control-impact approach) to establish its effectiveness for native forests in the IFOA region.

While the clumps are largely planned at the coupe level, retention forestry principles indicate that they should be one component in a multi-scale conservation system, with additional forest cover and connectivity across the wider landscape.[14] The additional harvest limits and exclusion zones acting across multiple scales within the proposed IFOA settings provide for this wider landscape cover and connectivity.

2.4 The Commission's review

Despite the progress around agreed settings outlined in **Section 2.3**, negotiations stalled around a set of outstanding settings and issues that have remained unresolved (see **Appendix 1** for list).

The Premier has asked the Commission to review outstanding settings for the new Coastal IFOA, and advise the Minister for the Environment and the Minister for Primary Industries within four months on the extent to which the proposed IFOA settings would, or would not, deliver the Government's commitments (see **Appendix 2** for Terms of Reference).

If it is not considered possible to meet the commitments, the Commission is to provide options for how to balance or reduce the impacts on environmental values or wood supply.

Appendix 3 explains the Commission's process in more detail, including steps to develop a suite of settings most likely to deliver on the Government's dual commitments and an approach to test the extent to which the commitments are mutually achievable.

11 Beese, W.J., Dunsworth, B.G., Zielke, K. and Bancroft, B. (2003). Maintaining attributes of old-growth forests in coastal B.C. through variable retention. *The Forestry Chronicle*. 79: 570-578.
Gustafsson, L., Baker, S.C., Bauhus, J., Beese, W.J., Brodie, A., Kouki, J., Lindenmayer, D.B., Lõhmus, A., Pastur, G.M., Messier, C. and Neyland, M. (2012). Retention forestry to maintain multifunctional forests: a world perspective. *BioScience*. 62: 633-645.

12 Baker, S.C. and Read, S.M, (2011). Variable retention silviculture in Tasmania's wet forests: ecological rationale, adaptive management and synthesis of biodiversity benefits. *Australian Forestry*. 74: 218-232.
Baker, S.C., Halpern, C.B., Wardlaw, T.J., Crawford, R.L., Bigley, R.E., Edgar, G.J., Evans, S.A., Franklin, J.F., Jordan, G.J., Karpievitch, Y. and Spies, T.A. (2015). Short-and long-term benefits for forest biodiversity of retaining unlogged patches in harvested areas. *Forest Ecology and Management*. 353: 187-195.

13 Mori, A.S. and Kitagawa, R. (2014). Retention forestry as a major paradigm for safeguarding forest biodiversity in productive landscapes: a global meta-analysis. *Biological Conservation*. 175: 65-73.

14 Gustafsson, L., Bauhus, J., Kouki, J., Lõhmus, A. and Sverdrup-Thygeson, A. (2013). Retention forestry: an integrated approach in practical use. In. Kraus D. and Krumm F. (eds) (2013). *Integrative approaches as an opportunity for the conservation of forest biodiversity*. European Forest Institute. p. 74-81.

As per the Terms of Reference, the Commission has also:

- engaged independent ecology and forestry experts[15] to inform its advice, including to assist with research, expert opinion and evidence on the environmental or silvicultural implications of any recommendations
- engaged with FCNSW, EPA, OEH, DoI and DPC during the review process
- shared relevant information with FCNSW, EPA, OEH, DoI and DPC, including proposed settings put forward by FCNSW and EPA, and the Commission's preliminary findings and recommendations.

The Commission has held three joint forums to facilitate discussion between the Commission, government representatives and expert advisors, and to test findings and possible settings. In addition, there have been several meetings on specific settings such as koala protection. The outstanding issues have remained fully contested between parties during the review.

15 Experts include: Professor Brendan Mackey (Director of the Griffith Climate Change Response Program and immediate member of the International Union for Conservation of Nature Council); Professor Rod Keenan (School of Ecosystem and Forest Sciences, University of Melbourne and former Director of the Victorian Centre for Climate Change Adaptation Research; Associate Professor Cris Brack (Fenner School of Environment and Society, Forest Measurement and Management, Australian National University).

3 Recommendations for outstanding settings

Key points:

1 Following consultation with EPA and FCNSW, and analysis of a range of alternative settings, the Commission has developed a suite of proposed settings that go closest towards meeting the Government's Coastal IFOA objectives and commitments at the state scale.

2 The recommended settings combine with the existing agreed settings to form a broader integrated package, and the Commission has considered the expected impact and enforceability of the agreed settings when developing its advice.

3 Some recommended settings require the EPA and FCNSW to collaborate on guidance material and protocols for harvesting plans, including settings with transitional arrangements and those allowing for limited environmental impacts in exceptional circumstances.

4 However, as discussed further in **Section 4**, the Commission found the commitments in their current form are not mutually achievable, particularly given local wood supply impacts.

3.1 Recommended settings

The Commission's recommended settings are presented in **Table 2, Table 3** and **Table 4**, with the settings grouped according to whether they primarily relate to species and habitat protections, harvesting limits or effective implementation. The tables also list how each setting could contribute to desired outcomes as described in Section 6.2.2. **Figure 5** shows how the recommended settings are applied in a hypothetical state forest.

In addition, **Appendix 4** provides more information about the harvesting approaches and zones referred to in the tables.

The recommended settings draw on EPA and FCNSW proposals, along with new prescriptions developed by the Commission. Some settings also include provision for limited flexibility on a temporary basis to minimise overall impacts as operations transition to the new setting.

In developing the recommended settings, the Commission has focused on choosing settings that:

- are based on acknowledged best practice or best available information, including predictive modelling, scientific literature, and expert advice
- limit negative impacts on wood supply and environmental values as much as possible
- are practical and cost effective to implement and enforce **(Box 1)**
- streamline, simplify and clarify requirements for planning, compliance and / or regulation
- provide greater operational flexibility, where possible without compromising environmental values across the landscape
- align with one or more of the working outcomes statements developed during the Commission's review process (see **Section 6.2.2**).

Overall, the Commission strove to achieve balance between no erosion to environmental values and no net change to wood supply in individual settings and across settings as part of an integrated package.

Importantly, the Commission's recommended settings represent a small sub-set of the broader package of approaches and settings within the Coastal IFOA. As outlined previously in **Section 2.3**, there are new and existing agreed settings under the multi-scale model that maintain environment protections compared with current IFOA provisions (and are an improvement compared to current uncodified intensive harvesting practices), and serve to reinforce the settings in place at other scales.

Further, other agreed settings improve operational efficiencies and cost savings. We have considered the likely impacts of the agreed settings when developing the recommendations. As such, the agreed settings and Commission recommended settings form an integrated package that seeks to minimise risks to key values, and deliver on the IFOA commitments and objectives to the best extent possible within a contested environment.

The Commission has relied on expert judgement to explore the available evidence, identify settings and balance the Government's twin commitments for wood supply and environmental values. In many cases, there has been a lack of empirical evidence or the available evidence is contested. As such, the Commission understands its recommended settings are likely to remain contested between parties.

However, we believe that we have identified the best possible way forward given current information and time constraints of this review. Negotiations on the IFOA started in 2013 and have since stalled. It is timely for Government to make an informed decision. We advise that the risks associated with evidence gaps should not prevent implementation at the present time, but that they should be monitored and managed via an adaptive management approach supported by sound monitoring and evaluation processes.

Box 1: Cost-effectiveness and enforceability

The Commission has sought to ensure the new settings are cost effective to apply and enforce. The Commission considered how the settings could be practically applied, the costs for FCNSW to comply, and costs for the EPA to monitor and assess compliance over time.

Recommendations that reflect this consideration include changes to the settings for managing basal area retention in selective harvesting zones, based on the minimum average threshold for trees retained, rather than the maximum amount that can be removed – the latter being difficult to enforce post-harvest.

Landscape level protections encompassing tree clumps, threatened ecological communities and Koala protections are based on discrete area protections, which can be mapped by FCNSW and then readily checked by EPA on harvest plans, pre- or post-harvest.

For other settings, the Commission has proposed more specific definitions to improve clarity and enforceability. For example, with rocky outcrop protections, which feature definitions that provide more specific metrics, as well as provisions for other rocky features to be managed on a case by case basis, with timely collaboration between FCNSW and EPA on field inspections.

On this basis, the Commission expects the focus of forest regulation and compliance will shift from extensive field assessments to check each setting, to more desktop level assessments based on agreed mapping of boundaries and clear rule sets, complemented by more selective and targeted auditing in the field to ensure consistency in interpretation and compliance.

It is also expected that through the development of collaborative guidance material and EPA review of a sample of initial FCNSW harvest plans for such issues as mixed harvesting settings, any misunderstandings can be clarified early, saving costs later that may have arisen from enforcement activity.

Table 2: Recommended settings and arrangements for species and habitat protection

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to species and habitat protection				
1. Threatened species and habitat protections ('habitat clumps')	a) **5 percent of net harvest area per local landscape area permanently protected from harvesting in clumps -** including habitat clumps, strike rate modifier (mark-up, carry-over and survey-driven exclusions), rocky outcrops and giant trees. In addition, one of the following will also be applied depending on the zone: b) **5 percent per coupe/compartment permanently protected from harvesting in clumps -** in intensive and selective *regrowth* zones; or c) **8 per cent per compartment permanently protected from harvesting in clumps -** in intensive and selective *non-regrowth* zones. **Note:** ▪ Total area protected in intensive and selective regrowth zones is 10 percent, and in intensive and selective non-regrowth zones is 13 percent. ▪ Clumps are in addition to already excluded areas including Threatened Ecological Communities**.** ▪ Clumps identified before first harvest in any local landscape area. ▪ The clump protections at the coupe scale should include hollow bearing and recruitment trees as a priority. ▪ A collaborative, proactive approach should be implemented to develop guidance material and planning protocols.	▪ **Balance Government's twin commitments -** strong evidence supports permanent retention and clumping concept (see **Section 2.3.1**.); provides permanent protection to hollow trees within clumps; provides more opportunities to strategically design and optimise corridors and protections of other environmental features (**no erosion of environmental values)**; splitting clumps between Local Landscape Area and coupe / compartments increases FCNSW's clump placement flexibility (**no net loss of wood supply**). ▪ **Enforceability** – Tree clumps can be mapped as discrete area exclusions in harvest plans, and readily checked pre- or post-harvest.	**Ensure viable populations of native flora and fauna, particularly threatened species (for example Koalas), are maintained in landscapes** For example, by maintaining habitat quality and connectivity through a network of protected riparian, ridge and headwater habitat, landscape exclusion zones and wildlife habitat clumps.	Nil

<table>
<tr><th>Issue</th><th>Recommended setting and arrangements</th><th>Key rationale</th><th>Desired outcome</th><th>Transitional arrangements</th></tr>
<tr><td colspan="5">Settings and arrangements related to species and habitat protection</td></tr>
<tr><td>2. North Coast Koala protection</td><td>a) Use DoI predictive habitat model and OEH likelihood mapping to determine tree retention requirements.
b) Apply tree retention shown in the table below (tree retention provides temporary protection for the harvest cycle).
<table>
<tr><th></th><th>OEH Likelihood High (greater than 0.2)</th><th>OEH Likelihood Moderate (between 0.075 and 0.2)</th></tr>
<tr><td>DoI model - High
Less than 500 metres: 0.6 and above
Greater than 500 metres: 0.65 and above</td><td>10 healthy feed trees per hectare at least 20 centimetres diameter at breast height over bark (DBHOB) for mapped cells (cell size is 6 hectares)</td><td>5 healthy feed trees per hectare at least 20 centimetres DBHOB for NHA in a compartment (if mapped cells cover 25 percent or more of the NHA of a compartment)</td></tr>
<tr><td>DoI model – Moderate
Less than 500 metres: 0.45 – 0.59
Greater than 500 metres: 0.45 – 0.64</td><td>5 healthy feed trees per hectare at least 20 centimetres DBHOB for NHA in a compartment (if mapped cells cover 25 percent or more of the NHA of a compartment)</td><td>5 healthy feed trees per hectare at least 20 centimetres DBHOB for NHA in a compartment (if mapped cells cover 25 percent or more of the NHA of a compartment)</td></tr>
</table>
c) Prioritise retention of primary browse trees (at least 50 percent, where available); the remainder can be secondary browse trees (where available).
d) Retain 10 healthy browse trees per hectare in areas not yet modelled (for example, predictive habitat modelling does not include the Lower Hunter. Also, data on koala likelihood is insufficient for around 6,000 hectares).
e) Include moderate to high quality habitat in tree clumps, where possible
f) Train existing staff and contractors to spot Koalas ahead of harvest in moderate to high quality habitat and / or where koalas have been previously recorded (search Atlas of NSW Wildlife records).
g) Harvesting must not occur within 25 metres of a tree with a Koala in it or until the Koala is safely relocated.</td><td>▪ Balance Government's twin commitments - targets strategic tree retention to predicted and likely Koala habitat; increases the area of tree retention; assists Koala movement within, and between tenures (no erosion of environmental values); modest increase in tree retention rates aim to minimise impacts on wood supply to best possible extent while recognising Government's policy initiatives and targeted investment in Koalas as an iconic species (no net change to wood supply),
▪ Cost effective – reduces reliance on pre-harvest survey, including scat detection which can be challenging in wet forests.</td><td>Ensure viable populations of Koalas are maintained in landscapes
The prescriptions are intended to provide habitat retention to support viable and resilient populations of koalas across their range and to minimise potential for death or injury to individuals</td><td>Nil</td></tr>
</table>

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to species and habitat protection				
3. Threatened ecological communities protections	a) **No harvesting in areas mapped as threatened ecological communities** – any buffers should be incorporated into one boundary line. b) **Maintain existing roading and harvesting access –** for all machinery and vehicle movement between isolated patches through newly mapped areas. c) **New roading and harvesting access** – to be approved by the EPA; with the view reasonable requests are supported. **Note**: ▪ Mapped threatened ecological communities are Environmentally Sensitive Areas 1 and Endangered Ecological Communities Buffers Environmentally Sensitive Areas 2	▪ **Certainty** – mapping supports more efficient and effective planning and operations ▪ **Consistent** – with the current legal requirements (no harm or damage to Endangered Ecological Communities) and with Scientific Committee determinations	**Ensure viable populations of native flora and fauna, particularly threatened species, are maintained in landscapes**	Develop guidance on circumstances where roading can occur and mitigate harm

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to species and habitat protection				
4. Giant tree protections	a) **Minimum 160cm -** for blackbutt and alpine ash diameter at stump height over bark (DSHOB). b) **Minimum 140cm -** for all other species diameter at stump height over bark (DSHOB).	▪ **Balance Government's twin commitments -** number and diversity of tree hollows and cavities increases with tree diameter (usually associated with age), and the probable occupancy by arboreal species increases with the number of cavities **(no erosion to environmental values)**; proposed size thresholds likely to have limited impact on wood supply (**no net change to wood supply**). ▪ **Enforceability** – clear definitions and a simple rule set, based on no harvesting of trees with diameters greater than specified thresholds. Diameter at stump height over bark is an industry standard measurement, and cost effective way to assess tree size. ▪ **Flexibility** – different tree size limits reflects variability between species.	**Ensure viable populations of native flora and fauna, particularly threatened species are maintained in landscapes**	Nil

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to species and habitat protection				
5. Rocky outcrop protections	a) **Permanent harvesting exclusions in areas that clearly meet the definitions of rocky outcrops or a cliff and are mapped as permanent exclusions in pre-harvest surveys -** where *rocky outcrops* are defined as areas: - where rock features cover more than 70 percent of the surface of any 0.1 hectare area (30 metres by 30 metres) and there is a distinct change in vegetation character, for example, or a distinct vegetation community with occasional emergent trees; - cliffs are defined as a rocky slope of bedrock greater than 70 degrees, 3 metres high and at least 10 metres in length (exceeding 3 metres in height). **Note:** can be included in habitat clumps. **b) Permanent harvesting exclusions in other rock features, mapped on a case-by-case basis in pre-harvest surveys -** which contain threatened species or locally important habitat features identified in pre-harvest surveys; these could include large boulders, erratics and areas of rocks and / or boulders generally in a single layer or occasionally overlapping; can be included in clumps. **Note:** ▪ This setting is indicative. The two parties are in a current legal dispute. Rocky outcrops vary markedly depending upon the geological region. Local variation and clarity is best achieved via collaborative field visits and development of guidance material that sits beneath the IFOA. ▪ The Commission notes that EPA involvement in pre-harvest surveys to identify rocky outcrop features prior to harvesting which, the Commission understand has resulted in improved levels of compliance.	▪ **Balance Government's twin commitments -** maintains habitat values (**no erosion of environmental values**) ▪ **Clarity** – increase ease of interpretation, compliance and mapping for permanent protection. ▪ **Enforceability** – provide more specific definition and more clarity. Enforceability for other rock features will benefit from more collaborative initiatives and joint field inspection by FCNSW and EPA, to discuss protection measures for precedent examples.	**Ensure viable populations of native flora and fauna, particularly threatened species, that use these habitat types are maintained in landscapes** **Ensure viable populations of native flora and fauna, particularly threatened species, are maintained in landscapes**	Nil

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to species and habitat protection				
6. Burning in exclusion zones	**a) No deliberate pre or post-harvest burn can occur in exclusion zones –** unless in exceptional circumstances there is no safe or practical alternative and detailed plans are prepared in consultation with EPA.	▪ **Balance Government's twin commitments -** guidelines and permission would provide oversight to ensure impacts to environmental values are minimised, while still delivering fire management outcomes, maintains habitat values (**no erosion of environmental values**). ▪ **Risk management** – due diligence requirement to prioritise the protection of life and property when undertaking fire management. ▪ **Enforceability** – Exclusion zones can be mapped as discrete areas in burn plans, and readily checked pre- or post-burning operations. Further consideration could be given to the firebreak buffer requirements around exclusion zones, and the extent to which minimum standards for firebreaks (including their width and condition) are required.	**Ensure viable populations of native flora and fauna, particularly threatened species, are maintained in landscapes** Protect life and property.	Nil

Table 3: Recommended settings and arrangements for harvesting limits

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to harvesting limits				
1. Size of intensive harvesting coupes	**a) Maximum 45 hectares –**in intensive harvesting zones.	▪ **Reflects recent harvesting trends** – coupe size has fallen in recent years. Between 2013 and 2015, the majority of coupes (81 percent) were 45 hectares or less; average coupe size will likely be around 30 hectares (same as EPA's proposed maximum 30 hectares) ▪ **Balance Government's twin commitments -** coupe size is offset by additional habitat clump protections, Koala protections and other harvesting space and time limits (**no erosion to environmental values**); provides flexibility to increase coupe sizes in some cases to limit impacts on operational efficiency; promotes regeneration to sustain wood supply and promote genetic diversity and resilience (**no net change to wood supply**). ▪ **Enforceability** – Setting a maximum upper limit with guidance to the expected average provides a clear basis for enforceability, while maintaining some flexibility, compared to a simple maximum. Coupe sizes are readily measured and monitored with desktop applications.	**Ensure the productive capacity of the state forest is maintained or enhanced** For example, maintaining sustainable timber supplies of appropriate species and quality across locations, including enhancing and protecting growing stock. **Ensure viable populations of native flora and fauna, particularly threatened species, that use these habitat types are maintained in landscapes** Maintaining or improving landscape heterogeneity by applying time and space limits on harvest activities.	Up to 5 coupes at maximum 60 hectares per financial year, with no more than 1 in any Local Landscape Area per year for 5 years until first formal IFOA review. Notify EPA when these transitional arrangements are used.

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to harvesting limits				
2. Time for full harvest commencing from start of new IFOA	**a) Minimum 21 years** – for the intensive harvest tract in the net harvest area in a Local Landscape Area in the intensive harvesting zones **b) 3 harvest cycles** – the net harvest area will be harvested in three cycles at least 10 years apart (**Cycle 1:** 1-10 years; **Cycle 2:** 11-20 years; **Cycle 3:** 21-30 years) c) **Maximum 33.33 percent** - of the Net Harvest Area in a Local Landscape Area harvested in any one cycle. Any shortfall below 33.33 percent within a cutting cycle cannot be 'caught up' in other cycles by exceeding the 33.33 percent limit. **d) Minimum 15 percent -** of the Net Harvest Area in a Local Landscape area must be retained and consolidated at the start of the third cycle with trees older than 20 years **Note:** A collaborative, proactive approach should be implemented to develop guidance material and planning protocols. See **Figure 6** for further explanation of this setting.	▪ **Balance Government's twin commitments** - distributes environmental impacts of intensive harvesting over a longer time frame compared to current practice (**no erosion to environment values**); promote long-term sustainable harvest supply (**no net change to wood supply**). ▪ **Enforceability** – can be based on harvest planning schedules and tracking of harvesting over time, through desktop applications and field audits.	**Ensure the productive capacity of the state forest is maintained or enhanced** Maintaining the age and size class structure of uneven-aged stands and enhancing and protecting growing stock to ensure sustainable timber supplies of appropriate species and quality across locations. **Ensure viable populations of native flora and fauna, particularly threatened species, that use these habitat types are maintained in landscapes** Maintaining or improving landscape heterogeneity by applying time and space limits on harvest activities.	Nil

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to harvesting limits				
3. Adjacency rule (without use of 40 metre buffers)	**a) Minimum 10 years –** to return to adjacent coupes in intensive harvest zones without the use of buffers**.** **Note:** ▪ A collaborative, proactive approach should be implemented to develop guidance material and planning protocols.	▪ **Balance Government's twin commitments** - prioritise longer return time over coupe size to protect environmental values; distributes environmental impacts of intensive harvesting over a longer time frame compared to current practice (**no erosion to environment values**); transitional arrangement is necessary to balance likely impacts on wood supply (**no net change to wood supply**). ▪ **Enforceability** – Time and space measures (ie. the harvest period intervals and the distance between adjacent coupes) can be readily checked and monitored against harvesting plans. The regulation of this can be done using desktop applications (for cost-effectiveness), complemented by auditing in the field.	**Ensure the productive capacity of the state forest is maintained or enhanced** Maintaining the age and size class structure of uneven-aged stands and enhancing and protecting growing stock to ensure sustainable timber supplies of appropriate species and quality across locations. **Ensure viable populations of native flora and fauna, particularly threatened species, that use these habitat types are maintained in landscapes** Maintaining or improving landscape heterogeneity by applying time and space limits on harvest activities.	Minimum 7 year return time, transitional for 5 years until first formal IFOA review. See **Box 2** for further explanation. Notify EPA when these transitional arrangements are used.

