New IFOA Changes in Forest Protection
In the Clarence and Richmond River Valleys
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The NSW Government is making a new Integrated Forestry Operations Approval (IFOA) to regulate logging activities on public land. The Government has repeatedly stated that the new IFOA will result in "no erosion of environmental outcomes" (Parker 2013), and current Environment Minister, Mark Speakman (31 July 2015) claimed "he was determined to pursue" the commitment that "any changes will not erode environmental values".

To test this claim, the consequences of the proposed changes to logging exclusion areas were mapped for 13 areas of State Forest, totalling 10,661 hectares, scattered throughout the Clarence and Richmond River catchments. A total of 2.9% of native State Forests in the catchments were sampled. This review focuses on the proposed changes to exclusion zones around streams and records of threatened species.

Within the sampled area there are 480 kilometres of streams, with 62% of the stream length within catchments smaller than 20ha. On State Forests across the Clarence and Richmond valleys over 10,000 kilometres of streams are likely to occur within catchments smaller than 20ha. This shows the overwhelming importance of the headwater streams for catchment health as this is where most of the interaction between the terrestrial and aquatic realms occurs. The science is that we should be establishing buffers at least 30m wide around these headwater streams. The NSW Government's intent is to reduce already inadequate buffers around headwater streams from 10m down to 5m.

These catchments are part of an identified biodiversity hotspot of national and international significance with more plants and animals threatened with extinction than anywhere else in NSW. Over a hundred of the region's most vulnerable animal species have been identified as particularly threatened by logging. The NSW Government's intent is to remove the requirements to survey for these threatened animals, and to get rid of the need to establish logging exclusion zones around any records of them.

This review found the new IFOA is likely to result in a reduction of 13% in logging exclusion areas on State Forests, and a 35% reduction in riparian protection outside 'informal reserves'. This equates as a reduction in riparian buffers on State Forests across the Clarence and Richmond valleys of over 10,000 ha, and reductions in non-riparian exclusions around records of threatened animals by over 5,500 ha. Over 7,000 kilometres of vital headwater streams in catchments less than 20ha will have their buffers cut by 50%.

What is being lost are the most important buffers around our stream heads, where our rivers are most vulnerable, and key habitat around locations of our most vulnerable animals. This is a major erosion of environmental protections that will further degrade the water quality of the creeks and rivers of the Clarence and Richmond valleys, and imperil the survival of numerous species.

If the NSW Minister for the Environment is to honour his commitments, then he must intervene to stop the Environment Protection Authority from removing the already minimal protection for our streams and threatened species.
Fleay’s Barred Frog (Koreelah State Forest), one of those species requiring expanded riparian zones around records to better accommodate their foraging needs.
1. Introduction

The Clarence and Richmond River valleys encompass most of the State Forests in the Upper North East region (with some from the Lower North East) and thus approximate the area covered by the Forestry and National Park Estate Act 1998, Integrated Forestry Operations Approval for Upper North East Region.

In May 2012 the NSW Government announced it was going to make a new single Integrated Forestry Operations Approval (IFOA) covering NSW's four coastal IFOAs, the EPA (2015) notes: The objectives of the IFOA remake are to reduce the cost associated with implementation and compliance whilst improving the clarity and enforceability of the IFOAs. The government also committed to delivering these objectives with no net change to wood supply and no erosion of environmental values.

The government has set the following key principles to underpin the new IFOA (EPA 2015):

- commitments made under the Regional Forest Agreements and NSW Forest Agreements will not be affected
- the new IFOA will not change the comprehensive, adequate and representative reserve system
- the ability of Forestry Corporation of NSW (FCNSW) to meet high-quality wood supply commitments established in the NSW Forest Agreements will not be reduced
- the new IFOA will be outcomes-focused and supported by monitoring, evidence and risk-management principles
- threatened species and their habitat will be better protected though an emphasis on landscape-based protection measures
- the new IFOA will be credible and transparent.

While the Government promised that its new Integrated Operations Approval (IFOA) to regulate logging of public lands would result in no erosion of environmental outcomes, it was obvious that this would not be possible due to the intent to halve buffers on headwater streams and remove exclusion zones around records of threatened species. No amount of alternative exclusions could compensate for the loss of our most sensitive riparian areas and occupied core habitat of threatened species.

Preliminary reviews of the quantitative impacts of these intended changes were undertaken for 3 areas (Royal Camp, Richmond Range and Yabbra SFs) and presented to the NSW Environment Minister Mark Speakman in August 2015 in the hope that he may intervene to stop the EPA slashing protection for some of our most important forests. This review builds upon those initial assessments with the intent to obtain a representative sample across the Clarence and Richmond River valleys.

For this assessment, 13 areas of State Forest spread across the Clarence and Richmond river catchments were selected (based on geographical spread and the availability of harvest plans). For each area the existing exclusions applied in the most recent logging were mapped, along with the likely changes due to new riparian buffers and removal of species-specific protections.

The area mapped totalled 10,661 ha which is considered to provide a representative 2.9% sample of the 365,000 ha of native State Forests in the Clarence and Richmond catchments. Within the assessed areas there are some 480 kilometres of streams, with 62% of the stream length within catchments smaller than 20ha. On State Forests across the Clarence and Richmond valleys there
are likely to be over 16,000 kilometres of streams, with over 10,000 kilometres of streams within catchments smaller than 20ha.

Based on this sample, it can be expected that within the Clarence and Richmond catchments that around 33% of native State forests are currently excluded from logging, with 23% in base exclusions (which are likely to be retained), 7% in additional riparian exclusions, and 3% in species-specific exclusions. Therefore 67% is available for logging, but still subject to steep slope limitations, with likely further species constraints if Mark-Up surveys were being done professionally, and unmapped rainforests and Endangered Ecological Communities (EECs) identified.

In the sample areas, 3,462 ha of forest is included in logging exclusion areas, this will reduce by 13% to 3,000 ha if the proposed riparian and species changes proceed. This is a reduction in exclusion areas from 33% of the State Forest to 28%. Across the Clarence and Richmond catchments the changes in riparian and species protection would reduce the area protected by over 15,500 ha.

Riparian buffers are now primarily based on standardised distances determined by stream order, with this complemented by expansions to buffers in the vicinity of records of certain threatened species. The proposed changes will halve the buffers on the most vital headwater streams while removing increases in buffers due to records of threatened species.

Within the assessed area the proposed changes will result in the loss of some 35% of existing riparian buffers, outside base exclusion areas (mostly 'informal reserves'). This is a 24% reduction due to changes in stream buffers and an additional 11% reduction due to the loss of increases in riparian buffers due to records of threatened fauna. There will be a reduction of 51% in stream buffers within catchments <20ha, offset to some extent by an increase of 17% in buffers within catchments >20ha, so the impact of headwater streams will be more significant than identified by the aggregated figures - particularly as the buffers being lost are not meant to have been logged in at least the last two decades, while those being added have been regularly logged.

Across the State Forests of the Clarence-Richmond catchments, over 10,000ha of existing riparian buffers are likely be lost if the proposed new rules are applied. Given that on State Forests over 10,000 kilometres of streams are likely to occur within catchments <20ha in the Clarence and Richmond valleys, and that some 73% of these are within the nett logging area, reducing their buffers to 5 m will have widespread ramifications.

It is recognised that it is no longer tenable to persist with the outdated 1:25,000 stream mapping given that more accurate mapping is available. It is also clear that the EPA wants to change the methodology for allocating riparian buffers based on stream orders because their application to the more accurate and numerous streams identified by LiDAR results in a significant increase in riparian exclusions. Though it is equally evident that within the Richmond-Clarence River systems, and the Upper North East RFA region, there can be no environmental justification for slashing already inadequate riparian buffers around headwater streams down to 5m - it is environmental vandalism.

To the contrary, in these vital headwater streams there is a need to protect the full extent of the active riparian system and apply buffers to it, rather than just the stream channels.

Exclusion areas around records of animals accounted for 3% of the assessed area, outside base exclusions and riparian buffers. Almost half the species-specific exclusions relate to increases in stream buffers. Away from expanded riparian exclusions, species specific exclusions are likely to comprise 5,500 ha in the Clarence-Richmond catchments.
Given that the Forestry Corporation do not undertake adequate surveys to identify many species-specific exclusion areas, and fail to apply them to some records in their harvesting plans, it is considered that the exclusions identified in harvesting plans are only a fraction of what should be identified. It is also likely that some results from Mark-up Surveys are not included in the data applied. Potential fauna losses are likely to be greater than identified herein.

What is being lost are the most important buffers around our stream heads, where our rivers are most sensitive, and key habitat around some locations of our most vulnerable animals.

Instead of implementing a variety of species-specific exclusions the EPA's intent is for the Forestry Corporation to identify “wildlife clumps” of around 0.5 ha using some undeveloped guidelines. These are likely to encompass in the order of 1.2% of the State Forests, equating to some 4,400 ha across the Clarence-Richmond catchment. Though these “clumps” are likely to primarily encompass clumps of trees otherwise required to be retained and areas unavailable for logging. They are in no way comparable to the high conservation value riparian buffers and known key threatened fauna habitat that the EPA is proposing removing protection from.

While making more than 15,500 ha of currently protected forest available for logging will provide a resource boost to the Forestry Corporation and help them meet their “high-quality wood supply commitments", it will not make up for their growing deficit of large sawlogs.

For over a decade the Forestry Corporation (Forests NSW 2005) have been claiming to use adaptive management to ensure forestry operations in north-east NSW are ecologically sustainable and threatened species habitat protected. Yet they have never bothered to apply the most basic principle of adaptive management - learning from their mistakes - because they do not monitor the outcomes of their actions.

Neither the Forestry Corporation nor the EPA have ever bothered to assess the effectiveness of current riparian and threatened species prescriptions, they have no idea of how they affect threatened species, and therefore they have no justification for reducing or removing them. They can certainly not demonstrate that "threatened species and their habitat will be better protected" by their significant reduction in exclusion zones, particularly when all the evidence is to the contrary. They have not applied "monitoring, evidence and risk-management principles’ in determining the new logging rules. They simply don’t care about the consequences as long as they can get access to more timber. They have failed to satisfy the Government's objectives and principles.

Conservation Groups have distanced themselves from the biased and secretive process undertaken by the EPA because they refused to implement a transparent and open process. The new IFOA already has no credibility.

This review proves that for the streams and threatened species covered by the Integrated Forestry Operations Approval for Upper North East Region the EPA's proposed changes will result in a drastic reduction in environmental protections, and a significant erosion of environmental values. The EPA have clearly failed to deliver on the political commitments. The issue now is whether the NSW Government will intervene to honour its commitment that there will be "no erosion of environmental outcomes".
2. Background

The remnant forests of the Richmond and Clarence River catchments in north-east NSW have been identified as being of outstanding international, national and state value for threatened biodiversity. They encompass part of the Gondwana Rainforests of Australia World Heritage property. They are part of one of the world’s 35 biodiversity hotspots because of their exceptional species endemism and the threat of habitat loss (Williams et al. 2011). They include part of Australia’s 15 recognised biodiversity hotspots, the ‘Border Ranges North and South (Queensland and New South Wales)’. They also contain the most plants and animals threatened with extinction in New South Wales.

