Independent Forestry Panel

Public submission

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Topic 1. Sustainability of current and future forestry operations in NSW

This submission investigates the clearance of native forests and native vegetation for plantation establishment, otherwise known as forest conversion, in the state-owned plantations of New South Wales, Australia. It begins with an outline of the history of public hardwood plantations in New South Wales, and explores the regulatory frameworks that allow this practice to happen. The submission notes conversion in the hardwood plantations of northern NSW, and concludes that the current regulatory environment facilitates deforestation, with cumulative impacts at the landscape level, and that without government intervention, efforts to prevent this by non-state action, such as forest management certification, will only be partially successful, leading to ongoing habitat and species loss. The failure of existing legislative and regulatory frameworks to adequately acknowledge, define, and prohibit conversion will remain an impediment to sustainable forest management, as the entry of such timber into the market contaminates supply chains, resulting in considerable reputation risk. Reform is needed in both public and private governance systems to ensure strong governance, effective planning, and ecosystem integrity at the landscape level. Recommendations are provided. An offer to present to the panel in more detail, including methods and approaches, is extended. The materials presented below have been subjected to peer review.

The author has engaged with all parties mentioned in this submission without success in ending forest conversion and plantation expansion to date. The author expresses reservations over the integrity of this process, the panel composition, and the intent to actually deliver sustainable timber production.

The context

In NSW, three different government bodies have oversight and management of forests (Department of Primary Industries, 2022), the Forestry Corporation of NSW (FCNSW " the primary manager of native forests and plantations), the Department of Primary Industries (DPI - largely responsible for plantation oversight and authorisation), and the Environment Protection Authority (EPA " responsible for the oversight of native forests, but not plantations). FCNSW oversees more than two million hectares of state forests with the main objective of producing timber. These forests consist of over 1.8 million hectares of native, or naturally occurring, forests, as well as roughly 225,000 hectares of softwood timber plantations and around 35,000 hectares of hardwood timber plantations. The Hardwood Division (containing both native forest and hardwood plantations) and the Softwood Plantations Division are the two operating segments of the Forestry Corporation (Forestry Corporation, 2022).

The Plantations and Reafforestation Act 1999 (PRA) and the Plantations and Reafforestation (Code) Regulation 2001, as well as their amendments; the Plantations and Reafforestation Amendment Bill (2010) and the Plantations and Reafforestation (Code) Amendment Regulation 2010 govern the plantation industry in NSW. The PRA and Code are the two most significant legal documents governing plantation forestry in NSW and govern all plantations, whether they are on public or private lands, and were created to establish an expedited approval process (Prest, 2011). The PRA repealed and replaced the Timber Plantations (Harvest Guarantee) Act 1995 (NSW

Government, 1999). The Act is administered by DPI Forestry, resulting in a single point of contact for plantation approvals, including establishment, management, and harvesting activities (NSW Department of Primary Industries, 2019). According to the Act a plantation is an area of land on which the predominant number of trees or shrubs forming, or expected to form, the canopy are trees or shrubs that have been planted (whether by sowing seed or otherwise)(NSW Government, 1999). The Act further confirms this statement by adding that a natural forest is not a plantation for the purposes of this Act but continues immediately with the caveat that an area is not a natural forest merely because it contains some native trees or shrubs that have not been planted (NSW Government, 1999). In Tasmania, by way of contrast, the definition is far more explicit, referring to a plantation as being established by the planting of seedlings or cuttings of trees selected for their wood producing properties and managed intensively for the purposes of future timber harvesting and noting that native vegetation remnants and paddock trees occurring within a plantation should be mapped separately
(Kitchener and Harris, 2017).

The PRA has no specific prohibition of the conversion of native forest, or native vegetation, to plantation, and refers instead to clearing and protection of biodiversity (NSW Government, 2001). Clearing is not permitted in buffer zones of places, objects, or items of heritage significance. Native vegetation in a plantation must be retained, and includes rainforest or wetland, any native vegetation on rocky outcrops, regionally significant categories of vegetation (Government of NSW, 2022), and any grassland of high conservation value. Individual patches of woody native vegetation of more than one hectare are to be retained; smaller areas may be cleared, unless rainforest or wetland, as per the provisions of the Act and Code. Regrowth vegetation may also be cleared, if not regionally significant. Where this vegetation intrudes into plantations, it may be removed (with the permission of the Director General). The size of vegetation to be removed must not exceed ten per cent of the patch, and any removal must be duly authorised (including an on-site visit). Authorisation consists of a statement demonstrating compliance with all the relevant development standards of the Code (NSW Government, 2001), and is approved by the relevant Minister. Beyond initial stakeholder engagement, there appears to be no other regulatory obligation for public consultation (NSW Government, 1999). Any permitted clearing under the Act and Code was previously exempt from the Native Vegetation Act (NSW Government, 2003), which in turn has been replaced by the Local Land Services Act of 2013 and the Biodiversity Conservation Act of 2016. These now govern the clearance of native plants; the Act and Code were repealed on August 25, 2017, although a number of transitional arrangements now exist,(Government of NSW, 2023b) (NSW Department of Planning and Environment, 2023) and there has since been a change of government. In short, while forest regulations in NSW have relatively high levels of prescriptiveness and substantive performance thresholds compared with other international jurisdictions (Maesen and Cadman, 2015, McDermott et al., 2007), implementation remains complex, confusing and at the discretion of regulators.

The problem

As the above discussion indicates, forest managers in NSW face a number of complicating factors complying with the requirements of PRA and Code, and meeting standards of private environmental governance, if they wish to be independently certified as sustainable.

The Act defines plantations in such broad terms as to include native forest; certification schemes on the other hand proscribe the conversion of native forest to plantations and have tightened provisions in their standards to avoid the risk of conversion. An examination of the expansion of the public plantation estate in NSW demonstrates the extent to which the resource base has been, and is being expanded into areas of native vegetation. Table 1 below situates the NSW public plantation estate within the broader national context, and shows a considerable increase in hardwood plantations in NSW in recent years.

In 2000, the NSW hardwood plantations consisted of approximately 27,000 ha, with an increase of some 2,000 ha by 2016. By 2022 this area had increased considerably to over 36,000 ha. NSW public hardwood and softwood plantations of which there are approximately 225,000 ha (FCNSW, Undated) are mostly situated within what is referred to as the plantable area, which is authorised to be planted as timber plantations under the PRA, and overseen by DPI (DPI, 2023). Some areas of plantation also exist outside the plantable area. As of 2021 almost 36,000 ha, or around nine percent of the plantable area was identified as retained vegetation. There is a significant amount of the plantable area that is not identified as either plantation or retained vegetation. Since 2021 the hardwood plantation estate has expanded to over 38,0000ha at the expense of native forest, streamside reserves and previous set-aside areas.

Public regulation has been passive, indulgent, and non-responsive to non-commercial stakeholder concerns whereas private governance, especially the Forest Stewardship Council, has been active, restrictive, and responsive. What appears to have made the FSC system mores responsive is that it enables stakeholders to not only raise issues, but have them explicitly addressed although this can be slow and create opportunity costs for stakeholders (e.g. time, and financial expenditure) as a consequence. While initial attempts to use Responsible Wood formal complaint processes were unsuccessful in bringing about change, feedback from stakeholders on this matter was subsequently considered by the AFS Standards Development Committee which incorporated a tightened definition of remnant vegetation, and a revised standard was published in December 2021 (Responsible Wood, 2021). This move pre-empted the potential for significant reputational damage that could have resulted from Responsible Wood becoming isolated on this issue.

Spatial data reveals an expansion of the plantation estate, and the investigations in areas such as Conglomerate SF reveal the removal of remnant forest during operations. The point to be made here is not that the Conglomerate operation was illegal, although some aspects were non-compliant with the harvest plan, but that neither the PRA or Code was able to prevent the loss of original forest. The conversion of natural forests to tree crops and associated forest loss and degradation is an activity more normally associated with developing countries and is not considered compatible with sustainable development (Kartodihardjo, 2000, Nurrochmat et al., 2022).

FCNSW is certified to the Australian Forestry Standard, and has previously supplied plantation timber to companies with FSC controlled wood and chain of custody accreditation (Australia, 2020). While both schemes require legal compliance, they are not legality verification schemes, but rather sustainability certification programmes (Cadman et al., 2015). At present, the legislative and regulatory environment for plantations can provide the former, but it cannot provide the latter. The current situation in NSW allows for the legal conversion of native forest, including forest remnants, to plantation. This has implications at the landscape level, for private environmental governance systems, such as forest certification, and for public policy and legislation.

By contrast, both private governance systems have updated their standards, in response to new information about planning failures. This suggests a more responsive approach to planning, although the outcome of these changes is yet to be seen. Legislative loopholes within state forest regulation in NSW have enabled ongoing conversion of native vegetation to plantation areas, despite such practices conflicting with increasingly influential global norms on forest conversion. When such practices were initially brought to light in NSW, private regulatory processes operated by both FSC and Responsible Wood also suffered from gaps and inconsistencies in regulatory standards regarding conversion of forest remnants and had failed to identify and redress these practices through routine systems of monitoring and certification, highlighting parallel weaknesses in the stringency and enforcement capacity of private regulation (Van der Ven et al., 2018, Ruysschaert and Salles, 2014). The responsiveness of certification schemes stands in stark

contrast to the persistent unresponsiveness of the state regulatory regime to stakeholder scrutiny.

The various States of Australia have recognised the importance of native vegetation, including remnants, to a greater and lesser extent, but in most instances have developed policies and frameworks to ensure they are identified and protected (Australian and New Zealand Environment Conservation Council, 2001, Environment Australia, 2001, Land Water Resources Research Development Corporation, 2002, Lindenmayer et al., 2010, Productivity Commission, 2004, Saunders, 1987, Slee and Associates, 1998). To avoid confusion as to what constitutes a plantation, other states have introduced laws, policies and guidelines that emphasise the planting of trees as a central attribute (Kitchener and Harris, 2017, Government of Queensland, 2023, Smethurst et al., 2012, Raison et al., 2012).

New South Wales remains an outlier, however, as it permits forest areas, which in other states would be understood as native forests, to be included within the plantation estate,. The PRA, rather than addressing the protection of native vegetation by putting limits on clearing inside plantations as originally intended, makes no mention of conversion or deforestation, and instead provides a whole series of exceptional circumstances, which allow conversion to occur. Areas of less than one hectare may be cleared, larger areas may be cleared and offset, trees of minimum and maximum diameters may also be removed, native forest may be included for plantation design purposes, and so forth. By the time these exceptions are taken into consideration, few areas that are not available for plantation establishment remain.

While the (agriculture) Minister may intervene if special biodiversity values are affected, determining those values depends on regional vegetation schedules, and preclude interventions if exceptional circumstances are invoked. In a similarly problematic arrangement, the Environmental Protection Authority has a restricted role within plantations, while the Department of Primary Industry does not have commensurate powers to address the removal of native forest, other than under the provisions of the Act and Code, nor is there a formal, legally clarified role for public stakeholder consultation regarding plantation management.

In addition, to its hardwood plantations NSW has around 225,000 ha of public softwood plantations (FCNSW, Undated), and a plantable area of over 395,000 ha containing approximately 35,000 ha of hardwood plantation and 35,000 ha of retained vegetation, leaving a considerable area of native forest and native vegetation, including remnants, potentially available for conversion. In short, NSW has created for itself a spatial and definitional dilemma which threatens to impact significantly on biodiversity values, impact Australia's international reputation as a signatory to the Glasgow Declaration, and potentially affect sales of otherwise sustainable plantation timber. Without changes to the PRA and Code to bring them up to date with national and international norms, there is no guarantee native vegetation in plantations will be protected into the future. The rules governing regrowth (secondary native forest) within plantations; not defined in the Act and Code, and referred to simply as "ingrowth" by the State manager, are similarly problematic. Consequently, forest conversion will continue, as the regulatory environment allows it, as not all managers are certified.

Recently the NSW Environment Minister Penny Sharpe stated the Government of NSW supports plantation forestry, on the basis that the trees were put in the ground to be harvested but further stating the Government must be very clear about what is plantation and what is native forestry and the way in which that is managed (NSW Legislative Council Hansard, 2023). Regrettably, the current regulatory environment in the NSW plantation estate does not allow for this, but rather facilitates incremental deforestation and forest degradation, with cumulative impacts at the landscape level.

Recommendations

Consequently, the author recommends that Government of NSW investigates the public and private plantation estate of NSW to identify and map remnant native forest, other remnant native vegetation, and areas of native forest and other vegetation of high conservation value in the plantation estate to ensure they are protected. Changes to the PRA and Code are required to make it consistent with international and national definitional norms, to ensure only trees expressly planted for wood production are established and zoned for plantation.

