Coastal Integrated Forestry Operations Approval Approved Monitoring Program 2019-2024

March 2020

This document has been prepared by the Natural Resources Commission on behalf of the NSW Forest Monitoring and Improvement Steering Committee.

Enquiries about the monitoring program should be directed to:

Phone   (02) 9228 4844

Fax   (02) 9228 4970

E-Mail   nrc@nrc.nsw.gov.au

Postal address   GPO Box 5341, Sydney NSW 2001

List of acronyms and abbreviations

Conditions	Coastal Integrated Forestry Operations Approval Conditions of Approval
DPI	Department of Primary Industries
The Commission	Natural Resources Commission
EES	Environment, Energy and Science Group under the Department of Planning, Industry and Environment
EPA	New South Wales Environment Protection Authority
FCNSW	Forestry Corporation of New South Wales
FMIP	New South Wales Forest Monitoring Improvement Program
FRAMES	Forest Resource and Management Evaluation System
IFOA	Integrated Forestry Operations Approval
LiDAR	Light Detection and Ranging
NSW	New South Wales
RFA	Regional Forest Agreement
SEPP	State Environmental Planning Policy
Steering Committee	The Forest Monitoring and Improvement Program Steering Committee

Table of Contents

1   Executive summary

The Coastal Integrated Forestry Operations Approval (Coastal IFOA) sets out the rules for native timber harvesting in New South Wales' (NSW) coastal state forests and establishes environmental outcomes that must be achieved under the approval. The Coastal IFOA requires that a monitoring program is applied at multiple landscape scales to ensure the ongoing effectiveness of the approval in achieving these outcomes. This program will form part of the wider NSW Forest Monitoring Improvement Program.

This document sets out the monitoring program for the Coastal IFOA following joint approval by the Chief Executive Officer of the NSW Environment Protection Authority (EPA) and the Director General of the Department of Primary Industries (DPI) in March 2020. The program development was overseen by the NSW Forest Monitoring and Improvement Steering Committee (the Steering Committee), which is a multi-agency body chaired by the Natural Resources Commission (the Commission). It was informed by input from agency representatives and independent scientific experts, as well as stakeholder feedback obtained through public consultation processes.

The monitoring program was proposed in December 2019, before the full extent of the 2019-2020 wildfires had been experienced. The wildfires affected 5.3 million hectares of New South Wales, including 890,000 hectares of native state forests. The timing and priorities, as envisaged before these events were fully realised, has been reconsidered and will be further refined to address wildfire related impacts during the detailed design phase. The design and implementation of monitoring will remain adaptive during the recovery of the forests to ensure the program can monitor Coastal IFOA conditions and ensure they continue to meet outcomes.

The monitoring program will answer four overarching questions, related to:

- **effectiveness monitoring** – are the Coastal IFOA conditions effectively meeting its objectives and outcomes?

- **trend monitoring** – is the Coastal IFOA having a neutral, positive or negative impact on landscape-scale environmental values or wood supply?

- **compliance monitoring** – are non-compliances compromising the outcomes or the ability to monitor the effectiveness of the Coastal IFOA conditions?

- **adaptive management** – can Coastal IFOA conditions, forestry operations, forestry management or monitoring be improved to better meet objectives and outcomes?

The monitoring program centres on nine monitoring strategies, which were identified through a risk-based prioritisation process. These strategies will evaluate key risks and the effectiveness of priority conditions in meeting the Coastal IFOA objectives and outcomes. The monitoring program will also assess landscape-scale trends against baselines across a range of variables to assess whether the Coastal IFOA conditions are affecting environmental values or leading to changes in native hardwood forest wood supply over time.

Information from existing EPA and Forestry Corporation of NSW (FCNSW) compliance programs will also inform the program's assessment of the effectiveness of conditions. This component of the monitoring program will focus on identifying potential risks that non-compliances pose to the monitoring of effectiveness and achievement of outcomes.

During implementation, annual stakeholder forums will be held to jointly review the findings of the program and implications for forest management in NSW. These annual forums, along

with five-yearly major reviews, will support the adaptive management of the Coastal IFOA and improvement of the monitoring program.

The monitoring program is estimated to cost approximately $2 million to establish and run in the first year and approximately $1.8 to $1.9 million annually in following years. In-kind contributions from FCNSW (in the form of specialist staff) and funding reallocation from the EPA, DPI and the Commission are expected to cover the estimated program costs until at least June 2023.

The approved monitoring program will now be further developed, including detailed design of the nine monitoring strategies, and implemented.

2 Monitoring program context and requirements

2.1 Monitoring program context

The Coastal IFOA is an agreement between the NSW Minister for Energy and Environment and the Minister for Regional NSW, Industry and Trade.[1] It sets the minimum thresholds of environmental protection to ensure threatened plants, animals, communities and the protection of water quality are maintained during native timber harvesting operations in state forests and Crown timber land in the Eden, North East and Southern Regional Forestry Agreement regions of NSW.[2]

> **Coastal IFOA conditions and protocols:**
>
> The Coastal IFOA is comprised of objectives, outcome statements, conditions and protocols. The conditions set mandatory actions and controls for protecting threatened plants and animals, habitats, soils and water. The conditions are supported by protocols, which set out additional enforceable actions and controls for effective implementation of the Coastal IFOA.
>
> In this document, the term 'conditions' refers to the Coastal IFOA conditions and protocols as stated above.

The Coastal IFOA requires that the effectiveness of its conditions and the extent to which its objectives and outcomes are achieved are continually monitored.

The NSW Government has established the NSW FMIP to lead and coordinate monitoring, evaluation and research for improved forest management on public and private land. The Steering Committee was established as a multi-agency body chaired by the Commission as a key element of NSW FMIP governance and oversight.

Attachment 1 provides further information about the Coastal IFOA, including a map of the relevant coastal regions and details of the NSW FMIP Steering Committee.

2.2 Monitoring program development

Under the terms of reference, the Steering Committee was asked to propose a monitoring program for the Coastal IFOA.[3] This monitoring program will contribute to and draw on information from the NSW FMIP. Development of the monitoring program was led by the Commission in collaboration with a technical working group, established by the Steering Committee and made up of agency representatives and independent scientific experts.

The Steering Committee sought feedback from stakeholders on a draft version of the monitoring program and received 14 submissions from a range of community, industry and environment stakeholders. Nine workshops were held with interested stakeholders in Grafton,

---

[1]   The Coastal IFOA commenced on 16 November 2018.

[2]   The Coastal IFOA applies to **native timber forests in state forests and Crown timber lands** within the region shown in **Figure 3** in **Attachment 1**. It does not apply to soft or hardwood plantations or forestry activities in other tenures (for example, private native forestry).

[3]   The Coastal IFOA conditions specifically require a monitoring steering committee to be established and chaired by the Commission (NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Conditions*. Chapter 8, Condition 122.1. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1177-coastal-ifoa-conditions.pdf).

Port Macquarie, Eden, Batemans Bay and Sydney to inform the design of the monitoring program. Additional stakeholder feedback relevant to the monitoring program was also received through the consultation process for the draft state-wide NSW FMIP (see **Section 2.3.2**), including feedback from written submissions.

Stakeholder feedback from the submissions processes and forums was considered by the Steering Committee when finalising the program. **Attachment 2** provides a summary of feedback received during stakeholder consultation.

Overall, stakeholders were generally supportive of the monitoring program, although they were concerned that there has historically been a lack of robust and accessible evidence from forest management to inform decision-making. Stakeholders were also keen for the wider cross-tenure NSW FMIP to advance, at least in parallel with the Coastal IFOA, and were concerned about the difficulty of establishing baselines in a timely manner. Some stakeholders called for a broader range of values to be monitored. However, the Coastal IFOA – as approved by the NSW Government – specifically outlines monitoring requirements. This is discussed in the following section.

2.3   Program requirements

2.3.1   Coastal IFOA requirements

The Coastal IFOA states that:

Monitoring programs are applied at multiple landscape scales to ensure the ongoing effectiveness of the approval in delivering the <u>objectives</u> of the approval and <u>outcome statements</u>.[4]

This requires that the monitoring program will take an outcomes-driven approach to evaluate whether the established outcomes are achieved or not. **Attachment 3** outlines the objectives and outcome statements that will be used to assess the performance of the Coastal IFOA conditions, which have been defined in the Coastal IFOA and approved by the NSW Government.[5]

Protocol 38 of the Coastal IFOA sets out a range of requirements that the monitoring program must address, including monitoring priorities, which are outlined in **Table 1**.[6] Protocol 38 specifies that the design and timing of the program must consider available budget and resources. The estimated budget and funding sources for the program are outlined in **Section 3.8**.

---

[4]   NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Conditions.* Chapter 8, Section 121.1. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1177-coastal-ifoa-conditions.pdf.

[5]   NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Conditions.* Chapter 1, Division 3. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1177-coastal-ifoa-conditions.pdf.

[6]   NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Protocols.* Chapter 8, Protocol 38. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1178-coastal-ifoa-protocols.pdf.

Table 1: Summary of Coastal IFOA monitoring requirements under Protocol 38

Protocol 38 requirements (38.3(1))

a) Monitor and evaluate the effectiveness of Coastal IFOA conditions, including but not limited to:

    i. the multi-scale landscape protections
    ii. drainage feature crossing and road conditions
    iii. riparian exclusion zones and ground protection zones on Class 1 drainage lines
    iv. exclusion zones for Coastal State Environmental Planning Policy (SEPP) wetlands
    v. effectiveness of soil and water protection in intensive harvesting forestry operations
    vi. protecting and recruiting hollow-bearing trees
    vii. koala conditions
    viii. effectiveness of selective harvesting limits in achieving regeneration and stocking standards as measures of longer-term regeneration
    ix. maintaining sufficient levels of coarse woody debris

b) Establish a scientifically valid environmental and wood supply baseline to track and evaluate the effectiveness or impacts of the Coastal IFOA on the maintenance of environmental values and wood supply

c) Provide environmental trend monitoring at the landscape scale, including but not limited to:

    i. water quality monitoring
    ii. forest regeneration
    iii. biodiversity trend monitoring

d) Provide species-specific monitoring, including but not limited to those management plans listed in Protocol 21: Species management plan

e) Provide species-specific monitoring for other species that require monitoring under existing programs related to the monitoring of threatened flora

f) Meet principles of ecologically sustainable forest management under the NSW Regional Forest Agreements

g) Provide linkages to other relevant NSW Government programs and/or review related to the monitoring of state forest management and the NSW forest estate, including but not limited to:

    i. NSW Report on Native Vegetation (Department of Planning, Industry and Environment)
    ii. Saving our Species (Department of Planning, Industry and Environment)
    iii. DPI – Fisheries Strategic Research Plan 2014-2018 (DPI – Fisheries)
    iv. NSW Regional Forest Agreements
    v. AdaptNSW (Department of Planning, Industry and Environment)
    vi. DPI – Forest monitoring program (DPI – Fisheries)

2.3.2　Other relevant programs and policies

The monitoring program will form part of the wider NSW FMIP.[7] The NSW FMIP program aims are to:

▪ focus on the information required to improve the adaptive management of NSW forests

▪ be cost-effective by employing efficient mechanisms to meet program objectives

▪ be adaptable to changes in both research priorities and forest monitoring methods

▪ satisfy the NSW Government's obligations to national and international forest management reporting

---

[7]　Natural Resources Commission (2019) *NSW Forest Monitoring and Improvement Program Strategy – Draft for consultation*, prepared for the FMIP Steering Committee.

▪ provide the public with transparent, independent, accessible and robust evidence of forest management performance.

To satisfy the aim to provide the public with transparent, independent and accessible information, the monitoring program will also comply with the NSW Government's Open Data Policy.[8]

---

[8] NSW Government (2019) *NSW Open Data Policy.* Available at: https://www.digital.nsw.gov.au/policy/data-information/making-data-open/nsw-open-data-policy.

3 Monitoring program overview

3.1 Overarching questions

The program will answer four overarching questions, related to:

- **effectiveness monitoring** – are the Coastal IFOA conditions effectively meeting its objectives and outcomes?

- **trend monitoring** – is the Coastal IFOA having a neutral, positive or negative impact on landscape-scale environmental values or wood supply?

- **compliance monitoring** – are non-compliances compromising the outcomes or the ability to monitor the effectiveness of the Coastal IFOA conditions?

- **adaptive management** – can Coastal IFOA conditions, forestry operations, forestry management or monitoring be improved to better meet objectives and outcomes?

These overarching questions are inter-related and information collected to answer one question may contribute to answering other questions. In particular, effectiveness and trend monitoring will draw on information from many of the same monitoring activities.

The following sections outline how the monitoring program will address these questions.

3.2 Effectiveness monitoring

Are the Coastal IFOA conditions effectively meeting its objectives and outcomes?

This question is the primary focus of the monitoring program. The monitoring program includes nine strategies to monitor and evaluate the effectiveness of the Coastal IFOA conditions in meeting its objectives and outcomes. The strategies are outlined in **Table 2**, including the monitoring questions the program will evaluate and how the program could be designed to answer those questions.

Given the cost of monitoring and the need to work within available resources[9], the strategies were selected through a strategic, risk-based prioritisation process in order to make the best use of available resources. The prioritisation process was undertaken by the monitoring program's technical working group in collaboration with the CSIRO Conservation Decisions Team. Further risk assessment and prioritisation will also be carried out as part of the detailed monitoring strategy design process.