These river systems have already been heavily degraded by past land practices, with the water quality so degraded that most reaches are now unsafe even for swimming. The biggest single contributor to the degradation of our rivers has been the loss and degradation of riparian vegetation.

The Clarence and Richmond River catchments total around 2.9 million hectares, of which publicly owned State forests comprise 398,000ha. Hardwood plantations are claimed to represent 18,000 ha and softwood plantations 15,000 ha, leaving 365,000 ha of native vegetation, which is 12.5% of the catchments. State Forests encompass a far higher proportion of the remaining native vegetation in these heavily cleared catchments, and a higher proportion of headwater streams. Thus State forests play a significant role in maintaining the health of the river systems and the region's biodiversity.

Forestry operations on State Forests in the Clarence-Richmond catchments are governed by the Integrated Forestry Operations Approval (IFOA) for the Upper North East Region and the licences it contains. These are referred to as Environmental Protection Licence (EPL), Threatened Species Licence (TSL) and Fisheries Licence (FL). Together with various clauses of the IFOA these constitute the regulatory regime applied to forestry operations on the public's State forest lands in north-east NSW.

The NSW Government is in the process of re-writing the logging rules for a new IFOA covering the whole of eastern NSW. The intent is to simplify the rules and make them more like guidelines, while reducing the need for surveys and tree-marking, increasing logging intensity and apparently increasing the area available for logging.

As the full changes proposed for the new IFOA are unknown, this assessment was primarily limited to the announced changes to stream buffers and the intention to remove the need for species-specific surveys and thus record based exclusions around threatened species. This assessment is based upon mapping the logging-exclusions applied in harvesting plans for recent logging operations, and identifying the likely changes to riparian buffers and species-specific protections that will result from the new rules.

Three classes of logging exclusions were identified: base exclusions that are likely to remain in place under the new IFOA; riparian exclusions (outside base exclusions) that are proposed to be changed; and record-based species exclusions (outside base and riparian exclusions) that are likely to be removed.

Base exclusions primarily comprise protected Forest Management Zones 2 and 3A, variously including rainforest, High Conservation Value Oldgrowth, some wetlands, regional wildlife corridors, non-commercial forest types, and some excessively steep slopes. To these are added corridors
linking stream systems across ridges, regionally mapped owl exclusion zones, and some forest
types that are thought to approximate Endangered Ecological Communities.

Riparian exclusions are currently based on mapped stream order, with buffers applied from both
banks according to a stream's position in the stream hierarchy (ie unmapped and 1<sup>st</sup> order 10m, 2<sup>nd</sup>
order 20m, 3<sup>rd</sup> order 30m and 4<sup>th</sup>+ order 50m). The intent is that this will change to one based on a
stream's catchment size (i.e. 0-20ha 5m, 20-100ha 20m, 100-400ha 30m, 400+ha 50m).

The intent is to stop most record-based species exclusions because the EPA consider “pre-harvest
surveys have been highly inefficient and ineffective”. Unfortunately, as implemented by the Forestry
Corporation, the identification of species, and thus application of species-specific exclusion zones,
has been grossly inadequate, though this is no excuse to remove the intended protection. The
indication is that regionally based owl exclusions and threatened plant buffers will be retained
because they don't protect much.

As the full changes proposed for the new IFOA are unknown, this assessment was primarily limited
to the announced changes to stream buffers and the use of species records to trigger increased
protection, as were applied in the recent logging.

It is recognised that there are other exclusions applied to logging. In particular there is a
requirement to do Mark-up Surveys at the time of logging to identify a range of species-specific
exclusions. As this review is based upon harvesting plans prepared before logging commenced it is
likely that some additional exclusions were identified in Mark-up Surveys, though in most cases no
information is available on what was found. There are requirements to amend harvesting plans to
include new records, though these do not appear to be put on-line. It must be assumed that Mark-
up Surveys have identified additional exclusions not included in this review - meaning that the
reduction in species-specific exclusions will be greater than identified herein.

There are also numerous Endangered Ecological Communities occurring in the region. Some of
these are encompassed by mapped forest types, though most require identification on the ground.
Logging has been found to extend into EECs on a number of occasions because they were not
identified. Though if properly assessed many additional areas of EECs would require exclusion. To
complicate this further, the EPA are now proposing to make some EECs available for logging.

The current EPL (Schedule 3) prohibits logging on slopes that are “Extreme soil erosion and water
pollution hazard”, which includes all slopes over 30° and lesser slopes depending on the logging
intensity and erosivity, extending down to 10° slopes with extreme erosivity when greater than 50%
of the canopy is proposed for removal. It is not known at this stage how much longer such
exclusions will be retained. The EPA have put proposals for cable/logging of slopes over 30° on
hold for the time-being. When the Forestry Corporation get their way, thousands more hectares of
our steepest and most unstable slopes will also be opened up for logging.

2.1. Base Exclusions

For the Regional Forest Agreement the Forestry Corporation identified areas of non-commercial
forest types, excessively steep slopes, and a series of 100m wide wildlife corridors along major
streams, for protection. In the assessment process rainforest and a subset of oldgrowth forest
termed "High Conservation Value Oldgrowth" were identified for protection. As an outcome of the
Regional Forest Agreement these were combined into protected Forest Management Zones (FMZ)
2 and 3A. These are explicitly identified as exclusion areas in the Threatened Species Licence
(TSL), along with Ridge and Headwater Habitat corridors 40 or 80m wide linking stream systems across ridges.

These zones, along with “rare-non-commercial forest types” were identified as “informal reserves” and counted as contributing to ecosystem targets as part of the 2000 North East Regional Forest Agreement (RFA) between the NSW and Commonwealth Governments. Even with their inclusion there remain major shortfalls in national ecosystem and species targets, meaning more of our forests need to be reserved to satisfy the national forest reserve targets (JANIS 1997).

The EPA maintain that “Existing RFA commitments to the protection of old growth, rainforest, rare non-commercial forest types and the Forest Management Zone (FMZ) layer will be maintained unchanged”.

The Forestry Corporation also includes regionally mapped owl exclusion zones in the few plans it applies to. Some plans also identify forest types as exclusions when these are thought to approximate Endangered Ecological Communities. Given that these are likely to be retained in the new IFOA they were counted as base exclusions.

2.2. Riparian Exclusions

Good water quality is fundamental requirement for the health of aquatic ecosystems and the diversity of plants and animals they sustain. Good water quality is also important to maintain the numerous benefits that streams provide to us: we store their waters for drinking, eat fish and shellfish obtained from them, recreate within them, and water our livestock and crops with them.

With severe declines in populations of most native fish, massive increases in sedimentation and turbidity, loss of riparian vegetation, alienation of floodplain wetlands, increasing salinity, alteration in flow and flooding patterns, and increasing instances of toxic blue-green algae blooms, there is little doubt that many, perhaps the majority, of Australia’s rivers and streams are seriously degraded.

In 1995 the Environment Protection Authority (RACAC1996) undertook a systematic sampling of water quality across the Northern Rivers (Tweed, Brunswick, Richmond and Clarence). For low flow conditions most sites were ranked very poor for potable (drinking) water, with 19% on the Clarence qualifying as poor. For aquatic ecosystem protection 54-100% of sites on the three northern rivers were ranked poor-very poor, with only the Clarence River having the majority of sites (58%) with a fair-good ranking. For edible seafood 60-100% of sites on the three northern rivers were ranked poor-very poor, with only the Clarence River having the majority of sites (66%) with a fair-good ranking. For primary contact recreation (ie swimming) 57-80% of sites were ranked poor-very poor.

Under high flow conditions following heavy rainfall water quality deteriorated dramatically, with no sites in the Richmond or Clarence River catchments passing the criteria for potable water, aquatic ecosystem protection, edible seafoods, or primary contact recreation. There were large increases in suspended sediments and nutrients, with over 20,000 tonnes of suspended sediments, 179 tonnes of nitrogen and 17 tonnes of phosphorous per day moving down the Clarence River through Grafton.

As noted by the EPA (RACAC1996):
Land use practices that involve the removal of vegetation and/or disturbance of soils, including cropping, grazing, logging and urban development, will increase the export of suspended sediments and nutrients from the catchment during heavy rainfall events. ...

Vegetation plays an essential role in limiting erosion and transport of material from the catchment, slowing the movement of water across the catchment surface, allowing for increased infiltration and lower erosion energy.

Ryder et. al. (2015) assessed the health of the Richmond River almost 20 years later, finding it was still in poor condition:

The Overall Grade for the Richmond catchment was D-, ranging from an F in the Wilsons River and upper Richmond estuary to a C in the headwater streams of the catchment. Twelve of the 17 river systems recorded a score of D or less. The upper freshwater reaches of the Richmond catchment had better water quality, aquatic macroinvertebrates and geomorphic condition than the lower freshwater reaches, but no better riparian condition. ...

Concentrations of all nutrients, Total Nitrogen (TN) and oxides of nitrogen (NOx), and Total Phosphorus (TP) and SRP (the form directly usable by aquatic algae and plants) exceeded the guideline value consistently across all sites throughout the study period. ...

Ryder et. al. (2015) identified degraded riparian vegetation as one of the most significant problems, stating:

Vegetation clearing and the presence of livestock continue to accelerate the deterioration of riparian condition....

The area within a riparian zone contains valuable water resources, highly fertile soil and supports high levels of biodiversity as well as many social and economic functions. Riparian condition scores were poor throughout all regions of the Richmond River catchment, with 10 of the 17 river systems recording a score of D or lower.

Strongly linked to riparian condition, the active restoration of riparian revegetation as a long term action for improving geomorphic condition must be a priority in the Richmond catchment. The poor geomorphic condition is directly linked to low scores in water quality, macroinvertebrates and riparian vegetation.

Ryder et. al. (2014) assessment of the Clarence River system found that it was in better condition than the Richmond River, achieving an overall ranking of C+, finding “Concentrations of nutrients exceeded the trigger guideline value at some point in all river systems”. They note that “Riparian condition scores were generally poor throughout all regions of the Clarence”, recommending: Riparian revegetation in tablelands and coastal reaches must be a priority. The lack of streambank vegetation is linked to poor bank condition and localized erosion, sediment deposition and benthic habitat smothering throughout rivers, reduced habitat for biota, and poor water quality (evidenced by high nitrogen and turbidity in flood periods from streams with poor riparian condition).

A riparian zone is found where a body of water directly influences, or is influenced by adjacent land. Riparian boundaries extend outward from the water’s edges to the limits of flooding and upward into the canopy of the riverside vegetation. As identified by Ryder (2014) “The area within a riparian zone contains valuable water resources, highly fertile soil and supports high levels of biodiversity”. Ryder (2015) recognises the importance of riparian vegetation as habitat:
Organic litter is an indicator of habitat as it provides shelter for smaller invertebrates, nesting materials for birds and is a source of coarse particulate organic matter. Standing dead trees, fallen trees and large trees provide hollows in which approximately 15% of all Australian terrestrial vertebrate fauna use as habitat at some point in time (Gibbons & Lindenmayer 2002). Fallen trees and logs provide in-stream habitat for spawning sites and areas for fish to hide from predators, and to avoid intense sunlight and high current velocities (Crook and Robertson 1999). Logs also provide habitat for biofilm and invertebrates that maintain essential links in the food web for fish (Ryder 2004).