All states need to ensure that all remnant- and high conservation value vegetation within plantations, regardless of condition or size, are recognised as having significant biodiversity value, and are not permitted to be removed or converted. The Commonwealth Government also needs to include the recognition of remnant vegetation and its conservation status and management requirements under the national Environmental Protection and Biodiversity Conservation Act and associated standards. Subsidies, grants or other incentives to encourage plantation establishment should only be provided on the condition that no native forest or forest remnants are converted within plantation boundaries and if such areas exist, they are expressly mapped and protected.

Collaboration with the States is required to ensure a nationally consistent definition of plantation which excludes native forests and native vegetation from conversion. This is particularly important for koala habitat, impacted as it has been by recent bushfires, and inconsistent planning at the municipal, state and federal levels (Schlagloth et al., 2022). With the creation of a national park for koalas on the NSW Mid North Coast a stated policy of the current government (Government of NSW, 2023a), the integrity and legitimacy of landscape governance will be central to regulating the currently conflicting interests of forestry and conservation, notably when koalas live in areas zoned both plantation and native forest. This highlights the problems of plantation definitions in NSW as well as demonstrating a lack of understanding of koala ecology, and habitat needs (Cadman and Clode, Cadman and Clode, 2023). This has national implications for koala management and related policy.

Finally, it is crucial that attention to these policy changes occurs within an overarching governance system that prioritizes the participation of multi-stakeholders in land use planning. This can facilitate better integration and consistency across actors and scales, and help ensure that the knowledge and experiences of diverse interests can be effectively channelled into governance structures and processes (Cadman, 2011). In turn, this will increase the likelihood that regulatory loopholes, inconsistencies and enforcement failures are exposed and remedied, and the legitimacy and effectiveness of the overall forest governance system bolstered (Biermann and Gupta, 2011, Bernstein and Cashore, 2004).

Without these changes, the reputation of NSW in particular, as a provider of sustainably managed plantation wood products will continue to be adversely affected: native flora and fauna will be impacted; and the nation will not be in alignment with the aspirations of the 2021 Glasgow Declaration, nor the EU deforestation regulation.

Bibliography available on request.

Topic 2. Environmental and cultural values of forests, including threatened species and Aboriginal cultural heritage values

Values well known. Timber should be sourced from areas outside natural forests, on agricultural land, and from planted sources only, and, as with other agricultural commodities, managed sustainably. There is no role for native forestry. First Nations have a sovereign right to manage cultural resources. This is not a lifeline for an unsustainable forest industry, but a cultural right and practice.

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Topic 3. Demand for timber products, particularly as relates to NSW housing, construction, mining, transport and retail

Topic 4. The future of softwood and hardwood plantations and the continuation of Private Native Forestry in helping meet timber supply needs

Timber should be sourced from areas outside natural forests, on agricultural land, and from planted sources only, and, as with other agricultural commodities, managed sustainably. There is no role for native forestry.

Topic 5. The role of State Forests in maximising the delivery of a range of environmental, economic and social outcomes and options for diverse management, including Aboriginal forest management models

State forests should be incorporated into the reserve system and managed for their broad suite of non-extractive values (water/air quality, climate mitigation, natural and cultural values).

Topic 6. Opportunities to realise carbon and biodiversity benefits and support carbon and biodiversity markets, and mitigate and adapt to climate change risks, including the greenhouse gas emission impacts of different uses of forests and assessment of climate change risks to forests

There is no role for offsets while native forests continues to be cleared, and conversion to plantations is occurring. Reservation of state forests allows for the carbon increments to be used to achieve carbon neutrality of the planted timber estate. The burning of forests for electricity generation must be halted immediately.

Koalas, Climate, Conservation, and the Community

A Case Study of the Proposed Great Koala National Park, New South Wales, Australia

Tim Cadman, Rolf Schlagloth, Flavia Santamaria, Ed Morgan, Danielle Clode, and Sean Cadman

Abstract

Koalas are one of the most globally recognized conservation species. With populations rapidly declining in core forest habitats in northern New South Wales, pressure has mounted on successive governments to create a regionwide park to protect this population from further decline. Establishing a conservation-effective national park at a landscape level in a highly fragmented area with high pressure from alternative land uses, such as forestry, agriculture, and urban development, presents considerable challenges in design. The authors explore how the exclusion of prime koala habitat from the proposed park for logging is inconsistent with koala protection, which needs to consider the integrity of the broader reserve system and be accorded the requisite status of World Heritage. A commentary on the implications from the social quality perspective is provided.

Keywords: conservation, habitat protection, hardwood plantations, koala, native forest logging, New South Wales, *Phascolarctos cinereus*

The authors acknowledge the Gumbaynggirr people on whose land the proposed park is located, and pay their respects to Elders past, present, and emerging. They also wish to recognize Dr. Leonie van der Maesen for her groundbreaking methodologies on sustainable forest management and community-based conservation in Australia. With the exception of Sean Cadman, all authors are members of the Koala History and Sustainability Research Cluster (www.khsrc.com) and acknowledge the assistance and support of other members of the group; the plantations-related research was conducted by Dr. Tim Cadman, funded by an internal grant provided by the Arts Education and Law Group of Griffith University, "Ensuring the Sustainability of Plantation Management: A Citizen Science Approach" (protocol 2022/466). Artwork: Danielle Clode.

This article is dedicated to the memory of Trevor Bailey, 10 July 1952–10 December 2023, a great friend to the koala.

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Untitled Koala I, by Danielle Clode

The koala occupies a special place in the pantheon of Australian native animals. It has been a flagship species for conservation since its near extinction from hunting in the early 1900s and internationally attracts considerable funds for conservation and welfare efforts. Extensive land-clearing, forestry operations, urban development, and bushfires, exacerbated by climate change, have led to claims that, unless drastic action is taken, the koala will become extinct in parts of its native range by 2050. Domestically, there are continuing community calls for increased and improved protection for koalas.

This article begins with a description of the animal, its physiology, population dynamics, threats, and efforts to protect it at the landscape level. Touching on the so-called "koala wars" of recent decades, the article delineates the political environment confronting koala conservation. A case study situates this discussion in the context of the proposed Great Koala National Park (GKNP) in northeast New South Wales (NSW) and explores the challenges this initiative faces in trying to balance the political, economic, social, and environmental dynamics that a park of this scale must address if the koala is to survive in the wild. The article concludes that unless all forestry activities are ended within the GKNP footprint, and the area is listed as World Heritage, conservation strategies will not protect this internationally acclaimed icon, nor its habitat.

From a social quality perspective, the plight of the koala represents in microcosm the overall sustainability challenges of the Anthropocene. Beyond simply compensating resource-extractive industries for lost revenue, the community must be included in land-use decision-making at the local level, and global efforts to decarbonize the economic system must be accelerated as a matter of urgency. Without these actions, the current trajectory of the koala—and humanity—toward extinction is likely to continue.

Koala Biology

The koala (*Phascolarctos cinereus*), the sole living representative of the family Phascolarctidae (Strahan 1995), is a popular and iconic animal, internationally recognized as a flagship for conservation (Schlagloth et al. 2018). Koalas are a widely dispersed species across much of the forested southern and eastern seaboard of Australia.

A mostly solitary species, koalas generally maintain a very low population density, with one animal per 1 ha–300 ha (Clode 2022: 129), and maintain territory through vocalization and scent marking (Gordon et al. 1991). Koalas are a slow-breeding species, living for up to fifteen to eighteen years, reaching sexual maturity at two years, and usually giving birth to one young each year (Martin and Handasyde 1991). Many of these life history traits relate to the koala's diet as a specialist *Eucalyptus* spp. folivore. Koalas are reported to feed on around eighty-one of the 910 species of eucalypts found in Australian forests (Mitchell 2015) many of which are characterized by varying levels of toxicity and nutritional value, which is processed by the koala's specialized gut (Brice et al. 2019). Individual koalas are mostly restricted to a few *Eucalyptus* species prominent in a particular habitat (Moore and Foley 2000), but they are known to eat or use a wider range of tree species including *Lophostemon*, *Allocasuarina*, *Corymbia*, and *Melaleuca* (NSW Department of Planning and Environment 2023a). Consequently, in order to manage the varying and complex balance of toxicity and nutrition, koalas require large forest areas with the requisite number of suitable feed and shelter trees (Clode 2022).

History of Koala Populations

Once widespread across the forested areas of southeastern mainland Australia, populations of this unique marsupial were reduced to fragmented and isolated remnant populations by the early nineteenth century through land clearance and fur hunting, and they were declared extinct across most of their southern range. The koala's modern range spans the forested regions of five states and territories along the southeast and east coast of Australia: from north Queensland, through New South Wales, Australian Capital Territory, Victoria, and into the southeast corner of South Australia (Phillips 1990). They currently have a somewhat patchy distribution on the eastern seaboard and in the hinterland of New South Wales and southern Queensland, with large populations in small areas descended from reintroduced individuals and remnant populations in Victoria and South Australia (Clode 2022). There are no wild koala populations in Western Australia, Tasmania, or the Northern Territory.

While Indigenous Australians historically managed their interactions with koalas through complex systems of traditional knowledge and cultural lore (e.g., Cahir et al. 2020), the relations between European colonizers and the koala have been fraught. A study undertaken for the Australian Government by the International Union for the Conservation of Nature (IUCN) Threatened Species Commission in the mid-1990s claimed that since European settlement, numbers throughout the species' range may have decreased by more than 50 percent (Maxwell et al. 1996). Subsequent studies confirmed this trend (Melzer et al. 2000), with some claiming that almost a quarter of those remaining had gone by the second decade of the new millennium (Adams-Hosking et al. 2011) and with Queensland and New South Wales populations decreasing in abundance or becoming extinct (Rhodes et al. 2011; Seabrook et al. 2011). In February 2022, the koala was listed as endangered in Queensland, New South Wales, and the Australian Capital Territory (Department of Agriculture, Water and the Environment 2022a) under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 (Department of Climate Change Energy the Environment and Water 2023a).

Threats to Koalas

Although koalas are no longer hunted for fur, and now attract valuable tourist dollars, the koala still faces many threats to its survival (Department of Agriculture, Water and the Environment 2022b). These are outlined below.

Climate Change and Bushfires

Severe drought and bushfires have caused large numbers of koala deaths in certain populations in Queensland, such as Noosa (McAlpine et al. 2006), in New South Wales,

such as Port Stephens (Matthews et al. 2016), and in South Australia (Robinson et al. 1989; Dunstan et al. 2021). These factors are ongoing and expected to increase with continuing loss and fragmentation of koala habitat and the expected worsening in climatic conditions (Department of Agriculture, Water and the Environment 2022a; Lunney et al. 2007). Koalas are highly vulnerable to bushfires, which are a common feature of Australian eucalypt forests. The increased number and intensity of wildfires (Lunney et al. 2007) and climate change (Department of Agriculture, Water and the Environment 2022b; Rhodes et al. 2015; Seabrook et al. 2011) pose significant threats to koala survival through a range of factors, including changes to habitat and rainfall, as well as by potentially altering toxicity in leaves. The bushfires of the now infamous Black Summer of 2019–2020 have been estimated to have resulted in the death or injury of over sixty thousand koalas, although determining exact numbers is difficult (Cristescu et al. 2023; Penn et al. 2000; Van Eeden et al. 2020).

Habitat Loss and Fragmentation

Habitat loss and fragmentation are two of the many anthropogenic changes greatly affecting koala populations throughout Australia (Department of Climate Change, Energy, the Environment and Water 2023a; Lunney et al. 2007). The increased edge effect caused by habitat clearing can lead to a greater risk of predation and increased exposure to heat, exacerbated by climate change (Youngentob et al. 2021a; NSW Department of Planning and Environment 2022). Such changes also increase the distance between high-use areas within koala ranges (Rus et al. 2021), which increases energy expenditure and water intake (Davies et al. 2013). The low-nutrient and high-toxicity folivorous diet of koalas provides most of the water they need; however, water availability significantly impacts koala physiology and energetic balance. Climate change presents a further potential driver for reduced water access, affecting the ability to raise young and increasing mortality (Beale et al. 2018; Youngentob et al. 2021b).

