NEFA Submission to proposed Improved Native Forest Management in Multiple-use Public Native Forests (INFM) method

Dailan Pugh, North East Forest Alliance, January 2026

In the midst of the unfolding climate and biodiversity crises it is imperative that we stop clearing and logging public native forests to allow them to recover their natural structure, rebuild their wildlife populations, regain their lost carbon, and restore their natural resilience. Accordingly, with reservations, the North East Forest Alliance (NEFA) supports the generation of carbon credits from the protection of State forests as National Parks provided the revenue is spent assisting their rehabilitation.

Because of the Improved Native Forest Management (INFM) method's primary reliance upon the Forestry Corporation's exaggerated estimates of sustainable yields as a baseline, and their inconsistent reporting of yields, it is submitted that the proposed methodology is vulnerable to unreliable and inflated abatement claims that cannot be verified as real and additional. For private lands there are currently no accurate baseline yield assessments to measure performance against. Assessments and monitoring of carbon benefits need to be based on identifying existing carbon stocks and carbon carrying capacity across the landscape by applying LiDAR mapping.

The nebulous proposition to generate carbon credits by "deferring" timber harvesting, either by reducing logging intensity or delaying logging, has no credibility as in multi-aged native forests its carbon benefits cannot be reliably quantified or verified, and are wide open to manipulation and abuse. The concept of claiming carbon credits for a one-off logging operation that is a net carbon emitter, because it is not releasing as much carbon as it could, or emissions have been delayed for a few years, is an anathema. Its inclusion will devalue the credibility and economic value of carbon credits obtained from protecting forests.

NEFA recognises that in pursuit of net zero that there are unavoidable activities that will generate carbon emissions that will require offsets. The protection of public forests in eastern NSW provides the most credible, reliable and proven method for safely removing and storing atmospheric carbon, and thus should attract a premium value. Using carbon credits should be a last resort once all reasonable measures have been taken to avoid emissions, and thus should not be available for fossil fuel projects as alternative energy sources are available.

In summary:

1. Identifying benchmarks and sequestration potential

Despite the intent of the 1992 National Forest Policy, and the 2000 North East NSW Regional Forest Agreement, to instigate a period of Ecologically Sustainable Forest Management, whereby yields of sawlogs from native forests would be maintained in perpetuity, the reality has been ongoing and precipitous declines. Native forest logging remains a tree mining operation, only maintained by increasing logging intensities, reducing log sizes, increasing utilisation, opening up excluded areas, and removing protections for mature trees. There is nothing sustainable about this.

Logging has progressively run down the biomass of north-east NSW's forests, and their carbon storage, as large trees are removed and forests are progressively reduced to young regrowth or lantana, in the process reducing carbon storage in logged forests by 40-60%, and releasing hundreds of millions of tonnes of carbon dioxide into the atmosphere. What is needed is for existing trees to be retained and allowed to begin regaining the forests' lost carbon. Claiming carbon credits for continuing to degrade forests and further run down their carbon stores is an anathema.

1.1. A History of Inflated Sustainable Yields and Overcommitments

In signing the National Forest Policy Statement in 1992 the State and Commonwealth Governments committed to establishing a comprehensive, adequate and representative reserve system and implementing ecologically sustainable forest management, which is meant to be the basis for identifying sustainable yields. For north east NSW the Forestry Corporation first developed their FRAMES resource model as part of the comprehensive regional assessment, and in various iterations it has been applied since 1998 to identify future yields from State Forests over 100 year timeframes. In 1998 Wood Supply Agreements (WSA) were issued to sawmillers for 269,000 m^3/yr of large high quality sawlogs, piles and veneer logs (Large HQL) per annum, based on FRAMES' assessment that this could be supplied for 20 years, after which there would need to be a significant reduction. This was followed by a series of yield revisions, compensatory payments for inability to supply commitments, substitutions of small sawlogs for large, WSA buybacks and progressive wind backs of environmental constraints, most notably:

- By 2002 it became apparent that FRAMES had over-estimated resources, leading to a 2003 reappraisal of FRAMES which gave modelled yields of Large HQ sawlogs over 20 years of 205,000 m^3/yr, with yields modelled to drop to around 64,000 m^3/yr after 2023.
- In 2004 two internal damning reviews of FRAMES, that were never publicly released, identified numerous deficiencies with FRAMES's process of estimating merchantable volume.
- New WSA agreements were issued in 2003 for 227,589 m^3/yr of Large HQ sawlogs, which were reduced to 209,500 by 2007.
- Volumes of large high quality sawlogs committed in WSAs were never able to be provided and yields progressively declined. Boral took Forests NSW to court for failure to honour WSAs for every year from 2004 until 2010.
- In 2009 the Auditor General noted that native forest "*on the north coast is being cut faster than it is growing back",* Forests NSW were taking 56% more sawlogs from plantations than proposed, and that Forests NSW were only obtaining 23% of the timber targeted as needed from private properties to supplement supplies.
- In 2010, for high quality logs, FRAMES was showing almost a halving in supply beginning in 2020, with a further major reduction after 2064
- by 2012 sawmillers were openly expressing concerns about future timber yields, proposing that one million hectares of national parks needed to be opened up for logging

1.2. Resetting Sustainable Yields in 2014

In 2012 a Project 2023 Steering Committee was established to investigate the issues associated with timber supply on the north coast. New modelling was undertaken, increasing the long term 20-100 year modelled yields of HQL from an average of 101,250 m^3/yr identified in 2010 up to 216,000 m^3/yr, in total almost doubling the estimated total volumes of HQL available over the next 100 years. The Government refused to release details of the methodology and assumptions applied to achieve such a turnaround, though it seems that key changes relied upon were formalising a clearfelling regime termed "regeneration harvesting" and removing protection for most mature trees. Based on this, in 2014 the NSW Government paid Boral $8.55 million to buy back 50,000 m^3/yr of HQL allocations for the next nine years, on the basis that they would be able to maintain the reduced WSA commitments for 100 years. To increase volumes, 140,000 ha was zoned for "regeneration harvesting" in 2018, though to avoid the limitation that logging of an area using this regime needs to be spread over 21 years, the Forestry Corporation has not been applying "regeneration harvesting", presumably compromising their revised modelling. Despite the buyback and optimistic modelling, few sawmillers had faith that yields were not going to decrease and a further buyback was recommended.

1.2.1. Changing Logging Intensity to Increase Yields

The issue of applying clearfelling as a management regime in northeast NSW has long been controversial, with 1996 expert review recommending against it in favour of low intensity selective logging for speciality hardwood products. The 1999 IFOA logging rules limited the extent of

clearfelled gaps to 0.25ha under Australian Group Selection (AGS), with gaps in an area to be implement over 28 years. Otherwise logging had to be limited to less than 40% removal of basal area applying Single Tree Selection (STS). After 2006 STS became the dominant silvicultural regime because, despite the objections of the EPA, the Forestry Corporation found they could pervert its intent to remove up to 90% of the basal area over large swathes of forest at one time. While this was contrary to the IFOA rules the Forestry Corporation got away with it. Despite this practice being illegal, it was applied to increase timber yields in the 2014 remodelling by Project23. As part of their 2018 IFOA Remake the Forestry Corporation and EPA created a new 140,000ha North Coast Intensive Zone, where 46ha virtual clear-fells are allowed over a 21 year period. Despite getting what they wanted, the Forestry Corporation are now rezoning intensive areas for selective logging and applying selective logging in the intensive zone, presumably because then they can log the whole area in one go, rather than staging logging over 21 years, and because they only need to retain 8 hollow-bearing trees per hectare, rather than all of them. The 2018 changes also increased logging intensities in the balance of the region and removed most protections for mature trees.

1.3. Comparing Predicted Yields with Actual Yields

One of the most basic requirements of yield models is to subject them to reality checks by comparing predicted yields to actual yields. State Forests initially did this for the north coast in 2002 and identified that only 78% of the predicted yields were obtained, leading to a yield review that dramatically reduced yield assessments. Since then, State Forests resisted numerous requests to compare predicted and actual yields, though belatedly did reconciliations for 2011/15 and 2015/19, identifying actual yields were 87.3% of predictions. The next reconciliation was due in 2024, which significantly covers the post-fire period, though Forestry Corporation have been reluctant to do it. It is revealing that Forestry Corporation's argument against comparing predicted yields with actual yields is that FRAMES is "*a strategic planning tool designed to predict the potential wood supply at a regional level"* and that it is not appropriate to use FRAMES below this level, and that it is not possible to differentiate reasons for changes in yields. It is clear that it is not an appropriate tool for assessing or measuring changes in yields resulting from changes in logging regimes in one part of a region.

1.4. Reliability of Forestry Corporation Reporting of Yields

There have been numerous cases of the Forestry Corporation misreporting product yields and net logging areas, with significant discrepancies between various reports. In 2024 NEFA had the Forestry Corporation remedy their inclusion of 2021/22 data in their 2022/23 Biomaterial Report, thereby halving claimed yields. After further complaints, in 2025 they reduced claimed yields in their revised 2022/23 Biomaterial Report by a further 24%, as well as reducing claimed yields in their 2021/22 and 2023/24 Biomaterial Reports by 23%. At the same time, they identified that since 2017 they had "overreported the area harvested in coastal forests by around 14,000 hectares" while not responding to our complaints they had underreported logging in 2021/23 by 2,518 ha. NEFA identified numerous other data inconsistencies that were not responded to, though it is particularly worrying that despite yields being rectified in their Biomaterial reports they are still reporting significantly higher annual yields than given in their Sustainability Report. It is evident that the Forestry Corporation cannot be relied upon to provide accurate data on either areas logged or volumes attained, that external regulators are unable to identify data errors, and the Forestry Corporation are reluctant to rectify errors when identified to them or provide explanations. Forestry Corporation data cannot be relied upon as a basis for the INFM.

1.5. FRAMES Fails to Account for Key Variables

The Forestry Corporation's FRAMES is designed to undertake assessments at a regional level and fails to adequately account for the degraded state of many forests, including the current and future loss of resources in the 2019/20 wildfires, areas of failed regeneration due to problems like suppression of regrowth by lantana invasion, death of mature trees and loss of future yields due to Bell Miner Associated Dieback, and the increasing loss of trees due to droughts and heatwaves. The failures to accommodate these resource losses result in over estimates of sustainable yields. If

there is an intent to account for the environment in INFM's concept of "sustainable" then there is also an overdue need to improve protections for threatened species, particularly in response to the 2019/20 wildfires.

1.5.1. Failure to Account for the impacts of the 2019/20 Wildfires on timber resources

The 2019/20 wildfires burnt through half the loggable areas of State Forests in north-east NSW. Based on their 0.85ha a sample of one 2016 burn class in the southern forests and mapping of fire intensity, and without remeasuring any of their 1821 active plots on the north coast, the Forestry Corporation estimates are there has been a loss of around 10% of sawlogs and 25% of smaller trees when averaged across the north coast State Forests. While the estimated loss of so many existing and future sawlogs could be expected to have significant resource impacts, the estimates are that that there will only be a 4% reduction in high quality sawlogs from the north coast over the next decade and only a 1% reduction over the next century. Based on this superficial and unbelievable assessment the NSW Government signed new Wood Supply Agreements in 2022 to extend the Wood Supply Agreements due to expire in 2023 until 2028, at the same volumes. The Forestry Corporation have also failed to undertake their last 5 year FRAMES Actual vs Predicted Harvest Reconciliation for 2019/2024. The reality is that since the 2019/20 wildfires there has been a 44% reduction in actual yields. Before any decisions are made about the application of sustainable yields to underpin the INFM there first needs to be a genuine and comprehensive assessment of the impact of the 2019/20 wildfires on resources.

1.5.2. Failure to account for the overdue need to improve logging protocols

As practiced, logging of north-east NSW's forests is not sustainable. Since 2014 the over-riding objective has been to maintain timber commitments to industry. To increase timber volumes the 2018 revision of the Coastal Integrated Forestry Operations Approval (CIFOA) increased logging intensity, removed most protections for mature trees, removed of most species-specific prescriptions, reduced riparian buffers, and over-rode expert advice. Even after this, it was claimed that sustainable yields could not be met and that therefore protected oldgrowth would have to be logged. Logging of high quality sawlogs then proceeded in excess of commitments. As an example of FRAMES' adaptability, when the idea of logging oldgrowth was later dropped, the claimed yield shortfall also disappeared. The clear imperative since the adoption of the CIFOA has been that any changes must not have a significant impact on timber. The 2019/20 wildfires impacted half north-east NSW's State Forests and had significant environmental impacts that should have resulted in widespread improvements in species protections. The only significant change were improvements for Greater Gliders, which the Forestry Corporation claimed would result in significant reductions in sustainable yields, though these do not appear to have been accounted for in current estimates. The five year reviews of the 2018 Regional Forest Agreement and CIFOA should have been undertaken in 2023 and so are overdue, with foreshadowed changes and the need to improve protection for threatened species, the sustainable yield needs to be revised to accommodate overdue changes. This has been made more apparent by the decision to remove the RFA exemption from the EPBC Act and apply National Environmental Standards to logging, hopefully over-riding NSW's prohibition on increasing needed protections for nationally threatened species if it has an impact on resources. It is irresponsible for the INFM to attempt to lock in current standards as the benchmark when these are overdue for review and improvements.

1.5.3. Failure to account for the loss of resources due to lantana and BMAD

Logging is spreading the invasive weed lantana throughout the forests of north-east NSW. With each logging operation the prevalence of lantana increases, greatly hindering eucalypt regeneration and reducing future yields. At the worst, Bell Miner Associated Dieback (BMAD) develops, resulting in tens of thousands of hectares with dense lantana understories and scattered overstories of dead and dying trees. This has been identified as a growing problem since the 1940's, yet the Forestry

Corporation still refuse to recognise its association with logging, account for its extent, or adapt their practices to reduce the risk. Despite BMAD having a significant impact on resources it is not an input to FRAMES and estimates of sustainable yields are blind to its occurrence. Government agencies refuse to address this problem. This is particularly concerning as it appears to be rapidly expanding as trees become increasingly stressed due to the increasing frequency and intensity of droughts.

1.5.4. Failure to account for the growing impacts of climate change on tree mortalities and species survival

Climate change is having an accelerating impact on native forests, though has yet to be considered or accounted for in either the CIFOA protocols or Forestry Corporation's estimates of sustainable yields. Climate change is already increasing tree mortality due to the increasing frequency and intensity of heatwaves and drought. This needs to be accounted for when identifying current and future yields, and carbon stores. The reliance on estimates of sustainable yields that ignore the need for increased protection for increasingly threatened species, and the growing impacts on tree health and survival, is a fundamental problem with the Forestry Corporation's estimates and predictions. For the INFM to ignore and not make allowances for these impacts is contradictory

1.6. Determining the Modified Sustainable Yield

For north-east NSW the INFM proposes averaging yields over a 10 year period (excluding the 3 years after the fires), which (without accounting for firewood) gives predicted volumes 550,390 m^3/annum and actual volumes of 325,970 m^3/annum, or 59.2% of predicted yields. The modified sustainable yield would be 325,970 m^3/annum, which is no better than a guestimate. Since the 2019/20 wildfires there has been a 44% reduction in actual yields of all products from north-east NSW, with average yields in the past 4 years 221,486 m3/annum, only 40% of estimated sustainable yields and 68% of the modified sustainable yield. This leaves it open for the proponent to claim major yield reductions without actually doing so. The discrepancies between actual and predicted is greatest for pulp/other, and these categories are predicted to become increasingly important over the next 15 years while high quality logs decline, this makes it easy to claim major phantom yield reductions in the pulp/other category (which is also the most polluting) without having to reduce actual yields. It is misleading to suggest the FullCAM plots are somehow going to improve estimates when they are simplistic reporting based on the major vegetation group, the harvesting type, and the estimated average age of trees in the plot based on logging history, with no on-ground measurements or consideration of the structural variables most significant for yields. The unaccounted variability between forests is demonstrated by the variations in yields per hectare and basal area retention.

1.6.1. Impact of the Great Koala National Park

If the full proposed Great Koala National Park (GKNP) is created it is essential that its impacts are accurately accounted for. While it represents 21% of the loggable native forests in north-east NSW, in recent years it represented 39% of the area logged and has provided 38% of the resource. Over the past four years the Forestry Corporation have obtained an average of 94,167 m^3 of timber from the GKNP and 155,863 m^3 from other native forests in north-east NSW. The NSW Government's attempts to reduce yields of high-quality products committed in Wood Supply Agreements (WSAs) by 89,320 m3 (41%) this year to compensate for the GKNP is illustrative of the problems of dealing with Forestry Corporation data. Plantations contribute to WSA's and have been heavily and prematurely logged to increase yields since the 2019/20 fires. Plantations give the Forestry Corporation flexibility with how it deals with wood reductions. It is assumed that with the 41% WSA reduction, the Forestry Corporation will still be legally required by the WSAs to provide some 109,000 m^3 of high quality products from native forests outside the GKNP. This compares to 2024-25 yields of 65,671 m^3 of high quality products from native forests outside the GKNP. So, while there is an apparent intent to reduce the actual cut of high quality products by 41%, and thereby avoid leakage, because of the Forestry Corporation's failure to adjust their yields since the fires they will have to increase yields of high quality logs outside the GKNP by 66% to meet legally enforceable WSA commitments.

2. What is Deferred Harvesting?

The granting carbon credits for modified logging, which will still result in net carbon emissions, is an anathema. “Deferral of harvesting” is an undefined action that is therefore open to interpretation and abuse. It is absurd to consider that Forestry Corporation’s FRAMES logging data which can only be reported at a regional scale will in any way suitable for assessing the outcomes of modified logging of specified areas. For years NEFA have been auditing the Forestry Corporation’s compliance with legal requirements to retain habitat trees and protect exclusion areas, and identified repeat and systematic breaches due to their priority of satisfying over-committed timber resources, only to find the EPA unwilling to take regulatory action to enforce the rules or their intent. NEFA does not consider that vague voluntary restrictions on logging will be effective nor enforceable. The concept of claiming carbon credits in return for extending logging return times in mixed age native forests is absurd, particularly as return times have been increasing as forests are increasingly converted to young regrowth, and rewarding this will encourage more intensive logging and further reductions in carbon storage. There are many areas of degraded forests that are not recognised by FRAMES that can be put aside from logging without materially affecting yields.

2.1. Logging Frequency

Logging regimes in north-east NSW have historically been based on retaining growers capable of developing into high quality products in the near future, with frequent return times. Logging events are generally becoming less frequent as logging intensity increases and forests are progressively converted to regrowth, with greatly reduced carbon storage. Current return times are currently mostly 12 to 26 years. Granting carbon credits for reducing the frequency of logging (extending rotation lengths) will reward and encourage the conversion of multi-aged forests to young regrowth forests, with significantly reduced carbon storage.

2.2. Degraded Forests

Under deferral of harvesting, areas of degraded forests can be claimed as *“Cessation of Harvesting”* or “deferred harvesting” where there are no or limited prospects of obtaining a commercial crop in the foreseeable future. There are vast areas of native forest that have been degraded by past logging, without sufficient regrowth to provide economic returns in the foreseeable future. Such areas are generally not recognized by the Forestry Corporation and not accounted for in “sustainability” estimates. Neither will the FullCAM plot method identify them.

3. Identifying the carbon benefits of stopping logging and protecting forests

The intent of the INFM to use erroneous and unverifiable estimates of “sustainable” yields as a baseline for State forests, and combine this with guestimates for private forests to ensure there is no leakage, will not ensure any claimed abatement that is credited in INFM projects is real and additional. There is a high risk of creating yet another shoddy carbon scheme with no credibility. The data is available to undertake an assessment with high integrity, if there is the will. With the use of Light Detection and Ranging (LiDAR), including biomass satellites, it is feasible to obtain relatively accurate baseline data on the standing carbon volumes across the whole landscape, to identify the carbon carrying capacity of each Plant Community Type (PCT), and to monitor carbon changes over time. Once a reliable baseline has been established then the rate of carbon sequestration can be determined by combining LiDAR with existing plot data on species growth rates. LiDAR can also be applied with data on timber removals to assess carbon losses due to logging, though the degree to which carbon losses are offset by storage for variable time periods in products off-site is a contentious issue.

3.1. Carbon Benefits of Protecting Forests

It is the biggest and oldest trees that are of utmost importance for carbon sequestration and storage. It is the oldgrowth stage of forest ecosystems that store the most carbon and achieve their carbon carrying capacity. By removing the larger trees and converting forests to regrowth, logging has more than halved the carbon stored in forests, with repeat logging events carbon stores are

maintained at suppressed levels. Past logging in northeast NSW has released hundreds of millions of tonnes of CO_2 into the atmosphere that can be regained if State forests are allowed to regain their carbon carrying capacity. As an example of the potential carbon benefits of protecting forests it is reasonable to assume an average Carbon Carrying Capacity of 250 tC/ha^{-1} for natural forests in north-east NSW. LiDAR and existing growth plots can be used to assess annual sequestration potential.

3.2. Carbon emissions due to logging

Logging involves the cutting down of trees, in north-east NSW leaving over 66% of their volume behind to rot and burn, converting a further 20% into waste or short-lived products, and at best converting 13% of their volume into products that may last for decades. In this process the tree's ability to go on sequestering carbon is curtailed, and the carbon it has been accumulating for decades or centuries is oxidised to return to the atmosphere as CO^2. Based on this simplistic, but indicative, assessment, stopping logging of north-east NSW's public forests will avoid the quick emission of over 488,000 tonnes of CO_2 per annum from tree biomass, and the creation of legacy emissions of over 416,000 tonnes of CO_2 per annum that will be realised over decades as logs left in the forest decay and wood used in buildings reaches the end of its useful life.

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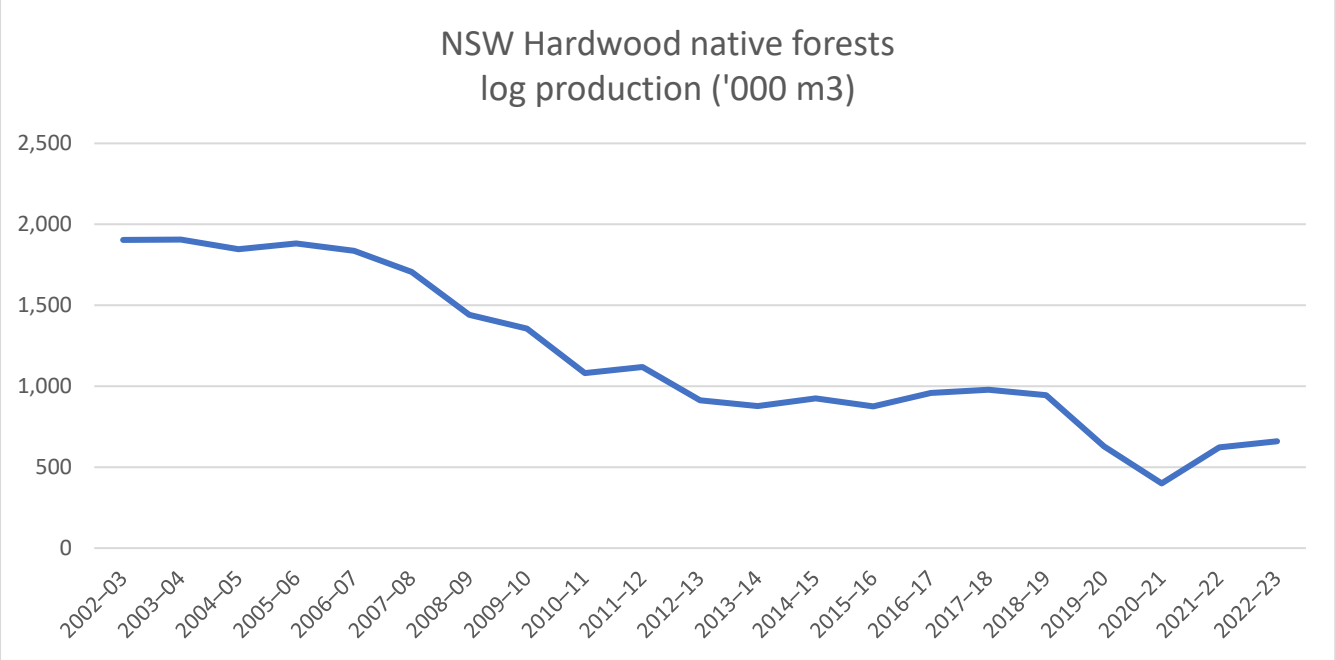
1. Identifying benchmarks and sequestration potential

Despite the intent of the 1992 National Forest Policy, and the 2000 North East NSW Regional Forest Agreement, to instigate a period of Ecologically Sustainable Forest Management, whereby yields of sawlogs from native forests would be maintained in perpetuity, the reality has been ongoing and precipitous declines. Native forest logging remains a tree mining operation, only maintained by increasing logging intensities, reducing log sizes, increasing utilisation, opening up excluded areas, and removing protections for mature trees. There is nothing sustainable about this.

Logging has progressively run down the biomass of north-east NSW's forests, and their carbon storage, as large trees are removed and forests are progressively reduced to young regrowth or lantana, in the process reducing carbon storage in logged forests by 40-60%, and releasing hundreds of millions of tonnes of carbon dioxide into the atmosphere. What is needed is for existing trees to be retained and allowed to begin regaining the forests' lost carbon. Claiming carbon credits for continuing to degrade forests and further run down their carbon stores is an anathema.



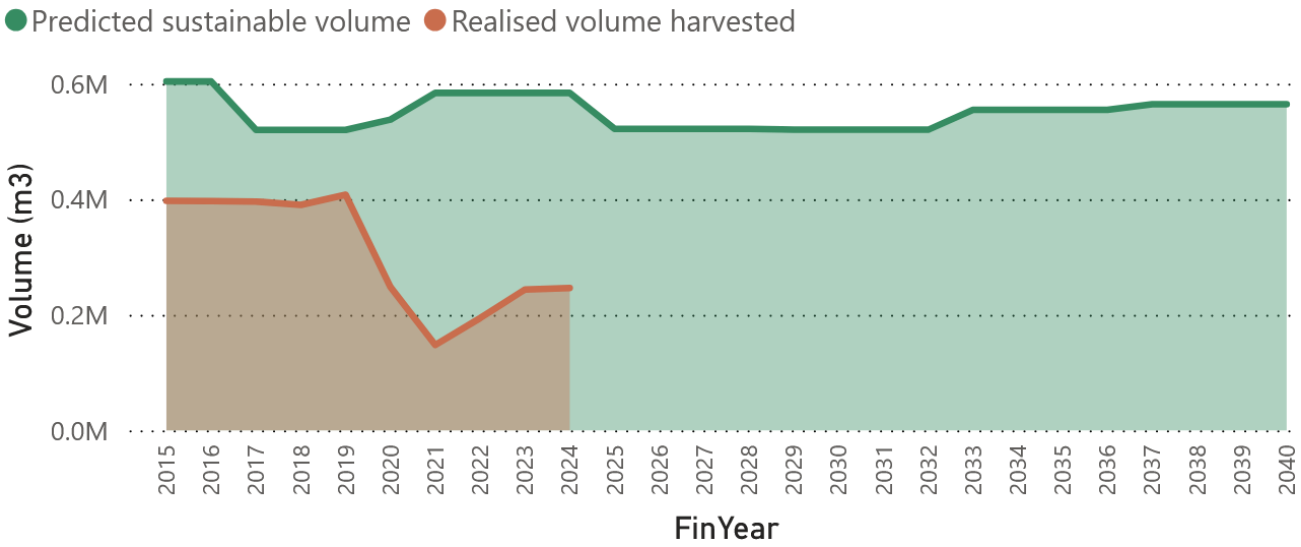
Graph derived from ABAREs (2023) showing the ongoing decline in NSW's production of hardwood logs from native forests across all tenures. The trend is obvious.

Since 1998 the Forestry Corporation has relied upon their FRAMES model to estimate sustainable yields. There have been a series of downward yield revisions, compensatory payments for inability to supply commitments, substitutions of small sawlogs for large, Wood Supply Agreement buybacks, logging in excess of estimated yields, and progressive wind backs of environmental constraints to increase timber yields. Despite the 2019/20 wildfires killing many large trees and significantly impacting resources there has only been a token reassessment of resources, and in 2022 Wood Supply Agreements were extended at pre-fire levels until 2028, intentionally continuing over-cutting. The outcomes of over-estimations and over-allocations have been continuing yield declines.

Since the Wood Supply Agreements (WSA) were originally issued in 1998 the then commitments for 269,000 m^3/yr of large high quality sawlogs, piles and veneer logs (Large HQL) per annum from north east NSW have almost halved down to 142,757 m^3/yr in 2018. Since the 2003/4 new WSA

commitments of large HQL have been reduced from 209,500 m^3/yr of Large HQL by 32%.Though actual yields have been well below commitments in most years.

It is apparent that since the 2014 yield review and Wood Supply Agreement buyback the Forestry Corporation have never been able to supply their estimated Sustainable Yields, and that since the 2019/20 wildfires there has been a major reduction in actual yields.



Graph from Forestry Corporation 2024 Sustainability Report showing yields from NSW native forests compared to sustainable yield estimates, showing ongoing yield declines. Note that the 2019/20 wildfires caused a reduction in yields, though they have not recovered (which they should have by now), and are unlikely to.

For north-east NSW, the INFM proposes averaging yields over a 10 year period (excluding the 3 years after the fires), which generates a modified sustainable yield of 325,970 m^3/annum, which is no better than a guestimate. Since the 2019/20 wildfires there has been a 44% reduction in actual yields of all products from north-east NSW, with average yields in the past 4 years 221,486 m3/annum, only 40% of estimated sustainable yields and 68% of the modified sustainable yield. This leaves it open for a proponent to claim major yield reductions without actually doing anything. There is nothing real or additional about this.

The intent of the INFM is to lock in the Forestry Corporation's pre July 2024 estimates of sustainable yields (in a modified form) as a baseline for estimating carbon benefits of protecting forests for the next 15 years. This is not considered appropriate because Forestry Corporation's estimates of sustainable yields:

- are not ecologically sustainable, with prescriptions (logging constraints) determined by resource yields rather than ecological requirements
- are an inappropriate and inaccurate surrogate for assessing carbon benefits
- have repeatedly been found to be grossly inflated, with unachievable estimates often requiring downward revisions
- do not provide consistent results, and are open to manipulation by changing parameters
- are not spatially applicable, so cannot provide results at smaller scales than regions, such as compartments or even whole State Forests
- cannot account for changes at a site level due to logging events
- are not undertaken in an open and transparent process, with access to documents denied even under freedom of information requests
- are predicated on a further 27% reduction in yields of Large High Quality Logs over the next century, further reducing the carbon stored in logged forests

- have not been realised since the 2019/20 wildfires, with average actual yields of all products from north-east NSW over the past 4 years only 40% of predicted yields.
- have not been adequately or justifiably adjusted to account for the impacts of the 2019/20 fires resources, despite the killing and damaging of many trees and apparent major impacts on yields
- have not been adjusted to account for recent changes to the Great Glider protocol
- have not been adjusted to account for the impacts of the 2019/20 wildfires on native plants and animals,
- have not accounted for the overdue 2023 revision of CIFOA protocols
- are not open to future revisions of the CIFOA, particularly resulting from the application of National Environmental Standards to logging
- are blind to areas of failed regeneration, such as the extensive areas where regrowth has been suppressed by lantana and collapsing ecosystems affected by Bell Miner Affected Dieback, and their increase due to climate change
- do not account for the impacts of climate change, including the increasing stresses on forests and tree losses due to droughts and heatwaves, or the need to increase protection for increasingly threatened species and ecosystems

If there is a genuine intent to introduce a scheme that has real and additional carbon benefits then it must be based on actual measurements of standing carbon volumes across the whole landscape, identification of carbon carrying capacity, and estimates of annual carbon sequestration potential. This is achievable at the necessary scale by utilising Light Detection and Ranging (LiDAR) to map biomass, which also allows for periodic reviews. Avoided emissions from stopping logging can also be estimated. Though any project can only have credibility if it involves stopping logging and permanently protecting State forests as National Park.

1.1. A History of Inflated Sustainable Yields and Overcommitments

In signing the National Forest Policy Statement in 1992 the State and Commonwealth Governments committed to establishing a comprehensive, adequate and representative reserve system and implementing ecologically sustainable forest management, which is meant to be the basis for identifying sustainable yields. For north east NSW the Forestry Corporation first developed their FRAMES resource model as part of the comprehensive regional assessment, and in various iterations it has been applied since 1998 to identify future yields from State Forests over 100 year timeframes. In 1998 Wood Supply Agreements (WSA) were issued to sawmillers for 269,000 m^3/yr of large high quality sawlogs, piles and veneer logs (Large HQL) per annum, based on FRAMES' assessment that this could be supplied for 20 years, after which there would need to be a significant reduction. This was followed by a series of yield revisions, compensatory payments for inability to supply commitments, substitutions of small sawlogs for large, WSA buybacks and progressive wind backs of environmental constraints, most notably:

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- **In 2009 the Auditor General noted that native forest "*on the north coast is being cut faster than it is growing back",* Forests NSW were taking 56% more sawlogs from plantations than proposed, and that Forests NSW were only obtaining 23% of the timber targeted as needed from private properties to supplement supplies.**
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- **by 2012 sawmillers were openly expressing concerns about future timber yields, proposing that one million hectares of national parks needed to be opened up for logging**

In signing the National Forest Policy Statement (CoA 1992), Commonwealth and state governments committed to establishing comprehensive, adequate and representative network of dedicated and secure nature conservation reserves and ecologically sustainable forest management and codes of practice. For the Comprehensive Regional Assessment, the Forestry Corporation first developed their Forest Resource and Management System (FRAMES) for identifying timber yields. FRAMES identified the 100 year sustainable yields of High Quality Large Sawlogs from public native forests and hardwood plantations as 80,319 m^3 gross per annum for the Upper North East CRA region (UNE) and 136,902 m^3 per annum in the Lower North East (LNE), a total of 217,221 m^3 per annum from north east NSW. The outcome was the issuing of Wood Supply Agreements (WSA) in 2018 for 269,000 cubic metres of High Quality Large (HQL) Sawlogs for 20 years. After 2018 this was modelled to reduce to 183,500m3 for the next 80 years.

