Natural Resources Commission

NSW Coastal IFOA Monitoring Program

Monitoring Plan - Harvesting in fire-affected sites
May 2021

Monitoring strategy summary	
Monitoring strategy	Harvesting in fire-affected sites
Version 1.0	13 May 2021

Commission representative contact details	
Part 1	Monitoring strategy details
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Part 1: Monitoring strategy details

1.1 Strategy title

Harvesting in fire-affected sites

1.2 Background

- The Coastal Integrated Forestry Operation Approval (IFOA) Monitoring Program was developed and approved by the EPA and DPI before the full extent of the 2019-20 wildfire season was known.

- The 2019/20 wildfires burnt 4.8 million hectares of land in NSW, including just over 64 percent of the native state forest estate (around 0.7 million hectares).

- The Coastal IFOA was not designed to moderate the environmental risks associated with harvesting in landscapes that have been severely impacted by wildfire. As such, the EPA has issued additional site-specific conditions that tailor protections for the specific circumstances of these burnt forests.

- These supplementary site-specific environmental operating conditions have been issued under condition 23.4 of the Coastal IFOA to Forestry Corporation of NSW (FCNSW). They are applied in addition to, or instead of, the prescriptions set out in the Coastal IFOA and are issued on a case by case basis.

> **Coastal IFOA condition 23.4**: If applying a condition of the approval at a specific site would result in a poor environmental outcome, or if in a specific and unique circumstance FCNSW would not be able to comply with the conditions of the approval, then prior to commencing the relevant forestry operation:
> (a) FCNSW may submit a report to the EPA in accordance with Protocol 5: Approvals for restricted activities; and
> (b) the EPA may grant a site-specific operating condition in response to the report that specifies:
> (i) the conditions of the approval that must be implemented at the specific site for the duration of the forestry operation; and
> (ii) site-specific operating conditions that must be implemented at the specific site for the duration of the forestry operation in that area, or for another time period specified by the EPA.
> **Condition 23.5** Where the EPA has issued FCNSW with a site-specific operating condition:
> (a) the relevant forestry operation must be carried out in accordance with the site-specific operating condition; and
> (b) unless otherwise specified in the site-specific operating condition, all other conditions of the approval must be complied with.

Condition 23.6 At the completion of the forestry operation, subject to the site-specific operating condition, the site-specific operating condition ceases to operate, and any subsequent forestry operation in that area must be carried out in accordance with the conditions of the approval.

- Unlike other conditions that the approved monitoring program is addressing, condition 23.4 does not have an associated outcomes statement.

- The Coastal IFOA Approved Monitoring Program was approved before the full extent of the 2019-20 wildfire season was known. As such, it did not incorporate monitoring actions for burnt area harvesting operations being conducted under site-specific conditions.

- Several harvesting operations have commenced during 2020 – under agreed site-specific operation plans and FCNSW's voluntary measures - without an agreed monitoring plan in place. However, FCNSW have been undertaking some site-specific operational monitoring and will be adopted as part of this plan.

- **There is a significant knowledge gap on the potential impacts of retention-based harvesting in burnt areas in NSW forest types[1].**

Site-specific environmental protections overview

- Retention of unburned or lightly burned forest in these sites to ensure they can provide ongoing refuge and food for animals that persisted during the fires

- Increased protections for landscape features like rainforest, rocky outcrops and heathy vegetation to provide additional shelter and food resources for animals, and appropriate environmental conditions for the regeneration of unique native plants

- Increased protections for hollow-bearing trees and important feed trees to ensure more nesting and food resources are retained and protected

- No intensive harvesting permitted in burnt areas to lessen erosion risks and biodiversity impacts

- Increased requirements to prevent or minimise erosion and water pollution in local creeks and rivers where fires have removed most of the ground cover and destabilised soils – including:

  - significant expansion of protections around streams

  - stricter limits to reduce the distance water can flow on roads, tracks and log dumps

  - requirements to stabilise exposed soils during and after harvesting operations.

FCNSW voluntary Coastal IFOA supplementary measures for fire-affected landscapes

- In February 2021, FCNSW issued an operating procedure for harvesting in fire-affected areas in South Coast and Eden RFA regions

- The supplementary conditions are to be applied in Local Landscape Areas (LLAs) with:

  - >50% moderate or high fire intensity; or

  - >25% severe or high fire intensity.