Forestry and Agriculture

The impact of logging on koalas varies, and is dependent on type, intensity, frequency, and extent (Law et al. 2022a, 2022b). Forest conversion, or the clearing of native forest and its replacement with plantation timber, significantly affects biodiversity (Ashman and Watchorn 2019). Plantation forestry itself can also have a negative impact, due to the practice of clear-felling, which involves the complete removal of forest canopy, requiring koalas to leave these areas and find suitable habitat elsewhere (Hynes et al. 2021). Conversely, plantations can also provide highly desirable habitat, and habitat connectivity to natural forests (Ashman et al. 2020), if the right mix of plantation species and mature trees is present; however, the replacement of preferred browsing trees with secondary species not palatable to koalas degrades habitat suitability (Natural Resources Commission 2022) while failure to retain forest remnants

reduces the habitat value of plantations (Kavanagh and Stanton 2012). Overuse of clear-fall forestry, notably the creation of large gaps and the subsequent replacement of cleared areas with nonpreferred browse tree species, as well as the removal of favored koala tree species in native forestry and an emphasis on encouraging the regrowth of secondary, non-favored, species, have been criticized as incompatible with koala conservation (Smith 2004). The mortality of koalas in plantations due to forestry practices has led to efforts in the NGO sector to encourage the uptake of a consistent national code of practice (Phillips et al. 2014), but to date this has been unsuccessful, and koalas continue to be killed or injured during logging (Mayers and Jeuniewic 2023).

Land-clearing for agricultural activity also results in fragmentation and loss of biodiversity as increasing global food production leads to the conversion of native vegetation to farmland. This is resulting in an overall decline of koala numbers in the rural landscape, requiring management strategies that consider varying spatial and temporal scales, and involve a wide range of stakeholders across properties and tenures (Dargan et al. 2019). Farm forestry, particularly blue gum plantations, may attract koalas, but can also result in large-scale deaths if management operations are not properly supervised (Mayers and Jeuniewic 2023).

Urban Development, Predation, and Collision

Australia's sprawling suburbs are resulting in ever-increasing peri-urban contact between human development and the natural environment. Development, which results in both habitat loss and fragmentation, has transformed areas that were previously wild into urban ecosystems, where animals such as the koala must contend with housing, roads, domestic animals, and traffic if they are to survive (Gentle et al. 2019; Hundloe et al. 2015). Koalas are naturally hunted by dingoes, large owls, eagles, and snakes, with juveniles, back-young, and their mothers being the most vulnerable, but domestic and feral animals such as the dog, fox, and cat also prey on koalas, and vehicles and roads continue to take their toll and arguably pose a much greater threat (Lunney et al. 2022; Rhodes et al. 2015).

Genetic Diversity and Disease

Populations that become isolated due to loss of habitat risk the loss of genetic diversity due to the potential of genetic bottlenecks and diseases (Department of Agriculture, Water and the Environment 2022b; Sherwin et al. 2000; Tarlinton et al. 2005). Anthropogenic stressors have a direct impact on the health of wildlife, including koalas, with the increase in common and novel disease outbreaks causing the decline of many populations (Deem et al. 2001; McAlpine 2011). In fact, loss of habitat has been associated with the spread of infectious diseases in koalas (Rhodes et al. 2017a). Disease causes stress in koalas (Santamaria et al. 2023) and stressed koalas have an increased likelihood of being further affected by illnesses, hindering their natural recovery and

well-being (Department of Environment and Heritage Protection 2023). Furthermore, management initiatives, such as translocation, which may be implemented to mitigate the effect of habitat loss, can also be responsible for both acute and chronic stress, increasing the likelihood of disease occurrence such as *Chlamydia* infection (Chipman et al. 2008; Maxwell et al. 1996; Santamaria and Schlagloth 2016; Waugh et al. 2016). *Chlamydia pecorum* is one of the bacteria causing devastating diseases in koalas, affecting the urogenital system with cystitis, endometritis, pyelonephritis, and prostatitis, as well as causing blindness and impacting the respiratory tract (Burach et al. 2014).

Historical and Contemporary Approaches to Conserving Koalas at a Landscape Level

Effective koala conservation in a highly fragmented landscape with high pressure from alternative land uses, such as forestry, agriculture, and urban development, presents considerable challenges to conservation. Previous historical efforts at koala conservation in the early twentieth century in Australia were based on the capture and translocation of wild koalas to offshore islands in order to maintain insurance populations for reintroduction onto the mainland at a later date. This approach has been successful in that there are now thriving translocated "southern" populations of koala in both Victoria and South Australia. These animals have expanded into and recolonized areas of suitable habitat. This history is largely distinct from that of the extant wild "northern" populations of southeast Queensland and northern New South Wales. It is this wild, northern NSW population that inhabits the case study area, discussed below.

An integrated landscape approach to koala conservation allows for the consideration of the management of natural resources in a more holistic and cross-sectoral manner than conventional, single-sector management approaches (Arts et al. 2017; Freeman et al. 2015; Reed et al. 2017; Sayer et al. 2013; Coffey et al. 2011). In general, these approaches recognize that landscapes have multiple ecosystems and multiple stakeholders seeking differing, and sometimes conflicting, uses of the landscape. A similar model for public land management recommendations has been successfully employed in Victoria since the 1970s (Coffey et al. 2011). These approaches seek to balance protection of the ecosystems and their function with multiple uses and values (Arts et al. 2017; Freeman et al. 2015).

Recent years have seen a greater focus on Koala Plans of Management (KPoMs), with limited success. Although KPoMs are an effort to encourage an integrated landscape approach to koala management, they are limited by existing institutional arrangements and stakeholder priorities, including centralization and development (Schlagloth et al. 2022). For example, existing arrangements recognize neither the importance of genetic diversity in koala populations nor the maintenance of landscape linkages between previously connected populations. The loss of koalas from any part

of their historical range drastically reduces the genetic diversity of surviving populations. Conservation must therefore be prioritized on the basis of the scale and intensity of the processes that threaten surviving populations (Lott et al. 2023).

Case Study: The Proposed Great Koala National Park (GKNP)

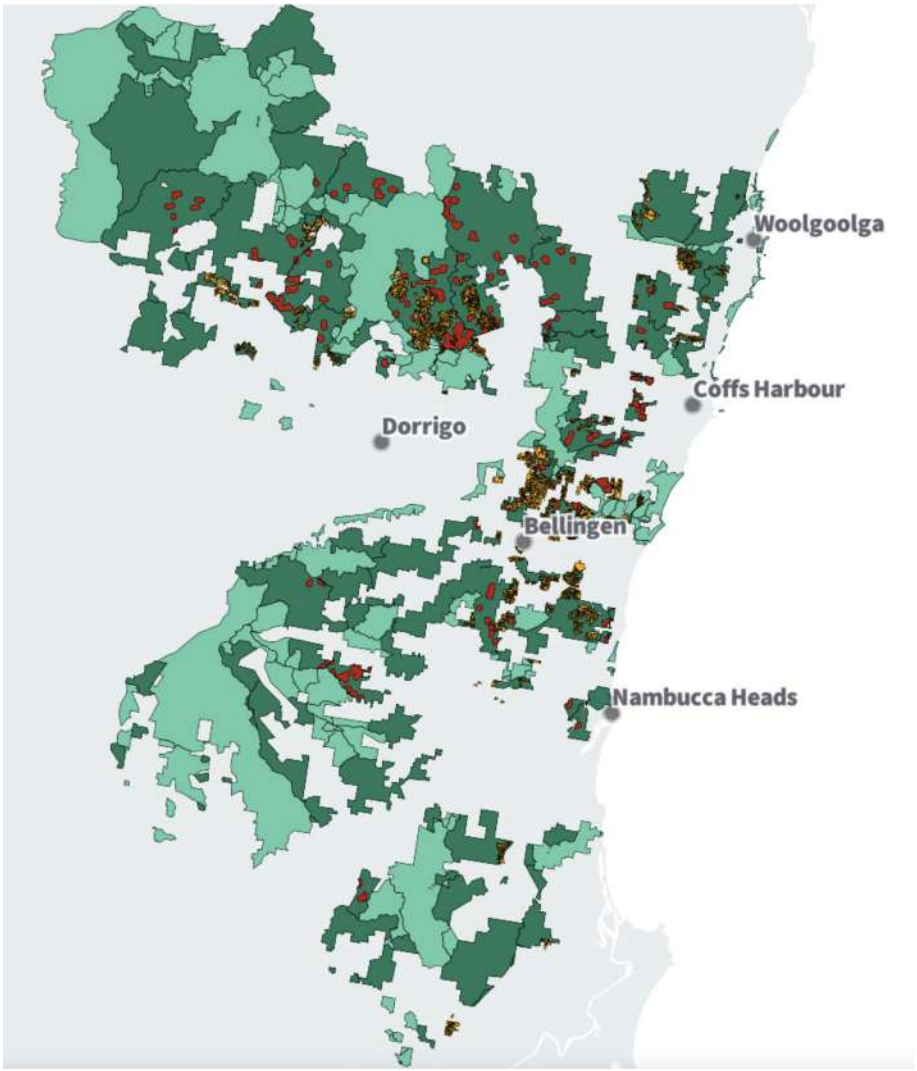

Figure 1. Great Koala National Park. OpenMapTiles, Open Street Map and contributors, Commons, public domain (Cadman and Clode 2023). Light green indicates existing national parks; dark green, state forests; red, koala hubs; yellow, plantations.

Background: The NSW Koala Wars

Koala policy in NSW in recent decades can be characterized as a series of unsuccessful attempts to balance protection with development. The Liberal–National Party (LNP) Coalition governments (2011–2023) were internally conflicted regarding natural resource management, culminating in the so-called "koala wars" between the more progressive, largely urban Liberals and their rural National counterparts (Davies 2020). While this epithet has been applied to political tensions over koala policy in other Australian jurisdictions (Haigh 2009), it is in NSW that they have been the most pronounced.

In 2016, in the face of a declining koala population, Liberal Premier Gladys Berekjiklian commissioned the state's Chief Scientist to undertake a review of policy, which resulted in a series of recommendations, notably on the need for the creation of a formal Koala Strategy to manage and mitigate threats at a landscape level, and the creation of a network of conservation areas across land tenures (O'Kane 2016). The Office of Environment and Heritage was given the task of analyzing records to map likely koala habitat as well as identifying areas of regional and local koala significance (ARKS and ALKS), also referred to as "koala hubs" (Rennison and Fisher 2017, cited in Brearley et al. 2019). The report was not made public at the time, leading to allegations that the NSW government was concerned that reservation of these areas was not "politically or industrially convenient" (National Parks Association of NSW 2018: 1), and the report was not formally published until April 2020, with minor changes (see NSW Department of Planning, Infrastructure and Environment 2020).

The Black Summer bushfires of 2019–2020 had a devastating impact on koalas and threatened species habitats, with the government permitting salvage logging operations in burnt forests, as well as in unburnt areas, and increasing logging in plantations (Cox 2020; Perkins and Foley 2020). A report arising from a parliamentary inquiry into koala populations and habitat in New South Wales found that, of the estimated 36,000 koalas extant in the wild, at least 5,000 had been lost to the fires, and the animal would become extinct in NSW before 2050 unless urgent action was taken (NSW Legislative Council 2020). Although the inquiry helped encourage the government to act on koala protection, it also brought internal differences to a head. These were focused around efforts to better protect the koala through a range of proposed changes to the State Environment Planning Policy 44 on agricultural land, the role of the Local Land Services agency and associated policy measures, and the approval of a number of KPoMs under consideration at that time. Effectively these disputes blocked progress on koala conservation (Hannam 2020). The Nationals' Deputy Premier, John Barilaro, threatened to join the cross-benches if the reforms went ahead (Davies and Cox 2020). Although Premier Berejiklian successfully called her Deputy's bluff, forcing him to back down, the hostilities recommenced under the new Premier, Dominic Perrottet, when the Nationals introduced their own, ultimately

unsuccessful, amendments to forestry laws to allow increased removal of habitat (Cox and Rose 2022; Rose and Cox 2022).

In January 2023, in the lead-up to the March elections, the NSW Australian Labor Party (ALP) (re)committed to implementing the Great Koala National Park (GKNP) if elected, pledging $80 million to cover costs of park consultation and creation (Parmeter 2023). Although this was criticized by the premier, the LNP's koala policy may be partially attributable to its defeat in the light of the numbers of independent or "teal" candidates who stood in a number of Liberal Party seats as a protest, among other environmental issues, over the government's failure to combat escalating land-clearing and habitat loss (McGowan and Rose 2023).