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to harvesting limits				
4. Basal area of trees to be retained in selective harvesting zones	**a) Minimum average 10 square metres per hectare -** trees retained per compartment and excluding clumps in selective *re-growth* zones **b) Minimum average 12 square metres per hectare -** trees retained per compartment and excluding clumps in selective *non-re-growth* zones **Note:** ▪ A collaborative, proactive approach should be implemented to develop guidance material and planning protocols.	▪ **Balance Government's twin commitments** – 40 percent basal area removal is equivalent to basal area retention of on average 17 square metres per hectare, with a range of 10 to 24 square metres per hectare. New IFOA rules will include tree clumps, so basal area retention data needs to account for basal area included in tree clumps (**no net change to wood supply**). ▪ **Enforceability –**minimum average is easy to comply and enforce with compared to an average. Applies a minimum limit to the trees *retained*, rather than a maximum limit to the trees *removed*. This will provide for most cost-effective assessment and enforcement post-harvest operations ▪ **Starting point** – provides an interim solution until a better metric is identified, field tested and implemented (ideally, need to identify and measure the different age classes and densities in the standing stock of trees).	**Ensure the productive capacity of the state forest is maintained or enhanced** Maintaining the age and size class structure of uneven-aged stands and enhancing and protecting growing stock to ensure sustainable timber supplies of appropriate species and quality across locations. **Ensure viable populations of native flora and fauna, particularly threatened species, that use these habitat types are maintained in landscapes** Maintaining or improving landscape heterogeneity by applying tree retention limits on harvest activities	Identify, field test and implement new metrics that measure different successional or structural stages and densities in tree standing stock by first formal IFOA review

Issue	Recommended setting and arrangements	Key rationale	Desired outcome	Transitional arrangements
Settings and arrangements related to harvesting limits				
5. Mixed Intensity Harvesting *(where both intensive and selective harvesting events occur in the same local landscape area)*	a) **Intensive and selective harvesting must only occur in areas mapped for this purpose –** FCNSW must prepare maps and notify EPA prior to any harvesting in a Local Landscape Area to ensure harvesting is appropriately dispersed across the landscape. b) **Maintain 40 metre buffer between coupes –** selective harvesting cannot be used to overcome the 40 metre buffer rule. The buffer is to be a forested area protected through a permanent exclusion zone, a coupe that is over 10 years old, or temporary 40 metre buffers (in which the vegetation is over 10 years old). **c) Apply intensive and selective harvesting settings** **d) Harvest intensive tract in a single cycle -** rather than a minimum of 3 cycles, where an intensive harvesting tract is under 45 hectares (or 10 percent of the total Local Landscape Area, whichever is less). **Note:** ▪ EPA and FCNSW raised concerns about the potential for unforeseen wood supply and environmental impacts associated with this setting. A strong collaborative and adaptive management approach is recommended to allow issues to be addressed as they arise in a timely manner.	▪ **Balance Government's twin commitments -** capacity to adjust mapped boundaries and harvesting approaches on a case-by-case basis in consultation with the regulator (**no net change to wood supply**). ▪ **Clarity** – upfront mapping facilitates implementation and compliance. ▪ **Enforceability** – Enforcement will rely on the designation of mixed intensity harvesting areas, prior to any harvesting in a Local Landscape Area.	**Ensure viable populations of native flora and fauna, particularly threatened species, are maintained in landscapes** Allowing for the persistence or recolonisation of threatened species at the local landscape scale following harvesting, and support the maintenance of those populations throughout their range.	Nil

Table 4: Recommended settings and arrangements to support effective implementation protections

Issue	Recommended settings and arrangements	Key rationale
Settings and arrangements to support effective implementation		
1. Monitoring	**a) DoI/FCNSW designs and funds monitoring and evaluation program focused on performance, learning and outcomes for environmental values and wood supply -** to support meaningful adaptive management and build trust between parties and stakeholders	▪ **Performance** – a framework that compliments the new outcomes-based structure of the IFOA is required to support adaptive management; provides an opportunity to gather empirical data and improve outcomes based on solid evidence. ▪ **Cost-effectiveness** – significant funding allocated to pre-harvest surveys can be better spent on programs that review outcomes. ▪ **Suitability** – agency design to create buy-in and ensure monitoring is integrated into systems and practices, supported by validation by an expert peer reviewer.
2. Operational boundaries	**a) IFOA spatial dataset contains position of compliance boundaries based on best available information and technology -** with all FCNSW, EPA and operators and regulator working from the same dataset **Note:** ▪ Operator to apply due diligence and regulator to apply discretion	▪ **Cost-effectiveness** – technology can deliver efficiencies for the regulator and operator, and increase profitability; the new IFOA will have more mapped areas that can be identified using Global Positioning System (GPS), leading to cost savings. ▪ **Best practice** - other jurisdictions are beginning to move towards georeferenced evidence for assessing compliance; there is an opportunity for NSW to lead in this space. ▪ **Innovation** – outcomes-based approach allows for technological solutions to be implemented to identify operational boundaries; in line with a general shift towards 'precision forestry' supported by improved technology, including use of LIDAR for improving delineation of features and more accurate GPS devices. ▪ **Practicality** – due diligence is important given current limitations in technology (despite advancements), balanced by regulatory discretion given potential for error. ▪ **Transparency** – making boundaries publicly available has the potential to increase stakeholder understanding about forestry operations (go and no-go areas).

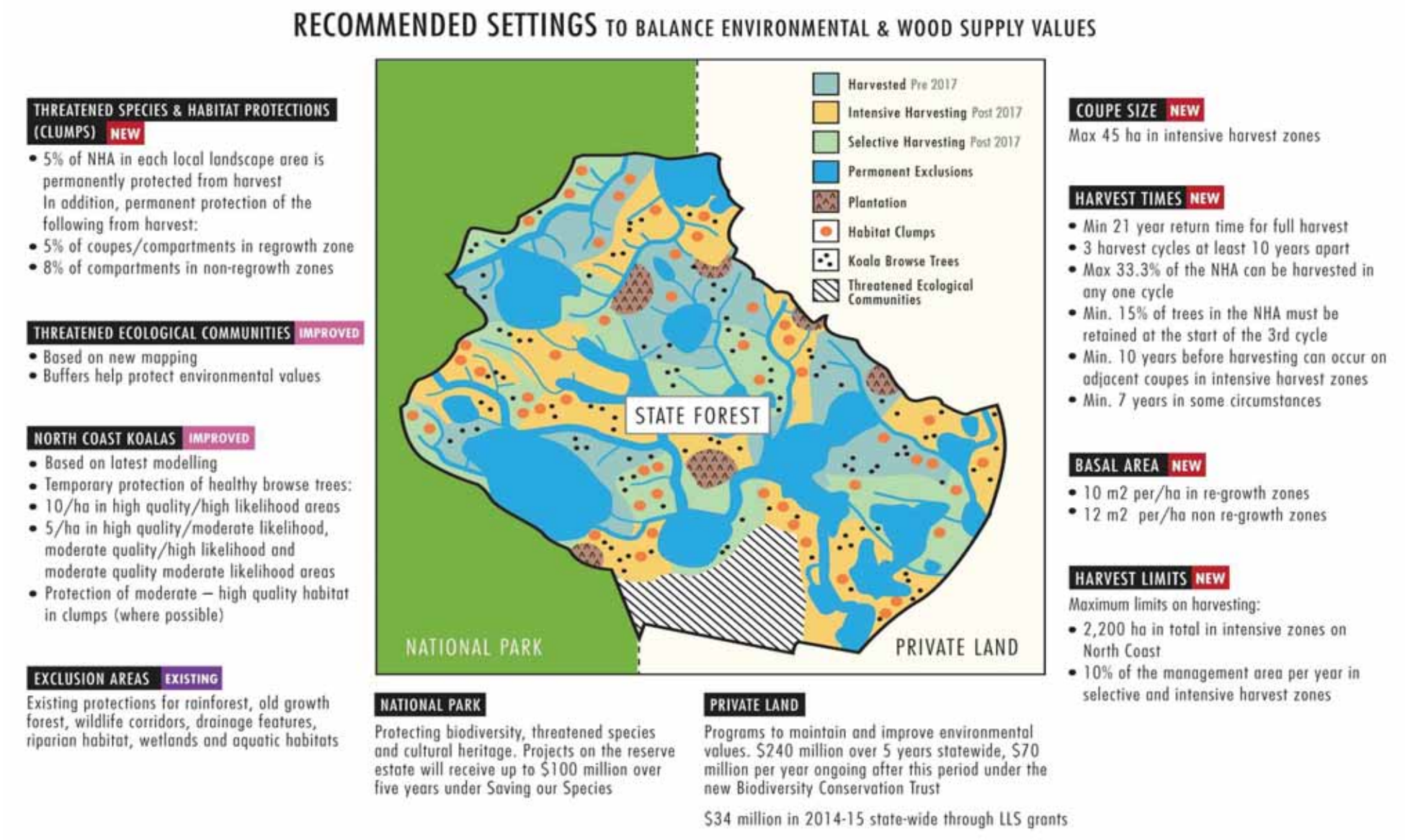


Figure 5: Application of recommended settings in a hypothetical state forest

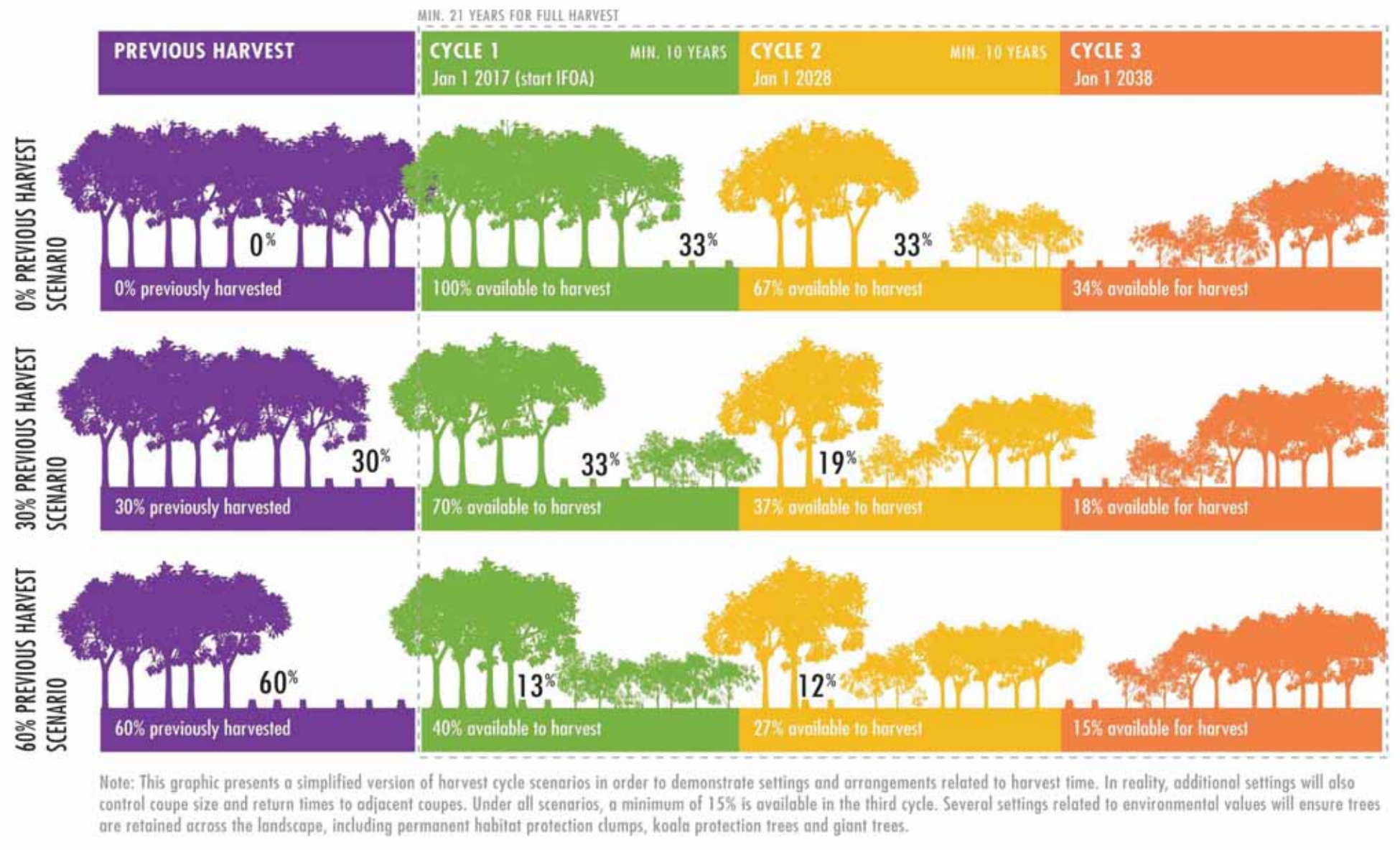


Figure 6: Indicative scenarios to explain the time setting for full harvest of a local landscape area

Box 2: Explanation of transitional arrangements for return time to adjacent coupes

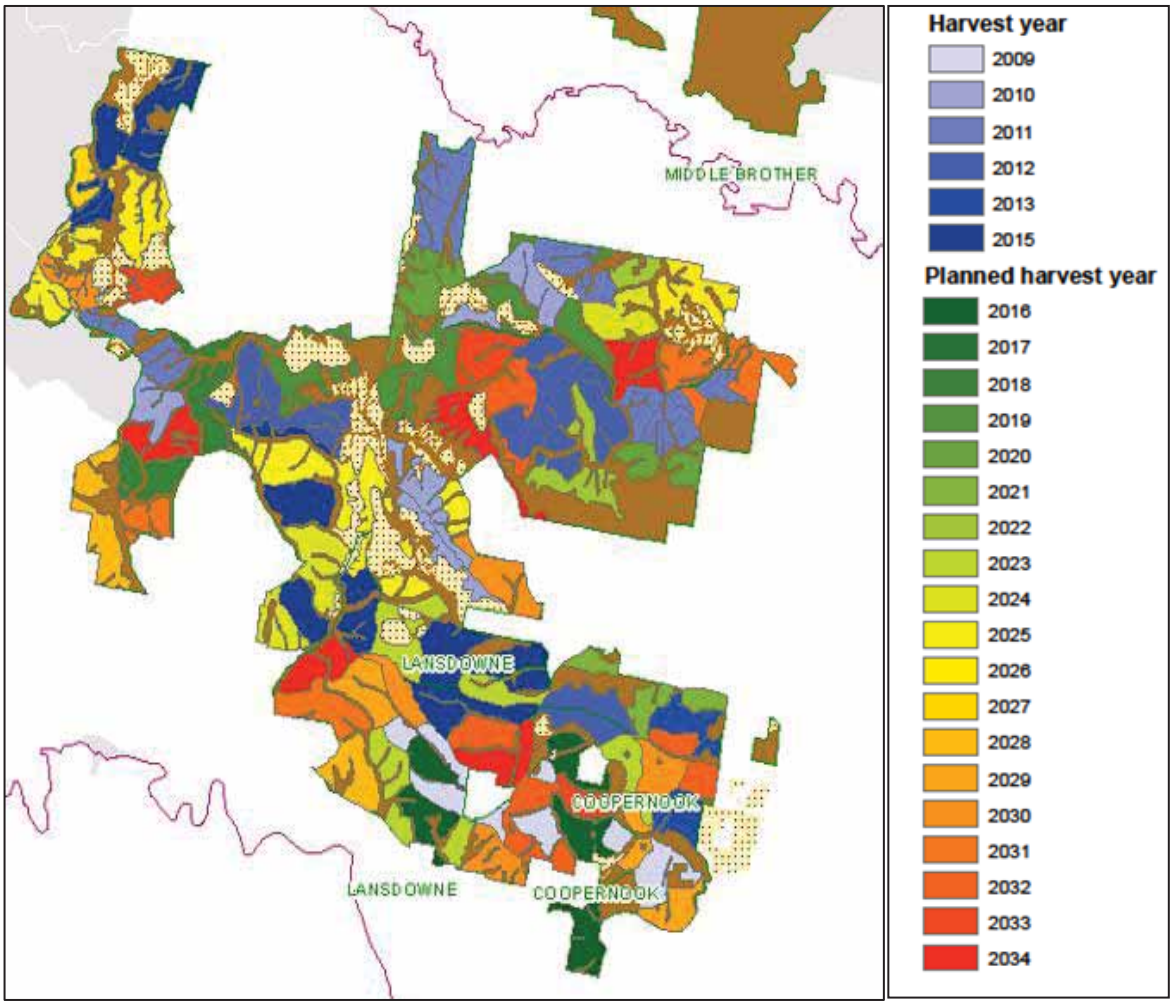
The Commission has recommended that in the intensive harvest zone, FCNSW cannot harvest a coupe that is immediately adjacent to any coupe that was harvested fewer than 10 years earlier (otherwise the already agreed 40 metre buffer setting for adjacent coupes applies). For instance, in 2017, FCNSW could either:

- harvest in coupes surrounded by areas that have not been harvested since 2007
- apply a 40 metre buffer when harvesting in coupes adjacent to any areas harvested later than 2007.

However, in intensive harvest zones, most unharvested areas are located next to coupes that have been harvested within the last 10 years. For example, referring to the Coopernook harvest area shown in **Figure A**, any coupe located next to areas coloured with darker shades of green could not be harvested without the use of buffers until at least 2019. With the recommended 10 year adjacency rule in place, FCSNW would initially find it difficult to meet wood supply commitments on the north coast.

As such, the Commission has recommended a transitional arrangement be applied. Specifically, FCNSW can harvest in a coupe providing the adjacent coupes were harvested more than seven years earlier. This transitional arrangement is in place for until the first IFOA review in five years.

This transitional arrangement seeks to manage short-term risks to Government's ability to meet current wood supply commitments. This is a temporary measure to support the transition to the Commission's recommended 10-year setting, which provides for a longer return time in comparison to current practice and should minimise risks to environmental values in the long term.



Additional key: brown areas = exclusion areas; dotted areas = plantations

Figure A: map showing previous and planned harvest areas in Coopernook harvest area

4 Reviewing impacts and risks relating to the Government's commitments

Key points:

1 Overall the Commission found the commitments in their current form are not mutually achievable.

2 The agreed and proposed settings have been designed to maintain an equivalent level of environment protection and outcomes. While the settings are expected not to erode environmental values, they will likely have impacts on overall wood supply, including potentially significant localised impacts in some areas via decreased supply of particular timber species and/or increased production costs.

3 Most individual settings are assessed to pose **low to medium risk** for both wood supply and environmental values.

4 Individually, all settings pose a **moderate or low risk** to environmental values. The settings, when considered together as an integrated package are a significant improvement compared to current reference practice.

5 There is a **high risk** that two individual settings have the potential to impact wood supply: (1) koala protections; and (2) improved knowledge of permanent harvesting exclusions in threatened ecological communities (as a result of updated mapping). Taken together, the two high-risk settings have the potential to effect the operation of mills due to reduced supply from certain supply zones, and related reductions in availability of key species such a tallowwood and spotted gum.

6 The Commission used the best available information and analysis to quantify impacts and risks. However, further modelling with FRAMES should be undertaken after the settings have been adopted to more accurately quantify wood supply impacts

7 There are additional factors outside of the IFOA settings that affect the ability to meet the commitments both now and into the future, such as emerging threats from climate change.

8 Options for addressing risks to the Government's commitments are discussed in **Section 5**.

As required under the Terms of Reference, the Commission has assessed whether Government's twin commitments to maintain wood supply and environmental values are mutually achievable under any combination of the agreed, and proposed or recommended settings.

4.1 Defining the baseline practices

To assess whether the commitments are mutually achievable, the Terms of Reference asks the Commission to determine the baseline practice having regard to the conditions in the current IFOA and their practical application.

The Commission has based its analysis of the expected impact of agreed and outstanding settings in comparison with the reference practices set out in **Table 5**.

The Commission has adopted the term 'reference' practice rather than 'baseline' practice as set out in the Terms of Reference. Traditionally, a baseline refers to the starting point for comparing and measuring change, such as the change in condition of vegetation. Ideally, a comprehensive set of evidence-based datasets on the condition for wood supply and environmental values would be

used as the baseline for assessing whether commitments are mutually achievable. However, the preferred baselines put forward by EPA and FCNSW focussed on current IFOA settings and forestry practices (respectively).

The Commission acknowledges that there is significant contention between the EPA and FCNSW as to which reference practices should be used for settings relating to intensive harvesting on the North Coast.

The EPA proposes that Australian Group Selection is used as the reference practice, as this was understood to be the most intensive form of harvesting permitted under the existing IFOAs. Australian Group Selection was used by FCNSW up until 2007, at which point FCNSW started applying current intensive practices (Regeneration Single Tree Selection).

FCNSW have reported that there were issues with the Australian Group Selection practices as specified in the original IFOAs, particularly that they were not achieving regeneration objectives and were incurring efficiency costs. As a result, FCNSW do not currently use these practices. During a 2009 review of the existing IFOAs, FCNSW sought to have the IFOAs amended to explicitly permit Regeneration Single Tree Selection. The proposed changes were then opposed by the EPA as Australian Group Selection delivers environmental benefits compared with regeneration harvesting, particularly in providing better structure and mitigating impacts.

As a result, the IFOA was not amended to codify new harvesting approaches. As there has been no formal agreement between EPA and FCNSW on replacement practices, the EPA considers that Australian Group Selection remains the most intensive harvest approach permitted under the existing IFOAs.

Despite not being explicitly codified under the existing IFOAs, Regeneration Single Tree Selection has, however, become established FCNSW practice since 2007. Further, these practices have formed the basis for recent future resource planning and Government decisions around buy-backs on the North Coast under Project 2023 (see **Figure 3** for key decision points).

Having considered all views, the Commission has drawn the reference practice from the most relevant comparable practice for each setting. The Commission has drawn on practices as currently prescribed in the IFOA to test impacts of settings on the commitment around no erosion to environmental values.

In contrast, current harvest practices were chosen as the primary reference point for testing the impacts on the commitment requiring no net change to wood supply. While FCNSW's current intensive harvesting may not necessarily be judged to be 'best practice' or even 'good practice', it is the most realistic and informative point of reference for assessing expected impacts and risks for this particular group of settings for wood supply. It also recognises that parties have agreed to codify intensive harvesting as a form of silviculture under the new IFOA.

