Addendum

Forestry Corporation Rationale for operations under the CIFOA with additional environmental safeguards

Executive Summary

1. This document is an addendum to the document *Forestry Corporation Rationale for short-term operations under the Coastal Integrated Forestry Operations Approval (CIFOA) with additional environmental safeguards while the Natural Resources Commission (NRC) charts a long-term pathway to return to the CIFOA (February 2021) – herein known at 'the rationale document'.*

2. The Environment Protection Authority (EPA) have been provided all documents relating to the original rationale following a notice to produce documents and information served on Forestry Corporation through their investigation powers, however Forestry Corporation is unaware if the EPA have formed any opinion following the response to this notice.

3. Forestry Corporation is tasked with managing 2 million hectares of native State forests for a range of purposes including supply sustainable timber to industry and protecting the forest environment (See clause 51 of *the rationale document).*

4. Forestry Corporation continues to seek to balance its principal objectives as set out in s10 of the Forestry Act 2012.

5. This addendum outlines operations which have taken place since February 2021, provides an assessment of the additional environmental safeguards employed and recommends the way forward

Harvesting under Voluntary Environmental Safeguards

Southern and Eden Regional Forest Agreement (RFA) regions

6. Forestry Corporation re-commenced harvesting operations in Eden in March 2021 and Southern in April 2021 with additional environmental safeguards put in place in recognition of the impacts of the 2019-2020 bushfires.

7. These additional environmental safeguards seek to provide the balance which Forestry Corporation is required to strike between environmental considerations; the need to support the

regional communities reliant on timber industry jobs; and meet its supply commitments with small family businesses and key local mills.

8. The following operations have taken place from March-June 2021:

Sub-Region	**State Forest**	**Plan**	**Status**
Eden	Nadgee	95A	Suspended
		116A, 117A	Active
	Yambulla	303A	Active
		1301A	Active
South Coast	Mogo	180A	Active
	Bolaro	242A, 243A	Active
Tumut	Bago	54A, 55A, 63A	Active
	Bago	73A	Completed
	Bago	22A	Active

9. Details of these operations have been provided to the regulator and the general public via the Plan Portal in accordance with the requirements of the CIFOA.

North Coast

10. On the North Coast, operations have continued to take place in unburnt forests and hardwood plantations with no further harvesting in burnt areas under SSOC.

11. It is anticipated that a range of voluntary environmental safeguards will be developed and implemented for harvesting of fire affected forests to recommence on the North Coast in the coming months. However, this work has not yet been completed.

Legal and regulatory framework and obligations

12. The CIFOA is the legal regulatory framework governing native forest harvesting in NSW State forests (See clause 55 of *the rationale document).*

13. In March 2021, the Minister for Planning and Public Spaces requested the NRC through a terms of reference to provide independent, evidence-based advice on forestry operations under the CIFOA as the NSW public forest estate recovers from the 2019-20 bushfires.
14. The Commission will provide its final advice in confidence for consideration to the Minister for Planning and Public Spaces, the Deputy Premier and Minister for Regional NSW, Industry and Trade, and the Minister for Energy and Environment.
15. Forestry Corporation will await any consideration and adopt any recommendations agreed by the NSW Government.
16. In the absence of amendment to the CIFOA or Government adoption of recommendations from the NRC, the current CIFOA is the legal regulatory framework governing native forest harvesting in NSW State forests remains the case.

17. Forestry Corporation also has legally enforceable contractual obligations in its Wood Supply Agreements (WSAs) to supply various volumes of timber from specific geographic locations (price zones). The NSW Government is also party to many of these agreements.

18. Forestry Corporation is required to undertake sustainable forest management and have regard to the precautionary principle in this context, as well as to ensure adaptive management as acknowledged in the state-wide framework for Monitoring Biodiversity integrity across the state and the monitoring requirements that are the responsibility of all land managers across tenures pursuant to the requirements of the Biodiversity Conservation Act (2016).
19. Forestry Corporation continues to seek to balance the social, environmental and economic obligations under the Forestry Act in timber harvesting in native State forests following the bushfires.

Contractual obligations

20. There is a declaration of force majeure in place in relation to the impact of the bushfires however this does not extend to impediments to timber supply which might arise from the regulatory environment (See clause 42 of *the rationale document)*.

Eden region and south coast sub region

21. Forestry Corporation has three WSA's with ANWE for supply of 160,000 tonnes of pulpwood from Eden, up to 90,000 tonnes of pulpwood from the South Coast and 25,000m^3 of sawlogs from Eden annually. The pulpwood WSAs provide that at ANWE's instigation, with Forestry Corporation's agreement, the pulpwood component can vary year to year subject to the terms of each agreement.

22. Under ANWE's WSAs in the Eden region Forestry Corporation is required to provide ANWE with a 12 month plan of operations identifying which compartments will be made available for harvesting and what volume will be supplied within each year.
23. Boral does not have a current WSA but rather a 12 month Parcel Sale Agreement (PSA) for an indicative volume of 25,400m^3.
24. Boral is seeking confirmation by 30 June 2021 of South Coast supply arrangements beyond the 12 month PSA that concludes at end of 2021.

Tumut sub region

25. Forestry Corporation has a WSA with Ryan and McNulty for supply of 18,500m^3 of sawlogs from part of the Tumut sub region.
26. Forestry Corporation has two PSAs with Mountain Hardwood and Spot Pallet for up to 15,000 tonnes of low quality sawlog.

North Coast

27. On the North Coast Forestry Corporation has a number of WSAs in place for varying volumes of timber. Most high quality sawlog agreements run to end of 2023 but the Boral agreement runs to the end of 2028.
28. An annual plan of operations for the North Coast will be provided at 30 June 2021. However, this will not delineate operations intended to supply any single customer.

Current state of supply

29. The Eden and Southern industry has continued to operate at a significantly reduced level. Supply for FY21 is below

Table 1. Supply by supply zone FY21

	Eden Normal	***Eden Post Fire***	**SC Normal**	***SC Post Fire***	**Tumba Normal**	***Tumba Post Fire***
HQ Sawlog (m3)	25,000	*3,000*	38,500	*7,500*	18,500	*25,082*
LQ Sawlog (m3)	5,000	*100*	15,000	*2,250*	10,000	*10,191*
Pulpwood (t)	180,000	*50,000*	40,000	*6,500*	5,000	*5,011*
Firewood (t)	4,000	*120*	30,000	*10,500*	5,000	*3,833*
Total	214,000	*53,220*	123,500	*26,750*	38,500	*44,117*

Table 2. Total supply by product FY21

	Total Normal	***Total Post Fire***	**Impact**
HQ Sawlog (m3)	82,000	*35,582*	-57%
LQ Sawlog (m3)	30,000	*12,541*	-58%
Pulpwood (t)	225,000	*61,511*	-73%
Firewood (t)	39,000	*14,453*	-63%
Total	376,000	*124,087*	-67%

30. The ANWE and Boral mills are understood to have supplemented supply from Private Native Forest and interstate operations although they are thought to be operating under capacity.

31. Construction of the ANWE mill has continued. Forestry Corporation understands that ANWE was the beneficiary of substantial NSW Government loans to support this project.

32. Forestry Corporation has been unable to supply work for all contractors in the Southern region on a regular basis with the result that those contractors engaged by Forestry Corporation have been operating on a reduced basis commensurate with supply levels.

33. Contractors engaged by ANWE for the Eden area have been operating across NSW hardwood and softwood State forests, Victorian state forests and private property.

34. Timber supply to North Coast customers has been largely from hardwood plantations. There has been an impact on timber supply from the force majeure events of both fire and flood with two force majeure notices issued to harvest and haulage contractors and WSA holders on the North Coast. Timber supply as at end May 2021 is around 34,000 cubic metres below sawlog contracts. The current supply source from hardwood plantations has largely been exhausted with remaining plantations needing further time to grow to maturity.

Assessment of additional environmental safeguards – environmental outcomes and timber supply considered

35. Voluntary conditions have been applied to operations in the Southern and Eden regions since March 2021. These were intended to augment the already robust conditions of the CIFOA to specifically protect environmental values at risk in the immediate post-bushfire landscape.

36. The additional environmental safeguards were developed by Forestry Corporation. An external ecologist also provided expert advice in relation to the additional environmental safeguards.

37. The additional environmental safeguards implemented for these operations are outlined in full in the original rationale document. The safeguards included a conservative approach to the identification and protection of hollow bearing trees in each operation; large areas excluded from harvesting at both the Local Landscape Area and Operational Area scales; additional ecology surveys and planning assessments; and additional buffers on all drainage channels and environmental protection zones which are already excluded from harvesting.

38. Robust operating procedures were developed and employed to manage compliance with these additional safeguards and share the outcomes.

39. Operations continue to be monitored via Forestry Corporation's operating procedures with any non-conformances identified and reported appropriately.

40. There has been some local media coverage of the operations with environmental groups opposing native forest operations in the post-bushfire environment. Questions were raised by stakeholders, including the regulator, around two aspects of compliance in these operations and information provided to refute these allegations.

Proposed changes to environmental safeguards

41. In June 2021 Forestry Corporation undertook a review of the additional environmental safeguards considering compliance with these, the expected environmental outcomes and the impact on timber supply in the small number of operations undertaken in Eden and Southern in 2021.

42. The outcome of these considerations and recommendations moving forward are outlined below.

Eden Silviculture and harvesting intensity

43. In preparing to return to harvesting with additional environmental safeguards in March 2021, Forestry Corporation decided to implement selective harvesting only but made the following observations about harvesting intensity:
    - Basal Area is not in itself ecologically significant for protection of forest values in regrowth forests, as opposed to landscape protection measures and retained tree provisions, which seek to identify and protect specific ecological values.
    - Resumption of alternate coupe operations in Eden would be considered after a more detailed review was undertaken (or by Jan 2022).