---

[9]   This aligns with the requirements of Protocol 38 in the Coastal IFOA that the design and timing of the program must consider available budget and resources (see **Section 2.3.1**) and the aims of the NSW FMIP related to cost-effectiveness and efficiency (see **Section 2.3.2**).

> **Risk-based prioritisation:**
>
> The risk-based prioritisation approach undertaken with CSIRO seeks to reduce the risks associated with the Coastal IFOA conditions not meeting the stated objectives and outcomes. As such, monitoring program design elements were assessed based on:
>
> - their ability to detect that outcomes are not being met
>
> - the consequence of not detecting that the outcome is not being met
>
> - the cost of monitoring required to detect that the outcome is not being met
>
> - their potential to inform changed management practices to improve Coastal IFOA performance.
>
> **Attachments 4 through 8** provide further details on this approach.

Monitoring strategies were selected on the basis that they are most likely to:

- support evidence-based decision-making and improve the likelihood of Coastal IFOA outcomes being delivered

- deliver cost-effective monitoring

- meet Coastal IFOA requirements under Protocol 38 and the Premier's terms of reference

- meet the aims of the NSW FMIP.

Each monitoring strategy is guided by monitoring questions that are focused on meeting the needs of decision-makers and forest managers. These strategies have been designed to minimise duplication across the program and improve cost-effectiveness of monitoring. In some cases, multiple risks are addressed under a single monitoring question and multiple monitoring questions are captured within one monitoring strategy.

The monitoring program will implement monitoring and research at two different scales:

- **Site-scale** – for example, the extent to which conditions are maintaining habitat features, such as hollows for fauna.

- **Landscape-scale** – for example, using remote sensing techniques to investigate the extent to which harvesting conditions maintain forest age classes across the landscape.

As a result, information from the monitoring strategies in **Table 2** will also be closely linked to the assessment of landscape-scale trends (**Section 3.3**), while being informed by the compliance monitoring (**Section 3.4**) and adaptive management (**Section 3.5**) aspects of the monitoring program. For example, the following monitoring strategies are considered to have a landscape focus:

- monitoring regenerating forests

- monitoring forest structure and health

- monitoring species occupancy

- monitoring waterway and wetland health.

The monitoring strategies will be overseen by the Commission as the independent chair of the Steering Committee. New strategies within the program may be subject to peer review by external experts.

More detailed design of the strategies (including developing methods, identifying focal species and locations of monitoring) will occur following the monitoring program's approval. As part of the detailed design and to allow adaptive management of the program (**Section 3.5**), key performance indicators will be established against which the performance of the conditions will be tracked. Where these key performance indicators are not met, this may trigger changes to conditions.

Baselines will also be established using information collected in the first years of the monitoring program and will be used to assess ongoing effectiveness and trends under the Coastal IFOA, including measures of biodiversity, water quality and forest regeneration. In addition, the monitoring program needs to be assessed in conjunction with the broader state-wide NSW FMIP for trends in biodiversity, water quality and forest regeneration being observed in other tenures. Information and results from current and previous monitoring programs will be drawn on where relevant, particularly where historical evidence is being collated like that described in **Table 4**.

Stakeholders and the community will be given the opportunity to provide further feedback on the detailed design of the strategies (see **Section 3.11**).

Table 2: Overview of the monitoring strategies

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Monitoring regenerating forests	▪ Are the conditions effective in ensuring regenerating forests meet benchmarks for: (i) floristic composition (ii) forest structure (iii) coarse woody debris? ▪ Are the conditions and practices effectively managing risks of invasive flora species in regenerating forests? ▪ Are the conditions affecting current commitments to meet wood supply? ▪ Are the conditions effectively promoting regeneration for long-term sustainable wood supply?	▪ Monitor a permanent, cross-tenure plot network covering the Coastal IFOA area (including state forests) ▪ Use floristic composition[10], forest structure, including large living trees[11], and coarse woody debris benchmarks, established for each vegetation class and forest age-class ▪ Use sampling methods consistent with cross-tenure, state-wide monitoring plot network and following agreed protocols and conventions	▪ Uses the permanent plot network ▪ Plot density may be higher in intensive harvesting and alternate coupe harvesting areas	▪ State-wide forest monitoring program ▪ Wood supply monitoring ▪ NSW Report on Native Vegetation	▪ $400k first-year establish-ment ▪ $ 350k annual	▪ FCNSW ▪ Environ-ment, Energy and Science Group (EES) ▪ DPI – Forest Science	▪ Steering Committee ▪ Commission

---

10   Recognising that that floristic composition of forest will adapt to changes in climate.

11   As defined in the NSW Biodiversity Assessment Methodology.

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Monitoring forest structure and health	▪ Do harvesting conditions establish an appropriate mosaic of forest age classes at the landscape scale? ▪ Are the conditions maintaining functional connectivity for focal fauna species to move within and across the forest? ▪ To what extent are the conditions effectively managing the risk of new or existing areas subject to dieback?	▪ Establish benchmarks for landscape heterogeneity (age class, structure) ▪ Analyse remote sensing data, LiDAR[12] and multispectral imagery consistent with the approach used in the state-wide monitoring program	▪ Five-year rotating group of plots (20 percent of plots sampled annually) ▪ Spatial data reviewed every five years	▪ State-wide forest monitoring program ▪ Passive Acoustic Monitoring Program	▪ $250k first-year establish-ment ▪ $200k annual ▪ Does not include spatial data purchase and storage costs	▪ FCNSW ▪ EES ▪ DPI – Forest Science	▪ Steering Committee ▪ Commission

---

[12]   LiDAR: Light Detection and Ranging.

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Monitoring key habitat features	▪ To what extent do retained habitat features maintain their function?[13] ▪ Do the conditions establish enough key habitat features to maintain fauna species within and across the forest?	▪ Monitor a representative sample of key habitat features identified and conserved through strategic and operational planning processes ▪ Monitor persistence, use and generation of key habitat features ▪ Use hollow inspection, camera trapping and hair trapping ▪ Results of habitat features will be reviewed against the results of the monitoring species occupancy strategy	▪ Sample habitat features monitored annually ▪ Stratified – in clumps, Environmentally Significant Areas[14] and harvest areas	▪ Saving our Species	▪ $250k first-year establish-ment ▪ $200k annual	▪ FCNSW	▪ Steering Committee ▪ Commission

---

13   Habitat features can include hollows, winter flowering trees and feed trees.

14   Environmentally Significant Areas incorporate both Category 1 and Category 2 listed areas including but not limited to rainforest, old growth, wetlands, corridors and threatened ecological communities.

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Monitoring species occupancy	▪ To what extent do the Coastal IFOA conditions maintain species occupancy in the landscape?[15] ▪ To what extent do the conditions maintain the population status of focal species?	▪ Use passive sensors ▪ Use automated data collection and species detection methods, including for koalas, microbats, forest owls and frogs ▪ Continually update species call libraries ▪ Reanalyse historical data ▪ Key habitat features results will be incorporated into species occupancy results for relationship between forest function and species occupancy	▪ Uses the permanent plot network ▪ Five-year rotating group of plots (20 percent of plots sampled annually) ▪ Spatial data reviewed every five years	▪ Saving our Species ▪ WildCount	▪ $350k first-year establish-ment (including additional equipment purchases) ▪ $200k annual	▪ FCNSW ▪ DPI – Forest Science ▪ EES	▪ Steering Committee ▪ Commission

---

[15] For the purpose of effectiveness monitoring, landscape only refers to state forests within the Coastal IFOA.

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Species-specific monitoring – fauna	▪ To what extent do the Coastal IFOA conditions maintain fauna species viability in the landscape? ▪ To what extent are the species-specific management plans effective in maintaining the viability of that species?	▪ Approach will be species dependent but will be consistent with the monitoring requirements of any relevant species management plan, if applicable	▪ Dependant on the species ▪ Consistent with the monitoring requirements of any relevant species management plan, if applicable	▪ Saving our Species ▪ Passive Acoustic Monitoring Program ▪ Monitoring key habitat features (under this monitoring program) ▪ National programs, for example for the Smoky Mouse, Flying Fox and Eastern Bristle Bird	▪ Existing program ▪ $200k annual	▪ FCNSW ▪ EES ▪ DPI – Forest Science	▪ Steering Committee ▪ Commission
Species-specific monitoring – flora	▪ To what extent do the Coastal IFOA conditions maintain flora species viability in the landscape? ▪ To what extent are the species-specific management plans effective in maintaining the viability of that species?	▪ Approach will be species dependent but will be consistent with the monitoring requirements of any relevant species management plan, if applicable	▪ Dependant on the species ▪ Consistent with the monitoring requirements of any relevant species management plan, if applicable	▪ Saving our Species	▪ $100k annual	▪ FCNSW ▪ EES	▪ Steering Committee ▪ Commission

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Waterway and wetland health monitoring	▪ To what extent are the soil and water conditions effective in minimising the impact of harvesting and roading on waterway condition? ▪ Are the exclusion zone conditions for Class 1 classified drainage lines effective in minimising the impact on waterway condition? ▪ Are the exclusion zone conditions effective in reducing the impact of forestry operations on Coastal SEPP wetlands?	▪ Evaluate learnings from the existing long-term replicated paired catchment experiments at Yambulla and Karuah ▪ Undertake macroinvertebrate or environmental DNA sampling on large river systems flowing out of state forests ▪ Establish a before-after-control-impact site on the north coast in the intensive zone ▪ Undertake flood scenario modelling	▪ Water quality, water yield ▪ Macro-invertebrate sampling twice annually for two years prior to impact to create baseline and then twice annually after impact ▪ Review and update studies into exclusion zones around class 1 streams	▪ NSW Estuary Health Risk Dataset ▪ State of the catchment reports ▪ WaterNSW river health data ▪ State-wide forest monitoring program ▪ Catchment-based waterway health monitoring	▪ $300k annual	▪ FCNSW ▪ EES	▪ Steering Committee ▪ Commission

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Research program	▪ What are the implications of changing fire intensity and regimes on the achievement of the Coastal IFOA's objectives and outcomes? ▪ How are koalas responding to conditions, including changes in tree retention rates, species, distribution and size? ▪ Can technology improve the probability of detection for a range of species in forestry operations? ▪	▪ Assessment of the impact of the 2019/20 fires on the objectives and outcomes of the Coastal IFOA ▪ Evaluation of the implications of burnt area logging on Coastal IFOA objectives and outcomes ▪ Commissioned research to be performed by research institutions and/or agencies ▪ Design will depend on the nature of the research ▪ Design will be peer reviewed ▪ Further research priorities will be developed and adopted throughout the monitoring program ▪ Note: The Commission is currently overseeing an independent research program on koala response to regeneration harvesting in NSW north coast state forests. The program investigates koala density and diet and habitat nutritional value	▪ Dependant on the nature of the research ▪ Experimental design peer reviewed	▪ The Commission's koala research project ▪ Further research priorities will be developed and adopted throughout the monitoring program	▪ $200k annually for first four years	▪ Commission	▪ Steering Committee ▪ Commission

Monitoring strategy	Monitoring questions	Program design	Proposed sampling density and frequency	Links to existing or proposed programs	Indicative cost	Responsible party	Oversight, annual review and reporting
Independent evaluation of forestry practice	▪ Is pre- and post-harvesting burning maintaining the function of key habitat features? ▪ Are drainage feature crossings and road features effectively designed and maintained to reduce the impact of forestry operations on waterway condition? ▪ Are the species and habitat survey and modelling conditions and practices effective?	▪ Independently evaluate the effectiveness of the planning and implementation of forestry operations and forest management practices[16] Priority evaluation themes[17] ▪ Pre- and post-harvesting burning ▪ Roading and drainage features ▪ Species and habitat surveys and modelling	▪ Evaluation will occur once prior to the five-year review	▪ None	▪ $200k in the first four years	▪ Steering Committee	▪ Steering Committee ▪ Commission

---

[16]   FCNSW currently has its practices independently certified to the Sustainable Forest Management Standard (Responsible Wood).

[17]   Priority themes were derived from a strategic and risk-based prioritisation process, which is detailed in **Attachment 5**.

3.3 Trend monitoring

Is the Coastal IFOA having a neutral, positive or negative impact on landscape-scale environmental values or wood supply?

The Coastal IFOA requires that the monitoring program assess landscape-scale trends against baselines across a range of landscape-scale indictors for biodiversity, water quality, forest regeneration and wood supply.[18] The landscape-scale baselines will be in addition to the effectiveness monitoring baselines established under the monitoring strategies in **Table 2**. The landscape-scale baselines will complement the management-scale baselines established under the effectiveness monitoring.

Trend monitoring and evaluation will:

- indicate whether the Coastal IFOA conditions are affecting environmental values or leading to changes in wood supply from native hardwood forests over time

- help evaluate what type of effect the Coastal IFOA conditions are having on environmental values or wood supply overall.

It is acknowledged that establishing and monitoring baselines for trends in environmental values and wood supply is difficult, as landscape-scale systems are dynamic and can change in response to many factors, such as drought and fire. As such, multiple lines of evidence will be used over a range of timeframes, including plot, remotely sensed, LiDAR and satellite data.