However, in the interest of reflecting both agency perspectives, the Commission has also estimated the likely impacts in comparison to the Australian Group Selection practices as described in the existing IFOAs.

Table 5: Reference practices for impact analysis

Issue	Reference practice	Comment
Threatened species and habitat protection (habitat clumps)	**North coast IFOA provision** Threatened species protections / strike rate modifier (average 3.4 percent) Average habitat and recruitment tree retention rates.	▪ Reflects conditions present under current threatened species protections and habitat and recruitment tree retentions to some extent in the IFOA. ▪ There is no equivalent setting to the proposed habitat clump requirements in the current IFOA. ▪ The strike rate modifier is an appropriate estimate for unmapped protections measures required under the Threatened Species Licence and used in timber resource planning. ▪ Average habitat and recruitment tree retention rates have also been considered as they reflect actual forestry practice to date, although these trees are not permanently protected.
North Coast Koala protection	**Current IFOA provision** Undertake compartment mark-up surveys; exclude harvesting from high use areas[16] (apply a 20 metre exclusion zone around the boundary of the high use area); retain 10 trees per 2 hectares in Koala intermediate use areas.	▪ This reference is considered appropriate as it reflects the conditions of the original IFOAs and regulation to date. ▪ Application of current prescriptions are dependent on scat detection which has limitations in wet sclerophyll forests. ▪ Around 200 hectares of koala high use area has been protected over the past 15 years and tree retention requirements have been triggered on around 33 percent of compartments (130,000 hectares).
Threatened ecological vegetation communities	**IFOA provision** Strict liability for any harm, picking or damage to listed threatened ecological communities; must be guided by any advice provided by EPA	▪ This reference is considered appropriate as it reflects the conditions of the original IFOA and regulation to date.
Giant tree protection	**No comparable practice** No diameter threshold specified	▪ No comparable practice in NSW. Tasmania and Victoria do have giant tree protection provisions. ▪ Assessment of impacts considers the diameter thresholds for commercially viable trees – trees that are too large to be feasibly commercially milled have not been counted as having an impact on wood supply.

16 Under the current Coastal IFOAs, a Koala high use area means an area where any of the following features are located: i) three out of any ten consecutive trees inspected are found to have Koala scats beneath them; or ii)a sighting of Koala; or iii) a tree with more than 20 Koala scats beneath; or iv) any trees with Koala scats of two distinctly different sizes beneath; and where the subsequent star search locates at least an additional three out of any ten consecutive trees inspected as having Koala scats beneath them.

Issue	Reference practice	Comment
Rocky outcrops	**IFOA provision** Definition of a rocky outcrop as provided in the current IFOA	▪ This reference is considered appropriate as it reflects the conditions of the original IFOA and regulation to date.
Burning in exclusion zones	**IFOA provision** Prohibited in all exclusion and protection zones	▪ This reference is considered appropriate as it reflects the conditions of the original IFOA and regulation to date.
Size of coupes (Intensive harvesting zone)	**Current harvesting practice** Regeneration Single Tree Selection – no upper coupe size limit, coupes range in size from 5 hectares to over 100 hectares, 4 harvest cycles, 7 year average gap, 21 years until all harvested	▪ This has been chosen as the reference practice as it provides a more realistic decision context which: - considers current harvesting practices, rather than historical practices in place prior to 2007; these harvesting practices have been adopted to promote regeneration and sustainable wood supply - is relevant to the NSW Government's Project 2023 decision, which resulted in buyback of timber from Boral in 2014 and subsequent resource planning. - Australian Group Selection prescriptions were noted as ambiguous and difficult to enforce - Australian Group Selection is not a comparable silviculture practice to intensive harvesting which parties have agreed to codify under the new IFOA ***Note:*** *This proposal is not an endorsement of FCNSW's current practice*
Basal area	**North coast IFOA provision** Up to 40% of the basal area of a stand (equates to 17square metres per hectare retention rate in the regrowth zone, and 15 square metres per hectare in the non-regrowth zone)	▪ Current Single Tree Selection basal area removal rates have been converted to retention rates based on compliance activities and the data collected through trial of the Coastal IFOA.
Time for full harvest (Intensive harvesting zone)	**Current harvesting practice** None specified but average full harvest is 20 years	▪ As there is no equivalent setting in the existing IFOA, this reference is considered appropriate as it reflects current harvesting practice.
Time to return to adjacent coupe (Intensive harvesting zone)	**Current harvesting practice** Planning occurs around a 7-year cycle	▪ This reference has been chosen as there is no equivalent setting to coupe adjacency requirements in the existing IFOAs and no specified return time for current single tree selection. ▪ This reference practice is considered appropriate as it reflects current harvesting practice.
Mixed intensity	**No comparable practice**	▪ N / A

4.2 Impact assessment and findings

The terms of reference asks the Commission to determine metrics, and assess the impacts of settings proposed by FCNSW and EPA on environmental values and wood supply. **Box 3** explains the metrics used for the assessment.

Table 6 sets out the Commission's impact assessment findings for FCNSW and EPA. It also includes assessment of the Commission's recommendations. This assessment uses the reference practices set out in **Table 5**.

Overall the Commission found the commitments in their current form are not mutually achievable.

Table 7 presents the findings of an impact assessment using the alternative Australian Group Selection baseline instead of the current forestry practices set out in **Table 5** (refer to discussion in **Section 4.1**). In most cases, the level of impact is reversed under this analysis compared with impacts in **Table 6**. However, the commitments remain mutually unachievable.

Box 3: Determining metrics

FCNSW and EPA had previously analysed the impacts of their proposed settings to some extent. They largely used area-based metrics to assess the impact of the proposed settings on net harvest area, which is a proxy for impact on both wood supply and environmental values. However, neither party carried out a systematic nor cumulative assessment of all agreed and proposed settings as an integrated package.

The Commission notes it is difficult to progress a more sophisticated, quantitative analysis of the impacts of settings within the given review timeframe. Challenges and limitations include:

- a lack of appropriate metrics, clear outcome statements and comprehensive data for measuring environmental impacts
- significant limitations within the strategic planning model (FRAMES) for assessing all settings and values at the required scales
- interrelationships between many of the settings that make it challenging to quantify cumulative or net impacts in the context of multiple variable settings.

To help overcome these challenges, the Commission developed a qualitative rating traffic-light system to assess the impacts of the agreed and outstanding settings against a specified reference practice. Experts were consulted in this approach and, while it has some limitations, it allowed a practical assessment of all settings within the timeframe of this review.

4.2.1 Environmental values

We found that many of the proposed Coastal IFOA settings are likely to favour the maintenance of environmental values, providing a basis for confidence that overall environmental values will not be eroded. For example, vegetation and other features will be permanently retained in 'clumps' providing important habitat for fauna.

However, it is noted that the current IFOA approach does not make the desired environmental outcomes explicit, and therefore it is not possible to know if the current protections deliver the assumed environmental benefits. The new Coastal IFOA needs to provide a strong framework for setting, monitoring and evaluating environmental outcomes that up to now have been inferred from the implementation of protections.

4.2.2 Wood supply values

The Coastal IFOA Remake settings are expected to lead to changes to timber harvesting plans, which will impact on wood supply across the Coastal IFOA region as a result of:

- **agreed restrictions on the maximum level of intensive harvesting** – intensive harvesting in the regrowth intensive zone will be restricted to 2,200 hectares per year across the north coast
- **new habitat and threatened species prescriptions at different scales** – for example, specified tree retentions for Koalas in high and moderate habitat quality and tree clumps retained within coupes, compartments and local landscape areas for habitat
- **improved knowledge on environmental values** – such as the new mapping for Threatened Ecological Vegetation Communities that now provides defined areas of harvest exclusions

Some new settings should allow FCNSW to adapt and adjust operations at a strategic scale to avoid significant reductions in net timber supply across the coastal native forests in the short to medium term. Nonetheless, there are likely to be localised changes in supply volume or species mix that are expected to have a material negative impact on some local mill operations. The likely impact of the proposed settings has been estimated using best available data, but the full impact will only be confirmed following ongoing monitoring of IFOA implementation.

The material risks posed to Government's twin commitments by these expected impacts are discussed further in **Section 4.3**, while options to manage the risks are explored in **Section 5**.

Table 6: Key findings for impact analysis

(**Note:** a commitment is mutually achievable if a setting receives either a neutral and positive or a positive and positive ranking for both wood supply and environmental values)

More strongly positive		No significant change		More strongly negative

Settings related to species and habitat protections	Impacts against the twin commitments, compared with IFOA and current forestry practices						Are the commitments mutually achievable under Commission recs?
	Wood supply			Environmental values			
	FCNSW proposal	EPA proposal	NRC rec	FCNSW proposal	EPA proposal	NRC rec	
1. Threatened species and habitat protection:							
a) **All** Local Landscape areas **Combined with (b) or (c):**	Minimum 5 percent	Minimum 10 percent	Minimum 5 percent	Minimum 5 percent	Minimum 10 percent	Minimum 5 percent	×
b) Selective and intensive re-growth zones *(per compartment)*	Minimum 5 percent	Minimum 6.5 percent	Minimum 5 percent	Minimum 5 percent	Minimum 6.5 percent	Minimum 5 percent	✓
c) Selective and intensive non re-growth zones *(per compartment)*	Minimum 8 percent	Minimum 10 percent	Minimum 8 percent	Minimum 8 percent	Minimum 10 percent	Minimum 8 percent	✓
d) Use of strike rate modifier **Reference practice**: North coast IFOA provision	Minimum 0 percent but maintain carry-over (0.2 – 1 percent, mark-up (around 1 percent, variable) and some survey-triggered (around 1 percent, variable) exclusions	Minimum 3.4 percent per compartment, including carry-over, mark-up and some survey-triggered exclusions	Incorporated in 1(a) above (Minimum 5 percent per Local Landscape Area)	Minimum 0 percent but maintain carry-over (0.2 – 1 percent, mark-up (around 1 percent, variable) and some survey-triggered (around 1 percent, variable) exclusions	Minimum 3.4 percent per compartment, including carry-over, mark-up and some survey-triggered exclusions	Incorporated in 1(a) above (Minimum 5 percent per Local Landscape Area)	✓

Settings related to species and habitat protections	Impacts against the twin commitments, compared with IFOA and current forestry practices						Are the commitments mutually achievable under Commission recs?
	Wood supply			Environmental values			
	FCNSW proposal	EPA proposal	NRC rec	FCNSW proposal	EPA proposal	NRC rec	
2. North Coast koala protection **Reference practice**: IFOA provision	Use DoI predictive habitat model. Retain trees with minimum 20 centimetre diameter DBHOB using preferred list of browse trees: **10 trees per hectare** High quality habitat **5 trees per hectare** Moderate quality habitat	Use DoI predictive habitat model and OEH Koala likelihood mapping. Prescriptions based on matrix (high and moderate categories) with compartment-wide application. In addition to tree clumps retain trees with minimum 25 centimetre diameter DBHOB, prioritising primary browse species, then secondary browse species: **25 trees per hectare** High / high quality habitat **20 trees per hectare** High / moderate quality habitat **15 trees per hectare** Moderate / moderate quality habitat	Use DoI predictive habitat model and OEH Koala likelihood mapping. Prescriptions based on matrix (high and moderate categories). In addition to tree clumps retain trees with minimum 20 centimetre diameter DBHOB, retaining trees where available with 50 percent primary browse species: **10 healthy trees per hectare with cell-based application** High / high quality habitat **5 trees per hectare with compartment-wide application** High / moderate or moderate / moderate cells over 25 percent or more of compartment	Use DoI predictive habitat model. Retain trees with minimum 20 centimetre diameter DBHOB using preferred list of browse trees: **10 trees per hectare** High quality habitat **5 trees per hectare** Moderate quality habitat	Use DoI predictive habitat model and OEH Koala likelihood mapping. Prescriptions based on matrix (high and moderate categories) with compartment-wide application. In addition to tree clumps retain trees with minimum 25 centimetre diameter DBHOB, prioritising primary browse species, then secondary browse species: **25 trees per hectare** High / high quality habitat **20 trees per hectare** High / moderate quality habitat **15 trees per hectare** Moderate / moderate quality habitat	Use DoI predictive habitat model and OEH Koala likelihood mapping. Prescriptions based on matrix (high and moderate categories). In addition to tree clumps retain trees with minimum 20 centimetre diameter DBHOB, retaining trees where available with 50 percent primary browse species: **10 healthy trees per hectare with cell-based application** High / high quality habitat **5 trees per hectare with compartment-wide application** High / moderate or moderate / moderate cells over 25 percent or more of compartment	×

Settings related to species and habitat protections	Impacts against the twin commitments, compared with IFOA and current forestry practices						Are the commitments mutually achievable under Commission recs?
	Wood supply			Environmental values			
	FCNSW proposal	EPA proposal	NRC rec	FCNSW proposal	EPA proposal	NRC rec	
3. Threatened ecological communities **Reference practice**: IFOA provision **Note –** harvesting is already excluded. The impact arises from new knowledge rather than any setting change	Proposed exploring options to minimise the wood supply impact of introducing the new mapping	No harvesting	No harvesting Maintain road access New reasonable access approved by EPA	Proposed exploring options to minimise the wood supply impact of introducing the new mapping	No harvesting	No harvesting Maintain road access New reasonable access approved by EPA	×
4. Giant tree protection **Reference practice**: no comparable practice	Minimum 160 centimetres	Minimum 135 centimetres blackbutt	Minimum 160 centimetres blackbutt / alpine ash	Minimum 160 centimetres	Minimum 135 centimetres blackbutt	Minimum 160 centimetres blackbutt / alpine ash	✓
		Minimum 120 centimetres all other species	Minimum 140 centimetres all other species		Minimum 120 cm all other species	Minimum 140 centimetres all other species	
5. Rocky outcrops **Reference practice**: IFOA provision	-	-	Clarify rocky outcrop and cliff definition Review protection of other rocky features during pre-harvest planning	-	-	Clarify rocky outcrop and cliff definition Review protection of other rocky features during pre-harvest planning	✓

Settings related to species and habitat protections	Impacts against the twin commitments, compared with IFOA and current forestry practices						Are the commitments mutually achievable under Commission recs?
	Wood supply			Environmental values			
	FCNSW proposal	EPA proposal	NRC rec	FCNSW proposal	EPA proposal	NRC rec	
6. Burning in exclusion zones **Reference practice**: IFOA provision	Limited deliberate ignition in exclusion zones where required to safely conduct burning or for practical containment	Prohibited in all exclusion and protection zones	No deliberate pre or post-harvest burns in exclusion zones – unless in exceptional circumstances with no safe or practical alternative and detailed plans prepared in consultation with EPA.	Limited deliberate ignition in exclusion zones where required to safely conduct burning or for practical containment	Prohibited in all exclusion and protection zones	No deliberate pre or post-harvest burns in exclusion zones – unless in exceptional circumstances with no safe or practical alternative and detailed plans prepared in consultation with EPA.	✓

Settings related to harvest practices	Impacts against the twin commitments, compared with current practice						Are the commitments mutually achievable under Commission recs?
	Wood supply			Environmental values			
	FCNSW proposal	EPA proposal	NRC rec	FCNSW proposal	EPA proposal	NRC rec	
7. Size of coupes **Reference practice**: current harvest practice	Maximum 60 hectares	Maximum 30 hectares	Maximum 45 hectares[17]	Maximum 60 hectares	Maximum 30 hectares	Maximum 45 hectares	×
8. Time for full harvest **Reference practice**: current harvest practice	Minimum 14 years 3 cycles 33.33 percent (already agreed)	Minimum 21 years 3 cycles 33.33 percent (already agreed)	Minimum 21 years 3 cycles 33.33 percent (already agreed)	Minimum 10 years 3 cycles 33.33 percent (already agreed)	Minimum 21 years 3 cycles 33.33 percent (already agreed)	Minimum 21 years 3 cycles 33.33 percent (already agreed)	×
9. Time to return to adjacent coupes **Reference practice**: current harvest practice	Minimum 7 years	Minimum 10 years	Minimum 10 years (Minimum 7 years transitional setting)	Minimum 7 years	Minimum 10 years	Minimum 10 years (Minimum 7 years transitional setting)	✓
10. Basal area of trees to be retained **Reference practice**: North coast IFOA provision	Minimum 10 square metres re-growth and non re-growth zones	Minimum average 12 square metres re-growth zones Minimum average 14 square metres non re-growth zones	Minimum average 10 square metres re-growth zones Minimum average 12 square metres non re-growth zones	Minimum 10 metres squared re-growth and non re-growth zones	Minimum average 12 square metres re-growth zones Minimum average 14 square metres non re-growth zones	Minimum average 10 square metres re-growth zones Minimum average 12 square metres non re-growth zones	✓
11. Mixed intensity harvesting **Reference practice**: no comparable practice	*Impacts considered in Settings 7 – 10 above*	*Impacts considered in Settings 7 – 10 above*	*Impacts considered in Settings 7 – 10 above*	*Impacts considered in Settings 7 – 10 above*	*Impacts considered in Settings 7 – 10 above*	*Impacts considered in Settings 7 – 10 above*	-

17 This setting also includes transitional arrangements of up to 5 coupes at a maximum of 60 hectares per financial year (see Table 3 for more details)

Table 7: Impact assessment against Australian Group Selection baseline

Settings related to silviculture	Impacts against the twin commitments, compared with Australian Group Selection practice						Are the commitments mutually achievable under Commission recs?
	Wood supply			Environmental values			
	FCNSW proposal	EPA proposal	NRC rec	FCNSW proposal	EPA proposal	NRC rec	
1. Size of coupes **Baseline -** 0.25 ha	Maximum 60 hectares	Maximum 30 hectares	Maximum 45 hectares[18]	Maximum 60 hectares	Maximum 30 hectares	Maximum 45 hectares	×
2. Time for full harvest **Baseline –** 21 years; 4 cycles; <22.5 percent	Minimum 14 years	Minimum 21 years	Minimum 21 years	Minimum 14 years	Minimum 21 years	Minimum 21 years	×
	3 cycles	3 cycles	3 cycles	3 cycles	3 cycles	3 cycles	
	33.33 percent (already agreed)	33.33 percent (already agreed)	33.33 percent (already agreed)	33.33 percent (already agreed)	33.33 percent (already agreed)	33.33 percent (already agreed)	
3. Time to return to adjacent coupes **Baseline –** average 7 years	Minimum 7 years	Minimum 10 years	Minimum 10 years (Minimum 7 years transitional setting)	Minimum 7 years	Minimum 10 years	Minimum 10 years (Minimum 7 years transitional setting)	×
4. Basal area of trees to be retained **Baseline –** no more than 40 percent of the basal area of all trees immediately prior to harvesting (equates to basal area retention of on average 17 square metres per hectare, with a range of 10 to 24 square metres per hectare)	Minimum 10 square metres re-growth and non re-growth zones	Minimum average 12 square metres re-growth zones Minimum average 14 square metres non re-growth zones	Minimum average 10 square metres re-growth zones Minimum average 12 square metres non re-growth zones	Minimum 10 metres squared re-growth and non re-growth zones	Minimum average 12 square metres re-growth zones Minimum average 14 square metres non re-growth zones	Minimum average 10 square metres re-growth zones Minimum average 12 square metres non re-growth zones	×

18 This setting also includes transitional arrangements of up to 5 coupes at a maximum of 60 hectares per financial year (see Table 3 for more details)

4.3 Key risks associated with the recommended settings

The Commission has assessed the potential level of risk with each setting that Government will carry if the recommended settings are adopted. **Table 8** summarises the results of the risk analysis, while **Appendix 5** explains the Commission's approach to the risk assessment, including threshold ratings for likelihood and consequence.

Table 8: Key findings for risk analysis

Settings Commission recommendations	Wood supply			Environmental values		
	Consequence	Likelihood	Risk class	Consequence	Likelihood	Risk class
1 Permanent harvesting exclusions for threatened species and habitat ('clumps')	Moderate	Moderate	**Medium**	Insignificant	Rare	**Low**
2 Koala protection	Moderate	Likely	**High**	Insignificant	Rare	**Low**
3 Permanent harvesting exclusions in threatened ecological communities	Moderate	Likely	**High**	Insignificant	Rare	**Low**
4 Protections for giant trees	Insignificant	Rare	**Low**	Insignificant	Moderate	**Low**
5 Rocky outcrops	Moderate	Unlikely	**Medium**	Insignificant	Moderate	**Low**
6 Burning in exclusion zones	Insignificant	Moderate	**Low**	Moderate	Unlikely	**Medium**
7 Size of coupes at the compartment scale in intensive harvest zones	Insignificant	Moderate	**Low**	Moderate	Moderate	**Medium**
8 Time for full harvest of area at local landscape scale in intensive zones	Moderate	Unlikely	**Medium**	Minor	Unlikely	**Low**
9 Time to return to adjacent coupes in intensive harvest zones	Moderate	Moderate	**Medium**	Moderate	Moderate	**Medium**
10 Basal area of trees to be retained in selective harvesting zones	Insignificant	Moderate	**Low**	Moderate	Moderate	**Medium**
11 Mixed Intensity Harvesting	Insignificant	Moderate	**Low**	Minor	Moderate	**Medium**

The Commission has found that most settings have the potential for **low to medium risk** for both wood supply and environmental values. The risks to environmental values posed by five settings are assessed to be medium.

In the case of one of these settings – basal area for tree retention in selective harvesting zones – there is agreement between the agencies and expert advisors that work needs to be undertaken to devise a more appropriate metric to replace this setting over the life of the new IFOA. Provided this work is undertaken and monitored within an adaptive management framework during the transition period, the currently assessed moderate risk should be able to be managed and reduced.

Similarly, the other risks to environmental values currently identified as moderate should be able to be confidently managed and minimised in the preparation of harvest plans. These plans should address, amongst other things:

- the use of larger coupes on an exceptional basis
- the application of threatened ecological communities protections
- post-harvest and harvest burning plans, particularly where there is potential to impact sensitive areas.

However, there is a **high risk** that two of the individual settings have the potential to materially impact wood supply, especially in instances where they are likely to be applied together in some geographically sensitive locations. These settings are:

- koala protections
- permanent harvesting exclusions in threatened ecological communities (updated threatened ecological communities mapping).