Origins of and Developments Regarding the GKNP

The GKNP encompasses more than 315,000 ha of public land, both national park and state forest, and is situated to the west of Coffs Harbour, 530 km north of Sydney in the Australian state of New South Wales. The region sits within the warm temperate and subtropical zones and is characterized by eucalypt forests and rainforests, which extend from the coast to the hinterland ranges. The claim that the GKNP, once gazetted, will be the first national park to protect koalas (University of Newcastle 2021) is not strictly correct. Dungirr National Park, gazetted in 1997, takes its name from the word for koala in the language of the Gumbaynggirr people (NSW National Parks and Wildlife Service n.d.), whose country extends approximately from modern-day Grafton to near Kempsey, and encompasses the footprint of the current proposed park. Other areas on the mid-north coast of NSW with known koala populations were protected during the 1990s. This included 978 ha of eucalypt plantation and native forest in and adjacent to Pine Creek State Forest in 1995, to which was added a further 3,156 ha in 2003 as a consequence of the North East Regional Forest Agreement (NSW Department of Planning, Infrastructure and Environment 2021) forming Bongil Bongil National Park.

These initiatives were largely piecemeal in nature, however. The idea for a larger regionwide park sufficient to protect koalas is said to have arisen out of a comprehensive study of the NSW north coast koala populations commissioned by local environment groups in 2012 (National Parks Association of NSW n.d.a). This examination recognized northern NSW as a koala location of national significance, and identified seven large (meta)populations and twenty-five sub-populations across six local government areas living in a broad range and quality of forest habitats, including hardwood plantations (Scotts 2013). In 2014 environmental NGOs began contemplating the GKNP concept (Bellingen Environment Centre n.d.), and by 2015, these metapopulations had been situated within a series of reserve proposals developed by the National Parks Association of NSW (NPA NSW). The largest and most comprehensive took in the Coffs Harbour–Guy Fawkes and the Bellinger–Nambucca–Macleay metapopulations, and was referred to as the Great Koala National Park, consisting of around 315,000

ha, comprising 175,000 ha of state forests and 140,000 ha of existing national parks (Love and Sweeney 2015). In the same year the NSW ALP, then in opposition, adopted the creation of the GKNP as policy (Nicholls 2015), taking the proposal to two (unsuccessful) elections, and the vision for a park remained unfulfilled.

Analysis of the data collected in the aftermath of the Black Summer bushfires indicates that around 1.6 million ha across northeast NSW were burned, including a significant amount of high-value habitat in both state forests and national parks, with approximately one-third of the proposed park affected, and as much as one-third of the population of koalas lost (Department of Climate Change, Energy, the Environment and Water 2023b; NSW Department of Environment and Planning 2022d; Perkins and Foley 2020).

Uncertainty regarding the future of the GKNP during this period, largely on account of the impacts of the fires and ongoing logging, appear to have sparked a number of smaller initiatives by local, community-based "Friends" groups, aimed at protecting parts of the larger park. A number of conservation proposals were launched, including more than 13,000 ha in the catchment forests of the Kalang, Bellinger, and Nambucca rivers, endorsed by Bellingen Shire Labor (Friends of Kalang Headwaters n.d.; Vivian 2021; Woodward 2023).

Parliamentary efforts to create a koala park in the interim also continued, with the NSW Greens introducing the Great Koala Protected Area Bill 2021 (NSW). While the boundaries of the proposed 2015 park included some plantations and excluded others, the bill explicitly ruled out plantations in the park (ibid., 3). The excision of plantations from the GKNP was endorsed by a number of environmental groups, albeit with some qualifications (Bellingen Environment Centre n.d.; National Parks Association of NSW n.d.b; Vivian 2022b). The removal of native hardwood timber from areas zoned plantation but not necessarily actual plantation, remained a source of concern, with allegations surfacing in the media and in NGO commentary that much of the forest in question had never been planted, and was in fact original forest, or secondary regrowth, and constituted important koala habitat (Pugh 2022; Vivian 2022a).

The bill, introduced in late 2021, was defeated in June 2022, unable to secure the support of either the LNP government or the Opposition. In what was condemned by the Greens as the triumph of politics over koalas (The Greens NSW 2022), NSW ALP Shadow Environment Minister Penny Sharpe justified the party's position by claiming that the bill would "put into the hands of an underfunded government department the creation of a national park that a hostile government does not want" (Fuller 2022).

The GKNP Today

On coming to power in 2023, the NSW ALP was both welcomed by environmental organizations for its commitment to creating the park and also heavily criticized for not suspending forestry operations within the proposed park. Forestry operations have continued within the proposed park since its inception, with claims that recent

activity has impacted somewhere between 10–20 percent, and have escalated due to deliberate targeting of the area, although this is disputed by the Forestry Corporation of NSW (FCNSW) (National Parks Association of NSW 2023b; O'Malley 2023a). NPA NSW again called for an end to native forest logging in the park, and a transition to plantation-based forestry (National Parks Association of NSW 2023a). Support for ongoing operations was confirmed by Minister Sharpe, although she indicated that the government had advised the state's regulatory body, the Environmental Protection Authority, to engage with the FCNSW "to encourage them to take a precautionary approach . . . in areas with highly suitable koala habitat . . . if forestry operations are necessary in these areas" (Jones 2023).

The controversy surrounding plantation forestry within the proposed park came to a head in May 2023. In response to a move by the Greens to turn a motion of support for native forest logging tabled by the National Party into an endorsement of plantation forestry, Minister Sharpe stated the government's explicit support for plantation-based operations within the park footprint and asserted that the government "must be very clear about what is plantation and what is native forestry and the way in which that is managed throughout the process of creating the great koala national park" (NSW 2023: 75).

The government's decision to allow all types of forestry operations within the park proposal over the course of negotiations prompted local residents and conservation organizations to hold a joint press conference in Parliament House, warning of the risks to koala lives and objecting, in the words of a representative of Friends of Orara East State Forest, to "the stench of dead animals that comes up after a logging operation" (Roe 2023a).

Concerns also began to be raised about the impacts of logging from within the scientific community at home and abroad (O'Malley 2023b; Vivian 2023), and in September the government moved to suspend logging in 8,400 ha of koala hubs contained within the state forests, receiving a mixed response. Some of these areas had already been logged, and they constituted a mere 5 percent of the park. With future gazettal deferred until 2025, this left more than 50 percent of known koala habitat in the area unprotected (Cox 2023). In addition, the government excluded plantations from the park assessment process, reducing the state forest to be considered for protection by 4,000 ha from the original 175,000 ha to 171,000 ha (Cadman and Clode 2023; NSW Department of Environment and Planning 2023a).

Having determined the parameters for the assessment of what was to be considered eligible for inclusion in the park, the government also announced that there would be a series of "independent" and "expert" social, economic, environmental, and cultural assessment processes, as well as three advisory panels made up of industry, community, and Aboriginal organizations (NSW Department of Environment and Planning 2023a). The rules of procedure and makeup of the panels are not public, but they are known to include "national and local conservation groups intended to represent the views of their affiliates and members" as well as "elected local government officials"

(Sharpe 2023). Local communities and "Friends" groups have not been included, leaving them to resolve their issues around ongoing logging through legal avenues and other forms of civil engagement (Williams 2023; Mackenzie 2024).

Evaluation of the GKNP at the Landscape Level

A recent synthesis of the multiple conceptualizations of landscape approaches suggests that effective, integrated landscape management rests on three pillars: ecosystem integrity, effective planning, and strong governance (Morgan et al. 2021).

Considering ecosystem integrity ensures that landscape structures and functions, and the ecosystem services they provide, are maintained (Mackey et al. 2023; Rogers et al. 2022). In this context, the exclusion of plantations from the park assessment is problematic. These plantations were established on previously cleared forested lands, and were subsequently replanted with mixed *Eucalyptus* species (*E. piluaris*, *E. grandis*, *E. microcorys*, and *E. saligna*) from the mid-1960s (Forestry Commission of NSW 1966). In some locations within the proposed park, notably Bellingen Shire, they constitute a major component of the forested landscape (see Figure 1). In some cases they are plantations in name only, and comprise silvicultural (post-logging) regrowth and original forest. While a small component of the park, they are important koala habitat due to their location, soil fertility, and moisture, but are being progressively converted to single-species monoculture. If excluded, they will continue to be available for clear-fall forestry, filling the park with holes for the foreseeable future, and severing some of the most important corridors, thereby hindering the movement of koalas across the landscape (Cadman and Clode 2023). Ongoing forestry operations scattered throughout the park severely compromise the ecological integrity of the GKNP.

Effective planning ensures that the impacts of land use changes and activities are understood and important aspects and values of the landscape are maintained into the future (Morgan et al. 2021). There is evidence that successive NSW governments have heeded the 2016 recommendations of the Chief Scientist, with the NSW Department of Environment and Planning reporting on several initiatives supporting the implementation of a Koala Strategy at a landscape level over the last eighteen months, and that they have developed strategies to enable planning for koala conservation into the future at a landscape level since then (NSW Department of Environment and Planning 2022a, 2022b, 2022c, 2023b). Data collection, availability, and quality to support these initiatives, however, have been beset by problems. Koala and other species sightings are slow to be uploaded onto governmental systems and records are missing, which casts doubt on the effectiveness of policies to protect wildlife (Roe 2023b). It should also be noted that there is no published academic literature on koala hubs, yet the concept has both policy traction and political currency. Its value may lie in the mutability of the concept, as it has been redefined on several occasions (Brearley et al. 2019; NSW Department of Planning and Environment 2023b; NSW Environment

Protection Authority 2023) and is an ongoing source of grants and consultancies (Biolink n.d.; NSW Office of Environment and Heritage 2019) via the state's Saving Our Species program and its Iconic Koala Project (NSW Department of Planning and Environment 2023c). A significant problem for GKNP planning is that much of the data underlying the proposed reservation is both incomplete and out of date, shortcomings that need to be taken into consideration in the context that a third of the park has been burned, including areas identified as hubs.

Strong governance in the forest policy and management arenas ensures that decision-making and deliberation are participatory, productive, and legitimate (Clode 2006: 70–71; Cadman 2012). Together these ensure high-integrity decision-making that considers multiple values and viewpoints and includes consideration of the ecosystems and their benefits in the landscape (Morgan et al. 2021). Including diverse interests and ensuring that they have a voice strengthens governance quality, while exclusion weakens it (Arts 2006; Kjaer 2004; Koenig-Archibugi 2006; Young 2000; Zurn and Koenig-Archibugi 2006). Inclusive and deliberative processes in environmental decision-making are important for the collective determination of what is to be valued, and how it is valued; exclusion of citizens needed for that evaluation undermines the legitimacy of any determined outcome (Vargas et al. 2017). Transparency is also important as it helps those with an interest in a given environmental issue to know and understand who is involved, as this helps shape the evaluation process, and why certain decisions have been made and for what reason (Berni 2017; Drew and Nyerges 2004). Including local knowledge makes the evidence base more accurate and provides an important mechanism for ground-truthing scientific and timber industry research, and once verified such knowledge improves the quality and accuracy of data, which cannot be achieved by species records alone. This is why other states such as Victoria formally integrate public consultation into their consultative processes (Clode 2006). Excluding local communities will lead to questions about the credibility and rigor of the GKNP consultation and its outcomes.

The Way Forward

Research has shown that protected areas increase the viability of koalas in forested landscapes (Terraube et al. 2023). Reserve design needs to focus on habitat quality but also has to take larger considerations into account, notably the threats posed by climate change, resource extraction, and predation (McAlpine et al. 2015; Reckless et al. 2018). Importantly, a broad mix of eucalypt and non-eucalypt tree species (*Angophora*, *Corymbia*, *Lophostemon*, or *Melaleuca*) is important, as is a mosaic of forest age-classes, soil types, and adjacent habitat (McAlpine et al. 2023). In short, an assessment that focuses on the forest the koala lives in, and on identifying, protecting, and restoring forest conservation values, will be critical to the integrity and viability of the park (See Figure 2).