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[1] Add craig's footnote for now for review purposes

- ▪ These conditions, like the site-specific operating conditions, apply some increased environmental protections and additional pre-operational surveys at the site-scale as well as additional landscape protections.

- ▪ Although there are similarities with the site-specific operations conditions already described, there are differences in some of the settings such as those relating to retained trees and soil erosion measures.

Requirement for monitoring of long-term impacts and recovery

- ▪ In the site-specific operating conditions that have been issued to FCNSW to date, monitoring requirements are included, with a role for the Commission with respect to monitoring long-term impacts and recovery of the site. An example of these requirements is provided in the following text box:

> **Site-specific operating conditions for Bagawa State Forest compartment BGW028**
> 65. FCNSW must monitor the effectiveness of the site-specific operating conditions that apply to the site, and submit a further report to the EPA in relation to the site under condition 23.4 of the approval if in the reasonable opinion of FCNSW:
> (a) these site-specific operating conditions:
> i. result in poor environmental outcomes;
> ii. do not effectively mitigate erosion and water pollution risks;
> iii. are not delivering the objectives and outcomes of the approval; or
> iv. are unable to be complied with, or
> (b) FCNSW identify that the spatial data sets held by the EPA showing partially burned areas and unburned areas are inconsistent with those areas that appear to have been partially burned or unburned at the site.
> **66. FCNSW must work with the Natural Resources Commission, or other agency agreed by the EPA, to monitor the long-term impacts and recovery of the site as part of the monitoring program**.

- ▪ In accordance with the site-specific operating conditions, the Commission agreed that FCNSW, working with the Commission team, would develop a monitoring plan for harvesting in fire-affected sites using methods in the broader Coastal IFOA monitoring program. The monitoring plan should:

  - outline existing baseline data or plans to collect

  - be tailored to address the effectiveness of the site-specific conditions applied to that approval (but should be consistent with the approaches under the broader program).

- ▪ There are significant gaps in the research and monitoring of harvesting impacts in fire-affected areas. There are few studies in Australia on the impacts of retention-based salvage logging on biodiversity and ecosystem services and functioning in the region.

- ▪ Available studies are largely based on salvage logging that focus on the impacts of practices akin to clearfell silviculture. These studies are generally small-scale assessments and have not considered the impact of meso (i.e. compartment) and macro (i.e. local landscape) scale retention of disturbed and undisturbed forests and their associated biodiversity and ecosystem functioning.

- ▪ A key knowledge gap to be filled is the impact of the 2019-2020 post-fire retention-based salvage logging on forest values.

- ▪ It is important that a robust, multi-scale, long-term study based on monitoring unburnt, unburnt harvested, burnt and burnt harvested state forests is established and supported to provide the evidence base for understanding the short- and long-term impacts of

harvesting in these post-fire landscapes. Such a study should include monitoring the impacts from different types of harvesting post fire, including intensive and selective harvesting and different types of site-specific protections.

> **Harvesting under the Coastal IFOA**
>
> Under the Coastal IFOA there are two broad categories of harvesting allowed under the approval:
>
> Selective harvesting
> Selective harvesting techniques involve removing a proportion of the trees across a coupe. These techniques are generally applied in mixed-age forests where removing a proportion of mature trees will promote effective regeneration of other trees through small canopy openings. A range of intermediate sized trees is retained. An uneven-aged forest is expected to result from selective harvesting.
>
> The selective harvesting method used under the Coastal IFOA is single tree selection, with permanent clumps retained and protected in addition to minimum retained basal area.
>
> Intensive/alternate coup harvesting
> Intensive/alternate coupe harvesting involves uniformly harvesting a unit of forest to encourage growth of the next generation of trees. The approach is designed to create canopy openings of sufficient size to provide for regeneration and growth of shade intolerant species, such as Silvertop Ash, and to support timber supply.

- The monitoring plan will look to investigate how different harvesting treatments can affect regenerating values in burnt and unburnt state forests at multiple scales.