When we think of catchments it is often the large rivers which come to mind, though it is along the smallest streams and drainage lines where most of the interaction between terrestrial and aquatic environments occurs. Small headwater streams generally drain catchments smaller than two square kilometres and can constitute over 75 per cent of the stream length in a drainage basin (Barmuta et al. 2009). Restoration of catchment health must start in the headwaters and expand downstream.

In a natural forest most water movement occurs as subsurface flows seeping through the ground. In logging operations the removal of vegetation cover, soil disturbances and roading create and channel overland flows, which erode soils and nutrients, transporting them into streams. Forestry is largely focussed on the smaller headwater streams and thus can have a disproportionate affect on stream health.

Direction of runoff onto undisturbed vegetation and the maintenance of undisturbed filter strips along streams are the principal means of slowing runoff and trapping mobilised sediments and nutrients before they reach a stream. They are thus the principal means of mitigating the unavoidable impacts of logging and roads on water quality. Outside of saturated areas the undisturbed soil allows increased infiltration of water and thus sediment deposition and the roughness of the ground litter and vegetation slows surface-flows and act as sediment traps. The vegetation can uptake, assimilate and remove many of the nutrients.

Vegetation growing along streams physically affect streams by binding streambanks and stabilising channels, while providing shade to cool the streams and regulate in-stream primary productivity. Detritus from the vegetation is the primary contributor to aquatic food webs. Branches and logs are important for flow mediation and sediment deposition, while providing important habitat requirements for many species.

Riparian buffers serve several functions:
- shading of streams and minimising fluctuations in water temperatures
- reducing the volumes of overland flows entering streams
- trapping sediments and associated pollutants moving from upslope towards streams
- maintenance of stable stream banks and channels;
- providing wood, leaf litter, fruits, flowers, insects and other resource inputs to streams;
- maintenance of habitat requirements for many aquatic and terrestrial species; and,
- provide corridors for the movement of a suite of terrestrial species.

While limited buffers can directly protect stream bank vegetation, these still need to be of sufficient width to deliver the required benefits of bank stabilisation, stream shading and inputs of resources for aquatic species. Wider buffers are needed to provide habitat for terrestrial fauna and limit pollution of waterways by nutrients and sediments.

Reviews by Munks (1996) and Hansen et al. (2010) recommend minimum buffer widths of at least
30m on each side of streams, with wider buffers depending on the objectives (see http://www.nefa.org.au/logging_prescriptions, The need for Stream Buffers).

For the Richmond River catchment DLWC (Boyd 2001) identifies that a large proportion of 1st and 2nd order streams are in National Parks and State Forests and recommended protection of 20m from the high bank of all watercourses in the Richmond catchment, commenting:

Lower order streams should be adequately protected with a wide buffer as they will generally be draining steeper slopes. Lower order streams must be well protected as the quality of the water flowing in these streams directly influences the quality of the water of the higher order streams.

Current stream protection on State forests is based upon the application of buffers on streams according to their size. Drainage depressions are dips in the landscape where water may flow occasionally over the surface but usually underground. Streams start where overland flow is frequent enough to begin to erode a channel. First order streams are those at their start, they are the capillaries of the system where most of the interaction occurs with the terrestrial environment. Where two first order streams combine it is classed as a second order stream, where two second order streams join it becomes a third order stream, where two third order join it is a fourth order, and so on down the ever larger streams.

Regulation of logging on public lands is largely based on establishing intact riparian buffers along streams, starting at 10m buffers each side of 1st order streams, then 20m each side of 2nd order streams, 30m each side of 3rd order streams, and 50m each side of 4th and higher order streams. These buffers are also incorporated into the Threatened Species Licence as a significant contributor to the protection of threatened species.

The basis for application of buffers is stream mapping undertaken decades ago as part of the 1:25,000 scale topographic maps. While the standard is high, it becomes less reliable in steep forested country where many streams have not been mapped. For the numerous unmapped streams both the Environment Protection Licence and the Fisheries Licence require their protection with 10m buffers each side. Currently, on ground marking of stream buffers rectifies any mapping problems as the buffers are physically marked from the top of the creek bank.

As part of the Regional Forest Agreement the likely location of unmapped streams was modelled, excluded from timber calculations, and zoned as FMZ8 for further assessment to accurately delineate, buffer and appropriately zone the currently unmapped streams before logging. The intent was that they would be rezoned for protection as FMZ 2 or 3A, though now they are instead routinely rezoned as part of the net logging area (FMZ 4).

In 2004 the Forestry Corporation obtained an exemption of most of their logging operations from the Environment Protection Licence (EPL). While this had the intended effect of removing external regulation, it was specifically aimed at making unmapped stream buffers available for logging. It also removed limited protection for drainage depressions. This opened up a large unaccounted resource to the Forestry Corporation to help them try to satisfy their over-commitments, though at a very significant environmental cost.

In 2009 NEFA caught the Forestry Corporation logging unmapped streams in Yabbra State Forest, they justified this on the basis that the EPL did not apply. They had not realised that because of a
large population of Endangered Eastern Freshwater Cod downstream that the Fisheries Licence's requirement for the protection of unmapped streams still applied. Up to 20 ha of these buffers could have been illegally logged in that one operation. They were fined $1,000 with no remediation required.

It appears that since 2004 the Forestry Corporation had been routinely logging unmapped streams in the Clarence and Richmond catchments in contravention of their Fisheries Licence. Under the "supervision" of Fisheries NSW hundreds of hectares of vital riparian buffers appear to have been illegally logged. Thanks to NEFA's intervention this is no longer the case. The Fisheries Licence is triggered by maps of Eastern Freshwater Cod habitat prepared by Fisheries NSW and provided to the Forestry Corporation. Despite NEFAs requests for the past 5 years, Fisheries NSW are still refusing to provide available mapping for other threatened fish, such as Oxleyan Pygmy Perch and Purple-spotted Gudgeon, to the Forestry Corporation - which avoids the Fisheries Licence being triggered when these species are nearby.

The EPA are now intending to change the approach to stream protection to one based on LiDAR (Light Detection and Ranging) terrain mapping and GeoNet modelling of streams (rather than 1:25,000 mapping) which does result in a better identification of streams, particularly currently unmapped streams in the headwaters. If the current stream hierarchy system based on stream orders is applied to LiDAR mapped streams, it results in a significant increase in the number of first order streams, and the classification of streams as 2nd and 3rd order, and thus the riparian area required to be protected.

To avoid this the EPA are proposing to base stream buffers on the size of the catchment area: 5m buffers on both sides of streams within catchments <20ha, 20m buffers within catchments 20-100ha, 30m within catchments 100-400ha, and 50m within catchments >400ha. On State Forests over 10,000 kilometres of streams are likely to occur within catchments <20ha in the Clarence and Richmond valleys. The reduction of already inadequate stream buffers for most unmapped and first order, and some second order, streams to 5m is a major loss of riparian protection where it is most needed. This loss is masked to some extent by increased protection of some second and third order streams, though the reduced protection for first order streams will have far greater environmental impacts.

The EPA justify this reduced protection on the grounds that they will be restoring protection removed in 2004 for many unmapped streams, which they claim makes up for reduced protection for first order streams. Though as demonstrated herein, not all protection was lost in 2004 as most unmapped streams in the Clarence and Richmond catchments still require protection because of the Fisheries Licence, so this is just a halving of protection with no corresponding gain.

There is abundant evidence that at a minimum 30m buffers should be applied to first order streams. It is obvious that 10 metre buffers are already grossly inadequate. Reducing stream buffers down to 5m is scientifically indefensible and environmentally irresponsible. It is an act of environmental vandalism.

As early as 2000 the wetland systems in the Richmond catchment were mapped by API (Early 2000), this included drainage depressions, flood channels and floodplains. If we wanted to achieve the best environmental outcome then such riparian areas would be protected in their entirety, and the required buffers applied to them, rather than just to the main channels. With LiDAR mapping it is easy to accurately map areas which are part of the active riparian system.
With the example of Royal Camp State Forest below, 30m buffers were applied around the active riparian system, combining streams and wetlands as mapped by Early (2000). This would result in the exclusion of 400 ha outside base exclusions, compared to 106 ha under current rules (see 3.5). Though in the steeper headwaters where most State Forests occur most streams do not have such wide and extensive riparian areas.

AN EXAMPLE OF WETLAND MAPPING UNDERTAKEN FOR THE RICHMOND CATCHMENT

AN EXAMPLE OF BUFFERING THE RIPARIAN SYSTEM
The EPA have ignored their responsibility to identify and properly protect riparian systems on an ecological basis. It is clear why buffering riparian systems is not being considered where timber is considered more valuable than water and wildlife. Though it is not clear why the EPA are proposing reducing stream buffers on our most vital headwaters down to 5m.

2.2. Threatened Species Exclusions

Of those animal species identified as being of particular conservation concern in north-east NSW, a total of 34 mammals (27 bats), 31 birds, 16 frogs, 5 turtles, 15 lizards and 8 snakes were identified as being specifically vulnerable to logging, with many of these species, and a number of others, also vulnerable to the associated fire regimes, hydrological changes, stream pollution and weed invasions (Environment Australia 1999). For 41 of these 109 species logging is identified as a primary (number 1) threat.

The current Threatened Species Licence (TSL) relies upon the base and riparian exclusions to protect sufficient habitat to mitigate logging impacts on an array of threatened species. The TSL reinforces protection for many of these landscape features, and is the means of providing legal protection to a variety of others, such as rare non-commercial forest types, unmapped wetlands, heathlands, rock outcrops and caves, and ridge and headwater habitat (corridors). Endangered Ecological Communities are specifically excluded from the TSL and are protected under the NPWS Act, though largely remain unmapped.

The TSL assumes that most threatened animals are adequately catered for by these exclusions, though “for those species that have been assessed as not being adequately protected by the general conditions” the need for additional measures is identified, most particularly those species inhabiting eucalypt forests that are known to be vulnerable to forestry activities or are poorly known. To help cater for these species on a landscape level the TSL specifies the retention of important trees scattered across the forest, this includes 5 hollow-bearing trees (and a mature recruit), along with 3 eucalypt feed trees, per hectare. This is supplemented by the IFOA's intended limitations on logging intensity, allowing only Single Tree Selection (limiting logging to less than 40% of the basal area) and Australian Group Selection (medium) (limiting the size of cleared patches to 0.25 hectares, and their extent within a compartment to 90% in a staged process over a 28 year time frame).