3.3.1 Information sources and links to effectiveness monitoring

The trend assessment for environmental values will draw on information from:

- the monitoring program's nine monitoring strategies for effectiveness (see **Table 2**)

- other landscape-scale, cross-tenure NSW Government monitoring programs.

The monitoring program's trend monitoring activities will help bring the information from these two sources together – supplemented by additional cross-tenure and/or state forest monitoring as required – to identify relevant trends in environmental values and wood supply.

Monitoring strategies for effectiveness

As outlined further in **Attachments 4 through 8**, the monitoring questions within the effectiveness monitoring strategies can be grouped into four streams:

- ecological function and habitat connectivity

- persistence of native species

  Biodiversity

- forest regeneration and forest structure

- aquatic habitat and water quality.

These streams align with the variables required for trend monitoring under Protocol 38. **Table 3** shows how information from effectiveness monitoring can be aggregated within each stream to inform the landscape-scale trend analyses. This also provides the measure of landscape protections provided through the Coastal IFOA.

---

[18]   NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Protocols.* Chapter 8, Protocol 38.3(1)(c). Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1178-coastal-ifoa-protocols.pdf.

Table 3: Links between effectiveness monitoring and trend monitoring

Effectiveness monitoring strategy	Biodiversity trends		Forest regeneration and forest structure trends	Aquatic habitat and water quality trends
	Ecological function and habitat connectivity	Persistence of native species		
Monitoring regenerating forests			✓	
Monitoring forest structure and health	✓		✓	
Monitoring key habitat features	✓			
Monitoring species occupancy		✓		
Species-specific monitoring – fauna		✓		
Species-specific monitoring – flora		✓		
Waterway and wetland health monitoring				✓
Research program		✓	✓	
Independent evaluation of forestry practice	✓	✓	✓	✓

Other NSW Government programs

There are a range of other NSW Government programs related to forests management that will provide inputs to the trend monitoring component of the monitoring program, including but not limited to the:

- NSW State-wide Forest Monitoring Program

- NSW Report on Native Vegetation (EES)

- State of the Forest Report

- Saving Our Species (EES)

- NSW Koala Monitoring Framework (EES)

- DPI – Fisheries Strategic Research Plan 2014–2018 (DPI – Fisheries)

- NSW Regional Forest Agreements

- AdaptNSW website resources (EES)

- DPI Forest Monitoring Program (DPI – Fisheries).

To avoid duplication of plots and assess how forests in the Coastal IFOA region are changing in comparison to forests in other tenures, the monitoring of state forests under this program will, where possible, be informed by plot design used for relevant forest monitoring in other tenures. It is likely this will be in the form of group of core variables that will be measured consistently across all tenures, with additional variables depending on land use. These core variables will include metrics related to climate change and fire regimes.

For example, data on areas outside the Coastal IFOA will be collected through the state-wide NSW FMIP.[19] Trend monitoring within the Coastal IFOA program – for instance, monitoring activities under the monitoring regenerating forests monitoring strategy – will seek to replicate the methodology of state-wide plots that form part of the state-wide NSW FMIP to complement the assessment of state-wide forest values.[20]

This will ensure the plots can be used to assess changes within the Coastal IFOA region, while also allowing for comparison across tenures, including in the national parks estate, Crown land, private land and other state forests. This will help determine if changes to environmental values and wood supply can be attributed to the Coastal IFOA conditions or if external factors, such as climate change, are also affecting environmental values and wood supply[21] in other tenures.

In addition to the monitoring questions identified in the Coastal IFOA monitoring program, the NSW FMIP will also identify a broader set of state-wide evaluation questions to inform monitoring and research on other tenures.[22] These questions could focus on broader landscape drivers such as climate change and fire regimes. Information from other programs can also inform the evaluation of the Coastal IFOA.

Other relevant monitoring programs will also be considered to complement the monitoring program. For instance, the monitoring, evaluation and research plan for the Regional Forest

---

[19] This is in line with the NSW Forestry Industry Roadmap commitment to undertake 'transparent environmental and regeneration monitoring of state forests to determine the effectiveness of the IFOAs at achieving their objectives, within the framework of a broader landscape monitoring program across tenures'.
[20] The NSW FMIP's *Program Framework 2019-2024* commits to this deliverable.
[21] Wood supply will be only measured in state forests.
[22] The NSW FMIP's *Program Framework 2019-2024* commits to this deliverable.

Agreements is due in mid-2020 and will include areas covered by the Coastal IFOA. This program will monitor criteria related to ecologically sustainable forest management.

3.3.2 Monitoring trends in environmental values

Defining landscape scales for environmental values and wood supply

To assess landscape-scale trends in environmental values, the appropriate scale for analysis needs to be defined. **Figure 1** shows the scales at which environmental values can be assessed in a landscape context, including:

- Local landscape areas[23]

- Management zones

- Regional Forest Agreement regions (broadly aligned with Coastal IFOA sub-regions)

- North Coast/South Coast NSW geographic regions

- Coastal IFOA region.

---

[23]   Note: Local landscape areas are approximately 1,500 hectares in size and are restricted to state forests. Therefore they are too small to represent on Figure 1.

Landscape scale environmental values monitoring
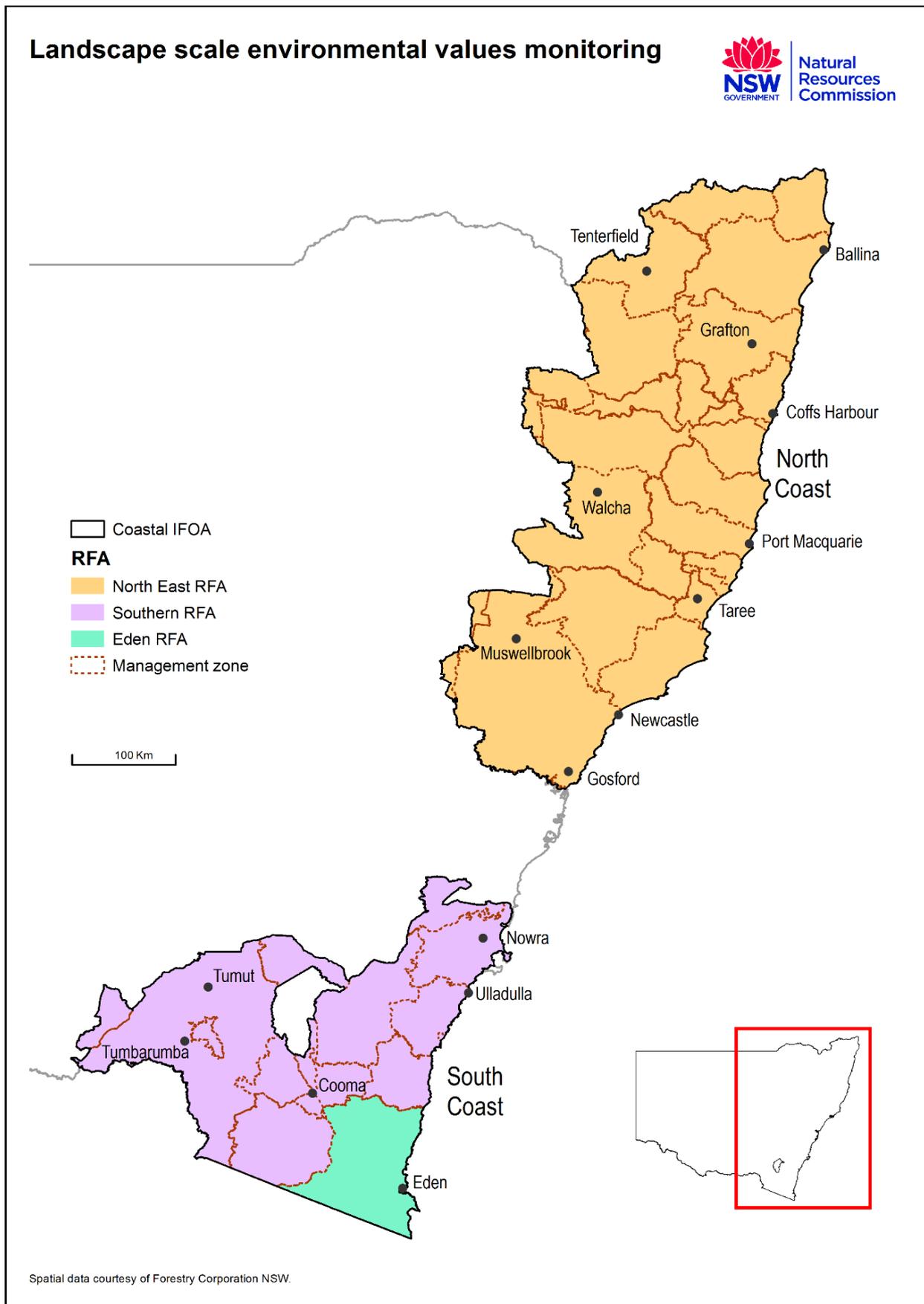
Figure 1: Types of landscape scales to assess trends in environmental values

Establishing baselines for trends in environmental values

Baselines for environmental values will provide a starting point from which the impacts of the Coastal IFOA conditions across the landscape can be assessed. **Table 4** describes the baselines that will be used in the monitoring program. Protocol 38 of the Coastal IFOA outlines that the baselines may contain – but are not limited to – measures of biodiversity[24], water quality and forest regeneration. As discussed in **Section 3.3.1**, these align with the four monitoring streams that underpin the effectiveness monitoring strategies in **Table 2**.[25]

Table 4: Baselines for environmental values

Baseline	Description
Coastal IFOA Conditions **(2020 baseline – ongoing)**	Baseline will be the first years of monitoring results[26] from the commencement of the Coastal IFOA monitoring program for variables used to assess the effectiveness of its conditions (see **Section 3.2**) **Attachments 4 to 8** provide further detail on how each monitoring question is used to monitor biodiversity, water quality and forest regeneration trends Data collected as part of landscape-scale monitoring strategies will be used for both the effectiveness and trend monitoring components of the program Trend monitoring will also be part of state-wide, cross-tenure monitoring through the state-wide monitoring plot network and other NSW Government programs related to forest management (see **Section 3.3.1**)
Historical trends **(1999 – ongoing)**	Historical trends will be based on the datasets from the Comprehensive Regional Assessment undertaken in 1999 that are comparable with current datasets[27] This will be a reference point from which the trajectory of environmental values will be tracked These will identify longer-term temporal trends in environmental values before the commencement of the Coastal IFOA and will be used to assess how the Coastal IFOA affects these values

3.3.3 Monitoring trends in wood supply

Defining landscape scales for wood supply

Figure 2 shows the different spatial scales at which wood supply trends will be assessed, including:

- Supply zone
- Regional Forest Agreement/ Coastal IFOA sub-regions
- North Coast/South Coast NSW geographic regions
- Coastal IFOA region.

---

[24]   Comprised of two parts – 1) ecological function and habitat connectivity and 2) native species presence.

[25]   The monitoring streams are – 1) ecological function and habitat connectivity, 2) native species presence, 3) forest regeneration and forest structure and 4) aquatic habitat and water quality. Streams 1 and 2 would inform assessments of biodiversity as part of the assessment of trends in environmental values.

[26]   Noting that the period to establish a baseline may differ between monitoring strategies and will require multiple years of assessment.

[27]   Note: Datasets from the Comprehensive Regional Assessment will only be used if they are comparable to current datasets. The Commission also notes that older datasets are likely to be at a coarser scale to current datasets and will be used to give a broad indication of trends. Since the Comprehensive Regional Assessment technology, data collection methods and means of recording results have improved.
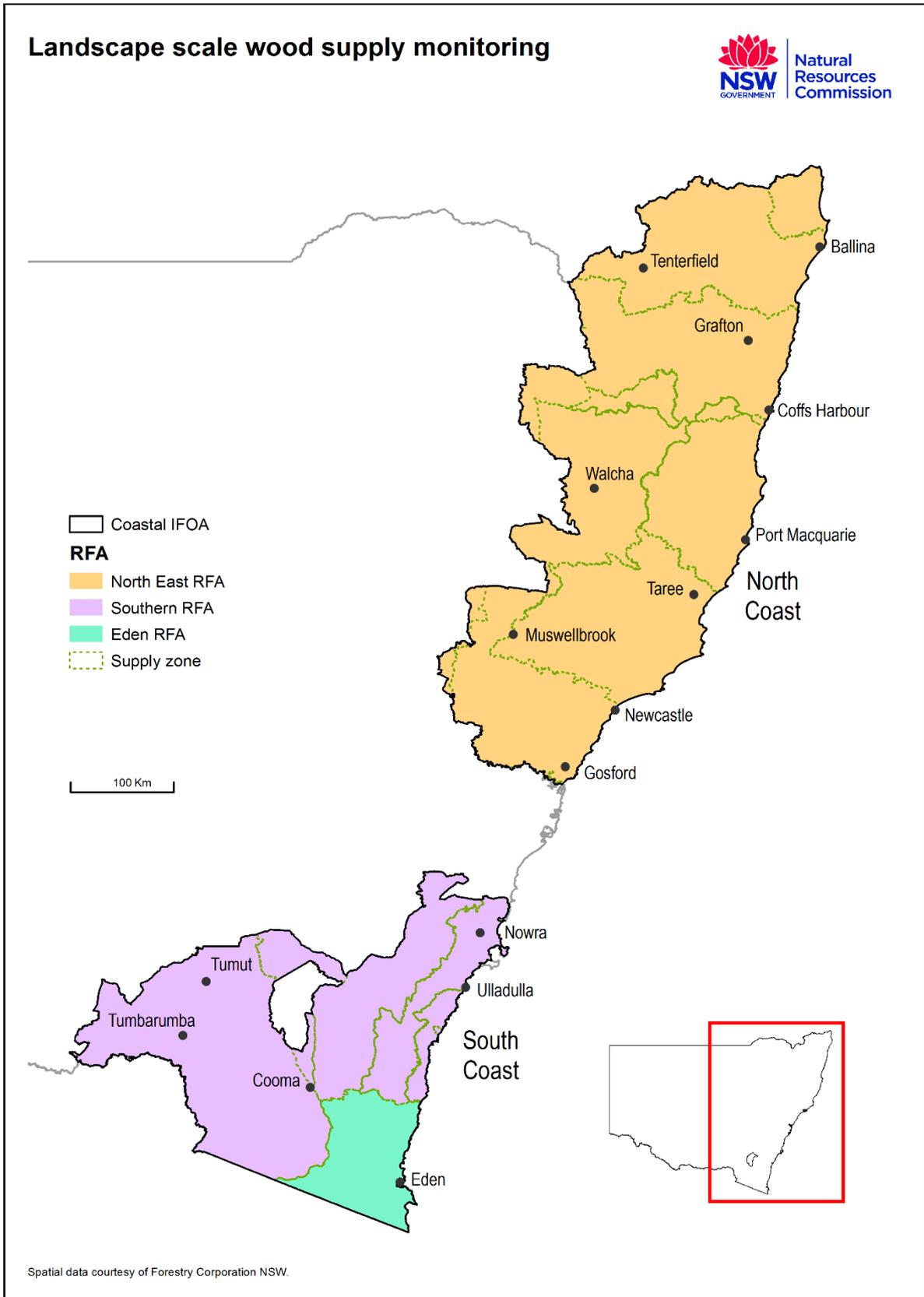
Figure 2: Types of landscape scales for wood supply trend monitoring