The following sections discuss the settings deemed to pose a high risk to timber supply and their potential impacts in more detail, followed by a summary of expected cumulative impacts on native forestry businesses. It is noted that while the current process used the best available data and analysis, there are remaining data confidence limitations. The true extent of the impacts will be apparent once the Coastal IFOA has been implemented and monitored.

Links to Project 2023 and existing North Coast native forestry issues

It is critical that the risks identified in this report are considered in the context of the broader wood supply issues already affecting the NSW North Coast native forestry industry, which the Commission advised government on in mid-2015. In particular, the risks associated with the species-specific contract and five year contract extension provided to Boral as part of the high quality wood supply quota buyback following the outcomes of Project 2023.

Any restrictions on wood supply imposed through the Coastal IFOA, particularly those that reduce access to key species, are likely to significantly exacerbate existing supply issues and potentially impact mill viability. If additional pressures are placed on North Coast wood supply, it is likely that customers without species-specific contracts will be negatively affected through an increasing proportion of supply being made up of wood with less desirable species and size characteristics. As a result, it is important to have the flexibility to manage the flow of over the duration of the IFOA to minimise the commercial impact of fluctuations in size and species mix.

These businesses will be at a further disadvantage around 2025 when supply issues are expected to increase (see **Figure B**). At this time, their current wood supply agreements will expire several years prior to that of the business that was able to negotiate a five year extension during the buyback process. There is concern within the industry that significantly lower volumes, if any, may be offered to these businesses under new wood supply agreements if government are having difficulty meeting existing commitments at this time.

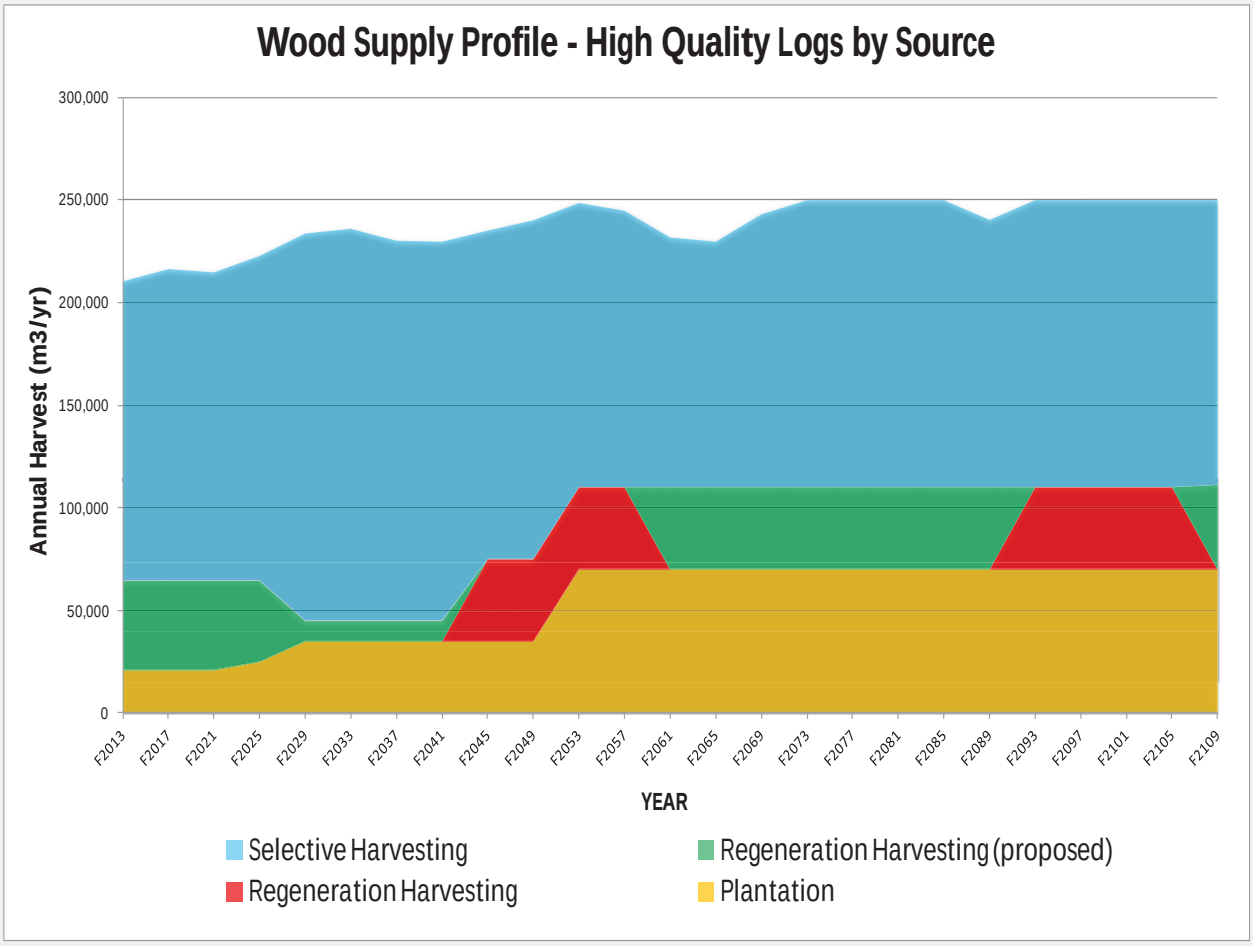


Figure B: Projected wood supply profile

4.3.1 Koala protections

Koalas are an iconic species under the NSW Government's Saving our Species program.[19] An explanation of the current and proposed Koala protections is provided in **Box 4.**

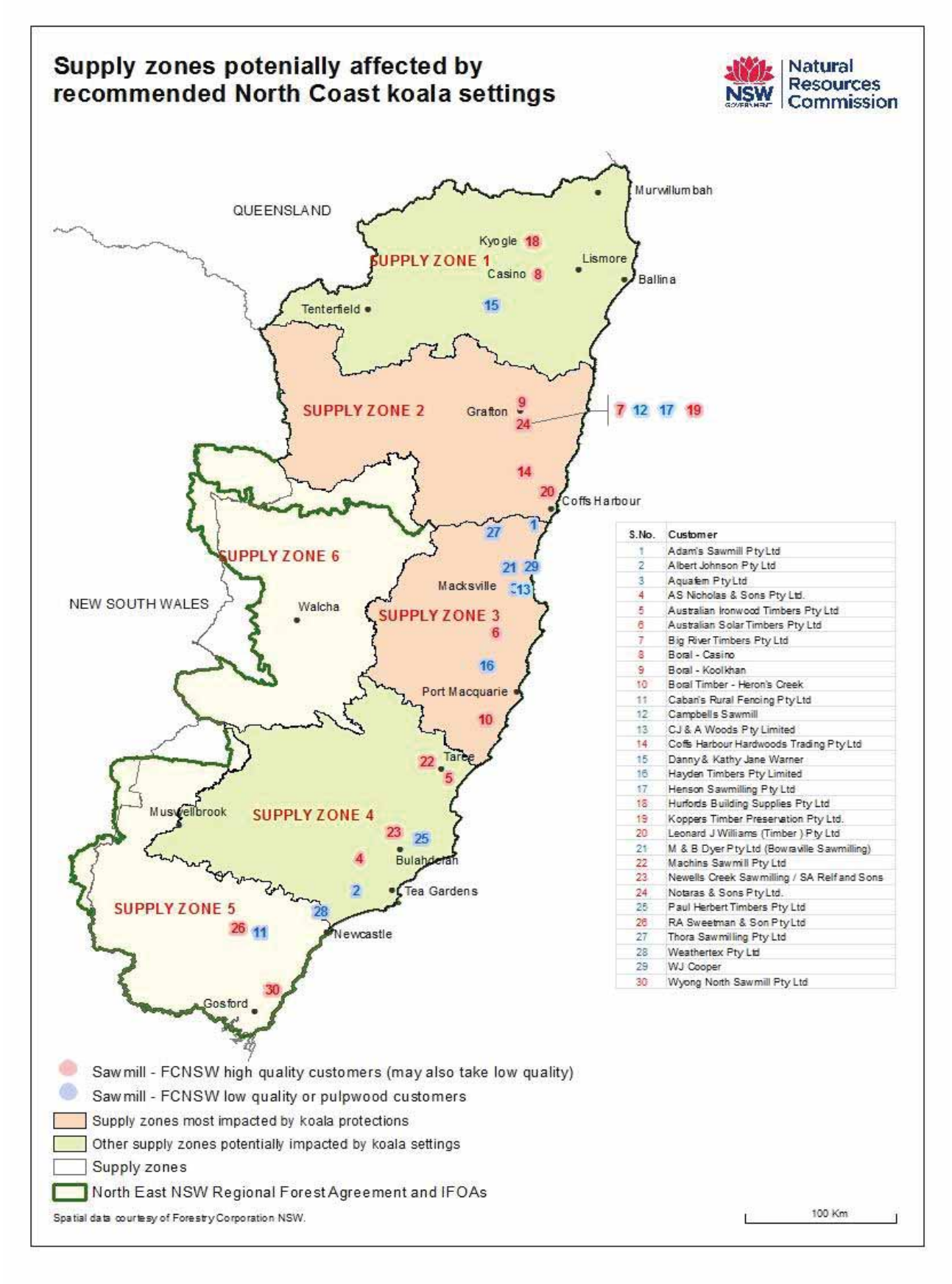
The Commission's recommended koala protections are likely to impact the native timber industry across the North Coast. The Commission's also notes the FCSNW and EPA's proposed settings for Koalas would also likely impact wood supply to lesser and greater extent respectively (**Table 6**).

An analysis of the impacts of North Coast koala settings on high quality sawlogs indicates around a 9 percent reduction in harvestable volumes of Koala browse tree species is expected (around 3,500 cubic metres per year). In particular, impacts are expected in Supply Zones 2 and 3 (see **Figure 7**). There will be a high degree of variability in impacts given natural variance in koala browse trees across the landscape.

Impacts on industry are attributed to likely reductions in Tallowwood harvest – a commercially important species and also preferred Koala feed tree - as well as reduced supply of locally marketable species such as Sydney Blue Gum, Red Gum and Grey Gum. Reductions in these species will potentially impact species-specific and non-species specific contracts.

Given time constraints it was not possible to analyse potential impacts on low quality sawlogs and poles. According to FCNSW, the impacts would be 1:1 for low quality logs and 1:10 for poles. The above analysis on high quality sawlogs is indicative only.

19 NSW Government, 2016, *Saving our species 2016-2021 – More plants and animals to be saved from extinction.* Available: http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program



S.No.	Customer
1	Adam's Sawmill Pty Ltd
2	Albert Johnson Pty Ltd
3	Aquafem Pty Ltd
4	AS Nicholas & Sons Pty Ltd.
5	Australian Ironwood Timbers Pty Ltd
6	Australian Solar Timbers Pty Ltd
7	Big River Timbers Pty Ltd
8	Boral - Casino
9	Boral - Koolkhan
10	Boral Timber - Heron's Creek
11	Caban's Rural Fencing Pty Ltd
12	Campbells Sawmill
13	CJ & A Woods Pty Limited
14	Coffs Harbour Hardwoods Trading Pty Ltd
15	Danny & Kathy Jane Warner
16	Hayden Timbers Pty Limited
17	Henson Sawmilling Pty Ltd
18	Hurfords Building Supplies Pty Ltd
19	Koppers Timber Preservation Pty Ltd.
20	Leonard J Williams (Timber) Pty Ltd
21	M & B Dyer Pty Ltd (Bowraville Sawmilling)
22	Machins Sawmill Pty Ltd
23	Newells Creek Sawmilling / SA Relf and Sons
24	Notaras & Sons Pty Ltd.
25	Paul Herbert Timbers Pty Ltd
26	RA Sweetman & Son Pty Ltd
27	Thora Sawmilling Pty Ltd
28	Weathertex Pty Ltd
29	WJ Cooper
30	Wyong North Sawmill Pty Ltd

Figure 7: Sawmill customers potentially affected by recommend North Coast koala settings

Box 4: Koala setting – North Coast

The Koala (*Phascolarctos cinereus*) is a landscape species listed as vulnerable under State and Commonwealth legislation. It is also listed as an iconic species under the NSW Government's Saving our Species program.

In NSW, koalas mainly occur in the north-east of the State from the Hunter region north, although populations also occur in the Sydney Basin region and to the south, and west of the Great Dividing Range.[20] Its preferred habitat is restricted to eucalypt woodlands and forests. Habitat quality and socio-biological factors influence distribution and home range.

The Koala faces a number of threats, including habitat loss and fragmentation, disease, predation by dogs, vehicle strikes and wildfire.[21] Timber harvesting and clearing practices that lead to permanent changes in forest structure (at a landscape level) and reduce preferred koala feed trees due to changes in forest composition, are also considered a potential threat.[22] However, the extent that timber harvesting impacts koalas and the level of risk posed by the activity, particularly intensive harvesting, remains unclear[23] and is the subject of further research. Research in North East NSW indicates koala populations can be maintained in areas subject to low intensity harvesting, but may be impacted by high intensity harvesting.[24] Further research into the impacts of timber harvesting is underway in areas of predicted koala habitat.

Modelling and mapping of koala likelihood and habitat quality

The NSW Government has recently invested in two projects to better understand where Koalas are likely to live in north east NSW - through likelihood mapping and predictive habitat modelling. Both projects are intended to inform decisions regarding forestry operations. The predictive habitat model mapped 1.66 million hectares of potential moderate to high quality habitat, the majority of which occurs on private land (53 percent) followed by national park (25 percent). The remaining area of modelled moderate to high quality habitat was mapped on State forests - 14 percent in areas available for harvest and 8 percent in areas that are currently permanently excluded from harvesting.[25]

Current settings for Koalas

Current coastal IFOAs include a number of prescriptions for protecting koala habitat – for example, high use areas where harvesting is temporarily excluded and a 20 metre buffer applies; and intermediate use areas where 10 trees per 2 hectares must be temporarily retained. These settings are generally triggered by koala records and scat detection which has limitations in wet sclerophyll forests and is labour intensive.[26]

Over the past 15 years, around 200 hectares has been temporarily protected as high use area, whilst tree retention has been triggered on around 130,000 hectares of intermediate use area.[27]

Proposed settings

The Commission's recommended settings for North Coast Koalas (**Table 2**) are intended to balance the Government's twin commitments across an integrated package of other settings.

The Commission recommends temporary tree retention in addition to tree clumps, with the intent that browse trees are dispersed across the landscape. Five healthy browse trees per hectare would be retained across the net harvest area of a compartment if modelled high quality / moderate likelihood; moderate quality / high likelihood or moderate quality / moderate likelihood areas comprise 25 percent or more of a compartment. Ten browse trees per hectare would be retained for modelled high quality / high likelihood

20 Office of Environment and Heritage (2015), *Koala – profile*. Available: http: / / www.environment.nsw.gov.au / threatenedspeciesapp / profile.aspx?id=10616

21 Ibid.

22 Department of Environment and Climate Change (2008). *Recovery plan for the koala* (Phascolarctos cinereus). November 2008

23 Smith, A.P. (2004), Koala conservation and habitat requirements in a timber production forest in North-east New South Wales. In Lunney, D (ed,) *Conservation of Australia's Forest Fauna* (second edition). Royal Zoological Society of New South Wales, Mosman, NSW: 591-611.

24 Ibid.

25 Given this modelling will improve over time, these figures will potentially change.

26 Personal communication with EPA / FCNSW, November 2016.

27 Data provided by Forestry Corporation of New South Wales.

areas based on mapped cells (approximately 6 hectares in size). In some cases, higher tree retention for high quality / high likelihood areas may occur in compartments where five trees per hectare are retained.

Potential impacts of proposed settings

The proposed settings will likely have a negative impact on timber supply, potentially reducing average annual supply volume by 3,500 cubic metres (9 percent reduction in harvestable Koala browse tree species). Supply Zones 2 and 3 would experience the greatest reduction in volume (1,400-1,800 cubic metres per year and 900-1,200 cubic metres per year).

Risks and research priorities

The proposed suite of settings for North Coast koalas includes a number of risks, such as:

- potential impacts on timber supply and contracts
- lack of tree retention in some areas – low quality modelled habitat and low koala likelihood
- increased potential for browse tree damage during harvest (from adjacent trees falling or machinery movements) – for areas where higher tree retention applies (10 trees per hectare)
- limitations of current modelling (although this can be addressed through further validation and refinement)
- uncertainty around the adequacy of browse tree retention for Koalas.

Further research, monitoring programs and adaptive management are essential to improve the management of Koalas in State forests. For example, to:

- better understand the impacts of harvesting
- inform minimum tree retention requirements
- test new technologies for Koala detection, including sniffer dogs, infrared / thermal fitted drone and songmeters.
- surveying trees that are retained in tree clumps given they also likely protect koala habitat.

The Department of Industry (Lands) is currently progressing some research on koalas following the habitat mapping project, to determine koala presence in high quality habitat areas.

Furthermore, a state-wide, cross-tenure approach to monitoring would improve the management of the Koala and deliver a more unified approach to population trends over time.

4.3.2 Permanent harvesting exclusions in threatened ecological communities

Threatened ecological communities are listed by the NSW Scientific Committee under the *NSW Threatened Species Conservation Act 1995* and are protected from harm under the *NSW National Parks and Wildlife Act 1974* and associated licencing conditions. Under the existing IFOAs, threatened ecological communities are already protected from harvesting. However, until recently, threatened ecological communities on state forests were unmapped, posing a significant business risk for FCNSW in terms of operations, compliance and quantifying impacts on timber supply.

FCNSW and EPA agreed to map priority threatened ecological communities to improve their management on state forests. The EPA received grant funding for this project from the NSW Environmental Trust and engaged OEH to undertake mapping of 18 of 108 priority threatened ecological communities. The project ran from July 2013 to June 2016. The 18 threatened ecological communities assessed were specifically targeted as they are among the most widespread in the coastal state forest estate and generally contain commercially valuable timber. There is potentially a risk for FCNSW in terms of the remaining unmapped threatened ecological communities. These threatened ecological communities are also subject to harvest exclusions and regulations, and are pose a complex survey and operational challenge for FCNSW.

Although the harvest exclusions for threatened ecological communities are not new protections, the updated mapping provides new information as to their distribution and cumulative impact on the net harvestable area. **Table 9** presents the results of new mapping for 13 of 18 threatened ecological communities. Results for five TECs are not shown here as they do not occur on state forest or were not in the area that the new IFOA agreement will apply.

The mapping indicates that potentially 11,776 hectares of threatened ecological communities may occur in net harvestable area, whilst a further 27,473 hectares is likely to occur in in areas already excluded from harvest. Threatened ecological communities mapped in the net area require exclusion from harvesting and potentially affect three percent of the net harvest area on the North Coast.

Note that the area and impacts presented have been modelled off indicative maps, and as such are indicative figures. For some of the mapped threatened ecological communities a ground survey is required to determine the true boundary, which may reduce the total area (and thus impact on wood supply) to some extent. For example, maps are indicative for some areas with grey-box grey gum, and for all areas of lowland grassy woodlands and white gum moist forest.

Table 9: Mapped area of threatened ecological communities

Threatened Ecological Community	In net harvest area (hectares)	In current exclusions (hectares)	Gross area (hectares)	Buffer used in modelling (metres)
Subtropical Coastal Floodplain	4,209	6,848	11,058	0
Lowland Rainforest	2,472	11,582	14,054	0
Grey Box – Grey Gum Wet Sclerophyll	1,940	991	2,931	0
Lowland Grassy Woodland	1,445	881	2,326	0
Riverflat Eucalypt Forest	603	3,426	4,029	10
White Gum Moist Forest	502	498	1,000	20
Montane Peatlands	256	1,401	1,657	20m or relevant wetland buffer per size (up to 40m)
Swamp Sclerophyll	252	807	1,059	20m or relevant wetland buffer per size (up to 40m)
Swamp Oak	49	223	272	20m or relevant wetland buffer per size (up to 40m)
Lowland Rainforest on Floodplain	34	643	677	0

Threatened Ecological Community	In net harvest area (hectares)	In current exclusions (hectares)	Gross area (hectares)	Buffer used in modelling (metres)
Brogo Wet-Vine	12	5	18	20
Coastal Saltmarsh	3	96	99	20m or relevant wetland buffer per size (up to 40m)
Tablelands Snowgum	-	71	71	20
Total	**11,776**	**27,473**	**39,429**	**-**

FCNSW assessed the impact on standing volume of high quality sawlogs from the exclusions associated with the updated threatened ecological communities mapping for each supply zone and for species or species group. Although these are not new protections per se, the impacts of the exclusion area have not previously been estimated or accounted for in FCNSW planning.

A substantial portion of Urbenville Management Area in Supply Zone 1 is excluded from harvesting through this analysis. Five of the state forests in this area[28] were considered impractical to manage for commercial purposes given reductions in net harvest area and areas affected by Bell Miner Associated Dieback.

FCNSW modelling indicates that the presence of threatened ecological communities most significantly impact on wood availability in the Upper North Coast Supply Zone 1 (**Figure 8**), reducing the net harvest area by 12 percent and particularly impacting the supply of the preferred species spotted gum. Spotted gum is the predominant high quality log species in this region. In addition, estimated harvest areas for other key timber species such as blackbutt, brushbox and tallowwood are all expected to have similar reductions in harvestable area once the mapped threatened ecological communities are factored in to harvest estimates.

In addition, impacts on Supply Zone 2 are estimated to be approximately 3 percent of high quality supply. Impacts on low quality timber supply in both zones are expected to be similar.

Further, consequential impacts on operational access have not been assessed and may further negatively impact supply volume or operating efficiencies and therefore cost. On one hand, the new mapping provides significant operational benefits, risk-reductions and costs savings for FCNSW, the industry and the regulator. Survey and regulatory costs are reduced, and FCNSW has more regulatory certainty around harvesting near threatened ecological communities.

However, wood availability may be impacted due to the complexity of the operational arrangements regarding the exclusion areas. The threatened ecological communities protections continue to have the potential for removal of net harvest area due to operational and logistics constraints, which are discussed further in **Box 5**. The updated mapping has made these existing constraints visible, and able to be incorporated into FCNSW planning in advance, hence the newly-quantified impacts from existing protections.