For those species still considered to be inadequately protected the TSL includes a variety of species specific prescriptions that are triggered by records or the presence of suitable habitat. Records of most threatened plants and some animals trigger the creation of exclusion areas around them (such as most frogs, Hastings River Mouse, Koala High Use Areas, Golden-tipped Bat, Marbled Frogmouth, Albert’s Lyrebird, Brush-tailed Phascogale, Squirrel Glider and most plants). Records of a few species (i.e. Yellow-bellied Glider, Koala records, various honeyeaters) trigger requirements for retention of additional feed trees in their vicinity.

These prescriptions are supplemented by requirements to protect identifiable feed trees (Yellow-bellied Glider and Squirrel Glider sap-feed trees, Glossy Black Cockatoo feeding trees) and the roost, den and nest trees/sites of most threatened species, if found.

As part of the harvest plan preparation the Threatened Species Licence now requires Pre-logging and Pre-roading Flora and Fauna Surveys to be conducted by suitably experienced and trained persons, with minimum survey requirements explicitly identified. Targeted fauna surveys are required within compartments that contain known or potential habitat for those fauna species that
require site-specific or species-specific conditions. They are not required if there has been a reliable survey in the vicinity in the previous decade. For Upper North East NSW there are 38 fauna species identified as requiring targeted surveys. For 21 of these species, rather than surveying the Forestry Corporation can opt to assume they are present and apply the required prescriptions either the whole compartment or to modelled habitat. The Forestry Corporation would usually rather undertake the survey because in the unlikely event that they find the species they will only have to apply the prescription to a limited area.

As well as the species specific surveys, the Forestry Corporation is required to traverse 4km of every 200 hectares of the logging area, during which they are required to spend six person hours surveying for threatened plants and four person hours looking for scats, feed trees, dens and nests of specified threatened fauna. The Forestry Corporation primarily rely upon their own staff to undertake pre-logging flora and fauna surveys using prescribed methods over broad areas before harvesting plans are prepared.

Many survey requirements are not triggered until logging, where the Forest Corporation is required to undertake Mark Up Surveys ahead of logging. Under the TSL Harvesting Operations are prohibited in areas which have not been subject to compartment mark up surveys. At this time “an adequately trained person must conduct a thorough search for, record and appropriately mark … threatened and protected species features”. These features include nests, roosts and dens of a variety of hollow-dependent species, Koala high use areas, latrine and den sites of the Spotted-tailed Quoll, Glossy-black Cockatoo feed trees, Yellow-bellied Glider and Squirrel Glider sap feed trees, bat tree roosts, Swift Parrot and Regent Honeyeater feed or nest trees, wombat burrows, soaks and seepages in Philoria spp. habitat, and threatened flora. This is a key step in providing the intended protection to a range of threatened species. It is only by undertaking the required on-ground assessment that the features can be found that that trigger a variety of prescriptions.

The triggering of Koala protection is dependent upon 'Koala Mark-up Searches' being undertaken, in conjunction with Mark Up Surveys, to find sufficient Koala scats to identify Koala “high use” and “intermediate use” areas. The TSL requires the Forestry Corporation to thoroughly search trees for Koala scats ahead of logging at 10m intervals in suitable habitat. If there is no mark up surveys then there is no protection for Koalas. Given the frequent failure to undertake Koala Mark-up Searches found in our audits (i.e. Royal Camp) it is apparent that no attempt is being made to minimise impacts on Koalas in many logging operations.

The Forestry Corporation claim to spend millions of dollars every year undertaking the required surveys, though they have little to show for it. A major part of the problem is that they use their own poorly trained staff to do most surveys. They are simply not capable of identifying many of the species they are meant to be looking for. They also suffer from a lack of will to find anything, which was particularly obvious at Royal Camp SF where the Forestry Corporation Mark-up Surveys failed to locate any Koala scats in an area with unusually abundant Koala scats, amongst the highest density of Koala scats on State forests in the Clarence-Richmond catchments.

The EPA’s claimed aim is to get rid of most species specific prescriptions for threatened species and focus on a landscape based approach to reduce “the need to locate threatened species through costly surveys”. They go so far as to assert that “The government considers that relying on record-based triggers for species protection is an unnecessary risk to most threatened species”. The absurdity of this claim is astounding.
The EPA are proposing to identify Local Landscape Areas (LLA - a group of compartments with up to 1,500ha loggable area). Where a LLA has less than 20 per cent within existing exclusion zones (riparian, oldgrowth, rainforest etc), the Forestry Corporation will identify additional areas to protect using some undeveloped guidelines. This is not expected to require many additional exclusions.

The EPA's intent is also for the Forestry Corporation to identify “wildlife clumps” using some undeveloped guidelines. There are required to be 6 of these per 100ha of the “clumpable area” with an average size over 0.5 ha (ie 3.2 ha per 100ha). The “clumpable area” is the residual logging area left after buffering all mapped exclusion zones (except Class 1 streams) by 100m. Unlike in species-specific exclusions, tree retention requirements can be met within these clumps.

These clumps will mostly just cover clumps of trees required to be retained under the general tree-retention prescriptions and are unlikely to result in significant additional protection. It is expected that the subjective manner of determining these, their location away from riparian areas, and the ability to locate them over areas unloggable for other reasons (ie uneconomic, inaccessible, unmerchantable, excessively steep) will mean that little additional productive habitat will be included. Their small size (averaging 0.5ha, but down to 0.1 ha) is a grossly inadequate substitute for the 8, 12 and 20 ha exclusions now implemented around records of Squirrel Glider, Hastings River Mouse and Brush-tailed Phascogale respectively.

These “wildlife clumps” are in no way comparable to record based species-specific exclusions.
3. Case Studies

For this review the goal was to achieve a representative sample of State Forests from across the catchments of the Clarence and Richmond Rivers in north-east NSW. The choice of compartments was mostly limited to those for which harvesting plans are available online (a few had been subject to previous assessments by NEFA).

Thirteen areas of State Forest, totalling 10,661 ha, were chosen to achieve a reasonable spread across the Clarence and Richmond river catchments. They represent a 2.9% sample of the 365,000 ha of native State Forests in the catchments and are considered a reasonably representative sample.

A Geographic Information System was utilised. For each area the first step was to reproduce the exclusions identified in the mapped harvesting plans using a combination of existing forestry data layers and digitising on screen from the harvesting plans.

Four categories of exclusions were identified:

- Base exclusions which are expected to be retained, comprising FMZ 2 and 3A, Ridge and Headwater Habitat corridors, and other features identified for exclusion in harvesting plans (i.e. forest types used as surrogates for EECs, regional owl exclusions).
- Riparian exclusions based on stream order (outside base exclusions), as currently implemented.
- Record-based threatened species exclusions (outside base and stream order riparian exclusions), primarily based on those shown in harvesting plans, though incorporating NEFA records where reported to the Forestry Corporation (Koreelah, Royal Camp and Cherry Tree SFs).
- Riparian exclusions based on catchment size (outside base exclusions), as proposed to replace those based on stream order.

The principal problem was delineating "unmapped streams". Some harvesting plans showed recent LiDAR based stream mapping, though most still relied upon 1:25,000 stream order mapping. For these areas a combination of FMZ8 modelled streams and contour mapping was used to identify the likely presence of unmapped streams. In most areas the identification of "unmapped streams’ is therefore only indicative, and is considered to under-represent their actual extent. Generally around half the headwater streams were "unmapped".

Because of the presence of Eastern Freshwater Cod habitat adjacent to, or within 100km downstream, all compartments were identified as either Class 1 or 2 Aquatic Habitat in accordance with the Fisheries Licence, so conditions requiring protection of unmapped drainage lines applied. The Environment Protection Licence (EPL) applied to Newfoundland SF, Orara West SF and part of Ellis SF.

Given that in all areas assessed both mapped and "unmapped" streams require buffering and protection under both the old and new IFOAs, under-representation of unmapped streams was not considered a significant problem. Though, because the intent is to reduce buffers on "unmapped" streams from 10m down to 5m, the likely under-representation of "unmapped" streams means that the loss of riparian exclusions is likely to be greater than identified herein.
Streams were mapped both according to stream order derived from 1:25,000 topographical maps and catchments. Catchments of 20, 100 and 400 ha were mapped. Buffers were applied to streams based on stream order (unmapped and 1st order 10m, 2nd order 20m, 3rd order 30m and 4th+ order 50m), and catchment size (0-20ha 5m, 20-100ha 20m, 100-400ha 30m, 400+ha 50m).
Existing exclusions were taken to include base exclusions, riparian exclusions based on stream order, and record-based threatened species exclusions. The new IFOA exclusions were taken to include base exclusions and riparian exclusions based on catchment size. These were reported in hectares to identify gains and losses under the new IFOA.

It is important to recognise that, aside from size, these gains and losses are not equivalent. Buffering the smaller headwater streams is relatively more important for maintaining water quality than downstream buffers. Though the most stark difference is that the additional buffers are likely to have been mostly recently logged whereas the buffers being removed are unlikely to have been logged for decades, if ever. The damage to riparian habitat and streams is likely to be far more significant than the actual loss of riparian habitat.

Qualitatively the loses and gains are not equivalent, high conservation value native forest is being replaced with lower conservation value degraded forest.

### 3.1. Koreelah State Forest

The likely consequences of the new IFOA on the area excluded from logging in compartments 27, 28, 30, 31 and 32 of Koreelah State Forest were assessed. The total area of the compartments is 609 ha. The Harvesting Plans were approved in January 2013, and logging commenced in March 2013.

The base exclusion zones encompass 57ha and are comprised of rainforest (Forest Management Zones (FMZ) 2 and 3A), rocky outcrops, the forest type Dunns White Gum (a surrogate for the EEC White Gum Moist Forest) and one small Ridge and Headwater Habitat corridor.

The compartments are identified as Class 2 aquatic habitat, so the Fisheries Licence applies and buffers are required on unmapped streams. Streams are 1:25,000 mapped streams, with likely unmapped streams identified from FMZ 8 mapping, meaning they are only indicative. Based on this process, buffers around mapped and unmapped streams encompass 65 ha in addition to the base exclusion areas.

NEFA intervened, as logging was starting in compartment 30, to survey for threatened species because both the Forestry Corporation and the EPA refused our requests to do so. On one evening we located 3 Marbled Frogmouths and 4 Fleay's Barred Frogs, along with one Sooty Owl and 2 Yellow-bellied Gliders. We also recorded the Albert's Lyrebird in compartment 28, as well as finding sufficient Koala scats to identify the compartment as an Intermediate Use Area. As the Forestry Corporation had to, we applied the prescriptions required for our records, as well as those identified in the Harvesting Plan, in this review. NEFA has no doubt that further surveys would have located more localities of threatened species that would have increased required protections.