Establishing wood supply baselines

Like the environmental values baselines, multiple baselines are required to assess trends in wood supply. **Table 5** gives and overview of the baselines.

Table 5: Wood supply trend monitoring baselines

Baseline	Description
Modelled (2020 – ongoing)	This assesses the modelled sustainable yield volumes[28] under the Coastal IFOA
	A baseline will be established as modelled wood supply under the previous IFOA conditions
	This allows actual wood supply under the Coastal IFOA to be compared with the wood supply that would be expected if the Coastal IFOA had not been implemented
Actual yield (2003 – 2020 then ongoing)	This baseline will reflect actual yields every year from 2003[29] and will continue to monitor actual yields annually
	This is based on 2003 harvest volumes to identify longer-term trends in wood supply
	Actual yield will need to be tracked over several years to accurately assess the impact of the Coastal IFOA on actual volumes and test wood supply models. This is because annual wood supply can vary due to weather and market conditions[30], and the Coastal IFOA allows annual harvest volumes to vary by up to 25 percent from annual limits[31]

Assessing wood supply against the modelled baseline

Modelled volume yields of native hardwood forest wood supply from the public forest estate will be assessed against the modelled baseline identified in **Table 5** using:

- log grade and size (high quality large and high quality small)

- species or species grouping

- supply zone and price zone

- haulage distance between harvest and supply nodes

- period (over 100 years).

The modelled baseline requires an estimate of the volume of wood that would have been sustainably supplied to maintain wood supply agreements if the Coastal IFOA was not implemented. To do this, a strategic-scale modelling assessment and a tactical-scale field assessment will be undertaken:

- **Strategic-scale modelling** – this uses FCNSW's Forest Resource and Management Evaluation System (FRAMES). It quantifies wood supply under previous IFOA settings at the regional and sub-regional scales, such as price or supply zones.

- **Tactical-scale field assessment** – this involves the field validation of strategic-scale modelling results under previous IFOA settings at the local landscape area and compartment scales. It identifies compartments that would have been selected under a

---

[28]   As reported in DPI (2018) *Sustainable yield in New South Wales Regional Forest Agreement Regions*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/842098/sustainable-yield-in-NSW-RFA-regions.pdf.

[29]   FCNSW reports on actual versus predicted yield as part of reporting to the Australian Government on the Regional Forest Agreements. Actual yield figures from this process will be used as part of trend monitoring.

[30]   Including any previous and future NSW Government buybacks.

[31]   Under the Coastal IFOA, FCNSW is allowed to overcut and undercut their annual limits by up to 25 percent. However, to be in line with sustainable yield, the average yield over 20 years must not exceed the annual limits.

multi-year plan of harvesting operations for previous IFOA settings and applies the first four or five years of yield data (wood volumes) to show if the implementation of Coastal IFOA has changed, what has been harvested or the distance that harvest products have to travel. This field assessment will collect a suite of attributes for a representative sample of compartments in the plan of operations, using a plot-based sampling approach.

After establishing the modelled baseline, FCNSW will continue to fund the measurements for and running of FRAMES and reporting as part of its obligations under the Regional Forest Agreements. The role of the monitoring program is to independently review and validate wood supply to meet both short-term commercial obligations and long-term sustainable yield to enable the assessment of the effectiveness of the IFOA conditions.

Assessing wood supply against the actual yield baseline

The actual yield baseline outlined in **Table 5** will be established based on the average actual yields harvested over time from coastal state forests from 2003[32] until the inception of the Coastal IFOA in 2018. Volume metrics for this assessment will include:

- log grade and size
- species or species grouping.

3.4 Compliance monitoring

Are non-compliances compromising the outcomes or the ability to monitor the effectiveness of the conditions of Coastal IFOA?

To assess the effectiveness of Coastal IFOA conditions, it is important to know whether they are being implemented as intended. In particular, to understand if instances of non-compliance are likely to have compromised the outcomes of any conditions or the ability to monitor their effectiveness.

Compliance monitoring for the Coastal IFOA is the responsibility of the EPA. FCNSW must publicly self-report on compliance with the Coastal IFOA conditions as they occur, as well as in its consolidated annual reports. The monitoring program will draw on compliance monitoring data from these agencies.

Table 6 shows the types of questions that will guide the monitoring program's compliance assessment.

---

[32]   This is the first year for which harvest volumes from the whole Coastal IFOA region is available.

Table 6: Questions to guide the compliance monitoring action

Question	Purpose
1 Which conditions have or haven't been met?	▪ Understand where outcomes are likely to be adversely affected by non-compliance
	▪ Identify and address high-risk conditions that are likely to be generating poor outcomes
2 What are the reasons for non-compliance?	▪ Understand why conditions and protocols are not being implemented (including frequency, regions and other trend information)
	▪ Explore whether there are inherent flaws in the design of the conditions and protocols that are resulting in non-compliance and perverse outcomes and need to be addressed
3 Are there any challenges monitoring compliance with the Coastal IFOA?	▪ Understand if there are systemic or underlying issues that will lead to knowledge gaps around compliance and performance that will undermine evaluation of Coastal IFOA effectiveness

3.5 Adaptive management

Can Coastal IFOA conditions, forestry operations, forestry management or monitoring be improved to better meet objectives and outcomes?

The Coastal IFOA requires that the Steering Committee recommend to the EPA[33] and the NSW Government[34] changes to the Coastal IFOA based on the results of the monitoring and evaluation activities, including changes to the conditions, supporting protocols, or underlying management practices. The effectiveness of the monitoring program itself will also be reviewed and improved if necessary.

During the detailed design of the monitoring strategies, performance benchmarks and management action triggers will be established where possible for each of the monitoring questions. The outputs of the monitoring and evaluation activities will be reviewed against the benchmarks and triggers to identify any changes to the Coastal IFOA to improve its ongoing effectiveness. As part of the consultation process for the detailed design phase, there will be opportunities for stakeholder input into the design of the benchmarks and triggers.

Table 7 outlines the adaptive management process for the Coastal IFOA. Informal annual reviews linked to annual forums will be complemented by formal reviews held every five years, starting in 2024. The annual forums will consider the results of the monitoring program and will also identify new priority themes for independent evaluations and research. The formal review will use all the monitoring results to identify the adequacy of the monitoring program and make recommendations for any consequential changes to the Coastal IFOA. The outcomes of the informal and formal reviews will be provided to the EPA and NSW Government. Stakeholders will have a chance to participate in the adaptive management of the Coastal IFOA through these annual forums (see **Section 3.11**).

---

[33]   Where it relates to protocols.
[34]   Where it relates to conditions.

Alongside the broader adaptive management of the Coastal IFOA, ongoing review and improvement of the monitoring program is also good practice.[35] Programs need to be able to explore, evolve and develop in response to new questions, and improve monitoring approaches and protocols.[36] As such, the effectiveness and adequacy of the monitoring program itself will be reviewed and improved as necessary as part of the annual review process.

Table 7: Key adaptive management opportunities

Timing	Opportunity		By who	To who
Annual	1	Emerging results from the program	▪ Overseen by Steering Committee	▪ EPA
	2	Recommended changes to the Coastal IFOA (if any)	▪ Annual forums with experts, researchers and community	▪ DPI ▪ Community through public reporting[37]
Five-yearly	3	Detailed results from the program, including trends	▪ Overseen by Steering Committee	▪ EPA ▪ DPI
	4	Recommended changes to the Coastal IFOA (if any)		▪ Community through public reporting[38]

3.5.1   Reporting and data availability

The Commission – on behalf of the Steering Committee – will provide progress reports and advice about recommended changes to the Coastal IFOA at least annually to the NSW Government, EPA and DPI, along with the results of any program reviews. These reports will be made publicly available online to meet Coastal IFOA requirements.[39]

In addition, to align with the NSW Government Open Data Policy, the monitoring program will include an access platform where data collected through the monitoring program will be made publicly available. For example, bird call libraries will be published that would allow organisations and individuals with relevant expertise to help undertake call analysis (for example of non-focal, non-listed species), which would contribute to the monitoring data.

3.6   Program schedule

Table 9 shows the timeline for key elements of the program, particularly the monitoring strategies and adaptive management reviews.

For the forest structure and health and species occupancy monitoring strategies, it will be difficult to comprehensively monitor the Coastal IFOA area every year, given the available time and resources. As such, monitoring for these strategies will be staged through a five-year rotating group of plots across the Coastal IFOA, with 20 percent of all plots monitored annually.

---

[35]   Lindenmeyer, D.B. and Likens, G.E. (2010) *Effective ecological monitoring.* CSIRO Publishing, Victoria.

[36]   Lindenmeyer D.B. *et. al.* (2012) Improving biodiversity monitoring. *Austral Ecology,* 37(3), pp. 285-294.

[37]   Available on the EPA website or other location approved by the EPA.

[38]   Available on the EPA website or other location approved by the EPA.

[39]   Reviews of the program must be provided to the EPA and DPI and will be published on the EPA website or other EPA-approved locations, as detailed in the protocols.

This approach will collect data on forest structure and species occupancy for the entire Coastal IFOA area every five years. This aligns with the monitoring program's evaluation and reporting timeframes, as well as the development of new spatial datasets from updated LiDAR and satellite imagery.

3.7 Potential amendments to timing and priorities post wildfires

The monitoring program was proposed in December 2019, before the full extent of the 2019-2020 wildfires had been experienced. The wildfires affected 5.3 million hectares of New South Wales, including 890,000 hectares of native state forests. The timing and priorities, as envisaged before these events were fully realised, has been reconsidered and will be further refined to address wildfire related impacts during the detailed design phase. The design and implementation of monitoring will remain adaptive during the recovery of the forests to ensure the program can monitor Coastal IFOA conditions and ensure they continue to meet outcomes.

Table 8 provides detail of the potential post wildfire amendments the monitoring program design will have to consider.