28 Donaldson, Mount Lindsay, Unumba, Bald Knob and Wooden Bong State Forests

Addressing issues associated with threatened ecological community mapping

Although clarifying existing protections, the extent of three of the 18 threatened ecological communities mapped so far – and hence the potential impact on wood supply – is greater than that which FCNSW anticipated. This is balanced to some extent by other mapped threatened ecological communities that have been shown to have a lesser extent than anticipated. However, a further 90 threatened ecological communities remain unmapped, and present an ongoing operational risk to FCNSW.

The recent mapping project also means there is an imbalance in the knowledge base across different land tenures. At present, there is a better knowledge base estimating the distribution and extent of threatened ecological communities on state forests than on national park and other reserve types. Without understanding the overall distribution and extent of threatened ecological communities across all tenures it is difficult to make decisions about which, if any, additional protection measures are required within the IFOA.

Options for addressing current issues around threatened ecological communities mapping include:

- reviewing the confidence level – a 95 percent confidence level has been applied to the current mapping on state forests to ensure a high degree of confidence that communities have been captured; however, the Commission understand this confidence level is likely to include more than 20 percent additional vegetation types that are not necessarily threatened
- undertaking vegetation mapping on other tenures to better estimate true distribution and extent of communities
- an Independent Scientific Committee review of threatened species listings where mapped extent suggests a change in an ecological communities' threatened listing may be warranted.
- ongoing engagement with the Scientific Committee to clarify the risks posed by regulated harvesting on vegetation communities that may require disturbance.

Box 5: Operational challenges

The new mapping delivers greater clarity around the boundaries of threatened ecological communities, which has the benefit of reducing ambiguity around compliance requirements. However, the new mapping also presents a range of operational challenges in the field. For example:

- **infrastructure** – in some cases roads are now located in newly mapped threatened ecological communities areas. The Commission has recommended that existing roads can be maintained to provide continued access to harvest areas, which would mitigate the potential for impact (see purple circle on **Figure C**).
- **harvest 'islands' –** in some cases the new mapping has created 'islands' of harvestable areas within areas identified as threatened ecological communities (see red circle on **Figure C**). The Commission has recommended new access is allowed subject to the approval of the EPA. However, FCNSW will need to assess the cost and benefits of accessing such areas.
- **high-risk boundary types –** in many areas, the mapping has created fingers or spines of threatened ecological communities in harvest areas (see yellow circle on **Figure C**). In other cases, a mapped threatened ecological communities polygon may be too small to be identified with any accuracy by GPS in the field (see orange circle on **Figure C**). These will be complex boundaries to identify, manage and avoid crossing in the field. Again, FCNSW will need to assess the costs, benefits and risks of managing these types of boundaries. One option is to increase the boundaries with mapped buffers to reduce compliance risks. However, this approach would reduce the net harvest area and impact wood supply further.

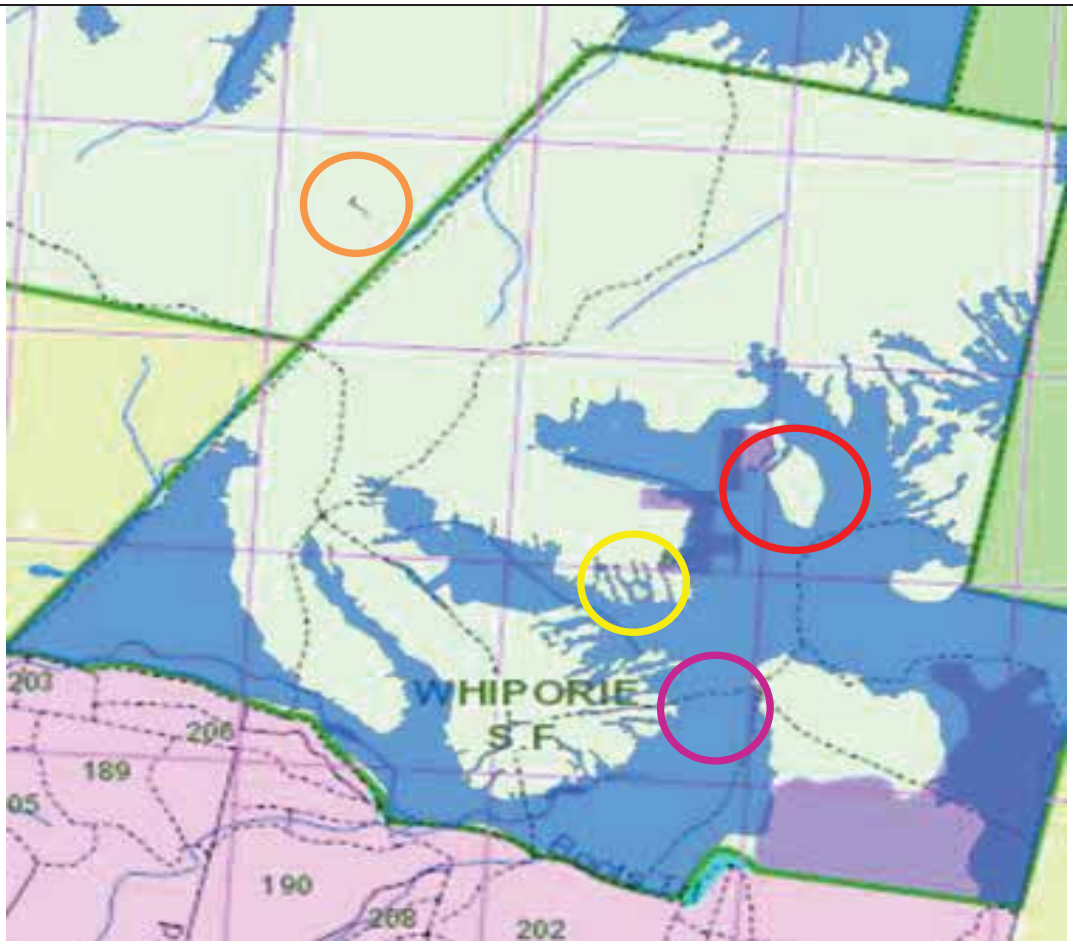


Figure C: map showing potential operational challenges as a result of threatened ecological community mapping

S.No.	Customer
1	Adam's Sawmill Pty Ltd
2	Albert Johnson Pty Ltd
3	Aquafem Pty Ltd
4	AS Nicholas & Sons Pty Ltd.
5	Australian Ironwood Timbers Pty Ltd
6	Australian Solar Timbers Pty Ltd
7	Big River Timbers Pty Ltd
8	Boral - Casino
9	Boral - Koolkhan
10	Boral Timber - Heron's Creek
11	Caban's Rural Fencing Pty Ltd
12	Campbells Sawmill
13	CJ & A Woods Pty Limited
14	Coffs Harbour Hardwoods Trading Pty Ltd
15	Danny & Kathy Jane Warner
16	Hayden Timbers Pty Limited
17	Henson Sawmilling Pty Ltd
18	Hurfords Building Supplies Pty Ltd
19	Koppers Timber Preservation Pty Ltd.
20	Leonard J Williams (Timber) Pty Ltd
21	M & B Dyer Pty Ltd (Bowraville Sawmilling)
22	Machins Sawmill Pty Ltd
23	Newells Creek Sawmilling / SA Relf and Sons
24	Notaras & Sons Pty Ltd.
25	Paul Herbert Timbers Pty Ltd
26	RA Sweetman & Son Pty Ltd
27	Thora Sawmilling Pty Ltd
28	Weathertex Pty Ltd
29	WJ Cooper
30	Wyong North Sawmill Pty Ltd

Figure 8: Map showing sawmill customers in areas in Supply Zones 1 and 2 likely to be affected by new threatened ecological community mapping

4.3.3 Cumulative impacts from settings on native forestry businesses

Overall, the Commission's preliminary analysis estimates annual high quality wood supply could indicatively decrease by between 7,600 to 8,600 cubic metres based on the available data supplied to the Commission at this point of time (**Table 11**). Most of the impacts are estimated to be in mid-upper North Coast, and spread across FCNSW customers receiving timber from Supply Zones 1 through 4.

The overall reduction of high quality sawlog availability is approximately 3 to 4 percent of previous estimates of high quality sawlog supply that did not factor in threatened ecological communities protections. However, this reduction particularly impacts on supply of certain preferred high quality timber species. This projected shortfall may be offset by supply of other non-preferred high quality timber species from greater distances.

The impact of changed high quality availability will be influenced by the application of the current wood supply agreements. The table notes the indicative changes compared to a historical supply to FCNSW customers. For this group of customers, the most material impact would arise on the processors located in the Upper North Coast, where they could face material reductions in availability of key high quality species.

However, the actual supply dynamic due to changes in the IFOA remake will need to take into account the species specific contract supplied to Boral. In the event this contract is unchanged, the overall reduction would then be taken from the non-species specific wood supply agreements, and result in greater reductions than those shown below, and potentially impacting a broader group of FCNSW customers.

Further analysis and modelling with FRAMES is required to more accurately estimate the potential impacts on individual customers. It is important to note, that FRAMES models wood supply at the strategic landscape scale over the short-to-long term. It is less reliable estimating wood supply at the harvest scale. It cannot be applied at the compartment or coupe scale, where many of the recommended settings operate.

Table 11: Estimated indicative cumulative impacts of koala and threatened ecological communities on primary tree species and wood supply

Customer		Supply Zone 1 (cubic metre decrease)	Supply Zone 2 (cubic metre decrease)	Supply Zone 3 (cubic metre decrease)	Supply Zone 4 (cubic metre decrease)	Total	Primary species impacted
Estimated impact	**Koala settings**	300-400	1,400-1,800	1,250-1,650	100-200	3,050-4,000	Tallowwood, Spotted Gum, Grey Box,
	Threatened Ecological Communities mapping	2,200	2,400	-	-	4,600	Spotted Gum,, Brush Box
	Total	~2,500-2,600	~3,800-4,200	~1,250-1,650	100-200	7,600-8,600	-

4.4 External risks and issues relevant to forest management outcomes

The focus of the Commission's review is outstanding settings within the Coastal IFOA, and associated benefits and impacts. The terms of reference allows the Commission to consider external research relating to forestry. As such, we have also identified a range of risks that may impact on forest management outcomes and the ability of the Government to achieve its objectives around wood supply and environmental values. The following sections serve to highlight that even if the IFOA settings were theoretically able to deliver against the Government's commitments, there are still additional challenges to maintaining wood supply and environmental values in practice.

4.4.1 Climate change

Climate change has the potential to impact forests and their environmental values by causing changes in species distributions, community composition and forest structure, tree regeneration and growth rates, as well as disruption of biotic processes that provide ecosystem services.[29] Climate change may also impact forests through altering fire regimes and catchment hydrology.

Forest ecosystem conditions may be altered by a rapidly changing climate faster than individual species are able to adjust, resulting in a decline in the resilience and productivity of forest ecosystems.[30] Projected changes in climate will favour some vegetation types over others, and may result in the transformation of forest ecosystems from one type to another. Further, increasing fragmentation due to past and present land-use change – for example conversion from forest to agricultural land use – is likely to limit native forest species migration in response to shifting climate zones.[31]

Climate projections and modelling for the NSW north and south coasts under the NSW and ACT Regional Climate Modelling (NARCliM) Project provide an indication of potential impacts of climate change on NSW coastal regions.[32] Some key predictions are outlined below:

- an increase in average minimum and maximum temperatures of around 0.7°C by 2040, and 2.0°C by 2070
- increased spring rainfall in the North Coast region over the long-term, but a decrease in the South Coast region that has direct implications for fire risk, including an expected increase in combustibility and potential fire severity
- baseline average Forest Fire Danger Index of 6.1 for the South Coast region is expected to increase by 10 percent by 2070, while the index of 4.9 for the North Coast region is expected to increase by 4 percent by 2070.

29 Boulter, S.L. (2012). *A preliminary assessment of the vulnerability of Australian forests to the impacts of climate change – Synthesis*, National Climate Change Adaptation Research Facility, Gold Coast, 257pp.

30 CBD (2009) *Connecting Biodiversity and Climate. Change Mitigation and Adaptation*. Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. CBD Technical Series No. 41. Secretariat of the Convention on Biological Diversity. ISBN: 92-9225-134-1.
Thompson I., Mackey B., McNulty S. and Mosseler A. (2009). *Forest Resilience, Biodiversity, and Climate Change. A synthesis of the biodiversity/ resilience/stability relationship in forest ecosystems*. Secretariat of the Convention on Biological Diversity, Montreal. Technical Series no. 43, 67 pages

31 Wilson, R. and Turton, S. (2011). *Climate change adaptation options, tools and vulnerability.* Contribution of Work Package 4 to the Forest Vulnerability Assessment, Gold Coast, Australia, National Climate Change Adaptation Research Facility.

32 OEH (2014). *North Coast Climate Change Snapshot.* NSW Office of Environment and Heritage.
OEH (2014). *South East and Tablelands Climate Change Snapshot.* NSW Office of Environment and Heritage.

The overall impact of forecast climate change on the forestry sector in NSW is projected to be negative.[33]

As well as impacting environmental values, changes to forest ecosystems have a direct consequence on the capacity of forests to provide timber products. The capacity of eucalypt trees to adjust and cope with periodic drought and chronic increases in aridity is very limited. This means some, if not all, eucalypt forests are at high risk of reduced productivity and possibly widespread drought-induced forest mortality under changing climatic conditions.[34]

4.4.2 Changing fire regimes

Fire regimes are key factors influencing the ecological function of native forests. Changing fire regimes may result in changes to the environmental and productive values of the forests. Fire regimes are driven by weather, fuel and ignitions. As temperatures become warmer and rainfall seasonality changes as a result of climate change, the number of extreme weather days will increase along with the risk of severe and destructive bushfires.[35]

Climate change will also extend the accumulated fire risk over the year, increasing the length of a fire season.[36] Fire danger is predicted to increase in spring, summer and autumn, resulting in shorter periods suitable for prescribed burning.[37] Changes in the distribution of flora as a result of longer term climate change may also form a positive feedback loop, if temperate rainforest and wet eucalypt forests are replaced by more flammable dry eucalypt forests.

Managing fire regimes is a critical component of managing forestry and biodiversity in the face of climate change. However, there is no 'optimal' fire regime due to the changing nature of the environment, as plant and animal species in fire-prone environments exhibit various adaptive fire responses.[38] Further, fuel dynamics and their associated management under climate change are complex. Higher risk of fire will come from rising temperatures and drier landscapes, although these factors this may also lead to lower fuel accumulation rates, thus limiting fuel availability. Assessment and monitoring of fuel levels and rates of change associated with climate change and management regimes should be undertaken to inform management decisions.

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33 Cowie, A., Barton, C., Singh, B., Ximenes, F. and Stone, C. (2007). *Climate Change Impacts and Research Priorities for the Forestry Sector.* Background paper to the DPI Priority Actions for Climate Change Workshop, October 25 and 26, 2007.

34 Pfautsch et al. (2016). Climate determines vascular traits in the ecologically diverse genus Eucalyptus. *Ecology Letters* 19:340-349.

35 Bradstock, R.A., Cohn, J.S., Gill, A.M., Bedward, M. and Lucas, C. (2010). Prediction of the probability of large fires in the Sydney region of south-eastern Australia using fire weather. *International Journal of Wildland Fire*. 18: 932-943.
Pitman, A.J., Narisma, G.T. and McAneney, J. (2007). The impact of climate change on the risk of forest and grassland fires in Australia. Climatic Change. 84: 383-401.

36 Williams, R. J., Bradstock, R. A., Cary, G. J., Enright, N. J., Gill, A. M., Liedloff, A. C., Lucas, C., Whelan, R. J., Andersen, A. N., Bowman, D. M. J. S., Clarke, P. J., Cook, G. D., Hennessy, K. J., and York, A. (2009). Interactions between climate change, fire regimes and biodiversity in Australia – a preliminary assessment. Report to the Department of Climate Change and Department of the Environment, Water, Heritage and the Arts, Canberra.

37 Hennessy, K.J., Lucas, C., Nicholls, N., Bathols, J., Suppiah, R. and Ricketts, J. (2005). *Climate change impacts on fire weather in southeast Australia*. CSIRO Atmospheric Research. Consultancy report jointly funded by the Commonwealth of Australia and the governments of New South Wales, Victoria, Tasmania, and the Australian Capital Territory, p. 91.

38 Bradstock, R. A., Williams, J. E. and Gill, A. M. (2002). *Flammable Australia: the fire regimes and biodiversity of a continent*. Cambridge University Press, Cambridge, UK.

4.4.3 Forest dieback

Forest dieback refers generally to instances where stands of trees die at a higher rate than usual.[39] Diebacks are an important structural and dynamic feature of forested landscapes, and contribute to the variability of forest structure and composition.[40] Forest dieback is often a result of multiple, interacting factors such as drought, insect pests and diseases, and generally cannot be attributed to a single cause.[41]

Bell Miner Associated Dieback (BMAD) is a type of forest dieback affecting moist coastal eucalypt forests in north-eastern NSW and south-eastern Queensland.[42] BMAD is associated with the interaction of herbivorous insects (predominately psyllid species) and the Bell miner or Bellbird (*Manorina melanophyrys*). Although psyllids and Bell miners are characteristic of BMAD, it is also facilitated by other underlying factors.[43] The complexity of the interactions of stressors in forest ecosystems means that a range of potential contributing factors have been proposed, including:

- **secondary factors** – such as climate and drought, fire, herbivory, soil and plant pathogens
- **human influences** – such as the introduction of weeds, forestry practices, pollution, fire management, grazing regimes, land clearing and fragmentation
- **conditioning factors** – age, forest structure, soil structure, soil conditions and stress history.[44]

BMAD presents a potentially significant risk to NSWs forests. Forest dieback can have serious impacts on forestry economics, biodiversity, and landscape aesthetics.[45] There is also a considerable risk that the rate and extent of BMAD may accelerate as the magnitude of factors stressing forest ecosystems become larger in response to future shifts in climate and land-use intensification.[46]

Studies directly associating forestry practices, forest structure, floristics and BMAD have not been carried out. There is a need to evaluate how specific forest management practices can either increase or mitigate the risks associated with BMAD, and what alternative forestry practices might be appropriate to adopt. BMAD is also occurring on other tenures, including in conservation reserves, so a holistic, cross-tenure approach to research and management is needed.

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39 Allen, C.D., 2009. Climate-induced forest dieback: an escalating global phenomenon? In A. Perlis, ed. *Adapting to climate change - Unasylva No. 231/232*. Rome: Food and Agriculture Organization of the United Nations.

40 Mueller-Dombois, D., 1991. The Mosaic Theory and the Spatial Dynamics of Natural Dieback and Regeneration in Pacific Forests. In H. Remmert, ed. *The Mosaic-Cycle Concept of Ecosystems*. Berlin Heidelberg: Springer, pp. 46–60. Seidl, R. et al., 2011. Modelling natural disturbances in forest ecosystems: a review. *Ecological Modelling*, 222(4), pp.903–924.

41 Allen, C.D., 2009. Climate-induced forest dieback: an escalating global phenomenon? In A. Perlis, ed. *Adapting to climate change - Unasylva No. 231/232*. Rome: Food and Agriculture Organization of the United Nations.

42 Wardell-Johnson, G. et al., 2006. *Bell Miner Associated Dieback (BMAD) Independent Scientific Literature Review: A review of eucalypt dieback associated with Bell miner habitat in north-eastern New South Wales, Australia*, Sydney: Department of Environment and Conservation (NSW).

43 Wardell-Johnson, G. et al., 2006. *Bell Miner Associated Dieback (BMAD) Independent Scientific Literature Review: A review of eucalypt dieback associated with Bell miner habitat in north-eastern New South Wales, Australia*, Sydney: Department of Environment and Conservation (NSW).

44 Mitchell, P., Wardlaw, T. & Pinkard, L., 2015. Combined Stresses in Plants: Physiological, Molecular, and Biochemical Aspects. In R. Mahalingam, ed. Cham: Springer International Publishing, pp. 223–244. Wardell-Johnson, G. et al., 2006. *Bell Miner Associated Dieback (BMAD) Independent Scientific Literature Review: A review of eucalypt dieback associated with Bell miner habitat in north-eastern New South Wales, Australia*, Sydney: Department of Environment and Conservation (NSW).

45 Ayres, M.P. and Lombardero, M.J. (2000). Assessing the consequences of global change for forest disturbance from herbivores and pathogens. *The Science of the Total Environment*. 262: 263-286.

46 Mitchell, P., Wardlaw, T. & Pinkard, L., 2015. Combined Stresses in Plants: Physiological, Molecular, and Biochemical Aspects. In R. Mahalingam, ed. Cham: Springer International Publishing, pp. 223–244.

5 Managing risks around the commitments

Key points:

1 As currently described, the Government's commitments are not mutually achievable under the Coastal IFOA settings proposed by EPA or FCNSW. Nor are the commitments mutually achievable under the Commission's recommended settings.

2 There are also external factors that affect forest management outcomes and place pressure on wood supply both now and into the future, for example, changes in the total area of state forest and emerging threats from climate change.

3 The Commission has identified a range of potential ways forward for Government to address the current issues around the commitments, each requiring a different level of action.

A key finding of the Commission's impact and risk analysis is that, as currently described, the Government's commitments are not mutually achievable under the Coastal IFOA settings proposed by EPA or FCNSW. Nor are the commitments mutually achievable under the Commission's recommended settings. In addition, attempts to balance the commitments are confounded by a lack of data on environmental values and outcomes, which makes it difficult to accurately assess the likely impact of potential alternative settings.

The Commission considers that it is unlikely that the tension in meeting the two commitments can be resolved through the choice of settings alone. The recommended settings represent the Commission's view of the integrated package of prescriptions that will come closest to meeting both Government commitments in the short term. Finalising the Coastal IFOA will, however, require adopting settings that incur some risk or uncertainty for one or both of the commitments.

As shown previously in **Table 8**, the recommended settings are not likely to erode environmental values over time, but are likely to impact wood supply of preferred species. This assessment has been based on the available information and expert advice.

Whilst FCNSW may be able to sustain delivery of supply to its customers that meets wood supply agreement requirements, there is a risk it will be of lesser quality and delivered at higher cost. Changes of this nature would impact mill viability, with flow on effects to regional employment and community well-being.

There are also external factors to consider that affect the ability to meet the commitments both now and into the future. For example, current pressures on wood supply, along with an increased focus on markets built around key species and the impacts of species-specific wood supply agreements.