1.4 Strategy objectives

- To monitor the short and long-term impacts and recovery of fire-affected areas that are harvested under a variety of site-specific operating conditions and FCNSW voluntary measures.

- To determine if the conditions within site-specific forestry operations in a fire-affected landscape:

   - support a trajectory of forest regeneration that is consistent with unburnt harvested forests

   - do not harm the recovery of habitat or put priority species at risk of local extinction over the long-term

   - minimise and impede soil erosion and transfer from harvest areas to waterways in the short term to maintain water quality over the longer-term

- To identify how different types of harvesting in a post-fire landscape can impact forest values.

- To provide evidence on the practicality and commercial viability of harvesting in a fire-affected landscape.

- To identify Aboriginal forest values and uses and how they can be integrated into forest monitoring and management practices.

1.5 Expected strategy outcomes

▪ a robust evidence-base to inform decision making on best practice approaches to managing forestry operations and roads in fire affected areas

1.6 Strategy summary

Key features of the plan

▪ Provide timely feedback on the impacts of harvesting in fire-affected areas through monitoring, research, review, and modelling.

▪ Monitor long-term impacts and recovery.

▪ Integrate, as far as practical, with the CIFOA monitoring program and plans to support comparisons between sites harvested under SSOCs, those harvested under voluntary measures and those under normal CIFOA conditions and those not harvested.

▪ Priority given to monitoring, evaluation, and research in post-fire harvest areas over areas to be harvested under the general Coastal IFOA

Monitoring design

▪ To monitor and evaluate the recovery trajectory of a harvested site, under different harvesting treatments such as intensive harvesting, selective harvesting and ecological thinning, the program will identify and survey the following within the same local landscape area:

- A burnt and harvested site

- A burnt and unharvested site (as a pair for each harvested site assessed)

▪ Paired sites should have similar forest types, topography, aspect, and fire severity pattern to the harvested site.

▪ Monitor and compare with unburnt sites within the same local landscape area or management zone that are nested under the broader CIFOA monitoring and forest monitoring improvement programs. This will provide comparison data for:

- Unburnt and harvested sites

- Unburnt and unharvested sites

▪ To test the short term impacts of harvesting in burnt sites compared to harvesting in unburnt sites, this stratification will be applied to a relatively small but targeted sample of local landscape areas (LLAs) so the data can be used to compare the relative effects of the IFOA conditions in burnt and unburnt harvested sites.

▪ The program will add wildfire history into the stratification for the Forest Monitoring and Improvement Program (FMIP) permanent monitoring plot network.

Data stocktake

▪ As part of the rollout of the burnt areas harvest monitoring, the NRC will collate, analyse and evaluate post-fire surveys conducted in Coastal IFOA state forests.

▪ Data that will be accessed includes, but is not limited to, FCNSW pre-harvest mark-up data (vector data), strategic inventory plot data, groundcover plots, species surveys, water quality monitoring and pre- and post-fire LiDAR capture.

- Locations of post-fire survey work will be integrated into the broader design of the monitoring program to allow for repeat surveys to occur into the future.

Forest structure, regeneration and key habitat features recovery

- Using existing harvest operational planning data collected by FCNSW develop a harvest and retained features map of the local landscape area incorporating the strata detailed above. The map will be created by intersecting structural features, such as harvested areas, FESM and spectral recovery mapping, ESAs and retained features with the vegetation formation.

- Supplement operational planning data with fixed-wing based Lidar/Imagery products, and ground-based surveys using both terrestrial laser scanning with traditional plot sampling consistent with the forest structure, health, and regeneration monitoring from the broader Coastal IFOA monitoring. Repeat sampling of these LLAs will occur to assess change over time.

- Assess regeneration of sites using protocol 37 stocking plots with larger forest plots as proposed in the forest structure, health, and regeneration monitoring plan.

- Where appropriate data is available, incorporate burnt area retention into the hollow-tree simulation modelling being delivered by Australian National University.