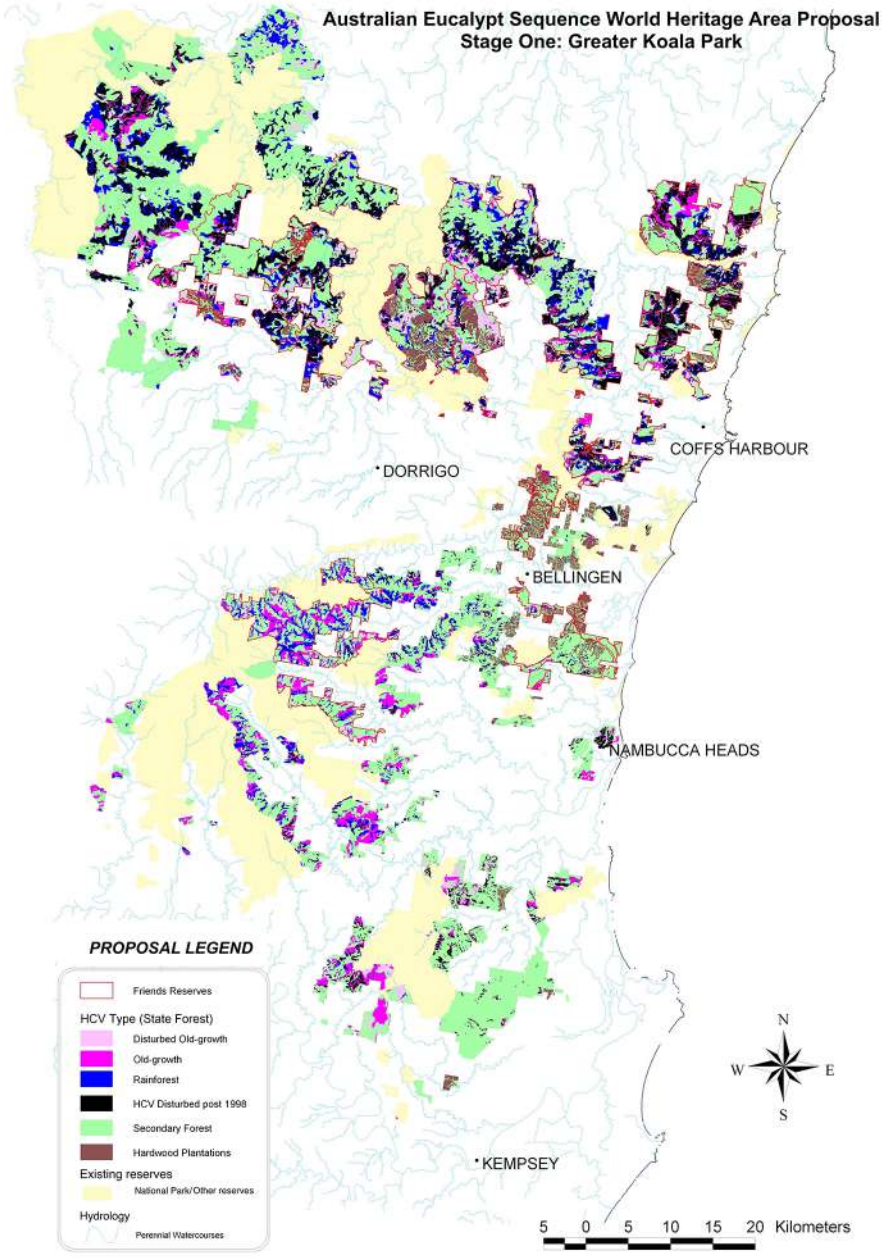

Figure 2. Map of proposed reserve, showing existing protected areas (yellow), Friends reserves (red boundaries), and conservation values within state forests. Source: NSW government data.

It is not the intention of the authors to elaborate in detail the conservation values of the state forests within the proposal footprint, except to note that: (a) a considerable area to the north, and some forests to the south, have seen those values degraded and are therefore in need of restoration; (b) the plantations straddle the entire proposal area and their excision compromises the connectivity and integrity of the park; and (c) the central section is largely undisturbed and of high conservation value and should be maintained as such, free from logging. Maintaining and restoring habitat mosaics, as well as refugia, can assist other species as well (McAlpine et al. 2015; Reckless et al. 2018). While alternative land uses can occur across a landscape, this is not an optimum approach to conservation, and research has shown that koalas survive best in large areas of high-quality habitat. Unless strategies are put in place to maintain these, the koala and other species will continue to decline (McAlpine et al. 2005).

Managing koalas is not merely a scientific process, and little attention has hitherto been paid to the social dynamics of koala conservation. In Queensland, for example, the Koala Expert Panel recognized the need "for partnership development and engagement with the broader community, utilizing an approach that is sensitive to the nature and views of local communities" (Rhodes et al. 2017b: iii). In many ways, the koala epitomizes the conflicts that can arise over competing land uses, with diverse interest groups advocating for (and against) koala protection. Greater collaboration across the natural and social sciences is required to inform policymaking (Stratford et al. 2000).

When scientific expertise is required, it is important that it is given to those sectors that need it in a way that enables them to maintain the specific roles they play, thereby contributing to sustainability. At the same time, however, political and economic players (such as government and industry) need to allow the academy to play its role, thereby balancing sociocultural and socioeconomic interests. If that science is funded, it is critical that it remains independent. It was this approach in Western Australia, for example, that led to a science-informed investigation into the sustainability of the state's forestry activities, and ultimately paved the way for a successful community and NGO campaign to end native forest logging activities (Van der Maesen and Cadman 2015).

Biological and cultural diversity are consequently interdependent, and natural and cultural heritage, it has been argued, should be considered as primary components of sustainable development (Roa 2012). The nomination and inscription of any future koala park on the list of World Heritage properties maintained by the United Nations Educational Scientific and Cultural Organization (UNESCO) may provide a greater level of national and international recognition and status than a simple national park. Visitor numbers to World Heritage-listed areas are usually higher, and they attract a greater number of international visitors and are beneficial to local interests and communities (Buckley 2004). The main body associated with evaluating World Heritage nominations, the IUCN, also "promotes a rights-based approach to conservation" and expects to "see indigenous peoples and local communities meaningfully involved in the development and implementation of laws, policies and plans when it comes

Table 1. List of the criteria for World Heritage assessment and indicative justification for nomination.

	Selection criteria	Value(s)	Eligibility	Indicative justification
(i)	to represent a masterpiece of human creative genius;	Cultural	NO	N/A
(ii)	to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning, or landscape design;	Cultural and Natural	YES	Cultural landscape managed by First Nations over millennia
(iii)	to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization that is living or that has disappeared;	Cultural	YES	Locality of First Nations creation stories and living culture relating to country
(iv)	to be an outstanding example of a type of building, architectural or technological ensemble, or landscape that illustrates (a) significant stage(s) in human history;	Cultural and Natural	YES	See (ii), (iii) above and (v), (vi) below
(v)	to be an outstanding example of a traditional human settlement, land use, or sea use that is representative of a culture (or cultures) or human interaction with the environment, especially when it has become vulnerable under the impact of irreversible change;	Cultural and Natural	YES	Locality of First Nations stories and culture relating to changes in country
(vi)	to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria);	Cultural	YES	See (ii), (iii), (iv), (v) above, notably creation stories
(vii)	to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;	Natural	YES	Several areas already listed with these values
(viii)	to be outstanding examples representing major stages of earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features;	Natural	YES	Several areas already listed due to Gondwana association
(ix)	to be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal, and marine ecosystems and communities of plants and animals;	Natural	YES	Locality for a diverse array of plants and animals, notably eucalypt species
(x)	to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation	Natural	YES	Known stronghold for endangered species, notably the koala

to designating new sites for World Heritage," which provides a strong participatory aspect to nomination (IUCN 2012). Consequently, while Word Heritage listing provides global recognition of an area as being of outstanding universal value, there is also a strong emphasis on both natural and cultural integrity (Gullino and Larcher 2013). Previous effort has been made in arguing the case for World Heritage for the unique *Eucalyptus* forests of northeastern NSW (Cerese 2012), and a nomination of various forest types, or sequences, would simultaneously capture koala habitat. Table 1 above lists assessment criteria and the rationale for nomination.

Conclusions and Recommendations

Complex, multidimensional problems require a comprehensive approach, and a positive transformation of the sociopolitical, sociocultural, socioenvironmental, and socioeconomic dimensions is required if overall sustainability is to be improved (Nijhuis and Van der Maesen 2021; Van der Maesen 2018). The overall sustainability of the approaches currently being adopted to address what might be termed the koala problematic have been limited at all levels of Australian government. In the specific context of the Great Koala National Park, an overly political focus on securing a forestry deal that appeases environmental groups and the timber industry risks losing sight of the koala and their habitat requirements. On a broader level, the complex of activities currently underway will impact both the course of those efforts and the measures and outcomes taken. The koala occupies a unique cultural position in Australia as well as internationally, and failing to take this into account may have negative political consequences, as well as a societal impact (Stratford et al. 2000; Nijhuis and Van der Maesen 2021).

An integrated approach that identifies, maps, and protects community, cultural, and natural values at the landscape level is the best way forward for the koala into the future. Consequently, an emphasis on protecting forest habitat in collaboration with the community should be the focus of any koala strategy, whether regional, in the case of the koala park, or local, in the case of municipal plans of management. Such an emphasis allows for scalability, which will be critical given expanding human populations and escalating environmental threats caused by climate change.

The NSW government has a simple choice when it comes to implementing the GKNP. It can opt for a purely state-based 'national' park, or it can aim for a reserve suitable for World Heritage nomination. In the case of the first option, it can afford to overlook the local community and exclude plantations, but risks undermining the integrity of the park and the viability of the local koala population. Alternatively, it can pursue World Heritage nomination, but this would require greater consultation and a more comprehensive assessment of the cultural and natural values of the park. Whatever decision it makes, it must concentrate on expanding, maintaining, and restoring habitat. To do anything less would be to fail to see the koala for the trees.

Untitled Koala II, by Danielle Clode

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Forest conversion and timber certification in the public plantation estate of NSW: Implications at the landscape and policy levels

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ABSTRACT

This paper investigates the clearance of native forests and native vegetation for plantation establishment, otherwise known as forest conversion, in the state-owned plantations of New South Wales, Australia. It begins by describing Australia's forests, plantations, and forest conversion, continues with an outline of the history of public hardwood plantations in New South Wales, and explores the regulatory frameworks that allow this practice to happen, and the responses adopted by non-state environmental governance systems, notably forest certification, to address this problem. The paper presents a case study analysis of conversion in the hardwood plantations of northern NSW, and concludes that the current regulatory environment facilitates deforestation, with cumulative impacts at the landscape level, and that without government intervention, efforts to prevent this by non-state action will only be partially successful, leading to ongoing habitat and species loss. The failure of existing legislative and regulatory frameworks to adequately acknowledge, define, and prohibit conversion will remain an impediment to sustainable forest management, as the entry of such timber into the market contaminates supply chains, resulting in considerable reputation risk. Reform is needed in both public and private governance systems to ensure strong governance, effective planning, and ecosystem integrity at the landscape level. Recommendations are provided for policymakers.

1. Introduction

Forests sustain a wide range of human needs and planetary systems (Fernholz and Bowyer, 2015). A number of competing land uses pose a threat to these significant ecosystems (Morgan et al., 2021). The destruction of natural ecosystems and their replacement with plantations, for such commodities as palm oil, soy beans, or pulpwood, referred to as conversion, is one of the most significant causes of global deforestation (Curtis et al., 2018). Plantation establishment is occurring at the expense of natural or semi-natural ecosystems and planted forests have in some instances become the antithesis of places for biodiversity conservation (Brockerhoff et al., 2008). This is having long-term effects on ecosystems, carbon and nitrogen cycling, biodiversity, and productivity (Wang et al., 2021). The associated loss of microbiological and chemical fertility and impacts on the sustainability of ecosystems is only set to increase as global climate warming worsens (Peng et al., 2021). World governments formally recognised the linkages between climate change and deforestation in the Glasgow Declaration, one of the signature outcomes of the twenty-sixth Conference of Parties (COP 26) to the UN Framework Convention on Climate Change (UNFCCC), committing to work together to "halt and reverse forest loss and land degradation by 2030" (UNFCCC, 2021). Deforestation has been the topic of discussion at numerous intergovernmental panels, forums and ministerial declarations even before the 1992 Rio 'Earth' Summit (Humphreys, 1996,

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Table 1
Snapshot of plantation spatial data[1] 2000–2022.

Set Number	Date	Name	Description	Projection	Area (ha)
1.	2000	hwd2_gis (hwdpln_may2k)[3]	SFNSW hardwood plantations	28356	27,125
2.	2016	AustraliasPlantations_2016	All plantations Australia[3,4]	3308	1995,526
			Softwood plantations	3308	1025,793
			Hardwood plantations	3308	918,869
			Mixed plantations, Australia	3308	11,264
	2016–2021		FCNSW hardwood plantations, NSW[5]	3308	29,735
3.	2021	FCNSWHWDPltResourceUnitt	FCNSW hardwood plantations[6]	3308	36,822
4.	2021	Plantable_Area[7]	DPI authorized plantable area	3308	395,506
	2021		FCNSW hardwood plantation inside plantable area corresponding with set number 3 above	3308	34,685
5.	2021	Retained_Vegetation[7]	DPI Retained vegetation within the plantable area	3308	35,860
6.	2022	FCNSW_Hardwood_Plantation	FCNSW hardwood plantations[8]	3308	36,427

Notes: [1]All projections and original attribute tables converted to hectares. Data generated using QGIS v3.12. Area of polygons summed from existing attribute tables using function *Show Statistical Summary*; [2]Historical dataset received May 2000 archived and exported from ArcView in 2012 as shapefiles, see acknowledgements; [3]Converted from multipart geometry to singlepart using function *Multiparts to Singlepart*. [4]Converted from projection ESPG 3577 to ESPG 3308 using function *Reproject Layer* to align with other files; [5]Calculated by retaining the hardwood part of set number 2 overlapped by 3; [6]Provided by FCNSW on request; [7]Provided by DPI on request; [8]Set number 6 contained numerous negative values for area of polygons, recalculated using Function *Field Calculator*. Sources: (2021a; Government of Australia, 2016; State Forests Of, 2000, FCNSW, 2022, DPI, 2021a, DPI, 2021b)

Fig. 1. Location map. Maps data: Google, Maxar Technologies, copyright 2023; (State Forests of NSW, 2000). [colour].