There are records of 4 threatened fauna which require stream buffers to be expanded in response to records, in total requiring another 26.5 ha to be protected outside base and riparian exclusions. The species exclusions overlap. Marbled Frogmouth's require buffers on first order streams to be increased to 20m, and buffers on second order streams to be increased to 30m, in compartments where they are found (30, 31), resulting in an additional 21 ha needing to be protected outside other exclusions(these overlap with habitat retention required for various other species). Fleay's Barred Frog requires 30m buffers to be applied to all streams within 200m, resulting in a further 3ha to be protected in addition to the Frogmouth exclusions, Albert's Lyrebird requires require buffers on first order streams to be increased to 20m, and buffers on second order streams to be increased to 30m,
within 300m of a record, resulting in an additional 1.6 ha required to be protected. Golden-tipped Bat requires buffers on first and second order streams to be increased to 30m, requiring another 0.9 ha to be protected.

The outcome of the new IFOA rules is that, based on stream buffers determined on catchment size, outside protected FMZs stream buffers will total 48 ha. Most of this is within existing buffers, with only 0.5ha being additional to existing exclusions. It is assumed that the EPA are intent on getting rid of record based protections, so none of these will apply in the future.
3.2. Yabbra State Forest

The likely consequences of the new IFOA on the area excluded from logging in parts of compartments 162 and 163 of the Yabbra State Forest were assessed. The 340ha area assessed was based on the availability of Lidar mapping. The harvesting plan is dated October 2008, and logging began January 2009.

Forest Management Zones (FMZ) 2 and 3A encompass 80.4ha (comprised of rainforest, a wildlife corridor along the creek, and steep slopes), the forest type Dunns White Gum (a surrogate for the EEC White Gum Moist Forest) extends over an additional 9.7ha, there is an additional 1.7 ha of rainforest (this was illegally logged in the 2009 operation) and a small area of Ridge and Headwater Habitat of only 0.3ha. The makes the base excluded area 92 ha.

Few streams are mapped in this area, with most streams being unmapped. There are numerous records of the Eastern Freshwater Cod within 100km downstream so the Fisheries Licence requirement to protect all unmapped drainage lines in the compartments applies. Currently, buffers based on stream order around mapped and unmapped streams (as identified by LiDAR) encompass 27 ha in addition to protected FMZ zones. Most of these are unmapped streams which were illegally logged by the Forestry Corporation in 2009 with no buffers being applied, up to 20 ha of these buffers could have been illegally logged.

There are also numerous small wetlands in the area which require 10m buffers to be applied, though as these have not been mapped they have not been assessed. These were also illegally logged in the 2009 operation.

The record of the Marbled Frogmouth in compartment 162 triggered the need for 20m buffers on first order streams and 30m on second order streams, though due to the poor stream mapping and the Wildlife Corridor, this only resulted in an additional 1.5 ha being protected outside required stream reserves. An exclusion area of 20ha was established around the record of Brush-tailed Phascogale in compartment 163 though this was situated to maximise inclusion of other exclusions, so that an additional 11.7 ha was protected (part of this was also logged in 2009). So fauna resulted in an additional 13ha being protected.

This brings the total of currently required exclusions to 132 ha, a significant part of which was illegally logged in 2009. The outcome of the new IFOA rules is that, based on stream buffers determined on catchment size, outside protected FMZs stream buffers will total 18.4 ha. Some 11.9 ha of existing stream buffers will be lost, though an additional 3.3 ha will be protected along lower reaches of unmapped streams. This is a net loss of 8.6 ha (32%) of stream buffers. The additional loss of riparian exclusion areas for the Marbled Frogmouth and Brush-tailed Phascogale will greatly compound stream impacts.
3.3. Richmond Range State Forest

The likely consequences of the new IFOA on the area excluded from logging in compartments 327, 328, 329 and 330 of the Richmond Range State Forest were assessed. The gross area of the compartments is 887ha.

The Harvesting Plan for compartments 327 and 328 was prepared in November 2013, with logging given as starting in September 2013. The Harvesting Plan for 329 and 330 is undated, though logging was commenced in November 2010.

The base exclusion area includes 130ha of FMZ 2 and 3A, which encompass a wildlife corridor 50m each side of Peacock Creek, High Conservation Value Oldgrowth Forest, rainforest, and mapped Dunn's White Gum (as a surrogate for the Endangered Ecological Community White Gum Moist Forest). To this is added 5.5ha of ‘Ridge and Headwater Habitat’ corridors. The base exclusion area is 135ha.

The EPL does not apply. The compartments are Class 2 Aquatic Habitat because the Clarence River, and abundant habitat for the endangered Eastern Freshwater Cod, is downstream, so the Fisheries Licence requirement to protect all unmapped drainage lines in the compartments applies. This is not recognised in the Harvesting Plan for compartments 329 and 330 (presumably they predate Yabbra). Stream orders add 65ha to the base exclusion areas.

The Giant Barred Frog and Golden-tipped Bat have been recorded at multiple sites in the compartments. There are 6 Giant Barred Frog and 6 Golden-tipped Bat locations in the compartments. The TSL requires that 30m buffers be placed around mapped streams within 200m of records which represents a total area of 20ha. Most of this is encompassed within existing FMZ and riparian exclusions, leaving an additional area of 2ha requiring protection. A record of Green-thighed Frog requiring a 30m buffer is located in the Wildlife Corridor. An exclusion area was established near the record of the Squirrel Glider in compartment 329, though as it was mostly in the National Park only 3 ha was excluded on the State Forest. So species only add 5ha to other exclusion areas.

There can be no doubt that more rigorous searching would result in significant increases in records and the habitat requiring protection for threatened species. For example, NEFA’s brief searches identified Koala scats and indicated that there were likely to be Koala high use areas present, while indicating that Great Barred Frog and Golden-tipped Bat habitat is more widespread.

Conversely, stream buffers based on catchments add 55ha to the base exclusion areas.
3.4. Cherry Tree State Forest

Compartments 359 and parts of 360 & 361 of Cherry Tree State Forest total 496ha. The harvesting plan was approved in June 2014 and logging commenced in January 2015.

The base exclusions here consist of part of a wildlife corridor along the southern boundary of the compartments and mapped rainforest included in FMZ 2 and 3A. A small additional Ridge and Headwater Habitat corridor was protected. A small area of Forestry Corporation mapped (RN17) rainforest was excluded from the CRA mapped rainforest and thus FMZ 3A, though is included as an exclusion on the harvesting plan. Taken together the base exclusions total 99 ha.

These compartments represent one of the few areas where the Forestry Corporation are still legally required to abide by the EPL and thus to protect unmapped streams. There are numerous records of the Eastern Freshwater Cod within 100km downstream so the Fisheries Licence requirement to protect all unmapped drainage lines in the compartments also applies. The "unmapped" streams have also been mapped by Lidar and are included on the harvesting plan as "Indicative drainage features", so these were used as the basis for this review.

Currently, buffers around mapped and indicative unmapped streams encompass 48 ha in addition to protected FMZ zones.

The Giant Barred Frog and Golden-tipped Bat have been recorded at one site each in the compartments. The TSL requires that 30m buffers be placed around mapped streams within 200m of records. Most of this is encompassed within existing FMZ and riparian exclusions, leaving an additional area of 2.1 ha requiring protection. An 8ha exclusion area was established near the record of the Squirrel Glider in compartment 359, though there were frequent incursions across its boundary during logging.

NEFA located 26 vulnerable Onion Cedar, none of which had been found by the Forestry Corporation and 4 of which had been physically damaged, which require 20m buffers. Most of these are within rainforest, with only an additional 0.2ha requiring exclusion outside rainforest (though this will decrease as the damaged individuals die).

By contrast the change to applying buffers based on catchment size will reduce riparian protection to 30 ha. This comprises 0.2ha outside existing riparian buffers, so some 17.4ha of existing buffers will be opened up for logging.
3.5. Royal Camp State Forest

The likely consequences of the new IFOA on the area excluded from logging in compartments 13-16 of the Royal Camp State Forest were assessed. The area totals 1,456 ha. The harvesting plan for compartments 14 and 15 were approved in September 2011 and logging began 5 days later. Logging of compartment 16 began in July 2012.

In August 2012 NEFA found Koala high use areas being logged and proposed for logging. Logging soon resumed in compartment 16 and logging of Koala High Use Areas continued for another month. When the Forestry Corporation attempted to start logging of Compartment 13 in 2013 NEFA inspected the area and found extensive Koala high use areas.

For the harvesting plan the mapped Red Gum forests in Compartments 15 and 16 were treated as wetlands and Swamp Sclerophyll Endangered Ecological Communities (EECs) and a 40m buffer applied. As well as these, the indicative extent of the Subtropical Coastal Flood Plain EEC was identified in the harvesting plan for compartment 16. While doubtlessly the extent of these would be better refined by surveys, for the purpose of this review they were adopted as mapped. It is not known which of these will be opened up for logging under the new rules, though for the purposes of this review it was assumed they will remain unlogged.

In addition there are 13ha of “Ridge and Headwater Habitat” corridors.

These were combined with Forest Management Zones 2 and 3A (a 50m wildlife corridor along Sandy Creek and candidate oldgrowth) to identify the base exclusions. The total area of these is 214 hectares.

The compartments were not licenced under the EPL. The compartments encompass Class 1 and Class 2 Aquatic Habitat because there are numerous records of the Eastern Freshwater Cod and Oxleyan Pygmy Perch within 100km downstream (and modelled habitat for Eastern Cod in compartment 16) so the Fisheries Licence requirement to protect all unmapped drainage lines in the compartments applies. Streams were derived from a mixture of mapped streams, LiDAR mapping in compartment 13, and estimates of unmapped streams from FMZ8 zones.

Currently, buffers around mapped and unmapped streams encompass 106 ha in addition to protected FMZ zones.

In addition to stream buffers, the Forestry Corporation avoided the need to do surveys for the Giant Barred Frog by applying the default prescription for 30m each side of streams in modelled habitat. This resulted in the additional protection of 9 hectares. Similarly they applied the default prescription for Large-footed Myotis of 30m on all permanent waterbodies and permanent streams, though this condition has since been removed.

Koala High Use Areas (HUAs) are required to be identified and protected. NEFA caught the Forestry Corporation logging a Koala HUA and about to log 4 others in 2012. When they resumed logging for a month we found another 2 Koala HUAs logged. When they attempted to start logging in compartment 13 a year later we again found a number of Koala HUAs where they were intending logging. Before NEFA intervened, the Forestry Corporation had found one Koala HUA of 1.4ha in compartment 14. There is still no assessment of the actual extent of Koala HUAs in Royal Camp SF, so for the purposes of this review those identified by NEFA in our limited surveys were applied.
This gives a total area of 10 ha outside other exclusions. This significantly understates their true extent.

There is a high density of the nationally vulnerable Slaty Red Gum (*Eucalyptus glaucina*), which achieves densities of 5-10 per hectare, though nothing is required for it. The Ecology Report identifies 8 records of the Slaty Red Gum in compartment 15, with six of these cited as being made by Robert Kooyman on 08/12/1998. Forester Robert Kooyman undertook 7 Flora Traverse Surveys in compartment 15 for Forests NSW on 7-9 of December 1998. His record sheets identify >128 records of Slaty Red Gum (that are also mapped), though most of these got lost in translation. They were not marked for retention in the logging.