Species impacts and recovery

- Investigate the usefulness of data collected through previous targeted species-specific surveys in post-fire areas for:

    - Koala – 60-70 north coast sites sampled 2020 spring

    - Greater Glider – repeat visits to previously surveyed sites, Tallaganda, Walcha area, plus surveys in South Coast and mid-north & north coast areas

    - Yellow-bellied Glider – mid-north coast

    - Southern Brown bandicoot – Eden (includes sampling for Long-nosed Potoroos, Long-nosed Bandicoot and feral species, such as cats)

    - Hastings River Mouse – mid-north and north coast tableland areas, trapping of existing grids, many of which burnt

    - *Philoria sphagnicolus* – mid-north coast

    - *Mixophyes balbus* – mid-north coast

- Implement species occupancy monitoring under the broader Coastal IFOA monitoring program that includes all LLAs subject to site-specific conditions.

Waterway health

- Expand the literature review of current state of knowledge of timber harvesting and water quality to include harvesting post-wildfire.

- Develop a risk framework for linking timber harvesting operations (and the forest road network more broadly) to hydrologic impacts on waterways in burnt and unburnt catchments.

- Nested under the broader water quality monitoring, use paired sites to survey for frequency of erosion channelling into waterways within harvested and unharvested fire affected forests with an emphasis on restoring or reactivating existing monitoring sites.

- Implement road and track network monitoring within burnt catchments as well as unburnt with a focus on the connection between roads and the natural stream network.

- Research into the role of temporary log crossings in harvest areas including those area that are subject to burnt area harvesting.

- Research into the connectivity of compacted roads and tracks with the natural streams in the post fire period.

Implications for changing first intensity and regimes

- University of Wollongong has been engaged to undertake an evaluation of the risk of Coastal IFOA objectives and outcomes not being achieved due to changing fire regimes. The University of Wollongong team will provide:

  - An overview of the way in which the 2019/20 fires are likely to have affected the key elements of the Coastal IFOA.

  - An overall evaluation of the risks to the Coastal IFOA objectives and outcomes resulting from the 2019/20 fires.

  - Options to mitigate risks posed by the 2019/20 fires.

1.7 Outline of methods and approach

Data stocktake

- As a first step, document the data collection that has been conducted on Coastal IFOA state forests by FCNSW, DPI and any other agencies or research organisations.

- Collate, review, analyse, and evaluate post-fire surveys conducted in Coastal IFOA state forests. Post-fire surveys can include:

  - Pre-harvest mark up

  - Inventory and stocking plots

  - Groundcover plots

  - Fauna surveys

  - Flora surveys

  - Water-quality assessments

  - LiDAR capture

- All sites that have already been harvested under SSOCs have been subject to pre-harvest mark up and species surveys. This data will be investigated for its usefulness as part of a broader monitoring program.

- For future monitoring of burnt areas, integrate sites subject to post-fire survey into the broader design of the monitoring program to allow for repeat surveys as well as comparison with other sites, such as unharvested burnt sites, to evaluate the trajectory of recovery in these sites.

Forest structure, health and regeneration

This monitoring component will be nested under the broader Coastal IFOA monitoring program.

Forest strata map

- Develop a 'forest strata' map for the site[2] to calculate the area of different post-harvest/reserved vegetation formations mapped in the local landscape and surrounding state forest.

- Source spatial datasets from FCNSW within the site, plus a 1-km buffer around the local landscape (confined to state forest only). These are:

  - retained trees (as defined under the Coastal IFOA)

  - retained wildlife clumps

  - environmentally significant areas (ESAs) (including category 1 and category 2 areas)

  - harvest footprints (intensive, selective, mixed, alternative couple)

  - fire extent and severity mapping (FESM)

  - spectral recovery mapping

  - vegetation formation mapping.

Forest plot monitoring

- Use remotely sensed data products developed as part of the State-wide program and supplemented by a ground-based forest and stocking plot network. This will be implemented under the broader Coastal IFOA monitoring program so that it also provides ecological condition and regeneration response in post-fire areas as well as unburnt areas.

- As part of the State-wide program, a network of plots will be implemented for verifying structural attributes collected by remotely sensed data products. This monitoring plan will use the metrics established for the State-wide plot network.

- Collect the following key forest metrics as part of the forest plot monitoring:

  - Above ground biomass

  - Stand basal area

  - Forest structure (including canopy height and canopy cover)

  - Canopy health

  - Fuel hazard (including litter fuel load)

  - Stumps and stags

  - Coarse woody debris

  - Floristic composition

- Sampling for the Coastal IFOA monitoring program is likely to be required at a higher density than that required in the State-wide component. These plots will be established in conjunction with the requirements of State-wide plot network and will be used to collect the metrics relating to monitoring forest structure, health, and regeneration.