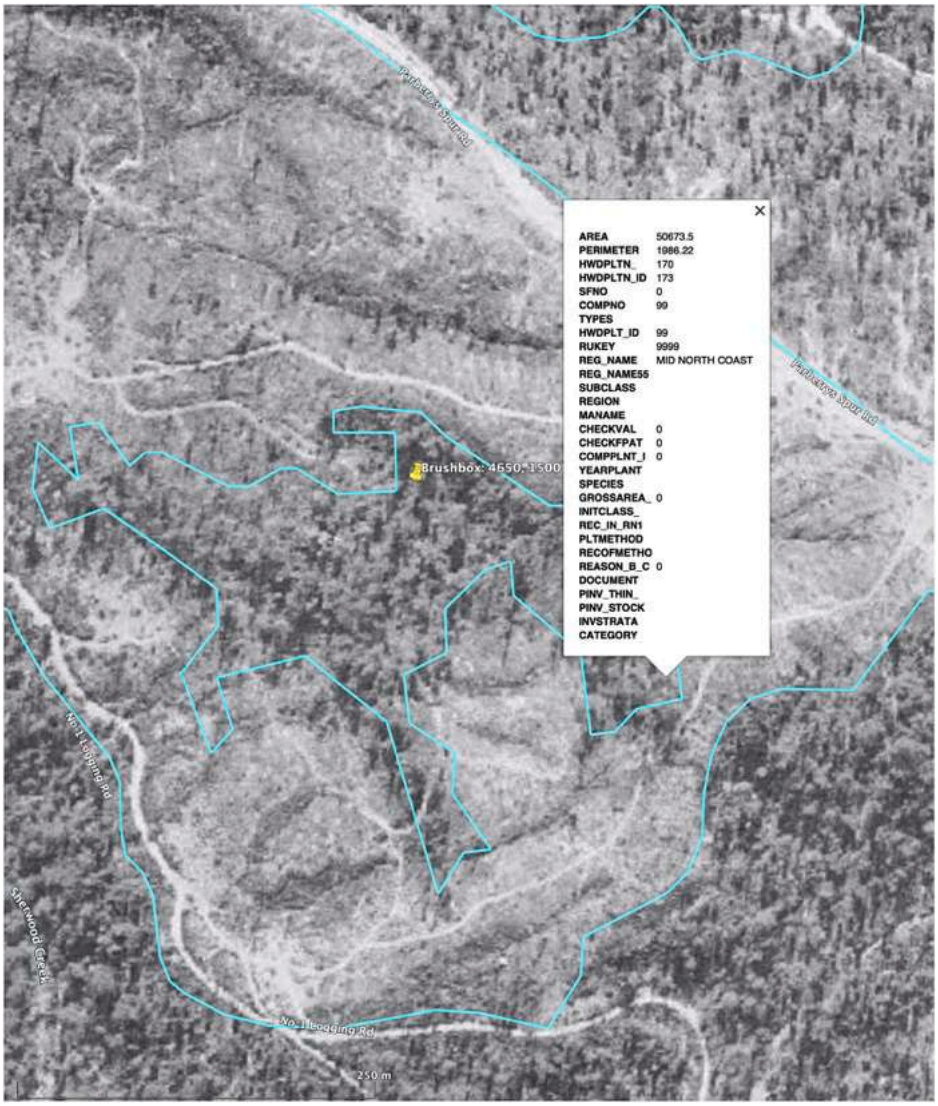

Fig. 2a. (Government of NSW, Undated, Government of NSW Spatial Services, 2023b, State Forests of NSW, 2000). Screenshot captured 13 June 2023. Maps data: Google, copyright 2017. [colour].

Humphreys, 2006). Forest loss is one of the principal factors leading to the rise of such concepts as sustainable forest management and the use of market mechanisms including timber certification and eco-labelling (Cashore et al., 2004, Cadman, 2011).

This paper explores the response of both state and non-state actors to addressing deforestation and forest conversion in the developed nation of Australia, and the state of New South Wales in particular. It uses a novel, mixed-method approach, combining policy analysis with spatial information to determine the potential outcomes of forest conversion at a landscape level. Based on this analysis, the authors find that both the public and private sectors have struggled to prevent forest loss due to contradictory legislation and inconsistent standards. If conversion is to be prevented, there is a need for both a more integrated approach to landscape management, and greater responsiveness by public and private regulators to stakeholder feedback attempting to expose and redress regulatory failings. Otherwise, incrementally, plantation management will result in the increasing loss of native forest and make efforts to implement the Glasgow Declaration unachievable. These findings have both practical policy implications for public and private forest regulators, and broader theoretical implications for ongoing scholarly debates (Gulbrandsen, 2004, Cashore et al., 2021) about the relationship between public and private regulation of the world's forests.

2. Methodology and methods

In the following sections, comprise a detailed literature review, policy evaluation and conceptual analysis of the public and private regulations, governance arrangements and classifications covering forest plantations in Australia, focussing on the State of New South Wales. This is supplemented with a detailed micro-level case study investigation of the change in the size of a native forest component within a hardwood *Eucalyptus* plantation in Conglomerate State Forest in North Eastern NSW, a process referred to as forest conversion.

Section 3 covers the material factors governing Australia's forests, plantations, and regulatory frameworks. In 3.1, forest management practices in NSW are explained in detail; in Section 3.2, legislation covering forest conversion in NSW is reviewed; and in Section 3.3 non-state measures covering forest conversion in NSW are reviewed and analysed. Both government policies and legislation and non-state measures on forest conversion in NSW were reviewed using a traditional narrative literature review approach, which synthesised and critically

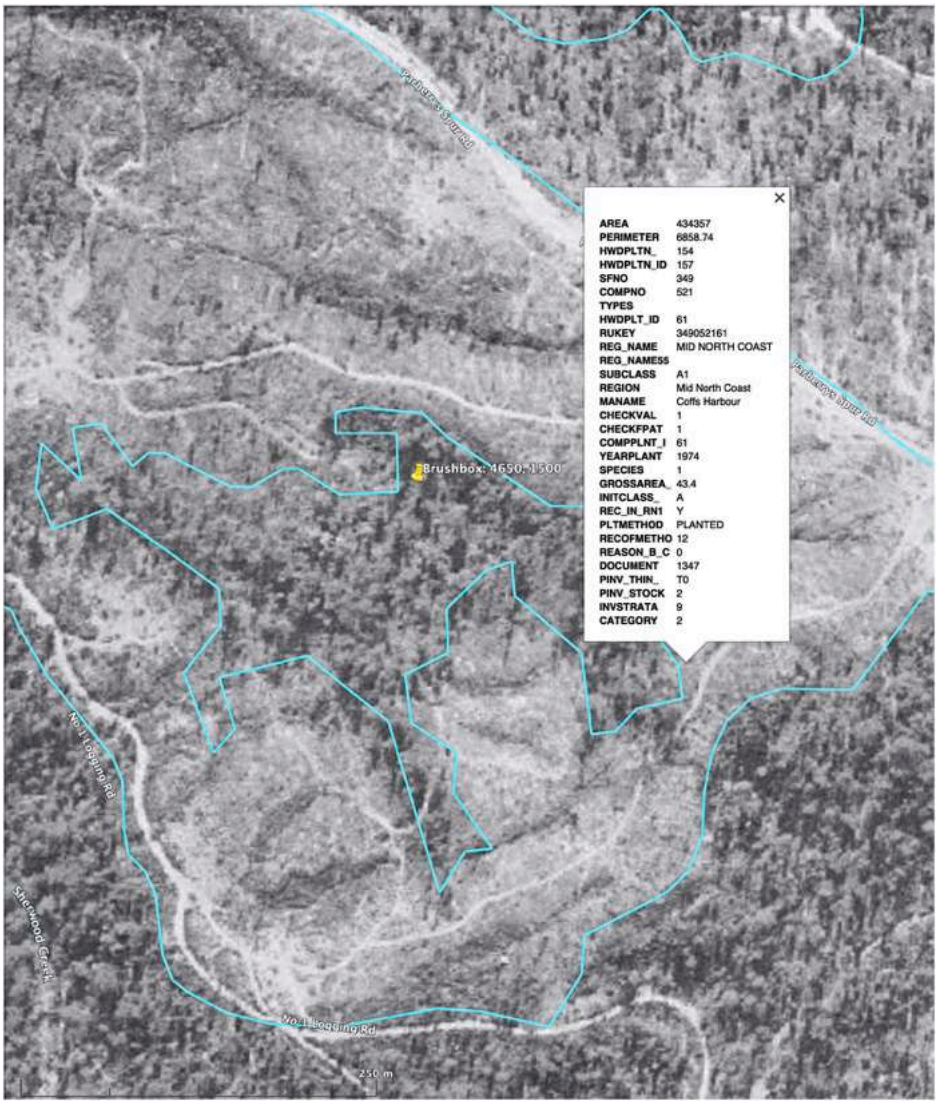

Fig. 2b. (Government of NSW, Undated, Government of NSW Spatial Services, 2023b, State Forests of NSW, 2000). Screenshot captured 13 June 2023. Maps data: Google, copyright 2017. [colour].

analysed both secondary literature and primary documents relating to existing regulatory frameworks, thereby establishing the context of this research and helping to identify gaps in existing forest management practices in NSW. Of importance in this analysis is the difference between a natural forest (native forest), planted forest (plantation), and original (remnant) forest, as this enables tracking of natural forest removals in the case study of Section 4. Section 3.4 situates the NSW public plantation estate within the broader national context, and shows a considerable increase in hardwood plantations in NSW in recent years. For this section, the forest spatial data was inspected and processed in QGIS v3.12 (2022). Summary data for area of each polygon within each layer was obtained from the attribute tables provided with the file, using the function *Show Statistical Summary*. One file was converted into a new projection using the function *Reproject Layer*. All other projections and original attribute tables were in square metres. These values were converted to hectares in the results by dividing by 10,000. Due to the large number of polygons in each layer, some further processing was required. One file was converted from multipart geometry to single-part, and all files were checked for small errors in geometries with the function *Check Validity*. Ring self-intersection errors were found in many of the polygons; however, these were corrected with the function *Fix Geometries* with little impact on the data summary. To compare the data layers, the *Intersection* function was used to measure the subset of one layer that overlapped another. To measure the summed area of the resulting polygons the *Field Calculator* and *Statistics* functions.