44. Forestry Corporation has now conducted that more detailed review of the situation in Eden and determined that Alternate Coupe harvesting (without selective harvesting basal area retention rates) in fire affected Silvertop Ash stands represents the most balanced strategy for continuation of harvesting in the Eden Region. It will facilitate the greatest level of dispersal of operations, minimising potential impacts on the broader forest landscape, while also providing the conditions for effective regeneration of fire affected stands.
45. Alternate coupe harvesting ensures adequate regeneration of obligate seeding species such as the ash types that dominate the forests in the Eden region. In alternate coupe harvesting a modified shelterwood system is applied within the harvested coupes. Harvesting removal is intensive, however a range of trees are retained across the harvest area for fauna habitat protection, seed supply, or in clumps as required under the CIFOA. Trees not required for these purposes are harvested for sawlogs and pulpwood, creating optimal regeneration conditions.
46. After fire, younger regrowth stems are likely to die outright from wildfire conditions, older regrowth that is closer to economic maturity will persist and redevelop crowns through epicormic shoots. This has been observed historically and again following the 2019-20 wildfires. While the trees can maintain basic, albeit less dynamic, growth function through this strategy the remaining stems frequently develop a dead top. 'Dead topping' will not only lead to the loss of tree form and quality in the stem, but eventually facilitate the entry of rot that will significantly degrade the wood properties and ultimately lead to the early death of the tree.
47. It is broadly recognised that the biodiversity and threatened species habitat value of silvertop ash dominated stands is low (e.g. Kavanagh and Bamkin 1994, Lunney 1987, Loyn et al 1980). This would be even more pronounced in younger even aged regrowth forests that have been significantly impacted by wildfires such as those being considered for harvesting under this proposal in the Eden Region.
48. Resumption of alternate coupe harvesting will be the most efficient means of concentrating harvesting in this manner, while also providing for broader recovery in the balance of the landscape and will optimise conditions for regeneration in the harvested fire damaged stands.

Local Landscape Area Offset Mapping Procedure

49. The additional environmental safeguards employed in the Southern region included a mapping protocol to ensure a minimum threshold offset area was established in each local landscape area (LLA) to provide a refugia for flora and fauna that are recovering from the impacts of the fires.
50. A correction is now required to the mapping protocol. The protocol was intended to ensure an offset area of a minimum of 50% of each LLA to be established. However, the application of this mapping protocol resulted in areas far in excess of 50% of the LLA being excluded.

51. The revised protocol to be used on the South Coast retains the same intent of identifying 50% of each LLA to be temporarily offset focussed on areas of high ecological value including unburnt, low intensity burnt and substantially recovered forest.
52. The new protocol includes the use of updated and additional NSW Government fire severity and recovery data and incorporates observations and learnings from implementation of the existing mapping protocol, forest ecology surveys, forest recovery and associated ground validation.

Recommencement of South Coast tablelands (Tallaganda State Forest) harvesting

53. In June 2020, Forestry Corporation's report *2019-20 Wildfires Environmental impacts and implications for timber harvesting* (**Forestry Corporation 2019-2020 Wildfire Report**) flagged the potential impact of the fires on greater glider populations in the region as an issue for further consideration.
54. No timber harvesting was scheduled in the tablelands forests until surveys could be undertaken to better understand post-fire occupancy levels in the forest and to determine if further measures might be considered in implementing the CIFOA.
55. The greater glider is widely distributed throughout NSW. The species is listed as vulnerable by the federal government but not listed as a threatened or vulnerable species in NSW as most of the concern around the species is in Victoria.
56. When the remade CIFOA was introduced in November 2018, Greater Gliders were listed as adequately protected by the standard conditions, due to the protection of hollow-bearing trees and general exclusion zones in the CIFOA, as well as the significant protections for the species habitat in the reserve system on national parks.
57. Past surveys show that the measures in the Southern IFOA have been successful in retaining a significant population of Greater Gliders across Tallaganda State Forest in concert with renewable timber harvesting events.
58. Preliminary post-fire survey results also show that the population of greater gliders within Tallaganda State Forest has been largely resilient to the 2019/2020 bushfires in this forest (and the preceding drought). The population density in burnt areas is lower than in unburnt areas but is generally still very high compared with many other known populations.
59. Given the initial resilience of the population of gliders in the forest, including fire affected areas, and the ongoing high densities recorded in areas subject to previous harvesting it is considered that further harvesting under the conditions of the CIFOA will not compromise the glider population in Tallaganda State Forest or regionally.
60. As such, harvesting in unburnt areas of Tallaganda State forest is proposed to take place under the CIFOA conditions during 2021. In burnt areas, additional protections will be put in place for

identified high quality glider habitat in local landscape areas where the exclusion zones under the CIFOA are compromised during 2021.

61. Further surveys and analysis will be carried out in coming years to determine occupancy trends over time, including with the DPI Forest Science Unit and in the context of the NRC forest monitoring program.

North Coast

62. On the North Coast, Forestry Corporation intends to develop additional environmental safeguards for operations in burnt forest to commence over the coming months.

Recommendations

63. Accordingly, it is recommended that Forestry Corporation:

    (a) Prepare timber harvesting plans under the CIFOA with additional environmental safeguards as outlined in Attachment 1 for Eden and the South Coast and Attachment 2 for Tumut Subregion.

    (b) Implement recommendations in attachments 3, 4 and 5 regarding regeneration monitoring, seed collection and predator control programs in Eden and additional monitoring for greater glider in Tallaganda.

    (c) Finalise and adopt conditions for the North Coast burnt areas to be implemented during 2021.

    (d) Engage with NSW government agencies on how and when this proposal will be implemented.

    (e) Continue to engage with NSW government agencies in the NRC review process and implement those NRC recommendations which are adopted by government.

Attachment 1: Forestry Corporation Updated Proposal: July 2021 South Coast & Eden

CIFOA with additional environmental safeguards– supplementary measures

Supplementary Measure	Justification Summary
Application	
Apply conditions in LLAs: • Apply to All LLA's impacted by fire in 2019-2020 wildfires.	• As a continuing precautionary approach this LLA condition will be applied to all LLAs affected by fire during the 2019-2020 wildfires. • As described in the mapping protocol review the intent remains to disperse potential impacts from harvesting across the broader forest and to ensure that adequate, precautionary refugia exist within each LLA in which timber is harvested.
Duration	
Duration – SSOC apply for the duration of the current planned operations during 2021 or until an alternative approach is approved by the NSW government	No change from original voluntary measures.
Landscape Exclusions	
LLA Limit • Minimum of 50% of gross area to be excluded • Apply revised Forestry Corporation mapping protocol	• Minor change in construction of the protocol is to be implemented to ensure that the original intent in delivered. • This condition provides specific protection to unburnt areas of forest and provides up to 50% offset in LLAs where significant areas were subject to moderate or lower burn intensity. Consequently, larger ecological reserves will be mandated to include less burnt parts of the forest landscape in areas where harvesting is planned. • This protocol has been revised to ensure that it provides precautionary landscape refugia wherever timber harvesting in planned, while still allowing for access to reasonable areas of available timber and not overly restricting yields.
Additional 10m on all mapped exclusion zones. • Boundary marking to be a combination of GPS in harvesters and on-ground	• No change from original voluntary measures.
Harvesting limit (intensity)	

Return to CIFOA	• Forestry Corporation note that Basal Area is not in itself ecologically significant for protection of forest values in regrowth forests, as opposed to landscape protection measures and retained tree provisions, which seek to identify and protect specific ecological values. • Resumption of intensive harvesting with seed tree retention under CIFOA alternate coupe conditions in Eden will be implemented in plans approved after July 1, 2021. • Selective harvesting limits apply to the remainder of the southern production region.
Retained Trees	
Minimum 8 *Habitat* trees identified / hectare Habitat trees include in order of priority: • Hollow Bearing Trees where they exist • Trees > 100cm DBHOB in Eden and South Coast sub-region • recruitment trees where hollow bearing trees don't exist.	No change from original voluntary measures
Riparian Exclusions	
10m additional buffer on all riparian zones. ESA 2 on outer buffer Maps to use GPS centre line marking of drainage lines.	No change from original voluntary measures
Surveys	
Survey Proposal is detailed in previous rationale	No change from original voluntary measures.
Soil and Water protection conditions	
Forestry Corporation to use methodology established by Dr Peter Walsh to determine if additional conditions are required.	No change from original voluntary measures

Attachment 2: Forestry Corporation Proposal – July 2021 Tumbarumba

CIFOA with additional environmental safeguards– supplementary measures

Supplementary Measure	**Justification Summary**
Application	
Apply conditions in all LLAs	No change from original voluntary measures
Duration	
Duration – SSOC apply for the duration of the current planned operations during 2021 or until an alternative approach is approved by the NSW government	No change from original voluntary measures
Landscape Exclusions	
LLA Limit • Minimum of 50% of gross area to be excluded • Apply revised Forestry Corporation mapping protocol	• Minor change in construction of the protocol is to be implemented to ensure that the original intent in delivered. • This condition provides specific protection to unburnt areas of forest and provides up to 50% offset in LLAs where significant areas were subject to moderate or lower burn intensity. As such larger ecological reserves will be mandated to include less burnt parts of the forest landscape where harvesting is planned. • This protocol has been revised to ensure that it provides precautionary landscape refugia wherever timber harvesting in planned while still allowing access to reasonable areas of available timber and not overly restrict yields.
Additional 10m on all mapped exclusion zones. • Boundary marking to be a combination of GPS in harvesters and on-ground	No change from original voluntary measures
Harvesting limit (intensity)	
Normal CIFOA silviculture limits	No change from original voluntary measures
Retained Trees	

Minimum 8 *Habitat* trees identified / hectare Habitat trees include in order of priority: • Hollow Bearing Trees where they exist • Trees > 100cm DBHOB in Eden and South Coast sub-region • recruitment trees where hollow bearing trees don't exist	No change from original voluntary measures
Minimise damage to all live trees (30cm DBHOB) to the greatest extent practical • Unless they are otherwise a retained tree under the CIFOA in which case normal procedures must be followed	No change from original voluntary measures
Riparian Exclusions	
10m additional buffer on all riparian zones. • ESA 2 on outer buffer • Maps to use GPS centre line marking of drainage lines.	No change from original voluntary measures
Surveys	
Normal CIFOA surveys only (where safe to conduct).	No change from original voluntary measures
Soil and Water protection conditions	
Forestry Corporation to use methodology established by Dr Peter Walsh to determine if additional conditions are required.	No change from original voluntary measures

Attachment 3 Eden Silviculture Review

Issue:

Harvesting in Native Forests within the Eden RFA region was significantly limited following the 2019-20 wildfires. This was due to a number of factors including: the initial physical impacts of the fires on the forest, a process of negotiated site specific conditions between Forestry Corporation and the EPA and; Forestry Corporation taking time to evaluate the impacts of the fires, and determine an appropriate harvesting strategy.

In early 2021 Forestry Corporation undertook a review of legal and regulatory obligations, harvesting practices and industry supply options for fire affected forests. In this review Forestry Corporation resolved to apply selective harvesting practices while further assessments were undertaken as forest recovery progressed in the broader region. In that review:

- Forestry Corporation note that Basal Area is not in itself ecologically significant for protection of forest values in regrowth forests, as opposed to landscape protection measures and retained tree provisions, which seek to identify and protect specific ecological values.
- Resumption of alternate coupe operations in Eden would be considered after a more detailed review was undertaken (or by Jan 2022).

This paper presents a summary of the considerations to recommence alternate coupe harvesting in the Eden Management Area.