Environmental values are also changing and knowledge bases are improving, as there is new mapping available for listed threatened species and threatened ecological communities, along with emerging threats from climate change such as changes to fire regimes, temperatures and rainfall patterns.

The Commission has identified a range of options for Government to address the current issues around the commitments:

1 reassessing the intent and wording of the commitments to provide greater clarity and acknowledge local impacts

2 understanding the balance between values to clarify objectives and to provide a sound basis for any potential trade-offs

3 reviewing wood supply agreements to adjust for impacts on wood supply of any adopted settings

4 applying alternative approaches outside of the IFOA in order to meet both commitments.

5.1 Reframing the commitments

The commitments, as currently written, are very high-level and largely unrealistic given the inherent tension that often exists between wood supply and environmental values. Importantly, it would appear that the commitments do not take into account or clarify how these values may differ across different spatial and temporal scales.

The Commission advises that at a minimum, Government should review the intent and clarity of the commitments. For instance, Government may wish to clarify what is meant by 'no net change to wood supply'. Although it may be possible for FCNSW to minimise impacts to wood supply across the North Coast IFOA region, there remains significant potential for local impacts on quantity, quality and cost of production (particularly as a result of changed species mix) that should be explicitly considered.

Similarly, increased environment protections at the landscape scale may need to be offset by greater tolerance of localised and temporary impacts due to increased harvest intensity in specific coupes.

5.2 Understanding and clarifying the balance between values

The current management objectives for state forests focus on maintaining or enhancing conservation and other environmental values while also providing for a viable and resilient native forest timber industry to support regional communities.

The overarching joint Australian and NSW Government Agreements underpin this approach, by seeking 'a reasonable balance between conserving Australia's forest estate and its enduring use for economic production and recreation'.[47] These agreements are also driven by the principles of Ecologically Sustainable Forest Management, particularly:

- maintain the ecological process within forests and preserve their biological diversity
- obtain for the community the full range of environmental, economic and social benefits from all forest uses within ecological limits.[48]

The Commission has developed its recommended settings with a view to meeting the Government's commitments, while also recognising that some trade-offs are required in order to balance wood supply and environmental values. There was also recognition that there is uncertainty around the potential impact of certain settings on wood supply or conservation values. Thus, there is a need for ongoing monitoring and review of the impacts of different settings.

47 http://www.agriculture.gov.au/forestry/policies/rfa/about/why
48 http://www.agriculture.gov.au/forestry/policies/rfa/about/esfm

We consider that an ongoing, productive dialogue about what it means in practice to balance competing wood supply and environmental values is needed in order to foster a shared understanding of priorities and trade-offs amongst all stakeholders.

Often the language used to describe the intent of Ecologically Sustainable Forest Management differs from document to document and as such is open to interpretation, allowing different parties to choose to focus on the objectives that best align with their own values. The National Forest Policy Statement identifies that ecologically sustainable development is not consistently defined in the literature, and instead defines three principles for sustainable forest use:

- maintaining the ecological processes within forests (the formation of soil, energy flows, and the carbon, nutrient and water cycles)
- maintaining the biological diversity of forests
- optimising the benefits to the community from all uses of forests within ecological constraints.[49]

Drawing on the language used in the National Forest Policy Statement and to describe the Regional Forest Agreements, decision making in the context of state forests hinges on what is understood by key phrases such as 'a reasonable balance' and 'optimising… within ecological constraints'. Without clear guidance, the Commission believes these statements are likely to be a source of ongoing conflict.

Government may wish to consider being more explicit about how the different management objectives and values of state forests are being balanced to better reflect trade-offs being made at the state-wide strategic scale. Periodic review and discussion of objectives and trade-offs will help clarify and challenge the assumptions built into Ecologically Sustainable Forest Management approaches when it comes to making decisions about how we manage landscapes. This process should be informed by:

- the objectives and priorities set out within national and state policy frameworks
- the broader landscape and policy context, including trends in tenure change
- the impact of different spatial and temporal scales on different values and concepts of sustainability
- state-wide data and mapping covering all tenures for relevant factors such as threatened ecological communities
- consideration of future options and risks.

For instance, the process should consider that the contribution of state forests to environmental values occurs in the context of a range of other tenures, including the conservation reserve system and on private land. As state forest areas have been transferred to the reserve system for conservation purposes, it might be argued that a reasonable re-balancing may occur in the management of the remaining state forest areas available for harvest to allow continuity of wood supply. Management objectives and plans would need to be clear that the primary management objective for these areas are wood supply, involving more intensive silviculture while still seeking to sustain environmental values at the coupe and landscape scales and maintaining ecosystem function over the long-term.

49 Australian Government (1992), *National Forest Policy Statement*, signed by the Australian Government and all mainland state and territory governments in December 1992 and by the Tasmanian Government in April 1995.

Alternatively, while state forests continue to support a large proportion of native forest wood supply values in NSW, private native forestry and plantations can also provide alternative sources of timber resources. As such, given the trend towards increasing environmental protections in state forests and decreasing state forest area, Government may wish to avoid intensification of management activities on state forests by instead looking for further growth in supply opportunities on other land tenures, including private native forestry and plantations.

Positively, FCNSW expect additional supply from plantations to become available in the medium to long term, reducing the demand on supply from native forests. On the North Coast, current forecasts predict an initial stepwise increase in supply from plantations is expected in 2025, followed by a larger increase around 2049 (see **Figure B** on page 46).

However, although there are long-term plans to shift a greater proportion of wood supply from the native forest estate to the plantation estate, this will take some time to achieve. In the meantime, increasing pressure on native forest resources is expected in the period prior to increased log availability from hard wood plantations. In order for wood supply to be maintained in the short term, a temporary decrease in wood supply quotas or a temporary intensification of harvest practices may be considered justified for a limited time to sustain local industry, until the point at which additional plantation supply becomes available.

In the event that an assessment of trade-offs supports intensified harvest practices, either on a temporary or on-going basis, the extent and their potential long-term impact on ecosystem function is a key point to consider. Environmental values are not just about maintaining wildlife habitat, they also include maintenance of ecological processes that maintain the resilience and regenerative capacity of the forest ecosystem. The management of state forests should, as much as possible, ensure that these areas continue to function as a native forest and avoid transformation into a plantation-type system without strategic planning. This is also important in light of the contributions state forests make to the delivery of a Comprehensive, Adequate and Representative (CAR) reserve system. The need to retain ecosystem function means there is likely to be an upper limit to the extent to which intensified harvest practices can be applied, after which point alternative options will need to be considered (see **Sections 5.3** and **5.4**).

5.3 Reviewing wood supply agreements

The Commission's preliminary analysis estimates there could be a reduction of between 7,600 to 8,600 cubic metres per year to high quality wood supply in the North Coast IFOA region based on the recommended settings for Koala protection and the updated threatened ecological communities mapping (**Section 4.3.3).** This could impact up to seven mills in the region with varying levels of impacts.

This reduction may be higher, once the cumulative impact of all Coastal IFOA settings are taken into account. FCNSW will need to model this impact once the final settings are adopted by Government.

Based on this indicative analysis, the Commission suggests Government will need to consider buying back high quality sawlog quota to reduce the current pressures on wood supply, particularly until increased wood supply from plantation sources becomes available. This should be considered in the context of the Commission's previous advice on North Coast equity issues and Project 2023.

Native forestry wood supply agreements begin to expire on the South Coast from 2019, and 2023 in the North Coast. Under the *NSW Forestry Industry Roadmap 2016*, the NSW Government intends to provide greater certainty of resource supply for industry. The Government has committed to:

- commission a comprehensive and independent review of current coastal native wood supply agreements (early 2017)
- work with industry as a matter of priority to examine and resolve North Coast hardwood wood supply agreement concerns (2017)
- renegotiate expiring native wood supply agreements to provide certainty and stability for all stakeholders into the future, while ensuring the supply of timber continues to remain ecologically sustainable (commence end of 2016)
- improve timber resource and environmental modelling.[50]

Any decision to buy back high quality sawlog quotas needs to be considered in the context of these commitments around industry certainty.

5.4 Applying alternative approaches

The following alternative approaches may be considered to meet or limit impact on both commitments:

- **Initiate steep slope trial -** evaluate the benefits, costs, operational constraints and controls of accessing timber on steep slopes in NSW[51]; cable harvesting on steep slopes occurs in Tasmania.
- **Adjust boundaries or management –** transfer adjacent new or existing permanent exclusions with high conservation values (non-commercial value) in the state forest estate into the reserve system; or NSW National Parks and Wildlife Services manage areas of high quality conservation on the state forest estate
- **Review threatened ecological community listings** - map threatened ecological communities across all tenures to quantify extent, and if required review their listing against the criteria for threatened species
- **Active intervention and management –** more strategic, active intervention and management may be required to achieve desired outcomes. For example:
  - rehabilitating degraded public land with silvicultural techniques on all public tenures
  - thinning to reduce impacts on water availability, stand vigour and enhancing environmental outcomes
  - allowing more dynamic tenure boundaries to adapt to changing climate
  - artificially relocating timber tree species to more favourable climates ('assisted migration)
  - engineering artificial tree hollows
  - deploying more drought / disturbance tolerant species or selective species for environmental outcomes (for example, Tallowwood species for Koalas)
  - reducing losses of trees due to insects and diseases through sanitation harvests.

50 NSW Government (2016), *NSW Forestry Industry Roadmap*, Sydney NSW

51 As set out in NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW

6 Towards a fit for purpose contemporary regulatory framework

Key points:

1 While significant progress has been made in improving the IFOA settings and prescriptions, there remains tension and conflict between parties responsible for delivering ecologically sustainable forestry in NSW.

2 Successful and timely implementation of the IFOA will require a genuine cultural shift within Government to support a more outcomes and risk focused approach that is fit for purpose for native forestry. This includes greater collaboration on the development of guidance documents and protocols to facilitate adaptation as uncertainties are resolved. This is necessary to help achieve the Government's high level objectives for the IFOA remake.

3 Adaption triggers have been built into the agreed settings of the IFOA, including a five year review. These triggers can be further improved through an annual check point to help resolve any issues between the parties, maintain momentum and facilitate successful implementation and adaptive management of the Coastal IFOA leading up to the planned five-year review.

The NSW Government intends to deliver a contemporary regulatory framework for native forestry that is fit-for purpose. In line with the Commission's terms of reference, the Commission has identified some opportunities for further improvement in the EPA's implementation of its regulatory framework for native forestry.

These opportunities are already incorporated within the EPA's compliance policy that sets out its approach to contemporary regulation. [52] Native forestry regulation needs greater goodwill, collaboration and trust between the regulator and the operator to give these opportunities the best chance to succeed.

The EPA's general regulatory framework consists of an integrated series of components, including legislation, policy, education, incentives, licensing, administration, audit, investigation, and compliance and enforcement action with a strong commitment to continuous improvement. Its policy and approach is robust, credible and reflects best practice regulation principles.

The Compliance Policy also commits the EPA to be a:

> "modern and effective regulator that exercises its statutory authority fairly and credibly. It takes strong and appropriate regulatory action based on the following principles: responsive and effective; targeted; proportional; firm but fair; informed; consistent; transparent; ethical and accountable; and collaborative. " (p1)

IFOAs are different regulatory instruments than standard licenses due to their governance arrangements; as such it is appropriate to consider how to achieve a fit for purpose regulatory approach.

52 EPA (2013) *Compliance Policy*. Environmental Protection Authority, Sydney NSW.

6.1 Does the Coastal IFOA deliver a fit for purpose contemporary regulatory framework?

The Commission has concluded that there is a sound strategic policy framework for native forestry in NSW at both the national and state scales. Further, the intent and broad objectives of the IFOA remake reflect good practice, particularly the outcomes-focussed, multi-scale landscape approach and the commitment to further developing a modern regulatory framework.

The EPA and FCNSW made early progress in agreeing to a range of settings that are expected to deliver improved efficiency and regulatory outcomes (as shown previously in **Table 1** on page **13**). However, during this review, the Commission has observed that the stalling of negotiations on outstanding operational settings has resulted in to date limited development of the supporting regulatory framework that sit between the strategic objectives and operational scale prescriptions. The Commission considers these gaps and weaknesses present a significant risk to the successful achievement of the overall IFOA remake objectives and need to be addressed in addition to the resolution of the outstanding settings.

The IFOA does contain worthwhile adaptive management measures such as the five yearly review and ability to negotiate changes to protocols and guidance material as necessary to adjust to such things as new knowledge, compliance history or local site needs. These commendable measures can be further built upon to reflect the functioning of dynamic forest landscapes.

The prevailing regulatory model is characterised by a decision making process that depends heavily on prescriptive regulation of surrogates for environmental values, as opposed to adaptive management to achieve specified outcomes. This approach relies on certainty and stability , and is incompatible with the reality of managing diverse landscapes, with unavoidable uncertainties and disturbances continually demanding responses. In reality, forested landscapes are complex dynamic systems and should be managed through adaptive decision making.[53]

The Commission recognises that in many instances there is an important role for clear, transparent and enforceable prescriptions, particularly for those parameters that are better known and more stable such as exclusion areas based on topography. However, this needs to be balanced against greater flexibility to adopt different measures for those parameters that are more uncertain, regionally variable and / or where strict rule setting upfront can be counterproductive. The consideration of natural disturbance regimes, along with the provision of important habitats for species, will be essential for biodiversity-oriented forestry into the future.[54] It is also critical that prescriptions are being driven by strategic outcomes, rather than perpetuating existing practices and assumptions.

Figure 9 provides a high level outline of how adaptive management might be implemented under a modern regulatory framework. To ensure that the Coastal IFOA truly delivers against the Government's objectives in this area, there will need to be a focus on improving the areas discussed in the remaining sections of this chapter.

53 Keenan, R.J. and Nitschke, C. (2016) Forest management options for adaptation to climate change: a case study of tall, wet eucalyptus forests in Victoria's Central Highlands Region. *Australian Forestry,* http: / / dx.doi.org / 10.1080 / 000491158.2015.1130095

54 Mori, A.S. and Kitagawa, R. (2014). Retention forestry as a major paradigm for safeguarding forest biodiversity in productive landscapes: a global meta-analysis. *Biological Conservation*. 175: 65-73.

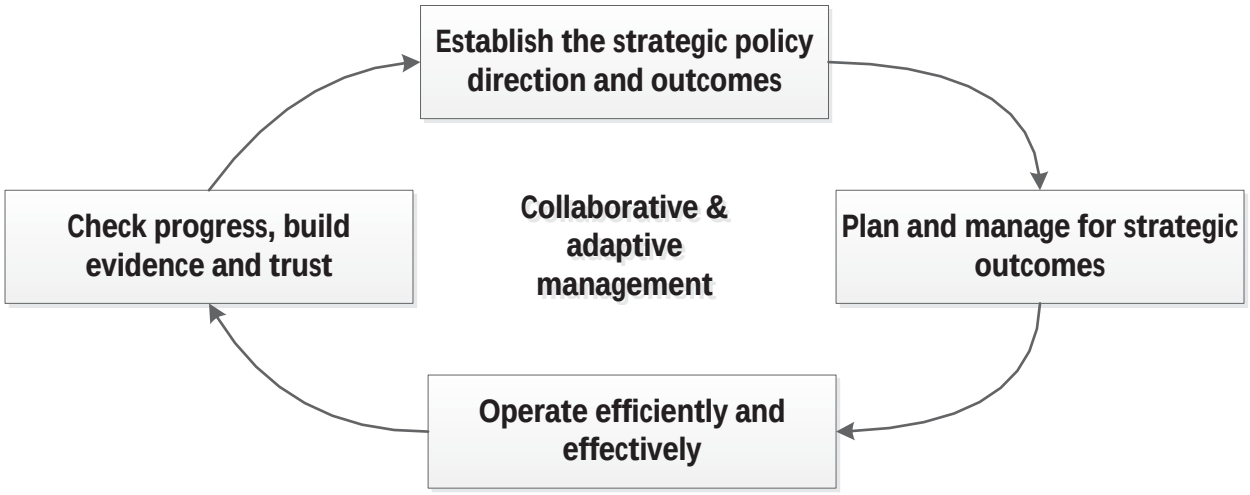


Figure 9: Key elements of modern regulatory practice

Importantly, the Coastal IFOA requires more than just policy and regulatory change – there needs to be a genuine cultural shift towards adaptive management, based on trust and shared objectives for sustainable productive native forestry. This will also require investment of adequate resources in order to establish the required frameworks and guidance that will ultimately deliver improved outcomes over time. Without these key elements, it will not be possible to transition from current practice to the contemporary regulatory approach that the Government is seeking.

6.2 Establishing the strategic policy direction and outcomes

6.2.1 Clear institutional arrangements and roles

The *NSW Forestry Industry Roadmap 2016* indicates the role of FCNSW and the EPA in managing and regulating public native forests, and the role of the DoI Forestry in regulating plantations.

There appears to be an opportunity for OEH and DoI Forestry as policy leads to help address the gaps identified in the supporting framework between strategy and settings and to diffuse unproductive tension between EPA and FCNSW.

It is desirable that all four agencies, and also DoI Fisheries collaborate on the formulation of operational guidance documents and harvest planning protocols to provide a robust basis for adaptive management.

6.2.2 Outcome statements

The Coastal IFOA remake was intended to take an outcomes-based approach, where the IFOA structure and regulatory action focuses on whether environmental outcomes have been achieved. This is to ensure regulatory practice is focused on outcomes rather than process that has little or no impact on outcomes.[55]

However, the Commission has seen limited examples of appropriate outcomes statements to date. Those that do exist seem to have been largely derived by clumping up existing prescriptions and describing outputs and activities, rather than representing genuine strategic outcomes. As such,

55 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney.

current prescriptions and approaches appear to be driving the outcomes statements, rather than the other way around. The Commission is also yet to see evidence of a clear hierarchy being established within the outcomes.

This Coastal IFOA remake is an opportunity for NSW to lead in outcomes-based regulation. Although there are some outcomes statements within early legal drafts, these do not seem to have been driving the process and are not considered fit-for-purpose to do so. The Commission recommends that the Coastal IFOA process be refocused at a more strategic level by developing a full suite of strategic outcome statements through a collaborative process.

At the second stakeholder forum, stakeholders identified and developed a working set of outcomes statements to support the IFOA remake. The Commission has updated the working outcomes statements, which are summarised in (**Table 10**). The broad intent is to maintain these outcomes over space and time, rather than measuring short-term impacts at the site scale.

The working outcomes statements are only a starting point. They will need further revision, with a focus on making them more measurable if they are to provide useful guidance for the Monitoring, Evaluation, Reporting and Improvement (MERI) framework. For instance, this may involve developing targets and measurable indicators to support each goal. The process of drafting the final outcomes statements would also benefit from the involvement of relevant stakeholders in order to build a shared understanding of goals and objectives for native forestry under the Coastal IFOA.

Table 10: Working outcome statements

IFOA outcomes	
Outcomes	**On the State forest (Crown Timber Land) estate, the Costal IFOA has the following goals:**
Production	1. *Ensure the productive capacity of the state forest is maintained or enhanced.* 1.1. Maintain sustainable timber supplies of appropriate species and quality across locations by ensuring adequate regeneration, protection of growing stock and maintenance of access to available harvest area
Forest Health	2. *Maintain or enhance forest ecosystem health in a changing climate.* 2.1. Appropriately identify, assess, prioritise and monitor risks to the continued provision of ecosystem services from forests under a changing climate, managing risks within acceptable limits. 2.2. Maximise the resilience of forests to climate change and other pressures by applying best practice fire and land management approaches.
Biodiversity	3. *Ensure viable populations of native flora and fauna, particularly threatened species, populations and ecological communities, are maintained or enhanced in landscapes.* 3.1. Maintain or improve landscape heterogeneity by applying long-term habitat protection measures and dispersing impacts over time and space 3.2. Maintain habitat quality and connectivity through a network of permanently protected forest areas across the landscape and species specific protections 3.3. Support the persistence or recolonisation of forest dwelling flora and fauna (including threatened species) at the local landscape scale following harvesting, and support the maintenance of those populations throughout their range.

IFOA outcomes	
Outcomes	**On the State forest (Crown Timber Land) estate, the Costal IFOA has the following goals:**
Soil and Water	4. *Maintain or improve the condition of the soil and aquatic ecosystems.* 4.1. Maintain or improve the condition of aquatic ecosystems by maintaining water quality and flow within and leaving state forests, and protecting or restoring riparian vegetation and instream habitat. 4.2. Support production and environmental functions by maintaining or improving soil conditions.

Once finalised, these outcomes statements should be included up front in the IFOA and used to test the proposed settings. The Coastal IFOA Discussion Paper states that any existing prescription or procedure based provisions that are not critical to achieving the outcomes will be considered for their relevance and may be included in supporting protocols and guidance material.[56] These protocols and guidance documents are more easily adapted than regulatory prescriptions, and thus better support adaptive management and continuous improvement.

It will then be appropriate for the outcomes to be reviewed and revised as an early step in the comprehensive review of the IFOA after five years.

6.3 Planning and managing for strategic outcomes

6.3.1 Reducing costs through ongoing collaboration

FCNSW and EPA should seek a more cooperative approach to develop and apply operational guidelines and planning protocols. The benefits of shared understanding and avoidance of potential costly litigation can readily outweigh the initial upfront costs of collaboration.

It is acknowledged that both EPA and FCNSW are committed to developing guidance material and protocols to inform local variations and address settings with a high degree of uncertainty, contestability or potential risk such as mixed harvesting. This commitment must be realised in a timely and cooperative manner. This should lead to FCNSW developing harvest plans that align and are consistent with the intent of the IFOA. Risk-based inspections and audits by EPA can then be used to check compliance, performance and promote improvement.

Annual check-points can be used to help discuss and resolve on-going any issues and to maintain the momentum of the Government's broader IFOA objectives (**Section 6.5.3**).

6.3.2 Arrangements for engagement and education

A credible regulatory regime requires enhanced transparency and a meaningful engagement with industry, environment and community groups. A carefully designed engagement and high level regional planning process should allow sensible refinement of some operational guidelines in some circumstances and adjustment to existing plans where warranted.

On-going education, training and learning for operators, contractors and regulators is also important to build trust and the capability to deliver outcomes.