In 2000 the NSW and Commonwealth Governments signed the Regional Forest Agreement for North East New South Wales (Upper North East and Lower North East Regions) (Anon2000), which states:

> *Under the Sustainable Wood Supply Strategy, NSW agrees to supply 129,000m^3 per annum for 20 years in the Upper North East Region and 140,000 m^3 per annum in the Lower North East Region of High Quality Large Sawlogs and Large Veneer Logs. Annually, approximately 20,000 $m^3$of High Quality Large Sawlogs and Large Veneer Logs allocated in the Upper North East Region will be sourced from the Lower North East Region over the period of the Agreement.*
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> *...*
>
> *... It is estimated that the 100 year supply levels after 2018 will average approximately 70,000 m^3 per annum in the Upper North East Region and 113,500 m^3 per annum in the Lower North East Region of High Quality Large Sawlogs and Large Veneer Logs from existing native forests and Plantations on State forests and other land owned by SFNSW, assuming harvesting under existing terms and conditions.*
>
> *...*
>
> *Both Governments aim to provide additional sawlog and other wood products that will become available through purchase by SFNSW of private native forest property and through Plantations established on purchased land or as joint ventures. These measures are currently predicted to bring the average annual available High Quality Large Sawlog and Large Veneer Log yield from State forests beyond the 20 years of this Agreement to within approximately 15 per cent of the 20 year contracted levels for Upper North East Region and Lower North East Region.*

Below are highlights of subsequent events detailed by Pugh 2018.

Soon after the 2000 North East Regional Forest Agreement was signed it became apparent that the estimated resources weren't there as by 2002 it was evident that the actual yields were 87 per cent of that predicted, In 2002 Jerry Vanclay (Southern Cross University) undertook a desktop "*Review of*

Projected Timber Yields for the NSW North Coast", concluding *"it is evident that the harvest able to be sustained during the next 20 years is 220,000 m3/year at most ... In the longer term (21-100 years), production from native forests is expected to range between 175 and 110,000 m3/year, and will need to be supplemented from hardwood plantations."*

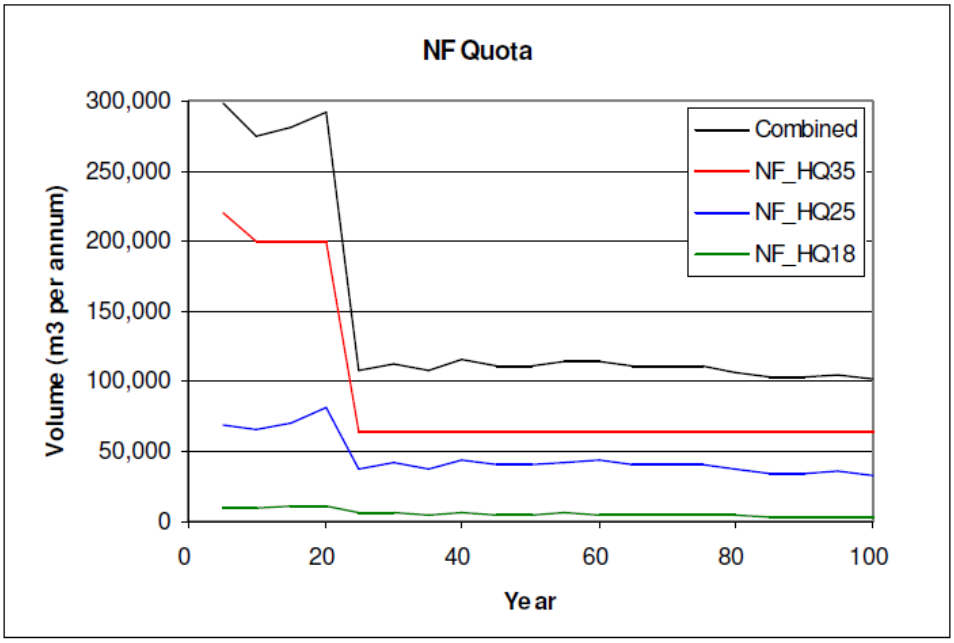
2002 North Coast Timber Supply Monitoring Estimates of large high quality sawlogs compared to FRAMES 1998 (From Vanclay 2002)

Item & Source	RFA-FRAMES	NCTS Monitoring
Short-term yield (20 yrs)	269,000 m3/yr	220,000 m3/yr
Medium-term yield (21-40 yrs)	183,500 m3/yr	175,000 m3/yr
Average Long-term yield (41-100 yrs)	183,500 m3/yr	110,000 m3/yr

In September 2004 State Forests released their report *"A Review of Wood Resources on the North Coast of New South Wales"* which gave modelled yields of Large HQ sawlogs over 20 years of 205,000 m^3/yr, with yields modelled to drop to around 64,000 m^3/yr after 2023. The average of Small HQL (assumed to be NR_NFHQ25) over the first 20 years is around 71,000m^3/yr, dropping down to an average of around 39,000 m^3/yr thereafter. The caveat was *"the modelled outcome is generally 10-15% above the likely outcome".*

The data is a bit confusing as this modelling relies on logs with small end diameters of 25 and 35 cm, whereas Large HQLs (HQ40) are defined as having a centre diameter greater than 40 cm and Small HQLs (HQ30) are modelled with a centre diameter between 30 cm and 40 cm.

Modelled Native Forest Quota Sawlog availability (From State Forests 2004). Note that HQ35 (red) is taken to correspond to Large HQL and HQ25 (blue) to Small HQL. Also, that the caveat is "*the modelled outcome is generally 10-15% above the likely outcome*".



Modelled Native Forest high quality sawlog availability from 2003 *(From Forests NSW 2004).*

The State Forests (2004) report states:

> *Current sawlog commitments from native forests will require substantial supplementation from plantations and an increased reliance on smaller logs in the medium to long-term. Only 50% of the native forest volume is easily accessible - on slopes less than 20º and more than 50m from an exclusion boundary. Harvesting practices and costs will need to address the issue of difficulty of access in order to meet current native forest commitments.*

Most significantly the report identifies a significant caveat on the modelled yields, stating:

> *Interpretation of these results and their translation into management actions requires some care. In particular, the modelled outcome is generally 10-15% above the likely outcome due to factors that cannot be incorporated for practical reasons or cannot be adequately represented mathematically.*

Around this time there were two internal damning reviews of FRAMES that were never publicly released. The July 2004 State Forests report "State of the Resource, A Review of Wood Resources on the North Coast of NSW" is not available on the web and has not apparently been referenced in the various RFA reports or yield reviews, though a subsequent report by Partington and Stevenson (State Forests 2004b) consider that it "*clearly described*" numerous deficiencies with the "*process of estimating merchantable volume*"; stating that:

> *... for some time there has been concern about actual volumes being less than those predicted by the FRAMES process. And recently a report by State Forests highlighted deficiencies in just about every aspect of the process of estimating merchantable volume ...*
> *…*
> *The deficiencies described include the following: merchantable classification of species that are never harvested; inaccurate estimates from some of the tree volume, taper, and height equations; problems of consistency, reliability and ease of use in relation to tree proportionment, issues in relation to defect modifiers and the division of losses due to inherent defect and those due to sub-optimal log making practices; the limitations of the GIS system in adequately handling the complexity of net harvest area analysis and the difficulty of verifying the results of such analysis; technical problems with the net harvest area modifiers, their lack of currency and the small sample sizes on which the defect modifiers are based; a single strike rate is used but studies suggest different strike rates apply in different areas; growth models and the records on which they are based need to be overhauled; and most importantly the inventory data was no longer considered a reliable description of the resource due to the effect of harvesting and a lack of replacements for the harvested inventory plots.*

Partington and Stevenson (State Forests 2004b) undertook a review claimed to be for the NSW Auditor General - 'Forests NSW: Review of North Coast Standing Volumes for the 2004 Valuation' which considered *"it has been clear for some considerable time that the timber volumes predicted by the FRAMES process are proving difficult to achieve. This naturally creates a question-mark over valuations derived from the FRAMES data."*

Partington and Stevenson (State Forests 2004b) found that the FRAMES data was in disarray for many reasons, including that 500 of the 2000 inventory plots had been logged, noting:

> *Unfortunately, following the FRAMES process the intensity of effort that went into inventory management diminished. The responsibility for inventory management was allocated to the regions until this was changed in 2003. During this time, about 500 of the original 2000 or so north coast inventory plots were lost to harvesting. Many of these plots were not replaced. We are not critical of this; it may have been an entirely appropriate choice by regional management to invest their resources in other areas that they saw as more important. However, the consequences in Forests NSW own words, was that, "The inventory data can no longer be considered a reliable description of the resource due to the level of harvesting over the last five years and the lack of a replacement programme for harvested plots."*[1]
>
> *There were also a number of other issues requiring attention including the need for a new system of management for the area records, the limited data on which estimates of the net harvest area modifier were based, variation in strike rates across the region, a need for new growth and product proportionment models, and various other issues that needed to be*

addressed. In short a complete overhaul of the native forest and hardwood plantation inventory was required.

… There will be a need for assessment and review and recalibration of some of the modelling. It is also apparent that the rebuilding of the inventory system is a work-in-progress. We think directions that are being taken are generally appropriate and the effort is admirable, but there is still some way to go.

It is also apparent that a number of interim measures have been employed in bridging the gap between the old system and the full implementation of the new system. This has been necessary in order to derive a set of numbers for the current valuation. For, example a single height diameter model was applied, irrespective of species, in order to estimate the height of trees from their diameter. Neither, with the functionality of the current system, was it possible to grow the forest forward from the date of original measurement of inventory plots. …

There are also some technical sampling issues. …

Partington and Stevenson (State Forests 2004) identified that Forests NSW were in the process of rebuilding the inventory system "*but there is still some way to go*", noting:

There was limited time to conduct a detailed statistical analysis of the inventory data and in our judgment little need to do so since it was clear that the prior basis of valuation had to be changed and that the new basis was still a work-in-progress the reliability of which could not be cost effectively determined. Consequently, we concluded that the 2004 valuation could differ substantially from the true value, and, in our judgement, none of the possible statistical analyses were going to change that conclusion.

Partington and Stevenson (State Forests 2004) did identify a variety of problems with the work to date, such as errors in the data, inadequate data on some species, inadequate height models, poor estimates of loggable areas, flawed growth models, poorly specified models for estimating Total Standing Volume, etc., noting:

For example, in the inventory plot data that we received there are 304 trees which are reported as each having a total standing volume (TSV) in excess of 100 cubic metres, and there is one remarkable tree with a TSV of 597 cubic metres! [1.6 cubic metres is considered the average per tree]

...

In past valuations height was modelled according to species group as a function of site and Dbhob. In the current valuation the height is estimated by a single model for all species as a function of Dbhob. ... This use of a single model across all species is a weakness in the valuation modelling and is only acceptable as an interim measure. We anticipate that when a wider range of models are implemented next year that volumes may change significantly as a result.

...

Another complicating issue is that areas previously considered unmerchantable are now being reclassified as merchantable as the constraints on available timber become more severe.

Partington and Stevenson (State Forests 2004) conclude:

In our opinion the comprehensive improvement of the hardwood inventory is highly desirable, and we believe that good work is being done. However, it is clear that the process is incomplete with many of the new models untested, and some models are still under development. Consequently, while it is feasible to conclude that this year's estimate of value

represents the best estimate currently available, it must also be concluded that there is the potential for the value estimated to differ substantially from the true value.

Despite highly critical internal reviews of FRAMES, new Wood Supply Agreements were issued in 2003 (for free), reputedly for 224,244 m^3/yr of Large HQ sawlogs (though various figures are used – see below) until 2023, then in 2005 the Forestry Corporation added the equivalent of some 32,000 m^3/yr of LHQ sawlogs in new WSA commitments for girders. veneer, piles and poles. Not unsurprisingly these new commitments were again found to be unattainable, with Boral taking Forests NSW to court for failure to honour WSAs for every year from 2004 until 2010, resulting in a government payout to Boral of $550,000 for the first 3 years, and undisclosed amounts thereafter.

Ever since the new Wood Supply Agreements were issued the committed volumes could not be supplied, as demonstrated by the EPA (2017) NSW Forest Report 2014–15.

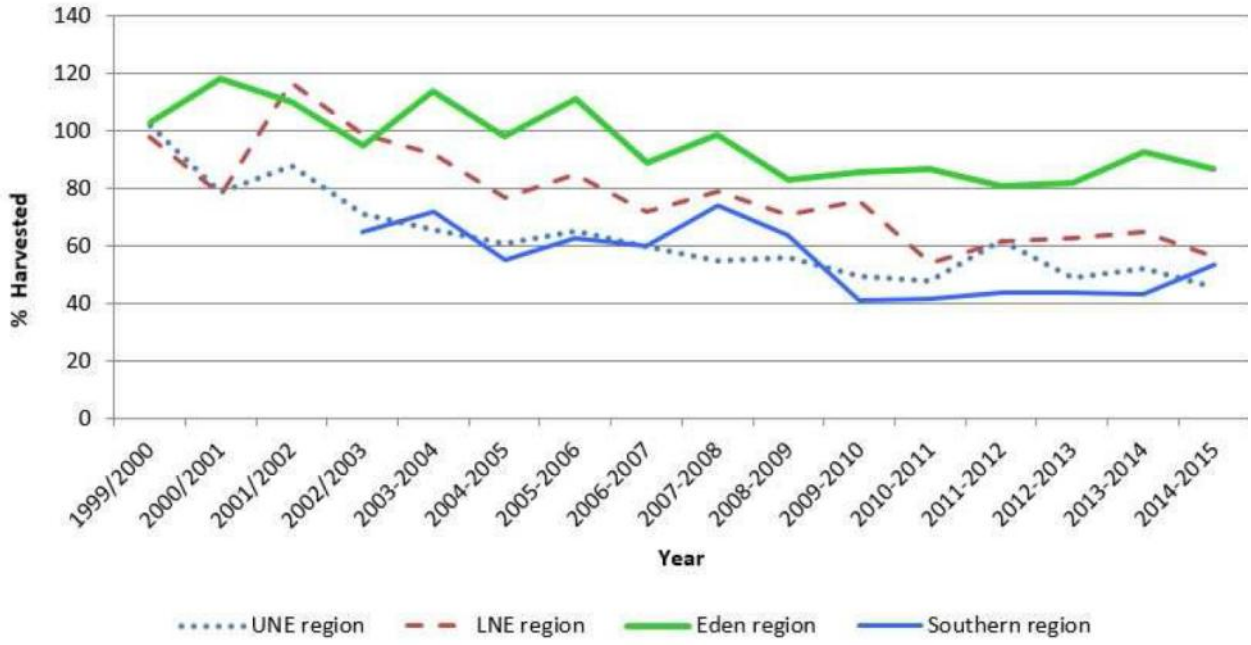
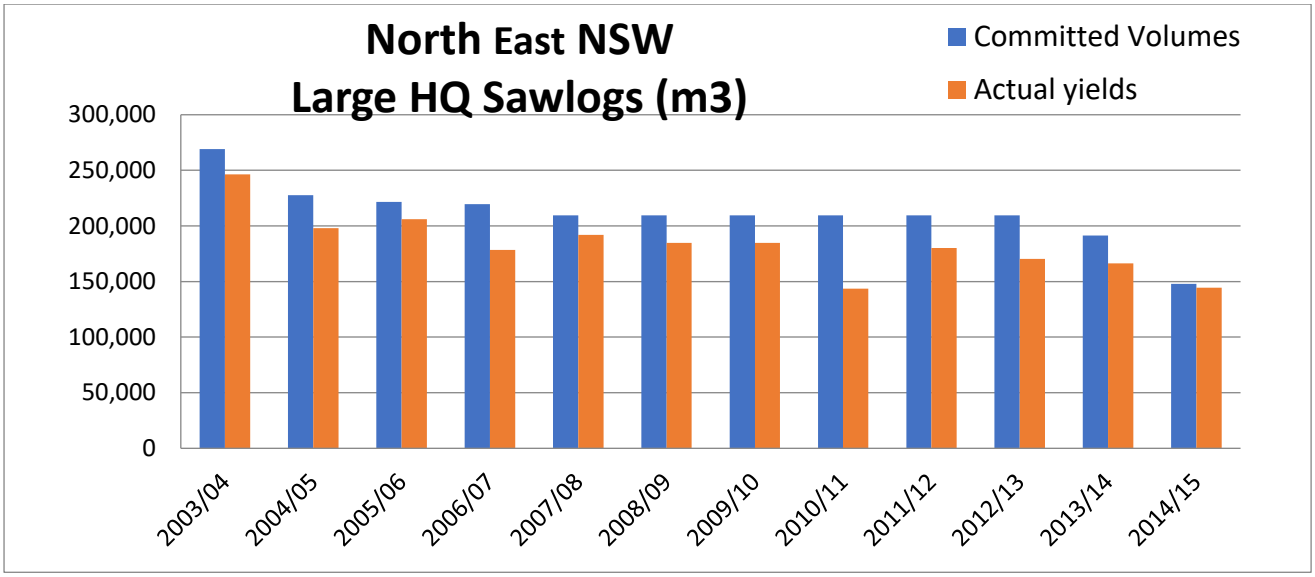


Figure 4: Log volumes harvested as a percentage of volumes specified in IFOAs – all coastal regions

From EPA (2017) NSW Forest Report 2014–15

The 2003 yield review obviously did not fix the problem. Over the 11 years from 2004/05 to 2014/15 there was a total shortfall in Large High Quality (LHQ) sawlogs of 316,412m3m which is 28,764 m3 per annum. Over the 5 years leading up to the latest Boral buyback, which took effect from 2014/15, the average annual shortfall had increased to 36,834m3.

The trends are obvious:



Over the 12 financial years 2004-15 there was a shortfall of 340,000 cubic metres between commitments and yields of large sawlogs. Over the five years up to July 2014 the average annual undercut was 36,834 m^3 p.a. So, the Minister's decision in 2014 (next section) was mostly buying back timber that the Forestry Corporation had be unable to provide, it never really existed.

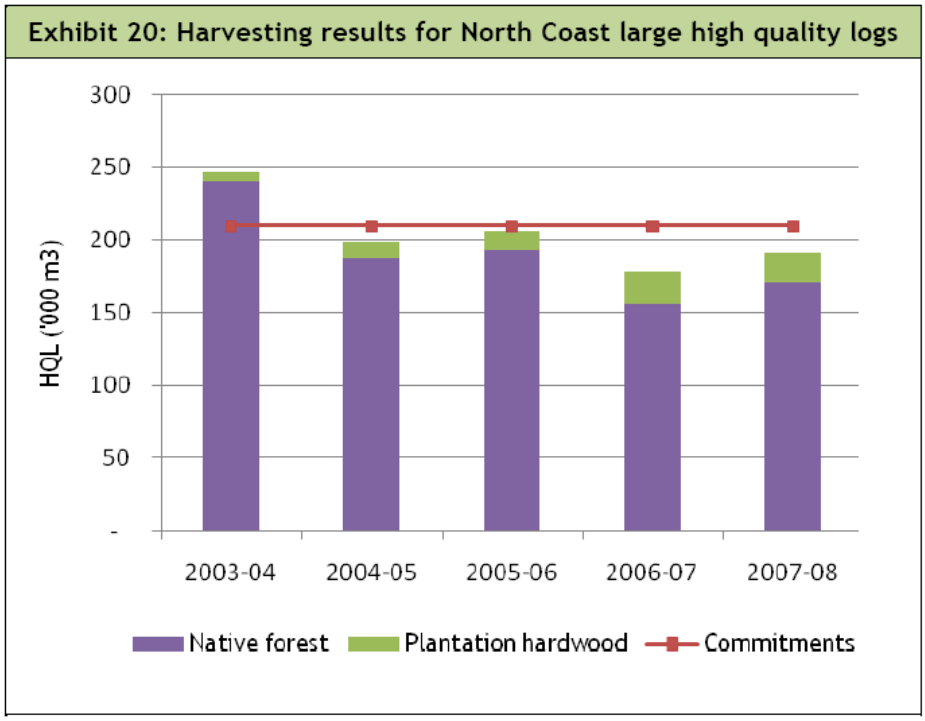
	Large High Quality Sawlogs	
YEAR	*Committed Volumes*	*Actual yields*
2004/05	*227,589*	*197,928*
2005/06	*221,700*	*206,077*
2006/07	*219,700*	*178,351*
2007/08	*209,500*	*191,967*
2008/09	*209,500*	*184,825*
2009/10	*209,500*	*184,771*
2010/11	*209,500*	*143,487*
2011/12	*209,500*	*180,289*
2012/13	*209,500*	*170,420*
2013/14	*191,500*	*166,364*
2014/15	*147,807*	*144,405*
	2,265,296	*1,948,884*

WSA compared to yields from north-east NSW (data provided by FC)

In 2009 the NSW Auditor-General, Peter Achterstraat, prepared the report "Sustaining Native Forest Operations: Forests NSW". He reached the obvious conclusion that "current yield from native forests in the north coast is not sustainable in the long term" stating:

> *To meet wood supply commitments, the native forest managed by Forests NSW on the north coast is being cut faster than it is growing back. This is especially the case for the blackbutt species. This does not mean that the forest will not regrow but there will be a reduction in yield in the future.*

The Auditor General (2009) identified that at 2008 there were wood supply agreements for some 209,500 m^3 per annum of large high quality sawlogs from north coast forests and that commitments were not being met (see below), and neither were commitments for low quality sawlogs.



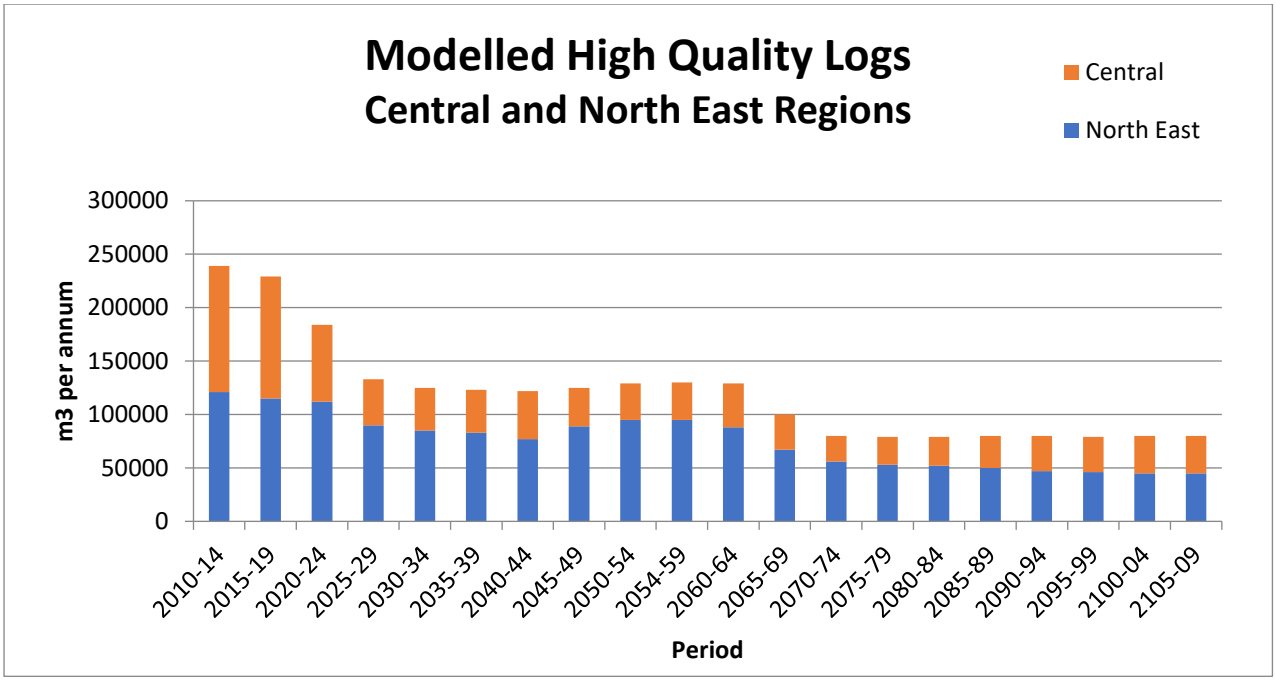
Note that the Auditor General fails to account for increased WSA commitments pre 2006-7.

The Auditor General also identified that Forests NSW were taking 56% more sawlogs from plantations than proposed, noting that if it is taking more than planned to meet commitments *"this could affect future production"* as plantations "*will form an increasing proportion of future supply*", *"because current yield from native forests in the north coast is not sustainable in the long term; that is, beyond the term of the current contracts".*

As well as possibly getting into the plantations and small sawlogs too early, the Auditor General notes that Forests NSW have not been meeting their target of 30,000m^3 per annum from private property for the north coast, instead averaging only 7,000m^3 per annum over 5 years. This increases the strain on public forests and plantations and further jeopardised intents to improve future sustainability.

It is most concerning that the two 2004 State Forests reports critical of FRAMES, particularly State Forests (2004) *Forests NSW: Review of North Coast Standing Volumes for the 2004 Valuation, Report for the NSW Auditor General,* were not apparently provided to the Auditor General, as they are not referenced in his report. NEFA have repeatedly asked why these two critical appraisals were suppressed, though have never been provided with an answer.

It is important to recognise that up until that time the expectation was that yields of high quality logs would continue to decline over time, and that this was compounded by predicted yields being over-estimated. Forests NSW (2010) estimated long-term yields of large and small high-quality logs from north east NSW shows that yields of HQL would begin to drop after 2020 down to some 127,000 m^3/yr, before declining further after 2064 down to around 80,000 m^3/yr. This long-term trend of declining yields was consistent with all yield projections up to that time. These show the significance of the yield decline expected to occur soon at that time.



Derived from Forests NSW's 2010 estimates of future yields of high-quality logs from north east NSW.

The modelling showed a dismal future for hardwood supply from north east NSW, which was always an intended outcome of the intentional overcutting for 20 years. Despite the buybacks and yield reductions, and intentional over-cutting, by 2012 sawmillers were openly expressing concerns about future timber yields, proposing that one million hectares of national parks needed to be opened for logging to meet expected shortfalls after the expiry date of the WSAs in 2023, or sooner (Pugh 2018).

1.2. Resetting Sustainable Yields in 2014

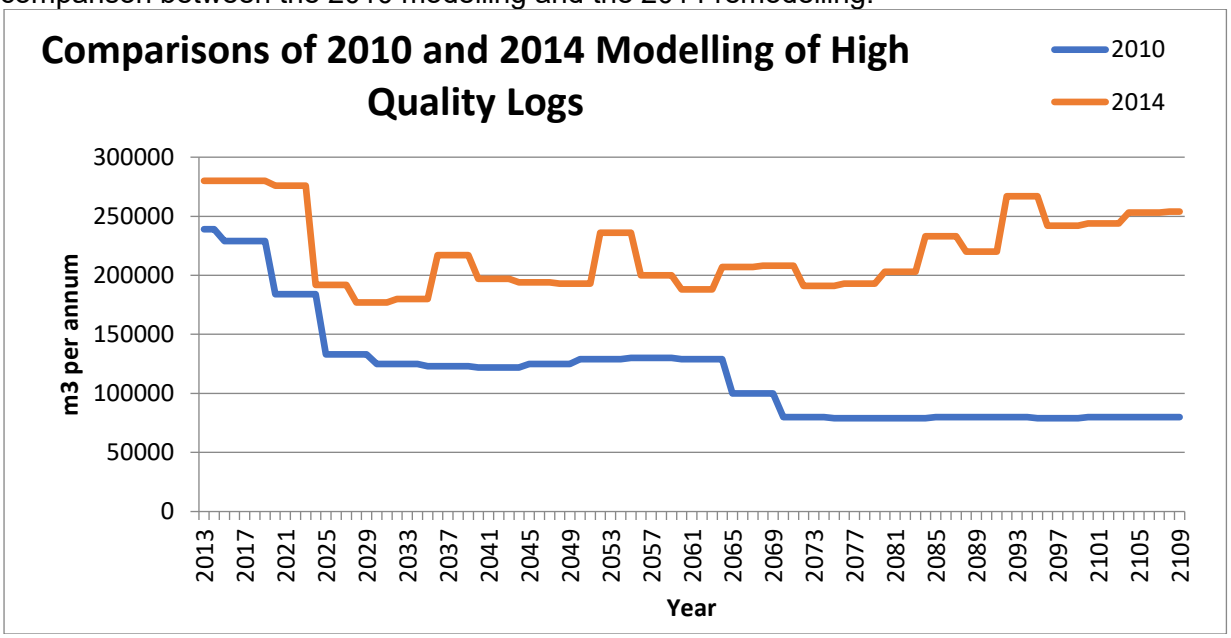
In 2012 a Project 2023 Steering Committee was established to investigate the issues associated with timber supply on the north coast. New modelling was undertaken, increasing the long term 20-100 year modelled yields of HQL from an average of 101,250 m^3/yr identified in 2010 up to 216,000 m^3/yr, in total almost doubling the estimated total volumes of HQL available over the next 100 years. The Government refused to release details of the methodology and assumptions applied to achieve such a turnaround, though it seems that key changes relied upon were formalising a clearfelling regime termed "regeneration harvesting" and removing protection for most mature trees. Based on this, in 2014 the NSW Government paid Boral $8.55 million to buy back 50,000 m^3/yr of HQL allocations for the next nine years, on the basis that they would be able to maintain the reduced WSA commitments for 100 years. To increase volumes, 140,000 ha was zoned for "regeneration harvesting" in 2018, though to avoid the limitation that logging of an area using this regime needs to be spread over 21 years, the Forestry Corporation has not been applying "regeneration harvesting", presumably compromising their revised modelling. Despite the buyback and optimistic modelling, few sawmillers had faith that yields were not going to decrease and a further buyback was recommended.

In May 2012 the NSW Government established a Project 2023 Steering Committee to investigate the issues associated with timber supply on the north coast including sustainability of supply to the end of the term of current wood supply agreements in 2023 and over the long term. This identified major resource shortfalls at the end of the current WSA.

The Steering Committee engaged URS Australia Pty Ltd to conduct a review of timber resources on the north coast. The revised modelling increased the long term 20-100 year modelled yields of HQL from an average of 101,250 m^3/yr identified in 2010 up to 216,000 m^3/yr. Over the overlapping 97 year period of 2013 to 2109 the 2010 modelling generates a total volume of 11.3 million m^3 of HQL compared to the 2014 modelling generating a volume of 21.3 million m^3 of HQL, almost double the 2010 total volumes. The differences are astoundingly large, with volumes significantly increased in the short and medium term, and yields more than tripled in the last 20 years. The differences are so large compared to all Forestry Corporation's previous modelling that it is hard to give them any credibility.

While it is apparent that the inputs to FRAMES were dramatically changed, the reasons cannot be ascertained because the Government refused to release the URS reports. An attempt to obtain the documents under a Government Information (Public Access) request 5 years later was refused on the basis of cabinet confidentiality.

While the assumptions used to underpin the new modelling are not revealed, the outcomes are dramatically different from previous yield modelling which all display far more significant drops in supply after the end of the then WSAs and declining yields thereafter. This is demonstrated by a comparison between the 2010 modelling and the 2014 remodelling.



Note the very dramatic increases in volumes expected by the 2014 modelling compared to Forests NSW's 2010 modelling. This is without any change in land area. The differences are so large compared to all Forestry Corporation's previous modelling that it is hard to give the 2014 claims any credibility.