- Use the results of the forest plots to validate the FESM and spectral recovery mapping.

Monitoring roll out (April – May 2021)

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[2] The site as determined in the site-specific operating condition

- In the first instance, the Coastal IFOA monitoring program will test the monitoring design and field methodologies, including validating existing and purchased airborne LiDAR with forest plots.

- Establish plot trial sites in six local landscape areas that include areas that are burnt and unburnt, including sites subject to site-specific operating conditions. The proposed trial sites are:

    - Cairncross North LLA (Lower North East RFA/IFOA)

    - Lorne LLA (Lower North East RFA/IFOA)

    - Parberrys Creek LLA (Upper North East RFA/IFOA)

    - South Brooman LLA (Southern RFA/IFOA)

    - Wyatts Creek LLA (Lower North East RFA/IFOA)

    - Yambulla LLA (Eden RFA/IFOA)

- The plot network field trial will be co-located with monitoring of fauna occupancy, see below.

- The LLAs in the initial field trials will receive future repeat visits under the monitoring program and can be seen as the first stage of the monitoring program roll out.

- Following the field trial of the six LLAs, the full roll out of the Coastal IFOA monitoring program will occur, including additional LLAs containing SSOCs and voluntary measures.

Post-fire hollow mortality and recruitment simulation modelling

- Australian National University has been engaged to create a hollow tree simulation model that can predict the number of trees with hollows perpetuated under the Coastal IFOA conditions. The habitat tree simulation model will help determine the effectiveness of the conditions and protocols of the Coastal IFOA at maintaining habitat resources over the long-term.

- This model will also be used to assess the effectiveness of SSOCs and voluntary measures at maintaining habitat resources over the long-term.

- The model will be evaluated and updated using on-ground monitoring of habitat features through the forest plot monitoring.

Species impacts and recovery

- 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, including Coastal IFOA state forests. This project will provide a pre-fire baseline for the occupancies for 28 key forest-dwelling species identified in the broader Coastal IFOA monitoring program. These include 16 mammal species, 10 bird species and two frog species.

- The CIFOA monitoring program will use the occupancy models produced by this project. Systematic fauna surveys on state forests paired with surveys on National Parks and Wildlife Service managed reserves will then gather the data to develop post-fire occupancies for the 28 priority species.

- In addition, the data collected as part of the forest structure, health, and regeneration monitoring including the forest plots will provide the covariates that are key to identifying the drivers of the change in species occupancy.

- Covariates for the analysis representing IFOA Conditions, include Environmentally Sensitive Areas (ESAs), retained wildlife clumps and retained hollow-bearing trees and feed trees, management (i.e., silvicultural treatment, regeneration and fire history) and environmental variables, like vegetation type and climatic variation.

- Conducting species occupancy monitoring in both the Coastal IFOA monitoring program and the monitoring of site-specific operating conditions will provide an opportunity not only to determine whether focal species occupy an LLA, but also to observe patterns in presence/absence data across different strata, notably areas subject to different types of silviculture and time since logging, burnt and unburnt sites following the 2019-2020 bushfires.

Monitoring roll out (Autumn and Spring 2021)

- A survey has been designed for a species occupancy monitoring pilot project in coastal state forests of NSW to monitor occupation of 28 priority fauna species (Attachment A). The survey proposes:

  - deployment of remote recording devices (camera, ultrasonic detector, audio recorder) based on a 5km grid, like the approach used by the NPWS WildCount program

  - operation of each device for at least 14 consecutive days

  - spotlighting for Greater Glider at sites where this species is likely to occur.

- Presence/absence data collected at each site would be used to:

  - identify the species (and determine the proportion of species) that occur with state forest areas subject to CIFOA conditions

  - generate species occupancy estimates for each species within different sites and different regions

  - analyse any significant differences in species presence/absence between different forest management.

