



Natural
Resources
Commission

Monitoring Plan

Monitoring landscape-scale
trends in environmental
values

Coastal IFOA Monitoring

Monitoring strategy summary	
Monitoring strategy	Landscape-scale trends in environmental values
Version 1.0	XX October 2020

Commission representative contact details (Internal Use Only)	
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Estimated cost breakdown (Internal Version Only)					
Component	2019-20	2020-21	2021-22	2022-23	TOTAL
Program funding¹	\$85,000	\$305,000	\$55,000	\$55,000	\$500,000

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Part 1: Monitoring strategy details
2.1 Strategy title
Landscape scale environmental values
2.2 Strategy objective
<ul style="list-style-type: none"> ▪ Establish suitable metrics and propose historical baselines for environmental values in coastal state forests ▪ Map the trajectory of environmental values from 1999 to present (NB: the start year will depend on when the comprehensive regional assessments were undertaken or when the RFA came into effect). ▪ Monitor the effectiveness of the Coastal IFOA conditions at a landscape scale through indicator metrics for biodiversity, forest regeneration and water quality ▪ Establish new trends baseline will through the environmental values metrics collected in the first five years of the program
2.3 Protocol 38 requirement
<ul style="list-style-type: none"> ▪ The monitoring program must be designed to provide environmental trend monitoring at the landscape scale, including but not limited to: <ul style="list-style-type: none"> (i) water quality monitoring;

¹ The stated costs represent the Coastal IFOA funding contribution only. The Coastal IFOA funding 50 percent of Projects 1-3 with the FMIP funding the other 50 percent plus 100 percent of Project 4.

- (ii) forest regeneration; and
- (iii) biodiversity trend monitoring

2.3 Strategy summary

As part of the approved monitoring program it requires the development of methods to assess landscape-scale trends against baselines across a range of landscape-scale indicators including biodiversity, water quality, and forest regeneration.

Landscape-scale trend monitoring of environmental values will:

- indicate whether the Coastal IFOA conditions are affecting environmental values over time
- help evaluate what type of effect the Coastal IFOA conditions are having on environmental values overall.

To meet the objectives, this strategy will:

- Source, transform and analyse historical coastal state forest data.
- Propose metrics as indicators of environmental value including biodiversity, forest regeneration and water quality
- Propose spatial and temporal framework for the monitoring of proposed indicator metrics
- Determine historic baselines for the indicators of environmental value
- Propose metrics that need to be collected to establish new baselines for the indicators for which there is no current data
- Analyse trends in the indicators of environmental value

2.4 Monitoring questions

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

2.6 Outline of methods and approach

Under Protocol 38 of the Coastal IFOA, a monitoring program must be designed to provide environmental trend monitoring at the landscape scale, including but not limited to:

- i. water quality monitoring;
- ii. forest regeneration; and
- iii. biodiversity trend monitoring.

The Coastal IFOA Monitoring Program aims to deliver a multi-scale program that incorporates stand, landscape, and regional scales for monitoring of environmental values in coastal state forests.

Under a suite of projects shared between the NSW Forest Monitoring and Improvement Program (FMIP) and the Coastal IFOA monitoring program, baselines and trends will be established in four thematic areas:

Project 1 - Baselines, drivers and trends in forest extent, condition and health

This project addresses the following state-wide question under the Forest Monitoring and Improvement Program:

- What is the extent, condition and health of NSW forests, and what are the predicted trajectories?

In addition, it addresses establishing Coastal IFOA baselines and trends for indicators of forest regeneration including, but not limited to:

- forest species composition
- forest structure
- forest health.

Project 2: Baselines, drivers and trends in species occupancy and distribution

This project addresses the following state-wide questions:

- What is the occupancy and distribution of forest-dependent fauna and flora species, and what are the predicted trajectories?

In addition, it addresses establishing Coastal IFOA baselines and trends for biodiversity including, but not limited to:

- ecological function and habitat connectivity
- occupancy of native species.

Project 3: Baselines, drivers and trends in water quality and quantity

This project addresses the following state-wide question under the Forest Monitoring and Improvement Program:

- Are forest water catchments healthy and what is the predicted trajectory for water availability and quality?

In addition, it addresses establishing Coastal IFOA baselines and trends for landscape-scale indicators of water quality values.