Table 8 Potential amendments to timing and priorities post wildfire

Monitoring Strategy	As endorsed pre-fire	Potential implications post fire
1. Monitoring regenerating forests	▪ Detailed sampling and plot network design in year 1 ▪ Monitor all harvested plots three to five years post-harvest	No change ▪ Note - harvested areas likely to be reduced by the fires
2. Monitoring forest structure and health	▪ Detailed design in year 1 ▪ Monitor 20% of CIFOA area annually	Amend ▪ Prioritise the high temporal resolution remote sensing monitoring to monitor forest recovery dynamics ▪ Develop scale and metrics to measure age class structure and connectivity
3. Monitoring key habitat features	▪ Detailed design in year 1 ▪ Implement annually	Amend ▪ Implementation schedule and location governed by assessment of the impact of fire
4. Monitoring species occupancy	▪ Detailed design in year 1 ▪ Monitor 20% of CIFOA area annually	Amend ▪ Implementation schedule and location governed by assessment of the impact of fire
5. Species-specific monitoring – fauna and flora	▪ Update / prepare species management plans ▪ Implement management plans	Amend ▪ Analysis of impact of fires on priority species ▪ Re-prioritise management plan development based on fire impact analysis
6. Waterway and wetland	▪ Detailed design in year 1 ▪ Implement annually	Amend

Monitoring Strategy	As endorsed pre-fire	Potential implications post fire
health monitoring		▪ Delay the selection of the sample North Coast catchment until assessment of the impact of fire on harvesting operations
7. Research program	▪ Deliver research based on priorities every two years ▪ Key evaluation question – "What are the implications of changing fire intensity and regimes on the achievement of the Coastal IFOA's objectives and outcomes?"	Amend ▪ Prioritise research on "What are the implications of the 2019/20 wildfire on the achievement of the Coastal IFOA's objectives and outcomes?"
8. Independent evaluation of forestry practice	▪ Commence with an evaluation of pre and post- harvest burning practices in 2020	Amend ▪ Review evaluation priorities post fires ▪ Develop evaluation program and plan
9. Landscape scale trends	▪ Baselines and metrics developed by 2020	No change ▪ Baselines and metrics developed as soon as possible in 2020

Table 9: Program schedule

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Monitoring regenerating forests	Detailed design	●															
	Plot establishment /baseline		●														
	Monitor plots (three to five years post-harvest)		Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5	Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5	Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5
Monitoring forest structure and health	Review imagery					●					●					●	
	Detailed design	●															
	Monitoring (20 percent of plots rotated annually for five years)		Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5	Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5	Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5
Monitoring key habitat features	Detailed design	●															
	Monitoring		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Monitoring species presence	Detailed design	●															
	Monitoring (20 percent of plots rotated annually for five years)		Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5	Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5	Plot Group 1	Plot Group 2	Plot Group 3	Plot Group 4	Plot Group 5
Species-specific monitoring – fauna	Management Plans	●															
	Monitoring	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Species-specific monitoring – flora	Management Plans	●															
	Monitoring		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Waterway and wetland health monitoring	Detailed design	●															
	Monitoring		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Research program	Research programs results[40]		R1	R2		R3		R		R		R		R		R	
Independent evaluation of forestry practice	Burning practices		●								●					●	
	Species survey and modelling				●												
	Roading and drainage						●										
	Review priority								**Priority 1**		**Priority 2**		**Priority 3**		**Priority 4**		**Priority 5**
Landscape-scale trends	Environmental values		Baseline			●											
	Wood supply		Baseline	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Reporting and adaptive management	Annual Forum	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Program Evaluation						●					●					●

---

40   R1: Fire intensity and regimes; R2: Wildlife detection technology; R3: The Commission's koala study; R: Additional research priorities to be established.

3.8   Budget

At this stage, the program has funding committed until June 2023.

Based on the best current available information at this time, it is estimated that it will cost approximately $2 million to undertake the first year of monitoring and establish the effectiveness monitoring. Following this, it is estimated that it will cost approximately $1.8 to $1.9 million annually to maintain the monitoring program's monitoring strategies.

To meet these costs, FCNSW has committed up to $1.5 million annually for effectiveness and trend monitoring components. This in-kind contribution is in the form of redirected staff costs that were used for pre-harvest surveys and water quality monitoring activities under the previous IFOA, which have been reduced or changed under the Coastal IFOA.

In addition, the EPA has allocated $2 million for the development and ongoing review and adaptive management of the monitoring program, as well as research projects and evaluation costs. This funding is being distributed between the financial years 2018/19 to 2022/23.

A cross-tenure plot network and remote-sensing program will be established in the Coastal IFOA region, including in state forests, using a consistent methodology. This will be funded from two sources:

- The $7.2 million announced by DPI in the 2018/19 budget and allocated to the NSW FMIP.

- FCNSW annual in-kind $1.5 million commitment for Coastal IFOA monitoring strategies will also be used as part of trend monitoring.

It is proposed that wood supply baselines could be established using methods developed by the Commission as part of its draft old growth reassessment framework submitted to NSW Government in August 2019 which has been put on hold. The project required the development and implementation of a method to establish a Coastal IFOA wood supply baseline.

Table 10 shows the budget for each monitoring component of the evaluation framework in the first five years.

Table 10: Indicative budget to deliver the evaluation framework over five years

Component	Indicative total value	Source of funds and in-kind contributions
Effectiveness monitoring	$8.8 million	- $1.3 million – EPA - $7.5 million – FCNSW[41]
Trend monitoring (environmental values and wood supply)	To be confirmed – under design as part of a cross-tenure, state-wide program	- NSW FMIP - FCNSW - Commission funds from wood supply verification
Compliance monitoring	$0.2 million	- EPA
Adaptive management	$0.5 million	- EPA

---

[41]   Includes components from the monitoring program used in landscape-scale trend monitoring.

It is noted that funding for the NSW FMIP is to be used for the purposes of the state-wide monitoring program (which may include Coastal IFOA areas). It is not proposed that NSW FMIP funding is used to fund the Coastal IFOA monitoring program.

3.9 Roles and responsibilities

3.9.1 Steering Committee

The terms of reference for the NSW FMIP requires that the Commission establish and independently chair a cross-agency Steering Committee to oversee the design, implementation, review and continuous improvement of the NSW FMIP. In relation to the Coastal IFOA monitoring program, the Steering Committee must:

- ensure the monitoring program meets the requirements in Condition 38.3 of Protocol 38 of the Coastal IFOA (see **Table 1**)

- oversee the implementation of the monitoring program

- review the effectiveness of the monitoring program and inform necessary amendments to ensure it is progressing and providing scientifically robust results

- review and analyse monitoring program data and provide expert scientific advice to the EPA, DPI and FCNSW

- engage with community, environment and industry stakeholders on the monitoring program.

3.9.2 Agencies

Under the Premier's terms of reference, the Commission has a role to independently oversee the NSW FMIP, including governance, design, direction, accountability and reporting.

The Coastal IFOA protocols identify specific agency roles and responsibilities.[42] For example, following approval of the monitoring program by EPA and DPI, FCNSW must:

- implement and comply with the program as per Coastal IFOA requirements

- contribute to adaptive management of the Coastal IFOA in response to relevant program findings and Steering Committee recommendations

- participate in public consultation processes associated with the program.

Delivery of the monitoring program is a cross-agency responsibility through the Steering Committee. It is the responsibility of all agencies to report and share data to the Steering Committee so it can adequately evaluate and report on the monitoring program and provide adaptive management recommendations.

---

[42] NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Protocols.* Chapter 8, Protocol 38. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1178-coastal-ifoa-protocols.pdf.

3.10 Linking with other programs

The Coastal IFOA protocols require the monitoring program to link to other relevant NSW Government programs and reviews related to the monitoring and management of state forests and the broader NSW forest estate.[43] Relevant programs and reviews are identified as part of the monitoring strategies (see **Table 2** in **Section 3.2**).

As mentioned in **Section 2.2**, the monitoring program will both significantly draw on and contribute to the NSW FMIP. The NSW FMIP will help facilitate the use of state-wide data from other tenures as an input to the monitoring program's evaluation of landscape-scale trends. It will also provide a mechanism for data collected through the monitoring program to inform state-wide monitoring and evaluation and share that could potentially help improve forest management on other tenures.

More information about this program can be found at the Commission's website: https://www.nrc.nsw.gov.au/forest-monitoring.

3.11 Community and stakeholder engagement

The community and stakeholders will be engaged on the monitoring program's design and implementation, as well as during review and adaptive management processes.

Stakeholders will also be kept informed and given opportunities to provide feedback on the detailed design of monitoring approaches and methodologies for the monitoring strategies. The timing and details of these opportunities are outlined in **Table 11**.

Stakeholders will also be invited to annual forums – a requirement of the Coastal IFOA protocols – to jointly review the findings of the program and implications for forest management in NSW.[44]

Details of current and upcoming engagement opportunities can be found on the Commission's website: https://www.nrc.nsw.gov.au/forest-monitoring.

Table 11: Key engagement opportunities

Subject	Details	Timeframe
Annual monitoring performance reviews	Online paper and forum	Annually every September, from September 2020
Major review	Online paper, submissions and forum	2024

---

[43]   *Ibid*, Protocol 38.1(1)(g).
[44]   *Ibid*, Protocol 38.4(1).

4 Next steps

Now the monitoring program has been approved, a detailed monitoring plan will be developed, consisting of nine monitoring strategies. The key steps and timing of this process are as follows:

- Review of the monitoring approaches of existing species management plans – **completed early November 2019**.

- Detailed design of monitoring strategies – commencing late 2019 (subject to EPA and DPI approval).

- Development of new species management plans by FCNSW and EPA – **commenced late 2019**.

- Establish monitoring – **commencing mid-2020**.

Monitoring under the program will begin in mid-2020. This chapter outlines the next steps and priority actions to implement the monitoring program, including the:

- detailed design of monitoring strategies – **commencing early 2020 with drafts to be finalised by July 2020**

- development of supporting plans and documentation, including the:

  - review of the monitoring approaches of existing species management plans – **commenced and ongoing**

  - development of new species management plans by FCNSW with EPA – **commenced late 2019 and ongoing**.

- potential amendments to timing and priorities post 2019-20 wildfires.

4.1 Detailed design of monitoring strategies

The monitoring strategies require further development before they are implemented. The level of additional planning required varies between the strategies. Some are existing programs that only require evaluation before they can proceed, such as the fauna species management plans discussed in **Section 4.2**. Other strategies need more detailed planning to ensure they provide the information required within the available resources.

The next steps for each of the monitoring strategies are outlined in **Table 12**.

Table 12: Next steps for each of the monitoring strategies

Monitoring strategy	Next steps
Monitoring regenerating forests	▪ This monitoring strategy establishes a permanent network of monitoring plots within the Coastal IFOA region ▪ The design of this plot network is critical as it will provide the infrastructure for many of the other monitoring strategies ▪ It needs to be consistent with the state-wide forest monitoring program and the requirements of Protocol 37 (regeneration and stocking) ▪ Benchmarks for floristic composition, structure and coarse woody debris need to be established for each harvested forest type
Monitoring forest structure and health	▪ Remotely sensed spatial data plays an important role in the monitoring of forests internationally and advances in technology are improving its cost-effectiveness ▪ The NSW Government has advanced capability in the field and the development of this strategy should proceed quickly ▪ An important next step is developing a process to measure landscape heterogeneity or age class structure and establishing appropriate benchmarks
Monitoring key habitat features	▪ An effective design of this monitoring strategy is critical, as the Coastal IFOA conserves a range of habitat features in different contexts and over a large area ▪ Developing a scientifically rigorous monitoring approach to gather information on the effectiveness of conditions within the available resources will be challenging ▪ Monitoring approaches will require regular inspections of conserved habitat features for evidence of use ▪ This will likely involve hollow inspections and employ remote sensing technologies such as ultrasonic detection and camera trapping ▪ FCNSW will work in partnership with research institutions to develop an experimental design for review by the Steering Committee
Monitoring species occupancy	▪ Remote sensing is an efficient and non- invasive way to study a broad range of species populations and communities to monitor species responses to the IFOA conditions ▪ Remote sensing as a monitoring tool is advancing rapidly, facilitated by emerging sensor hardware and the application of machine learning innovations to automated call identification ▪ Work is currently underway with Queensland University of Technology to develop automated detection capacity for priority forest species ▪ Detailed design of the program will involve maximising the return on investment for sensor, which require large capital expense

Monitoring strategy	Next steps
Waterway and wetland health monitoring	▪ This strategy involves both existing and new elements ▪ The current program in the South East region will be evaluated, along with the establishment of a new study ▪ The new study will assess macroinvertebrates to determine the soil and water impacts from intensive harvesting ▪ An existing before-after-control-impact experiment on the Wilson River in the intensive harvesting zone has several years of pre-harvest data, which will form the basis of further monitoring ▪ Another step will be to review the feasibility of flood modelling in state forests
Research program	▪ The research program's role is to derive information for priority issues through targeted research projects rather than broader monitoring ▪ Some research into priority areas is already underway, including the thermal koala survey and koala nutrition studies ▪ The next steps will involve seeking proposals for research priorities

Independent evaluation of forestry practice	▪ The next steps are to establish a plan for the monitoring program's evaluation questions including:
	
	   - identifying priorities and scheduling evaluations
	
	   - determining evaluation scope and design
	
	   - commissioning evaluation
	
	   - disseminating reports.

4.2 Developing supporting plans and documentation

Species management plans under the Coastal IFOA are designed to manage and protect priority fauna and flora species and the monitoring program is required to include any monitoring requirements outlined in the plans.[45] The Commission is currently reviewing existing species management plans to see if their monitoring approaches can be improved. FCNSW will develop new plans as required by the Coastal IFOA, which will then be reviewed and incorporated into the monitoring program.

4.2.1 Review of the monitoring approaches in existing species management plans

There are currently five species management plans for the Coastal IFOA, which are for the:

▪ Southern Brown Bandicoot (*Isoodon obesulus*) (South Eastern NSW) – in operation since 2008

▪ Giant Burrowing Frog (*Heleioporus australiacus*) (South Eastern NSW) – in operation since 2008

▪ Yellow-bellied Glider (*Petaurus australis*) (Bago Plateau) – in operation since 2013

---

[45] NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Protocols.* Chapter 8, Protocol 38.3(d). Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1178-coastal-ifoa-protocols.pdf.

- Eastern Bristle Bird (*Dasyornis brachypterus monoides*) (Donaldson State Forest and surrounding area) – in operation since 2016.

- Smoky Mouse (*Pseudomys fumeus*) (South Eastern NSW) – in operation since 2008.

These plans have been reviewed – with the exception of the Smoky Mouse plan[46] – and their monitoring approaches and data have been assessed and provided to EPA and FCNSW in order for those agencies to improve the monitoring of these species. The results of monitoring for fauna species management plans will be used as part of the fauna species-specific monitoring strategy (see **Table 2**).