Background:

The impact of large scale and intensive wildfires have always been intertwined in both the historical evolution of the Eden forests and the silvicultural approach applied. The historical footprint of fires and the overlay of alternate coupe harvesting is shown in appendix 1. Alternate coupe harvesting was first designed and implemented in the Eden forests during the 1980's to balance the regeneration needs of the predominant forest types with ecological outcomes and long term fire management principles.

Alternate coupe harvesting is designed to manage harvesting impacts on biodiversity by dispersing harvesting in space and time while ensuring adequate regeneration of obligate seeding species such as the ash types that dominate the forests in the Eden region. In alternate coupe harvesting a modified shelterwood system is applied within the harvested coupes. Harvesting removal is intensive, however a range of trees are retained across the harvest area for fauna habitat protection, seed supply, or in clumps as required under the CIFOA. Trees not required for these purposes are harvested for sawlogs and pulpwood, creating optimal regeneration conditions.

Specifically, the alternate coupe harvesting approach provides the following benefits:

- Intensive harvesting optimises conditions for the regeneration of obligate seeding species such as Silvertop Ash.
- Removal of overstory competition improves growth and productivity from regenerating stands.
- Concentrating harvesting impacts on a smaller footprint enables the establishment of a broad mosaic of forest age classes and structures across the region to support biodiversity (in conjunction with the CAR reserve system).
- Fire Management outcomes are optimised by facilitating coupe based burning regimes

- Utilisation of all available wood products can be optimised on a rotational basis

Silviculture in Fire damaged stands

Repeated impact of fire on the Ash forests and associated forest types in the Eden management area is well documented (Bridges 1983, NSW Silviculture Notes). Numerous significant high intensity fires have impacted these forests historically (see attachment 1). While younger regrowth stems are likely to die outright in wildfire conditions, older regrowth that is closer to economic maturity will persist and redevelop crowns through epicormic shoots. This has been observed historically and again following the 2019-20 wildfires (see photos in appendix 2). While the trees can maintain basic, albeit less dynamic, growth function through this strategy the remaining stems frequently develop a dead top. 'Dead topping' will not only lead to the loss of apical dominance (and hence tree form and quality) in the stem, but eventually facilitate the entry of rot that will cause significant degradation to the wood properties and ultimately the early death of the tree. The expected declining recovery of high quality timber over time from such fire affected stands provides a rationale for concentrating timber harvesting in the Eden Management Area in fire impacted stands. This will allow for greatest recovery of fire affected timber before it degrades and for less intensively burnt areas of forests to recover.

Resumption of alternate coupe harvesting will be the most efficient means of concentrating harvesting in this manner, while also providing for broader recovery in the balance of the landscape and optimising conditions for regeneration in the harvested fire damaged stands. Silviculturally, the silvertop ash-stringybark type forests are well adapted to respond to the disturbance caused by integrated harvesting (Bridges and Dobbyns, Forest Management in Australia 1991).

Monitoring of regeneration will be necessary to ensure that harvesting of fire affected stands does not significantly impact regeneration that was initiated by the 2019/20 wildfires. The impact of timber harvesting on regenerating stands has been previously documented (NSW Silviculture Notes). For example, following 1972 and 1979 wildfires salvage harvesting was undertaken in fire affected stands which saw a reduction in seedling density from 85,000 stems per hectare to 19,800st/ha and from 67,000st/ha to 8,500st/ha respectively (NSW Silviculture Notes). Despite these substantial impacts the residual stocking rates were still more than adequate to achieve full site productivity. However, monitoring of regeneration is still recommended, and scoping of a potential seed collection program should be undertaken in the coming years as an insurance against failure of regeneration in areas harvested post-fire.

Ecological Aspects of Silviculture in Eden:

Alternate Coupe silviculture facilitates a reduced footprint from harvesting over-time and forces the dispersal of harvesting impacts across the forest landscape, producing a mosaic of forest age classes and structure beneficial to biodiversity generally.

Within the Eden region, the dominant Silvertop Ash forest types typically do not support high levels of biodiversity nor do they support populations of threatened species, most of which tend to be niche habitat specialists existing outside the Silvertop Ash areas. It is broadly recognised that the biodiversity and threatened species habitat value of silvertop ash dominated stands is low (e.g. Kavanagh and Bamkin 1994, Lunney 1987, Loyn et al 1980). This would be even more pronounced in younger even aged regrowth forests that have been significantly impacted by wildfires such as those being considered for harvesting under this proposal in the Eden Region.

As an example, the Southern Brown Bandicoot is managed under the CIFOA Species Management Plans. The actions required by these species management plans incudes minimising disturbance to core habitat areas (typically Yertchuk forest type with heath understorey), monitoring of populations and predator control in these areas. These are broader land management actions, rather than adjustments to silviculture.

Further examples include threatened frogs in the Eden area such as the Little Johns Frog and the Giant Burrowing Frog. These are also catered for in the CIFOA conditions. These species have highly specific habitat requirements and are best managed on a site by site basis where they are known to be located or where detected in surveys and searches. Again, the type of silviculture applied in harvesting does not impact on the outcomes for these species.

Other hollow dependant species, such as owls and gliders are catered for in the CIFOA through the standard conditions such as application of the FMZ system and other mapped exclusions which provide for retention of large areas of undisturbed landscape. Standard CIFOA conditions also mandate the identification and protection of Hollow bearing trees, wildlife habitat clumps and tree retention clumps.

The Alternate Coupe silvicultural system employed in harvesting within the Eden Management Area is a positive approach to managing potential harvesting related impacts across the forest landscape and is not expected to have a negative impact on biodiversity or threatened species habitat when it is applied together with the CIFOA conditions. Further, Forestry Corporation has voluntarily adopted a range of measures in Eden that supplement the CIFOA's landscape and site-based measures including wider riparian buffers, additional exclusion zone buffers and enhanced tree retention in the application of the CIFOA Hollow Bearing tree condition, providing additional protection to ecological values in fire affected forests

Conclusions

Alternate Coupe harvesting of fire affected Silvertop Ash stands represents the most balanced strategy for continuation of harvesting in the Eden Region. It will facilitate the greatest level of dispersal of operations, minimising impacts on the broader forest landscape, while also providing the conditions for effective regeneration of fire affected stands. Concentrating harvesting for the foreseeable future on highly impacted stands through intensive harvesting will maximise the recovery of high quality wood from stands where it will otherwise degrade and die over time. This provides the opportunity to maintain ecological values while optimising forest productivity and minimising economic impacts.

Recommendations

On the basis of the above analysis it is recommended that:

1. Forestry Corporation resume alternate coupe harvesting in Eden from July 2021;
2. Forestry Corporation design and undertake an increased regeneration monitoring program and scope a seed collection program within the Eden RFA region; and
3. Forestry Corporation review and enhance current monitoring and predator control programs.

Appendix 1: Maps Showing historical fire and harvesting in Eden Management Area

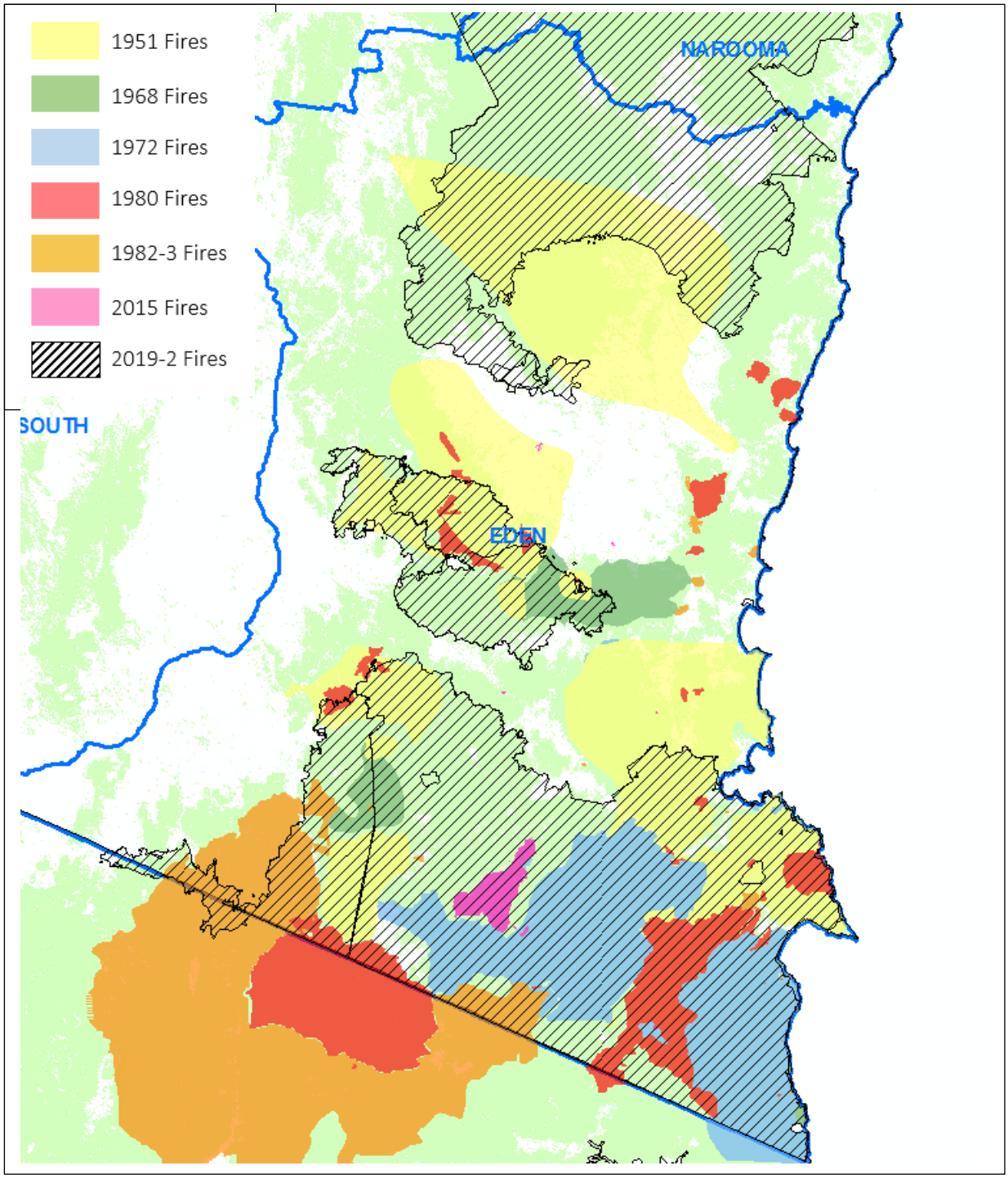


Figure 1: Eden management Zone: wildfire history 1950 -2020 (70 years). Fire has been a significant factor in the development of forests in the region.