Based on their highly questionable modelling the Steering Committee determined:

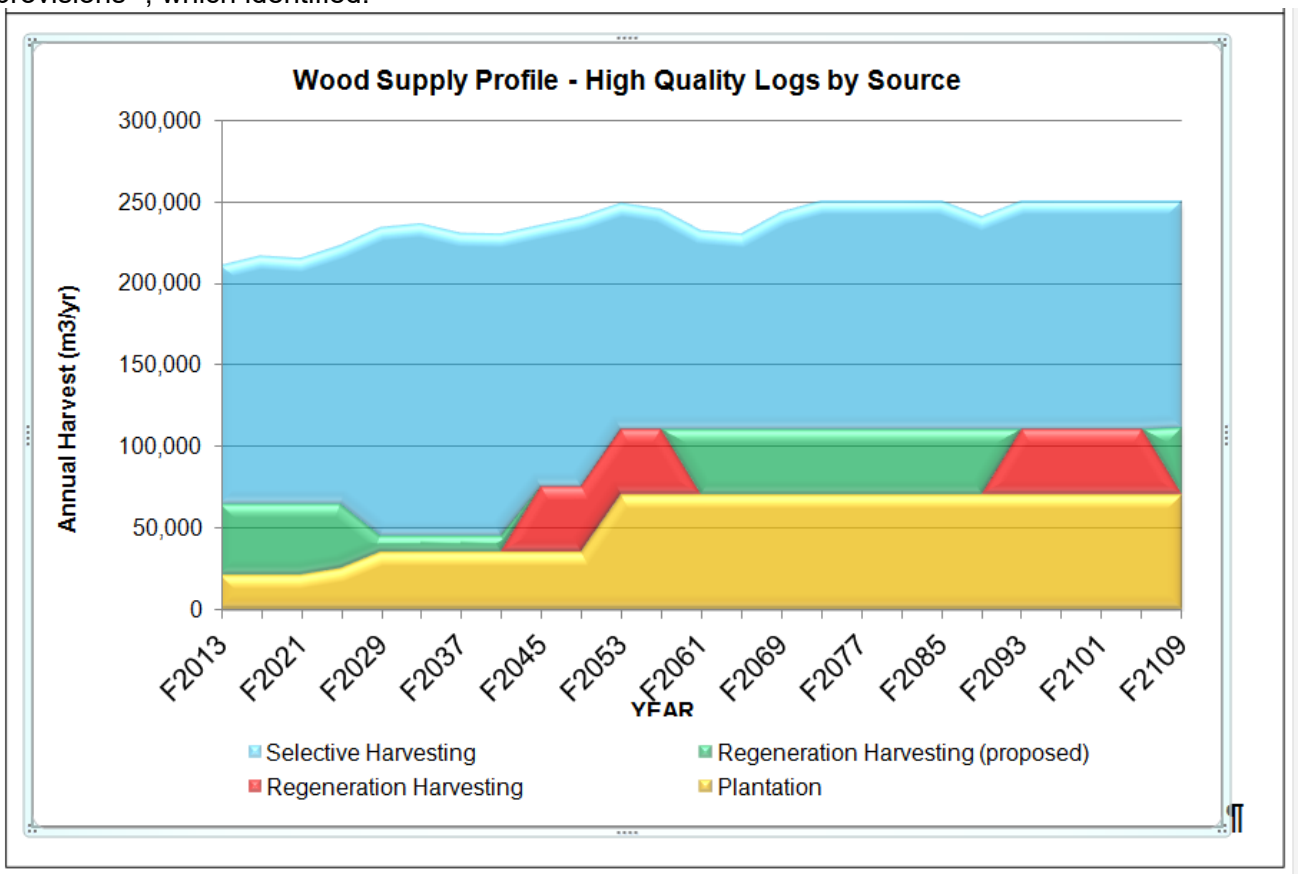
> *... that the option of buyback of 50,000 m3 per year of HQ logs including 40,000 m3 per year of Blackbutt is the most effective way of bringing harvest levels to an even flow, sustainable yield. ... The Government accepted this recommendation of the Steering Committee.*

In 2014 the NSW Minister for Primary Industries, Katrina Hodgkinson, announced the decision to pay Boral $8.55 million to buy back 50,000 m^3/yr of HQL allocations for the next nine years, reducing their WSA for Large HQL down to some 125,000 m^3/yr.

As a result of the Boral buyback the Forestry Corporation reduced the 2014 Wood Supply Agreement commitments for LHQ sawlogs to 127,137 m^3/yr, with an additional 31,351 m^3/yr of LHQ sawlogs as girders. veneer, piles and poles. Boral's WSA was extended from December 2023 to December 2028, giving them an additional 5 years allocation. This meant that the Government paid $8.55 million to buy back a total of 450,000 m^3 of sawlogs (9 years), while giving the company an

additional 580,000 m^3 of sawlogs for free. Boral also had their preferential allocation of Blackbutt and log qualities extended for a further 5 years.

The closest I could come to an explanation of the changes made is in a draft paper by Aaron Walker (October 2015) from the Premier's Office "IFOA negotiations - evidence base for time and space provisions" , which identified:



Notes on Wood Supply Forecast
There are a number of key assumptions in the wood supply forecasts produced by Forestry Corporation.

- *FCNSW continue to undertake Regeneration harvesting under the remade IFOA*
- *Tree retention settings adopted in the remade IFOA do not substantially impact of available timber volumes*
- *FCNSW retains the right to access to all current available forests*
- *No allowance for EEC's which have not yet been comprehensively mapped*
- *Only current High Quality log specifications are modelled*
- *The species mix supplied will meet industries requirements*
- *The transition to higher levels of supply from plantations in the longer term will meet customer requirements at that time.*

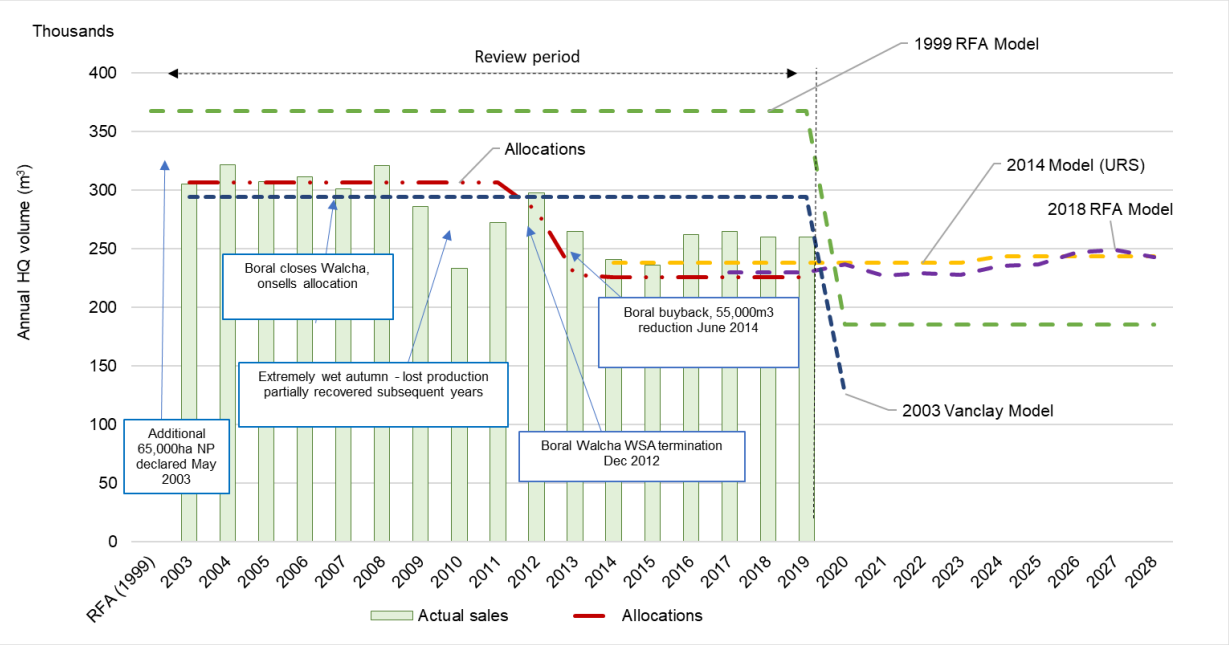
Provided these assumptions hold then FCNSW believes that it can continue to supply at the current commitment levels indefinitely. Importantly; Only Boral hold a contract that requires the delivery of minimum volumes of key species groups. All other agreements will vary in terms of species proportions based on the 'natural' variation of species that are yielded from the areas harvested in each year, which can be significant at the local scale.
Regeneration harvesting red & green colours show the expected return time to the areas that are cut now (red) and that will be cut over the next 10-15 years (green). This demonstrates a 45 – 60 year rotation length between harvesting cycles – which is consistent with the current harvesting age.

It is apparent from this that the increased yields assumed by the new modelling of sustainable yields were in part based upon the use of “regeneration harvesting” (intensive logging involving the virtual clearfelling of forests and their conversion to quasi-plantations), no increase in net logging exclusions, and minimising retention of loggable mature trees.

The 2018 Coastal Integrated Forestry Operations Approval (CIFOA) approved 140,000 hectares for regeneration (intensive) logging. Though it is apparent since then (see 1.2.1) the Forestry Corporation have not been applying the rules for the Intensive Zone in practice, presumably because the time constraints on subsequent operations limit the volumes immediately available. Given that the increased yields in their new modelling were apparently based on the application of the intensive logging regime, it would seem that yield estimates are jeopardised.

As identified below, the changes in predicted yields up until the 2019/20 wildfires have displayed a downward trajectory. Against this background, the revision in 2014, and claims it would bring yields onto a 100 year sustainable basis beggar belief. As identified in sections 1.5.1 and 1.6 the claims were not realised.

INDUFOR: A21-22109 NRC Wood Supply. Figure 4-1: Key HQ supply event overview (North Coast)



Changes in high quality sawlog actual and modelled yields. Note the various inflated modelled yields (it is important to recognise that the 1999 RFA model and the 2003 Vanclay model were for Large HQ sawlogs, whereas the displayed yields and subsequent yield models are for both large and small HQ sawlogs), reduction in the revised 2014 URS model and allocations, and the intentional over-logging above reduced WSAs after the Boral buyback which will have significant ramifications for future yields.

Even after the buyback there were still significant concerns about the Forestry Corporation’s claimed sustainable yields (see Pugh 2018). Aside from the ease of manipulating FRAMES, the Forestry Corporation's modelling has been proven to be highly unreliable. As well as conservation groups, few sawmillers have any faith in it. For example, the NSW Department of Primary Industries (2017) states:

> *Despite assurances that FCNSW is able to meet its future supply volumes on the North Coast, most customers indicated a lack of confidence and/or awareness of FCNSW resource projections. Customers on both the North and South Coast raised concern that areas of forest are being over cut in some instances to manage supply commitments.*

Many millers were expecting major problems with declining supply from public lands after the expiry of their current allocations in 2023. One miller commenting "*Very concerned - cliff coming needs addressing soon. Too many people chasing logs and in industry*".

Even after the Boral buyback, a review by GHD for the NSW Department of Primary Industries (2017) recommended further reductions in allocations, stating:

> *A buyback of WSAs could be considered as a precursor to a reallocation of the resource. ... GHD considers that an allocation in the order of 15,000 m_3 might be adequate for a buyback to adjust for all these considerations and potentially rationalise the industry or allow a new entrant, however, this would be subject to the development of a full business case.*
>
> *... GHD recommends that the NSW Government consider a further WSA buyback to reduce the current allocation.*
>
> *GHD has reviewed the current North Coast supply commitments against delivery volumes by species and concludes that a buyback in the order of 15,000 m^3 is targeted.*

Similarly, the 2018 North Coast NSW Private Native Forest Primary Processors Survey Report found the sawmill owners were still pessimistic about the volumes of timber available. Of the millers surveyed 24% considered log yields from State Forests will decline over the next couple of years, one commenting "*FC been over logging for a long time. SF NSW- logs getting smaller & lower quality*".

1.2.1. Changing Logging Intensity to Increase Yields

The issue of applying clearfelling as a management regime in northeast NSW has long been controversial, with 1996 expert review recommending against it in favour of low intensity selective logging for speciality hardwood products. The 1999 IFOA logging rules limited the extent of clearfelled gaps to 0.25ha under Australian Group Selection (AGS), with gaps in an area to be implement over 28 years. Otherwise logging had to be limited to less than 40% removal of basal area applying Single Tree Selection (STS). After 2006 STS became the dominant silvicultural regime because, despite the objections of the EPA, the Forestry Corporation found they could pervert its intent to remove up to 90% of the basal area over large swathes of forest at one time. While this was contrary to the IFOA rules the Forestry Corporation got away with it. Despite this practice being illegal, it was applied to increase timber yields in the 2014 remodelling by Project23. As part of their 2018 IFOA Remake the Forestry Corporation and EPA created a new 140,000ha North Coast Intensive Zone, where 46ha virtual clear-fells are allowed over a 21 year period. Despite getting what they wanted, the Forestry Corporation are now rezoning intensive areas for selective logging and applying selective logging in the intensive zone, presumably because then they can log the whole area in one go, rather than staging logging over 21 years, and because they only need to retain 8 hollow-bearing trees per hectare, rather than all of them. The 2018 changes also increased logging intensities in the balance of the region and removed most protections for mature trees.

In response to concerns that the Forestry Commission was undertaking patch clearfelling called "gaps and clusters", the NSW Forest Minister convened an expert "Review Panel to the Ministerial Committee into Gaps and Clusters" (Attiwill, Burgman and Smith 1996) which found against Gaps and Clusters and recommended the way forward for forestry in north east NSW needed to include the following principles:

1. *A greater focus on collection and analysis of existing quantitative data on timber yields and biodiversity impacts under current silvicultural treatments within major forest types and regions.*

2. *Proper evaluation of silvicultural alternatives … through long term (3-8 year) trials designed to provide conclusive data on yield, biodiversity and socio-economic costs and benefits.*
3. *Achieving a balance between wood production and biodiversity objectives through forest zoning at the landscape scale (after finalization of the proposed CAR reserves and proper trialing of silvicultural alternatives).*
4. *Promotion of the north-east forests as a region for production of high value-added specialty hardwood products … and biodiversity conservation, by management under low cost, low intensity (less than 35% canopy removal) selection logging techniques and discouragement of management for low-value products including scantling (housing frame), woodchips and wood fibre."*

The report acknowledged that the north eastern forests of NSW have the richest faunal diversity outside the wet tropics, advising:

> *On the basis of available evidence, application of gaps and clusters could be expected to reduce the average abundance and variety of vertebrate fauna in logged forest areas by about 18-30% which is approximately twice the level of reduction evident in north-east forest areas which have been selectively logged in the past.*

These findings were reflected in logging intensity on State Forests being limited by the 1999 Integrated Forestry Operations Approval (IFOA). The IFOA (5) (3) is very specific in stating "*This approval applies only to logging operations where trees are selected for harvesting using Single Tree Selection or Australian Group Selection*". No other silvicultural practices were legally allowed.

The explicit requirements to limit the extent of gaps to 0.25ha under Australian Group Selection (AGS) and the basal area removal to <40% under Single Tree Selection (STS) reflected an intent to limit both logging intensity and the size of clear-fells in accordance with Attiwill et. al. (1996). This was explicitly intended to reduce logging impacts on biodiversity and thus is an essential component of implementing ESFM in accordance with the RFA.

The 1999 IFOA permitted AGS, which is a staged patch clearfelling regime over 90% of the net logging area in a compartment over a 28 year period, effectively permitting small patches totalling 22.5% of a logging area to be patch clearfelled on 4 occasions at 7 year intervals. Clearfelled patches were not allowed to be bigger than 50x50m (0.25 hectares). The Threatened Species Licence prohibited Australian Group Selection within Koala intermediate use compartments. In practice the Forestry Corporation gave up using AGS when they realised they could get away with using STS as a clearfelling regime. AGS was practiced from 2000-2010, though starting in 2006 more extensive clearing began to be practiced under the guise of STS and began being applied over AGS areas.

The 1999 objective for STS was to maintain a self-sustaining forest of multiple age/size classes. STS was explicitly defined in the IFOA to mean:

> *"Single Tree Selection" refers to a silvicultural practice, which in relation to a tract of forested land has the following elements:*
>
> > *(a) trees selected for logging have trunks, that in cross-section, measured 1.3 metres above ground level, have a diameter (including bark) of 20cm or more (that is, a diameter at breast height over bark of 20 cm or more); and*
> > *(b) trees are selected for logging with the objective of ensuring that the sum of the basal areas of trees removed comprises no more than 40% of the sum of the basal areas of all trees existing immediately prior to logging within the net harvestable area of the tract.*

STS was always meant to be light selective logging, with Australian Group Selection the heavy logging. It was clearly never intended that STS would be used to clear fell large areas, or even create large gaps. After 2006 STS became the dominant silvicultural regime because the Forestry Corporation found they could pervert its intent to remove up to 90% of the basal area over large swathes of forest at one time. Forestry Corporation claimed that STS allowed for the 40% basal area limit to be averaged across the harvest area, allowing them to compensate for heavier logging of part of a logging area by temporarily exclude logging from another part, claiming the average removal is only 40%. The Forestry Corporation identified logging areas across multiple compartments, enabling them to include compartments they had no intent to log as offsets. While STS was based upon 15 years between logging events they often returned a few months or few years later to log the excluded area.

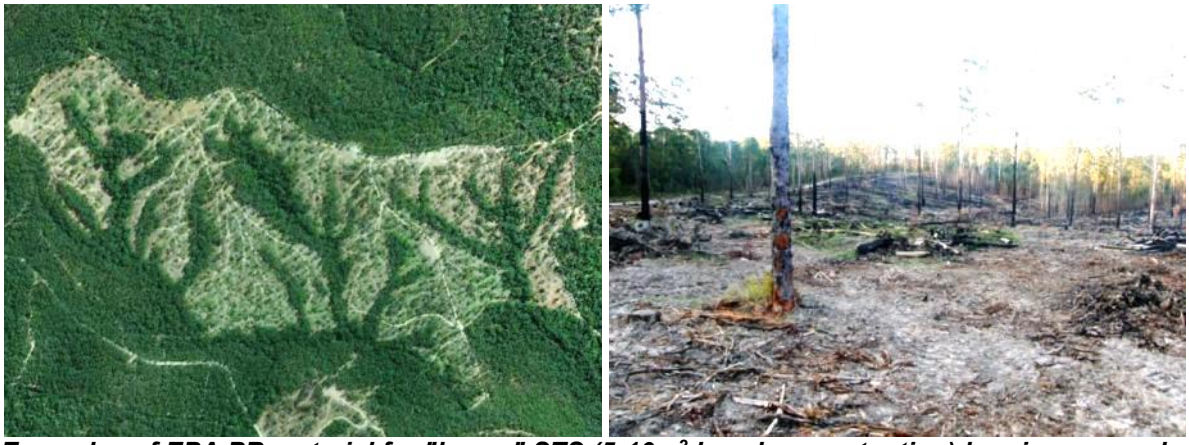
An examination of harvesting plans in 2017 (Pugh 2017) found that there is no clear definition of the various STS intensities, with "regeneration" STS involving average basal area removals ranging from 62-86% (average 75%), "heavy" STS from 50-85% (average 68%) and "medium" STS from 30-60%.(average 47%). Though it was obvious that all the new STS regimes of "regeneration", "heavy" and "medium" are more than the IFOA definitions of STS as involving less than 40% basal area removal.

Pugh (2017) notes:

> *The Government has provided data under a GIPA request on areas intensively logged for the Lower North East region, showing that the Forestry Corporation undertook small areas of clearfells in 2000, and started to systematically implement what they termed "Regeneration" Single Tree Selection (STS) in 2006, expanding their intensive logging to include "heavy" STS in 2008. After the first Australian Group Selection (AGS) cutting cycle, if appears from the data provided, that to date 1,900 ha of AGS areas treated on the 1st cycle have been converted to heavy/regeneration STS and 2,440 ha converted to STS medium.*
>
> *The Forestry Corporation data identifies that they have created 1,153 intensively logged patches, ranging in size from 0.001ha up to 280ha in size. Of these 1,110 are bigger than the 0.25ha limit for gaps allowed under AGS, with an average size of 21ha. 110 patches are above 50ha in size. Similarly 2,217 patches have been subject to medium "STS" with patches up to 343ha, and an average size of 23ha and 283 patches above 50 ha in size.*

The EPA described these as “quasi plantations” and despite recognising the intensive logging as a breach of the IFOA requirements, refused to take regulatory action because they claimed they could only enforce the conditions of the various licences, with it being the Minister's responsibility to enforce the silvicultural prescriptions of the IFOA. The Minister for the Environment acknowledged, through a letter written by the Environment Protection Authority (EPA 2016b) on his behalf, that this type of harvesting as “*practiced by the FCNSW, is not consistent with the definition and intent of STS (Single Tree Selection) in the Integrated Forestry Operations Approval (IFOA) as well as FCNSW’s own silvicultural guidelines*.” The Minister failed to take any regulatory action.

Extraordinarily the RFA Review (NSW&CoA 2009) sought to justify this new intensive logging, Appendix D Improvements to the NSW Forest Management System, stating “*The EPA has expressed concerns that regeneration harvesting, as practised on the midnorth coast since 2007, is inconsistent with the intent of the current IFOAs; however, the definition of STS within the IFOA is highly interpretable.”,* while extolling the virtues of heavy STS (regeneration harvest) operations.



Examples of EPA PR material for "heavy" STS (5-10m^2 basal area retention) logging, examples from Broken Bago SF intended to promote this form of clearing, the covering email to the Forestry Corporation (8/9/2014) states "maps now updated replaced 'cleared' with 'harvested'". Note the extensive removal of both large trees, trees <20cm diameter and understorey.

Apparently, the Forestry Corporation tried to get the EPA to agree to change the IFOA's allowable silvicultural regimes in 2009 to allow this intensive logging, though when the EPA refused they chose to rort the system by continuing their intensive logging rather than abiding by the IFOA and Regional Forest Agreement. NRC (2016) note:

> *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.*

Despite this intensive logging not being approved, it became the basis for the revised FRAMES models and increased timber yields under Project 2023. NRC (2016) further noting:

> *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).*

The 2018 Coastal Integrated Forestry Operations Approval (CIFOA) established 3 zones where logging is only limited by basal area retention; a 140,000ha North Coast Intensive Zone covering Coastal forests south from Grafton to Taree, a coastal "regrowth" zone and an escarpment "non-regrowth" zone.

The proposed North Coast Intensive Zone is for alternative coupe logging, with coupes limited to 45ha (60ha for first 2 years), no logging adjacent coupes within 10 years and no more than 33.3 per cent of the net harvest area of that local landscape area logged on each occasion over 21 years. 10% of the loggable area is required to set aside as wildlife or habitat tree clumps. For 90% of the loggable area there are no minimum basal area retention requirements, though there are requirements to retain hollow-bearing trees where they occur, Koala feed trees in modelled habitat, and (as from last year) retention of a total of up to 5 greater glider trees >50cm DBH and hollow-bearing trees per ha.

It is apparent that the Forestry Corporation have not been applying the rules for the Intensive Zone in practice, presumably because the time constraints of subsequent operations limit the volumes immediately available. In response to my complaints to the EPA about compartments in the intensive zone being rezoned as selective without the corresponding spatial data being updated, the EPA (Tony Chappel 28 August 2025) identified that on 16 different occasions a total of 186

compartments had been rezoned. Even when the zoning is not changed, they are usually logged using selective harvesting, for example the 2024/25 Biomaterial Report identifies that there were 20 logging operations in the remaining intensive zone, yet all of them were undertaken on a selective basis.

Under the new rules 10% of the loggable area in the "regrowth" zone, and 13% of the loggable area in the non-regrowth zone are required to be set aside as wildlife or habitat tree clumps (these will mostly be existing exclusions). The only limit on selective harvesting in the remaining 87-90% is that in the regrowth zone the minimal basal area required is $10m^2$ ha and in the non-regrowth zone $12m^2$ ha, which is significantly less than the previous requirement to retain 40% of the basal area. It is important to recognise that basal area retention is related to the number of trees that are merchantable and the number required to be retained as habitat trees. The 2024/25 Biomaterial Report provides data for basal area retention in 11 selective logging operations, identifying an average retention of 14.7 m^3/ha, varying from 10.3 to 22.8 m^3/ha.

In terms of timber yields the other significant change was the removal of most requirements to retain mature trees to increase timber yields. These changes included deletion of the requirement to retain one of the next largest trees as recruitment trees for each retained hollow-bearing tree, 3 mature eucalypts per hectare of species known to produce copious nectar as "eucalypt feed trees", 15 mature to late mature feed trees (smooth barked eucalypts shedding bark in long strips) for foraging within 100-200 metres radius of each Yellow-bellied Glider record, and a variety of other species specific requirements.
.
Under the 1999 IFOA, the retention of nectar feed trees increased to 5 'eucalypt feed trees' per hectare in compartments with nectivorous Swift Parrot, Regent Honeyeater or Black-chinned Honeyeater records, and was often adopted as the default in lieu of required surveys in potential habitat. The 2018 CIFOA changed this to the retention of 5 nectar trees per hectare within 2km of an existing record of Swift Parrot or Regent Honeyeater, with no requirements for surveys.

1.3. Comparing Predicted Yields with Actual Yields

One of the most basic requirements of yield models is to subject them to reality checks by comparing predicted yields to actual yields. State Forests initially did this for the north coast in 2002 and identified that only 78% of the predicted yields were obtained, leading to a yield review that dramatically reduced yield assessments. Since then, State Forests resisted numerous requests to compare predicted and actual yields, though belatedly did reconciliations for 2011/15 and 2015/19, identifying actual yields were 87.3% of predictions. The next reconciliation was due in 2024, which significantly covers the post-fire period, though Forestry Corporation have been reluctant to do it. It is revealing that Forestry Corporation's argument against comparing predicted yields with actual yields is that FRAMES is "*a strategic planning tool designed to predict the potential wood supply at a regional level*" and that it is not appropriate to use FRAMES below this level, and that it is not possible to differentiate reasons for changes in yields. It is clear that it is not an appropriate tool for assessing or measuring changes in yields resulting from changes in logging regimes in part of a region.

The NE RFA (Attachment 12 Part E 22) requires "Monitor FRAMES through comparison of actual versus predicted volumes".

For the 5-year RFA review Spencer (2009) could not understand why Forests NSW insisted that there could be no comparison between actual and predicted yields at any scale, stating:

However it is a specific RFA requirement to monitor modelled and actual performance on a continuous basis. The reasons for such a requirement seem quite obvious and to not do so suggests that models should be accepted without reference to whether they reflect reality.

The Auditor General (2009) recommended that by June 2010 Forests NSW *"compare harvest results against its yield estimates over five year periods as a means of testing the accuracy of estimates".*

In response to questions on notice from the General Purpose Standing Committee No.1 Budget Estimates 2009-10, Steve Whan claimed that the annual and five year (till June 2010) *"results will be published on Forests NSW website by December 2010".* They were not. On the 24 December 2010 Forests NSW finally responded to the Auditor General, presenting some unreferenced graphs of revised timber volumes which were published on Forests NSW website and effectively continuing their refusal to release results of comparisons between actual and predicted yields.

The RFA Review (NSW&CoA 2009) provides the justification for refusing to do yield reviews:

Tracking the performance of FRAMES is a difficult task. Early comparisons of actual and predicted yield were completed for the North Coast. The actual vs predicted comparisons illustrated a range of technical issues (e.g. sampling intensity) that have hindered meaningful analysis of predicted yield below the whole-of-forest-estate level, which defines the RFA outcomes. Fundamentally these relate to FRAMES being a strategic planning tool designed to predict the potential wood supply at a regional level. It is not appropriate to compare actual yields versus predicted yields at a level lower than the prediction level (i.e. the region level).

Until the subregional planning project is successfully completed, the only information that is available is allowable cut (based on whole-of-region predicted yield from FRAMES) versus actual yield, which is provided for all the RFA regions in appendix 4. This draft report outlines the yields from the commencement of the RFA until the end of June 2007.

Although the performance monitoring described above may be able to identify whether yields are close to or different from predicted cut, they do not identify whether detected variation is significant with respect to sustainability or timber-supply agreements. For instance, if actual yield is less than predicted cut, it is not known whether this is because volume available for harvest was overestimated or because harvestable volume was retained for some reason. Similarly, it is not known whether the difference is due to one part of the region being cut instead of another.

The simplistic reports found on Forestry Corporation's website for "FRAMES Actual vs Predicted Harvest Reconciliation" for "2010/11 to 2014/15", and "2014/15 to F2018/19" concluded that all was good with modelling of high quality sawlogs. Though the results for the North Coast show that over those periods across the 72,506 ha logged, yields were 87.3% of predictions, while one mid north coast area (COF_BBT_STS & MNC_BBT) was close to predictions, the other (COF_COASTAL_STS & MNC_COASTAL) was only 77% of predictions. Given that standard practice is to target higher yielding areas first, this deficit should be of concern, particularly as it has now been exasperated by the significant loss of trees in the 2019/20 fires.

NEFA raised the failure of the Forestry Corporation to prepare their next comparison of predicted and actual volumes, which was overdue for 2019/20 to 2023/2024, at a meeting with CEO Anshul Chaudry and Daniel Tuan on 19 March 2025, at that time they said they thought they no longer need to do this. In response to requests for clarification, on 23 July 2025 Daniel Tuan, General Manager Hardwood Forests, identified that they had changed their position, writing to NEFA "*We recognise the Auditor General's recommendation for five-year reconciliations. We remain committed to completing reconciliations*". We are still waiting.

1.4. Reliability of Forestry Corporation Reporting of Yields

There have been numerous cases of the Forestry Corporation misreporting product yields and net logging areas, with significant discrepancies between various reports. In 2024 NEFA had the Forestry Corporation remedy their inclusion of 2021/22 data in their 2022/23 Biomaterial Report, thereby halving claimed yields. After further complaints, in 2025 they reduced claimed yields in their revised 2022/23 Biomaterial Report by a further 24%, as well as reducing claimed yields in their 2021/22 and 2023/24 Biomaterial Reports by 23%. At the same time they identified that since 2017 they had "*overreported the area harvested in coastal forests by around 14,000 hectares*", while not responding to our complaints they had underreported logging in 2021/23 by 2,518 ha. NEFA identified numerous other data inconsistencies that were not responded to, though it is particularly worrying that despite yields being rectified in their Biomaterial reports they are still reporting significantly higher annual yields than given in their Sustainability Report. It is evident that the Forestry Corporation cannot be relied upon to provide accurate data on either areas logged or volumes attained, that external regulators are unable to identify data errors, and the Forestry Corporation are reluctant to rectify errors when identified to them or provide explanations. Forestry Corporation data cannot be relied upon as a basis for the INFM.

The 2018 North Coast NSW Private Native Forest Primary Processors Survey Report reports *"Interestingly, respondents reported buying larger volumes of pulp and 'other' grade logs than was sold to them by FCNSW".* Accepting that *"Survey capture of poles and piles was poor due to processors declining to be interviewed",* the data show a variety of discrepancies, which seems to indicate that timber reputedly sold by the FC as salvage grade is being purchased as high quality sawlogs, pulpwood and "other". Given that only 83% of sales are accounted for, this discrepancy is likely to be far more significant. No explanation is available.

Table 6 Surveyed capture of FCNSW hardwood log sales on the north coast

Log grade group	Purchases (m^3) reported by respondents	Annual volume (m^3) sold by FCNSW (av. June 2014-June 2016)	Percentage surveyed
HQ FC native (large & small sawlogs, veneer grade and girders)	213,486	201,200	106%
Poles FC (poles and piles)	5,620	27,403	21%
Salvage grade FC	126,338	201,204	63%
Pulp FC	22,708	14,634	155%
Other (miscellaneous, unknown & firewood) FC	15,028	13,223	114%
Total	383,181	457,665	83.7%

As well as the data that Forestry Corporation rely upon for yield assessments being inflated and unreliable, their reporting of their data in Sustainability Reports for 2021/22, 2022/23 and 2023/24 was proved by NEFA and SEFA to be greatly inflated and riddled with errors. Aside from being legally required to demonstrate how the Forestry Corporation complies with the limits on harvesting operations specified in the CIFOA, these data are the basis for evaluating the Forestry Corporation's performance in a broad range of processes and evaluations. The erroneous reporting means that all assessments of the Forestry Corporation's performance were based on inflated false

information for years. It is significant that despite oversight of Forestry Corporation's reporting by a range of bodies, it took repeated questioning from NGOs to get traction on our complaints.

From June 2024 NEFA bought inconsistencies with data on logging areas and product yields to the Forestry Corporation's attention in an attempt to obtain an accurate dataset to undertake a range of assessments.

The Forestry Corporation redid their 2022/23 Biomaterial Report in October 2024, claiming they had rectified gross errors by removing erroneously included 2021/22 data. This had the effect of reducing claimed yields of all products for north-east NSW by an average of 45% (52% across NSW). In October 2024 the 2023/24 Biomaterial Report was also released.

Following further complaints, revised 2021/22, 2022/23 and 2023/24 Biomaterial Reports were released in January 2025, all of which made significant changes to the volumes of products claimed to have been removed across north east NSW in those years:

- The second revision of the 2022/23 Biomaterial report identifies a further 24% reduction in volumes of all products, in addition to the earlier 45% reduction. It claims a 28% increase in the logging area, an overall increase of 811m^3 in claimed yields of high quality logs (though reallocates over 500 m^3 of **large** high quality logs to **small),** and a 73,986 tonne (38%) reduction in yields of low quality logs (33-47% across most products and operations).
- The revision of the 2021/22 Biomaterial Report identifies a 23% reduction in timber volumes, from a similar area it identifies an overall increase of 1,094m^3 in claimed yields of high quality logs (though reallocates over 326 m^3 of **large** high quality logs to **small**), and reduces yields of low quality logs by 59,321 tonnes (37%).
- The revision of the 2023/24 Biomaterial Report similarly identifies a 23% reduction in timber volumes from a similar logging area, identifies similar volumes of high quality logs yet reallocates over 1,000m^3 of **large** high quality logs to **small**, and reduces yields of low quality logs by 69,744 tonnes (38%).

As noted by NEFA, the 2023/24 Sustainability Report was also modified to admit that since 2017 they have "***overreported*** *the area harvested in coastal forests by around 14,000 hectares*", as well as double-counting some plantations and underreporting logging in Western NSW. The Forestry Corporation now claims to have rectified these errors, though a comparison with the revised Biomaterial Reports for north east NSW and the Forestry Corporation's mapping of logging shows that the revised Biomaterial Reports are **underreporting** the extent of logging by 1,414ha (21%) in 2022/23 and 1,104ha (24%) in 2021/22.

At a meeting with CEO Anshul Chaudry and Daniel Tuan on 19 March 2025, the Forestry Corporation told NEFA that the problem was that the data reported was reporting gross weight (including trucks) instead of net weights (excluding trucks), i.e. the wrong column was extracted, though at that time they refused NEFA's request to put this in writing, and explain other major discrepancies.