4.2.2   Developing new species management plans

To meet Coastal IFOA requirements, species management plans are being developed by FCNSW and EPA for seven flora species, including:

- *Euphrasia arguta* - Upper North East Subregion and Lower North East Subregion

- *Corchorus cunninghamii* (Native Jute) - Upper North East Subregion and Lower North East Subregion

- *Genoplesium vernale* (East Lynne Midge Orchid) - Southern Subregion and Eden Subregion

- *Macrozamia johnsonii* (Johnson's Cycad) - Upper North East Subregion and Lower North East Subregion

- *Niemeyera whitei* (Rusty Plum) - Upper North East Subregion and Lower North East Subregion

- *Parsonsia dorrigoensis* (Milky Silkpod) - Upper North East Subregion and Lower North East Subregion

- *Typhonium sp. aff. brownii* (Stinky Lily) - Upper North East Subregion and Lower North East Subregion.

These species profiles have been provided to EPA and FCNSW to assist with the development of management plans and monitoring for these species. The results of monitoring for flora species management plans will be used as part of the flora species-specific monitoring strategy (see **Table 2**).

---

[46]   Due to the broad range of stakeholders involved, the review of the Smoky Mouse plan will begin when the other plan reviews are complete.

Attachment 1 – Institutional context

A1.1   The Coastal IFOA

The Coastal IFOA is an agreement between the NSW Minister for Energy and Environment and the Minister for Regional NSW, Industry and Trade. It sets the minimum thresholds of environmental protection to ensure threatened plants, animals, communities and the protection of water quality are maintained during native timber harvesting operations on NSW state forests and Crown timber land.[47]

The Coastal IFOA commenced on 16 November 2018,[48] consolidating four previous approvals into a single approval covering the Eden, Southern, Upper North East and Lower North East coastal regions of NSW (see **Figure 3**).

The Coastal IFOA aims to balance the on-going protection of threatened species, water, soil and sustainable timber supply by ensuring forestry operations are carried out:

- in accordance with the principles of ecologically sustainable forest management

- in a manner that integrates the regulatory regimes for environmental planning, assessment and protection, and biodiversity and threatened species conservation.

The Coastal IFOA is comprised of objectives, outcomes statements, conditions and protocols. As an outcomes-based licence, the Coastal IFOA identifies high-level objectives and outcome statements. These are not enforceable requirements but are meant to clarify the intent of the Coastal IFOA conditions and guide its implementation.

The Coastal IFOA conditions set mandatory actions and controls for protecting threatened plants and animals, habitats, soils and water. The conditions are supported by protocols, which set out additional enforceable actions and controls to support the effective implementation of the Coastal IFOA.

Forestry operations that are compliant with Coastal IFOA conditions are expected to achieve its outcomes and objectives. However, it is important to test this assumption by monitoring and evaluating the effectiveness of the conditions. The Coastal IFOA requires that the effectiveness of the approval in meeting objectives and outcomes is assessed through an ongoing monitoring, evaluation, reporting and improvement framework, within available resources.[49]

Full details of the Coastal IFOA objectives, outcomes statements, conditions and protocols can be found at: https://www.epa.nsw.gov.au/your-environment/native-forestry/integrated-forestry-operations-approvals/coastal-ifoa.

---

[47]   The Coastal IFOA applies to **native timber forests on state forests and Crown timber lands** within the region indicated in **Figure 3**. It does not apply to soft or hardwood plantations or forestry activities on other tenures (for example, private native forestry).

[48]   When it was signed by the then Minster for the Environment and the Minister for Lands and Forestry.

[49]   NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Conditions.* Chapter 1, Division 3. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1177-coastal-ifoa-conditions.pdf.
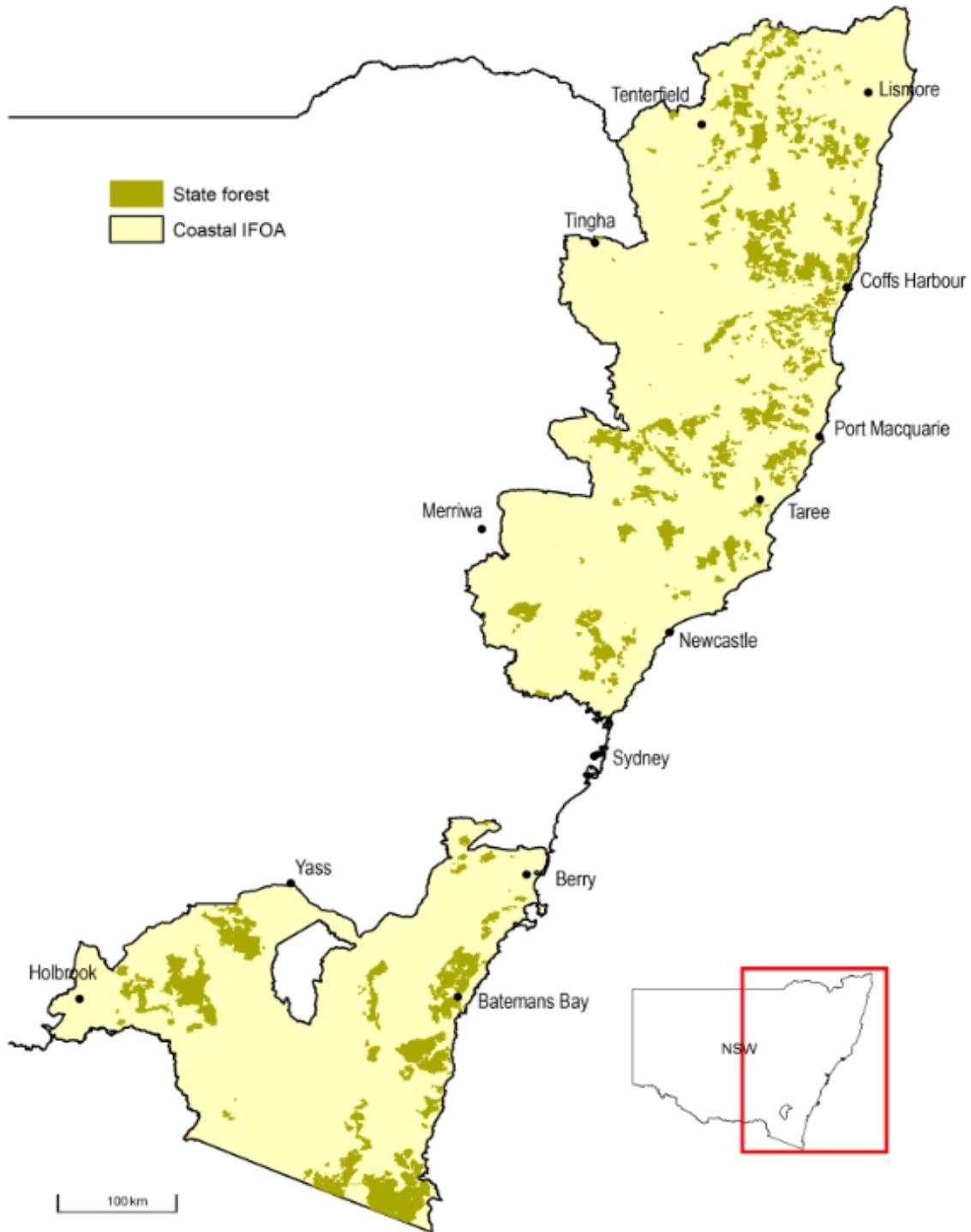
Figure 3: The Coastal IFOA region

A1.2   NSW Forest Monitoring and Improvement Program

The NSW Government has established the NSW FMIP. The NSW FMIP is a cross-tenure program that will lead and coordinate monitoring, evaluation and research for improved forest management on public and private land, including national parks, state forests and private native forestry areas. The program outlined in this report will contribute to and draw on information from the NSW FMIP.

The NSW FMIP will determine whether current forest management approaches – including IFOAs – are working and support evidence-based adaptive management. It will also consider whether the NSW Government is on track to achieve its commitment to ecologically sustainable forest management under the NSW Forest Management Framework.[50]

The Premier has asked the Commission to independently oversee the design and implementation of the NSW FMIP and this process is currently underway. The Commission will work with the Steering Committee, which includes agency representatives and independent scientific experts, to guide the development and implementation of monitoring, evaluation, and research plans under the NSW FMIP.

A1.3   NSW Forest Monitoring Steering Committee

The NSW Forest Monitoring Steering Committee is independently chaired by the Commission. It consists of NSW Government agencies that are responsible for natural resources and environmental policy, regulation, delivery and science, as well as agencies with a direct role in forest management, including:

- Department of Planning, Industry and Environment (EPA, DPI, EES, Local Land Services and Crown Lands)

- Department of Premier and Cabinet (including Aboriginal Affairs and Heritage)

- FCNSW.[51]

Four independent experts will advise the Steering Committee:

- **Professor Patrick Baker** – former Australian Research Council Future Fellow and School of Ecosystem and Forest Sciences, University of Melbourne.

- **Professor Phillip Gibbons** – Fenner School of Environment and Society, Australian National University.

- **Associate Professor Jacki Schirmer** – Institute for Applied Ecology & Health Research Institute, University of Canberra.

- **Dr Peter Hairsine** – Centre for Water and Landscape Dynamics at the Fenner School of Environment and Society, Australian National University.

---

[50]   Ecologically sustainable forest management seeks to maintain or increase environmental, social, economic and cultural forest values across the NSW native forest estate for present and future generations (NSW Government (2018) *Overview of the Forest Management Framework*. p. 1. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/833792/Overview-of-the-NSW-Forest-Management-Framework.pdf).

[51]   The Coastal IFOA requires FCNSW to participate in the Steering Committee (NSW Government (2018) *Coastal Integrated Forestry Operations Approval – Protocols.* Chapter 8, Protocol 38(122.1). Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/forestagreements/18p1178-coastal-ifoa-protocols.pdf).

Attachment 2 – Summary of stakeholder feedback

Table 13: Summary of stakeholder feedback and responses

Issues		Response
Overall approach		
1	Logging under the Coastal IFOA should be suspended until monitoring and the establishment of baseline data are complete	The Coastal IFOA conditions allow for the monitoring program to be created within 12 months of commencement of the approval
2	Need to more comprehensively embrace the principles of ecologically sustainable forest management, which requires consideration of the full suite of forest values. At present, the draft monitoring program is heavily biased toward environmental protection values	The content requirements for the Coastal IFOA monitoring program are clearly defined. It must focus on the effectiveness of the conditions in meeting the outcomes. Most of the outcomes and conditions in the Coastal IFOA relate to environmental protection
3	The monitoring program should give greater attention to the requirements contained within the Regional Forest Agreements, which includes monitoring that demonstrate how social and economic benefits are being achieved	Regional Forest Agreement monitoring requirements are linked to the principles of ecologically sustainable forest management. The report has been updated to refer to the Regional Forest Agreement monitoring program that will specifically address these requirements
Effectiveness monitoring		
4	The monitoring program needs to consider climate change	Climate change will be considered as part of landscape trends monitoring
5	Risk needs to be captured across the monitoring program design	The risk process does cover all four monitoring components. Effectiveness and trend monitoring have been developed using a risk-prioritisation process and the compliance monitoring questions address the risk of non-compliance to the monitoring program
6	Burning practices should be the first forestry practice evaluated. Changes in burning regimes are a key factor impacting forests and are also linked to Bell Miner Associated Dieback	Pre- and post-harvest burning practices have now been made the first priority in the evaluation of forestry practices monitoring strategy
7	The monitoring program should consider tracking regulatory cost	This is a NSW Government policy decision and is outside of the scope of the monitoring program
8	'Emerging threats' should be an additional monitoring category	Identifying and responding to emerging threats will be considered part of adaptive management
Trend monitoring		
9	The definition of environmental values and wood supply needs to be made available and community should be consulted on this	The definitions of environmental values and wood supply will be developed as part of the detailed design
10	There is a need to be more honest about the challenge of developing robust baselines	The monitoring program states that 'establishing baselines for trends in environmental values and wood supply is difficult, as landscape-scale systems are dynamic and can change in response to many factors, such as drought and fire'.