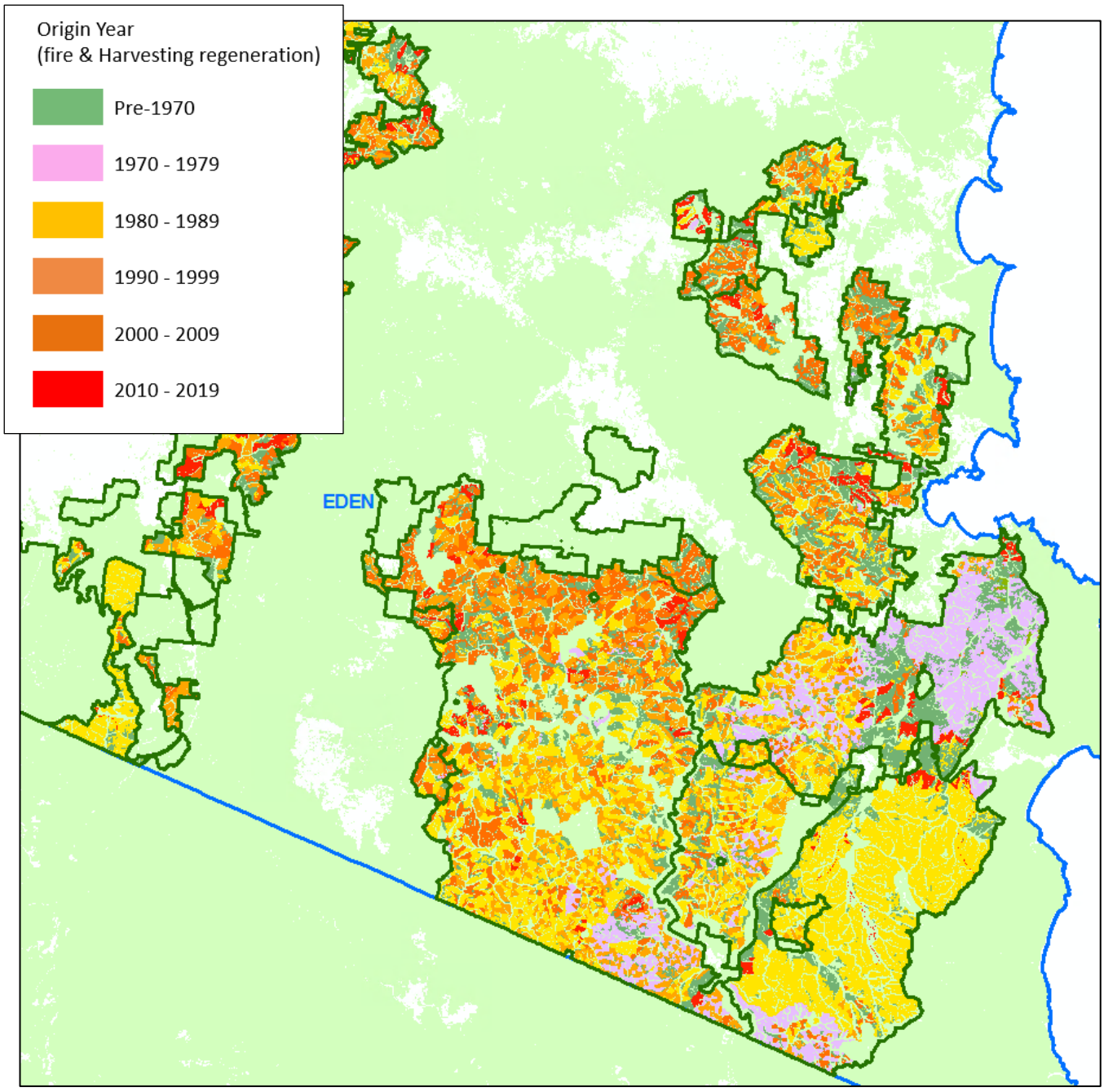


Figure 2: Alternate Coupe and fire history mapping Eden Management Area

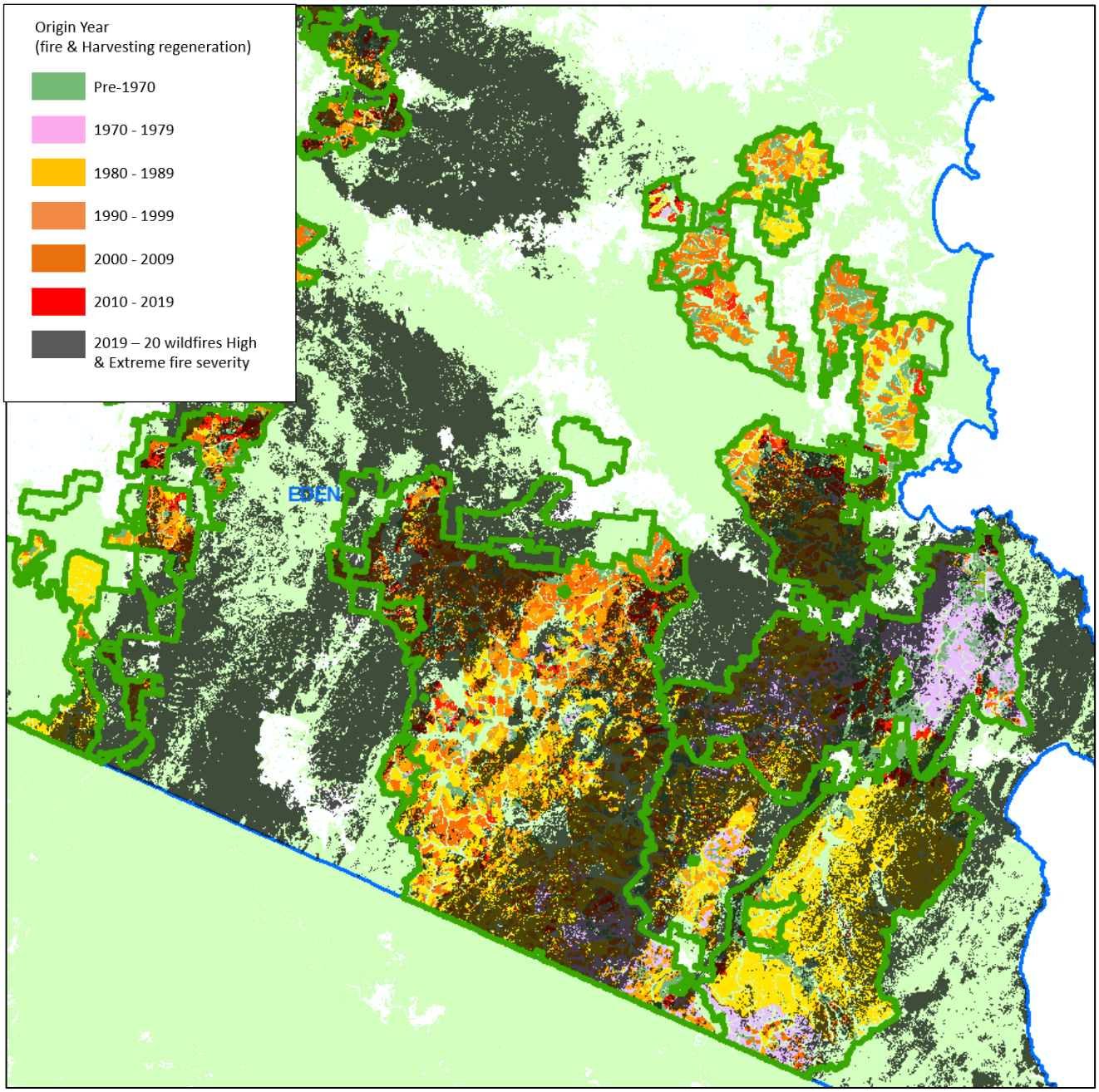


Figure 3: Alternate Coupe and fire history mapping Eden Management Area (showing high and extreme fire severity from the 2019-20 wildfires.

Appendix 2 Images of fire affected stands in Eden

Figure 1: Example of post-harvest stand – High/extreme fire affected silvertop Ash. Note the epicormic sprouting and 'dead-topping'. The retained stems do not provide any appreciable ecological value, but will have an impact on long term growth and productivity on the site as the thickening coppice shade out regenerating seedlings.

Figure 2: Example of regeneration of silvertop ash under alternate coupe harvesting (and fire). Regenerating seedlings in this instance are expected to have almost full access to site resources and will grow at maximum site capacity.

Figure 3: Example of recovering landscape exclusion zone, higher productivity site with higher biodiversity potential, including significant riparian habitat.

Low – moderate burn severity area with lower crown damage and stronger crown recovery. These stands will have a longer recover period under the prosed return to alternate coupe, where harvesting will be concentrated in more fire affected stands.

Attachment 4 Mapping Protocol review

Revision of Post-Fire Mapping protocols in the Southern Production Region.

Issue

Forestry Corporation have updated and improved the post fire offset mapping procedures approved in March 2021. The revised protocol retains the original intent of identifying 50% of each LLA to be identified as a temporary offset in the current operation focused on areas of ecological value with a minimum inclusion of unburnt, low intensity burnt and substantially recovered forest

Background

In early 2021 Forestry Corporation undertook a review of legal and regulatory obligations, harvesting practices and industry supply options for fire affected forests. In this review Forestry Corporation resolved to apply a mapping protocol as part of a suite of measures to be applied on a precautionary basis to reduce the potential impacts of timber harvesting on flora and fauna while further assessments were undertaken and as forest recovery progressed in the broader region.

The original mapping protocol was used in the development of a number of harvest plans, but has been found to produce unintended results in some instances (some examples of unintended results are shown in appendix 2). A range of potential improvements were considered in both the input layers and the technical approach used for determining temporary offsets in the protocol.

The revised protocol retains the same intent of identifying 50% of each LLA to be identified as a temporary offset in the current operation focused on areas of ecological value with a minimum inclusion of unburnt, low intensity burnt and substantially recovered forest

These improvements permit the use of updated and additional NSW Government fire mapping data for fire severity and recovery. Observations and learnings during operational planning implementation of the existing mapping protocol, forest ecology surveys, forest recovery and associated ground validation and operational implementation of voluntary exclusion zones.