The NSW endangered sedge *Water Nutgrass* (*Cyperus aquatilis*) and the endangered herbs Native Milkwort (*Polygala linariifolia*) and *Oldenlandia galioides* occur in the area and are all threatened by grazing and logging activities. Currently 20m buffers are required for these three species, it is assumed this will be maintained. The 7 locations within the nett harvest area only result in an extra 0.7ha being protected.

This brings the total area of threatened species exclusions, outside base and stream exclusions, to around 20ha.

By comparison, the application of buffers based on stream catchments will result in 82 ha being protected in addition to base exclusions. A total 34 ha of unlogged stream buffers are removed and 9ha of logged buffers are added.
3.6. Ewingar State Forest

Ewingar State Forest Compartments 624, 629 total 612ha. The Harvest Plan was prepared in January 2012 and Logging commenced in February 2012.

The Forest Management Zones 2 and 3A total 179 ha. This is comprised of rainforest, wildlife corridors either side of Ewingar Creek, High Conservation Value Oldgrowth, and rock outcrops. The total area of rainforest is 155 ha, with 20m buffers only applied to the 69 ha identified as forest type 11. In addition to this there are some areas of Ridge and Headwater corridors totalling 9 ha. The total base exclusions are thus 188 ha.

Class 2 Aquatic Habitat has been identified within these compartments, so the Fisheries Licence requires the protection of unmapped streams. Exclusion areas based on stream order add 26ha to the base exclusions.

One Stuttering Frog and 5 Golden-tipped Bat records require 30m riparian buffers within 200m of records, resulting in 4.4 ha of additional protection.

By comparison, buffers based on stream catchments result in a 22ha addition to the base exclusions.
3.7. Girard State Forest

Girard State Forest Compartments 398, 399, 403 and 404 total 498 ha. The Harvest Plan is dated April 2011, logging commenced that month.

FMZ 3A totals 121 ha, consisting of some High Conservation Value Oldgrowth, a 'bog and fen' wetland and buffer, rock outcrops and non-commercial New England Stringybark. A further 5ha is identified as a Ridge and Headwater Habitat corridor. The base exclusions are therefore 126ha.

Class 2 Aquatic Habitat for Eastern Freshwater Cod has been identified within the compartment so the Fisheries Licence requirement to buffer unmapped drainage lines applies. Based on stream order, stream buffers protect 32 ha in addition to the base exclusions.

There are 5 Stuttering Frog (Mixophes balbus) records in or near the compartments. Only 3 of these are mapped, the retention of 30m each side of streams in their vicinity is mostly covered by the wildlife corridor and riparian buffers, leaving an additional 0.8ha protected.

One Brush-tailed Phascogale was recorded in cpt 403 requiring a 20ha exclusion zone, 3 previous records of Brush-tailed Phascogale were not acted on (presumably because they were considered too old). This exclusion largely covered existing exclusions, including a "bog and fen" wetland, so results in only 5ha being protected.

One previous Hastings River Mouse record required application of the prescription at that time - establishment of a 200m exclusion zone around the record, and exclusion of all moderate or high quality habitat within a further 800m. This overlaps a large exclusion area, but still results in protection of an additional 58ha. The Threatened Species Licence was altered in November 2011 to dramatically reduce the protection afforded to Hastings River Mouse down to exclusion areas of 12ha. It is unknown how much additional habitat, if any, will be protected in the future under the new prescription. In keeping with the conservative approach of this review it is assumed that no additional habitat will be protected in the future.

So, with omission of the Hastings River Mouse, it is assumed that fauna will result in increased protection of only 6ha.

In comparison, stream buffers based on catchments protects 26ha in addition to the base exclusions.
3.8. Forestland State Forest

The likely consequences of the new IFOA on the area excluded from logging in compartments 280-285 of the Forestland State Forest were assessed. The area totals 981 ha. The harvesting plan was approved in March 2010 and logging commenced in November 2010.

The Forest Management Zones 2 and 3A total 386.6 ha. This is comprised of rock outcrops and 20m buffers, non-commercial forest types, candidate oldgrowth forest, temperate rainforest and 20m buffers, and a wetland. In addition to this there are some areas of Ridge and Headwater corridors totalling 2.6 ha. The total area of base exclusions is 389 hectares (40% of the total area).

Streams were derived from a mixture of mapped streams, and estimates of unmapped streams from FMZ8 zones. While the harvesting plan for compartments 280-284 is unclear about whether unmapped streams will be protected, the plan for compartment 285 is clear that it is Class 2 Aquatic Habitat because of the presence of Eastern Freshwater Cod habitat downstream (which also applies to 280-284). All unmapped drainage lines are thus required to be protected.

Currently, based on stream order, buffers around mapped and unmapped streams encompass 52 ha in addition to protected FMZ zones.

There are a variety of fauna exclusions based on records that require logging to be excluded from additional areas. There are two records of Stuttering Frog in the area, necessitating an additional 2.9 ha to be protected outside base and stream order exclusions.

When preparing their harvesting plan for compartments 280, 281, 283 and 284 the Forestry Corporation failed to apply the required stream buffers for a record of Stuttering Frog, this was pointed out to CEO Nick Roberts by Joe Sparks on 29/7/2014 and the failure was affirmed, though the Forestry Corporation claimed it hadn't been logged.

Rather than surveying for Hastings River Mouse in compartment 285 the Forestry Corporation accepted modelled habitat as an alternative, encompassing an additional 7.4 ha.

Similarly in compartment 285 a latrine site for a Spotted-tailed Quoll was located, resulting in an additional 8.2 ha protected. The TSL requires "An exclusion zone of at least 12 hectares must be implemented around Spotted-tailed Quoll latrine sites".

There is one record of a wombat burrow requiring a 20m buffer, which equates to slightly more than 0.1 ha. This brings the total of species exclusions to 19 ha.

Conversely, with the new catchment based buffers this will be reduced to 44 ha. A total of 15.8 ha of unlogged stream buffers are removed and 7.3 ha of logged buffers are added.
3.9. Newfoundland State Forest

Newfoundland Compartments 442, 443, 448 and 449 total 627ha. The Harvesting Plan is dated July 2012, with logging starting days later.

Base exclusions are primarily FMZ 2 and 3A, being rainforest, High Conservation Value Oldgrowth, non-commercial forest type 97 (Needlebark Stringybark) and a Wildlife habitat corridor. Ridge and Headwater habitat corridors add to this. The base exclusions total 133ha. The rainforest was identified as the Endangered Ecological Community Lowland Rainforest.

The compartments were licensed under the EPL so unmapped drainage lines were required to be protected. The Fisheries Licence was claimed to not apply to these compartments. Based on stream orders an additional 48ha beyond the base exclusions was required to be protected.

Two subterranean bat roosts were identified, requiring 100m buffers, which resulted in an increase of 3ha being protected. One Austral Toadflax *Thesium australe* has been recorded, which requires a 20m buffer around 90% of individuals, though it was already in an exclusion area. The default condition for Giant barred frog, exclusion zone 30m on both sides of streams in modelled habitat was applied, though this did not result in any additional protection.

By comparison, based on catchments the area of stream buffers in addition to base exclusions would be 33ha.
3.10 Dalmorton State Forest

Dalmorton State Forest Compartments 435-6 and 438-440 total 1,682ha. The Harvesting Plan is dated August 2011 and the operations are identified as commencing a couple of days later.

The base exclusion area is comprised of 363 ha of FMZ 2 and 3A encompassing High Conservation Value Oldgrowth, rocky outcrops (incl buffer), wildlife corridors on Downfall and Wintervale Creeks, and rainforest. Ridge and Headwater Habitat corridors add 19ha to this. There are some small areas of owl exclusions totalling 6 ha which are proposed for retention under the new IFOA and are thus treated as base exclusions. The total area of base exclusions is 388 ha.
The compartments are not licensed under the EPL. Class 1 or 2 Aquatic Habitat for the Eastern Freshwater Cod has been identified as occurring within all compartments so unmapped drainage lines are required to be buffered. Based on stream order, stream buffers add 89ha to the base exclusions.

Rather than doing surveys for the Giant Barred and Stuttering Frogs the Forestry Corporation applied the default prescription to all modelled habitat in the compartments. The Giant Barred Frog (*Mixophyes balbus*) is the only one with modelled habitat, resulting in an additional 19 ha being protected.

By comparison, stream buffers based on catchments add 62ha to base exclusions.

There are extensive areas shown on the harvesting plan as likely to comprise slopes over 30° which are currently excluded from logging, but may be made available under the new IFOA.
Dalmorton SF, cmpts 435-6 & 438-440
New IFOA Losses and Gains

Retained Protections
Lost Protections
Gained Protections

0 0.3 0.6 0.9 1.2 1.5 1.8 Kilometers
3.11. Moonpar State Forest

This area covers 405ha of compartments 105, 106 and 108 of Moonpar State Forest. A section of compartment 108 (approximately 1.6ha) was omitted from the Harvest Plan on the basis it would be logged with the adjacent compartments. The harvesting plan was approved in April 2014, though it has apparently not yet been logged.

The base exclusion area is primarily FMZ 2 and 3A, comprised of wildlife corridors 50m wide along the Nymboida River, some areas of High Conservation Value Oldgrowth, Rainforest, non-commercial New England Stringybark Forest, rocky outcrops plus buffer, and wetlands plus buffer. These areas total 71 ha.

To this is added two "Ridge and Headwater habitat" corridors totalling 4 ha. Part of the limited areas of owl exclusions also occur in this compartment, covering an additional 43 ha, given that this is proposed for retention it is included as a base exclusion. The total area of base exclusions is thus 118ha.

This operation is a non-scheduled operation under the Environment Protection Licence, though Class 1 Aquatic Habitat has been identified as occurring within these compartments so unmapped drainage lines require protection.

Stream buffers based on stream order add 29ha outside base exclusions.

Three Stuttering Frog (*Mixophyes balbus*) and 3 Golden-tipped bat (*Kerivoula papuensis*) records increase buffers on mapped streams to 30m within 200m of records, resulting in 6 ha of extra exclusions. There are 14 Hastings River Mouse records, all of which are required to be within 12ha exclusions, adding an extra 39 ha in addition to other exclusions. One squirrel glider record is present in the south of compartment 108 but no exclusion zone is required due to the age of the record. Fauna records thus result in 45ha of extra exclusions.

By comparison, exclusion areas based solely on stream catchments result in an increase of 20ha on base exclusions.
3.12. Ellis State Forest

Compartments 60, 61, 62, 198, 199, 201 and 202 total 1,376ha. Plans were prepared in 2013 and 2014, and logging is recorded as commencing November-December 2013.

The basal exclusions are primarily comprised of 247 ha of FMZ 2 and 3A, being primarily non-commercial forest type 117 (Scribbly Gum) High Conservation Value Oldgrowth, and rainforest. A total of 153ha is forest type 117. An additional 13 ha is “Ridge and Headwater Habitat” corridors. There are a further 2ha classed as “Nominated Candidate Oldgrowth”. So the total base exclusions are 262ha.