This may to some extent explain the major differences in low quality products, as NEFA and SEFA emphasised to the Forestry Corporation it does not explain the differences in high quality products, as such gross differences are not apparent. They particularly asked for an explanation as to why large high quality sawlogs were reclassed as small high quality sawlogs. While this was done frequently, it was variable, was not a systematic change attributable to erroneous reporting of gross volumes, and was done at a compartment level.

NEFA and SEFA persisted with obtaining a more fulsome response to the numerous problems we had identified, on 23 July 2025 Daniel Tuan, General Manager Hardwood Forests, wrote:

Clarification regarding reporting of gross and net weight in Annual Timber and Biomaterials Reports
Some categories of data initially submitted in Annual Timber and Biomaterial Reports showed the gross weight (including truck mass) instead of net weight. This was a data extraction error; the sales database records both net and gross weight and the incorrect item was selected for extraction. …

Classification of High-Quality Sawlog volumes in Annual Timber and Biomaterials Reports
In some instances, sawlog products were segregated according to the required specification, however length and diameter measurements were not recorded at the point of sale and were aggregated to be sold by weight. When the data was extracted to compile the Annual Timber and Biomaterials Reports, the sawlog products were erroneously allocated to the incorrect sawlog category in the report. …

Differences between data in different reports
The Annual Timber and Biomaterial Reports are prepared to report on operations carried out under the Coastal Integrated Forestry Operations Approval. The reports are prepared to meet a specific CIFOA condition and demonstrate that timber harvested has not exceeded the CIFOA limits. Data in other reports will not always be consistent with these reports. This is because other reports may relate to different reporting periods, may include operations completed under other instruments, including Western IFOAs or plantation or private native forestry regulations, or data may be extracted at different times to meet reporting timeframes.

The Forestry Corporation refused NEFA's requests to them to explain numerous other specific data inconsistencies identified by NEFA and highlighted in writing to the Forestry Corporation, including:

1. Changes in compartments included between original and revised Biomaterial Reports
2. Changes in the net areas logged (in aggregate and at the compartment level) between original and revised Biomaterial Reports
3. Inconsistencies between the net areas logged and the claimed yields in the revised Biomaterial Reports
4. Despite overall reductions, increases in volumes of "other" and "low quality sawlogs" in several cases in revised Biomaterial Reports
5. Significant discrepancies in the net area logged between Biomaterial Reports, and with logging history data
6. Significant discrepancies in the yields between the revised biomaterial reports and the corresponding Sustainability Report figures.

NEFA and SEFA also undertook a Comparison of Forestry Corporation's Snapshot Reports and Biomaterial Reports for 2019/20, 2020/21 and 2021/22 which found:

> *… there are significant discrepancies between most claimed volumes of products across all regions for all years. As well as significant differences (+/- 1000 m^3 or tonnes) in most reported volumes of products in each region, there are significant differences in most of the total volumes of products claimed to have been obtained in each year, and significant differences for nearly all regional total volumes across most regions in each year. None of the reports provide consistent and comparable volumes, so none can be considered to be an accurate recording of the volumes of products obtained.*

These discrepancies are not apparently related to incorrect reporting of gross as net, highlighting more systematic problems with reporting yields.

On 16 May 2025, EDO wrote to the Attorney General on behalf of NEFA requesting an investigation into potential breaches of statutory duties by officers of the Forestry Corporation in relation to their provision of false and misleading information. As noted in that request:

> *Our client is concerned that despite internal and external auditing of FCNSW (including by its Audit Committee, the EPA, Auditor General, and Programme for the Endorsement of Forest Certification), the consistent and systemic misreporting in Biomaterial and Sustainability Reports was not identified or rectified until our client's repeated questioning of errors and discrepancies in FCNSW data.*

Even after rectification of data in the Biomaterial Reports there are major unexplained discrepancies with data in the Sustainability Reports. The Sustainability Reports are stated to be in m^3, whereas the data for actual yields of Low Quality Logs and Pulp/other given in the Biomaterial Reports are in tonnes, to make the data comparable tonnes were converted to m^3 by multiplying by 1.2 as recommended by the Forestry Corporation.

Comparison of the data for high quality logs between the two reports shows that the Biomaterial Reports are consistently claiming higher volumes than the Sustainability Reports, by a total of 19,538 m^3 (4%) over the four years.

Applying the multiplier to convert tonnes to m^3 greatly increased the discrepancies between the two data sets for actual yields of Low Quality Logs and Pulp/other, which suggests the data for these products given in the Sustainability Reports for those years are for tonnes rather than m^3. Without applying this conversion, and assuming the volumes given in the Sustainability Report are for tonnes, still gives the volumes claimed in Biomaterial Reports consistently above those claimed in Sustainability Reports, by an average of 9% for Low Quality Logs and 16% for Pulp/other.

Comparisons of yield data for north east NSW given in Forestry Corporation Sustainability and corrected Biomaterial Reports.

NE NSW Native Forest		High Quality Sawlogs (m3)	Low Quality Logs (m3)	Pulp/other (m3)	TOTALS (m3)
2023/24	Sus Report	143918	73726	28594	246238
	Bio Report	149200	96018	39637	284855
2022/23	Sus Report	133729	71249	38651	243629
	Bio Report	138489	92756	53537	284782
2021/22	Sus Report	105255	53167	35644	194066
	Bio Report	109307	69739	49428	228474
2020/21	Sus Report	81696	45903	20070	147669
	Bio Report	87140	61625	28243	177008

These major discrepancies make any analysis of Forestry Corporation data fraught as there is no data set that can be considered accurate and reliable, and the inconsistencies between and within data sets frustrates attempts to reliably compare data.

The NRC (Todd Maher, pers comm,12 Jun 2018) maintained that in 2018 the modelled yield of High Quality Logs over a hundred year period was an average of 237,000 m^3/yr, with an average of 132,000 m^3/yr large high quality (LHQ) sawlogs and 105,000 m^3/yr small high quality (SHQ) sawlogs per annum. Over the next 20 years the mix was assessed as being an average 166,000 m^3/yr LHQ and 71,000 m^3/yr SHQ logs per annum. This is based on yields from both native forests and hardwood plantations.

Forestry Corporation's 2024 Sustainability Report gives an average potential yield of 241,786 m^3/yr of High Quality Logs from 2018-2117, with an average of 145,756 m^3/yr LHQ logs and 96,030 m^3/yr SHQ sawlogs. Over the 20 years from 2018 to 2037 it gives predicted yields of an average 166,727 m^3/yr LHQ and 65,139 m^3/yr SHQ logs per annum.

While the comparison between the two sets of figures for the same periods shows the 2024 data gives a 2% increase in sustainable yields of High Quality Logs from 2018-2117, this increases to over 10% of LHQ logs with the 2024 claims. These increases in the 2024 claims are particularly significant because this is after the 2019/20 fires, when estimates of sustainable yields should have decreased. The 20 year period does show a reduction in SHQ logs, but a slight increase in LHQ logs. This is just another example of the variability in Forestry Corporation data.

The pulplog data from 2019/20 to 2023/24 is given in tonnes in biomaterial reports and m^3 in sustainability reports (other years are in m^3). It was found that the total of pulplogs/other given over the five years 2019/24 in sustainability reports is 149,348 m^3, and in biomaterial reports is 168,762 tonnes, given that a m^3 weighs less than a tonne there is something fundamentally wrong with Forestry Corporation's data.

It is evident that the Forestry Corporation cannot be relied upon to provide accurate data on either areas logged or volumes attained, that external regulators are unable to identify data errors, and the Forestry Corporation are reluctant to rectify errors when identified to them or provide explanations. Forestry Corporation data cannot be relied upon as a basis for the INFM.

1.5. FRAMES Fails to Account for Key Variables

The Forestry Corporation's FRAMES is designed to undertake assessments at a regional level and fails to adequately account for the degraded state of many forests, including the current and future loss of resources in the 2019/20 wildfires, areas of failed regeneration due to problems like suppression of regrowth by lantana invasion, death of mature trees and loss of future yields due to Bell Miner Associated Dieback, and the increasing loss of trees due to droughts and heatwaves. The failures to accommodate these resource losses result in over estimates of sustainable yields. If there is an intent to account for the environment in INFM's concept of "sustainable" then there is also an overdue need to improve protections for threatened species, particularly in response to the 2019/20 wildfires.

1.5.1. Failure to Account for the impacts of the 2019/20 Wildfires on timber resources

The 2019/20 wildfires burnt through half the loggable areas of State Forests in north-east NSW. Based on their 0.85ha a sample of one 2016 burn class in the southern forests and mapping of fire intensity, and without remeasuring any of their 1821 active plots on the north coast, the Forestry Corporation estimates are there has been a loss of around 10% of sawlogs and 25% of smaller trees when averaged across the north coast State Forests. While the estimated loss of so many existing and future sawlogs could be expected to have significant resource impacts, the estimates are that that there will only be a 4% reduction in high quality sawlogs from the north coast over the next decade and only a 1% reduction over the next century. Based on this superficial and unbelievable assessment the NSW Government signed new Wood Supply Agreements in 2022 to extend the Wood Supply Agreements due to expire in 2023 until 2028, at the same volumes. The Forestry Corporation have also failed to undertake their last 5 year FRAMES Actual vs Predicted Harvest Reconciliation for 2019/2024. The reality is that since the 2019/20 wildfires there has been a

44% reduction in actual yields. Before any decisions are made about the application of sustainable yields to underpin the INFM there first needs to be a genuine and comprehensive assessment of the impact of the 2019/20 wildfires on resources.

The Explanatory Statement states: *The baseline harvest level, and the modified and unmodified sustainable yield, must be revised at 5-year intervals and after major disturbance events such as wildfires.* The Forestry Corporation did undertake a review after the 2019/20 wildfires, though it was superficial and grossly understated the impacts on resources, as identified in section 1.6.

The 2014 remodelled volumes have underpinned all subsequent yield assessments, the latest of which is the Forestry Corporation report '2019–20 Wildfires, NSW Coastal Hardwood Forests Sustainable Yield Review' , which undertakes a preliminary desktop review of the likely impacts of the Black Summer wildfires on timber resources. They identify that within the North Coast RFA region, 49 per cent of the native forest area available for harvesting (referred to as net harvestable area or NHA) was impacted by fire. It is noted that "*There are 1821 active plots used for native forest modelling on the North Coast. … 19 per cent of the active plots in the region were impacted by a hot fire (RAFIT Class 4), and 17 per cent by crown fire (RAFIT Class 5)*".

For their review the Forestry Corporation did not remeasure any of their north coast plots. Instead, they relied on a token 17x0.05-hectare plots from a 2016 Class 5 fire in the Eden Region. A 0.85ha a sample of one burn class in the southern forests cannot be considered to have any credibility for the Eden region, let alone be considered representative of the 424,200 ha of the very different north coast forests assessed.

The Forestry Corporation estimated that there has been a significant loss of trees across at least a third of the north coast's State Forests (north from Gosford), with a loss of 10-50% of large sawlog sized trees over 30 cm diameter at breast height, and 50-100% of smaller trees. Averaged across the north coast State Forests, the Forestry Corporation estimate there has been a loss of around 10% of sawlogs and 25% of smaller trees. North from Coffs Harbour these losses increase to 15% of sawlogs and 35% of smaller trees.

It is bewildering how the Forestry Corporation can conclude from this data that there will only be a 4% reduction in high quality sawlogs from the north coast over the next decade and only a 1% reduction over the next century. And it is shocking that the NSW Government relied upon this simplistic review, which builds on the unbelievable doubling of yield estimates in 2014, to sign new Wood Supply Agreements in 2022 to extend the Wood Supply Agreements due to expire in 2023 until 2028, at the same volumes.

It is astounding that six years after the fires the Forestry Corporation tell us they have not completed remeasuring of their 659 field plots within the heavily burnt forests to obtain real data on the fire impacts so that they can more accurately quantify impacts and future yields. The Forestry Corporation have also failed to undertake their last 5 year FRAMES Actual vs Predicted Harvest Reconciliation for 2019/2024, the post fire period (Section 1.3).

The Forestry Corporation's 2024 Sustainability Report, and 2024/25 Biomaterial report identify that since the fires there has been a 44% reduction in actual yields, resulting in a 60% reduction in predicted yields (Section 1.6). Though claims of long-term predicted sustainable yields appear to have increased since the fires (Section 1.4).

1.5.2. Failure to account for the overdue need to improve logging protocols

As practiced, logging of north-east NSW's forests is not sustainable. Since 2014 the over-riding objective has been to maintain timber commitments to industry. To increase timber volumes the 2018 revision of the Coastal Integrated Forestry Operations Approval (CIFOA) increased logging intensity, removed most protections for mature trees, removed most

species-specific prescriptions, reduced riparian buffers, and over-rode expert advice. Even after this, it was claimed that sustainable yields could not be met and that therefore protected oldgrowth would have to be opened up for logging. Logging of high quality sawlogs then proceeded in excess of commitments. As an example of FRAMES' adaptability, when the idea of logging oldgrowth was later dropped, the claimed yield shortfall also disappeared. The clear imperative since the adoption of the CIFOA has been that any changes must not have a significant impact on timber. The 2019/20 wildfires impacted half north-east NSW's State Forests and had significant environmental impacts that should have resulted in widespread improvements in species protections. The only significant change were improvements for Greater Gliders, which the Forestry Corporation claimed would result in significant reductions in sustainable yields, though these do not appear to have been accounted for in current estimates. The five year reviews of the 2018 Regional Forest Agreement and CIFOA should have been undertaken in 2023 and so are overdue, with foreshadowed changes and the need to improve protection for threatened species, the sustainable yield needs to be revised to accommodate overdue changes. This has been made more apparent by the decision to remove the RFA exemption from the EPBC Act and apply National Environmental Standards to logging, hopefully over-riding NSW's prohibition on increasing needed protections for nationally threatened species if it has an impact on resources. It is irresponsible for the INFM to attempt to lock in current standards as the benchmark when these are overdue for review and improvements.

Logging of native forests is not sustainable as it reduces biomass and carbon storage, removes mature trees and their abundance of nectar and browse essential for many species, removes and kills remaining hollow-bearing trees that provide essential homes for a plethora of NSW's species, increases fire threat and intensity, reduces stream flows, promotes weeds such as lantana, causes Bell Miner Associated Dieback and ecosystem collapse, reduces streamflows, degrades soils and increases erosion and stream pollution. The Forestry Corporation practices Ecologically Sustainable Forest Management in name only. It is repeatedly mentioned, though in practice is only a consideration, with ecological requirements systematically over-ridden by the requirement that protections for threatened species have no impact on timber yields. Changing logging prescriptions to account for the immense impact of the 2019/20 wildfires was met with obfuscation by the Forestry Corporation, ignoring of expert recommendations, political suppression of reports, and ended with continuation of business as usual, with at the best token voluntary measures in some areas.

When the Government was remaking the Coastal Integrated Forestry Approval (CIFOA) the claim was (EPA 2014):

> *The objectives of the coastal IFOAs remake are to reduce the costs of implementation and compliance and to improve the clarity and enforceability of IFOA conditions. The NSW Government has committed to delivering these objectives with no net change to wood supply and maintenance of environmental values.*

The Natural Resources Commission (NRC 2016) was requested to resolve prescriptions over which the EPA and Forestry Corporation were unable to reach agreement, often siding with the Forestry Corporation on the grounds of resources impacts, and concluding:

> *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.*

In practice the over-riding requirement was to have no impact on committed timber volumes, when combined with cost reductions and an intent to simplify prescriptions, this meant that logging intensity was increased, protections for most mature trees were removed, most species-specific

prescriptions were removed, and riparian buffers reduced. The outcome was not Ecologically Sustainable Forest Management.

There were a variety of issues that the agencies could not agree on (NRC 2016), which the NRC was requested to resolve, with the NRC mostly siding with the Forestry Corporation against the EPA based on resource shortfalls, including:

- reductions in the minimum area of landscape exclusions within logging areas
- reductions in the minimum numbers and size of trees to be retained for Koalas
- increases in the minimum sizes of "giant trees" to be retained
- increases in the size of patches allowed for clearfelling
- reductions in minimum basal area retention under "selective" logging

Even then the NRC (2016) claimed that "*it is not possible to meet the Government's commitments around both environmental values and wood supply*" maintaining there would be a shortfall in commitments from north-east NSW of 7,600 to 8,600 m^3/yr of High Quality Logs (HQL) due to protections for Endangered Ecological Communities (EECs) and Koalas. To make up this claimed shortfall there were a variety of options considered, such as allowing logging of EECs, cable logging on slopes over 30° and opening up High Conservation Value (HCV) Oldgrowth and rainforest protected in the informal reserve system on State Forests for logging. In the end the NRC (2018) *"was asked to provide supplementary advice on whether the NSW Government could remap and rezone old growth forest and rainforest to offset the impact to wood supply associated with its previous advice",* identifying that this would require an initial 14,600 ha of oldgrowth to be remapped and rezoned. Following the 2019/20 bushfires the NSW Government decided not to proceed.

As clearly illustrated by the "INDUFOR: A21-22109 NRC Wood Supply. Figure 4-1: Key HQ supply event overview (North Coast)" in Section 1.2, there wasn't really a supply shortfall, with yields of high quality logs in 2015/16, 2016/17, 2017/18 and 2018/19 (before the fires), well above both allocations and estimated sustainable yields. Pugh (2018) appears to have been correct in claiming this claimed shortfall was fraudulent. If it was not fraudulent then there remains an unmet need to reduce claimed sustainable yields.

This requirement to have no significant impact on timber supply continues to dominate all decisions on the CIFOA. In the estimates hearing for Planning and Environment on 29 August 2024 Chief Executive Officer, NSW Environment Protection Authority, Tony Chappel stated:

> *We will continue to review and adapt each of those conditions to try and improve them as much as possible, within the constraints of the balance we are required to take. Perhaps I didn't clarify it today but, in contrast to the other legislation the EPA operates under that allows us to integrate environmental, social and economic issues, the Forestry Act requires us explicitly to balance environmental protection with the economic and contractual obligations that the corporation has. Within those constraints, we work very hard to be rigorous and independent.*

The assessment of the 2019/20 fires by the University of Wollongong (Bradstock *et. al.* 2021) 'Risks to the NSW Coastal Integrated Forestry Operations Approvals Posed by the 2019/2020 Fire Season and Beyond', shows that the vulnerability of ecosystems and species has been significantly elevated, which will be compounded by likely future changes in fire regimes and species distributions. This should trigger an improvement in the protection afforded by prescriptions at the 5 year review.

Those species identified by Bradstock *et. al. (*2021) most likely to suffer significant declines in predicted suitable habitat under future climate scenarios by 2030, and known to be vulnerable to increased fire, include: Eastern Pygmy-possum, Spotted-tailed Quoll, Yellow-bellied Glider, White-footed Dunnart, Red-legged Pademelon, Glossy Black-Cockatoo, Powerful Owl, Masked Owl, Sooty

Owl, Eastern False Pipistrelle, Golden-tipped Bat, Greater Broad-nosed Bat, Stuttering Frog, and Giant Barred Frog. Note Koala was unable to be modelled. The report states:

> *These changes to fire regimes, wrought by the 2019/20 fires, were likely to pose significant risks to the CIFOA objectives and outcomes. Importantly the magnitude of the fires and their effect on disturbance regimes have placed the CIFOA, generally, in a highly vulnerable state where risk may be maintained at an elevated level into the immediate future. In particular, the integrity of riparian buffers, regeneration, hollows and carbon stocks may have been negatively directly affected by the 2019/20 fires and resultant changes to disturbance regimes.*
>
> *Indicators of plant biodiversity responses were significantly shifted into a vulnerable state (circa 50 percent of the area of National Parks estate and State Forests), along with a small increase in the proportion of area of most vegetation formations that were deemed to be too frequently burnt. Notably, a large proportion of rainforest assessed was shifted into this state (> 50 percent). Predicted suitable habitat for 25 threatened vertebrate species (including 17 focal species listed for the CIFOA) was substantially burnt by the 2019/20 fires (up to 62 percent) and resultant shifts in fire regimes for the bulk of these species may constitute a significant risk to key habitat elements such as hollows, nesting and food resources. A substantial proportion (about 15 percent) of a sample of major catchments across the CIFOA was burned in 2019/20. The magnitude of burning and severity patterns, coupled with well above average rainfall post-fire throughout 2020 into early 2021were likely to have resulted in significant erosion, transport and deposition of soil, ash and other material into waterways and estuaries. Resultant compromised water quality was likely to have posed significant risk to aquatic biodiversity.*
>
> *Increases in adverse fire weather were predicted across CIFOA using the NSW and ACT Regional Climate Modelling (NARCliM) ensemble, in both the near (2020 to 2039) and far (2060 to 2079) future. Such shifts in fire weather were likely to result in increased area burned by wildfires in sample case studies corresponding to the range of CIFOA regions across the domain of the CIFOA. Such trends potentially elevate risks to CIFOA objectives and outcomes, while capacity to mitigate these risks may be constrained. Changes in projected suitable habitat for the range of threatened vertebrate species may either elevate or buffer risks sustained by changes in future fire regimes.*

The five year reviews of the 2018 Regional Forest Agreement and CIFOA should have been undertaken in 2023, so they are overdue. There have been a variety of needed improvements to the CIFOA logging prescriptions foreshadowed by the EPA and NRC that are awaiting implementation when the overdue review is undertaken, though extensive changes to improve protection for threatened species are required. The overdue changes in protocols are likely to require additional reductions in yields. Given that these reviews are overdue, they need to be implemented and accounted for now when estimating sustainable yields.

Community pressure resulted in increased protection for a newly (in NSW) listed threatened species in 2024 that resulted in a significant impact on yields that has not yet been accounted for in sustainable yield estimates. Yields from native State Forests have been affected by the introduction of the 2024 ‘Site-specific biodiversity condition for Greater Gliders in the Coastal IFOA region’, which simply attempted to better implement the existing CIFOA requirement for the Forestry Corporation to protect Greater Glider dens. This identified a high and lower Greater Glider Zone. In the high zone an additional 6 trees per ha >80 cm dbh (diameter at breast height) are required to be retained, and in the lower zone 4 per ha >50 cm dbh. The Forestry Corporation’s (Jan 2024) advice to the EPA was that retention of 6 trees per ha >80 cm dbh would result in 3-14% reductions in yields in various north coast zones, and 4 per ha >50 cm dbh would result in 0-7% reductions. Since that estimate they have been required to look for and protect 50m around dens and 25m around records of Greater Gliders, increasing resource impacts. While the Forestry Corporation find

few den trees, citizen scientists are finding numerous dens in some forests. While final estimates of impacts on resources have not been seen, it is evident they have not been incorporated into sustainable yield estimates, and will have a significant impact on estimates when included.

The Federal Government has resolved that as from 1 July 2027 the RFA's exemption from Federal environmental laws will end, and forestry operations in northeast NSW will need to comply with *the* Environment Protection and Biodiversity Conservation Act 1999 *(EPBC Act).* Logging will need to comply with new, legally binding National Environmental Standards, and prescriptions will need to be strengthened if significant impacts on Matters of National Environmental Significance (MNES) are likely under the current rules, such as on threatened species habitat.

The decisions to refuse to improve protections for federal species because of timber commitments, and the limited response since the 2019/20 wildfires and the uplisting of many nationally threatened species, has resulted in a pent-up need to reduce timber yields to provide improved protections for numerous nationally threatened species.

Ward *et. al.* (2024) identified that 29 million ha (54%) of NSW's pre-1788 native forest and woodland vegetation has been cleared, with 9 million ha of the remaining 25 million ha estimated to be degraded. They identified there are 269 forest-dependent nationally (EPBC Act) listed threatened taxa in NSW. An estimated 435,000 ha of State Forests was logged from 2000-2022, affecting 150 EPBC taxa, 13 of which are listed as Critically Endangered, 51 as endangered, and 86 as vulnerable. The application of National Environmental Standards to forestry is likely to result in a significant reduction in timber yields.

It is irresponsible for the INFM to attempt to lock in current standards as the benchmark when these are overdue for review and improvements.

1.5.3. Failure to account for the loss of resources due to lantana and BMAD

Logging is spreading the invasive weed lantana throughout the forests of north-east NSW. With each logging operation the prevalence of lantana increases, greatly hindering eucalypt regeneration and reducing future yields. At the worst, Bell Miner Associated Dieback (BMAD) develops, resulting in tens of thousands of hectares with dense lantana understories and scattered overstories of dead and dying trees. This has been identified as a growing problem since the 1940's, yet the Forestry Corporation still refuse to recognise its association with logging, account for its extent, or adapt their practices to reduce the risk. Despite BMAD having a significant impact on resources it is not an input to FRAMES and estimates of sustainable yields are blind to its occurrence. Government agencies refuse to address this problem. This is particularly concerning as it appears to be rapidly expanding as trees become increasingly stressed due to the increasing frequency and intensity of droughts.

Lantana *Lantana camara* is regarded as one of the worst invasive weeds in Australia, it is recognised as a *Weed of National Significance,* declared a Noxious Weed under the *NSW Noxious Weeds Act 1993* and its establishment and spread identified as a Key Threatening Process. It is recognised as a disturbance adapted species, invading logged forests and increasing with repeated logging. It blocks native regrowth (including timber species), out competes and smothers native understorey species, renders some habitats unsuitable for resident animals, hinders dispersal, increases flammability and can lead to ecosystem collapse. It is a major, widespread and persistent problem across the forests of north-east NSW, and while the activities of the Forestry Corporation extend and compound infestations, they do extremely little to remedy their impacts or control infestations.

The Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) was identified as a key threatening process by the NSW Scientific Committee (2006). They identify Lantana can have a range of impacts on natural ecosystems, it *"may change soil microhabitat through shading, self-mulching, and altered water and nutrient balances", "may adversely affect the richness of some soil faunal assemblages", "inhibit growth of at least some microorganisms",* can *"arrest vegetation succession for decades",* prevent the establishment of *"eucalypt seedlings",* is *"thought to be allelopathic, i.e. able to inhibit or suppress by chemical means the germination and/or growth of at least some competing plant species",* can cause *"a large (at least 70%) decline in inferred recruitment (number of native tree and shrub saplings present)",* and *"adversely affects the ability of Koalas to move between trees".*

From their literature review Silver and Carnegie (2017) observed that lantana can become self-perpetuating, with impacts increasing over time:

> *Lantana can take better advantage of increased resources (nutrients) following disturbance, thus accumulating more biomass and further suppressing native shrub species (Gentle and Duggin, 1998). Gooden et al. (2009b) described a change in vegetation structure whereby increasing invasion of lantana results in a reduction in native species richness, especially of shrub and tree species, leading to a change from tall open forest to an understorey dominated by lantana. … Invasion by woody weeds, such as lantana, affects native vegetation regeneration, ultimately affecting species diversity, including of understorey, mid-storey and canopy species, thus perpetuating a dense understorey (Gooden et al. 2009a, b; Cummings et al. 2007)*

Day *et. al.* (2003) note:

> *Where wet sclerophyll forests and rainforests have been disturbed through logging, gaps are created; this allows lantana to encroach on the forests. Further logging aggravates the condition and allows the lantana to spread or become thicker (Waterhouse 1970). At some sites, lantana infestations have been so persistent that they have completely stalled the regeneration of rainforest for three decades (Lamb 1991). …*

There is no mapping of areas of forest where regeneration has failed, or been significantly impaired, by lantana invasion or for other reasons. Forestry Corporation's estimates of sustainable yields are blind to areas of failed regeneration due to the invasion of lantana.

Dense infestations of lantana (and sometimes other dense understories) can create habitat for colonies of Bell Miners which aggressively mob predators and perceived competitors and drive them from their territories. This initiates a process of ecosystem collapse whereby populations of sap-sucking psyllids proliferate and drain the life out of the eucalypts, resulting in extensive areas of dead and dying eucalypts over a dense understorey of lantana. This is called Bell Miner Associated Dieback (BMAD). The basic process for initiating Bell Miner Associated Dieback (BMAD) is:

- Logging removes canopy and creates soil disturbance
- lantana invades and takes over understorey
- Bell Miners thrive in altered habitat and aggressively exclude most other species
- Bell Miners 'farm' sap sucking psyllids that feed on eucalypt leaves,
- populations of psyllids explode, sucking the life out of eucalypts
- eucalypts sicken and die, often over decades
- BMAD

The seriousness of BMAD is acknowledged in the NSW & CoA (2009) 5 year review of the RFA:

> *The resultant cycle of tree stress commonly causes the eventual death of forest stands, and serious ecosystem decline. In NSW the potential impact of BMAD-induced native vegetation dieback represents a serious threat to sclerophyll forest communities, particularly wet sclerophyll forests, from Queensland to the Victorian border. The forests most susceptible to dieback are those dominated by Dunn's white gum (Eucalyptus dunnii), Sydney blue gum (E.*

saligna), flooded gum (E. grandis) and grey ironbark (E. siderophloia). There is also evidence that some normally nonsusceptible dry sclerophyll types may be affected when dieback is extreme. Current estimates place the potential at-risk areas at a minimum of approximately two and a half million hectares across both public and private land tenures in NSW.

BMAD is emerging as a pressing forest management issue in both the UNE and LNE regions. The potential impacts include:

- *degradation of sclerophyll forest ecosystems across the UNE and LNE*
- *reduction in diversity and abundance of threatened flora and fauna species including Dunn's white gum and rufous bettong*
- *increased weed invasion and associated displacement of native forest species.*

The NSW Scientific Committee's (2008) final determination for listing 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners' as a Key Threatening Process notes that

Broad-scale canopy dieback associated with psyllids and Bell Miners usually occurs in disturbed landscapes, and involves interactions between habitat fragmentation, logging, nutrient enrichment, altered fire regimes and weed-invasion (Wardell-Johnson et al. 2006). ... Over-abundant psyllid populations and Bell Miner colonies tend to be initiated in sites with high soil moisture and suitable tree species where tree canopy cover has been reduced by 35 – 65 % and which contain a dense understorey, often of Lantana camara.

The Forestry Commission recognised dieback associated with psyllids as a significant problem in north-east NSW in the 1940s (Campbell and Moore 1943). Stands of Sydney Blue Gum were reported as dying during the period 1949 to 1958, "*the increasing numbers of deaths reaching economic significance toward the end of that period*" (Moore 1959). The two areas assessed by Moore showed 55% and 59% of trees as dead or expected to die. Moore (1959) hypothesised that "*the abnormal rainfall adversely affected the physiology of Eucalyptus and other species generally, making them susceptible to heavy attack by psyllids*." Bird *et. al.* (1975) report Moore (1962) as finding that "*there were more than 150 separate occurrences of variable extent up to 1,500 ha*."

In 1995 the Forestry Corporation (Stone *et. al.* 1995) identified significant areas of dieback in the Morisset, Bulahdelah, Gloucester, Taree, Wauchope, Kempsey, Walcha and Urbenville Districts. Stone *et. al.* (1995) found that the affected areas range in size from 1 ha to nearly 100 hectares, with the Sydney Blue Gum league of forest types (FT no's 46, 49, 53 and 54) most affected and the grey ironbark/grey gum league (FT 60) second most affected.

Stone *et. al.* (1995) notes *"More recently, District staff have reported that affected areas are increasing in size and that previously unaffected areas are developing symptoms."* Stone *et. al.* (1995) concluded that:

"A possible long-term explanation of why the dieback problem may be increasing, is that the proportion of moist sclerophyll forest being exposed to selective logging is increasing throughout the State.

Jurskis and Turner (2002) emphasise the extent of the problem in NSW:

In Bega Valley Shire, on the south coast of New South Wales, every near-coastal drainage system contains bellbird dieback (Appendix 1). Personal observations over several years indicate that dieback areas are expanding.... Incidental observations suggest that the problem extends along the entire New South Wales coast.

Jurskis and Walmsley (2012) elaborate on the parlous state of forests on the south coast:

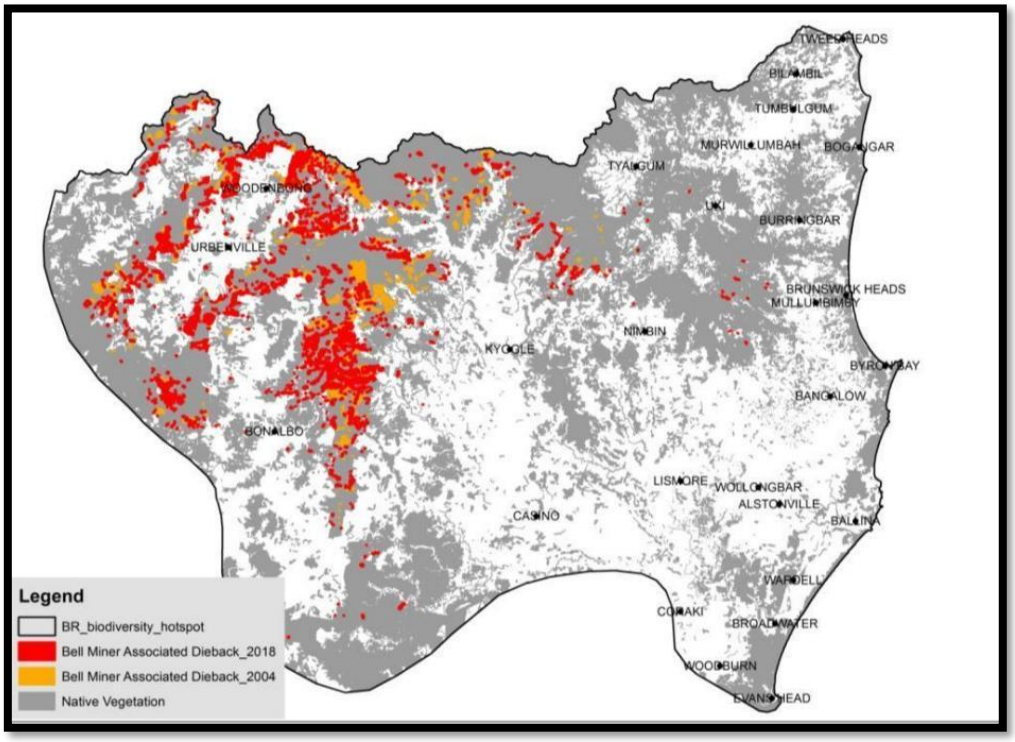
In 2001 Jurskis and Turner (2002 Appendix 1) recorded observations of eucalypt decline in each coastal drainage system within Bega Valley Shire. Six hours of helicopter survey in 2002 identified 10,000 hectares of declining forest in three coastal regions. In the Eden Region, Jaggers (2004) estimated that roughly 20% of about a half a million hectares of

forest appeared to be declining and a further 10% consisted of types that are prone to decline, in young stands that were below the age when decline becomes apparent. Limited sampling in the Batemans Bay Region during a drought in 2002 indicated that about 28% of State forests were stressed (Forests NSW unpublished data).