Principal improvements to the procedures and their contributing rationale include:

- Referencing the most recent release of FESM modelling to ensure currency with NSW Government fire mapping. (Note: where FESM data errors occur RAFIT can be used as a substitute dataset).
- Elimination of isolated polygons within FESM smoothed with an area <0.5ha.
    - These small polygons are generally unrepresentative of the surrounding forest with regard to wildfire intensity and subsequent forest recovery. Elimination of these polygons provides flexibility to manage larger tracts of forest in a contiguous manner, such as for ecological refugia in tracts which were largely subject to lower intensity fire or have recovered significantly.
    - Elimination of these smaller polygons substantially removes modelling inaccuracies resulting from FESM modelling errors over areas such as roads/dumps/tracks/rocks.
- Inclusion of NSW DPI EES Post-fire spectral recovery index for inclusion in locating LLA Offset areas. This product uses sentinel 2 satellite imagery to compare pre-fire and one-year post-fire

normalized burn ratios to model forest canopy and understory recovery. This product is in the final stages of development and is considered fit for purpose in LLA planning when verified with ground validation during the planning process.

- Re-organisation of the protocol to ensure that unintended outcomes are not derived through the process (see appendix 2).

Conclusion

The revised mapping protocol retains the original intent of 50% of the LLA being identified as a post fire refugia offset, while permitting the integration of the most current NSW Government imagery and modelling in the offset planning process. Finally, the improvements to the mapping protocol allow for a suite of GIS tool automations ensuring consistency across all mapping projects while minimising unintended outcomes resulting from the mapping process.

Recommendation

On the basis of the above analysis it is recommended that:

1. Forestry Corporation adopt the revised mapping protocol as per appendix 1.

Appendix 1: Mapping protocol

HARDWOOD FOREST DIVISION

POST-FIRE STANDARD OPERATING PROCEDURE

Forestry Corporation

Post-Fire LLA Offset Mapping

South Coast, Eden, Tumbarumba

A. LLA Planning Objectives

The LLA Offset Exclusion Zone must meet the following criteria:

1. At least 50% of the **gross LLA area** must be mapped as LLA Offset.
2. Priorities areas for achieving LLA Offset will include all permanent CIFOA exclusions including wildlife habitat and tree retention clumps, with additional area to meet the LLA Offset target selected from the following
    a) Unburnt, Low and Moderate FESM categories
    b) Areas of forest from the 'Forest Recovery' layer (where recovery is >= 80%)
    c) Other areas of forest base on regional/local priorities (refer to Post-Fire Planning Assessment Report)
    d) Contiguous forest areas that are recovering and strategically contribute to connectivity of other high priority LLA offsets (i.e a – e above)

Note: Areas that have been subject to harvesting post wildfires are not be eligible for inclusion in the LLA Offset.

B. Data Preparation

1. Use 'FESM – Latest Available' and 'Forest Recovery' from the layer loader.
2. Ensure LLA boundary editing (within Landunits layer) has been completed prior to running Offset Mapping process.
3. Select your LLA from the LLA layer, and using the **Post Fire Mapping** tool set, select the 'Clip Post Fire Planning Data to LLA' for further analysis tool, saving your output to your plan GIS directory in a new file geodatabase created by the tool (Post_Fire_Mapping.gdb). This tool will copy your LLA boundary, BNA, FESM and recovery polygons to your project geodatabase.
4. Using the clipped FESM data, the planner will manually edit erroneous values generated by infrastructure such as roads, tracks, log dumps and quarries.

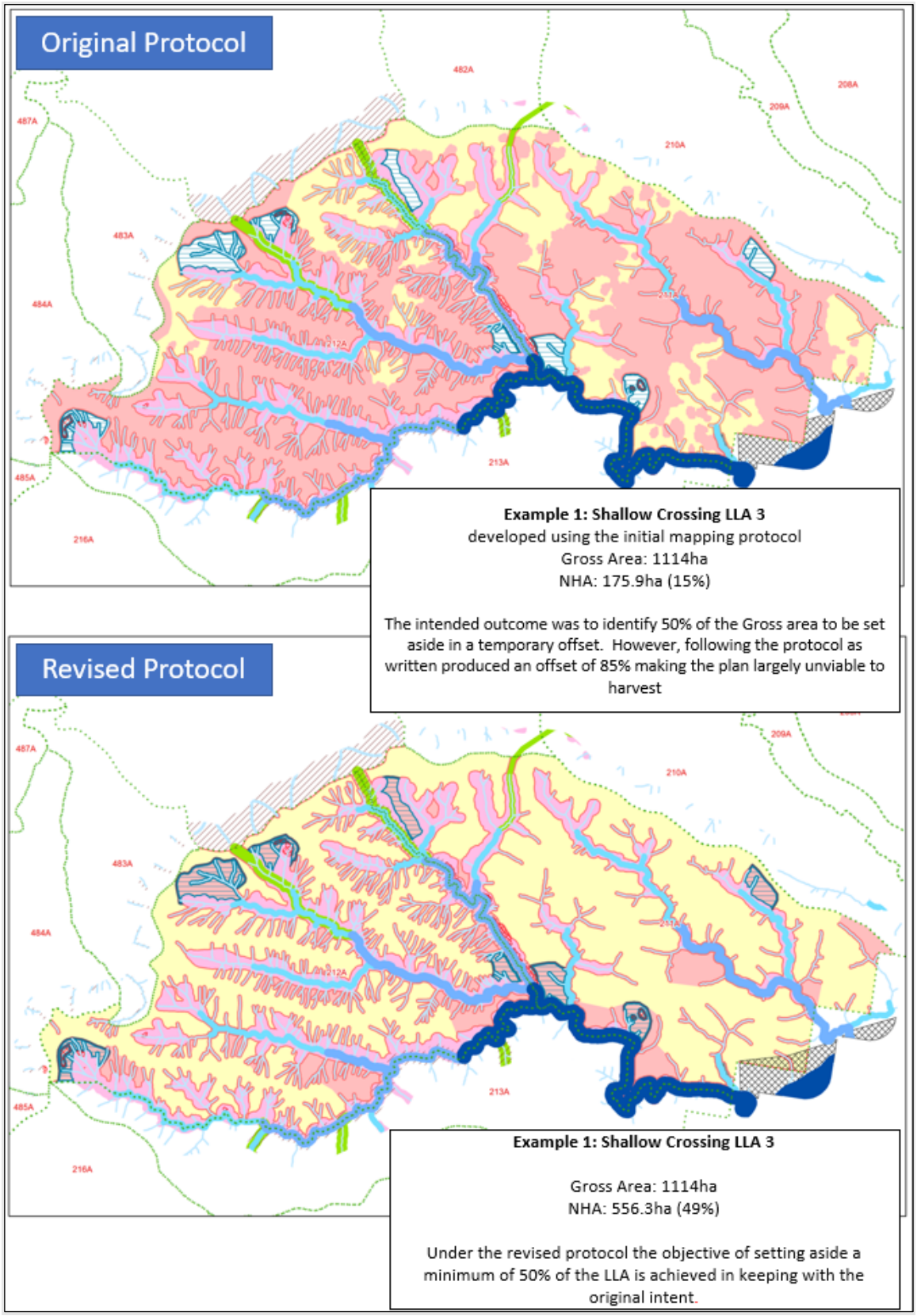
C. Planning Steps

1. Using the Post Fire Mapping toolset from the CIFOA Toolbar, calculate the LLA Offset area for permanent exclusions and the 10m OSA.
2. Then using the Post Fire Mapping toolset and prioritising area for inclusion into LLA offsets as outlined in 'A. LLA Planning Objectives' above, add additional forest areas to meet the LLA Offset target, recalculating as required to ensure target has been met.

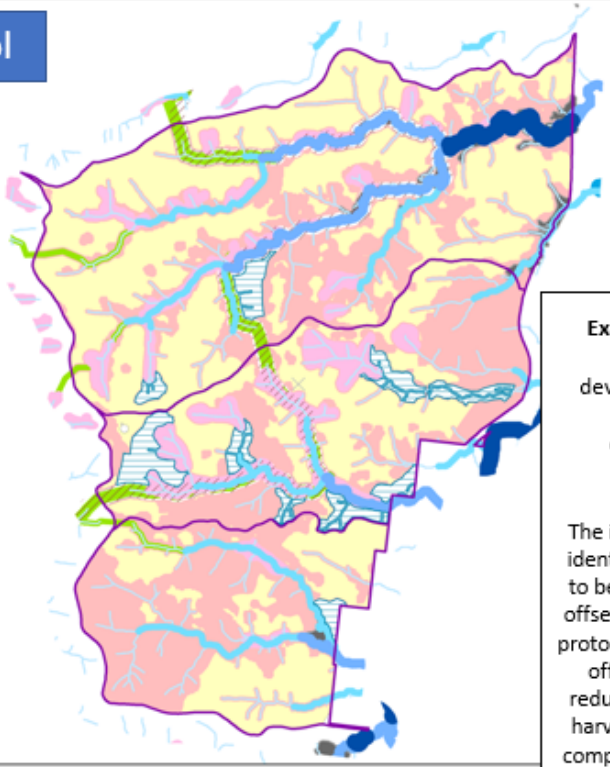
D. Post-Approval data load

1. From the Post Fire Mapping tool set, run the 'Load to OSA' tool on your project geodatabase. This tool will copy all LLA_Offset polygons to the *Regulatory Constraints – Edits* corporate layer. Populate "ConstraintType" field with "Post-Fire - Temporary LLA Offset Exclusion Zone" & "Comments" field with "Confirm with Operations Planning Manager if Exclusion Zones apply beyond January 2022". This tool will also output a table to your Post_Fire_Mapping.gdb detailing your LLA Offset statistics.

Appendix 2 Mapping Protocol Example Outcomes and options considered.