Issues		Response
11	The monitoring baseline should be based on the condition of forests at the commencement of the Comprehensive Regional Assessments—not the present day	The historical trend monitoring will use useful and comparable data from the Comprehensive Regional Assessments
12	It is not clear if the proposed assessment of 'wood supply' is supposed to include National Parks and Wildlife Service-managed land	The assessment of wood supply does not include National Parks and Wildlife Service-managed land
13	The program needs to go much deeper than matching FRAMES estimates to actual yields and should use multiple lines of evidence to assess the productive state of state forests. This revised approach will require the collection of a suite of data on silvicultural attributes from on-ground plots	The wood supply methodology will include multiple lines of evidence including species, species mix, log size and distance to node The tactical assessment includes on-ground plots

Compliance monitoring

14	A review of compliance should be incorporated into the Coastal IFOA monitoring program	A review of compliance monitoring results will be conducted prior to the five-year review of the Coastal IFOA

Adaptive management

15	All Coastal IFOA prescriptions should be assessed against measurable performance criteria	It is not cost-effective to monitor all Coastal IFOA prescriptions. The monitoring program has undergone a risk-prioritisation process in order to reduce the risks associated with Coastal IFOA conditions not meeting its objectives and outcomes
16	The monitoring program must include triggers or thresholds beyond which logging is halted	Appropriate adaptive management mechanisms will be developed as part of the detailed design of the monitoring program. Appropriate adaptive management mechanisms will include the identification of thresholds that trigger a review of management changes

Priorities for detailed design

17	The meaning and intent of the evaluation questions should be more tightly defined	The detailed design of the monitoring strategies will consider more targeted evaluation sub-questions
18	Broaden the monitoring strategies to capture the additional evaluation and monitoring questions proposed by stakeholders	The detailed design of the monitoring strategies will consider the suggested broadened questions where they help address the risks associated with Coastal IFOA conditions not meeting its objectives and outcomes
19	Stakeholders should be consulted on the detailed design	The community and stakeholders will be engaged on the program's design and implementation, as well as during review and adaptation processes

Issues	Response
Governance and funding	
20	Forest monitoring should be undertaken independently of FCNSW or subject to independent oversight	Condition 122.3 requires FCNSW to implement and comply with the monitoring program Continued oversight and evaluation of the monitoring program will be the responsibility of the Steering Committee which is chaired by the Commission
21	The full costs of monitoring the impacts of logging should be borne by FCNSW	Monitoring of the conditions will be funded in kind by FCNSW
22	Provide resourcing for non-government organisations to engage in the monitoring program	There will be opportunities to attend annual forums. In addition, a citizen science program will be established as part of the state-wide monitoring program
23	Monitoring funds must not be used to remap forests currently protected as old-growth or rainforest	Monitoring funds will not be used to remap forests currently protected as old growth or rainforest
Engagement and reporting	
24	It is not clear how electronic data will be analysed and stored. Nor that this data will be publicly available and so verifiable. The Commission could consider an open access platform which would allow local people with call identification expertise to undertake the wider call analysis	An open data policy is included in the monitoring program and an access platform will be made available for people to access call libraries
25	Use easy to follow reporting tools such as 'on-track' and 'off-track'	This will be considered in the detailed design of the monitoring strategies

Attachment 3 – Program requirements and design principles

Table 14: Summary of Coastal IFOA objectives

Coastal IFOA objectives	
Overall objective	To authorise the carrying out of forestry operations: ▪ in accordance with the principles of ecologically sustainable forest management ▪ in a manner which integrates the regulatory regimes for: ▪ environmental planning and assessment ▪ the protection of the environment ▪ threatened species conservation and biodiversity ▪ in accordance with the Coastal IFOA conditions and protocols, as applicable
Specific objectives	**Threatened species conservation and biodiversity** – to set out: ▪ the minimum measures required to be implemented to protect species, communities and their habitats from the impacts of forestry operations ▪ multi-scale protection measures that ensure sufficient and adequate habitat is provided at the site, local landscape area, and management zone scales ▪ measures for species or communities that require specific measures to ensure habitat is protected around known occurrences **Protection of the environment** – ensuring that practical measures are taken to protect the aquatic environment and waters from the impacts of water pollution caused by forestry operations **Threatened species under the *Fisheries Management Act 1994*** – set out the minimum measures required to protect threatened species, populations, communities and habitats (as per the *Fisheries Management Act 1994*) from the impacts of forestry operations and associated activities **All conditions** – ensuring the ongoing monitoring, evaluation, reporting and improvement of the Coastal IFOA so that it is effective in achieving the objectives of the approval and relevant outcome statements

Table 15: Summary of outcome statements from the Coastal IFOA conditions

Outcome location	Outcome statement
Chapter 2 – Administrative conditions	
Division 1 – Registers	Transparent, accurate and comprehensive information and records of a forestry operation (and matters covered by the approval) are maintained and accessible
Chapter 3 – Planning conditions	
Division 1 - Local Landscape Areas	Landscape planning units (local landscape areas) are designed and implemented to deliver both conservation and ecological sustainable forest management outcomes
Division 2 – Distribution of harvesting across the landscape	Harvesting operations are distributed across the landscape and over time, to support a mosaic of forest age-classes and maintenance of forest structure in the operational area or local landscape area
Division 3 – Environmentally Significant Areas	Habitat and environmental features are identified and retained to provide refuge, connectivity, and to support forest regeneration
Division 4 – Operational Planning	Environmental features, habitat and risks are identified and site-specific protections and management practices are developed to mitigate the impact of the forestry operation
Chapter 4 – Operational planning and implementation	
Division 1 – Planning Assessments and surveys	Environmental features, habitat and risks are identified to ensure that protections and management actions are implemented to mitigate the impact of the forestry operation
Division 2 - Habitat Protection	Environmental features, habitat, landscapes and communities are identified, and protections are permanently established, to mitigate the impact of the forestry operation Woody debris is retained across operational areas to provide shelter and foraging habitat for native species to support their persistence
Division 3 – Retained Trees	Important trees are retained and protected for shelter and food resources for native species, and to support their persistence
Division 4 – Species-specific conditions for fauna	Site-specific measures are implemented to mitigate the impact of the forestry operation on fauna species and their habitat, and to support their persistence
Division 5 – Species-specific conditions for flora	Site-specific measures are implemented to mitigate the impact of the forestry operation on flora species and their habitat, and to support their persistence
Division 6 – Species management plans	Monitoring, management and protection measures are identified, planned and implemented for specific native species to support their persistence.
Division 7 – Burning	Environmental features, habitat, landscapes and communities are maintained through the implementation of best management practices for pre-harvest burns and post-harvest burns
Chapter 5 – Operating conditions	
Division 2 – Management of Environmentally Significant Areas	Environmentally Significant Areas are protected during forestry operations to maintain their intended, specific environmental values
Division 3 – Riparian protection	Vegetation adjacent to drainage features and wetlands is protected, and groundcover is retained, to maintain water quality, stream stability, riparian habitat and contribute to habitat connectivity

Outcome location	Outcome statement
Division 4 – Roads	Water quality, aquatic habitat and native fish movement are maintained through the implementation of best management practices for roads and road crossings
Division 5 - Tracks	Water quality, aquatic habitat and native fish movement are maintained through the implementation of best management practices for tracks and track crossings
Division 6 – General soil and water operating requirements	Water quality, aquatic habitat are protected through the implementation of best management practices Dust and waste are managed to minimise pollution around operational areas
Division 7 – Burning operations	Environmentally Significant Areas and important habitat are managed during burning operations to maintain their intended, specific environmental values and provide short-term refuge habitat
Chapter 6 – Mapping	
-	Accurate data layers for forestry operations are created, maintained, used and publicly available
Chapter 7 – Regeneration	
-	Harvested areas are adequately stocked with a natural floristic composition to maintain ecological function and sustainable timber supplies
Chapter 8 – Monitoring Conditions	
-	Monitoring programs are applied at multiple landscape scales to ensure the ongoing effectiveness of the approval in delivering the objectives of the approval and outcome statements

Attachment 4 – Risk-based prioritisation process to inform program design

To satisfy the NSW FMIP's principles around transparency, risk-based decision-making and cost-effectiveness, the monitoring program's technical working group – in collaboration with the CSIRO Conservation Decisions Team – used a risk-based decision-making protocol to inform program design.

The approach seeks to reduce the risks associated with Coastal IFOA conditions not meeting its objectives and outcomes. As such, program design elements were assessed based on:

- their ability to detect that outcomes are not being met
- the consequence of not detecting that the outcome is not being met
- the cost of monitoring required to detect that the outcome is not being met
- their potential to inform change management practices to improve Coastal IFOA performance

Identifying ineffective or harmful management practices and addressing issues in a timely way reduces the likelihood of adverse outcomes from the implementation of the Coastal IFOA. An efficient, strategically prioritised monitoring strategy maximises the number of risks that can be monitored and increases the overall effectiveness of the program.

A4.1   Identifying risks

A comprehensive risk register was generated by analysing the Coastal IFOA conditions and outcomes statements. Additional risks were identified from submissions to the draft Coastal IFOA. Ninety-five risks were identified, which were then ranked by an expert panel.

A4.2   Initial prioritisation

Due to the high number of risks, an initial prioritisation process was used to develop a manageable set of risks for which monitoring questions and monitoring strategies could then be developed.

The prioritisation process focused on the likelihood and consequence of risks being realised without monitoring. Information to inform the process was elicited from a panel of 16 experts using a Delphi method. This process was designed to gather expert scientific knowledge while minimising expert fatigue and potential judgement biases. Members of the monitoring program's technical working group made up the initial expert group, nominating additional relevant expertise from agencies and organisations as required.

Forty-seven priority risks were selected; 42 from the initial prioritisation and five that were selected in order to align with the requirements of Protocol 38 of the Coastal IFOA. Monitoring questions and strategies were then developed for the final set of risks. The priority risks include all the priority conditions identified within Protocol 38.3(1)(a) of the Coastal IFOA.

Table 16 summarises the prioritisation criteria and assessment process used to identify the priority risks and associated monitoring activities.

Table 16: Overview of prioritisation criteria and assessment process

Criteria	Description	Assessment process

Risk	The level of risk that the condition presents to the achievement of Coastal IFOA outcomes	▪ Identify a comprehensive set of risks, including risks that are:
		  - associated with each condition
		  - identified from submissions to the Coastal IFOA
		  - based on consideration of community impacts, including the extent to which the monitoring fulfils community expectations or is needed to ensure social licence to operate
		
		▪ Assess the likelihood and consequence of each risk in relation to achieving the Coastal IFOA's objectives and outcomes

Monitoring effectiveness	The likelihood that each monitoring strategy will effectively detect a risk that is being realised or changes in the effectiveness of a condition	▪ Identify monitoring questions and potential monitoring strategies[52] (or a suite of alternative strategies) that address each risk
		
		▪ Assess the likelihood of monitoring success, including factors such as:
		  - the history of the monitoring strategy
		  - the likelihood of funding
		  - the social acceptability of the strategy
		  - time required to see results
		  - generalisability of results
		  - uncertainty
		
		▪ Assess the likely contribution that monitoring would make towards reducing each risk
		
		▪ The prioritisation process is ongoing and will inform the detailed design of the monitoring strategies

---

[52]   The monitoring strategies for the program are outlined in **Section 3.2**.

Criteria	Description	Assessment process

Risk mitigation	The availability of interventions or changed management practices that would reduce risks identified through monitoring and better protect the environment, species or biodiversity	▪ Identify the expected alternative management practices that could be implemented if monitoring indicates risks are occurring
		
		▪ Estimate the likelihood that alternative management practices could be adopted and implemented successfully, including factors such as:
		
		  - the history of the management practice
		  - the likelihood of funding
		  - the timeframe required to see results
		  - spatial coverage
		  - uncertainty
		  - the likelihood of adaptive management
		
		▪ Estimate the revised likelihood that the risk is realised, assuming that monitoring and alternative management practices are successfully implemented
		
		▪ Compare the relative risk post- and pre-mitigation to estimate the extent of risk mitigation that monitoring may achieve

Cost-effectiveness	Total cost and relative cost-effectiveness of each monitoring question, including the reduction in risk per dollar spent as a result of monitoring	▪ Estimate the cost of monitoring strategies for each risk and monitoring question ▪ Categorise estimated costs using a scale from minimal to high expense ▪ Dollar-range intervals will be developed during detailed planning, based on expert advice
IFOA requirements	Whether it is a priority requirement under Protocol 38.3	▪ Review against Protocol 38 requirements (refer to **Table 1** in **Section 2.3.1**) ▪ Any Protocol 38 requirements not initially identified as a priority in the initial prioritisation process added to the priority risk list

A4.3 Monitoring question development

Monitoring questions were developed for each monitoring strategy to focus monitoring activities on answering the key questions that are most useful for decision-makers and forest managers.

The strategies were designed to minimise duplication across the monitoring program and increase cost-effectiveness. In some cases, multiple risks are addressed under a single monitoring question and multiple monitoring questions are captured within one monitoring strategy.

A4.4   Monitoring strategy development

The monitoring strategies were developed in consultation with the expert panel based on:

1   what the monitoring strategy is trying to detect, the assumptions being made and the accuracy required from monitoring

2   the monitoring study design, including the method, what spatial and temporal scale should be used, sampling density and frequency, replication and stratification

3   a cost estimate for establishing and implementing the monitoring strategy

4   the likelihood that the monitoring would be successfully implemented and detect change if it occurred

5   the likelihood that the risk would occur if the monitoring (and associated changes in management practices) were implemented.

Through this process the expert group developed nine monitoring strategies that covered the full set of risks. These strategies are:

- monitoring regenerating forests

- monitoring forest structure and health

- monitoring key habitat features

- monitoring species occupancy

- species-specific monitoring – flora

- species-specific monitoring – fauna

- waterway and wetland health monitoring

- research programs

- independent evaluation of forestry practice.

Through this process it emerged that many of the risks could be monitored collectively through a set of complementary monitoring strategies. For example, a passive acoustic monitoring array can be used to monitor koala occupancy, the population of hollow-dependent birds and other risks to species that vocalise, such as bats. Similarly, remote sensing data can be used to monitor both forest health and forest structure.

Some risks can also be monitored using multiple strategies. For example, strategies to maintain adequate winter flowering trees includes conserving trees (monitored by the 'monitoring key habitat features' strategy) and ensuring they are regenerated (monitored by the 'monitoring regenerating forests' strategy).