In 2004 State Forests (Carnegie 2004) used a helicopter to sketch-map almost 20,000 hectares of the approximately 100,000 hectares of apparently susceptible forest types in the Urbenville Management Area (upper Clarence valley) as being affected by dieback attributed to BMAD.

In 2005 (Stone *et.al.* 2005) used high resolution multi-spectral imagery (DMSI) to map BMAD across 30,000ha of the Richmond Range. For the 23,700 ha of potentially susceptible forest, Stone *et.al*. (2005) identified 37% with 'moderately to severely BMAD affected trees', 25% 'mildly affected (slightly stressed) tree crowns', and 38% with 'healthy tree crowns'.

The helicopter to sketch-map process was repeated by Silver and Carnegie 2017, who mapped 44,777ha of BMAD over some 1,250,000 hectares of forest north from Taree, comprised of 17,005ha on State Forest,



Forestry's mapping of BMAD in the Border Ranges region. The map shows the area mapped in 2018 (red) with the additional areas mapped in 2004 (orange). It is considered that both need to be adopted to obtain a realistic assessment of BMAD distribution, though even then the mapping misses several areas known to be affected and does not recognise those areas in the early stages of BMAD (from Pugh 2018).

In their 2016 assessment for the CIFOA, the Natural Resources Commission (NRC 2016) recognised that BMAD was a significant problem:

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]

Despite this long term recognition of the problems of lantana suppressing regrowth and BMAD causing ecosystem collapse, and the scale of the problem, there has been no attempt to adjust sustainable yields to accommodate necessary yield reductions, or the likely consequences of excluding logging from BMAD affected or susceptible forests to arrest further forest degradation. The pretence is that these problems do not exist.

The exception was for some 11,006 ha of the worst BMAD affected forests in Donaldson, Mount Lindsay, Unumgar, Bald Knob and Woodenbong State Forests, which were excluded from the NRC's (2016) sustainable yield assessments, with their 'Advice on Coastal Integrated Forestry Operations Approval remake' identifying:

> *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 were considered impractical to manage for commercial purposes given reductions in net harvest area and areas affected by Bell Miner Associated Dieback.*

It is not apparent that these reductions have been incorporated into the Forestry Corporation's subsequent claimed sustainable yields as they have since increased. There are large areas of other BMAD affected and susceptible forests that need to be accounted for in sustainable yield estimates.

NRC (2016) recognised *"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."*

Despite recognising "*The over-abundance of psyllids that causes bell miner associated dieback (BMAD) poses the most significant dieback threat to eucalypt forests along the eastern seaboard of New South Wales*", the only project since funded by NRC relating to BMAD was "Characterising the (a)biotic soil factors associated with bell miner associated dieback in eastern NSW". This has been looked at before and is not the priority issue. The priority needs to be exploring the reasons for lantana infestations and appropriate management to reduce lantana and rehabilitate affected forests. When, at a public meeting, I questioned the NRC over their failure assess the principal causative factors of logging and lantana their response was to the effect that the timber industry was too important. What you don't know won't hurt you.

See Section 2.2. for more information on BMAD. NEFA have also undertaken detailed reviews of BMAD, see Our Forests are Dying … Logging Dieback.

1.5.4. Failure to account for the growing impacts of climate change on tree mortalities and species survival

Climate change is having an accelerating impact on native forests, though has yet to be considered or accounted for in either the CIFOA protocols or Forestry Corporation's estimates of sustainable yields. Climate change is already increasing tree mortality due to the increasing frequency and intensity of heatwaves and drought. This needs to be accounted for when identifying current and future yields, and carbon stores. The reliance on estimates of sustainable yields that ignore the need for increased protection for increasingly threatened species, and the growing impacts on tree health and survival, is a fundamental problem with the Forestry Corporation's estimates and predictions. For the INFM to ignore and not make allowances for these impacts is contradictory.

The NRC (2016) recognises the future risks to forests provided by 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]

...
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]

Despite this recognition of the risk, no attempt has been made to factor in a buffer for yield forecasts to account for current and potential future growth and yield declines due to climate change. Similarly, despite the recognition that climate change is likely to cause a significant decline in a multitude of species (i.e. Bradstock *et. al.* 2021) the logging rules have not been changed to account for this.

As climate change gathers momentum trees are increasingly dying from drought and heat related problems. This rise in background mortality has been accompanied by more frequent observations of large-scale mortality pulses, with abundant examples of drought and heat-induced mortality events reported in recent decades.

Australia's forests and woodlands are strongly influenced by large climatic variability and recurring droughts. Extreme droughts can cause widespread tree death in agricultural lands, woodlands and forests (Fensham and Fairfax 2007, Fensham et. al 2009, Mitchell et.al. 2014, Ross and Brack 2015). Mitchell *et.al.* (2014) identify that a wide range of studies have implicated temperature increases as amplifying moisture deficit, heat stress, and the impacts of biotic agents on tree species.

Within trees hydraulic failure (desiccation of water conducting tissues within the plant) and carbon starvation (depletion of available carbohydrates and failure to maintain defences against biotic agents) have been singled out as causes of tree death (Mitchell *et.al.* 2013, 2014). Mitchell *et.al.* (2014) found that periods of heat stress during droughts were likely to have been pivotal in initiating tree death. Species have been found to have differing susceptibilities (Calvert 2001, Fensham and Fairfax 2007, Mitchell *et.al.* 2013, Ross and Brack 2015, Lynch *et. al.* 2018). Fensham *et. al* (2009) also found trees at higher densities more vulnerable. In some cases, a drought event may simply be the coup-de-grace for a weakened stand of trees.

Episodes of widespread tree mortality in response to drought and/or heat stress have been observed across the globe in the past few decades. As noted by Anderegg *et. al.* (2016):

... the principal cause of drought induced tree death has been found to be the failure of a plant's vascular water transport system through embolism caused by air bubbles during high xylem tensions caused by low soil moisture and/or high atmospheric evaporative demand during drought, though there are numerous other contributing influences

The consequences of increasing temperatures and more erratic rainfall due to climate change are more frequent droughts, extreme temperatures and heatwaves. Steffen *et.al.* (2015) identify that by 2070 Sydney's average number of hot days (>35o) will increase from 3.4 to somewhere between 4.5-12 days per annum. As identified by Fensham *et. al* (2009):

A doubling in the frequency of severe droughts has been predicted under future climate scenarios. The physiological effect of drought on trees may well be enhanced by rising temperatures, ... Enhanced drought conditions will intensify tree-death which is likely to be a symptom of global climate change.

Mitchell *et.al.* (2014) warn:

> *Changes in the frequency of extreme drought under the scenario presented here and elsewhere ... may also reduce vegetation resilience through time if a complete recovery of plant vasculature, carbohydrate status and defensive mechanisms is not realized in the intervening years between drought events. A small number of predicted droughts fell outside the margins of the observed record and are perhaps indicative of "mega-drought" conditions, characterized by higher intensities and longer durations than have ever been observed in the historic record ... If realized, these climate events may generate unprecedented, extensive die-off that could induce long-term shifts in vegetation structure and function.*

Mitchell *et.al.* (2014) consider their findings suggests that "*regardless of regional climatic differences, tree populations among many species in Australian ecosystems tolerate at least 98% of the climatic conditions they experience and become vulnerable to drought stress events beyond this common climatic threshold*", noting "*the likelihood of drought events crossing these thresholds and inducing mortality will increase significantly under future climate scenarios for many forest and woodland ecosystems globally*".

The reality is that climate-related tree deaths are already increasing and affecting timber yields. An American study found forests are shifting to communities that can cope with greater average water stress as well as more variability in water stress, primarily through the death of less hardy tree species (Trugman *et. al.* 2020).

In Australia, Lu *et. al.* (2026) found a consistent trend of increasing tree mortality over the past eight decades, for warm-temperate forests finding the overall temporal trend, quantified as the annual fractional change in mortality rate, was increases of 0.019 yr^{-1} , while mean background mortality rates averaged around 0.01 yr^{-1}. They conclude "*The widespread demographic shifts documented in our study demonstrate that climate change is imposing physiological stress even on historically resilient forests".*

Regarding the Australian Carbon Credit Units scheme, Lu *et. al.* (2026) consider their assessments of tree mortality will improve carbon accounting:

> *However, the carbon accounting models underpinning these programmes remain highly uncertain due to incomplete and temporally inconsistent data on tree mortality. Our results indicate that ecosystem models failing to simulate increasing tree mortality rates will overestimate forest carbon sink strength, potentially leading to the misallocation of carbon credits and undermining climate mitigation efforts. Our assessment of historical demographic change here could benchmark existing forest biomass estimates to better capture transient carbon storage dynamics in terrestrial ecosystems.*

1.6. Determining the Modified Sustainable Yield

For north-east NSW the INFM proposes averaging yields over a 10 year period (excluding the 3 years after the fires), which (without accounting for firewood) gives predicted volumes 550,390 m^3/annum and actual volumes of 325,970 m^3/annum, or 59.2% of predicted yields. The modified sustainable yield would be 325,970 m^3/annum, which is no better than a guestimate. Since the 2019/20 wildfires there has been a 44% reduction in actual yields of all products from north-east NSW, with average yields in the past 4 years 221,486 m3/annum, only 40% of estimated sustainable yields and 68% of the modified sustainable yield. This leaves it open for the proponent to claim major yield reductions without actually doing so. The discrepancies between actual and predicted is greatest for pulp/other, and these categories are predicted to become increasingly important over the next 15 years while high quality logs decline, this makes it easy to claim major phantom yield reductions in the pulp/other category (which is also the most polluting) without having to reduce actual yields.

It is misleading to suggest the FullCAM plots are somehow going to improve estimates when they are simplistic reporting based on the major vegetation group, the harvesting type, and the estimated average age of trees in the plot based on logging history, with no on-ground measurements or consideration of the structural variables most significant for yields. The unaccounted variability between forests is demonstrated by the variations in yields per hectare and basal area retention.

The INFM identifies:

Harvesting levels in the baseline scenario are calculated as the lower of the following.

(a) The latest applicable modified sustainable yield estimate, calculated as:

i) for projects where there is a sufficient correlation between the sustainable yield and log production during the baseline period (R2≥0.7), the estimated sustainable yield multiplied by the average log production to sustainable yield ratio over the baseline period; and

ii) for projects where there is not a sufficient correlation between the sustainable yield and log production during the baseline period (R2<0.7), either:

iii) if the log production to sustainable yield ratio over the baseline period was ≥0.8 in all years, the estimated sustainable yield multiplied by 80%; or

iv) if the log production to sustainable yield ratio over the baseline period was <0.8 in any year, the estimated sustainable yield multiplied by the lower of the average log production to sustainable yield ratio over the baseline period or 60%.

(b) The last sustainable yield estimate published by the responsible government agency prior to 1 July 2024.

Further to this the INFM identifies:

The sustainable yield that is used for these purposes must be confined to the applicable estimate of the wood yield of sawlogs (high and low quality sawlogs, veneer/peeler logs, and logs used to produce poles, piles and girders) and pulplogs only, excluding residues (e.g. firewood). For the avoidance of doubt, to the extent that the volume of wood extracted from an area is used to calculate net abatement during the project period (including leakage requirements) or relinquishment requirements during the permanence period, it must include all wood extracted from the forest area, including residues.

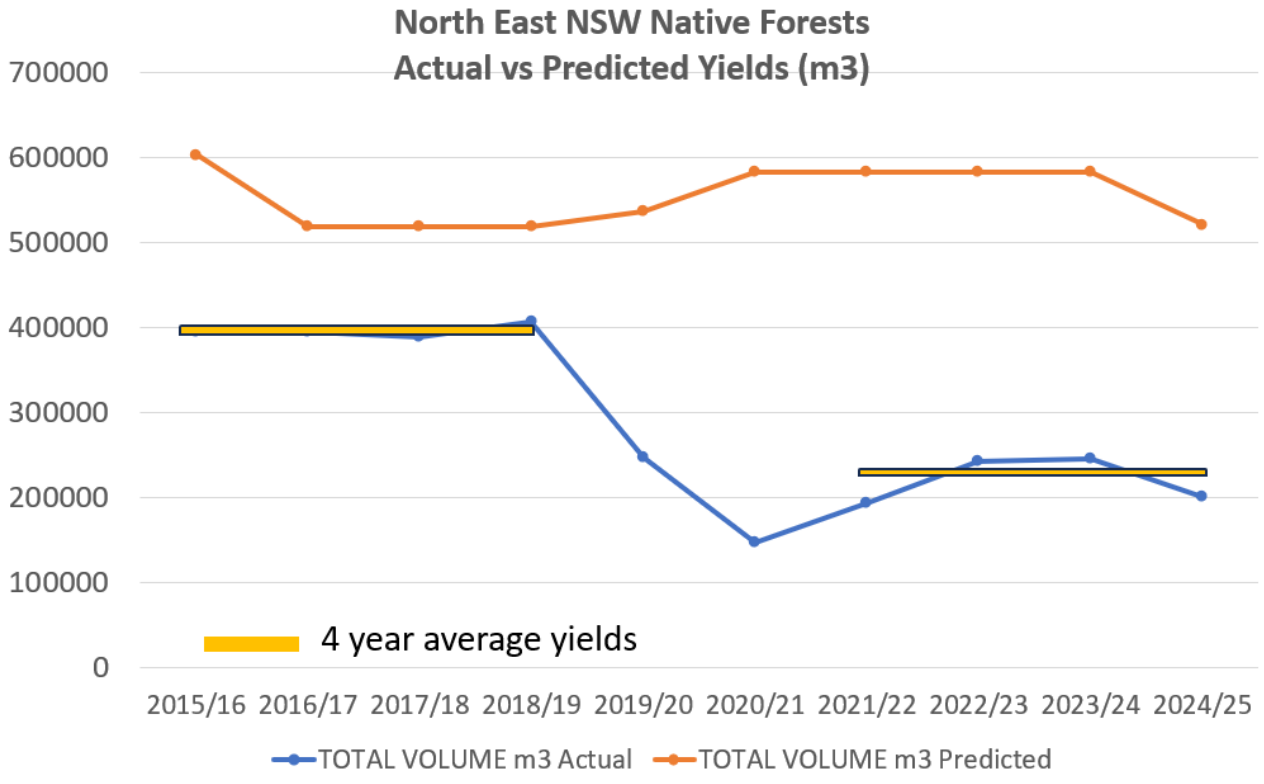
Data from Forestry Corporation (2024) Sustainability Report for north-east NSW.

Native Forest	*Large High Quality Sawlogs*		*Small High Quality Sawlogs*		*Low Quality Logs*		*Pulp/other*		*TOTAL VOLUME m3*	
	Actual	*Predicted*	*Actual*	*Predicted*	*Actual*	*Predicted*	*Actual*	*Predicted*	*Actual*	*Predicted*
2023/24	*98574*	*161130*	*45344*	*51310*	*73726*	*189110*	*28594*	*182260*	*246237*	*583810*
2022/23	*94427*	*161130*	*39302*	*51310*	*71249*	*189110*	*38651*	*182260*	*243629*	*583810*
2021/22	*76419*	*161130*	*28836*	*51310*	*53167*	*189110*	*35644*	*182260*	*194066*	*583810*
2020/21	*54211*	*161130*	*27485*	*51310*	*45903*	*189110*	*20070*	*182260*	*147669*	*583810*
2019/20	*99939*	*162280*	*34976*	*44280*	*86466*	*172190*	*26389*	*158890*	*247771*	*537640*
2018/19	*153003*	*162220*	*64669*	*64430*	*146145*	*170330*	*43783*	*122940*	*407600*	*519920*
2017/18	*149851*	*162220*	*65199*	*64430*	*140312*	*170330*	*34632*	*122940*	*389994*	*519920*
2016/17	*150683*	*162220*	*69724*	*64430*	*143141*	*170330*	*32330*	*122940*	*395878*	*519920*
2015/16	*143067*	*177220*	*66553*	*70860*	*158181*	*203830*	*28644*	*151720*	*396445*	*603630*
2014/15	*140957*	*177220*	*62823*	*70860*	*166618*	*203830*	*26669*	*151720*	*397068*	*603630*

To compare estimated sustainable yields with actual yields for north-east NSW, data from the Forestry Corporation (2024) Sustainability Report for north-east NSW was combined with data from the Forestry Corporation's 2024/25 Biomaterial Report. To make the data comparable volumes of Low Quality Logs and Pulp/other given as tonnes in the Biomaterial Report were converted to cubic metres (m^3) by multiplying by 1.2, also because of different classes all high quality logs were combined into a single class. Pulp logs are combined with "other" (including firewood) in the Sustainability Report, so firewood could not be differentiated, even though it is not counted under the method, resulting in the derived modified sustainable yield for north-east NSW being over-stated.

Comparison of claimed Sustainable Yields and Actual Yields from native State Forests in North East NSW for the past decade (includes data from the 2024/25 Biomaterial Report).

Native Forest	*TOTAL VOLUME m3*	
	Actual	*Predicted*
2015/16	*396445*	*603630*
2016/17	*395878*	*519920*
2017/18	*389994*	*519920*
2018/19	*407600*	*519920*
2019/20	*247771*	*537640*
2020/21	*147669*	*583810*
2021/22	*194066*	*583810*
2022/23	*243629*	*583810*
2023/24	*246237*	*583810*
2024/25	*202009*	*521720*

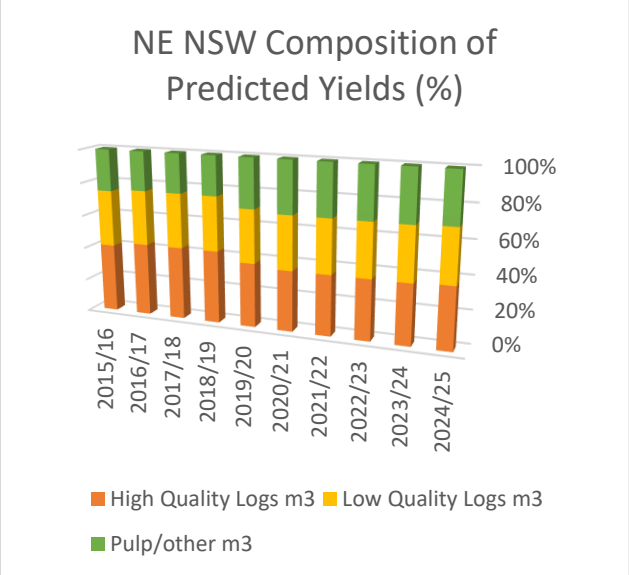


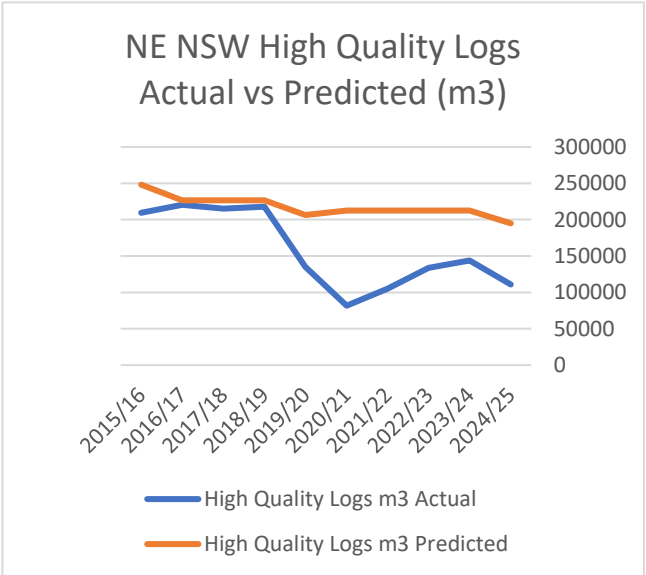
For northeast NSW, the predicted sustainable yield average annual volumes of all products over the past 10 years were 555,800 m^3/annum, though the actual yields were 287,130 m^3/annum, or 51.7% of predicted yields. With the allowable removal of three years because of the fires, the predicted volumes are 550,390 m^3/annum and actual volumes 325,970 m^3/annum, or 59.2% of predicted yields. So, under the proposed method it seems the modified sustainable yield would be 325,970 m^3/annum, which is no better than a guestimate. Given that over the past 4 years the average annual yield was 221,486 m^3/annum there is ample room to make major cuts to the modified sustainable yield without actually reducing logging.

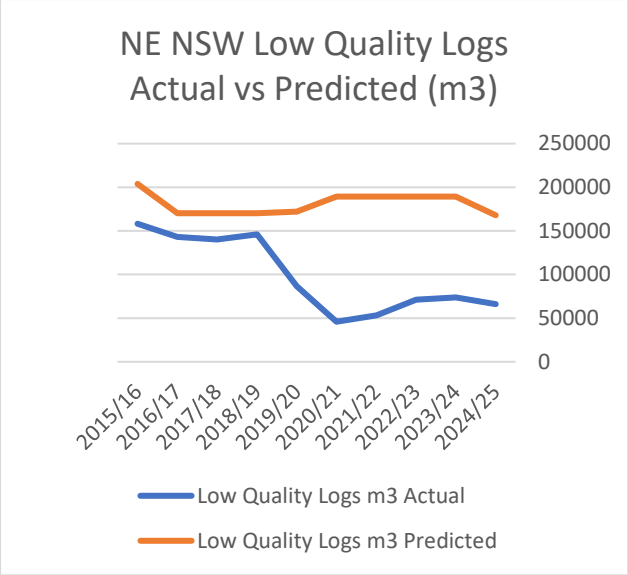
This approach masks the actual drop In yields since the 2019/20 wildfires. Over the four years 2015/16, 2016/17, 2017/18 and 2018/19 the average annual yield was 397,479 m^3/annum, and over the past four years 2021/22, 2022/23, 2023/24 and 2024/25 the average annual yield was 221,486 m^3/annum, a 44% reduction in actual yields. A yield of 221,486 m^3/annum is only 40% of predicted yields for that period, a 60% reduction. Given there has been long-enough since the wildfires for yields to recover, it is apparent that there has been a significant impact on yields that the Forestry Corporation is covering up (see Section 1.5.1). Yields since the fires may be the “new normal”. Even setting 221,486 m3/annum as a baseline can have no credibility because without an accurate post-fire assessment it is not known how sustainable this volume would be.

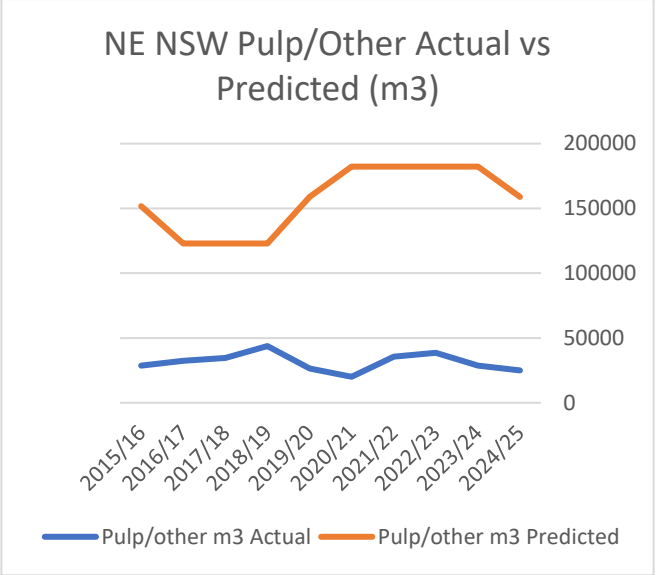
The most significant issue is that this current baseline is 32% less than the method’s guestimate, meaning that the proponents can claim a 32% reduction in logging without actually reducing yields.

The data show that pulplogs/other were predicted to make up an increasing proportion of the estimated sustainable yield over the past decade, though have been the worst preforming, in part due to the lack of a market in the Upper North East. Because any reductions are just based on volumes, with no consideration of products, there is a concern that the process could be further manipulated to proportionally focus any claimed reductions on pulplogs (which are also considered to immediately release their carbon), without any actual reduction in sawlogs.

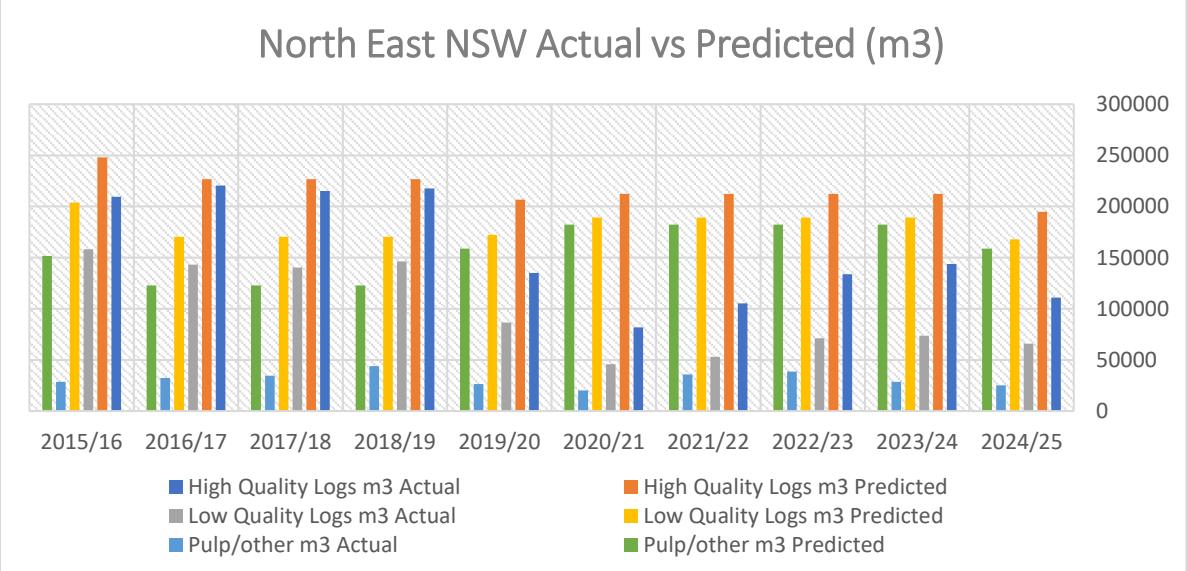




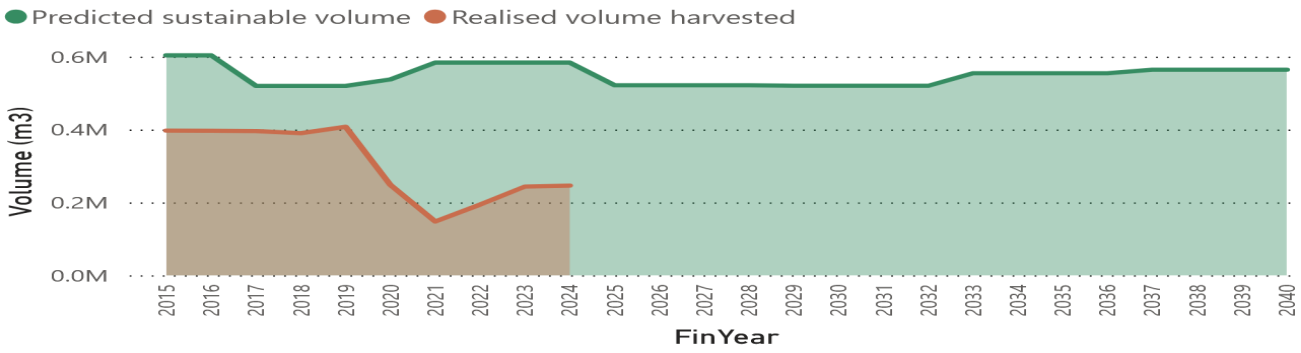




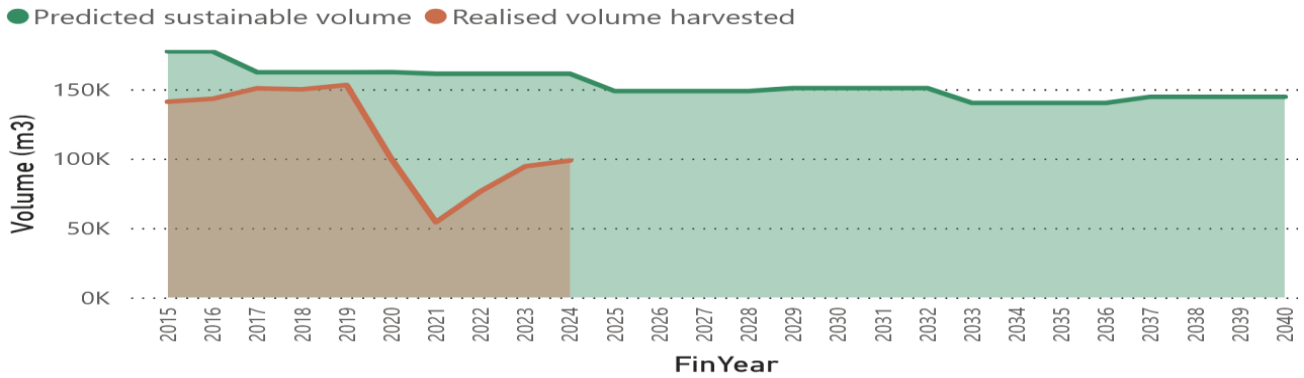
The combination of inflated baselines and manipulating products means that a proportional reduction is the method's baseline to account for the Great Koala National Park (GKNP), may effectively result in no reduction in actual yields. With no real carbon savings and a proportional increase in logging effort outside the GKNP.



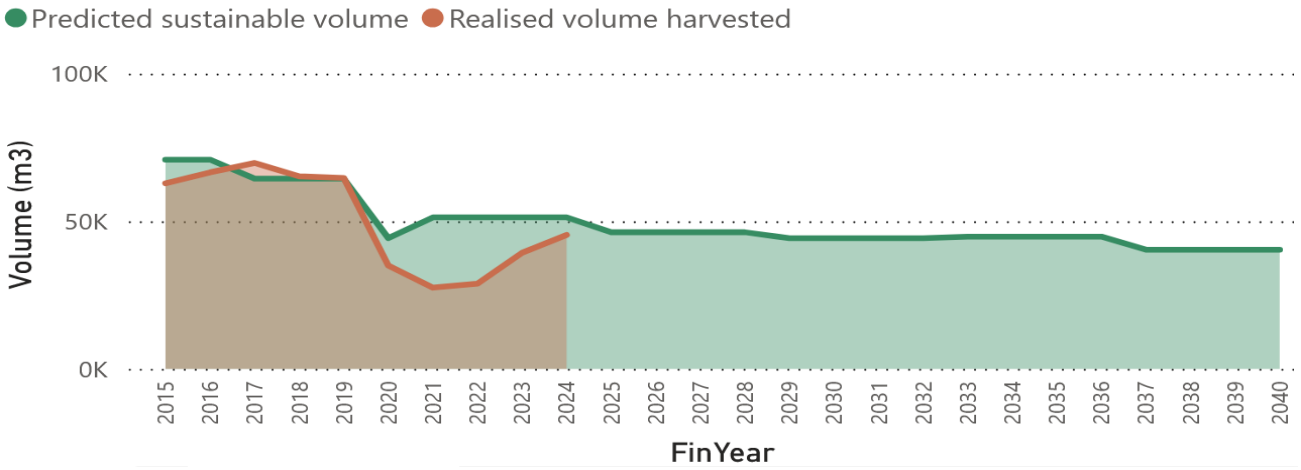
It is important to recognise that Forestry Corporation's sustainable yield estimates given in the 2024 Sustainability report show an ongoing decline in high quality sawlog production from native forests in north-east NSW. Below are Forestry Corporation estimates of sustainable yields from north east NSW native forests, taken from 2024 Sustainability Report, showing sustainable yield estimates for the next 15 years. Note that over that time overall sustainable yields are predicted to increase, due to increases in Low Quality Logs and Pulpwood/Other. Over this period Large High Quality Logs and Small High Quality Logs are predicted to decrease. Given that actual yields of Low Quality Logs and Pulpwood/Other are relatively less than high quality logs, there is significant scope to claim reductions in predicted yields in these categories while minimising reductions in actual yields of high quality logs.