Original Protocol

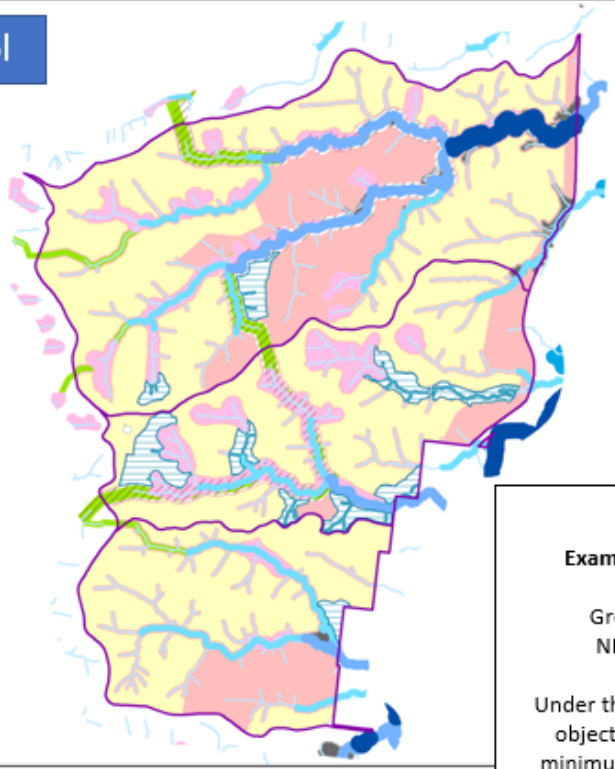


Example 2: Benandrah 1

developed using the initial mapping protocol
Gross Area: 1092ha
NHA: 432ha (39%)

The intended outcome was to identify 50% of the Gross area to be set aside in a temporary offset. However, following the protocol as written produced an offset of 61% significantly reducing the area available to harvest and creating multiple compliance challenges through scattered protected areas

Revised Protocol

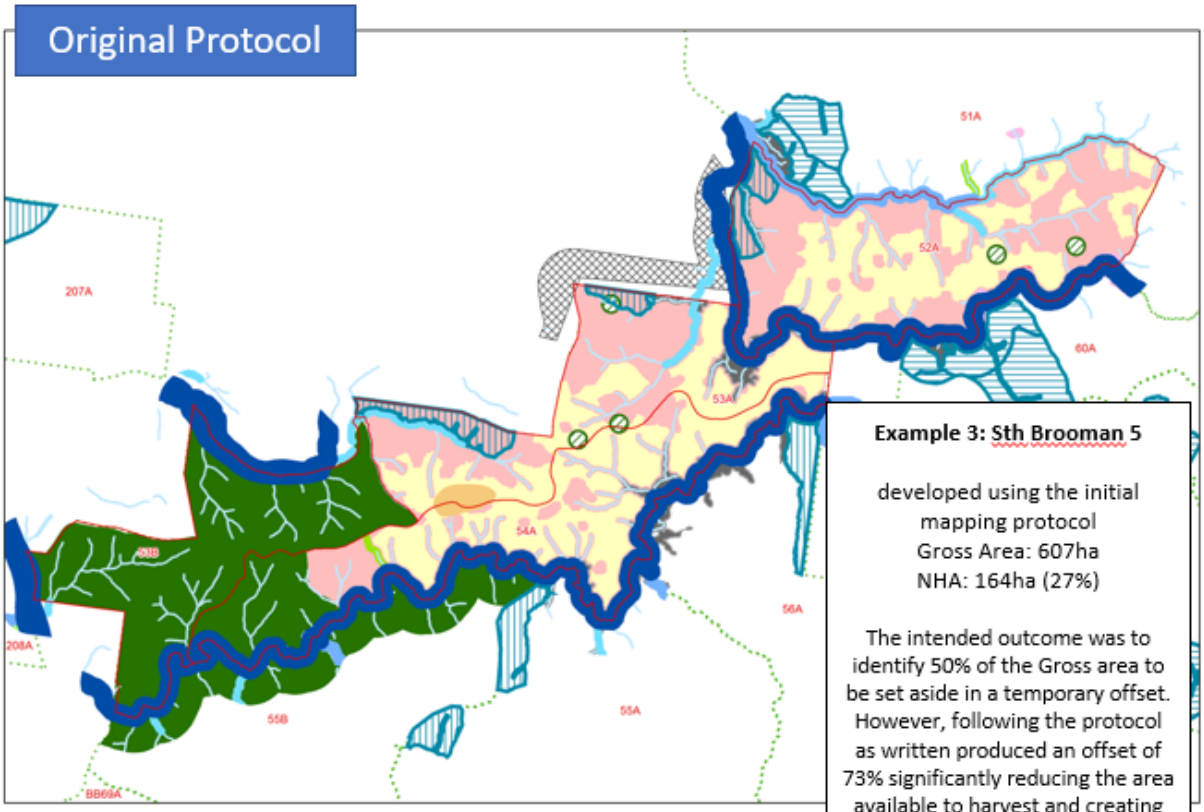


Example 2: Benandrah 1

Gross Area: 1092ha
NHA: 546ha (50%)

Under the revised protocol the objective of setting aside a minimum of 50% of the LLA is achieved in keeping with the original intent.

Original Protocol

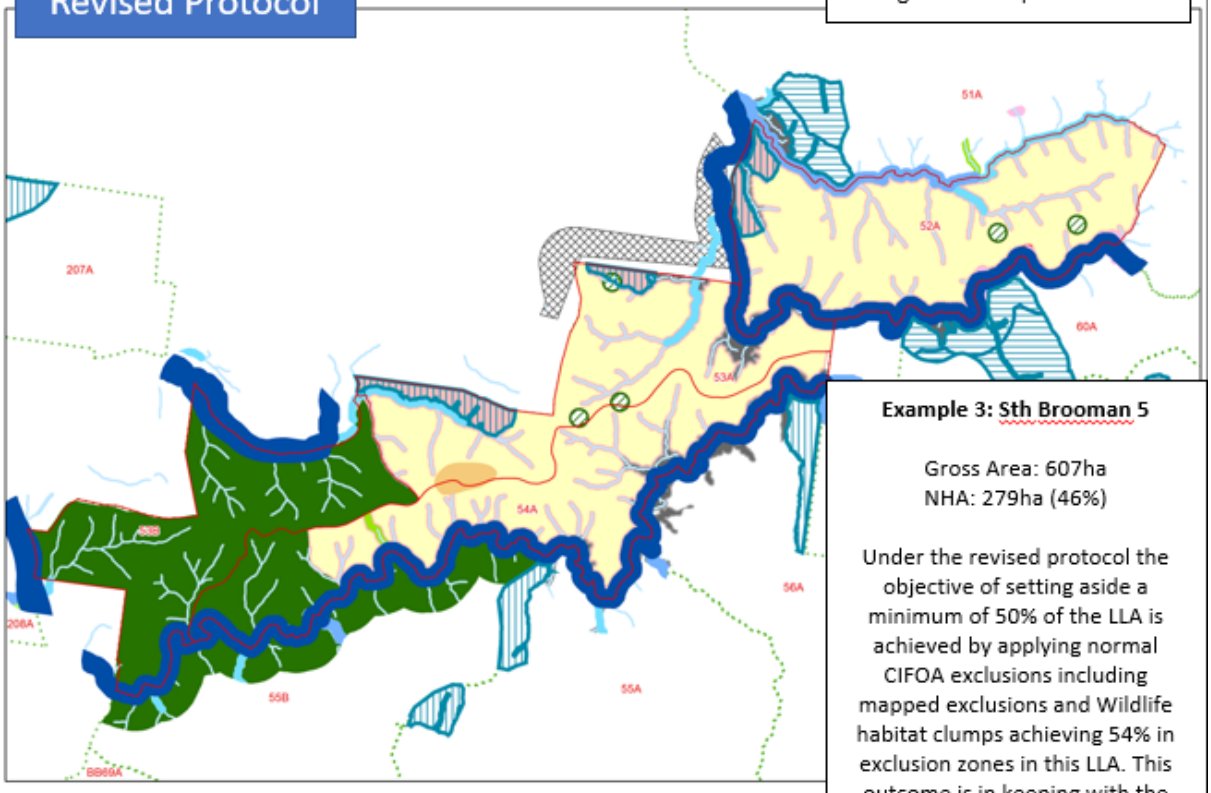


Example 3: Sth Brooman 5

developed using the initial mapping protocol
Gross Area: 607ha
NHA: 164ha (27%)

The intended outcome was to identify 50% of the Gross area to be set aside in a temporary offset. However, following the protocol as written produced an offset of 73% significantly reducing the area available to harvest and creating multiple compliance challenges through scattered protected areas

Revised Protocol



Example 3: Sth Brooman 5

Gross Area: 607ha
NHA: 279ha (46%)

Under the revised protocol the objective of setting aside a minimum of 50% of the LLA is achieved by applying normal CIFOA exclusions including mapped exclusions and Wildlife habitat clumps achieving 54% in exclusion zones in this LLA. This outcome is in keeping with the original intent.

Attachment 5 Review of Recommencement of Harvesting in Tallaganda State Forest following the 2019-20 wildfires

Issue:

Forestry Corporation is planning to commence harvesting in the Tallaganda State Forest in 2021. This is supported by an assessment to consider the population of Greater Gliders in the forest prior to recommencing harvesting following the 2019-20.

Background:

The fires affecting the south coast table lands were active between November 2019 and January 2020. The extent and severity of fires in the region and surrounding management zones is shown in table 2 below.

Row Labels	High & Extreme	Low & Moderate	Unburnt
Badja	50%	18%	31%
Batemans Bay	45%	50%	6%
Narooma	57%	33%	10%
Nowra	57%	26%	18%
Queanbeyan (Tallaganda SF)	16%	13%	70%

The fires were largely extinguished by the end of February 2020 and since that time no CIFOA harvesting operations have been undertaken in tablelands forests in the South Coast and Eden MA's, including Tallaganda SF.

In the Forestry Corporation 2019-202 Wildfire Report the potential impact of the fires on the greater glider populations in the region was flagged as an issue for further consideration. The distribution of Greater Glider records in the South Coast region, including Tallaganda State Forest is shown in Appendix 1. Considerations around the ecology of the species and the potential responses to fire and timber harvesting are outlined in appendix 2. Concerns regarding greater gliders following the 2019-2020 wildfires were also raised by Dr Andrew Smith in his report commissioned by the EPA. The concerns raised in the Smith Report are discussed in appendix 3.

Due to the initial concerns raised in the Forestry Corporation environmental assessment report no timber harvesting was scheduled in the Tallaganda State Forest until surveys could be undertaken to understand post-fire occupancy levels in the forest and to determine if further measures might be considered in implementing the CIFOA.

Greater Glider Status and CIFOA measures

The greater glider is widely distributed throughout NSW. The species is listed as vulnerable by the federal government but not listed as a threatened or vulnerable species in NSW as most of the concern around the species is in Victoria, where fire impacts on the species and its habitat have been

significant with multiple mega fires in the last decade. In the Remake of the CIFOA Greater Gliders were included in the list of species adequately protected by the standard conditions as part of the expert review in 2018. The inclusion of greater gliders in this list was largely driven by the standard measures implemented around identification and protection of hollow-bearing trees in the CIFOA, as well as the significant protections for the species habitat in both the reserve system on national parks and general exclusion zones under the CIFOA. Hollow bearing trees are the major limiting factor for greater glider persistence (Lindenmayer 2020). With a minimum of 8 Hollow bearing trees per hectare to be retained, plus 8% of the NHA dedicated to tree retention clumps based around protection of existing and potential developing hollow trees, as well as wildlife habitat clumps to strengthen the significant area already set aside for conservation within the harvest area, the CIFOA represents an increase in protection for greater gliders against the previous southern IFOA. However, survey results show that the measures of the Southern IFOA have been successful in retaining a significant population across the Tallaganda State Forest. This provides a strong rationale for using the normal provisions of the CIFOA when recommencing harvesting in Tallaganda State Forest.