All compartments were identified as containing Class 1 Aquatic Habitat for the Eastern Freshwater Cod, so unmapped drainage lines require buffers. Compartments 60, 61 and 202 were also licensed under the EPL.

Stream buffers based on stream order require an additional 126ha to be protected.
The harvesting plans identify 11 Stuttering Frog (*Mixophyes balbus*) records, and 4 Giant barred Frog (*Mixophyes iteratus*) records in the vicinity, requiring 30m wide riparian buffers within 200m of records, though only 3 localities are identified on the harvesting plans within the compartments and one nearby. Application of the prescriptions to the records in the plan results in an additional 3.4ha being protected outside existing exclusions.

There are 9 records of Stuttering and Giant Barred Frogs from wildlife atlas not shown on the plan, with at least 3 of these dated November 2013 which do impact on the nett harvest area:

- Stuttering frog SK SF-1298993 20/11/2013 E460440 N6668930
- Stuttering Frog SK-1298975 21/11/2013 E 459050 N6667900
- Stuttering frog SK-1298979 21/11/2013 E 459200 N

Given that the plan was not prepared until 29 January 2014 it is perplexing as to why these were not included. Regrettably this was not found until it was too late to include them in this review.

There are 2 records of Sphagnum frog (*Philoria sphagnicolus*) requiring 50m buffers, resulting in an additional 0.7 ha being excluded.

There are numerous Hastings River Mouse records requiring 12 ha exclusions around them, resulting in 5 areas totalling 55ha being protected in addition to other exclusions. It is worth noting that 3 of these are over 12ha in extent, one is 11.2ha and the other is placed over a large area of Forest Type 117 that is also FMZ2, resulting in the additional area excluded only being 5.5ha. This one, and two others are mostly not modelled habitat, given that the vast majority of the compartments are modelled habitat, it is evident that the Forestry Corporation have intentionally avoided it for commercial reasons.

Two Koala High Use Areas were located and included in a single exclusion zone of 7.3ha.

A single *Tylophora woollsi* record requires a 20m buffer, which equates to 0.13 ha.

Altogether, threatened species required an additional 67ha being protected (not counting the omitted Stuttering Frog exclusions).

By comparison, stream buffers based on catchments require 104ha to be protected outside base exclusion areas.

Note: there were serious omissions identified on the harvesting plans prepared for these areas, including failure to identify and buffer a first order stream in compartment 199, omission of at least 3 Stuttering Fog localities and their required buffers within the net logging area of compartments 62 and 198, and failure to establish the required exclusion area for one group of Hastings River Mice. It is probable that some required exclusion areas were thus logged.
3.13. Orara West State Forest

Orara West and Nana Creek State Forest compartments 794-7 total 692 ha. The harvesting plan was approved February 2012 and logging commenced in March 2012. Note that mapped plantations within the compartments were excluded from this review.

Base exclusion areas comprise rainforest, High Conservation Value Oldgrowth, a 50m wide wildlife corridor and Ridge and Headwater habitat. This totals 241 ha.

This operation was licensed under the Environment Protection Licence so unmapped drainage lines required protection. The Harvest Plan does not identify whether the compartments constitute Class 2 habitat under the Fisheries Licence, though it is likely to.

Based on stream order, at least an additional 29ha is required to be protected in stream buffers.

The Harvest Plan identifies that there were either one or three records (in different tables) of Stuttering Frog triggering the need to retain 30m on both sides of streams within 200m of the record. The harvesting plan provided is dated a few months after the written plan and identifies “Default Frog & Bat Exclusion” on all mapped streams in the compartments. The rationale for this is not explained in the Harvest Plan (assumed to be due to inadequate survey effort), though the 30m buffer is applied herein. There are also 9 records of Sphagnum Frog in or near the compartments requiring 50m buffers around them. Taken together these required an additional 40ha to be protected.

By comparison, riparian buffers based on catchments require 17ha to be protected in addition to the base exclusions.
Orara West SF. Cmpts 794-7
New IFOA Losses and Gains

- Green: Retained Protections
- Red: Lost Protections
- Blue: Gained Protections
3.0. Discussion

Across the 10,661 ha of the 13 State Forests assessed, base exclusions (likely to be retained) totalled 2,442 hectares, with current riparian protections based on stream order adding 742ha to this, and protections based on additional habitat around threatened species records adding another 278 ha (118ha due to expanded riparian exclusions) (Table 1). The total of existing exclusions is thus 3,462 ha.

Based on this sample around 33% of native State forests are currently excluded from logging, with 23% in base exclusions (which are likely to be retained), 7% in additional riparian exclusions, and 3% in species-specific exclusions. Therefore 67% is available for logging (though subject to some additional constraints).

Under the proposed rules for the new IFOA the exclusions are likely to comprise the base exclusions of 2,442 ha, with riparian protections based on catchments adding 561ha to this. The total of new exclusions is thus likely to be 3,003 ha, which is 28% of the assessed area (Table 1).

The new IFOA is likely to result in a reduction in exclusion zones of 13%, with riparian exclusions being reduced by 24%. If increased riparian exclusions due to fauna records are added to stream based riparian exclusions, the total reduction in riparian exclusions increases to 35%.

### Table 1: CHANGES TO EXCLUSION ZONES AS A RESULT OF PROPOSED NEW IFOA

<table>
<thead>
<tr>
<th>State Forest</th>
<th>Assessed Area</th>
<th>Base Exclusions</th>
<th>Current Riparian Adds</th>
<th>Key Fauna Habitat Adds</th>
<th>Proposed Riparian Adds</th>
<th>Riparian Losses</th>
<th>Total Exclusion Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koreelah</td>
<td>609</td>
<td>57</td>
<td>65</td>
<td>27</td>
<td>48</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>Yabbra</td>
<td>340</td>
<td>92</td>
<td>27</td>
<td>13</td>
<td>18</td>
<td>9</td>
<td>33</td>
</tr>
<tr>
<td>Richmond Range</td>
<td>887</td>
<td>135</td>
<td>65</td>
<td>5</td>
<td>55</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Cherry Tree</td>
<td>496</td>
<td>99</td>
<td>48</td>
<td>10</td>
<td>30</td>
<td>18</td>
<td>38</td>
</tr>
<tr>
<td>Royal Camp</td>
<td>1456</td>
<td>214</td>
<td>106</td>
<td>20</td>
<td>82</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td>Forestland</td>
<td>981</td>
<td>389</td>
<td>52</td>
<td>19</td>
<td>44</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Moonpar</td>
<td>405</td>
<td>118</td>
<td>29</td>
<td>45</td>
<td>20</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>Ellis</td>
<td>1376</td>
<td>262</td>
<td>126</td>
<td>67</td>
<td>104</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Ewingar</td>
<td>612</td>
<td>188</td>
<td>26</td>
<td>4</td>
<td>22</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Girard</td>
<td>498</td>
<td>126</td>
<td>32</td>
<td>6</td>
<td>26</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Dalmorton</td>
<td>1682</td>
<td>388</td>
<td>89</td>
<td>19</td>
<td>62</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>Newfoundland</td>
<td>627</td>
<td>133</td>
<td>48</td>
<td>3</td>
<td>33</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td>Orara West</td>
<td>692</td>
<td>241</td>
<td>29</td>
<td>40</td>
<td>17</td>
<td>12</td>
<td>41</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>10661</strong></td>
<td><strong>2442</strong></td>
<td><strong>742</strong></td>
<td><strong>278</strong></td>
<td><strong>561</strong></td>
<td><strong>181</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>

The extrapolation of these results across the 365,000ha of native State Forests of the Clarence-Richmond catchments, indicates that over 10,000ha of existing riparian buffers will be lost if the proposed new rules are applied. Away from expanded riparian exclusions, species specific exclusions are likely to comprise 5,500 ha.

What is being lost are the most important buffers around our stream heads, where our river catchments are most vulnerable, and key habitat around some locations of our most vulnerable animals.

Significant additional areas would be protected with more comprehensive and competent fauna and flora surveys (including Mark-up Surveys). There are also many parts of the remaining loggable area that are unavailable for logging due to inaccessibility, steep slopes, being unmapped rainforest
or being Endangered Ecological Communities (EECs). The EPA have proposed making some EECs available for logging and have proposed introducing cable logging for slopes over 30°, so it is probable that reductions in exclusions will be greater than identified herein.

**Riparian Exclusions**

Riparian vegetation only represents a small portion of the landscape, yet is of the utmost importance in maintaining terrestrial and aquatic biodiversity. Many species of plants and animals only occur, or are in far greater abundance, in riparian areas, with their importance increasing during dry periods (Burrows 2000, Jansen and Robertson 2001, Price and Tubman 2007, Martin and McIntyre 2007, Martin 2010). As noted by Burrows (2000):

> Although they occupy only a relatively small percentage of land area, riparian zones play a disproportionately important role in the overall environment. Per unit area, riparian zones have considerably higher plant and animal biomass and diversity, are more structurally and floristically diverse, provide critical refuge habitats during dry periods and buffer waterways and downstream environments from the effects of surrounding environmental conditions and land uses.

Within the assessed areas there are some 480 kilometres of streams, 62% of the stream length is within catchments 0-20ha and 20% within catchments 20-100ha. This shows the overwhelming importance of the headwater streams for catchment health as this is where most of the interaction between the terrestrial and aquatic realms occurs. To maintain the health of our creeks and rivers it is these headwaters that we most need to protect. It is thus reprehensible, and grossly irresponsible, for the EPA to propose halving the buffers for the most important streams.

The EPA's proposed changes are intended to reduce buffers on streams in catchments <20ha from (mostly) 10m down to 5m on each side. Across all the assessment areas there are some 296 kilometres of streams within catchments <20ha, with 43% of these 'unmapped', 54% first order, and 3% second order. Based on stream order, outside base exclusion areas, buffers for these streams total some 442ha, which reduces by 51% down to 216ha with the proposed 5m buffers (Table 2).

Extrapolating from these sample areas across the Clarence and Richmond Valleys indicates that the native State Forests include in the order of 16,400 kilometres of streams, with 10,100km within catchments <20ha, 3,200km within catchments 20-100ha, 1,600km within catchments 100-400ha and 1,400km within catchments >400ha. In total, outside base exclusions, there is likely to be a reduction of some 7,800ha in buffers within <20ha catchments, compared to an increase of 1,600ha in buffers within >20ha catchments.

It needs to be recognised that reducing the width of buffers, particularly from such a minimal start, will reduce their effectiveness as buffers by many times the actual reduction. Halving a 10m buffer will more than halve its effectiveness, it is likely to reduce its benefits by well over 75%. Five metre buffers will have a very limited effect.

Given the gross inadequacy of existing riparian buffers, this is a totally unjustifiable slashing of riparian protection. The new catchment based rules halve protection for the very headwaters which are the principal terrestrial/stream interface, most of which have been theoretically excluded from logging for decades. Under the new rules there are some increases in buffer-widths for larger streams, though these have been routinely logged in the past. The proposed removals of riparian
buffers are in the most vulnerable areas, with the full significance of this loss masked, to some extent, by increases of buffers on some larger streams.