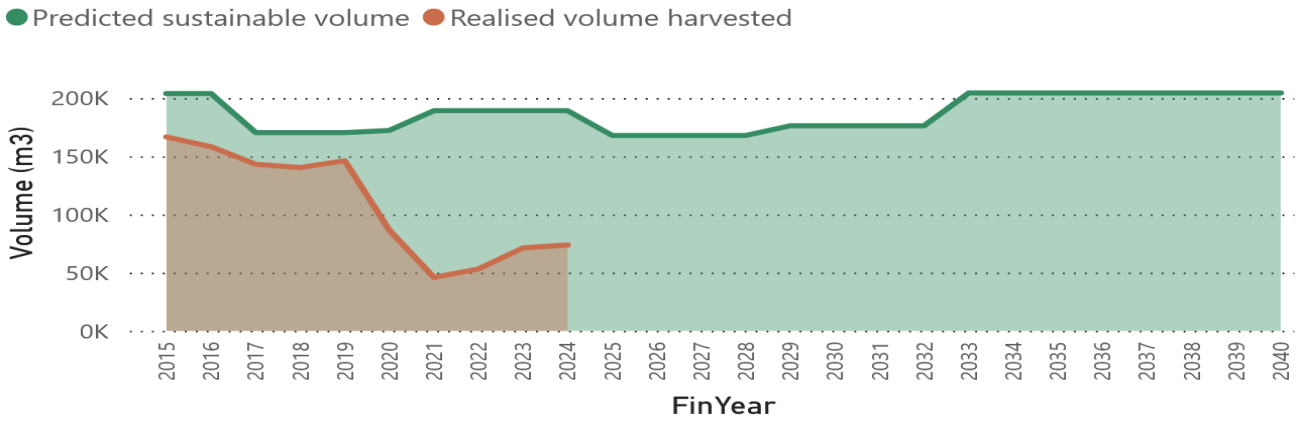
All Hardwood Products



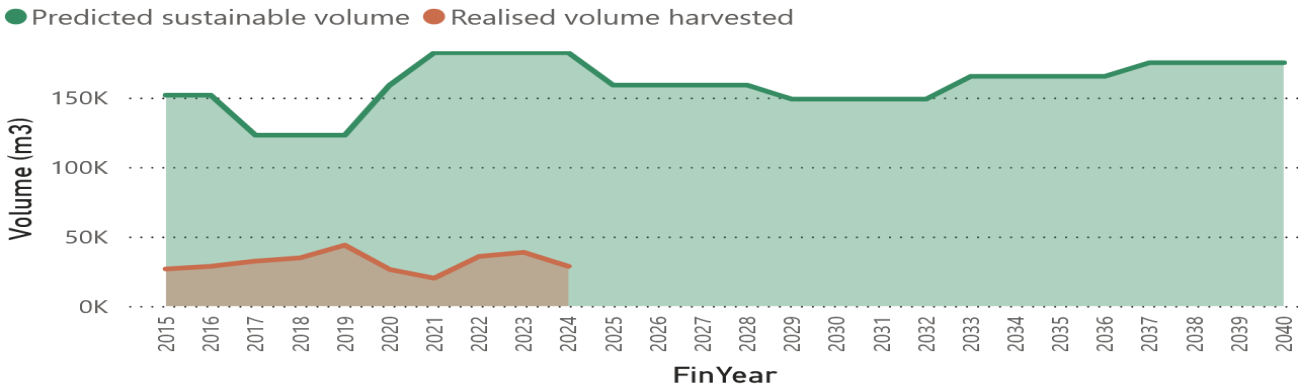
Large High Quality Logs



Small High Quality Logs



Low Quality Logs



Other/Pulpwood

The calculation of the net abatement amount requires a combination of the baseline harvest and FullCAM:

> ***Step 1:*** *Representative FullCAM model plots must be developed based on the timber harvesting and related forest clearing to facilitate timber harvesting (eg for access roads, snig tracks and log landings) that occurred in the 5-year period prior to the end of the financial year prior to the making of the application for the declaration of the project as an eligible offsets project (the prior period). The model plots must be used to develop a prior period FullCAM forest estate model that provides estimates of the total net harvested area (in hectares) in, and logs produced (in cubic metres (m^3) of logs produced) from, the project area that are within ±5% of the actual values for the prior period.*

The FullCAM plots only sample existing data layers, without any site-specific assessments. It seems they intend to rely upon a series of ”representative plots”, based on the major vegetation group, the harvesting type (i.e. invariably Single Tree Selection in north east NSW), and the estimated average age of trees in the plot (a bit hard to guess in multi-aged forests based on the last time it was logged). This will be supplemented by a single one hectare “*clearing plot”* to *“simulate clearing of public native forests to facilitate timber harvesting”* for each region.

As demonstrated in Section 3.1, it is evident that logging return times have been extending as forests are progressively converted to regrowth, with recent return times mostly 12 to 26 years. This does not mean the forest was 12 to 26 years old when last logged, so it is perplexing how they will guess the average age of trees in their plots.

There are numerous factors affecting the structure and biomass of often multi-aged native forests that cannot be accounted for by estimating average tree age, such as past logging regimes, failed regeneration, fires, lantana invasion, dieback, and variable tree retention rates. Without using LiDAR to directly measure forest structure (see Section 3), any attempt to model yields per hectare is going to be a fraught process with poor predictive capability (as demonstrated by FRAMES, despite its reliance on a multitude of growth plots).

This variability is shown by the dramatic variations in yields between logging operations. The Forestry Corporation’s Biomaterial Reports for the past 5 years show that the annual volumes of products obtained per hectare across north east NSW have varied from an annual average of 38.1 m^3/ha to 64.9 m^3/ha. Just considering those larger operations in 2024/25, where more than 100 ha were logged, yields varied from 15 m^3/ha up to 134 m^3/ha. There is also significant variability in retention rates (including carbon) following logging related to the number of trees that are merchantable and the number required to be retained as habitat trees. The 2024/25 Biomaterial Report provides data for basal area retention in 11 selective logging operations, identifying an average retention of 14.7 m^3/ha, varying from 10.3 to 22.8 m^3/ha.

Biomaterial Reports North East NSW	Net Area logged	TOTAL All products (m^3)	Yield per hectare (m^3/ha)
2020/21	4650	**177008**	38.1
2021/22	3523	**228474**	64.9
2022-23	5186	**284782**	54.9
2023/24	6324	**284855**	45
2024/25	4636	**202009**	43.6

Forestry Corporation Biomaterial Reports, yields per hectare.

The combination of volumes retained and removed can also vary widely. In 2024/25 one operation involved the removal of 88.8 m^3/ha and the retention of 14.4 m^3/ha, another the removal of 19.2 m^3/ha and the retention of 22.8 m^3/ha.

The use of simplistic averaged FullCAM plots will compound, rather than overcome, the manifest deficiencies of relying on a baseline harvest levels derived from the Forestry Corporation's grossly inflated and erroneous sustainable yield estimates.

1.6.1. Impact of the Great Koala National Park

If the full proposed Great Koala National Park (GKNP) is created it is essential that its impacts are accurately accounted for. While it represents 21% of the loggable native forests in north-east NSW, in recent years it represented 39% of the area logged and has provided 38% of the resource. Over the past four years the Forestry Corporation have obtained an average of 94,167 m^3 of timber from the GKNP and 155,863 m^3 from other native forests in north-east NSW. The NSW Government's attempts to reduce yields of high-quality products committed in Wood Supply Agreements (WSAs) by 89,320 m3 (41%) this year to compensate for the GKNP is illustrative of the problems of dealing with Forestry Corporation data. Plantations contribute to WSA's and have been heavily and prematurely logged to increase yields since the 2019/20 fires. Plantations give the Forestry Corporation flexibility with how it deals with wood reductions. It is assumed that with the 41% WSA reduction, the Forestry Corporation will still be legally required by the WSAs to provide some 109,000 m^3 of high quality products from native forests outside the GKNP. This compares to 2024-25 yields of 65,671 m^3 of high quality products from native forests outside the GKNP. So, while there is an apparent intent to reduce the actual cut of high quality products by 41%, and thereby avoid leakage, because of the Forestry Corporation's failure to adjust their yields since the fires they will have to increase yields of high quality logs outside the GKNP by 66% to meet legally enforceable WSA commitments.

Over the past four years the Forestry Corporation Biomaterial Reports identify they obtained an average of 250,030 m^3/annum (given as 221,486 m^3/annum in Section 1.6) from north east NSW's native State forests, comprised of an average of 94,167 m^3 of timber from the GKNP and 155,863 m^3 from other native forests in north-east NSW. So, if the GKNP becomes a "carbon protection area" the 'modified sustainable yield' of 325,970 m^3/annum (Section 1.6) would need to be reduced by 94,167 m^3 down to 231,803 m^3, meaning they could effectively continue logging as if nothing happened and increase logging in the rest of the region by 75,940 m^3.

Note that the figures applied above for the past four years are different depending on their source: for the 3 years 2021/2024 the Sustainability Report identifies the total timber yields from north-east NSW's native forests as 683,932 m^3, whereas the Biomaterial Reports give the volumes as 798,112 m^3. An example of the problems using Forestry Corporation data.

The Table below shows that based on the revised Biomaterial Reports, over the past 4 years the Forestry Corporation have obtained an average of 37.7% of their north-east NSW timber yields (varying from 31-45%) from the GKNP, and that it has comprised 39% of the area logged. These are very high percentages given that the GKNP only represents 21% of the loggable State Forests in the region.

Biomaterial Reports		Net Area logged	High Quality Large Sawlog + Large veneer (m^3)	High Quality Small Sawlog + Small veneer (m^3)	Poles, piles & girders (m^3)	Low Quality Sawlog (Tonnes)	Pulpwood (Tonnes)	Other (firewood, fencing, woodchop etc) (Tonnes)	TOTALS (m^3 (tonnes x1.2))
2021/22	NE NSW	3523	68740	19726	20841	58116	20103	21087	**228474**
	GKNP	1441	21012	8294	11649	35577	3597	13181	**103781**
2022-23	NE NSW	5186	86214	27521	24754	77297	14691	29923	**284782**
	GKNP	1579	26938	8893	10082	26569	1833	6978	**88369**
2023/24	NE NSW	6324	91464	32394	25342	80015	17444	15587	**284855**
	GKNP	2445	30292	13991	10318	32836	2101	4675	**102135**
2024/25	NE NSW	4636	67361	23227	20456	54916	9677	11211	**202009**
	GKNP	2199	23527	11534	10312	27124	732	2986	**82383**
Average Annual	**NE NSW**	**4917**	**78445**	**25717**	**22848**	**67586**	**15479**	**19452**	**250030**
	GKNP	**1916**	**25442**	**10678**	**10590**	**30527**	**2066**	**6955**	**94167**
	GKNP %	**39.0**	**32.4**	**41.5**	**46.4**	**45.2**	**13.3**	**35.8**	**37.7**

TABLE. North East NSW and GKNP timber yields given in the Forestry Corporation's Biomaterial Reports. These figures do not match those given in the Sustainability Report, indicating ongoing data errors. Note that to convert tonnes to m^3 for TOTALS a multiplier of 1.2 was applied.

If the proposed Great Koala National Park is created in north-east NSW, then all Forestry Corporation logging operations in the region that can claim any level of carbon benefit are eligible to receive ACCUs, as the 20% threshold will have been reached.

Because of the moratorium on the Great Koala National Park (GKNP), the NSW Government has significantly reduced yields legally required to be provided to millers in Wood Supply Agreements (WSAs) from North East NSW's native State Forests this year. While it appears that the NSW Government had an intent to not increase logging effort outside the GKNP, it is evident that in practice a similar volume of high quality products to that logged across the whole of North East in 2024/25 is required to be logged outside the GKNP again this year. Comparison with the average yields for the past four years, indicates there could be a 36% increase in the volumes of high quality products removed outside the GKNP.

WSAs are legally binding commitments to provide set volumes of products to sawmillers. The problem is that the NSW Government is relying on WSAs entered into before 2014 as their baseline for mandating yield changes against. This is despite evidence that since the 2019/20 wildfires yields have declined by over 40%, and volumes committed in WSA's can no longer be obtained, even with gross over-logging of plantations. The Forestry Corporation (FCNSW) have been hiding the magnitude of losses since the fires. WSA volumes also include hardwood plantations, giving a moveable baseline for the volumes coming from native forests.

On 8 September 2025 the Minister for Agriculture, Tara Moriarty, gave a Ministerial Direction that a moratorium would be placed on logging in the Great Koala National Park for a year, and that:

During the GKNP moratorium period, FCNSW must also reduce the total volume of high-quality products and low-quality products taken by harvesting operations in native State forests in the North East Region from the total volume of products from the North East Region that FCNSW has agreed to supply under the wood supply agreements during the same period. The reduction must be by the following amounts over the 12-month period commencing on 8 September 2025:

(a) *High-quality products by 89,320 m3, and*

(b) *Low-quality products by 39,422 m3.*

Also emphasising that during the moratorium period that no high-quality products be provided to Pentarch.

My understanding is that the Wood Supply Agreements (WSAs) for north east NSW now total 220,423m^3 per annum of high quality logs, including from hardwood plantations. Through the EPA and NRC (2018 pers. comm.) the Forestry Corporation provided the following data for allocations of High Quality Logs (HQL) from north east NSW:

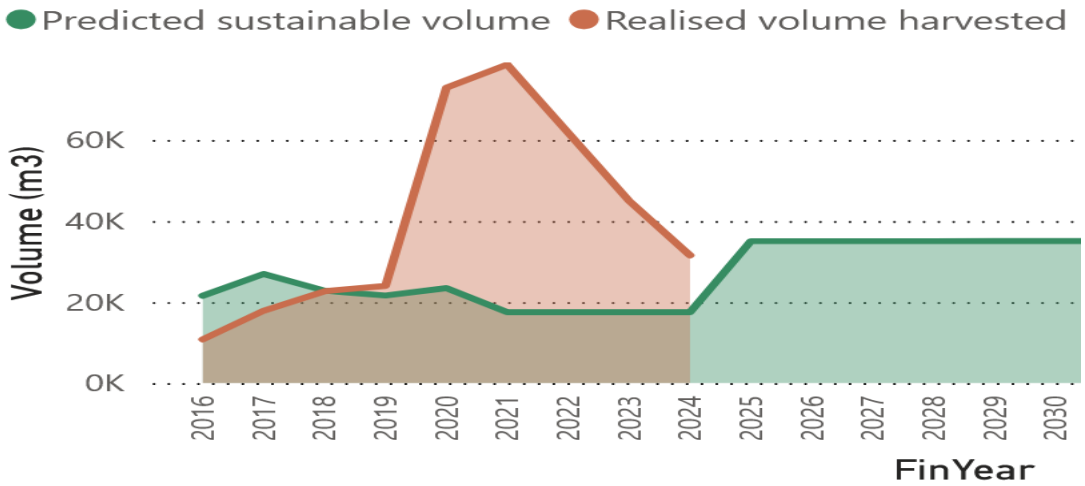
High Quality Product Allocation (m3)	***M3***
Large Sawlogs (>40 cm)	*127,145*
Small Sawlogs (<40 cm)	*46,096*
Poles	*31,600*
Veneer	*11,202*
Girders	*4,150*
Piles	*260*
Total	***220,423***

The data for high quality products from both native forests and plantations for the years 2018/24 show that since the 2019/20 wildfires FCNSW have been cutting plantations prematurely to make up for shortfalls from native forests. It is evident that over the 6 year period the volumes obtained from plantations can vary from 10-50% at FCNSW's discretion. It is apparent that plantations have been significantly over-cut since the 2019/20 wildfires, with yields from plantations well above estimated sustainable yields. If volumes obtained from plantations are reduced, volumes need to be increased from native forests.

High Quality Log Yields (m3)

NE NSW	*High Quality Yields Native Forests*	*High Quality Yields Plantations*	*% Plant*
2023/24	*143918*	*31515*	*18.0*
2022/23	*133729*	*44972*	*25.2*
2021/22	*105255*	*61751*	*37.0*
2020/21	*81696*	*78582*	*49.0*
2019/20	*134915*	*72859*	*35.1*
2018/19	*217672*	*23986*	*9.9*
AVERAGE	*136198*	*52278*	*27.7*

Source 2023/24 Sustainability Report.



Yields of high quality logs from North East NSW hardwood plantations. Note the gross over-logging since the 2019/20 wildfires (Source 2023/24 Sustainability Report).

The other aspect is that high quality products are variously committed depending on whether they are large, small, piles, veneer, girders or poles. Combined with plantations, this gives the Forestry Corporation a high degree of flexibility in how to reduce yields to satisfy the Ministerial Directive. To identify volumes of high quality products required to be targeted for logging this year it is necessary to first reduce the WSA commitments by the volumes likely to be obtained from plantations, before applying the Ministerial Directive to reduce WSA volumes from native forests by 89,320 m3. Given the gross overcutting of plantations in recent years, volumes of WSAs obtained from plantations should reduce to pre-fire levels of 10%, though given FCNSWs discretion the 2023/24 level of 18% is also considered.

Application of these reductions identifies that in the order of 109,000 m^3 of high quality products are required to be logged this year to satisfy WSAs as modified by the Ministerial Directive, though could be as low as 91,400 m3. These volumes need to be provided to avoid compensation claims.

WSAs	*220,423*	*WSAs*	*220,423*
Deduct 10% sourced from plantations	*198,381*	*Deduct 18% sourced from plantations*	*180,747*
Deduct MD 89,320	*109,061*	*Deduct MD 89,320*	*91,426*

This would theoretically represent reductions of 45-50% in what was required to be provided by the unmodified WSAs from native forests. Though the problem is that those volumes were not available, with significant yield reductions required irrespective of the creation of the GKNP (see Section 1.6).

Heavy logging of plantations since the 2019/20 wildfires has propped up WSAs, reducing relative declines. Even with this support it is evident that FCNSW have not been able to supply volumes committed in WSAs since 2019, with the undercut of high quality products over those 5 years totalling 212,923 m^3, almost a full year's allocation. This leaves the NSW Government liable to massive compensation claims. Given that these shortfalls were evident by 2022 it is astounding that the Coalition Government extended WSAs in June 2022 for an additional 5 years to 2028, gifting significant volumes of non-existent timber to mills knowing that compensation would be required if they could not be supplied.

NE NSW	Total High Quality Yields m3	WSA High Quality Commitments m3	Actual Yields %WSA
2023/24	175433	220,423	79.6
2022/23	178701	220,423	81.1
2021/22	167006	220,423	75.8
2020/21	160278	220,423	72.7
2019/20	207774	220,423	94.3
2018/19	241658	220,423	109.6
AVERAGE	188475	220,423	85.5

Source: 2023/24 Sustainability Report

As identified above, it is likely that in the order 109,000 m3 of high quality logs will be required to be logged this year from North East NSW's forests to satisfy WSAs. In 2024-25, 111,044 m3 of high quality products were obtained from native forests in North East NSW, which is not significantly different from the 109,000 m^3 apparently required to be obtained this year, despite the creation of the GKNP. The average over the past 4 years was higher at 127,010 m^3, with the GKNP providing an average of 46,711 m^3 (37%) of this yield.

The most telling metric is that in 2024-25 65,671 m^3 of high quality products were obtained from native forests outside the GKNP, and for this year under the Ministerial Directive the required take could be increased to 91,400-109,000 m^3, a major increase in logging intensity outside the GKNP. Over the past 4 years across north-east NSW, FCNSW obtained an average of 80,300m^3 of high quality products per annum from outside the GKNP, under the Ministerial Directive this is required to be increased by 14-36%. There has not been a proportional decrease in logging effort outside the GKNP, to the contrary there will be a significant increase.

Year	North East NSW High Quality Products m3	GKNP High Quality Products m3	GKNP %	High Quality Products outside GKNP m3
2021/22	109307	40955	37.5	68352
2022-23	138489	45913	33.2	92576
2023/24	149200	54601	36.6	94599
2024/25	111044	45373	40.9	65671
AVERAGE	**127010**	**46711**	**36.8**	**80300**

Source Biomaterial Reports. Note data from Sustainability (used above) and Biomaterial reports normally vary.

2. What is Deferred Harvesting?

The granting carbon credits for modified logging, which will still result in net carbon emissions, is an anathema. "Deferral of harvesting" is an undefined action that is therefore open to interpretation and abuse. It is absurd to consider that Forestry Corporation's FRAMES logging data which can only be reported at a regional scale will in any way suitable

for assessing the outcomes of modified logging of specified areas. For years NEFA have been auditing the Forestry Corporation's compliance with legal requirements to retain habitat trees and protect exclusion areas, and identified repeat and systematic breaches due to their priority of satisfying over-committed timber resources, only to find the EPA unwilling to take regulatory action to enforce the rules or their intent. NEFA does not consider that vague voluntary restrictions on logging will be effective nor enforceable. The concept of claiming carbon credits in return for extending logging return times in mixed age native forests is absurd, particularly as return times have been increasing as forests are increasingly converted to young regrowth, and rewarding this will encourage more intensive logging and further reductions in carbon storage. There are many areas of degraded forests that are not recognised by FRAMES that can be put aside from logging without materially affecting yields.

First up, it needs to be recognised that the basis for assessing the benefits of "deferral of harvesting" is the Forestry Corporation's FRAMES model, which they state is "*a strategic planning tool designed to predict the potential wood supply at a regional level. It is not appropriate to compare actual yields versus predicted yields at a level lower than the prediction level (i.e. the region level)*" (see Section 1.3). It is absurd to consider that such broad, erroneous and spatially inaccurate modelling can be used to determine logging impacts at an operational level. The pretence that a limited number of FullCAM plots are somehow going to improve estimates when they are simply based on broad derived averages, with no on-ground measurements, is misleading (see Section 1.6).

The performance of "deferral of harvesting" is to be based upon a baseline determined as a percentage of Forestry Corporation's identified sustainable yield. And claimed benefits will be relative to this artificial baseline. So, if the Forestry Corporation can claim a reduction in logging volumes due to "deferral of harvesting" they will be able to claim carbon credits for that volume.

If Deferral of Harvesting is applied in a region where >20% of State Forests have been excluded from logging (i.e. if the Great Koala NP is created in northeast NSW), then theoretically there are no minimum thresholds for modified logging elsewhere in the region.

"Deferral of harvesting" is an undefined and unlimited action that could apply to a multitude of activities, in both nature and extent. Such loose concepts can have no design integrity.

The Draft Methodology Determination defines deferred harvesting as:

> *reducing harvesting across the project area deferring timber harvesting and thereby extending the length of harvest rotations and reducing the volume of wood extracted from the project area over a given period.*

Also stating:

> *An offsets project to reduce timber harvesting may relate to reducing timber harvesting across the whole of the project area or only in one or more parts of the project area*

In the previous version the Design Outline variously describes it as "delaying harvesting" stating:

> *In the context of the Improved Native Forest Management (INFM) method, deferred harvesting methods include:*
>
> 1. *Cessation of Harvesting: Completely stopping harvesting activities in the project area to allow forests to grow and accumulate carbon beyond their typical harvest age.*
> 2. *Selective Harvesting: Reducing the intensity of harvesting by selectively removing certain trees while leaving others to continue growing and sequestering carbon.*

Despite repeated requests, no clear, and legally meaningful, definition of the nature and scope of what activities can be applied as “deferral of harvesting” is available. It does not appear limited to extending rotation cycles and could apply to many different unspecified activities, has no limits on the size a patch needs to be to qualify, provides no indication of how to determine baselines to quantify how long logging needs to be delayed, and does not address the problem of how to determine rotation lengths in multi-aged native forest.

The only example provided in the previously exhibited documents was “*if there are 100 mature trees in a 1-hectare coup and 70 of the trees are harvested, the event would be modelled as affecting 70% of the forest”* with the 30% retained claimed as a carbon benefit. This is an absurd proposal, because:

- Carbon credits should not be given for modified logging, for accountability and monitoring the only deferral that should be considered is where defined areas of productive forest are set aside from logging, this is the only way it can be checked and monitored.
- This example shows how broad the definition of deferred harvesting is, seems that anything is allowable.
- Retention across a stand is unverifiable unless every tree and stump is measured, which is a mammoth task for even a small area.
- This proposal has no credibility and will devalue all carbon credits
- There is no net benefit as the logging of 70% of trees will result in net carbon emissions.
- Retaining 30% of loggable trees is not equivalent to retaining 30% of a logging area, giving the degree of damage to retained trees, loss of regrowth trees, disturbance to understorey, carbon released from disturbed soils and other impacts.
- How can a few samples of selected plots be extrapolated across the forest estate when there are so many variables.
- Account needs to be made of the trees that need to be retained under various conditions and protocols (this includes minimum basal area retention of 10-12m2, koala feed trees, Greater Glider trees, hollow-bearing trees, giant trees, exclusions around threatened plants, fauna exclusions, etc), as well as “growers” routinely retained for future logging. This also needs to be open to being varied as protocols change - in particular the 5 year reviews of the RFA and CIFOA are overdue and should require increased protections.
- Selective logging is not equivalent to clearfelling in terms of regeneration and the rate of growth of trees.
- Assessments need to be made of whether retained trees are suppressed and unlikely to grow quickly.
- Assessment needs to be made of how many retained trees are defective and not suitable for sawlogs
- Assessments need to be made of the retention of each product (large sawlogs, small sawlogs, low quality sawlogs, pulplogs and other) to ensure its not just retaining low value trees.
- Assessments need to be made of weeds, such as lantana, that will proliferate after logging and suppress regrowth.
- Assessments need to be made of the likelihood of the stand being affected by Bell Miner Associated Dieback.

NEFA has undertaken numerous audits of logging operations and often identified blatant and systematic breaches of tree retention prescriptions, particular those relating to old and mature trees suitable as sawlogs. NEFA therefore has no faith that the Forestry Corporation will adequately protect trees required to be retained under “deferral of harvesting”. Problems NEFA repeatedly identified with the Forestry Corporation’s implementation of legal requirements for management of habitat trees are:

- Failure to mark sufficient habitat trees to satisfy requirements, often only marking a few token trees, with feed trees rarely identified, and at times not marking trees until logging was completed.
- Marking-up of areas after we reported breaches, before being investigated.
- Failure to retain the required numbers of hollow-bearing trees, and logging ones required.
- Commonly and repeatedly retaining small, suppressed and damaged recruitment trees, rather than large healthy trees.
- Where there were low numbers of hollow-bearing trees, marking hollow-bearing trees as recruitment trees to avoid having to retain the required number of recruitment trees.
- Interpreting the requirement for 10-16 hollow-bearing trees per 2 hectares opportunistically, on one hand saying they did not need to retain the required numbers in one patch of forest because they were retained elsewhere in the logging area, and on the other saying they only needed to retain the required numbers in a patch of forest (and could log additional ones) despite there being few elsewhere.
- Frequently and carelessly damaging retained habitat trees by sideswiping them with machinery, dropping trees on them, bulldozing tracks next to them, and/or driving over their roots.
- Imperilling the survival of habitat trees, and increasing the risk of damage, by leaving branches and leaves piled against their trunks ready for burning.

A feasible “deferral of harvesting” proposal could be to set aside an additional 15% of loggable areas from logging for 15 years. The Forestry Corporation could then preferentially exclude logging for 15 years from patches (of any size) of immature trees, failed regeneration, weed infestations, severe fire impact, and Bell Miner Associated Dieback to satisfy their “deferral of harvesting” requirements.

This is not idle speculation as such actions are common practice, After the 2019 wildfires the Forestry Corporation often chose as permanent Wildlife Habitat Clumps, as well as temporary fire impact offset areas, extensive areas the most heavily burnt forests in the compartments despite an intent to protect the least burnt stands, as shown in the example of Myrtle State Forest below.

For the 2018 Integrated Forestry Operations Approval the Environment Protection Authority (EPA) decided to remove most threatened species surveys and species specific protection requirements and replace them with the retention of 5% of the net logging area as Wildlife Habitat Clumps. These are meant to be the best habitat, though only need to satisfy any one of a broad range of criteria. In Myrtle State Forest the Forestry Corporation chose the most intensively burnt part of the stand, where there were extensive tree death and loss of most fauna. Despite NEFA’s complaints, the EPA took no regulatory action and the Wildlife Habitat Clumps were not altered to encompass good fauna habitat.

Example of the Forestry Corporation's selection of important fauna habitat as a Wildlife Habitat Clump in accordance with the CIFOA. This was the most intensively burnt forest, with many trees killed. A complaint was made to the EPA, though resulted in no change to the selection of Wildlife Habitat Clumps. An example of sloppy wording, Forestry Corporation ill will, selection of exclusions purely based on minimising timber impacts, and failure of enforcement.

It is apparent that there is an inherent timber bias in Forestry Corporation decisions, and this will extend to the selection of areas identified as "deferral of harvesting" areas. Choices will be biased towards areas with little timber value that will not deliver significant resources for far longer than average.

2.1. Logging Frequency

Logging regimes in north-east NSW have historically been based on retaining growers capable of developing into high quality products in the near future, with frequent return times. Logging events are generally becoming less frequent as logging intensity increases and forests are progressively converted to regrowth, with greatly reduced carbon storage. Current return times are currently mostly 12 to 26 years. Granting carbon credits for reducing the frequency of logging (extending rotation lengths) will reward and encourage the conversion of multi-aged forests to young regrowth forests, with significantly reduced carbon storage.

The INFM states:

> *The use of sustainable yield as the basis for setting the baseline harvest level is necessary to capture the effects of age class on harvesting. In simple terms, if a forest estate is dominated by young forests, there is likely to be less harvesting because many of the forests will not have reached the desired harvest age (i.e. generally 50-80 years), based on the targeted yield of sawlogs and pulplogs. The opposite applies to a forest estate that is dominated by forests that are at or above the desired harvest age – proportionally, there is likely to be more harvesting than if the age profile was appreciably younger. If sustainable yield is not used, there would be a risk of crediting increases in net carbon stocks that are attributable to reductions in harvesting that would have happened anyway, due to the relative absence of harvestable logs.*

For north east NSW, the logging history of a random selection of recently logged compartments were identified from Forestry Corporation' Logging History. It is recognized that some logging events were not complete and logging is often a mosaic, with varying intervals between logging events. Logging history before 2000 is very unreliable, and often only available on a whole compartment basis.

Allowing for apparent anomalies, based on this limited review recent logging events are mostly spaced 12 to 26 years apart. This therefore represents the current logging return time that applies to native forest logging in north east NSW. Though it is worth noting that some areas are being relogged as little as 7 years after previous operations over the same area.

There was a significant change to the logging rules in the revised 2018 CIFOA that allowed for more intensive logging. Basal Area retention was reduced from having to retain 40% of the basal area to retaining 10-12 m^2 basal area, protections for a variety of mature trees were removed, and the requirement to retain all trees <20 cm was removed. An intensive logging zone was also introduced with minimal tree retention requirements, where the designated area can be virtually clearfelled in three operations over 21 years, under a regime called "intensive" or "regeneration" harvesting.

The Remake of the Coastal Integrated Forestry Operations Approvals Final Report Threatened Species Expert Panel Review reports the EPA representative Brian Tolhurst as stating:

> *... The intensive harvesting has clearly moved the coastal state forests from being multiple use forests with significant biodiversity values to that of purely production forests more in line with plantations. I don't believe this is an appropriate outcome or use of these crown lands that was ever envisaged.*
>
> *... Removal of standing trees below a basal area of around 18 - 20m2/ha will reduce the structure of these native forests to such a simple form that the ecological processes will be severely diminished or non-functioning. Even in the best case scenario it will take many decades or even centuries of recovery for any level of native forest ecological function to be restored after this intensity and scale of impact.*
>
> *A typical healthily stocked Blackbutt forest could be expected to have a basal area of around 30 - 40 m2/ha. Currently under the IFOA a 40% removal would limit the minimum basal area retention of 18 m2/ha in the worst case scenario.*

Past logging was primarily based upon logging trees that had been retained in the last logging event and since grown to a merchantable size, with the focus on large high quality sawlogs. The intensity of logging has increased since the logging rules were changed in 2018 to remove protection for be trees protected in previous operations, such as mature recruitment and feed trees, and trees in protected riparian and fauna exclusions, while also reducing minimum basal area retention.

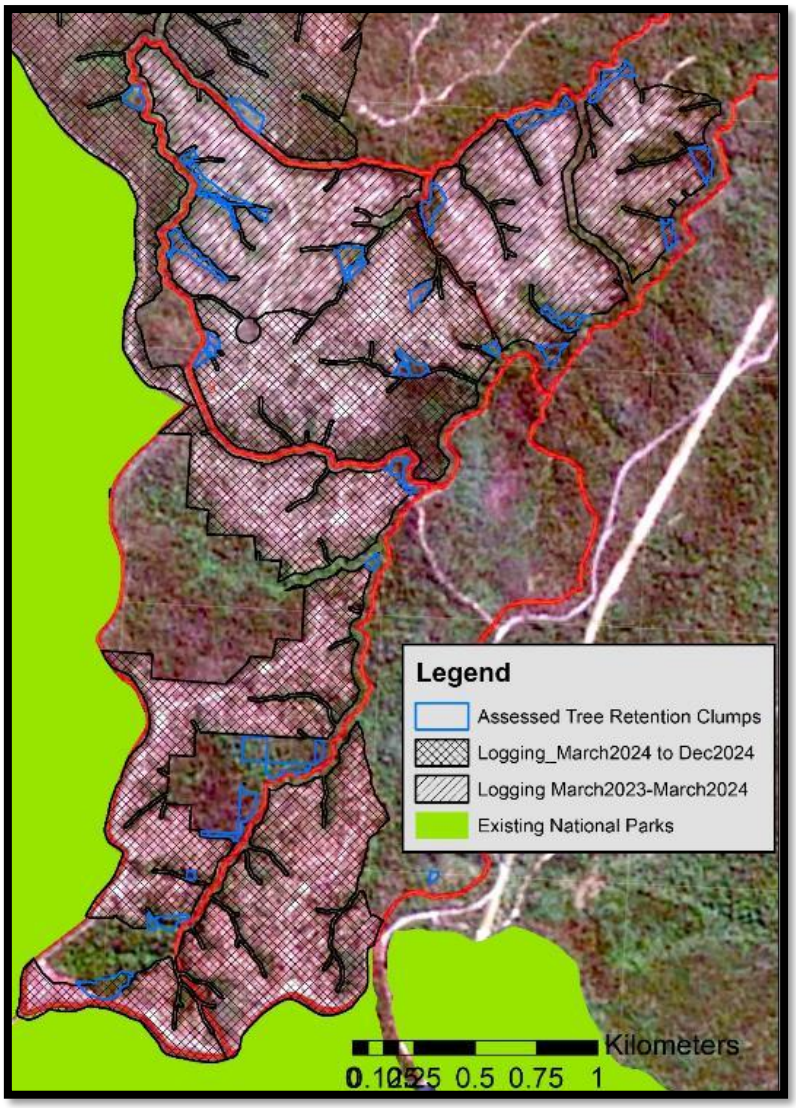
The more intensive operations now practiced often retain few growers, which is basically treating the forests more like plantations, requiring longer return times before merchantable trees can be removed. The limited market for small wood (i.e. pulplogs) in north-east NSW is currently an impediment to short rotations in regrowth forests.