- Data collected for the pilot project will contribute to an ongoing inventory of post-2019 presence/absence data that will be essential for generating post-fire species occupancy models in future. These models would be comparable with the 1990s baseline model and the pre-fire predicted occupancy model and would thus improve trend analysis of species occupancy across coastal forests, and identification of likely drivers of these trends.

- The proposed field trial sites are as follows:

  - Cairncross North LLA (Lower North East RFA/IFOA)

  - Lorne LLA (Lower North East RFA/IFOA)

  - Parberrys Creek LLA (Upper North east RFA/IFOA)

  - South Brooman LLA (Southern RFA/IFOA)

  - Wyatts Creek LLA (Lower North East RFA/IFOA)

  - Yambulla LLA (Eden RFA/IFOA)

- The plot network field trial will be co-located with the forest structure, health, and regeneration monitoring to generate the covariates needed for the species occupancy analysis.

- The LLAs subject to the initial field trials will be subject to future repeat visits under the monitoring program and can be seen as the first stage of the monitoring program roll out.

- Following the field trial of the six LLAs, the full roll out of the Coastal IFOA monitoring program will occur.

Waterway health

- As a first step, the program has reviewed the scientific literature to determine the state of knowledge in water quality and timber harvesting in NSW forests. The review has included relevant research in temporary log crossings, class 1 stream riparian exclusion zones, and soil and water protection in intensive harvest operations.

- The review recommended that a strategic approach of opportunistically measuring catchment response in areas where harvesting and wildfire intersect is needed. This will build better understanding of how current forest management can be adjusted to better address emerging risks associated with new catchment disturbance regimes.

- The monitoring program will next develop a risk framework for linking timber harvesting, with the forest road network as a variable, to hydrologic and ecological impacts on waterways to guide monitoring based on perceived risks, including the risks posed by wildfire.

- The program will commence research into the connectivity of compacted roads and tracks with natural streams in the post-fire period.

- The monitoring program will also develop a model, based on the concept of connectivity, that can be developed over time into a predictive tool for assessing impacts, including predicted wildfire and rainfall changes, and optimising timber harvesting operations for waterway outcomes.

Evaluating and monitoring the road network

- As part of the evaluation of forestry practices under a joint study with the Forest Monitoring and Improvement Program, the Commission has engaged Alluvium, in collaboration with Soil Conservation Services, to conduct an evaluation of forest road network design and management to protect in-stream water quality. This includes development of a risk-based model of roads that are at high risk of transferring sediment into nearby waterways as well as a field methodology to evaluate those roads to establish if they can be better designed or managed to mitigate sediment transfer into waterways in burnt and unburnt catchments.

- The modelling developed in this evaluation will be used to inform decision-making relating to the forest road network in post-fire sites.

Key research projects

- The monitoring program will aim to deliver research projects, subject to a prioritisation process through the Coastal IFOA research program and additional funding to cover post-fire related research, to address key knowledge gaps on:

  - how different types of harvesting impact forest values in a fire-affected landscape

  - the connectivity of compacted roads and tracks with the natural streams in the post fire period.

  - the roles of sediment composition and nutrient bioavailability in terms of the effectiveness of mitigation measures

- forest productivity and health in post-fire retention-based salvage-harvested forests.

▪ There is also the opportunity to investigate how different types of harvesting impact forest values in a fire affected landscape.

▪ There are a number of harvesting methods that can be used in the Coastal IFOA within this research as described in the background section. There are additional regeneration harvesting methods that could also be included in this research. General forms of regeneration harvesting include:

  - Variable retention: units of forest (coupes) are harvested, with retention of clumps or aggregates of trees based on the local conditions and desired outcomes for habitat protection. Regenerating occurs through seedfall from retained trees or clumps.

  - Seed-tree and/or habitat tree: seed trees are retained to provide for future regeneration; habitat trees are retained to provide ecological protection

  - Shelterwood: applied in harsher environments such as areas prone to extreme cold or moisture deficits, whereby new stands are harvested in two fellings; the first being used to open the canopy and either develop seed-beds and/or provide protection for regeneration of a new stand under partial canopy; the second felling is to harvest the remaining canopy trees and to release the growth of the regenerating stand

  - Group selection: groups of commercially mature trees are harvested to create canopy openings.