Section 4 is a specific spatial and ground-based, micro-level case study investigation of Conglomerate State Forest to explore the reality of forest conversion on the ground, to facilitate a broader understanding of what is occurring in the hardwood plantation sector in NSW and potentially, in the softwood plantations as well. The investigation uses a combination of historical aerial imagery (Government of NSW, Undated) and open-access geographical information systems to track land-use change over time, an approach increasingly being adopted in the social sciences for research purposes, with results comparable to commercial tools (Pinto et al., 2019, Calva et al., 2019). The historical imagery was derived from NSW Government sources and corrected (orthorectified) for latitude, longitude and elevation against data in tools employed by government agencies for their own spatial analyses and land-use decision-making (Government of NSW Spatial Services, 2023b, Government of NSW Spatial Services, 2023a, Intergovernmental Committee on Surveying and Mapping). Inclusion of this case study is important, as management prescriptions, whether public or private, are

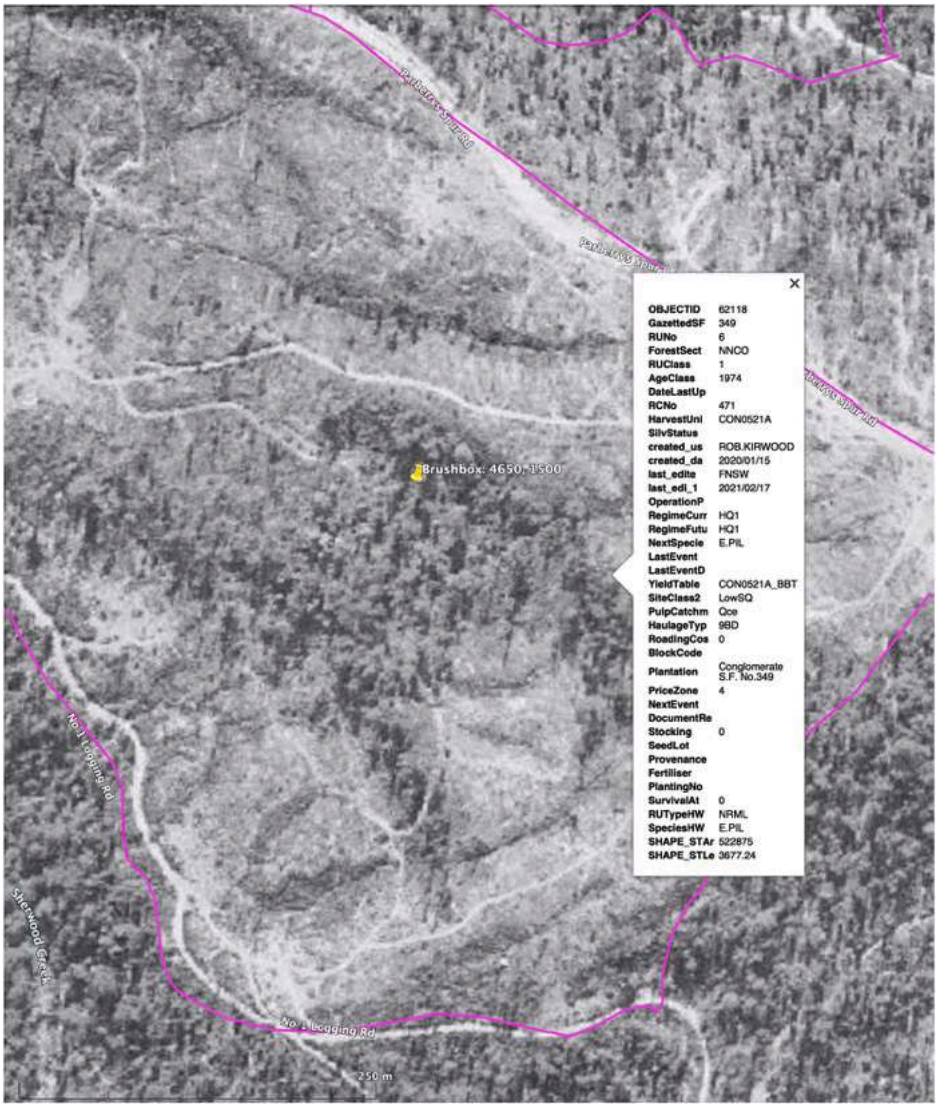

Fig. 2c. (Government of NSW, Undated, FCNSW, 2021a). Screenshot captured 13 June 2023. Maps data: Google, copyright 2017. [colour].

applied consistently across the plantation estate, and Conglomerate may therefore represent an example of forest conversion, which may be more widespread.

Section 5 continues with a discussion of the implications of the research at a landscape level (5.1), and in the private governance space of forest certification (5.2), and governmental policy and legislation (5.3).

Section 6, the final section contains a number of conclusions (6.1) and recommendations (6.2) arising from the implications outlined in the discussion.

3. Material factors governing Australia's forests, plantations, and regulatory frameworks

Australia is the nation with the seventh-largest forest area in the world, making up about 3% of all forests. Forests make up 17% of Australia's total land area or 134 million hectares (Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee, 2018). According to Australia's State of the Forests Report 2018, in Australia, Queensland has the most forest land (39% of the total), followed by the Northern Territory (18%), Western Australia (16%), and New South Wales (15%). More than 80% of Australia's native forests are made up of eucalypts and acacias, which grow well in a variety of soil types and rainfall. Commercial plantations have been developed on a large scale and are either exotic or native species planted with seedlings or saplings, and are primarily managed to produce commercial timber (mainly sawlogs, veneer logs, and pulp logs). Plantation forests are either public plantations managed as a state asset, or private plantations managed by or for landowners, and may contain both native and exotic tree species (Department of Agriculture Fisheries and Forestry, 2022).

3.1. Forests and plantations in NSW

In NSW, three different government bodies have oversight and management of forests (DPI, 2022), the Forestry Corporation of NSW (FCNSW – the primary manager of native forests and plantations), the Department of Primary Industries (DPI - largely responsible for plantation oversight and authorisation), and the Environment Protection Authority (EPA – responsible for the oversight of native forests, but not plantations). FCNSW oversees more than two million hectares of state forests with the main objective of producing timber. These forests consist of over 1.8 million hectares of native, or naturally occurring, forests, as well as roughly 225,000 ha of softwood timber plantations

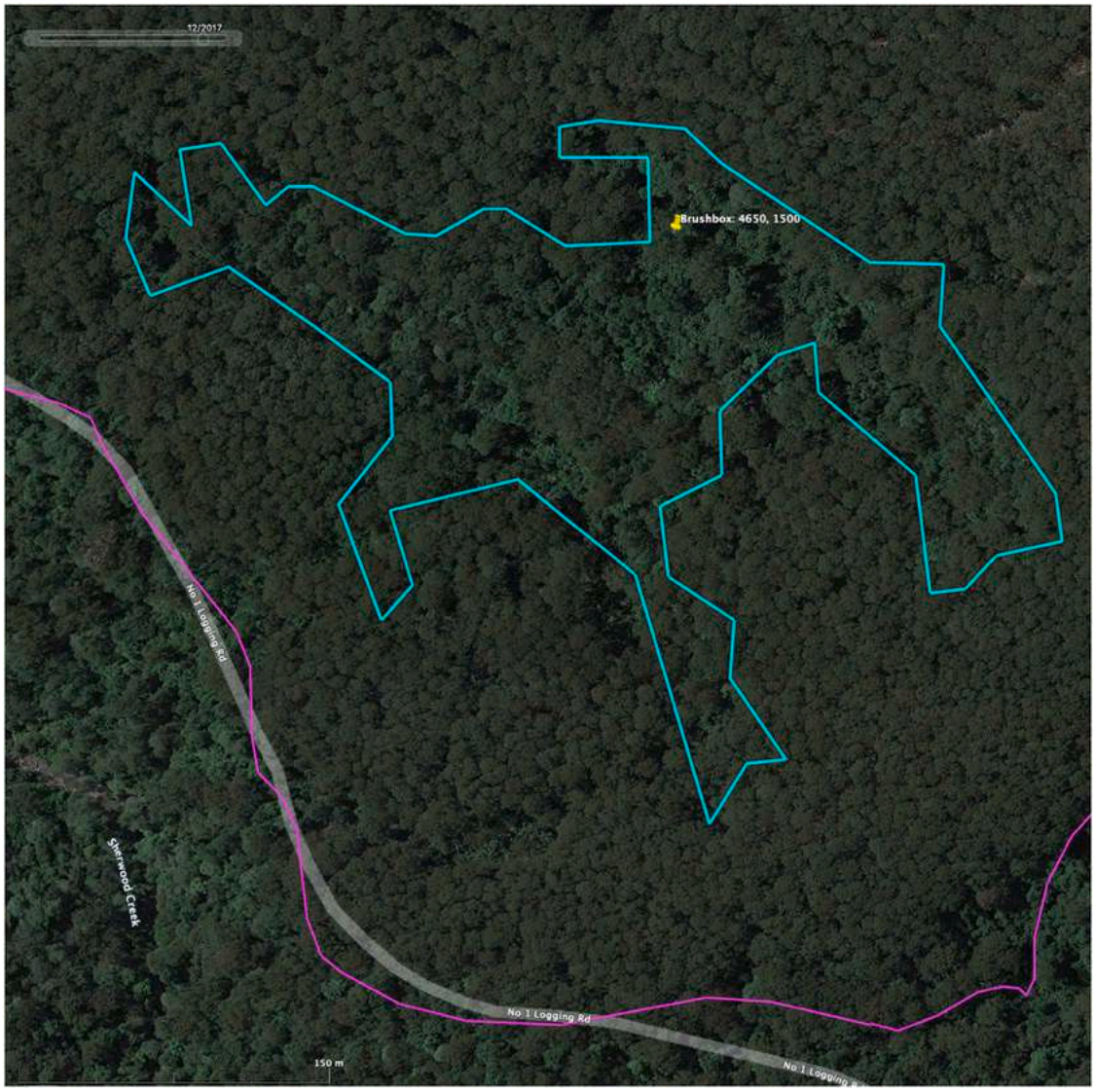

Fig. 3a. (State Forests of NSW, 2000, FCNSW, 2021a). Screenshot captured 18 November 2022. Maps data: Google, copyright 2017. [colour].

and around 35,000 ha of hardwood timber plantations. The Hardwood Division (containing both native forest and hardwood plantations) and the Softwood Plantations Division are the two operating segments of the Forestry Corporation (Forestry Corporation, 2022). The Forestry Corporation of NSW, was established in 2012 as a state-owned corporation, and has evolved over time from the Department of Forestry (1909) and the Forestry Commission of NSW (1916–1998), both government departments; State Forests of NSW (SFNSW; 1998–2004) a government trading enterprise; and Forests NSW (2004–2012), a public trading enterprise within NSW Department of Primary Industries (FCNSW, 2016).

The Plantations and Reafforestation Act 1999 (PRA) and the Plantations and Reafforestation (Code) Regulation 2001, as well as their amendments—the Plantations and Reafforestation Amendment Bill (2010) and the Plantations and Reafforestation (Code) Amendment Regulation 2010 govern the plantation industry in NSW. The PRA established the Plantation Assessment Unit (PAU) of the Department of Primary Industries as the authority for plantation approvals throughout the State (Smethurst et al., 2012a). The PRA and Code are the two most significant legal documents governing plantation forestry in NSW and govern all plantations, whether they are on public or private lands, and were created to establish an expedited approval process (Prest, 2011).

The PRA repealed and replaced the Timber Plantations (Harvest Guarantee) Act 1995 (NSW Government, 1999). The Act is administered by DPI Forestry, resulting in a single point of contact for plantation approvals, including establishment, management, and harvesting activities (NSW Department Of Primary Industries, 2019). According to the Act a plantation is "an area of land on which the predominant number of trees or shrubs forming, or expected to form, the canopy are trees or shrubs that have been planted (whether by sowing seed or otherwise)" (Government, 1999). The Act further confirms this statement by adding that "a natural forest is not a plantation for the purposes of this Act" but continues immediately with the caveat that "an area is not a natural forest merely because it contains some native trees or shrubs that have not been planted" (Government, 1999). In Tasmania, by way of contrast, the definition is far more explicit, referring to a plantation as being "established by the planting of seedlings or cuttings of trees selected for their wood producing properties and managed intensively for the purposes of future timber harvesting" and noting that "native vegetation remnants and paddock trees occurring within a plantation should be mapped separately" (Kitchener and Harris, 2017).

Fig. 3b. (State Forests of NSW, 2000, FCNSW, 2021a). Screenshot captured 18 November 2022. Maps data: Google, Maxar Technologies, copyright 2022.

3.2. *Legislation covering forest conversion in NSW*

The Plantations and Reafforestation Regulation Code, 2001 and 2010 amendment regulation outlines the minimal environmental requirements required for all authorised plantations and support the Act (NSW Department Of Primary Industries, 2019), combining other environmental laws into one procedure (Prest, 2011) (Government of NSW, 2010). Guidelines for managing native vegetation and safeguarding Aboriginal places and objects are also laid down (Prest, 2011).

The PRA has no specific prohibition of the conversion of native forest, or native vegetation, to plantation, and refers instead to clearing and protection of biodiversity (NSW Government, 2001). Clearing is not permitted in buffer zones of places, objects, or items of heritage significance. Native vegetation in a plantation must be retained, and includes rainforest or wetland, any native vegetation on rocky outcrops, regionally significant categories of vegetation (Government of NSW, 2022), and any grassland of high conservation value. Individual patches of woody native vegetation of more than one hectare are to be retained; smaller areas may be cleared, unless rainforest or wetland, as per the provisions of the Act and Code. Regrowth vegetation may also be cleared, if not regionally significant. Where this vegetation intrudes into plantations, it may be removed (with the permission of the Director General). The size of vegetation to be removed must not exceed ten per cent of the patch, and any removal must be duly authorised (including an on-site visit). Authorisation consists of a statement demonstrating compliance with all the relevant development standards of the Code (NSW Government, 2001), and is approved by the relevant Minister. Beyond initial stakeholder engagement, there appears to be no other requirement for public consultation (NSW Government, 1999). Any permitted clearing under the Act and Code was previously exempt from the Native Vegetation Act (NSW Government, 2003), which in turn has been replaced by the Local Land Services Act of 2013 and the Biodiversity Conservation Act of 2016. These now govern the clearance of native plants; the Act and Code were repealed on August 25, 2017, although a number of transitional arrangements now exist,(Government of NSW, 2023b) (NSW Department Of Planning And Environment, 2023) and there has since been a change of government. In short, while forest regulations in NSW have relatively high levels of prescriptiveness and substantive performance thresholds compared with other international jurisdictions (Maesen and Cadman, 2015, Mcdermott et al., 2007), implementation remains complex, confusing and at the discretion of regulators.