To better understand the changes proposed, changes in stream buffers for the assessed areas were considered in relation to catchment sizes (Table 2). This confirmed that the summary data used above (Table 1) masks the full extent of the loss of buffers on low order (headwater) streams, due to the increased protection of higher order streams. While the averaged reduction in riparian buffers is 24%, the reduction in buffers on headwater streams (catchments <20ha) is 51%. This reflects the fact that only 28% of streams in catchments <20ha are included in base exclusions, compared to 60% of streams in catchments >20ha.

Table 2: INDICATIVE CHANGES FOR THE ASSESSED AREA IN STREAM BUFFERS OUTSIDE BASE EXCLUSIONS

<table>
<thead>
<tr>
<th>Catchment Length (km)</th>
<th>Exclusion based on Stream Order (ha)</th>
<th>Exclusion based on Catchments (ha)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20ha</td>
<td>215.6</td>
<td>442.3</td>
<td>-226.7 -51.3</td>
</tr>
<tr>
<td>20-100ha</td>
<td>54.9</td>
<td>188.1</td>
<td>+31.7 +16.9</td>
</tr>
<tr>
<td>100-400ha</td>
<td>16.7</td>
<td>86</td>
<td>+14.4 +16.7</td>
</tr>
<tr>
<td>400+ha</td>
<td>1.7</td>
<td>15.4</td>
<td>+2      +13.0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>288.9</strong></td>
<td><strong>731.8</strong></td>
<td><strong>-178.6 -24.4</strong></td>
</tr>
</tbody>
</table>

Note: these figures were derived in a different process (XL spreadsheet) to those derived from the mapping process - the different methods explain the discrepancies.

Riparian losses are significantly increased by the losses of expanded riparian buffers due to threatened fauna. Some 118ha (43%) of the additional fauna protections identified herein (Table 1) are specifically expanded riparian buffers. So the loss of 35% of existing riparian buffers is very significant for fauna as well as water quality.

Any reductions in riparian buffers will have a disproportionate impact on fauna. Many of the exclusion zones for fauna are based on widening riparian zones in the vicinity of records to increase the area available for foraging, so these species will be particularly badly affected. In this sample of compartments, increased riparian buffer widths were found to have been applied for records of Giant Barred Frog (30m), Stuttering Frog (30m), Albert’s Lyrebird (20-30m), Marbled Frogmouth (20-30m), Golden-tipped Bat (30m), Sphagnum Frog (50m) and Green-thighed Frog (30m). The Fishing Bat had an affect on some riparian buffers, though its TSL protection has since been removed.

As well as reducing impacts on terrestrial fauna, part of the reason for implementing riparian buffers is to reduce impacts on aquatic fauna, particularly the endangered fish Eastern Freshwater Cod and Oxleyan Pygmy Perch. The reduction in riparian buffers will have significant impacts on water quality and the availability of resources for aquatic fauna, and thus directly affect aquatic food chains and fish.

The reduction in water quality resultant from reduced riparian buffers will affect all downstream users who store their waters for drinking, eat fish and shellfish obtained from them, recreate within them, or water their livestock and crops with their waters.
To test the consequences of the various buffer options, they were applied to LiDAR mapped streams in Cherry Tree SF (see 3.4) (Table 3). The options tested (based on riparian exclusions outside base exclusions) were:

- Exclusions applied to stream order based on 1:25,000 mapping (current, 'unmapped streams' with a 10m buffer)
- Exclusions applied to stream order based on LiDAR mapping ('unmapped streams' with a 10m buffer).
- Exclusions applied to catchments based on LiDAR, with 5m buffers <20ha (proposed)
- Exclusions applied to catchments based on LiDAR, with 10m buffers <20ha.

Table 3: TEST CASE OF DIFFERENT RIPARIAN EXCLUSION OPTIONS (Cherry Tree SF)

<table>
<thead>
<tr>
<th>RIPARIAN EXCLUSION</th>
<th>EXCLUSION AREA (outside base exclusions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream Order, 1:25,000 topo</td>
<td>48ha</td>
</tr>
<tr>
<td>Stream Order, LiDAR</td>
<td>57ha</td>
</tr>
<tr>
<td>Catchment, with 5m buffers &lt;20ha</td>
<td>30ha</td>
</tr>
<tr>
<td>Catchment, with 10m buffers &lt;20ha</td>
<td>46ha</td>
</tr>
</tbody>
</table>

These results show that if the current system of establishing buffers based on stream order was applied to the more accurate LiDAR stream mapping (which picks up 'unmapped streams') then this would significantly (19% in this case) increase the area of riparian protections required. This is because the increase in first order streams means there are more stream junctions and thus more streams are upgraded to 2nd order, the increase in 2nd order streams means there are more third order streams, and so on. The area increase is due to the increased widths of buffers needed to be applied to the higher order streams.

As expected, the maintenance of 10m buffers on streams in catchments under 20ha best approximates the current area of riparian protections, though will still result in a reduction.

Further work is required to quantify these options, though given that it is no longer tenable to persist with the outdated 1:25,000 mapping because more accurate mapping is available, it is clear that the EPA wants to change the methodology for allocating buffers because application of the current methodology results in significantly increased protection. Within the Richmond-Clarence River systems, and the Upper North East RFA region, there can be no justification for reducing already inadequate riparian buffers down to 5m, except for environmental vandalism.

If the NSW Government valued the health of our streams and survival of our wildlife more highly they would increase buffers on our vital headwater streams and buffer the full extent of the active riparian system (see section 2.2.), rather than just the stream channels.

**Species Exclusions Outside Riparian Areas**

Records of select threatened species variously trigger requirements for exclusion zones or increased tree retention in their vicinity. Many of the fauna exclusions overlap with the base exclusions and riparian exclusions, for this assessment only the additional areas requiring protection were tallied. In this sample, records required the addition of 278 ha to both base exclusions and riparian exclusions, which is 3% of the gross area (Table 1). 118ha of this increase is due to species-specific expanded riparian exclusions which have been considered above.
In this sample, outside riparian zones, records of species triggered exclusion zones around Hastings River Mouse (12ha around records), Brush-tailed Phascogale (20ha), Squirrel Glider (8ha), Koala (variable), bat roosts (3.1 ha), a Tiger-quoll latrine (12ha) and one wombat burrow (0.125ha). Taken together these represented 160 ha of key fauna habitat (in addition to 118ha of riparian exclusions specifically for fauna). Across the Clarence-Richmond catchments this equates as some 5,500 ha. These exclusions are particularly significant in that they are based on protecting habitat known to be occupied by threatened species.

NEFA have established (i.e. see Koreelah State Forest) that many key fauna locations are not currently being identified in pre-logging surveys by the Forestry Corporation. Similarly, NEFA have established that the Mark-up Surveys required to be undertaken during logging to identify Koala High Use Areas, threatened plants, wetlands, Philoria habitat, bat roosts, Quoll latrines and various other exclusions are rarely undertaken adequately (i.e. see Royal Camp). The paltry number of exclusions for threatened plants reflects the extremely poor survey effort by anyone who knows what they are looking for (i.e. see Cherry Tree SF).

It is also apparent that when preparing harvesting plans the Forestry Corporation often fail to include species records and their required buffers (i.e. see Ellis and Forestland SFs).

Until the surveys are done by competent ecologists, and the survey results fully and faithfully applied, the Forestry Corporation will continue to deliver inadequate protection for threatened species. The faithful application of the intent of the current rules would result in the protection of significantly more species-specific exclusions than is currently the case.

The EPA and NSW Fisheries have failed to ensure that the requirements to implement exclusions to reduce impacts on threatened species are appropriately applied. They have never really tried. To overcome their own failings, their solution is to get rid of any species-specific requirements for threatened species.

The EPA are proposing to identify Local Landscape Areas (LLA - a group of compartments with up to 1,500ha loggable area). Where a LLA has less than 20 per cent within existing exclusion zones (riparian, oldgrowth, rainforest etc), the Forestry Corporation will identify additional areas to protect using some undeveloped guidelines. Of the 13 State forests assessed in this review, the current exclusions represent at least 23% of all areas. Even under the proposed reduced exclusions, only one (Koreelah SF) falls below the 20% threshold. With the ability to select boundaries of the LLAs to suit desired outcomes, it is doubted that they will result in any significant increase in protection - which is the likely intent.

Instead of implementing a variety of species-specific exclusions the EPA's intent is for the Forestry Corporation to identify “wildlife clumps” using some undeveloped guidelines. There are required to be 6 of these per 100ha of the “clumpable area” with an average size over 0.5 ha (ie 3.2 ha per 100ha). The “clumpable area” is the residual logging area left after buffering all mapped exclusion zones (except Class 1 streams) by 100m. Unlike in species-specific exclusions, tree retention requirements can be met within these clumps. It is expected that the subjective manner of determining these, their location away from riparian areas, and the ability to locate them over areas unloggable for other reasons (ie uneconomic, inaccessible, unmerchantable, excessively steep) will mean that little productive habitat will be included. Their principal intent is to retain clumps of habitat trees otherwise required to be retained by the general prescriptions, they thus provide little additional protection. Their small size (averaging 0.5ha, but down to 0.1 ha) is a grossly inadequate
substitute for the 8, 12 and 20 ha exclusions now implemented around records of Squirrel Glider, Hastings River Mouse and Brush-tailed Phascogale respectively.

The "clumpable area" was calculated for each of the sample areas based upon catchment-based stream buffers (minus Class 1 streams) and base exclusions (Table 4).

Across the assessed area some 54% of the 7,660ha net logging area (under the new rules) would comprise the "clumpable area", resulting in some 131 ha being "clumped" compared to the loss of 181 ha of riparian buffers and 278ha of additional key fauna habitat. These small clumps are situated in that half of the logging area away from the major exclusion areas, including riparian areas.

Based on these areas, across the State forests of the Clarence-Richmond catchments there are likely to be 4,400 ha of "clumps". Though these "clumps" are in no way comparable to the high conservation value riparian buffers and known key fauna habitat that is being lost.

Table 4: CLUMPABLE AREA OF ASSESSED AREAS.

<table>
<thead>
<tr>
<th>State Forest</th>
<th>Assessed Area (ha)</th>
<th>Loggable Area (new rules) (ha)</th>
<th>Clumpable Area (ha)</th>
<th>% Clumpable of gross area</th>
<th>% Clumpable of loggable area</th>
<th>Area of &quot;clumps&quot; required (ha)</th>
<th>% clumps of gross area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koreelah SF</td>
<td>609</td>
<td>504</td>
<td>315</td>
<td>52</td>
<td>63</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Yabbra SF</td>
<td>340</td>
<td>230</td>
<td>109</td>
<td>32</td>
<td>47</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Richmond Range SF</td>
<td>887</td>
<td>697</td>
<td>426</td>
<td>48</td>
<td>61</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Cherry Tree SF</td>
<td>496</td>
<td>367</td>
<td>188</td>
<td>38</td>
<td>51</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Royal Camp SF</td>
<td>1456</td>
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4. References


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