Implications for changing fire intensity and regimes

▪ University of Wollongong has been engaged to undertake an evaluation of the risk of Coastal IFOA objectives and outcomes not being achieved due to changing fire regimes. The University of Wollongong team will evaluate:

  - the specific risks to achieving the Coastal IFOA objectives and outcomes as result of the legacy landscape scale impacts of the NSW 2019/20 wildfire season

  - the broad implications of predicted changing fire regimes on the achievement of the Coastal IFOA's objectives and outcomes

  - options to mitigate risks posed by future fire regimes.

Risks to the CIFOA posed by the 2019/20 fires

▪ Current appraisals (for example, Forestry Corporation, 2020) of impacts of 2019/20 fires are largely based on fire severity impacts on key CIFOA objectives and attributes such as harvesting, threatened species, erosion, and water quality.

▪ To explore the consequences of the 2019/20 fires more fully, other aspects of disturbance regimes need to be considered, such as fire frequency, past fire severity patterns, and past harvesting. The aim of the UOW work will be to provide a more comprehensive, integrated overview of landscape development trajectories created by the 2019/20 fires and to use this to evaluate risks to the Coastal IFOA.

▪ The University of Wollongong team will compile a comprehensive fire history for the area covered by the Coastal IFOA and adjacent public forested lands, including conservation reserves. At a minimum, this will be used to produce an overview of fire frequency across forested regions of NSW, at the beginning and conclusion of the 2019/20 season. This can then be complemented with information on harvesting history

to provide an integrated estimation of disturbance frequency. This work will be integrated with the DPIE/DPI post-fire recovery index once that work is complete.

- The University of Wollongong team will look to examine the severity patterns of some recent fires prior to 2019. This will allow some aspects of cumulative fire severity to be estimated.

- This will provide the necessary information for interpretation of consequences for the Coastal IFOA using spatial information on proposed harvesting operations, habitats, soils etc., as well as existing guidelines and indicators of fire regime effects. For example, fire frequency thresholds are currently used as a coarse indicator of biodiversity responses in risk planning. Such indicators, along with others such as species distribution models, habitat maps, soil vulnerability maps will be used to frame an overall assessment of possible risks of the Coastal IFOA not achieving its objectives and outcomes.

- The interpretation will require cross-tenure assessment of likely impacts to evaluate whether risks to the Coastal IFOA not achieving its objectives and outcomes arising from disturbance regime extremes will be ameliorated, offset, or exacerbated by likely impacts and responses on other public land tenures not subject to the Coastal IFOA, such as conservation reserves.

Future fire risks and mitigation options

- An evaluation of future risks to the Coastal IFOA not achieving its objectives and outcomes will primarily focus on changes to fire regimes that ensue from climate change and alternative strategies of bushfire risk mitigation.

- Climate change is likely to alter the incidence and size of unplanned fires, through elevation of fire weather conditions resulting from warming and drying. Prescribed burning for fuel reduction and risk mitigation is also likely to change in response to public demand and the specific recommendations from recent inquiries. For example, the recent NSW Independent Bushfire Inquiry recommended a concentration of fuel reduction burning close to settlements and developments but also in known ignition locations and key topographic features. These two sources of fire will interact to alter the state of future fire regimes. Other important, recommended changes to suppression capacity (e.g. extra remote area fire-fighting teams, aircraft, detection capability), vegetation management, including targeted clearing, may also contribute to changes in future fire regimes. Changes to fire regimes are likely to be wide ranging and will need to be addressed at large scales if their consequences are to be adequately evaluated.

- The aim will be to produce a quantitative overview of changes in future fire regimes as a function of these joint climatic and management influences and to use these to assess changes in risk to the Coastal IFOA not achieving its objectives and outcomes.

- The work will utilise simulation output from the NSW Bushfire Risk Management Research Hub, which in turn builds on work done to produce the Prescribed Burning Atlas (https://prescribedburnatlas.science).

- This work simulates responses of unplanned fires (size and intensity) to a wide range of alternative strategies of prescribed fire and integrates the outputs to estimate risk of loss to key values, such as lives and property, infrastructure and environmental attributes, such as carbon, and biodiversity thresholds. The work has been focussed on case study landscapes (circa. 200,000 ha) and uses the landscape fire spread model, Phoenix Rapidfire.