Project 4: Baselines, drivers and trends in soil stability and health.

This project addresses the following state-wide question under the Forest Monitoring and Improvement Program:

- What is the health and stability of soil in forests, and what is their predicted trajectory?

Approach

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

- the trajectory of landscape-scale environmental values on coastal state forests
- the effect that implementation of the Coastal IFOA has had on the trajectory of environmental values.

The monitoring program's trend monitoring activities will help bring the information from these two sources together – supplemented by additional cross-tenure and/or Coastal IFOA monitoring as required – to identify relevant trends in environmental value on coastal state forests.

The Coastal IFOA monitoring program aims to deliver a multi-scale model that incorporates stand, landscape, and regional scales for conserving environmental values in coastal forests. The landscapes that require environmental values are state forest within:

- Local landscape areas
- Management zones

- RFA regions
- Coastal IFOA region

Determine indicators and develop conceptual landscape-scale monitoring framework

Determine metrics for indicators of forest regeneration, biodiversity and water quality in Coastal IFOA state forests

- propose indicators for monitoring forest regeneration in Coastal IFOA state forests
- determine what existing data can be used to create historic baselines and trends for forest regeneration in Coastal IFOA state forests
- establish what existing data can be used to determine current baselines for ongoing landscape-scale trend monitoring in the Coastal IFOA and what additional field data should be collected through the monitoring program to fill the gaps in existing data.

Propose a conceptual framework for the monitoring of proposed indicator metrics

- review the existing literature to identify key drivers of change in forests
- detail the potential impacts on the indicators of environmental values, and the degree of uncertainty associated with each driver of change. This component will map out the range of drivers to be considered and their likely influence on the specific metrics of forest extent, condition and health and their resilience.
- develop a conceptual framework to evaluate the influence of forest management, climate, and other disturbances on the forest extent, health and condition values of forests over time and space.
- identify any existing benchmarks and adaptive management trigger thresholds for each of the indicators to monitoring against.
- the conceptual framework will be incorporated into an overarching disturbance and resilience framework to be developed under the Forest Monitoring and Improvement Program.

Establish baselines and trends

Propose historic baselines for the indicators of environmental values

- Analysis of past trends based on existing and available data.
- Establish historical baselines for forest attributes, where there is available data.
- Identify areas or indicators where there is little existing data.

Propose new baselines for the indicators for which there is no current data

- Determine what baselines should be established now with new data from the Coastal IFOA condition effectiveness monitoring to inform the trends in landscape environmental values.

Analyse trends in the indicators of environmental value

- Analysis of past trends based on existing data for the determined landscape-scale metrics.
- Analysis of trends emerging from current monitoring of the Coastal IFOA.

Between April and June 2020, the Commission ran a tender campaign to secure service providers for each of the four baselines, drivers and trends projects. The following service providers were engaged:

- **Project 1:** Spatial Vision and the NSW Department of Primary Industries Forest Science Unit will lead a consortium including RMIT University, University of New England, PF Olsen, University of NSW, NSW Forestry Corporation and the Department of Planning, Industry and Environment to deliver baselines, drivers and trends for forest health across all tenures. Stephen Farrell and Dr Christine Stone will lead a team of over twenty eminent scientists.
- **Project 2:** The University of New England and the NSW Department of Primary Industries Forest Science Unit will deliver baselines, drivers and trends for species occupancy and distribution in NSW forests across all tenures. Over 15 leading scientists will form the team including scientists from the NSW Department of Planning, Industry and Environment who will adopt indicators and modelling from the NSW Biodiversity Indicators program as part of the work.
- **Project 3:** The University of Melbourne will deliver baselines, drivers and trends for water quality and quantity in NSW forest catchments. The work will also identify data gaps and key metrics to track thresholds and support modelling future outcomes under different scenarios. A team of eminent researchers will deliver the work including Professor Andrew Western and Associate Professor Angus Webb.
- **Project 4:** A consortium including the NSW Department of Planning, Industry and Environment, University of Sydney and University of New England will implement a project to deliver baselines, drivers and trends for soil stability and health in forest catchments. Over ten eminent scientists will contribute to the project including Dr. Jonathon Gray, NSW Department of Planning, Industry and Environment, Associate Professor Brian Wilson, University of New England and Associate Professor Thomas Bishop, University of Sydney.