Tallaganda Glider Survey Program

Between 01/09/2020 and 28/09/2020 (the spring following the 2019-2020 wildfires), a total of 43.4 km of spotlighting transects were undertaken across 19 locations. Of these locations, 8 were in burnt areas in the far north and far south of Tallaganda State Forest and 11 were undertaken in unburnt areas. Surveys were undertaken by two suitably qualified staff, spotlighting from roads and walking at a pace of 1km per hour or greater.

Table 1: Summary of survey effort and glider detection in burnt and unburnt areas of Tallaganda State Forest

	# transects	Survey length	Total gliders	Gliders per km
Total	19	43437m	396	9.1
Burnt areas	8	16667m	117	7.1
Unburnt areas	11	26770m	279	10.4

A total of 396 greater gliders were detected, of which 117 were detected in burnt areas and 279 were detected in unburnt areas. When adjusted for transect length, we detected 10.4 gliders/km in unburnt areas and 7.1 gliders/km in burnt areas. Survey results suggest that burn severity may influence post-fire glider density, however there are a range of other potential influences, such as forest type, aspect and disturbance history that could also have some influence on this.

Figure 1 plots glider density against the proportion of the transect which burnt at high-extreme severity (categories 4 and 5 FESM). This suggests that when more of the landscape is burnt at high intensity, then glider mortality is higher. However, this is not a strong trend. Encouragingly, the survey results showed that greater gliders were still occupying the forest in high densities across all burn severity categories.

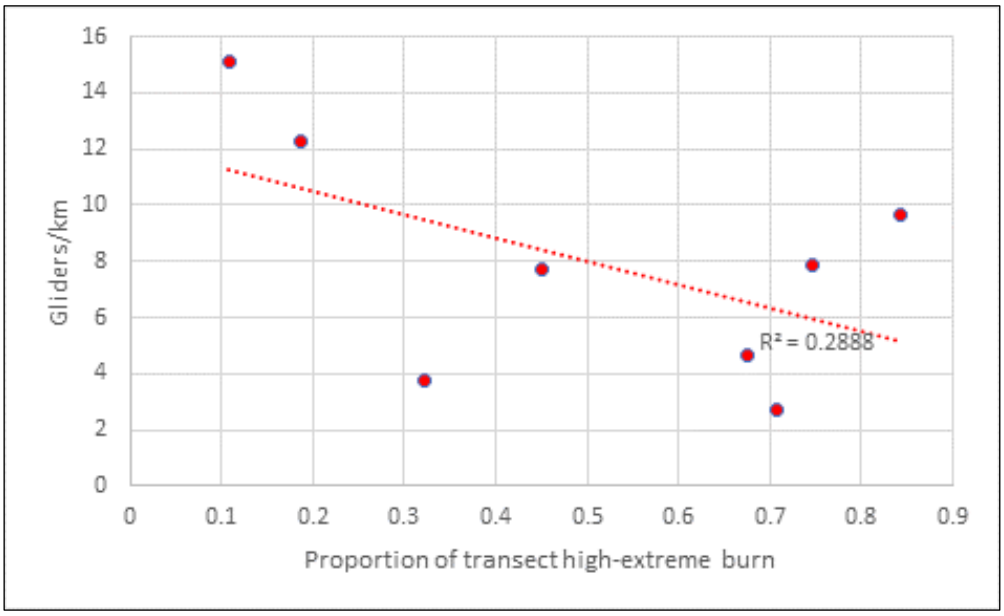


Figure 1: Plotted trend line showing the potential negative correlation between fire intensity in the area surrounding a transect and the density of greater gliders detected on those transects.

These preliminary results show that the population of greater gliders within Tallaganda State Forest has been largely resilient to the 2019-2020 bushfires in this forest (and the preceding drought). The population density in burnt areas is lower than in unburnt areas but is generally still very high compared with many other known populations. Further surveys and analysis will be carried out in coming years to determine occupancy trends over time following the fires.

Conclusion

Given the initial resilience of the population of gliders in the forest, including fire affected areas and the ongoing high densities recorded in areas the subject of previous harvesting, it can be concluded that further harvesting under the conditions of the CIFOA will not compromise the glider population in the Tallaganda State Forest or regionally.

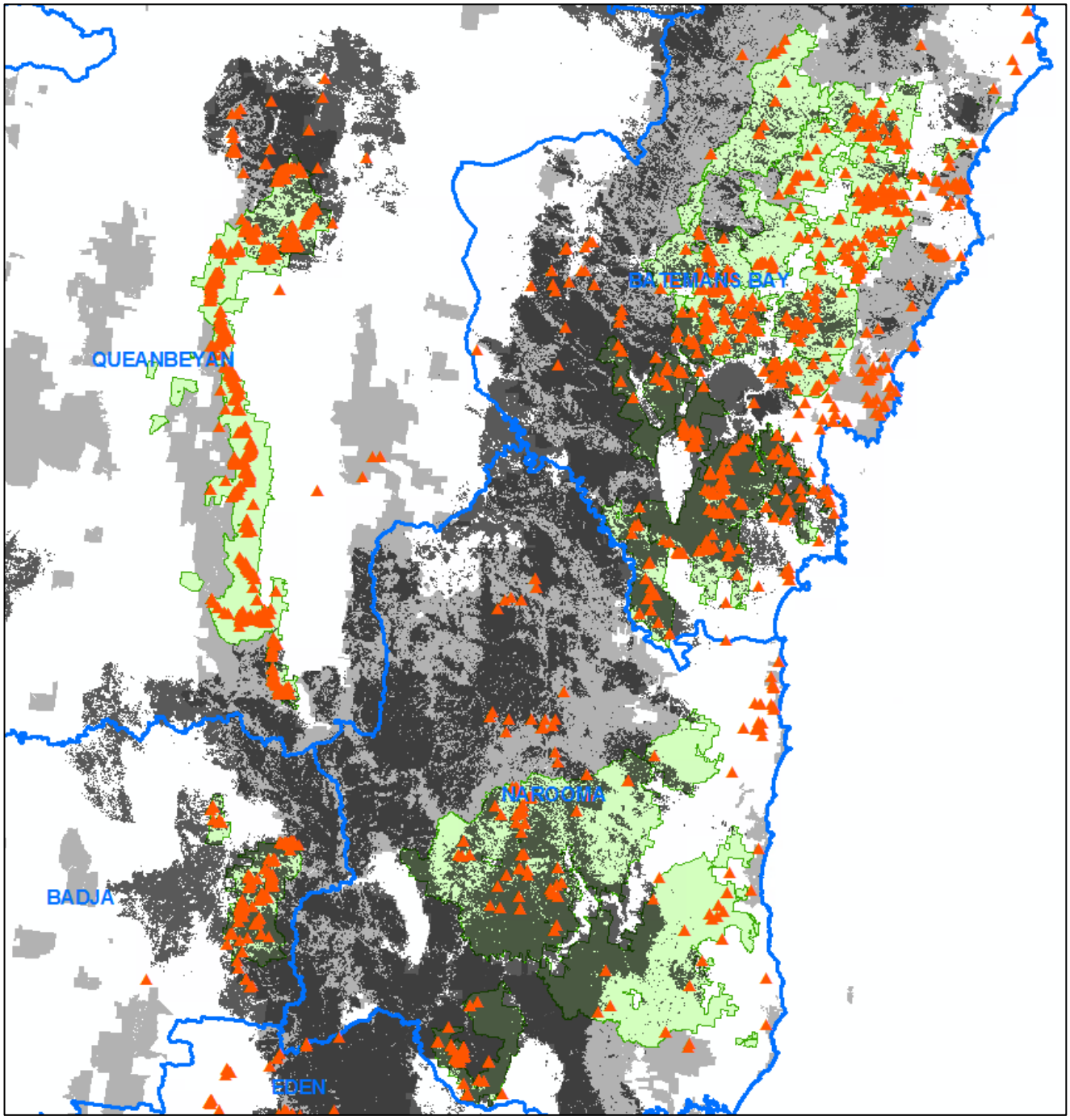
Recommendations

The following recommendations are made:

1. In unburnt areas: It is recommended that harvesting be recommenced under the CIFOA conditions, applying the strict compliance SOPs developed during 2021.
2. In burnt areas: Additional protections will be put in place for identified high quality glider habitat in local landscape areas where the exclusion zones under the CIFOA are compromised during 2021.
3. A further round of surveys and analysis should be conducted in conjunction with the DPI Forest Science Unit during 2022 to monitor trends in the glider population following the bushfires and this program will be considered for inclusion in the longer term as part of the NRC forest monitoring program.

Appendix 1: Distribution of Greater Gliders – South Coast Management Area:

Map showing all records for greater glider (including historical and post-fire survey detections)



Appendix 2: Summary Ecology of Greater Gliders:

Preferred habitat	Productive, mature forests at higher elevations (>850m asl). Species is typically found in much higher abundance at higher elevations.
Diet	Eucalypt foliage (leaf, bud, flowers)
Home-range	Small < 5 ha, core areas as little as 0.5 ha. Food abundant in mature forests. Home range size can flex in fragmented habitat.
Social structure	Solitary, does not vocalise.
Hollow-dependant	Multiple den trees 5-18 Hollow availability can limit abundance
Detectability	Spotlighting – very detectable but close proximity, abundance measures easier
Sensitivity to fire	Can decline with severe fire, due to loss of hollows and reduction in feed resource
Sensitivity to timber harvesting	Can decline with more intensive harvesting where hollow bearing trees are removed. Not frequently detected in coastal regrowth forests.

Literature on the potential fire and harvesting on greater gliders provide a range of potential outcomes for the species:

- Taylor et al. (2007) found that greater gliders can persist in patches of forest < 10 ha that are surround by pine plantations. This suggests that, for a species that is mobile, they should be able to move through the heterogeneous landscapes created by harvesting and fire.
- McClean et al (2018) found that harvesting that removed > 30 m2/ha had an impact on Greater Glider density but not occurrence and that lower levels of harvesting had less of an impact on density.
- Kavanagh (2001) found that when 40% of basal area was retained as well as retaining filter strips and riparian reserves that greater glider populations can be maintained post-logging.
- Taylor et al. (2007) found gliders in 1.6 to 124 ha remnant forest patches that persisted for 35 years due to immigration of individuals between patches and the surrounding forested landscape. This work highlights the importance of considering the meta-population structure of fauna at the landscape-scale not the patch scale.
- Lindenmayer et al. (1993) found that Greater Gliders were found at the same frequency as expected based on habitat availability in non-riparian buffers.
- Lindenmayer et al. (1993) found no effect of riparian buffer width on Greater Glider occurrence with the number of hollow-bearing trees, aspect and stream class having significant impacts on the occurrence of Greater Gliders in riparian strips ranging from 30-264 m (mean -110 m) in width.
- Lindenmayer et al. (2020) showed an increase in Greater Gliders from 2015 to 2017 in their study sites in Victoria and found no impact of landscape logging (% logged around survey sites). They did find a significant impact of number of Hollow Bearing Trees and the amount of landscape fire on Greater Glider occurrence.
- McClean et al. (2018) found that fire had a dominant influence on the abundance of Greater Gliders in north-eastern NSW but not occurrence.