- Simulation output under current and future climate is available for relevant areas of NSW covered by the Coastal IFOA.

1.8 Summary of approach to develop benchmarks and trigger thresholds for adaptive management

- Using the earlier work on linking data to decision making, in partnership with University of Melbourne, develop a risk framework for linking timber harvesting (in both burnt and unburnt state forests) to ecological impacts on species and their habitat. This is a starting point for using and/or refining the monitoring questions and developing a program for data collection and model development that focuses on the processes that are most problematic in terms of risk to ecological values.

- Investigating models/programs to input data from multiple monitoring strategies as a basis for decision-making

- Assessing potential models' ability to test the effectiveness of the Coastal IFOA settings against the monitoring questions to provide a basis for decision-making and triggering adaptive management.

- Testing the analytical framework within the Coastal IFOA monitoring pilot study to test the ability to detect effectiveness of the conditions.

- Designing the analytical framework so that it can capture evidence as it builds over the monitoring program and is able to provide the rationale to adapt management where issues are detected.

1.9 Summary of new evidence that will inform the monitoring plan

- Section 1.7 details the new data that will be collected as part of the roll out of the Coastal IFOA monitoring program.

- There is existing work underway in the Coastal IFOA monitoring program that will inform the monitoring of harvesting in fire-affected areas such as:

  - Review into timber harvesting and waterway health: https://www.nrc.nsw.gov.au/ifoa-mer-wq

  - Review into the use of hollows and the hollow mortality and recruitment modelling: https://www.nrc.nsw.gov.au/ifoa-mer-forest-health

  - Species-specific monitoring through the Coastal IFOA species management plans and the fauna monitoring on north coast forests: https://www.nrc.nsw.gov.au/ifoa-mer-biodiversity

  - Koala response to harvesting: https://www.nrc.nsw.gov.au/ifoa-mer-research

- Existing work underway in the NSW forest monitoring and improvement program will also provide new evidence for this monitoring program, for example:

  - Project FE2: Supporting post-fire ecological resilience and recovery planning in NSW forests: https://www.nrc.nsw.gov.au/fmip-baselines-ecosystem-health

  - Project BD4: Koala and habitat response post-wildfires: https://www.nrc.nsw.gov.au/fmip-baselines-biological-diversity

1.10 Existing programs and data that will inform the strategy

- Coastal IFOA monitoring elements:

- Forest structure, health and regeneration

- Key habitat feature

- Species occupancy

- Species-specific monitoring

- Waterway and wetland health monitoring

- Forest monitoring and improvement projects for establishing baselines, drivers and trends for:

  - Forest extent, condition and health

  - Species occupancy and distribution

  - Water quantity and quality

- Saving our Species program

- State-wide remote sensed plot network

- NSW State-wide Landcover and Trees Study (SLATS)

- Biodiversity Indicators Program

- Australian Government Dynamic Land Cover Dataset

1.10 How the data will be stored, analysed and presented

- Data will be stored in SEED and/or other NSW Government supported data repositories.

- Results will be interpreted by the Natural Resources Commission with the support of service providers, where required and reviewed by independent experts.

- Results will be made publicly available on the Natural Resources Commission webpage for the Coastal IFOA: https://www.nrc.nsw.gov.au/ifoa-mer

Part 2:Monitoring implementation timeline		
Activity description	**Start date**	**End date**
Implications for changing first intensity and regimes	**November 2020**	**April 2021**
Roading evaluation pilot	**May 2021**	**June 2021**
Data stocktake of post-fire survey data	**June 2021**	**June 2021**
Establish monitoring sites on SSOCs - Forest structure, health and regeneration – plots and LiDAR capture 1st monitoring sites	**April 2021**	**June 2021**
Establish monitoring sites on SSOCs - Species impacts and recovery monitoring 1st monitoring sites (Autumn) Acoustic and camera monitoring	**April 2021**	**June 2021**
Waterway connectivity model	**May 2021**	**November 2021**
Roll out of forest monitoring	**September 2021**	**Ongoing**
Species impacts and recovery monitoring (Spring)	**September 2021**	**November 2021**
Research projects	**Commencing 2021, subject to prioritisation**	