56 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW

6.4 Operating efficiently and effectively

6.4.1 Enhanced use of technology

Both the EPA and FCNSW are committed to adopting the latest technology to improve efficiency and effectiveness. The IFOA remake objectives include a clear commitment to enhance the use of technology. At present, it costs FCNSW around $1.5 million per year to locate and mark-up boundaries in the field.[57]

Technology is revolutionising natural resource management including forestry. The adoption of new information and communication technology can improve decision making and reduce costs. In particular cost-effective remote sensing technologies should be increasingly explored as a means of planning and monitoring outcomes related to the spatial heterogeneity of landscapes.

Technologies for acquiring spatial forest resource data have developed rapidly in recent years. Fieldwork has been enhanced by global satellite positioning systems (GPS), automatic measuring devices, field computers and wireless data transfer, and modern remote sensing. In particular, laser-based measurements are now able to provide cost-efficient spatial digital data that are more accurate than ever before.

Although these new technologies provide the capacity for 'precision forestry' feedback indicates that there are issues with accuracy and user error. At this stage, these technological application have been used predominantly with respect to operational arrangements, rather than being applied extensively in regulatory compliance.

Compliance approaches to defining and monitoring protection of environmental attributes continues to have a strong field based weighting, but there are opportunities to use new technologies to deliver on ground efficiencies. For example, in Victoria, the use of smartphones and georeferenced imagery has enhanced the regulator's capacity to verify claims of alleged breaches or sightings of threatened species.

New technologies also allow new parameters to be measured. Traditionally, parameters such as three-dimensional canopy measurements have been impractical, so surrogates around tree diameter have been used. It is now possible to sense these measurements directly, providing a robust basis for moving away from surrogate parameters towards direct measurement of the parameters of interest.

6.4.2 Risk management flexibility

The Coastal IFOA Discussion Paper indicates that the new IFOA will be based on risk-management principles.[58] In particular, it states that wherever possible low risk activities should be managed under guidelines and codes of practice rather than prescriptions. This approach is useful in enabling adaptive management, as it is easier to review and adjust guidelines and codes of practice periodically in response to new evidence.

The EPA routinely applies its regulator discretion in determining its enforcement approach to issues of non-compliance. The EPA evaluates the significance of any non-compliance, assesses the risk to the environment and considers other factors, including the offender's attitude to

57 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW

58 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW

compliance. In this way, regulatory resources are directed where they are most likely to have the biggest impact and prevent the most harm. With new and revised settings in the remade IFOA, there is scope for increased misunderstanding by operators in the early phase of implementation and this should be taken into consideration in determining the EPAs response.

A clear and transparent response system based on real time monitoring of risks can be used to demonstrate and justify which responses and / or tools are applied in each breach or complaint scenario.

Forest management should also ensure that the greatest risks posed to the continued provision of ecosystem services are managed within acceptable limits. The current regulatory framework considers impacts upon water quality, threatened species and aquatic habitat, but largely overlooks the impact of issues such as dieback, pests and disease, wildfires or climatic change on critical parameters such as water yield and tree mortality.

6.5 Checking progress, building evidence and trust

6.5.1 Monitoring, evaluation, reporting and improvement framework

A strong monitoring, evaluation, reporting and improvement (MERI) framework for native forestry needs to be developed for the Coastal IFOA in order to:

- support evidence based decision making,
- allow Government to measure performance
- enable continuous improvement in the future.

Monitoring and evaluation is fundamental to adaptive management and ecologically sustainable forest management.[59] Monitoring the outcomes of various settings through field surveys and remote sensing provides an opportunity to evaluate, learn, adapt and improve. Monitoring is a key component of good forestry practice, as reinforced in The Australian Standard for Sustainable Forest Management (SRC 2013) which states "there are requirements for researching, monitoring and evaluating the outcomes of management in relation to the forest management performance and stakeholder engagement requirements, and review and continual improvement of the management system".[60]

However, the Commission is concerned that the MERI framework and associated monitoring program is being designed as a late addition to the Coastal IFOA, rather than an early and integral part of the IFOA itself as per a true outcomes-based approach.

Continuous improvement relies on mechanisms for adaptive management; any regulatory approach that limits the flexibility of prescriptions can also limit the capacity for improvement. The ability to change practices and try new ideas are critical in instances where the results of monitoring and evaluation processes show that the outcomes being sought are not being delivered under the current approach. It also provides scope to respond to local conditions, changing circumstances and the emergence of innovative practices. Further, if interim measures are adopted they need to be supported by strong adaptive management processes to refine the measures over time.

59 Burrows, N., Dell, B., Neyland, M. and Ruprecht, J. (2011). *Review of Silviculture in Forests of south-west Western Australia*. Report to Department of Environment and Conservation.

60 SRC (2013). *Australian Standard: Sustainable Forest Management*. AS4708-2013. Standard Reference Committee of Australian Forestry Standard.

Currently, evaluation of the performance and effectiveness of the existing IFOAs is limited by the existing monitoring arrangements.[61] The Commission has also observed that despite some progress via the IFOA trial, there is a limited evidence base to inform Coastal IFOA decision making. As a result, new settings are being developed based on old assumptions and existing practices, with limited information available about outcomes or past performance.

The MERI framework should be designed to report against the outcome statements (see **Section 6.2.2**), so as to enable the Government to assess whether the management objectives are being met. If these objectives are not being met, it should trigger a process of adaptation where different approaches are implemented and evaluated, or identified negative impacts are remediated. The parameters being monitored and evaluated may also need to change over time to reflect forest dynamics. For instance, to effectively measure the progression from post-harvest regeneration to a mature stand.

The MERI framework should also draw on forestry research and development, such as programs under DPI's Forest Science unit.

In order to generate useful information to inform decision making, the MERI framework will need to be adequately funded. Appropriate upfront investment in designing and implementing an effective framework is likely to deliver longer-term benefits in the form of more effective and efficient forest management, lower compliance and enforcement costs as well as better outcomes.

Within the current MERI framework we have also noted a preference for using historical baselines and outputs (and their associated assumptions) as a measure for the maintenance of often poorly defined environmental values for the future. The associated monitoring program should be designed to meet and report against clearly defined desired future landscapes, as opposed to measuring against baselines based on historical practices and outputs.

6.5.2 Understanding environmental outcomes

Deciding on how, where and when environmental resources are used is complex. The assessment of environmental outcomes is challenging as the processes linking the environmental protection actions to environmental outcomes are often difficult to understand. This places them at a disadvantage compared to assessing impacts on wood supply due to limited environmental modelling and monitoring compared to FCNSW's knowledge of harvest volumes, forest classes and modelling capacity at a strategic level through FRAMES.

As a result, environmental value is often inferred by simple proxies such as 'amount of undisturbed forest vegetation'. Conversely, modelling can also test contested assumptions around the benefits and impacts of disturbance such as harvesting on native forests.

NSW currently lacks capacity to accurately model the function of forested landscapes, particularly how forested landscapes provide their ecosystem services and respond to impacts and shocks. This lack of understanding makes it difficult for the experts to provide advice on the appropriateness of the settings.

To inform more transparent decision making, the Government should prioritise the development of environmental modelling tools that model outcomes at the landscape (strategic) and site

61 NSW Government (2014), *Remake of the Coastal Integrated Forestry Operations Approvals - Discussion paper February 2014*, Sydney NSW

(tactical) scales to complement the current approach to wood supply modelling. In the meantime, knowledge gaps should be recognised and the associated risks addressed.

To best inform forest management, the proposed landscape function model should provide data on a more comprehensive range of environmental services provided by forested landscapes, including water yield. The current assessment of environmental values focusses predominately on the habitat requirements of selected native species.

6.5.3 Independent oversight and tracking

While regulatory and performance arrangements are in place under the existing IFOAs, the lack of external and independent oversight of the forest management and regulatory activities presents numerous risks. Forest resource management will always be a contentious area characterised by value based conflict, and there currently exists considerable mistrust between different user groups. Regaining and retaining trust in the regulatory system over time is difficult but important, and not impossible.

Periodic independent evaluation of forestry activities can help create the trust between various stakeholders that is necessary to move forward and successfully implement the IFOA. It could be useful in supporting continual improvement processes. The *NSW Forestry Industry Roadmap 2016* highlight a need for transparency; specific measures need to be identified to give effect to this.

It has also been suggested in the agency forums during this review that it may be helpful to task the Commission with convening an annual forum, or 'check-point' to help resolve any issues between the parties and to maintain the momentum of the transition. This annual forum would help facilitate successful implementation and adaptive management of the Coastal IFOA, and encourage ongoing collaboration and progress leading up to the planned five-year review of the IFOA. Priority issues for discussion at such a forum could include:

- operational clarifications of prescribed settings
- feedback on implementation issues
- update on monitoring programs
- update on research programs , especially in key areas such as Koalas.

It could also provide appropriate linkages into the various review and remake processes that are scheduled to occur over the next five years for the NSW Forest Agreements and joint Australian and NSW Government Regional Forest Agreements. An annual forum could provide cohesion throughout these processes, streamlining the collation of relevant data and minimising duplication of effort and resourcing.

A summary of the discussion could also be made public to further improve transparency and community understanding of IFOA implementation progress.

6.5.4 Reporting and public engagement

The Commission's review of native forestry in other Australian jurisdictions indicated that NSW appears to have comparatively good practices for regular reporting on overall compliance performance and enforcement. EPA audit reports for each audit of coupe level forestry operations are published and data on audits and breaches of applicable regulations are compiled.

However, there is further room for improvement, particularly involving FCNSW in a more proactive role. If FCNSW and EPA were to work together to provide more timely and innovative reporting, such as performance or outcome dashboards, it would build trust within the community. Currently, the reporting is at a scale that does not relate to the outcomes sought. Reporting on outputs at the coupe scale has limited impact and is less useful for informing decision making if the outcomes being sought are monitored at a different scale.

Reporting requirements should also be consolidated and streamlined wherever possible to reduce inefficiencies and burden.

Appendix 1 – Outstanding settings and issues

Priority issues as identified and grouped by agencies

Issue		Description
Set 1 – EPA and FCNSW have been unable to reach an agreement		
1	**Intensive Zone – Time and Space**	Limit settings to distribute the impacts of intensive harvesting over time and across the landscape.
2	**Selective Zone – Basal Area**	Settings to limit selective harvesting to a low – moderate intensity.
3	**Threatened species protections / clumps**	The application and distribution of threatened protections at the landscape and operational scales (strike rate application).
4	**Tree retention clumps**	Protection measures for hollow-bearing and recruitment trees (moving from a retention rate to an aggregated approach).
5	**Identifying and managing operational boundaries**	Rules for how mapped entities are implemented on ground using modern technologies (but not fettering enforceability of conditions or the regulator's discretion).
6	**Threatened Ecological Communities (TECs)**	Conditions for identifying and protecting TECs.
Set 2 – Other key issues not yet resolved by EPA and FCNSW		
7	**Mixed intensity operations**	Limit settings to deliver selective and intensive harvesting – and mitigate the impacts of harvesting across the landscape and over time.
8	**Giant trees**	Cutting limits on trees over a certain size to provide protection to isolated old growth trees.
9	**Burning**	Conditions for implementing burning, including protecting exclusion zones, delivering enforceable outcomes and balancing this with operational efficiencies and practicalities.
10	**Koalas – North**	Conditions for identifying and protecting koalas in northern NSW.
11	**Environmental monitoring framework**	The structure and design process for the strategic environmental monitoring framework – as set out in the Coastal IFOA remake discussion paper.
Set 3 - Complex and legally sensitive		
12	**Rocky outcrop definitions**	Definition of rocky outcrops and cliffs to ensure the features are identified and protected. The Commission understands there is an ongoing legal case and associated sensitivities around this issue. This issue was discussed confidentially and without prejudice with each party.

Appendix 2 – Terms of Reference

CABINET IN CONFIDENCE

TERMS OF REFERENCE

Remake of Coastal IFOA: Request for advice

The Premier requests the Natural Resources Commission (the Commission) provide independent, evidence-based advice on outstanding issues relating to a new coastal Integrated Forestry Operations Approval (Coastal IFOA) within the agreed Multi-Sale Model.

Background:

In 2013, the NSW Government announced that it was remaking the four existing coastal IFOAs into a single coastal IFOA.

The objectives of the IFOA remake are to:

- reduce the costs associated with implementation and compliance
- improve the clarity and enforceability of the IFOAs
- recognise innovations in best regulatory practice
- incorporate advances in technology
- deliver a contemporary regulatory framework that is fit for purpose (the Objectives).

The NSW Government committed to delivering the Objectives with both:

- no net change to wood supply, and
- no erosion of environmental values (the Commitments).

The NSW Government commitments, scope and proposals for the remake are set out in its Coastal IFOA Remake Discussion Paper, published in February 2014 (**Attachment A**).

The NSW Government has indicated that a draft Coastal IFOA will be released for public consultation before it is finalised.

There is agreement on the types of conditions that should be included in the Coastal IFOA. Collectively, these conditions form the Multi-Scale Model. This model applies at three levels: broad landscape; local landscape; and site scale. The settings for many of these conditions have been agreed (Agreed Settings), but remain outstanding for the other conditions (Outstanding Settings). Some of the Outstanding Settings relate only to the Upper and Lower North Coast IFOA Regions (the North Coast) but some relate to all coastal IFOA Regions.

Progress on the development of a draft Coastal IFOA, including details of the Multi-Scale Model and the Agreed Settings and Outstanding Settings is at **Attachment B**.

Purpose:

The purpose of the review is to provide the Minister for Environment and the Minister for Primary Industries (the Ministers) with independent, evidence-based advice on the extent to which each of the Outstanding Settings, when applied together with the Agreed Settings, would, or would not, meet the Commitments. If it is not possible to meet the Commitments, the Commission should provide options for how to balance or reduce the impacts on environmental values or wood supply.

The findings of this review will assist the Ministers' to decide on the final form of the draft Coastal IFOA.

Scope of advice:

The Commission will:

1. Determine the baseline practices to be used in assessing whether the Commitments can be met, having regard to the terms and conditions (and their practical application) defined in the relevant current IFOAs and Regional Forest Agreements, including:
    a. Australian Group Selection

   b. Single Tree Selection
   c. Strike rate modifiers.
2. Determine metrics for assessing the impact of settings put forward by Forestry Corporation of NSW (Forestry Corporation) and Environment Protection Authority (EPA) (the Proposed Settings) for the Outstanding Settings on environmental values and wood supply.
3. Assess the proposals for Outstanding Settings and make recommendations on whether the Commitments remain mutually achievable or whether the NSW Government needs to consider trade-offs or alternatives.
   a. If the Commitments are mutually achievable, advise on what settings would deliver this.
   b. If the Commitments are not mutually achievable, advise on the degree to which each of the proposed settings assessed would impact on each of the Commitments.
4. If the Commitments are not mutually achievable, make recommendations on trade-offs that the NSW Government could consider to deliver the Commitments, or to limit any shortfall in delivering them, including describing any environmental value and/or wood supply impacts from each trade-off or option.

In undertaking items 3 and 4, the Commission will, within the context of the Multi-Scale Model and the Agreed Settings, assess and provide recommendations on all Outstanding Settings including, but not limited to:

A. Limits for intensive harvesting in state native forests on the North Coast. Specifically:
   i. The maximum allowable area per harvest event (coupe size)
   ii. The minimum allowable return time to harvest an adjacent coupe.
B. Limits for selective harvesting in all state coastal native forests. Specifically:
   i. The basal area limits within the harvest area per harvest event.
C. Limits for mixed intensity harvesting in state native forests on the North Coast using a combination of settings at (A) and (B).
D. Environmental protections for harvesting in all state coastal native forests at a site scale. Specifically:
   i. The percentage area of each harvest event to be retained as aggregated tree retention clumps
   ii. The percentage area of each harvest event to be retained as wildlife habitat clumps
   iii. The size of giant trees to be retained
   iv. The definition of rocky outcrops.

In carrying out its tasks, the Commission may have regard to any materials it considers relevant, including:

- the Commitments, Objectives, and other key principles for the Coastal IFOA remake (set out in **Background** and **Attachment A**)
- any existing research and the inputs and outputs of previous discussions, other than 'without prejudice' proposals
- NSW Government research and decisions relating to forestry
- any other input the Commission requests from EPA, Office of Environment and Heritage (OEH) Forestry Corporation, Department of Primary Industries (DPI) and Department of Premier and Cabinet (DPC) during the review process.

Matters not within scope:

The Commission will not consider:

- 'Without prejudice' proposals put forward by parties during previous IFOA negotiations
- Anticipated external stakeholder responses to the Proposed Settings put forward by Forestry Corporation or EPA.

Process:

The Commission will determine and communicate to EPA, OEH, Forestry Corporation, DPI and DPC the process and timetable for the review. The process for the review must include the following elements:

- The Commission will engage independent experts to inform its advice, including:
  - ecology and forestry experts to assist with research, expert opinion and evidence on the environmental or silvicultural implications of any recommendations
  - an expert in timber availability modelling (FRAMES) to assist in assessing the timber supply implications of any recommendations.
- The Commission will engage with Forestry Corporation, EPA, OEH, DPI and DPC during the review process.
- The Commission will give Forestry Corporation and EPA opportunities to jointly:
  - advise all Agreed Settings at the commencement of the review, and
  - advise any Outstanding Settings that are agreed during the review.

  For the purpose of this review, a setting is taken to be an Outstanding Setting unless EPA and Forestry Corporation have jointly advised the Commission that is an Agreed Setting. An Agreed Setting cannot be revoked.
- The Commission will give Forestry Corporation and EPA opportunities to individually or jointly:
  - put forward proposals for baseline practices, metrics and Outstanding Settings, supported by evidence and other relevant information
  - respond to any proposals put forward by the other party, and
  - respond to any preliminary findings and recommendations by the Commission.
- The Commission will share all relevant information with Forestry Corporation, EPA, OEH, DPI and DPC. This includes Proposed Settings put forward by Forestry Corporation and EPA, and the Commission's preliminary findings and recommendations.

Final advice:

The Commission will provide its final advice to the Premier, Minister for the Environment and Minister for Primary Industries, and send copies to EPA, OEH, Forestry Corporation, DPI and DPC within four months of the receipt of this Terms of Reference.

The final advice must document the review's findings and recommendations. In the absence of conclusive evidence, the Commission may make findings and recommendations based on its judgement.

Confidentiality:

All information presented to the Commission, as well as its recommendations, should be treated as Cabinet in Confidence, unless otherwise determined by the Premier.

The Premier may direct the Commission to produce a public report of its final advice to assist the Ministers to communicate their joint decision on a Coastal IFOA.

Attachments:

A – NSW Government Coastal IFOA Remake Discussion Paper (2014)

B – Summary of progress on Coastal IFOA

Appendix 3 – The Commission's review

Developing recommended settings

The high level steps in the Commission's review process are shown in **Figure 3.A**.

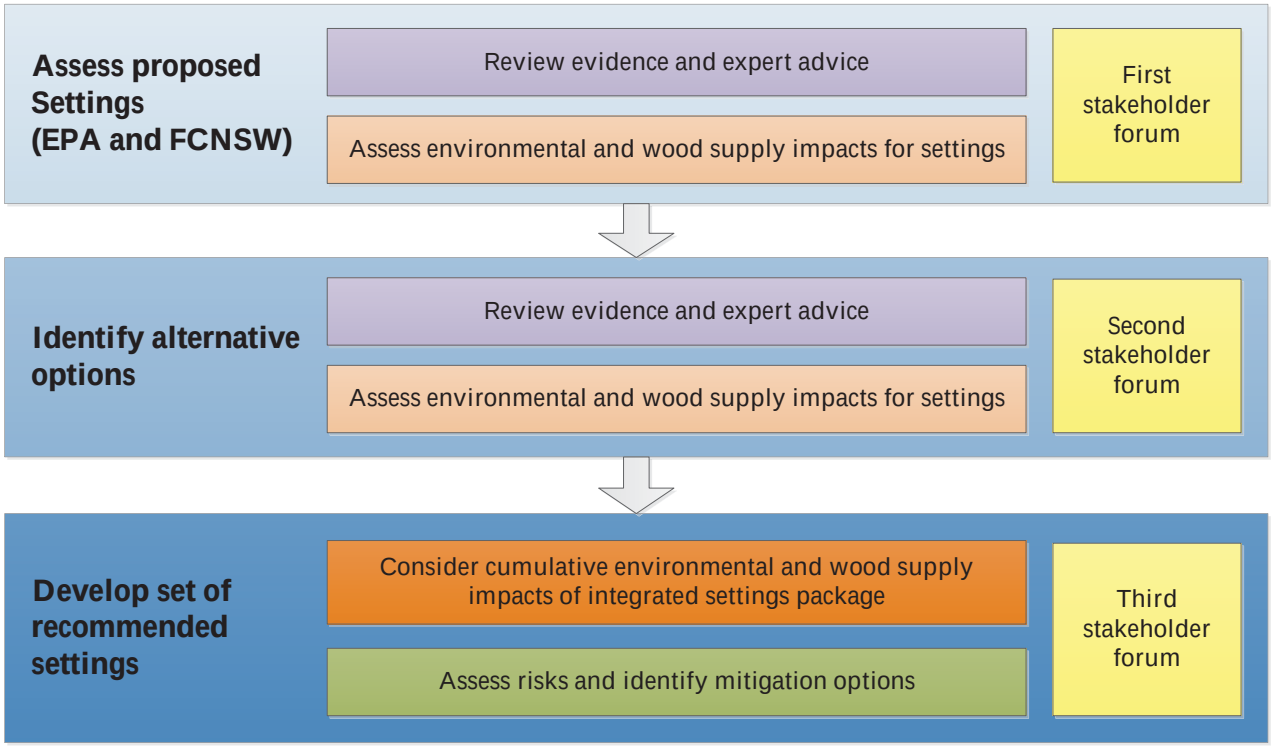


Figure 3.A Review approach

As a starting point, the Commission reviewed the proposed settings from EPA and FCNSW. We also identified and assessed a range of alternative settings. We sought to identify evidence in support of the various settings, and assess the expected impact on the Government's commitments.

We used this information and analysis to develop a final set of recommended settings, taking into consideration the expected cumulative impacts of these final settings. We also identified potential risks associated with each setting that the government would carry if the recommended settings were adopted, and ways to manage these risks.