2.7 Summary of approach to develop baselines and benchmarks for adaptive management

Baselines will be set for indicators of environmental value from 1999 to the present day, new baselines will be set through the data collected in the first five years of the program. Some indicators, such as forest extent, may set historical baselines before 1999 where suitable data exists.

Benchmarks:

The results of all Coastal IFOA monitoring strategies will be combined and analysed by a technical specialist team appointed by the FMIP Steering Committee to identify trends in the data. Benchmarks will be established on completion of further LLA assessments that comprise different area proportions and different spatial/temporal arrangements of silvicultural zones and informed by field assessments. It is likely that the program will require the several years of data to establish benchmarks for management action triggers.

Trends in the data will be analysed annually as part of the monitoring programs annual review with the benchmarks set in the first program evaluation in 2024.

Adaptive management

As part of the decision-making framework being developed under the program's adaptive management strategy, the process to establish performance benchmarks, analyse the monitoring results and the adaptive management activities that are triggered to adapt the Coastal IFOA to better meet its desired outcomes for landscape-scale environmental values will be described.

2.8 Existing programs and data that will inform the strategy

- Coastal IFOA condition effectiveness monitoring
- State-wide remotely sensed plot network
- Biodiversity Indicators Program
- NSW SLATS
- WildCount
- WaterNSW water quality monitoring network
- AdaptNSW
- NSW Bionet Vegetation Classification
- NSW Wildlife Atlas
- SEED
- ABARES State of the Forest Reporting
- Data archive from Comprehensive Regional Assessment
- Data archive from Regional Forest Agreement implementation
- Landsat and SPOT5 historical imagery
- Sentinel 2 and GEDI data

2.9 How the data will be stored, analysed and presented

Outputs will be stored initially in Forest Monitoring and Improvement Program data management system, including analysis and presentation data, then made available for integration with the state-wide forest monitoring program analysis platform. The Coastal IFOA requires all data and information is made publicly available on SEED or similar.

2.10 Expected strategy outcomes

Monitor the effectiveness of the Coastal IFOA conditions at a multi-scale model that incorporates stand, landscape, and regional scales.

2.11 Linkages and uses with the overall NSW Forest Monitoring and Improvement Program Framework

Will inform and rely on information for the overall program.

Part 2: Monitoring design team		
Organisation	Project role	Description of responsibilities
NRC	Component lead	Manage service providers, link with state-wide program, input from responsible effectiveness monitoring. Reporting to director.
NRC	Technical input	Technical input and review and assistance with data management requirements
NRC	Review and input	Review and input from responsible effectiveness monitoring strategies. Link with state-wide program
Spatial Vision, DPI and DPIE	Data sourcing and analysis – Project 1	Sourcing and delivering historical forest regeneration data and establishing requirements for landscape-scale monitoring
ANU/DPI/DPIE	Data sourcing and analysis – Project 2	Sourcing and delivering historical forest biodiversity data including flora and fauna occupancy models
University of Melbourne	Data sourcing and analysis – Project 3	Sourcing and delivering historical water quality baselines and landscape-scale monitoring
FMIP steering committee expert panel	Critical review	Critical review of the approach to develop landscape-scale trends and provide advice to the steering committee on deliverables

Part 3: Risks (Internal Use Only)	
Risk description	Mitigation
Data is not available for critical indicators	The proposed process will identify gaps in information that can focus future monitoring
Complexity in generating metric for environmental value	Values are set against high-level indicators. Metrics will form part of overall trend modelling
Existing data does not meet quality standards	Integrate with and follow the FMIP data management systems. Future monitoring and data collection will address appropriate quality standards.
Setting baselines and benchmarks can be contentious	Baselines will be directly informed by the data available. Benchmarks will be compared to other tenures at a landscape scale to allow for annual variations not related to forestry.

Part 4: Milestones		
Milestone description	Start date	End date
1. Development of landscape-scale indicators	July 2020	October 2020
2. Production of conceptual monitoring frameworks	July 2020	December 2020
3. Metrics for determining regeneration, biodiversity and water quality	October 2020	January 2021
4. Historical and current baselines established	January 2021	March 2021
5. Landscape-scale trends determined	March 2021	June 2021

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