Given the intensive logging now being practiced (see images below) it is apparent that in many areas logging will increasingly rely upon regrowth, and therefore necessitate longer logging rotations. It is evident that return times have been extending as forests are progressively converted to regrowth. A change from the current 12 to 26 year return times to 50 to 80 year rotations is likely to be required to allow sawlogs to grow in intensively managed areas of forest. Though as there will not necessarily be any carbon benefit from this change, it will be outrageous if carbon credits were now given for increasing return times.

It is apparent that in multi-aged native forests rotation length is an arbitrary measure open to manipulation without achieving any carbon benefit. Rotation length can only be an objective measurement in areas of plantation-like forests that were clearfelled and have even aged regrowth. The chief problem is that applying ACCUs to the deferral of harvesting will provide an increased incentive to reduce the retention of growers and convert native forests to pseudo-plantations of young trees, particularly as increased rotation lengths can thereafter be claimed.

Given the historical frequency of logging events in what are mostly multi-aged forests, it is not apparent how the INFM is intending to derive average tree ages for their FullCAM plots from logging history.

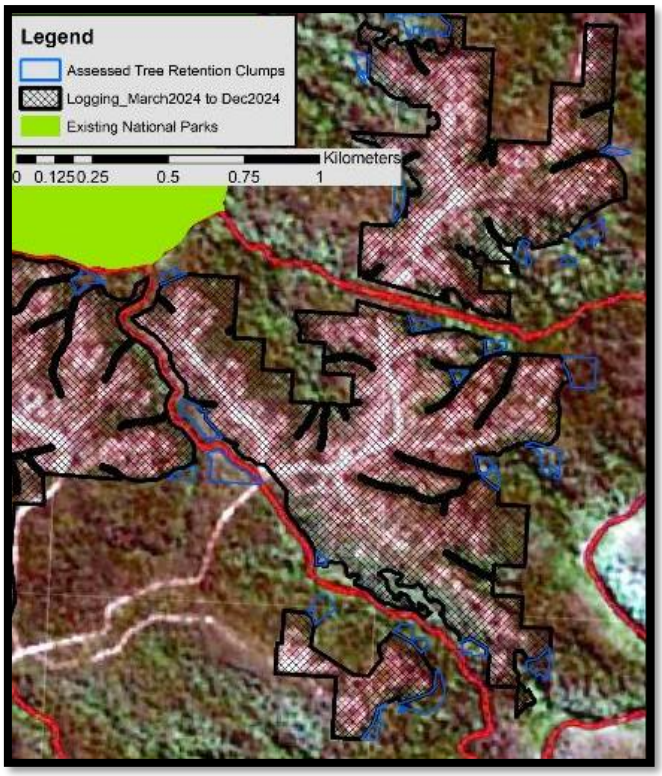
1. **Within Great Koala National Park**



Sheas Knob SF cmpts 2-5. Sentinel image 6 October 2024.
Logging history

- Sheas Knob 2: 1985, 2001, part 2024
- Sheas Knob 3: 2001, 2024
- Sheas Knob 4: 2001, 2024
- Sheas Knob 5: 2001, 2019, 2024

This is mostly some 23 years since the previous harvest, The trees logged were not 23 years old.

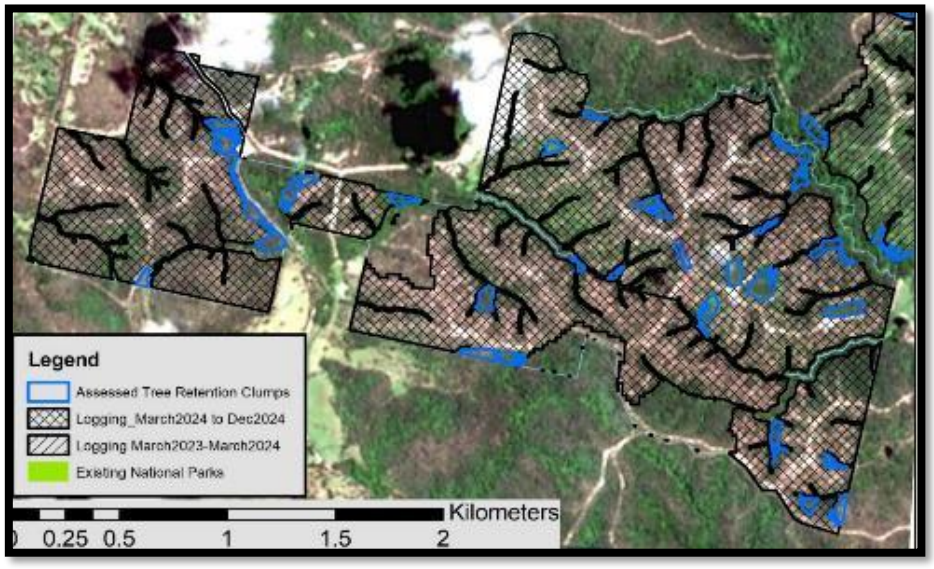


Wild Cattle Creek SF, cmpts 46-49. Sentinel image 6 October 2024

Logging history

- Wild Cattle Creek 47: 1970, 1994-6, 1999-2010, partial 2024
- Wild Cattle Creek 48: 1970, 1984, 1996, 2010, 2024
- Wild Cattle Creek 49: 1970, 1984, 1996, 2010, 2024

This indicates apparent return times of mostly 12-14 years.

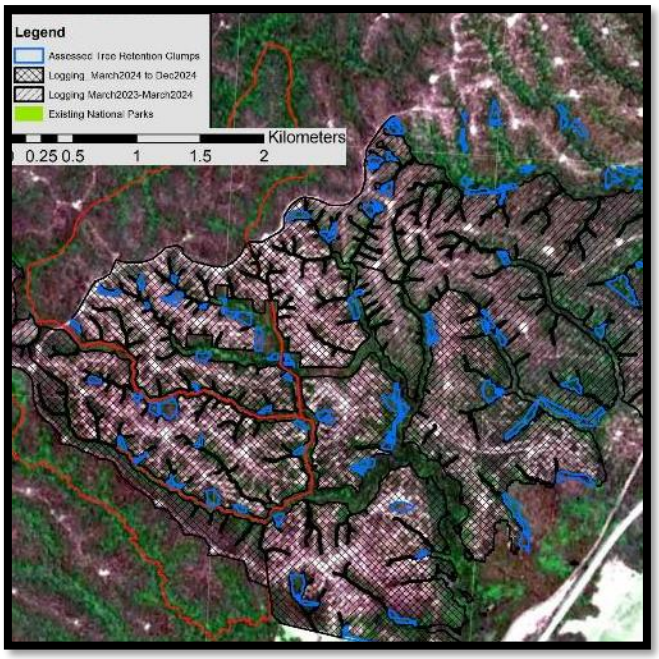


Collombatti SF, compartments 18-20. Sentinel image 6 December 2024

Logging history

- Collombatti SF 18: 1968, 1974, 1978, 1987, 1997-8, 2024
- Collombatti SF 19: 1974, 1978, 1987, 1989, 1998, 2024
- Collombatti SF 20: 1989, 2024

This indicates frequent earlier logging, often 9-12 years apart, with most recently 26-35 years apart.

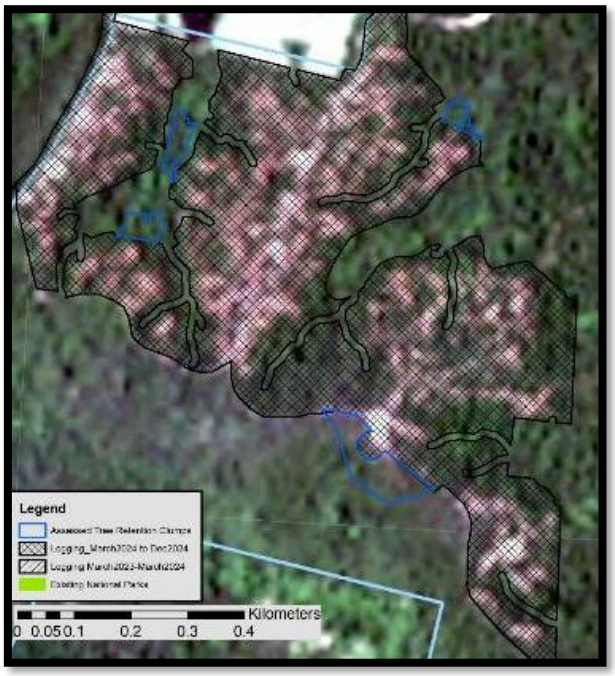


Tamban SF cmpts 22, 25, 27. Operations Complete. Operations in cmpts 20,21,26 on right of image are Temporarily Paused. Sentinel image 6 December 2024

Logging history

- Tamban SF 22: 1967, 1980, 1985, 2002, 2011, 2024
- Tamban SF 25: 1967, 1975, 1980, 1985, 2002, 2011, 2024
- Tamban SF 27: 1967, 1975, 1980, 1985, 1996, 2002, 2011, part 2024

This indicates frequent early logging, up to 17 years apart, with recent return times of 13 years.



Little Newry SF, cmpt 2. Sentinel image 20 December 2024

Logging history

- Little Newry SF 2: 1950, 1965, 1981, 1983, 1998, 2004, 2012, 2024

This indicates frequent earlier logging, sometimes up to 15 years between logging, with a recent return time of 12 years.

Outside Great Koala National Park

Doubleduke SF, logging history, compartments:

- 5: 1972, 2002, 2023
- 6: 1972, 1982, 1989-90, 1998, 2002, 2023
- 7: 1989-90, 1998, 2002, 2023
- 8: 1972, 1982, 2010, 2023

This indicates frequent earlier logging, often 8-12 years, most recently up to 21 years.

Gibberagee State Forest, logging history, compartments:

- 7: 1973, 1975, 1999, 2023
- 8: 1973, 1975, 1999, 2023
- 9: 1973, 1975, 1999, 2023

This indicates logging events mostly 24 years apart.

Cherry Tree State Forest, logging history, compartments:

- 1: 1979-80, 1988, 2015
- 2: 1972, 1980-1, 1988, 2000-1, 2015
- 3: 1972, 1979, 1983, 1987, 2000-1, 2022
- 5: 1972, 1979, 1983, 1987, 2000-1, 2022

This indicates frequent early logging, with more recent logging events 13-21 years apart.

Yarratt State Forest, logging history, compartments:

- 2: 1991, 2005, 2022
- 3: 1989, 1991, 1994, 2004, 2021, 2023
- 4: 1991, 1994, 2005, 2023
- 5: 1994-5, 2005, 2023

This indicates frequent earlier logging, often around 11 years apart, recently around 18 years apart.

Bulahdelah State Forest, logging history, compartments:

- 35: 1968-1970, 1973, 1987, 1990, 1997, 2023
- 36: 1964, 1966-70, 1974, 1976, 1978, 1982, 1987, 1989-90, 1997, 2023
- 37: 1964, 1966-70, 1974, 1976, 1978, 1982-3, 1987, 1989-1990, 1997, 2023

This indicates very frequent early logging events, extending to 7 years apart, and most recently 26 years.

2.2. Degraded Forests

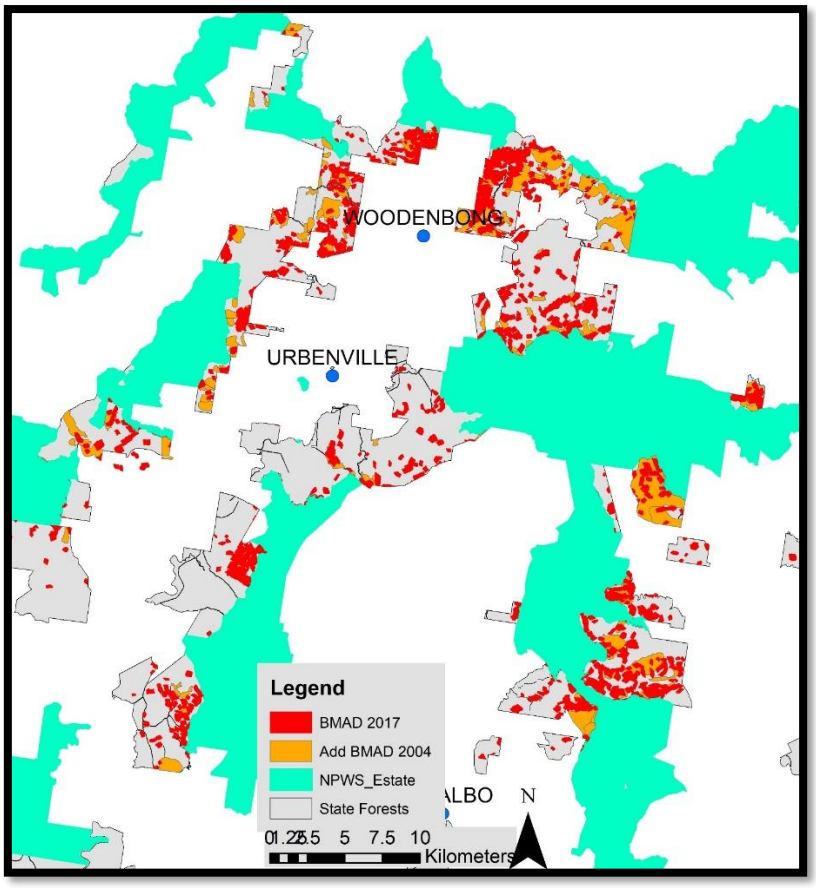
Example of BMAD affected forests, note the dense covering by lantana and the dead and dying overstory trees. The INFM will allow such areas to be claimed as carbon credits.

Under deferral of harvesting, areas of degraded forests can be claimed as *"Cessation of Harvesting"* or "deferred harvesting" where there are no or limited prospects of obtaining a commercial crop in the foreseeable future. There are vast areas of native forest that have been degraded by past logging, without sufficient regrowth to provide economic returns in the foreseeable future. Such areas are generally not recognized by the Forestry Corporation and not accounted for in "sustainability" estimates. Neither will the FullCAM plot method identify them.

On the north coast, invasion of lantana due to logging can hinder regrowth, with the problem worsening with repeat logging events. Bell Miner Associated Dieback (BMAD) occurs when canopy trees are removed allowing lantana to dominate the understorey. The open canopy and dense lantana understorey allow Bell Miners (Bellbirds) to dominate the forest, chasing away most other animals. The Bell Miners "farm" tiny sap-sucking insects called psyllids that feed on eucalypt leaves, which proliferate and drain the life out of the eucalypts which sicken and eventually die. When BMAD is advanced it can be identified from the air by the dead and dying trees.

See Pugh 2018 for details about BMAD and its extent in the Border Ranges.

Vast areas of State Forests have been significantly affected by BMAD, as shown by conservative Forestry Corporation mapping of BMAD. For this mapping it is considered that the 2004 and 2017 mapping need to be combined, and even then, understate the extent of the problem. As illustrated by the map below of the western Border Ranges there are many areas of forest that have been rendered unproductive due to lantana invasion and BMAD that the Forestry Corporation could now claim carbon credits for.



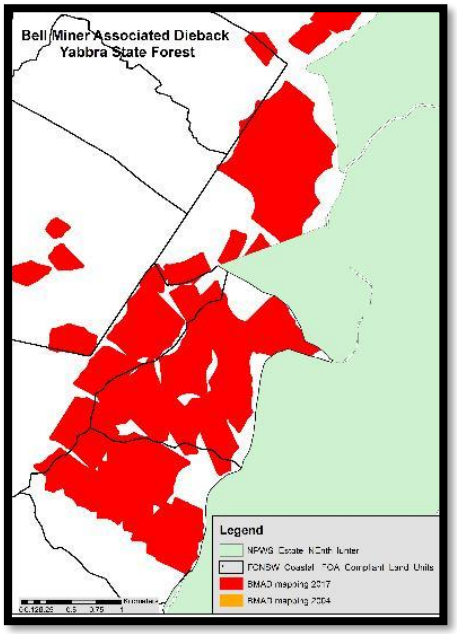
Forestry Corporation mapping of BMAD on State Forests in the western Border Ranges. Red was mapped in 2017, the orange was mapped in 2004. Even when combined they are considered to underrepresent its extent (see Pugh 2018).

Example of BMAD affected forests, note the dense covering by lantana and the dead and dying overstory trees. The INFM will allow such areas to be claimed as carbon credits.

Yabbra State Forest, an example of BMAD

In 2009 the Forestry Corporation logged compartments 162 and 163 of Yabbra State Forest. The forest was already suffering from Bell Miner Associate Dieback (BMAD) at lower elevations. Afterwards BMAD expanded to affect the whole logging area and has killed many of the retained trees, a process that is continuing. The dieback has also spread into patches excluded from logging. Lantana expanded. There has been poor regeneration of eucalypts.

It is a collapsed ecosystem, with the threat that it could be claimed for ACCUs to finance more logging of forests affected by BMAD.

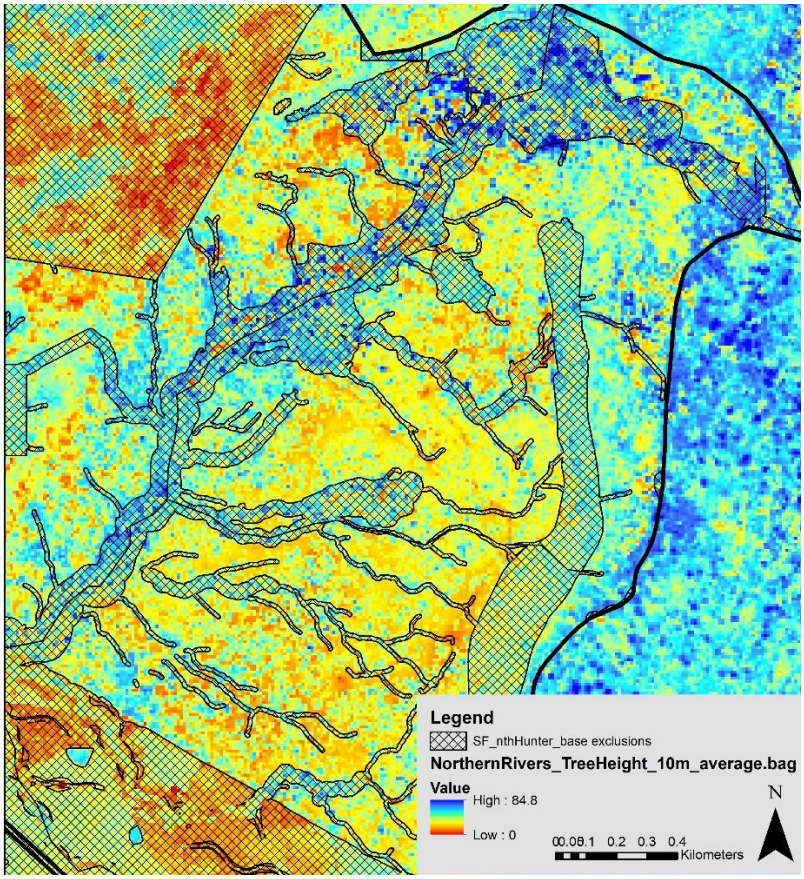


PHOTOS 3 months and 3 years after logging. The regrowth is mostly lantana with a couple of eucalypts and a few wattles.

PHOTOS 3 months and 3 years after logging, with the second photo in the vicinity of the first. Note the poor health of the retained trees after logging. Regrowth is mostly lantana with some wattles.


PHOTOS 3 years after logging, lantana dominates extensive areas.


PHOTOS Five years after logging the forest is still in a parlous state with large expanses of lantana, with remnant trees still dying.



Recent LiDAR mapping of tree height, showing that 15 years after logging this once productive tall forest is still in a parlous state with little prospect of recovery unless the BMAD is rehabilitated. Claiming carbon credits for such a degraded forest would be or little environmental or carbon benefit, particularly as it may go on degrading.

3. Identifying the carbon benefits of stopping logging and protecting forests

The intent of the INFM to use erroneous and unverifiable estimates of "sustainable" yields as a baseline for State forests, and combine this with guestimates for private forests to ensure there is no leakage, will not ensure any claimed abatement that is credited in INFM projects is real and additional. There is a high risk of creating yet another shoddy carbon scheme with no credibility. The data is available to undertake an assessment with high integrity, if there is the will. With the use of Light Detection and Ranging (LiDAR), including biomass satellites, it is feasible to obtain relatively accurate baseline data on the standing carbon volumes across the whole landscape, to identify the carbon carrying capacity of each Plant Community Type (PCT), and to monitor carbon changes over time. Once a reliable baseline has been established then the rate of carbon sequestration can be determined by combining LiDAR with existing plot data on species growth rates. LiDAR can also be applied with data on timber removals to assess carbon losses due to logging, though the degree to which carbon losses are offset by storage for variable time periods in products off-site is a contentious issue.

Oldgrowth forests provide the baseline of how much carbon forests can contain under natural disturbance regimes, they represent a forest's **Carbon Carrying Capacity**. One method of identifying how much carbon a degraded forest can sequester is to compare its **current carbon**

storage to the Carbon Carrying Capacity of the original oldgrowth forest likely to have occurred on the site. The difference between the two is a forest's **carbon sequestration potential**, indicating the volume of CO_2 a forest is capable of sequestering from the atmosphere if allowed to grow old in peace (Roxburgh *et.al.* 2006, Mackey *et. al.* 2008).

Mackey *et. al.* (2008) consider that for reliable carbon accounts two kinds of baseline are needed;

> *1) the current stock of carbon stored in forests; and*
> *2) the natural carbon carrying capacity of a forest (the amount of carbon that can be stored in a forest in the absence of human land-use activity). The difference between the two is called the carbon sequestration potential—*
>
> > *the maximum amount of carbon that can be stored if a forest is allowed to grow given prevailing climatic conditions and natural disturbance regimes*

Airborne LiDAR (Light Detection and Ranging) is a powerful tool for accurately measuring tree heights and forest structure. The system emits laser pulses that bounce off the ground and vegetation, creating a dense point cloud. This data can then be processed to generate two important digital models: a Digital Terrain Model (DTM) which represents the bare earth surface, and a Digital Surface Model (DSM) which captures the height of all objects, including trees. By subtracting the DTM from the DSM, tree canopy heights can be isolated, allowing for precise measurement of individual tree heights and overall canopy characteristics across large areas. As this type of LiDAR data is available for all of NSW, it is an incredibly use data source for assessing forests at fine resolutions (<3 m).

Qi *et. al.* (2022) consider:

> *… the emergence and development of light detection and ranging (LiDAR) technology provides a new solution for forest emissions reduction assessment. LiDAR is an active remote sensing technology that can penetrate dense forest canopies and capture detailed three-dimensional information on forest canopy (Zolkos et al., 2013), thereby presenting a high potential for forest biomass estimation. Previous studies have demonstrated the capability of LiDAR technology to quantify forest aboveground biomass and associated carbon stock (García et al., 2010; Li et al., 2014; Lin et al., 2016; Nie et al., 2017).*

Based on their assessment, Qi *et. al.* (2022) comment:

> *Using a forest-based emissions reduction project in China as an on-site experiment subject, we developed species-specific LiDAR-based biomass estimation models to assess emissions reduction. It was observed that LiDAR-derived feature parameters could accurately predict forest biomass measurements estimated by the traditional ground-based method (R^2 = 0.93). … Furthermore, we found airborne LiDAR technology could significantly reduce monitoring cost ($/t$CO_2$e), which would only account for a small share of the total implementation cost of a forest emissions reduction project.*

From their comparison of plot data with LiDAR estimates, Patenaude *et. al.* (2004) found*:*

> *At the stand level, the agreement between the plot data upscaled in proportion to area and the LiDAR estimates was r=0.85. At the woodland level, LiDAR estimates were nearly 24% lower than those from the upscaled plot data. This suggests that field-based approaches alone may not be adequate for carbon accounting in heterogeneous forests. Conversely, the LiDAR 20x20 m grid approach has an enhanced capability of monitoring the natural variability of AGCC across the woodland.*

For a 50-ha rainforest plot, Asner *et. al.* (2011) found *"airborne LiDAR can map carbon stocks with 10% error at 1-ha resolution — a level comparable to the use of field plots alone".*

LiDAR has the benefit of being able to remeasure carbon over time, so actual carbon benefits can be quantified. Dalponte *et. al.* (2019) demonstrated the benefits of applying LiDAR to monitor carbon fluxes over time:

> *By combining data from a network of forest plots with repeat airborne lidar, here we develop an approach to (i) map fine-scale variation in aboveground carbon density (ACD) and its change over time across the landscape, and (ii) link these changes in ACD to forest structural attributes, species composition, disturbance regimes and local topography … We demonstrated the potential of repeat lidar for characterizing not only the structure, but also the composition and aboveground carbon dynamics of forests. In doing so we open the door to monitor forests across large and inaccessible landscapes in order to better understand how they are responding to rapid global change and refine how we manage and conserve these critical ecosystems.*

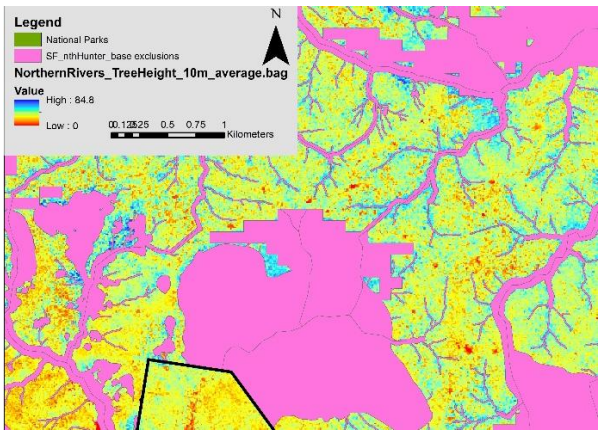
There is also increasing interest in using satellite based LiDAR assessments for carbon accounting. The European Space Agency has recently launched Biomass – an Earth Explorer research mission developed within ESA's FutureEO programme. This offers an alternative means of measuring actual carbon in forests.
https://www.esa.int/Applications/Observing_the_Earth/FutureEO/Biomass/Biomass_satellite_returns_striking_first_images_of_forests_and_more
https://www.esa.int/Applications/Observing_the_Earth/FutureEO/Biomass

> *Launched on 29 April, the Biomass mission will conduct a five-year survey of Earth's forests and map carbon stored within them using an innovative P-band synthetic aperture radar. This instrument is capable to pierce through the canopy to detect the full structure of the forest from the top of canopy down to the ground and will be crucial to the success of the Biomass mission.*
>
> *Importantly, it is tailored to support climate and carbon modelling, forest management, and national greenhouse-gas reporting activities as part of the United Nations Framework Convention on Climate Change Paris Agreement.*

From their study, Jiao *et. al.* (2023) observe:

> *This study presents a practical framework to assess forest emissions reduction using optical satellite imagery and space LiDAR data fusion, which provides a method using multiple remote sensing data sources to model carbon stock from individual trees to REDD+ projects. By conducting an on-site experiment of an ongoing forest carbon project, we evaluated the method's performance compared with the official ex post-monitored emissions reduction in the monitoring report. Our results demonstrated that forest emissions reduction assessment using optical satellite imagery and space LiDAR data fusion is efficient and economical. We also discuss the challenge of building a near-real-time monitoring system for forest-based mitigation activities by utilizing optical satellite imagery and space LiDAR data.*

The following maps depict examples of tree heights mapped by LiDAR in the Northern Rivers, overlaid with logging exclusions (pink). Tree-height is depicted from low (red) to high (dark blue). This is indicative mapping of likely carbon storage. It is self-evident that all forests are not equal. It is possible to delay harvesting of red/yellow areas while focussing logging on blue areas and thereby greatly increasing carbon impacts, while claiming carbon credits. This is effectively Forestry Corporation's current practice as they use similar data to identify which compartments or parts thereof to target for logging. With overall yields declining, and a shoddy baseline, the Forestry Corporation can claim yield reductions while logging the most carbon-rich stands.



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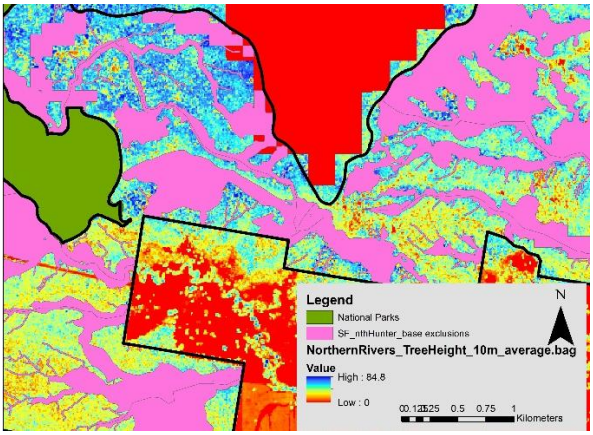

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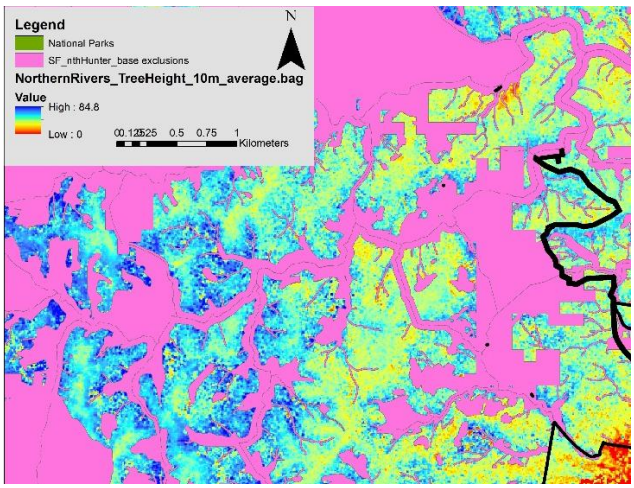
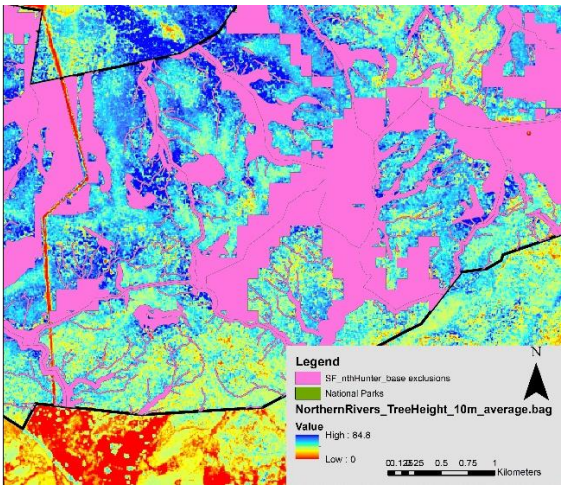


Ewingar SF



Yabbra SF

Utilising LiDAR to map the distribution of actual carbon storage across the landscape is essential if any proposal is to have integrity. The current LiDAR mapping by Griffith University covers most of the Upper North East and the whole of the Great Koala National Park, with the height and canopy width of each individual tree identified. From this data trunk and tree carbon volumes can be estimated and actual standing carbon inferred across all trees and land tenures. It is also feasible to derive the carbon carry capacity of each Plant Community Type (PCT) by assessments of the most mature stands, and to compare it with logging history and compartment yields to assess the reduction in carbon due to recent logging.

It is relatively easy to extend the LiDAR mapping across the whole of the North East NSW RFA regions. To get accurate measures will require establishing plots to measure actual standing carbon at representative sites. Forestry Corporation Permanent Growth Plots provide one data source, though additional plots will be required, particularly for oldgrowth stands and poorly sampled PCTs.

The establishment of an accurate baseline enables future changes in carbon storage to be reviewed and accurately identified, across all tenures.