The Commission has prioritised the use of clear, quantifiable evidence wherever possible. Ideally, evidence drawn from literature and empirically-based datasets at the appropriate scale would be readily available to assess the likely benefits and impacts of proposed settings and commitments in a timely and robust manner. However, for settings with a lack of available data and evidence, the Commission has instead relied on advice from ecology and forestry experts. As required under the Terms of Reference, the Commission also engaged with EPA and FCNSW throughout the process.

In light of the current evidence gaps, effective monitoring and adaptive management are essential components of the new Coastal IFOA. This will increase the evidence base and reduce uncertainty over time so that there is a robust foundation for the review in five years to which the Government has committed.

Assessing the expected impacts

The Commission has adopted a qualitative approach to assessing the likely impact of various proposed and recommended settings on the Government's commitments around environmental values and wood supply, informed by available evidence and expert judgement.

FCNSW and EPA had previously analysed the impacts of their proposed settings to some extent. They largely used area-based metrics to assess the impact of the proposed settings on net harvest area, which is a proxy for impact on both wood supply and environmental values. However, neither party carried out a systematic or cumulative assessment of all agreed and proposed settings as an integrated package.

The Commission notes it is difficult to progress a more sophisticated, quantitative analysis of the impacts of settings within the given review timeframe. Challenges and limitations include:

- a lack of appropriate metrics, clear outcome statements and comprehensive data for measuring environmental impacts
- significant limitations within the strategic planning model (FRAMES) for assessing all settings and values at the required scales
- interrelationships between many of the settings that make it challenging to quantify cumulative or net impacts in the context of multiple variable settings.

To help overcome these challenges, the Commission developed a qualitative rating traffic-light system to assess the impacts of the agreed and outstanding settings against a specified reference practice. Experts were consulted in this approach and, while it has some limitations, it allowed a practical assessment of all settings within the timeframe of this review.

Each setting was assigned a rating indicating the predicted impact on wood supply and environmental values compared with the specified reference practice. This process used a five point system, ranging from strongly negative to strongly positive with neutral in-between (**Figure 3.B**).

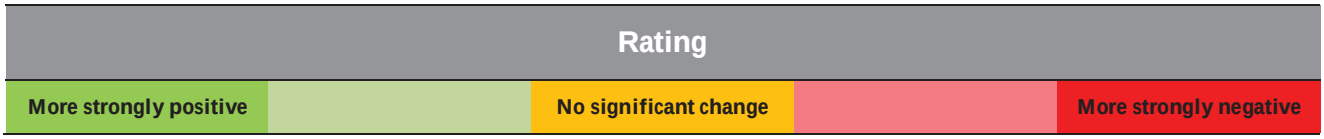


Figure 3.B: Five point traffic-light rating system

The Commission recognises the limitations of this qualitative approach, and notes that the scores do not necessarily reflect the complex biophysical interdependencies occurring between the settings. In practice, any positive or negative impacts will only become apparent over time, when repeat measures of discrete indicators can identify trends. Again, this points to the importance of implementing effective monitoring and adaptive management processes.

Appendix 4 – Harvesting definitions and practices

What are the different harvesting regimes?

Regeneration (or intensive) harvesting

- Regeneration harvesting involves uniformly harvesting a unit of forest to encourage growth of the next generation of trees. In this review, it has been referred to as intensive harvesting. The approach is designed to create canopy openings of sufficient size to provide for regeneration and growth of shade intolerant species, and to support timber supply (especially for preferred species such as blackbutt). Where trees are harvested, regenerating stands are expected to develop as even-aged forests.
- There are a number of regeneration harvesting methods, which are distinguished by the type and number of trees retained in the harvest area. General forms of regeneration harvesting include:
  - **Variable retention:** units of forest (coupes) are harvested, with retention of clumps or aggregates of trees based on the local conditions and desired outcomes for habitat protection. Regenerating occurs through seedfall from retained trees or clumps.
  - **Seed-tree and/or habitat tree:** seed trees are retained to provide for future regeneration; habitat trees are retained to provide ecological protection
  - **Shelterwood:** applied in harsher environments such as areas prone to extreme cold or moisture deficits, whereby new stands are harvested in two fellings; the first being used to open the canopy and either develop seed-beds and / or provide protection for regeneration of a new stand under partial canopy; the second felling is to harvest the remaining canopy trees and to release the growth of the regenerating stand
  - **Group selection:** groups of commercially mature trees are harvested to create canopy openings.
- The harvesting settings for the intensive zone proposed under the new IFOA incorporate variable retention harvesting, with small clumps and single trees retained after harvesting.
- Variable retention was developed in North America in the 1990s as an alternative to clearfelling. The harvesting method aims to emulate natural disturbance and protect biodiversity by retaining parts of the original forest after harvesting. Retention can be dispersed as single trees or small clumps, or aggregated into groups or patches of trees, depending on the local conditions. In some systems, retained trees and patches can be available for the next harvest rotation.[62] However, under the new IFOA, clumps will be permanently protected as will some tree types (for instance, habitat, giant trees).

Selective harvesting

- Selective harvesting techniques involve removing a proportion of the trees across a coupe. These techniques are generally applied in mixed-age forests where removing a proportion of mature trees will promote effective regeneration of other trees through small canopy openings. A range of intermediate sized trees is retained. An uneven-aged forest is expected to result from selective harvesting. General forms of selective harvesting include:
  - **Single tree selection:** single commercially viable trees are harvested throughout a forest.
- The selective harvesting method proposed under the new IFOA is single tree selection, with permanent clumps retained and protected in addition to minimum retained basal area.

62 Forestry Tasmania (2011) *Variable Retention Manual*

What are the different harvesting zones?

Non-regrowth zone

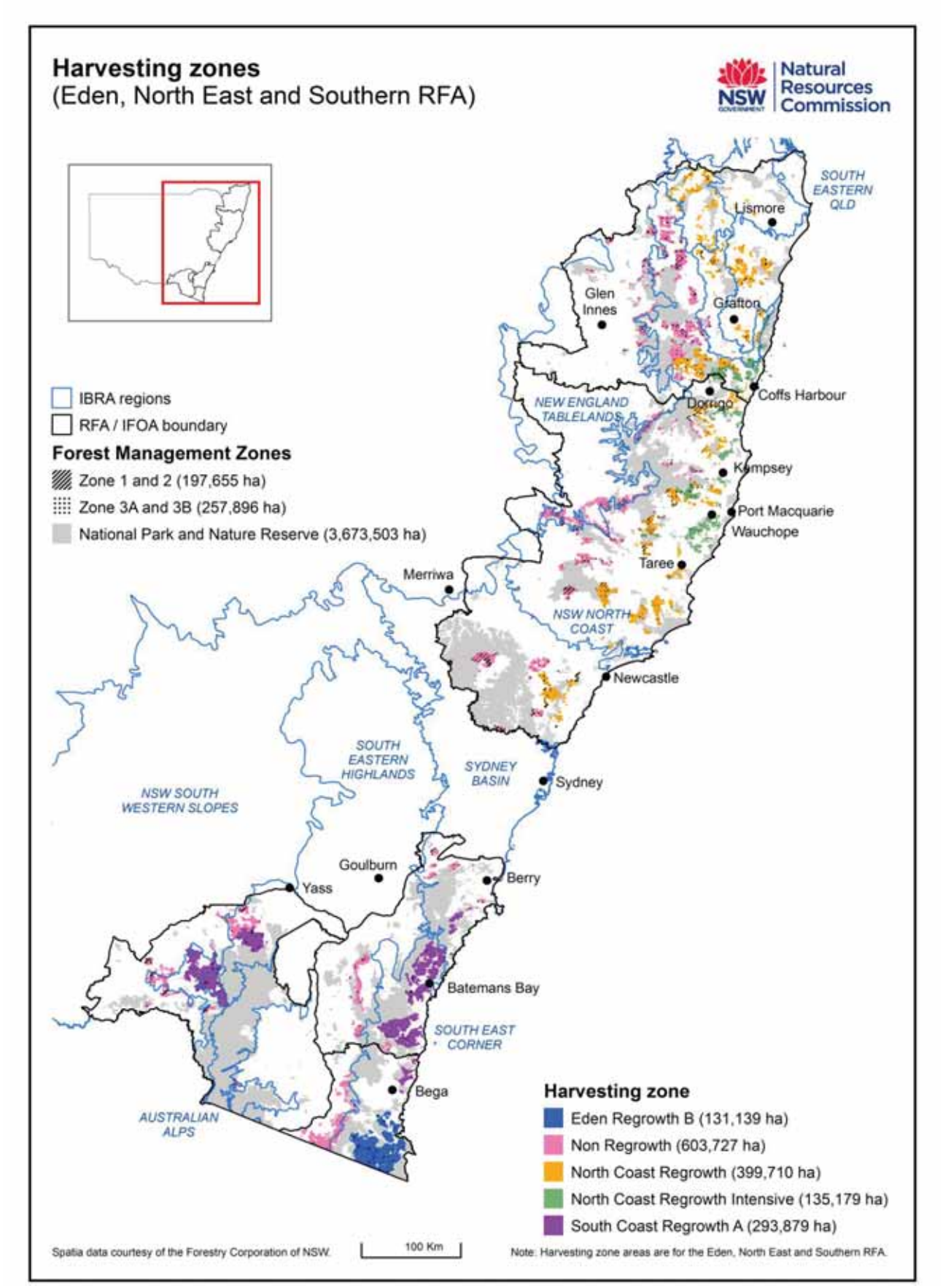
- This is the mapped area of State forest that has managed with limited, or no, intensive timber harvesting or timber stand improvement. These areas largely occur in the tablelands and cover a total area of around 600,000 hectares.
- Forests in these areas are expected to have a higher density of hollow-bearing trees and as such are likely to contain higher ecological values, compared with regrowth zones.
- Only selective harvesting is permitted in these areas.

Regrowth zone

- This is the mapped area of State forest that has historically been subjected to intensive timber harvesting and in some areas, timber stand improvement. These areas largely occur at lower elevations along the coast and cover a total area of around 960,000 hectares.
- Forests in these areas are expected to have a lower density of hollow-bearing trees than non-regrowth zone forests.
- Both regeneration and selective harvesting can occur in these zones. The mapped areas are further broken down into intensive and selective zones based on the type of harvesting that will occur.
- Thinning may also be necessary in this zone.

Intensive harvesting zones

- These are areas where forest regeneration readily occurs following removal of the overstorey, resulting in the permitting of intensive harvesting. Selective harvesting techniques are also permitted, and harvesting using a mix of these techniques can also occur.
- These zones are located within regrowth zones only and are generally areas dominated by Blackbutt forest on the North Coast. Within the regrowth zone, intensive harvesting zones cover an area of around 135,000 hectares.



Location of different harvesting zones in the NSW coastal IFOA region

Regeneration harvesting in other jurisdictions

Tasmania

- Tasmania applies a mix of regeneration harvesting techniques, including clearfall, variable retention, shelterwood and seed-tree. Clearfelling group selection and variable retention is largely used in wet eucalypt forests. Seed tree and group selection are largely used in dry eucalypt forests.
- Variable retention is practiced in areas with more than 25 percent old growth wet eucalypt forest, as part of strategic policy to phase out clearfelling in old growth forests. The technique was first applied in 2004, with 50 operational coupes with variable retention as of 2011. Clearfelling is still the primary harvesting practice in regrowth wet forests.[63]
- An aggregated retention technique is used, where trees are retained in 0.5-1 hectare groups (generally 1 hectare). Aggregates can be free-standing or 'edge aggregates' that are adjacent to the standing forest outside the coupe. They should be retained on specific locations of ecological value such as special vegetation communities, and represent the range of habitat types in the coupe.[64]
- Coupes must be designed to meet 'forest influence targets', so that the majority of the harvested area is able to be self-sown with seed from forest that is expected to remain unharvested for at least the next rotation. This is generally defined as within one tree height of unharvested forest. This usually results in felled areas of between 2 to 4 tree lengths wide.[65]
- There is no minimum amount of retention required. Up to 30 percent of each coupe is excluded by Forestry Tasmania for various reasons. These areas do not count as retention aggregates, but may provide influence over the felled area of coupes. In areas with high levels of exclusions and/or in smaller coupes (less than 20 hectares), 'influence targets' can often be met with little additional retention.[66]
- There is no maximum size for coupes in Tasmanian forestry systems. However, size and shape are guided by landscape protection requirements.67The Tasmanian Forest Practices Code states that the viewed shape and size of clearfelled coupes should be based on existing patterns and features seen in the surrounding landscape, including land use and vegetative patterns, and topographical features.[68]
- Average coupe size in trials of variable retention harvesting was 40 hectares. The trial report did note it would be preferable to increase the size of variable retention coupes to contain costs and limit the area impacted by roads.

63 Forestry Tasmania (2011) *Variable Retention Manual*
64 Forestry Tasmania (2009) *A new silviculture for Tasmania's public forests*
65 Forestry Tasmania (2010) *Native Forest Silviculture Technical Bulletin 5*
66 Forestry Tasmania (2011) *Variable Retention Manual*
67 Forest Practices Authority (2015) *Forest Practices Code*
68 *Ibid.*

Regeneration harvesting in other jurisdictions

Victoria

- In 2012-13, approximately 1,600 hectares of mixed species and 1,100 hectares of Ash (the majority of harvesting operations) were harvested using clearfell, seed tree or group selection harvesting.[69]
- Since 2014, regrowth retention harvesting (a form of variable retention) has been used in ash forest types within the Leadbeater's Possum habitat range. Up to 50 percent of operations in these areas are now using this technique.
- Under Victorian regrowth regeneration harvesting, more than 50 percent of the area harvested must be within the area of influence of retained habitat (one tree length or 60 metres in Ash forest). Retained habitat must be more than 50 years old, and old growth structures and other ecological values must be protected.[70]
- Maximum coupe size for regrowth retention, clearfall, seed tree and shelterwood harvesting is 40 hectares. Coupes may be aggregated but not exceed 120 hectares net harvested area over a period of up to five years. At least 20 metres of unharvested forest must be retained between the aggregated harvest areas.[71]

Western Australia

- Gap creation is a clearfall method used to harvest karri forests, due to the large size of karri trees and their intolerance to competition during regeneration[72] and jarrah forests where an adequate regeneration pool of lignotubers exists.

Queensland

- Regeneration harvesting is not used in Queensland.[73]

Selective harvesting in other jurisdictions

Tasmania

- Tasmania applies a mix of selective harvesting techniques (known as partial harvesting), including group selection, advance growth retention (larger trees are removed in un-even aged forest that has good potential for further growth), potential sawlog retention (two-aged high quality forests comprising potential sawlogs and a mature overstory), and thinning. Partial harvesting techniques are largely used in dry eucalypt forests.[74]
- Stocking standards for even-aged regrowth areas subject to overstorey removal harvesting or regrowth thinning is at least 200 well distributed potentially commercial stems per hectare over 10 metres tall or at least 100 such stems per hectare over 25 centimetres diameter. Stocking standards for multi-aged stands are a local stand basal area of at least 12 m2 per hectare or an adequate stocking of regeneration where retention is lower.[75]

69 VicForests (2014) *Area Statement*
70 VicForests (2016) *Regrowth Retention Harvesting* (http://www.vicforests.com.au/leadbeaters-possum1/regrowth-retention-harvesting-1)
71 VicForests (2016) *VicForests Procedures Regulatory Handbook Version 3.0*
72 WA Department of Parks and Wildlife (2014) *Silviculture* (https://www.dpaw.wa.gov.au/management/forests/managing-our-forests/167-silviculture)
73 Queensland Department of Agriculture and Fisheries (2013) *Timber Harvesting* (https://www.daf.qld.gov.au/forestry/state-native-forestry/timber-harvesting)
74 Forestry Tasmania (2009) *Native Forest Silviculture Technical Bulletin 3*
75 Forest practices Authority (2015) *Forest Practices Code*

Selective harvesting in other jurisdictions

Victoria

- In 2012-13, around 300 hectares of mixed forest and around 100 hectares of Ash were harvested using thinning, shelterwood or single tree selection.[76] Single tree selection is predominantly used in mixed species forests.
- Single tree selection coupes may be any size, where landscape or environmental values are not affected. If single tree selection is to occur in greater than 120 hectares, approval must be sought from the General Manager of planning. Thinning coupes must not exceed 120 hectares net harvest area.[77]
- In box-ironbark forests, tree retention specifications relate to habitat and habitat recruitment trees, using single-tree selection.

Western Australia

- Selective harvesting methods are used in jarrah forests, which are usually a mosaic of different stand types and ages. The harvesting method is selective harvesting, shelterwood and gap creation, however thinning to remove smaller or poor quality trees is also practiced.[78]

Queensland

- Queensland harvesting codes of practice are founded on selective harvesting, with the removal of suitable commercial species to leave a forest overstorey.
- Harvesting on any site is repeated at intervals of 20 to 40 years, depending on productivity. There are no maximum harvest area or minimum basal area limits for operations. Tree retention specifications relate to species, habitat and habitat recruitment trees, including the requirement for additional habitat trees to be retained when greater than 50 percent of the basal area is removed.[79]

76 VicForests (2014) *Area Statement*
77 VicForests (2016) *VicForests Procedures Regulatory Handbook Version 3.0*
78 WA Department of Parks and Wildlife (2014) *Silviculture* (https://www.dpaw.wa.gov.au/management/forests/managing-our-forests/167-silviculture)
79 Queensland Parks and Wildlife Service (2014) *Code of practice for native forest timber production on the QPWS forest estate*

Appendix 5 – Risk assessment

The materiality to the NSW Government of risks, relates to their potential to affect the twin commitments of no net loss of environmental values and no reduction of wood supply, and secondly the objectives and outcomes of the government.

The Commission's used an expert-based risk assessment to assess risks for each of the settings.

The materiality of any given risk is determined by reference to a threshold risk rating. The threshold risk rating is determined via assessment of the stated risk against the risk assessment matrix. This assessment involves an objective measure of the likelihood of the risk event or condition arising, and the consequences of the given risk should it arise.

Risks that are assessed at or above the acceptance threshold level are considered to be material risks.

The NSW Government's risk appetite in this area is unknown to the Commission. The Government may choose to set a higher or lower risk appetite than the Commission's.

In setting the risk materiality thresholds the Commission was influenced by state and national policies and strategies for native hardwood forestry. The Victorian Government's 2014 Management Guidelines for private native forests and plantations was used as a risk assessment benchmark. The thresholds and risk assessment should be reviewed by FCNSW, DoI, EPA and OEH at least annually.

For material business risks, the required actions must include:

- understanding the effectiveness of the control and mitigation strategies to be applied
- understanding the level of residual risk
- understanding accountabilities for risk control actions
- understanding accountabilities for risk control reporting and oversight.

Analysis of risks

The following risk rating tables and matrices were used to determine the level of risk in the following sequence:

- identify the risk (i.e. the settings)
- Determine the consequence of the risk occurring
- Determine the likelihood of risk occurring
- Assess the level of risk (i.e. combination of consequence and likelihood)

Consequence of risk occurring

Classification	Consequence description
Catastrophic (5)	▪ **To industry/wood supply:** new setting or arrangement causes severe monetary costs or loss of supply, native forest industry no longer viable in all of FCNSW's supply zones. ▪ **To environmental values:** new setting or arrangement causes severe and clear irreversible long-term damage to coastal forest ecosystem function.
Major (4)	▪ **To industry/wood supply:** new setting or arrangement causes very serious monetary costs or loss of supply; native coastal forest industry no longer viable in some regions; more than one mill unlikely to be viable in some of FCNSW's supply zones. ▪ **To environmental values:** new setting or arrangement causes serious clear and potentially irreversible long term damage to coastal forest ecosystem function.
Moderate (3)	▪ **To industry/wood supply:** new setting or arrangement causes high monetary costs; loss of supply; one mill unlikely to be viable in any of FCNSW's supply zones; existing functions and agreements of FCNSW and associated industry are likely to be subject to significant review or changes to operations. ▪ **To environmental values:** new setting or arrangement causes medium-term damage to coastal forest ecosystem function with the capacity to recover naturally in the long term.
Minor (2)	▪ **To industry/wood supply**: new setting or arrangement causes some monetary cost; threats to the efficiency or effectiveness of some aspect of operations, but at a level which can be dealt with internally. ▪ **To environmental values:** new setting or arrangement causes, short-term damage to coastal forest ecosystem function with the capacity to recover naturally in the medium term.
Insignificant (1)	▪ **To industry/wood supply:** new setting or arrangement causes low impacts and monetary costs; threats can be dealt with by routine operations. ▪ **To environmental values:** new setting or arrangement causes minor short term environmental impacts with the capacity to recover naturally in the short to medium term.

Likelihood of risk occurring

Classification	Likelihood
Almost certain	▪ **To industry/wood supply:** expected to occur more than once within a single year period. ▪ **To environmental values:** expected to occur in almost all circumstances, or greater than 95% of the time.
Likely	▪ **To industry/wood supply:** expected to occur more than once within a 3-year period. ▪ **To environmental values:** expected to occur in most circumstances, or between 75 - 95% of the time.
Moderate	▪ **To industry/wood supply**: expected to occur once within a 4-8 year period. ▪ **To environmental values:** likely to occur in some circumstances, or between 25 - 75% of the time.
Unlikely	▪ **To industry/wood supply**: expected to occur once over an 8 to 15 year period. ▪ **To environmental values:** unlikely to occur in most circumstances, or between 5 - 25% of the time.
Rare	▪ **To industry/wood supply:** may only occur less than once in a 15 to 20 year period. ▪ **To environmental values:** unlikely to occur in almost all circumstances, or less than 5% of the time.

Risk classification rating

	Consequence				
Likelihood	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Moderate	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium

Risk classification – potential responses

Classification	Potential responses
Extreme	▪ Severe or irreversible damage; precautionary principle should be applied. ▪ Impact cannot be mitigated or controlled internally. ▪ Significant effect requiring immediate NSW Government directed and managed controls, and external agency assistance. ▪ Reporting to Cabinet.
High	▪ Action plan required. ▪ Impact requires additional / external resources to control. ▪ Subject to annual monitoring and focus of external review. Senior executive attention needed. ▪ Annual reporting to Ministers.
Medium	▪ Impact can be controlled with existing organisational resources. ▪ Executive assigns responsibility for controls and monitoring. ▪ Subject to joint discussion between EPA and FC.
Low	▪ Impact unlikely to require resources to control. ▪ Little or no effect on business/environment. ▪ Managed by routine procedures.