The expert group also identified risks that would be difficult to monitor and for which information should be gathered through other means, such as targeted research or evaluation of forestry practice.

A4.5   Prioritising within monitoring strategies

The effectiveness of each monitoring strategy can be increased by prioritising the risks that they address. Risks within monitoring strategies can be prioritised using the expected level of risk reduction that could be achieved. This prioritisation process will be important in the detailed design phase for certain strategies to:

- identify how resource constraints can be addressed

- determine the order of issues to be addressed in the evaluation or research programs.

A4.6 Monitoring streams

The final priority risks, conditions, monitoring questions and monitoring strategies can categorised into four streams, which were informed by the requirements of Protocol 38 and include:

- ecological function and habitat connectivity

- persistence of native species

Biodiversity

- forest regeneration and forest structure

- aquatic habitat and water quality.

Attachments 5 through 8 outline the monitoring themes, including the relevant outcome statements, conditions, monitoring questions and monitoring strategies.

Attachment 5 – Ecological function and habitat connectivity stream priorities

Four key monitoring questions were derived from the prioritisation process that focus on the effectiveness of the Coastal IFOA conditions in addressing ecological function and habitat connectivity.

Monitoring questions:

1   Are the conditions effective in ensuring regenerating forests meet benchmarks for:

(i) floristic composition

(ii) forest structure

(iii) coarse woody debris?

2   Are the conditions maintaining functional connectivity for focal fauna species to move within and across the forest?

3   To what extent do retained habitat features maintain their function?

4   Do harvesting conditions establish an appropriate mosaic of forest age classes at the landscape scale?

5   Is pre- and post-harvesting burning maintaining the function of key habitat features?

Monitoring strategies that will answer the monitoring questions include:

- monitoring forest structure and health
- monitoring key habitat features
- independent evaluation of forestry practice.

Table 17 outlines the outcome statements, priority conditions, monitoring questions and monitoring strategies for the stream.

Table 17: Summary of outcome statements, priority conditions, monitoring questions and monitoring strategies for the ecological function and habitat connectivity stream

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
Habitat and environmental features are identified and retained to provide refuge, connectivity and to support forest regeneration	3(1)(a)(i)	C49 (Category 1 and 2 Environmentally Significant Areas) C52 (Ridge and headwater habitat)	Are the conditions maintaining functional connectivity for focal fauna species to move within and across the forest?	Monitoring forest structure and health
Habitat and environmental features are identified and retained to provide refuge, connectivity and to support forest regeneration	3(1)(a)(i) 3(1)(a)(vi)	C49 (Category 1 and 2 Environmentally Significant Areas) C50 (Wildlife habitat clumps in the Local landscape Area)	To what extent do retained habitat features maintain their function?	Monitoring key habitat features
Harvesting operations are distributed across the landscape and over time, to support a mosaic of forest age-classes and maintenance of forest structure in the operational area or local landscape area	Not listed	C45 (Intensive harvest limits) C46 (Selective harvest limits) C47 (Mixed intensity harvest limits) C48 (Alternate coup harvest limits)	Do harvesting conditions establish an appropriate mosaic of forest age classes at the landscape scale?	Monitoring forest structure and health
Environmental features, habitat, landscapes and communities are maintained through the implementation of best management practices for pre-harvest burns and post-harvest burns. C62 (Coarse woody debris protection)	Not listed	C64 (Retained trees) C85-87 (Burning conditions) C113 (Burning)	Is pre- and post-harvesting burning maintaining the function of key habitat features?	Independent evaluation of forestry practice
Environmentally Significant Areas and important habitat are managed during burning operations to maintain their intended, specific environmental values and provide short-term refuge habitat. C85-87 (Burning conditions)	Not listed	C91-92 (Category 1 and 2 Environmentally Significant Areas) C113 (Burning)		

Attachment 6 – Persistence of native species stream priorities

Four key monitoring questions were derived from the prioritisation process that focus on the effectiveness of the Coastal IFOA conditions in addressing native species presence and persistence.

Monitoring questions:

1   To what extent do the Coastal IFOA conditions maintain species occupancy in the landscape?

2   Are the species and habitat survey and modelling conditions and practices effective?

3   How are koalas responding to conditions, including changes in tree retention rates, species, distribution and size?

4   Do the conditions establish enough key habitat features to maintain fauna species within and across the forest?

5   Can technology improve the probability of detection for a range of species in forestry operations?

Monitoring strategies that will answer the monitoring questions include:

- monitoring key habitat features

- monitoring species occupancy

- species-specific monitoring – fauna

- species-specific monitoring – flora

- independent evaluation of forestry practice

- research program.

Table 18 outlines the outcome statements, priority conditions, monitoring questions and monitoring strategies for the stream.

Table 18: Summary of outcome statements, priority conditions, monitoring questions and monitoring strategies for the native species presence stream

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
Site-specific measures are implemented to mitigate the impact of the forestry operation on fauna species and their habitat, and to support their persistence	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den)	Do the conditions establish enough key habitat features to maintain fauna species within and across the forest?	Monitoring key habitat features
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C76 (Nest, roost or den)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C51 (large forest owl landscapes) C76 (Nest, roost or den)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C75 (Koala)		
Important trees are retained and protected for shelter and food resources for native species, and to support their persistence	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C63 (Tree retention clumps) C64 (Retained trees)	To what extent do the Coastal IFOA conditions maintain species occupancy in the landscape?	Monitoring species occupancy
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C63 (Tree retention clumps) C64 (Retained trees)		
Habitat and environmental features are identified and retained to provide refuge, connectivity and to support forest regeneration	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C49 (Category 1 and 2 Environmentally Significant Areas)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C63 (Tree retention clumps) C64 (Retained trees) C78 (Bat roost tree protection) C79 (Flying-fox camps) C80 (Subterranean bat roosts)		
Site-specific measures are implemented to mitigate	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den)		

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
the impact of the forestry operation on fauna species and their habitat and to support their persistence	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C76 (Nest, roost or den)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C51 (large forest owl landscapes) C76 (Nest, roost or den)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions Protocol 38.3(1) (d) – Species Specific Monitoring	C75 (Koala)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den)		Species-specific monitoring – fauna
	Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den) C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C71 (Northern Corroboree Frog)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C72 (Hastings River Mouse)		
	Protocol 38.3(1) (d) – Species Specific Monitoring			
	Protocol 38.3(1) (d) – Species Specific Monitoring	C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C57 (Broad area habitat searches) C76 (Nest, roost or den)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C76 (Nest, roost or den)		
	Protocol 38.3(1) (d) – Species Specific Monitoring	C76 (Nest, roost or den)		

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
Site-specific measures are implemented to mitigate the impact of the forestry operation on flora species and their habitat and to support their persistence	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C81 (Flora requiring protection of all individuals) C84 (Species management plans)		Species-specific monitoring – flora
	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C81 (Flora requiring protection of all individuals) C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C81 (Flora requiring protection of all individuals) C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C81 (Flora requiring protection of all individuals) C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C81 (Flora requiring protection of all individuals) C84 (Species management plans)		
	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C81 (Flora requiring protection of all individuals) C84 (Species management plans)		
Environmental features, habitat and risks are identified to ensure that protections and management actions are implemented to mitigate the impact of the forestry operation	Protocol 38.3(1) (d) – Species Specific Monitoring Protocol 38.3(1) (e) – Threatened flora	C56 (Targeted flora and fauna surveys) C57 (Broad area habitat searches) C58 (Records of species and habitat features)	Are the species and habitat survey and modelling conditions and practices effective?	Independent evaluation of forestry practice

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
Important trees are retained and protected for shelter and food resources for native species and to support their persistence	Protocol 38.3 (1)(a)(vii) – Koala conditions	C65 (Koala browse tree retention)	How are koalas responding to conditions, including changes in tree retention rates, species, distribution and size?	Research program
Site-specific measures are implemented to mitigate the impact of the forestry operation on fauna species and their habitat and to support their persistence	Protocol 38.3 (1)(a)(vii) – Koala conditions	C75 (Koala)	Can technology improve the probability of detection for a range of species in forestry operations?	Research program

Attachment 7 – Forest regeneration and forest structure stream priorities

Four key monitoring questions were derived from the prioritisation process that focus on the effectiveness of the Coastal IFOA conditions in addressing the persistence of native species.

Monitoring questions:

1   Are the conditions effective in ensuring regenerating forests meet benchmarks for:

(i)   floristic composition

(ii)   forest structure

(iii)   coarse woody debris.

2   Are the conditions and practices effectively managing risks of invasive plant species in regenerating forests?

3   Are the conditions affecting current commitments to meet wood supply?

4   Are the conditions effectively promote regeneration for long term sustainable wood supply?

5   To what extent are the conditions effectively managing the risk of new or existing areas subject to dieback?

Monitoring strategies that will answer the monitoring questions include:

▪   monitoring regenerating forests

▪   monitoring forest structure and health

▪   research.

Table 19 outlines the outcome statements, priority conditions, monitoring questions and monitoring strategies for the stream.

Table 19: Summary of outcome statements, priority conditions, monitoring questions and monitoring strategies for the forest regeneration and forest structure stream

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
Harvested areas are adequately stocked with a natural floristic composition to maintain ecological function and sustainable timber supplies	Protocol 38.3(1) (a) (viii) – The effectiveness of selective harvesting limits in achieving the regeneration and stocking standards as measures of longer term regeneration	C20 (Regeneration)	Are the conditions effective in ensuring regenerating forests meet benchmarks for: (i) floristic composition (ii) forest structure (iii) coarse woody debris?	Monitoring regenerating forests
	Protocol 38.3(1)(a)(ix) The maintenance of sufficient levels of coarse woody debris	C20 (Regeneration)		
	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions	C20 (Regeneration)		
	Not listed	C20 (Regeneration)	Are the conditions and practices effective in managing risks of invasive plant species in regenerating forests?	Monitoring regenerating forests
	Not listed	C20 (Regeneration)	Are the conditions affecting current commitments to meet wood supply?	Monitoring regenerating forests program
	Not listed	C20 (Regeneration)	Are the conditions effectively promote regeneration for long term sustainable wood supply?	Monitoring regenerating forests program
Environmental features, habitat and risks are identified and site-specific protections and management practices are developed to mitigate the impact of the forestry operation	Protocol 38.3(1) (a) (i) – Multiscale Landscape Provisions	C63 (Tree retention clumps) C64 (Retained trees)	To what extent are the conditions effectively managing the risk of new or existing areas subject to dieback?	Monitoring forest structure and health

Attachment 8 – Aquatic habitat and water quality stream priorities

Four key monitoring questions were derived from the prioritisation process that focus on the effectiveness of the Coastal IFOA conditions in addressing the persistence of native species.

Monitoring questions:

1   Are the exclusion zone conditions for class 1 classified drainage lines effective in minimising the impact on waterway condition?

2   To what extent are the soil and water conditions effective in minimising the impact of harvesting and roading on waterway condition?

3   Are drainage feature crossings and road features effectively designed and maintained to reduce the impact of forestry operations on waterway condition?

4   Are the exclusion zone conditions effective in reducing the impact of forestry operations on Coastal SEPP wetlands?

Monitoring strategies that will answer the monitoring questions include:

▪   catchment-based waterway health monitoring

▪   research program

▪   independent evaluation of forestry practice.

Table 20 outlines the outcome statements, priority conditions, monitoring questions and monitoring strategies for the stream.

Table 20: Summary of outcome statements, priority conditions, monitoring questions and monitoring strategies for the aquatic habitat and water quality stream

Outcome statement	Protocol 38 priority	Condition (C)	Monitoring question	Monitoring strategy
Vegetation adjacent to drainage features and wetlands is protected and groundcover is retained to maintain water quality, stream stability, riparian habitat and contribute to habitat connectivity	Protocol 38.3 (1)(a)(iii) – The effectiveness of the exclusion zones on class one classified drainage lines	C95 (Riparian exclusion zones for classified drainage features)	Are the exclusion zone conditions for class 1 classified drainage lines effective in minimising the impact on waterway condition?	Waterway and wetland health monitoring
Water quality, aquatic habitat are protected through the implementation of best management practices Dust and waste are managed to minimise pollution around operational areas	Protocol 38.3 (1)(a)(v) – The effectiveness of soil and water protection in intensive harvesting operations	C45 (Intensive harvest limits) C109 (Debris and spoil management)	To what extent are the soil and water conditions effective in minimising the impact of harvesting and roading on waterway condition ?	Waterway and wetland health monitoring
Water quality, aquatic habitat and native fish movement are maintained through the implementation of best management practices for roads and road crossings	Protocol 38.3 (1)(a)(ii) – Effectiveness of drainage feature e crossing and road conditions	C101 (Drainage of roads) C104 (Drainage of tracks) C106 (Track crossings)	Are drainage feature crossings and road features effectively designed and maintained to reduce the impact of forestry operations on waterway condition?	Independent evaluation of forestry practice
Vegetation adjacent to drainage features and wetlands is protected, and groundcover is retained, to maintain water quality, stream stability, riparian habitat and contribute to habitat connectivity	Protocol 38.3 (1)(a)(iv) – the effectiveness of the exclusion zones for Coastal SEPP wetlands	C99 (Wetlands)	Are the exclusion zone conditions effective in reducing the impact of forestry operations on Coastal SEPP wetlands?	Waterway and wetland health monitoring