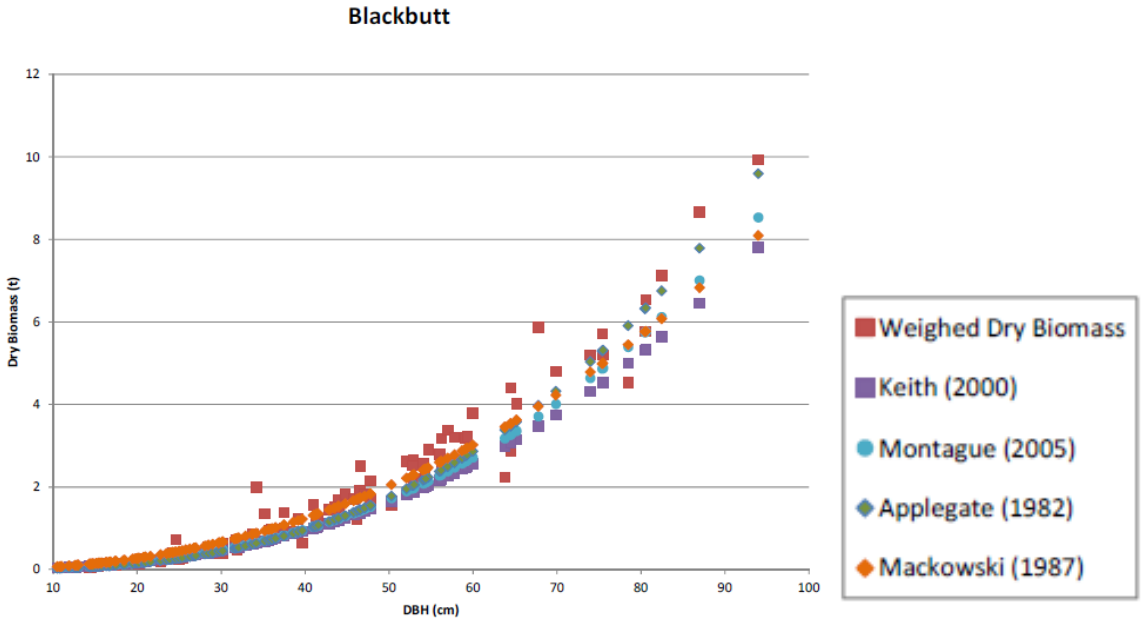
3.1. Carbon Benefits of Protecting Forests

It is the biggest and oldest trees that are of utmost importance for carbon sequestration and storage. It is the oldgrowth stage of forest ecosystems that store the most carbon and achieve their carbon carrying capacity. By removing the larger trees and converting forests to regrowth, logging has more than halved the carbon stored in forests, with repeat logging

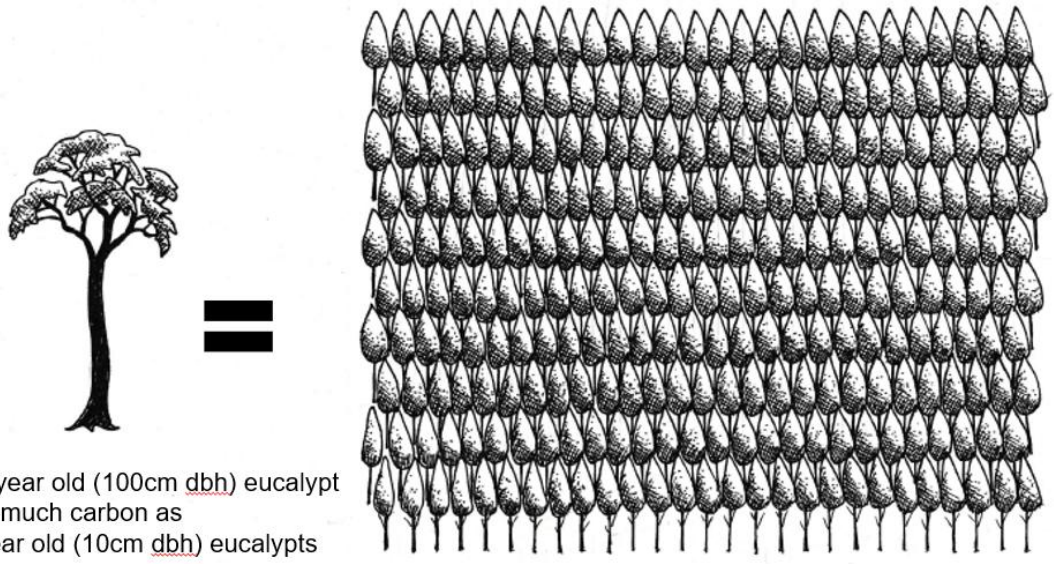
events carbon stores are maintained at suppressed levels. Past logging in northeast NSW has released hundreds of millions of tonnes of CO_2 into the atmosphere that can be regained if State forests are allowed to regain their carbon carrying capacity. As an example of the potential carbon benefits of protecting forests it is reasonable to assume an average Carbon Carrying Capacity of 250 tC/ha^{-1} for natural forests in north-east NSW. LiDAR and existing growth plots can be used to assess annual sequestration potential.

The volume of carbon stored in a natural oldgrowth forest is its **carbon carrying capacity,** The volume of carbon stored in logged forests has been reduced by an average of 40-60%. As large trees are progressively lost and forests converted to young regrowth their storage will continue to decline. A forest's sequestration potential is the difference between its current carbon storage and its **carbon carrying capacity.** Stopping logging allows forests to regrow into multi-aged forests and regain their lost carbon over time. The rate at which carbon is sequestered is one measure of the carbon benefits of protecting forests.

As trees age they sequester more carbon, with the volumes they store increasing exponentially, and along with this their annual rate of carbon sequestration. Far from being static carbon reservoirs, the biggest trees have also been found to sequester the most carbon (Zhou et. al. 2006, Sillett et.al 2010, Stephenson et. al 2014), with Stephenson *et. al* (2014) observing "*at the extreme, a single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree"*.



Carbon storage increases with tree size. Figure 1.40. from Ximenes et al. (2016) showing the relationship for Blackbutt between DBH (diameter at breast height) and dry above ground biomass (tonnes), from their direct weighing compared to various biomass equations developed by other studies. Each tonne of dry biomass is equivalent to around half a tonne of carbon.



One 100 year old (100cm dbh) eucalypt
stores as much carbon as
270 10 year old (10cm dbh) eucalypts

It is also evident that structurally complex forests are more effective at sequestering carbon than simplistic monocultures, for example Gough *et. al.* (2019) found that "*Forests that were more structurally complex, had higher vegetation-area indices, or were more diverse absorbed more light and used light more efficiently to power biomass production, but these relationships were most strongly tied to structural complexity*".

Forests also sequester carbon in slowly decomposing organic matter in litter and soil. (Zhou *et. al.* 2006, Luyssaert *et. al.* 2008). Moomaw *et. al*. (2019) consider the sequestering of carbon in soil another key factor in the storage of carbon in oldgrowth forests:

> *Intact forests also may sequester half or more of their carbon as organic soil carbon or in standing and fallen trees that eventually decay and add to soil carbon (Keith et al., 2009). Some forests continue to sequester additional soil organic carbon (Zhou et al, 2006) and older forests bind soil organic matter more tightly than younger ones (Lacroix et al., 2016).*

The older and bigger a tree gets the more carbon it sequesters, storing it in living and dead wood, as well as soil organic matter. Natural forests are generally multi-aged forests, dominated by giant old trees, but with a succession of age classes resulting from trees succumbing to old age or past disturbances. Such forests can be considered to have reached their Carbon Carrying Capacity. They are the benchmark for assessing changes against.

Carbon Carrying Capacity will vary with forest ecosystems, species composition, and site productivity. Even then oldgrowth forests have been found to continue sequestering and accumulating carbon indefinitely (Harmon *et. al.* 1990, Carey *et. al.* 2001, Chen *et. al.* 2004, Falk *et. al.* 2004, Roxburgh *et.al.* 2006, Mackey *et. al.* 2008, Luyssaert *et. al.* 2008, Dean *et. al.* 2012, Keith *et. al.* 2014b, Curtis and Gough 2018), so at best an indicative baseline Carbon Carrying Capacity is identified.

Mackey *et. al.* (2008) consider that for reliable carbon accounts two kinds of baseline are needed;

> *1) the current stock of carbon stored in forests; and*
> *2) the natural carbon carrying capacity of a forest (the amount of carbon that can be stored in a forest in the absence of human land-use activity). The difference between the two is called the carbon sequestration potential—*
>
> > *the maximum amount of carbon that can be stored if a forest is allowed to grow given prevailing climatic conditions and natural disturbance regimes*

Logging reduces the age classes of trees in forests, particularly the old giant trees, and thus their carbon storage. It is obvious that by removing the largest trees that logging dramatically reduces the

carbon stored in forests. on average, production forests are considered to have lost 40-60% of their carbon stores (Harmon *et. al.* 1990, Roxburgh *et.al.* 2006, Mackey *et. al.* 2008, Wardell-Johnson *et. al.* 2011, Dean *et. al.* 2012, Keith *et. al.* 2014b, Keith *et. al.* 2015, Noormets *et. al.* 2015). Carbon stocks are maintained at these low levels by repeat harvesting events, never allowed to regain their natural carbon carrying capacity.

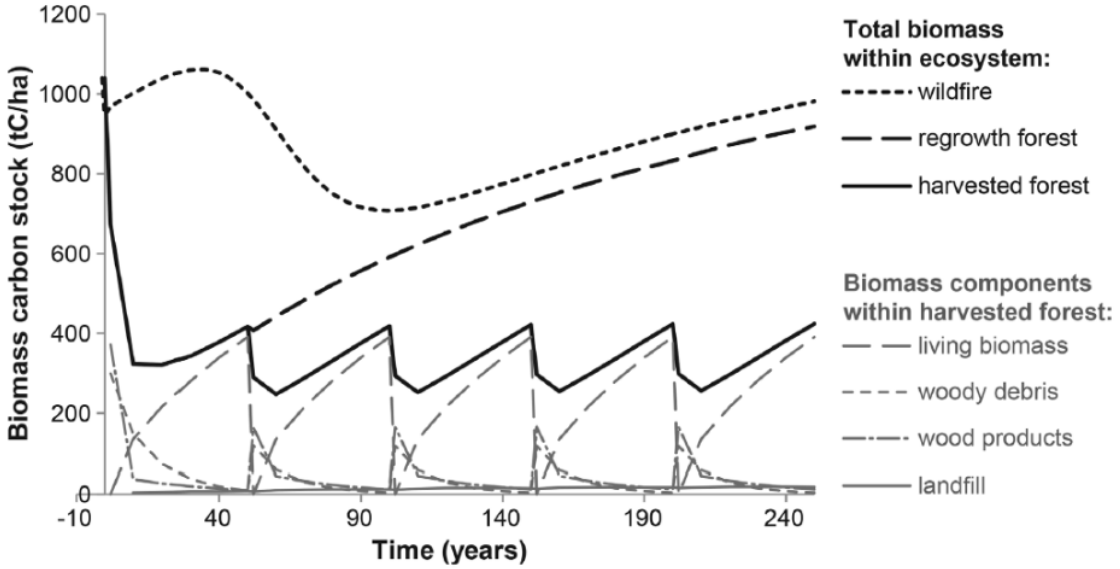
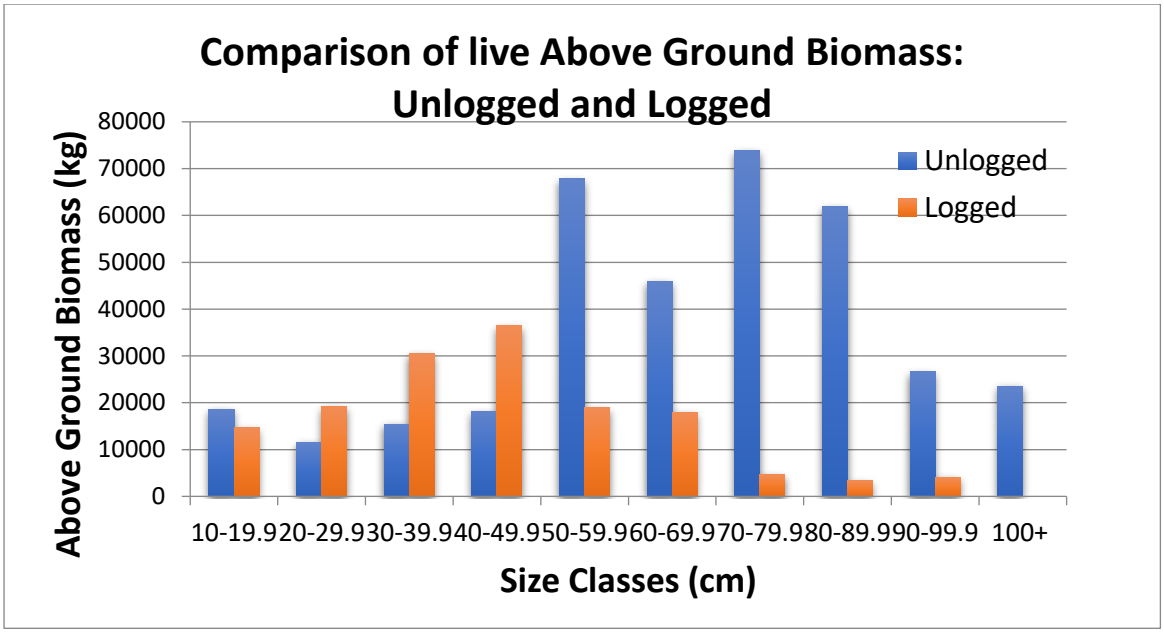


Fig. 10. from Keith et. al. (2014b): Changes in total biomass carbon stock of the ecosystem over time under three scenarios (shown as black lines) from an initial stock of a native forest: (1) wildfire that occurred at time 0 years and then the forest regenerated and dead biomass decomposed over time, (2) regrowth forest after logging once and regeneration, and (3) harvested forest under a regime of repeated logging rotations consisting of clearcutting and slash burning on a 50 year cycle. Note that this is based on a clearfelling regime, with a more complex process in multi-aged forests where biomass is progressively reduced.

The basal area of old dry sclerophyll forests has been assessed as 30 to 50 m^3 per hectare (Ximenes *et al.* 2016), The “wet sclerophyll” forest types, dominated by species such as Brush Box, Tallowwood, Sydney Blue Gum and Flooded Gum are far more productive and have far higher basal areas. The 2018 CIFOA increased allowable logging intensity by establishing 3 zones where logging intensity is limited by basal area retention; a 140,000ha North Coast Intensive Zone with no minimum basal area, a coastal "regrowth" zone with a requirement for retention of a minimum basal area of 10m^2 ha and an escarpment "non-regrowth" zone with a minimum basal area of 12m^2 ha. Compared to the original forest, most of the biomass can be removed.

NEFA (Pugh 2020) assessed the Above Gound Biomass of apparently unlogged and logged (generally over 20 years ago, though not clearfelled) Spotted Gum forests south of Casino, finding a reduction in basal area from 40.7 m^2 per hectare down to 20.2 m^2, primarily attributable to past logging. There had been an overall loss of 59% of live above ground biomass from these forests, which increased to 65% of biomass for trees above 30 cm dbh, and to 84% of biomass for trees above 50 cm dbh.

These forests are now being relogged with over half the biomass (including most trees in the 40-80cm size class) allowed to be removed.



Comparison of Above Ground Biomass of logged (over 20 years ago) and unlogged plots in Spotted Gum forest showing the dramatic reduction in the biomass of larger trees (from Pugh 2020).

Mackey et. al. (2008) assessed the Carbon Carrying Capacity for intact natural eucalypt forests of south-eastern Australia (which included north-east NSW) as an average of about 640 t C ha^{-1}, with 44% in soils, 45% in living biomass, and 11% in dead biomass.

Average Carbon Carrying Capacity of the Eucalypt Forests of South-eastern Australia. (from Mackey et. al. 2008)

Carbon component	Soil	Living biomass	Total biomass	Total carbon
Carbon stock ha^{-1} (t C ha^{-1})	280 (161)	289 (226)	360 (277)	640 (383)

Carbon stock per hectare is represented as a mean and standard deviation (in parentheses), which represents the variation in modelled estimates across the region.

Keith *et. al.* (2015) identified the maximum carbon stock for forests in aboveground living biomass on the south coast as 130-250 $tCha^{-1}$ and in Mountain Ash forests as 775 $tCha^{-1}$. With allowance for 25% of the biomass to be below ground, for south coast forests this translates as 162.5-312.5 $tCha^{-1}$ – an average of 237.5 $tCha^{-1}$.

Additional information on Carbon Carrying Capacity is provided by Ximenes et al.'s (2004, 2016) measurements of above ground biomass (AGB) at 5x0.5 ha sites in NSW, that were chosen as representative of older forests with no management history (though all appeared to have had some logging) and 2x0.5 ha sites chosen as representative of older logged forest. Ximenes et al.'s (2016) assessments were limited to above ground biomass, including dead biomass, so did not consider tree roots or soils. It is emphasised that as well as the small samples, these do not account for the wet sclerophyll types found in north-east NSW, dominated by species such as flooded gum, tallowwood, blue gum and brush box, which have far higher biomasses.

Ximenes et al.'s (2016) measurements of above ground biomass in "representative" stands of previously logged Silvertop Ash and Blackbutt (which had matured sufficiently for relogging), provide an indication of minimum biomass reductions in older logged stands:

Sites	Total live green AGB (t / ha)	Dead trees (t / ha)	CWD (t / ha)	Litter (t/ha)	Total AGB (t / ha)
Silvertop ash conservation	786.2	6.9	63.0	14.5	870.6
Silvertop ash production	320.8	28.0	85.2	14.6	448.6
Blackbutt conservation	674.8	5.4	48.1	21.9	750.2
Blackbutt production	399.0	19.8	170.4	23.4	612.6

Table 1.3. from Ximenes et al. (2016), Above ground biomass as measured for each site as fresh weight

Total carbon in living vegetation includes both above ground biomass (trunks, branches and leaves) and below ground biomass (roots). For conversion purposes, water may comprise 30-40% of the biomass of a tree, roots around 25% of the above ground biomass, and the dry weight of trees is taken to be comprised of 50% carbon.

For comparison Ximenes *et al.*'s (2016) assessed dry above ground biomass was converted to account for below ground biomass (x1.25), with 50% of the dry weight taken to be carbon. For Silvertop Stringybark forests on the NSW south-coast, this gives 128 tC/ha for the production forest and 298 tC/ha for the older forests, a loss of 170 tC/ha (57%). For Blackbutt forests on the north coast, this gives 161 tC/ha for the production forest and 261 tC/ha for the older forests, a loss of 100 tC/ha (38%), though the older forest had a low density of large trees and the ""*production" site yielded a slightly higher proportion of high quality logs than the average blackbutt forest*", meaning they likely understate the average carbon loss.

For the older forests Ximenes *et al.*'s (2016) results give a carbon content of 261-298 tC/ha in live biomass, with an average of 279.5 tC/ha, which is considered relatively low because the stands are likely below Carbon Carrying Capacity and are not representative of the more productive wet-sclerophyll types. The average carbon reduction live biomass in logged forests is 100-170 tC/ha, with an average loss of 130 tC/ha (46%). It is emphasized that current logging is more intense.

Ximenes *et al.* (2004) measured biomass in 3 "representative" south coast Spotted Gum forests on low, moderate and high site qualities which they claimed to be "*close to, or at, maximum carbon carrying capacity*" (though all had been logged in the late 1970s). The dry Above Ground Biomass was 220.2, 287 and 397.3 tonnes ha. For the low, moderate and high site qualities respectively. These are equivalent to a total (including below ground biomass) carbon content of 138, 179 and 248 $tCha^{-1}$ in live biomass – an average of 188 $tCha^{-1}$.

The Federal Government's FullCAM (Full Carbon Accounting Model) is applied at the national scale for land sector greenhouse gas emissions accounting. It includes a value for the maximum upper limit to biomass accumulation for any location based on potential site productivity, for NSW forests with a canopy cover >50% it identifies the upper limit of above ground dry matter of 210 to 287±9 t DM ha -1 (Roxburgh et. al. 2017). This is equivalent to a maximum (including below-ground) carbon accumulation of 131 to 179 $tCha^{-1}$, which are significantly below measured values, and thus bring into question the accuracy of FullCAM.

These are significantly less than the 289 tC/ha derived by Mackey *et. al.* (2008) for live biomass, the Keith *et. al.* (2015) south coast average of 237.5 $tCha^{-1}$, the derived Ximenes et al. (2016) average of 279.5 $tCha^{-1}$ and even the Ximenes *et al.* (2004) average for Spotted Gum of188 $tCha^{-1}$.

As an example of the potential carbon benefits of protecting forests it is reasonable to assume an average Carbon Carrying Capacity of 250 tC/ha^{-1} for natural forests in north-east NSW (which is conservative as it does not account for productive wet sclerophyll forests). Thus, it is considered

reasonable to assume that if logged forests have retained an average of 50% of their original carbon (which is unlikely with current logging intensities), they would have a carbon sequestration potential of 125 tC/ha^{-1}. This is the volumes of carbon that has been lost by past logging. Applying the multiplier of 3.67, this is equivalent to a carbon dioxide sequestration potential 459 tCO^2/ha^{-1}.

As well as the carbon carrying capacity, it is necessary to identify the rate of sequestration. LiDAR has the potential to assist the identification of the annual rate of carbon sequestration in recovering forests, which can be combined with available data from growth plots to get accurate estimations of sequestration potential. Ngugi et. al. (2015) used long-term growth plot data from across native forests in south-east Queensland to identify growth rates of native species across rainfall gradients, which can also be assessed for NSW from Forestry Corporation growth plots.

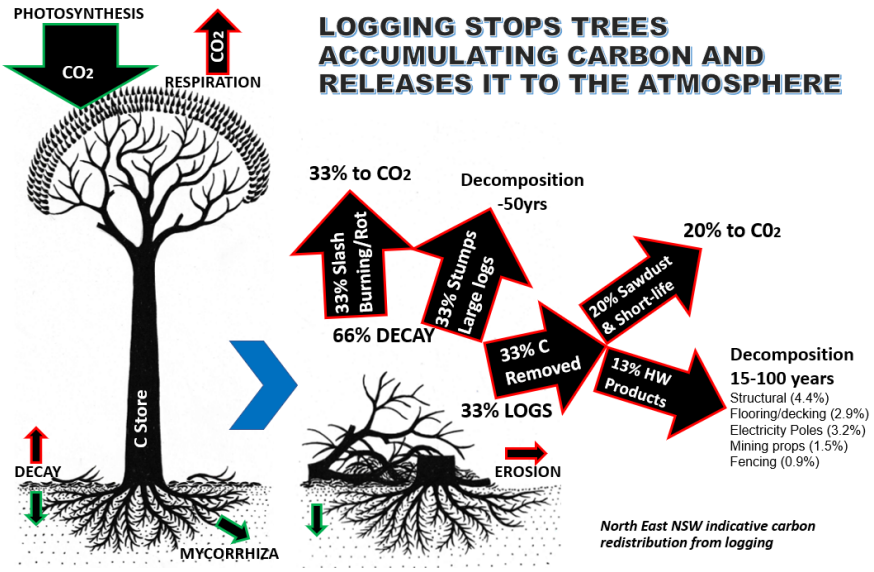
3.2. Carbon emissions due to logging

Logging involves the cutting down of trees, in north-east NSW leaving over 66% of their volume behind to rot and burn, converting a further 20% into waste or short-lived products, and at best converting 13% of their volume into products that may last for decades. In this process the tree's ability to go on sequestering carbon is curtailed, and the carbon it has been accumulating for decades or centuries is oxidised to return to the atmosphere as CO^2. Based on this simplistic, but indicative, assessment, stopping logging of north-east NSW's public forests will avoid the quick emission of over 488,000 tonnes of CO_2 per annum from tree biomass, and the creation of legacy emissions of over 416,000 tonnes of CO_2 per annum that will be realised over decades as logs left in the forest decay and wood used in buildings reaches the end of its useful life.

Sanger (2023) assessed that native forest logging in NSW releases 3.6 million tonnes of carbon (CO2e) per year, which is equivalent to the annual emissions of 840,000 cars. She considered that by 2050 76 million tonnes of carbon can be prevented from entering the atmosphere if forests are protected rather than logged, which could provide $2.7 billion worth of climate benefit to the community.

In regions with large pulpwood industries most of the logs removed from the forests are likely to be woodchipped and thus release their carbon quickly, with as little as 4-6% of the logged trees ending up in sawn products (i.e. Keith *et. al.* 2014). Export woodchipping from north-east NSW was stopped in 2013, though has since increased (mostly from plantations), with pulpwood currently comprising less than 5% of the logs removed from native forests.

Indicative fate of Logged Forest Carbon in north-east NSW



The only relevant sampling assessments located for north-east NSW were 2 in blackbutt forests on the mid north coast undertaken by Ximenes *et al.* (2016). These are very small samples from which to extrapolate across a million hectares of public forests, particularly as Ximenes et al. (2016) only accept one 500m^2 site as being representative.

Ximenes *et al.* (2016) assessed above ground biomass (AGB) in old blackbutt dominated forest and advanced regrowth blackbutt forests in north-east NSW by clearfelling 500m^2 plots. These identified that the old forest had 169% more live (tree) Above Ground Biomass (AGB) than the regrowth stand, which was offset to an extent by the 354% increase in Coarse Woody Debris (CWD) in the regrowth stand, which was attributed to unmerchantable logs remaining from the original forest felled in earlier logging and ringbarking.

	Basal Area (m^2/ha)	Total live green AGB (t/ha)	Dead trees (t/ha)	CWD (t/ha)	Litter (t/ha)	Total AGB (t/ha)
Old forest	39	674.8	5.4	48.1	21.9	750.2
Regrowth	25	399.0	19.8	170.4	23.4	612.6

Above Ground Biomass (AGB), including Coarse Woody Debris (CWD), identified on cleafelled plots by Ximenes *et al.* (2016).

Ximenes *et al.* (2016) exclude the below ground portion of trees from their calculations, by only accounting for AGB. This provides an incomplete picture of the fate of carbon. As tree roots represent around 25% of the biomass of a tree, their inclusion increases the volumes of live green biomass to around 843.5 t/ha for the old forest and 498.8 t/ha for the regrowth stand. Live tree biomass thus accounts for 70-92% of a forest's carbon storage, without accounting for the significant contribution of soil carbon.

Ximenes *et al.* (2016) weighed the trees to further identify the distribution of biomass within the logged trees, expressed in dry tonnes per hectare, identifying that on the old blackbutt forest site some 78% of the above ground biomass was left on site (bark, crown, stump and other) with 22% removed as logs, and on the regrowth site 52% was left on site with 48% removed in logs.

	Bark		Crown		Stump		Other		Logs		TOTAL
	t/ha	%	t/ha	%	t/ha	%	t/ha	%	t/ha	%	t/ha
Old forest	34	*8*	148	*35*	11	*3*	134	*32*	91	*22*	418
Regrowth	17	*7*	35	*14*	12	*5*	71	*27*	123	*48*	258

Live Above Ground Biomass (AGB), converted into dry biomass in tonnes per hectare, on cleafelled plots differentiated into tree parts left on site (bark, crown, stump and other) and removed in log form, as identified by Ximenes *et al.* (2016). The 'Other' residues include non- commercial species, dead and small trees as well as parts of the stem that had no commercial value due to damage during felling, decay or a reflection of the current market for that region. 'Other' is a lot higher for blackbutt than other types with pulpwood markets, i.e. averaging only 7% for silvertop ash.

Leaves, bark and small branches and rootlets will rapidly decompose, releasing their carbon in the process, though stumps, sections of trunks, large branches, and large roots will decompose more slowly. In dry environments standing dead trees and other Coarse Woody Debris (CWD) may remain for decades, with longevity dependent on species and temperature (Woldendorp *et. al.* 2002, Mackensen *et. al.* 2011, Keith *et. al.* 2014b). Keith *et. al.* (2014b) assume that half the logging debris will have a life of around 50 years. Mackensen *et. al.* (2011) found:

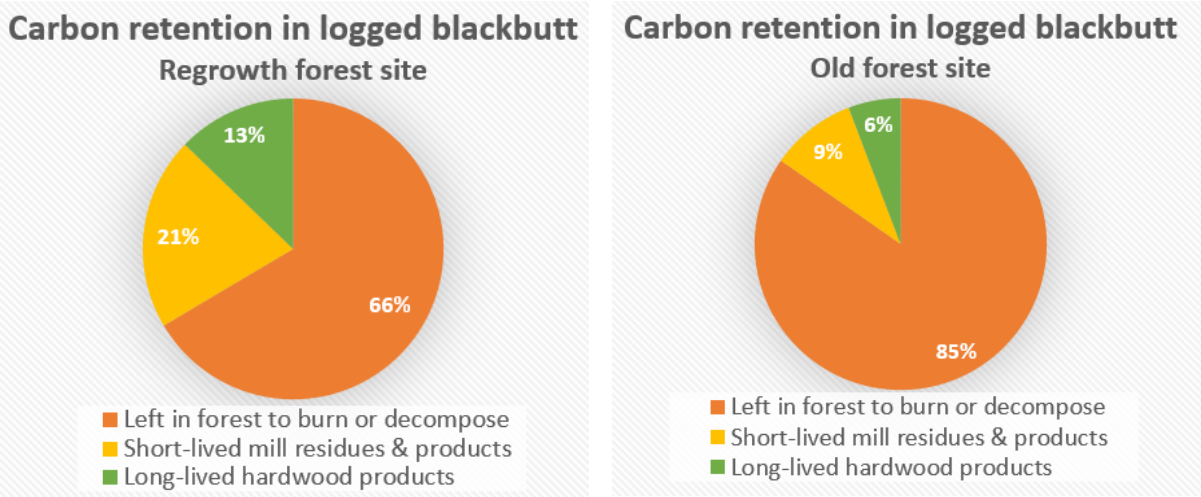
> *In total, 184 values for lifetimes (t0.95) of CWD were calculated from studies available in the literature. In 57% of all cases, the calculated lifetime (t0.95) is longer than 40 years (Fig. 4). The median of this distribution is at 49 years and the mean is 92 years.*

For this assessment it is assumed that half the biomass left on site will be burnt or decay within 3 years and half will progressively decay or burn over 60 years.

The figures of Ximenes *et al.* (2016) for dry tonnes per hectare were adapted to take into account root biomass retained on site, giving total volumes of tree biomass as 522.5t/ha for the old forest

site and 322.5 t/ha for the regrowth site. In addition, the adjustment applied by Ximenes *et al.* (2016) to removed log products from the regrowth blackbutt site to reflect more realistic "adjusted regional average production" resulted in a decline in logs deemed to be removed from 123 t/ha down to 108 t/ha (33.5%). Without a regional adjustment for the old blackbutt site the logs deemed to be removed are 91 t/ha (17.5%).

Ximenes *et al.* (2016) assume that 50% of the dry biomass is carbon. They identify the yield from the 108 t/ha (33.5%) removed from the regrowth blackbutt site as 66.8 t/ha (20.7% of tree carbon) of short-lived residues and hardwood products that will rapidly release their carbon, and 41.2 t/ha (12.8%) as longer lived hardwood products: structural (4.4%) flooring/decking (2.9%) electricity poles (3.2%), mining props (1.5%), and fencing (0.9%). For the old blackbutt site this would indicate that applying this ratio would result in 10.8% of tree carbon rapidly being released and 6.7% being held in relatively long-lived products.



Ximenes et al. (2016) estimates of the fate of carbon in logged forests.

Understandably Forestry Corporation and Ximenes *et al.* (2016) prefer the statistics for the regrowth (production) blackbutt stand and adopt this as being more representative of north-east NSW. These are extremely small samples, so actual carbon impacts should be considered to lie somewhere in the measured range.

The amount of carbon released by logging is to some extent offset by long term storage of carbon in products. Of the 38.2% of the timber removed (12.8% of tree biomass) that is processed into relatively long-lived hardwood products, over half can be expected to be in exposed situations conducive to decay (decking, poles, mining props and fencing) and thus have a lifespan of 15 to 40 years, with the balance (flooring, some structural timber) expected to have a lifetime equivalent to the building it is used in.

The National Electrical and Communications Association identifies *"Australian Standards indicate a life expectancy of up to 40 years above ground and 25 years below ground for hardwood poles. … If your customers' poles are hardwood, it is recommended that they replace all those that have been in service for more than 25 years".* They take this further by recommending that should power poles need replacement that they *"should use new steel poles … in preference to wood poles"*. Hardwood fencing has a reduced life expectancy of 15 to 30 years (when concreted in), with treated pine recommended for longer life.

In Australia, the average life of a brick home is 88 years and a timber home is 58 years (Snow and Prasad 2011), though some can last longer, while typical big box retail stores may only last 30-40 years.

After its useful life is over, a portion of the timber product may end up in landfill, where very low rates of decomposition are reported because of the anaerobic conditions. Keith *et. al.* (2014)

consider the proportion of the initial forest carbon stock that remains in long-term storage in landfill is less than 3%.

Based on this, it is reasonable to assume that of the 12.8% (at best) of tree biomass made into long-life timber products, some 7% will retain its carbon for 15-30 years, 3% will last 60-90 years and 2.8% over 100 years.

For the North Coast, the 2021/22, 2022/23, 2023/24 and 2024/25 Forestry Corporation Biomaterial Reports identify an average yield of 250,030 m^3/annum of logs. If it is assumed that around a third of this wood is carbon, this represents some 82,500 tonnes of carbon. Based on Ximenes assessments for Blackbutt, 51,028 tonnes of this carbon in removed logs can be assumed to be rapidly oxidised to CO2, with the balance released over decades. Another 163,769- 388,929 tonnes would have been left in the forest to decompose, with half this carbon being rapidly oxidised and the rest over decades. This 132,912- 245,492 t/yr of quick release carbon reacts with oxygen to generate 487,787- 900,956 t of CO_2.per annum. This will be added to over decades by the slower oxidisation of an additional 113,356 - 225,936 t/yr of carbon to generate 416,018 - 829,185 t of CO_2.

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