Appendix 3: Forestry Corporation Review of Smith Report concerns regarding greater gliders and yellow bellied gliders.

The Smith Report recommended:

1. At the Management Zone scale the minimum size of interconnected ESAs in Management Zones should be 12,500 ha in regions with Yellow-bellied Gliders, 2500 ha in regions with Squirrel Gliders and 1700 in regions with Greater Gliders and that these ESAs should include forests not less than 60 years of age in patches > 20 ha (Greater Glider, Squirrel Glider) or 60 ha (Yellow bellied Glider) connected by continuous wildlife corridors (ie no uncrossable gaps or barriers).

   Response: On average, the % of forest excluded at management zone scale is achieved under the CIFOA, not necessarily in the configurations proposed.

2. At the LLA scale the minimum size of connected ESAs in Local Landscape Areas should be 1250 ha in areas with Yellow-bellied Gliders, 250 ha in areas with Squirrel Gliders and 170 ha in areas with Greater Gliders. These ESAs should include forests not < 60 years of age in patches > 20 ha (Greater Glider, Squirrel Glider) or 60 ha (Yellow bellied Glider) connected by continuous wildlife corridors (no uncrossable gaps or barriers).

   Response: The author may not be clear about the LLAs. Average LLA size is 1300 ha so this proposal effectively prevents harvesting in LLAs with YBG, which is almost all coastal LLAs and a high proportion of tablelands LLAs – on average habitat areas for GRGL and SQGL would be met, not necessarily in proposed configurations.

3. No further logging be undertaken within any LLA with records of Yellow-bellied Gliders, Squirrel Gliders and Greater Gliders until the above targets are met.

   Response: As above

4. A minimum 50% of all forest should be left unlogged and protected in ESAs at the LLA scale in all state forests and that this retained area:
   • Include representative examples of all mapped forest types,
   • give priority to fire refuges, and actual and potential late stage mature, uneven-aged and old growth forests.
   • Include known records of Yellow-bellied Gliders and Greater Gliders.
   • Include all patches > 5 ha in size linked permanent wildlife corridors that are not dissected or isolated by barriers that Gliders are unable to cross (including roads, rivers, clearings, young dense stands even aged regrowth forests less than about 30 years of age and areas of non-forest habitat wider than about 35m) and that are not too long (> 1 km) or too narrow (<50-200 m) to sustain regular Glider movement, dispersal and genetic interchange;
   • include unlogged strips and corridors of forest vegetation along the edge or all roads

   Response: This is a complicated proposal to assess and would be even more complicated to implement. The existing mapped permanent ESA network includes habitat that has long been protected (>25 years) and the new clumps provisions of 10-13% of the net area target mature forest habitat. On average ~40% of LLAs are permanently protected although this ranges from ~20%-80%. LLAs with low proportions reserved typically coincide with the most intensive previous harvest management. It is unclear what benefits reserving young regrowth forests to meet an arbitrary target would achieve.

Forestry Corporations assessment report identified that fire severity impact on Glider habitat varied by region, with the South Coast most affected by severe fires and having the least proportion of public forest remaining unburnt. As a result, Forestry Corporation's assessment identified regional scale

surveys and the inclusion of occupied habitat into temporary or permanent reserves as a priority in this region.

The Greater Glider is the species most consistently reported as affected by timber harvesting due to its small home range and preference for hollow-bearing trees for denning and large trees for foraging. It is well catered for by the RFAs in terms of habitat inclusion in the reserve system. On public forests 75-87% of Greater Glider habitat is inside permanent reserves across the 4 sub-regions assessed. Yellow-bellied Gliders are also well protected in the reserve system with 71-86% of preferred habitat protected in permanent reserves.

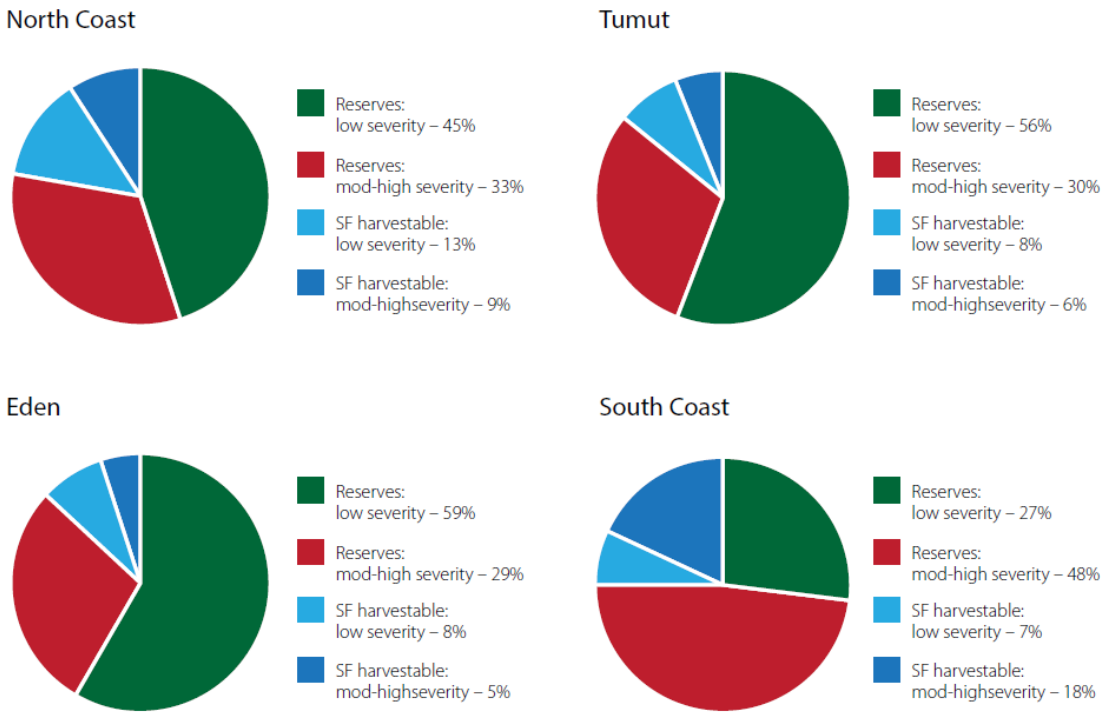


Figure 26: Fire severity in modelled Greater Glider habitat on public forests for each CIFOA region by harvest status for each region.

A close review of the Glider literature identified that the results of studies conducted on the impacts of timber harvesting on Gliders in the Central Highlands of Victoria (eg. Incoll et al 2001; Milledge et al 1991), where clearfall silviculture is conducted in often single species Ash forests, and those in other regions of Victoria, NSW and Queensland, were often very different. The most relevant studies to Forestry Corporation's assessment were conducted by Kavanagh and his colleagues in New South Wales.

Kavanagh and Bamkin (1994) undertook a regional study in the forests of Eden with 200 sites scattered across the region which sampled geology and previous logging history. This study found that timber harvesting did not have a significant impact on Yellow-bellied Gliders but did on Greater Gliders. This study also identified that Greater Gliders are much more abundant in wet, tablelands forests above 800 m. Lunney (1987) reported a similar result for Yellow-bellied Gliders being resilient to timber harvesting within Tanja and Mumbulla SFs in the Eden Region and all arboreal mammal species being much more abundant in gullies than in Silvertop Ash ridges. Alexander et al (2002) found Yellow-bellied Gliders were resilient to timber harvesting in East Gippsland Victoria, with forest type and remnant large trees, rather than time since harvesting, being important variables as to where

Yellow-bellied Gliders were detected. Kavanagh's (2000) Greater Glider specific study in high quality, previously unlogged, Greater Glider habitat within tablelands forests near Bombala utilised an experimental design (rather than retrospective study) to investigate impacts of various logging intensities. This study found that Greater Glider density was reduced in intensively harvested areas but not at a level that was significant.

The Kavanagh et al (1995) regional study on the North Coast of NSW examined 290 sites in the Grafton-Glen Innes-Dorrigo area. It found elevation was an important indicator of Greater Glider and Yellow-bellied Glider distribution with Greater Gliders much more common above 800 m a.s.l. and Yellow-bellied Gliders more common in coastal and foothills forests less than 800 m a.s.l. As few sites above 800 m in the study had been harvested it was hard to assess logging impacts on Greater Gliders, where as Yellow-bellied Gliders were somewhat associated with logged sites, although this may represent the preferred forest types occurring in harvested landscapes. Kavanagh and Stanton (2005) undertook a large analysis of 487 forestry EIS sites, including most of the sites assessed in individual district Fauna Impact Statement reports by Austeco and referenced in the Smith report. They found '*in particular, the two large gliding possums, the Greater Glider and Yellow-bellied Glider, were not consistently associated with unlogged or selectively logged forests'.*

McLean et al. (2018) assessed Greater Glider abundance in the tablelands forests of the Grafton, Glen Innes and Dorrigo regions in association with logging and fire. This study found Forest Type was the most significant variable determining Greater Glider abundance with wet forests carrying up to 27 gliders per km of transect and Gliders almost absent from dry forests. The next most significant variable was fire history with glider abundance halved in wet forests that had been burnt by wildfire at least once in the last 10 years. Finally harvest intensity had an impact with lower densities of Gliders in more intensively harvested sites although these impacts were much lower than forest type and fire history. Heavily logged and unburnt preferred sites had similar densities to twice burnt but unlogged sites.

Post-fire Glider surveys conducted by Forestry Corporation in Eden, South Coast, Tumbarumba, and on the North Coast have detected both Yellow-bellied Gliders and Greater Gliders in both unburnt refuges and heavily burnt areas. Initial data indicates numbers may have declined but both species are still readily detectable in both burnt and unburnt preferred habitat.

The conclusions drawn in the Smith report in respect of Gliders come largely from review of two net harvest area maps, one in the Brooman SF and another in Yambulla SF, neither of which have historically supported large numbers of Greater Gliders, along with a review of the EPA's population viability analysis for a single Local Landscape Area for Yellow-bellied Gliders. This PVA is not appropriately designed as it ignores the fact that the LLA is adjacent to a large expanse of connected habitat that Yellow-bellied Gliders can move between.

On the basis of this analysis we find that Smiths conclusions cannot be supported.