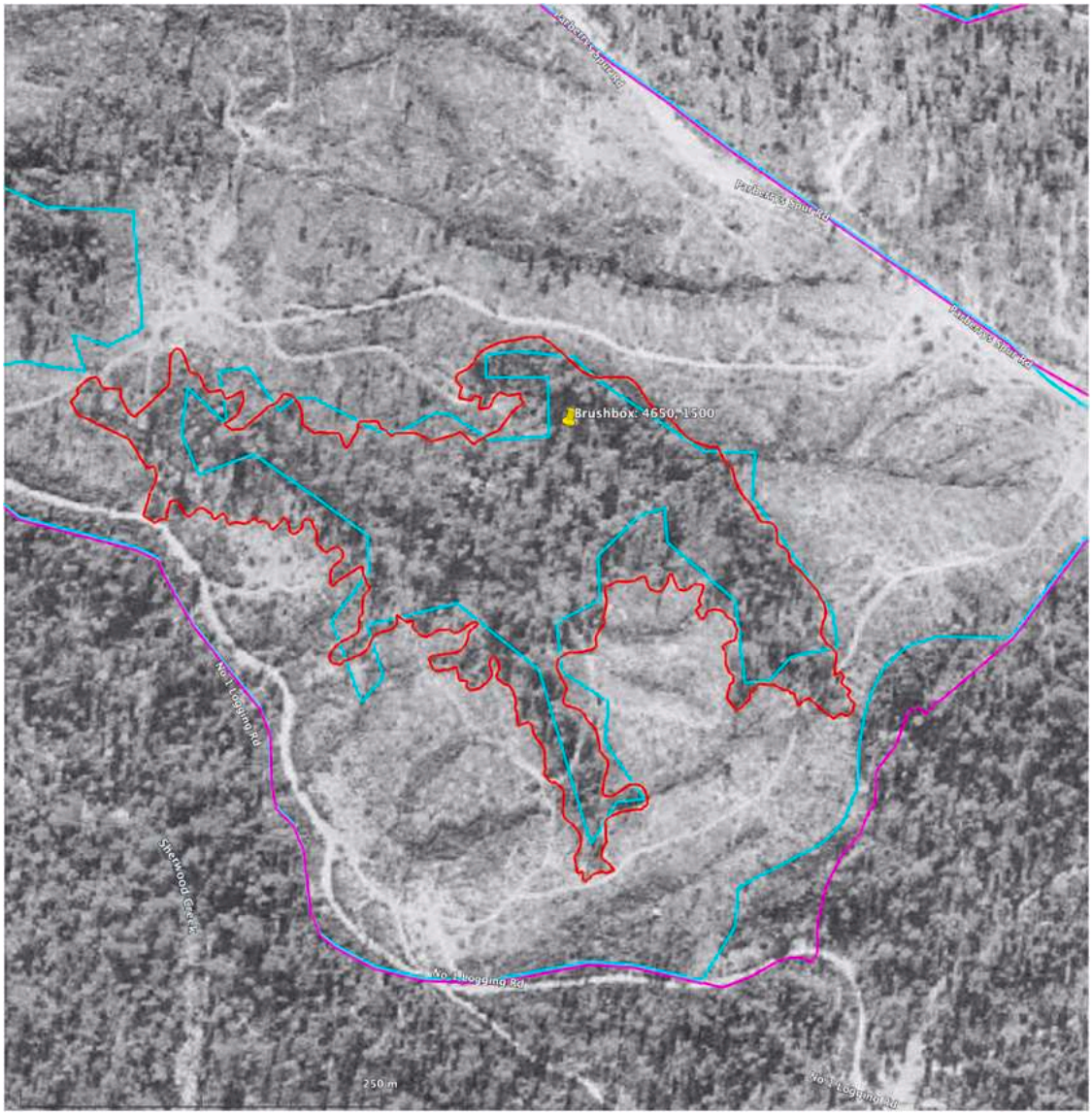

Fig. 4a. (State Forests of NSW, 2000, FCNSW, 2021a, Government of NSW, Undated, Government of NSW Spatial Services, 2023b). Screenshot captured 14 June 2023. Maps data: Google, copyright 2017. [colour].

3.3. *Non-state measures covering forest conversion*

Non-state market driven systems also exist, which go beyond the regulatory provisions of governmental authority, and accredit (certify) forest management under their own standards, which are aimed at encouraging forest management which is not merely legal, but is also sustainable (Cashore et al., 2004, Cadman et al., 2015). The two main forest certification schemes operating in Australia, which also have associated verification of their supply chains (known as chain of custody), are established under either the Programme for Endorsement of Forest Certification (PEFC) or the Forest Stewardship Council (FSC) (Gale et al., 2011, Gale, 2014). PEFC is delivered by Responsible Wood, the trading name of Australian Forestry Standard (AFS) Ltd. FSC is delivered through FSC Australia. As of 2022 these programmes had certified about twenty million hectares of Australian forests, including plantations and native forests, and over 440 million hectares globally – or roughly forty per cent of industrial roundwood production (Taylor, 2022).

Certification to either forest management scheme verifies that the production meets specific sustainability criteria. It also the enables the forest products to enter the supply chain as 'certified' though Chain of Custody (CoC) certification. CoC certification enables the tracking of forest products through the supply chain. The schemes do not enjoy mutual recognition. The FSC scheme also includes a Controlled Wood (CW) standard for forest management which essentially verifies that the forest products have been produced legally (Taylor and Lindenmayer, 2021). While such material may enter the supply chain, it does not carry any certification status (Cadman et al., 2015, Cadman, 2009). Likewise, the PEFC Scheme Chain of Custody recognises the legality of production and classifies non-certified material which enters the supply chain as coming from controlled sources (CS) (2020). Neither scheme allows for the conversion of native forest to plantations. In some instances, the standards associated with these schemes are more prescriptive than legislation regarding the management of forest remnants within plantations.

There are two main forest certification approaches in operation: forest management (FM) certification for managers certified under both FSC and AFS; and controlled wood (CW), under FSC, for companies in

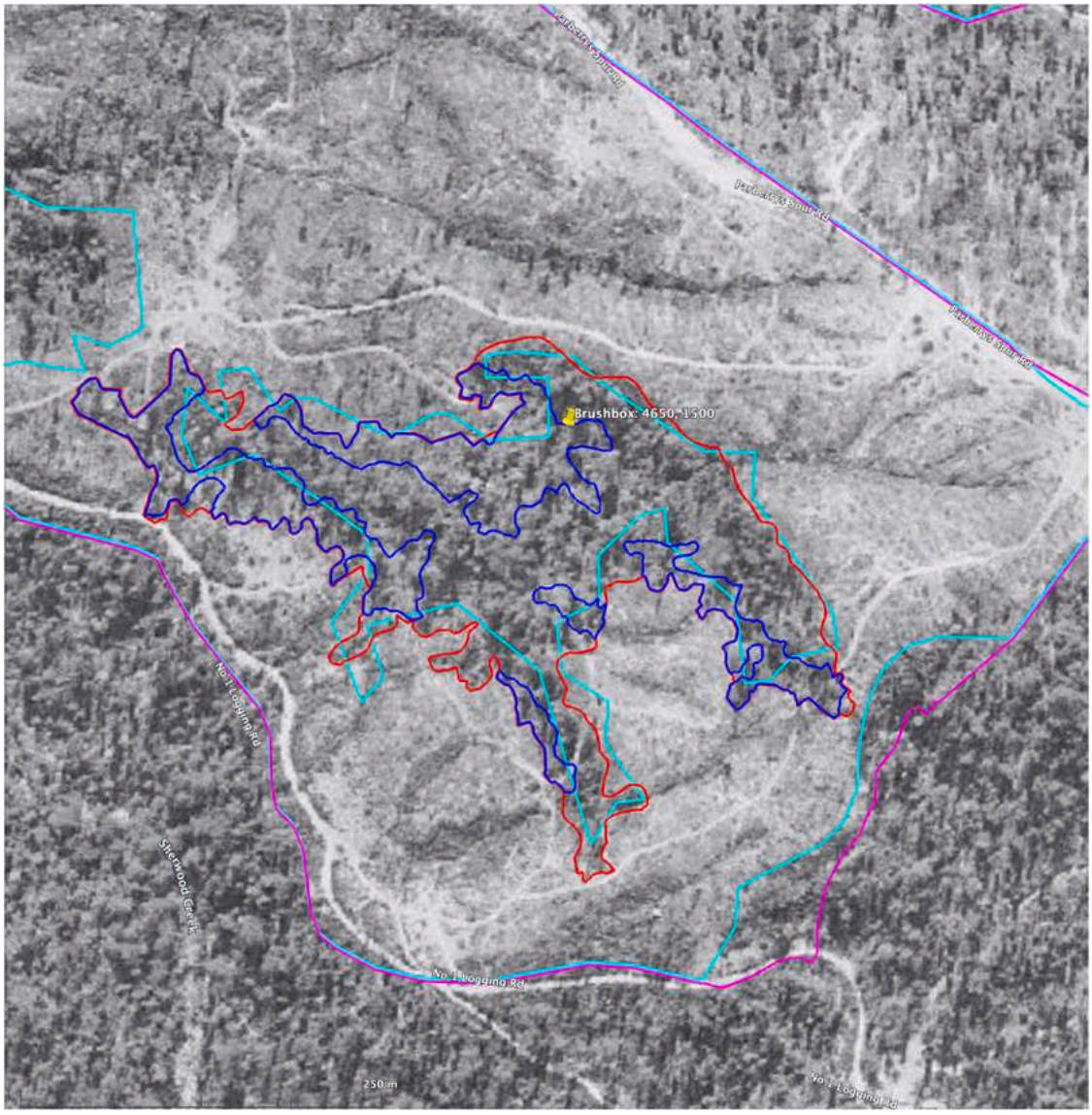

Fig. 4b. (State Forests of NSW, 2000, FCNSW, 2021a, Government of NSW, Undated, Government of NSW Spatial Services, 2023b). Screenshot captured 14 June 2023. Maps data: Google, copyright 2017. [colour].

receipt of timber from forest managers not certified under the FSC but meeting certain safeguards. This standard outlines the fundamental conditions that must be met at the forest management unit (FMU) level for forest management enterprises to show a company or independent certification body that the wood they supply is controlled. FSC CW/CoC certification enables FSC CoC certified organisations to demonstrate they have mitigated risk associated with material sourced without an FSC claim. It enables forest management businesses to demonstrate that the wood they provide has been managed to avoid wood that has been illegally harvested, harvested in violation of traditional and civil rights, harvested in forest management units where high conservation values are threatened by management activities, harvested in regions where forests are being converted to plantations or non-forest use, or harvested from forests where genetically modified trees are planted (FSC, 2006).

According to the 2013 version of the AFS conversion of native vegetation to plantations or other non-forest uses was not generally considered compatible with international norms. Initially, however, the AFS authorised the conversion of natural vegetation to plantation (AS4708(Int)-2003), but this standard this was replaced by AS4708–2007, at which point conversion was prohibited (after a cut-off date of December 31, 2006, unless it had already begun and in certain other situations). AS4708–2013 further recognised that limited conversion was permitted in certain situations. Conversion simply to expand the area accessible for plantation development was not permitted under the Standard. Significant biodiversity values (SBVs) were required to be safeguarded from conversion and clearing for non-forest uses. All natural vegetation losses required mitigation activities (offsets), and those offsets had to be long-term safeguarded. Forest managers were also obliged to show that no plantations established after that date on sites with converted native vegetation were included in the defined forest area unless they abided by the standards in effect at the time of plantation establishment operations (Australian Forestry Standard Limited, 2013). Conversion was allowed for infrastructure development, the establishment of practical plantation operational units, re-alignment of boundaries, and incorporation of new areas within the defined forest area. Conversion of an area of five per cent up to a maximum of five hectares of a single forest operation and limited to a total per annum of 5 ha or one per cent of the annual harvest area was also permitted.

A new standard AS/NZS 4708:2021 – Sustainable Forest

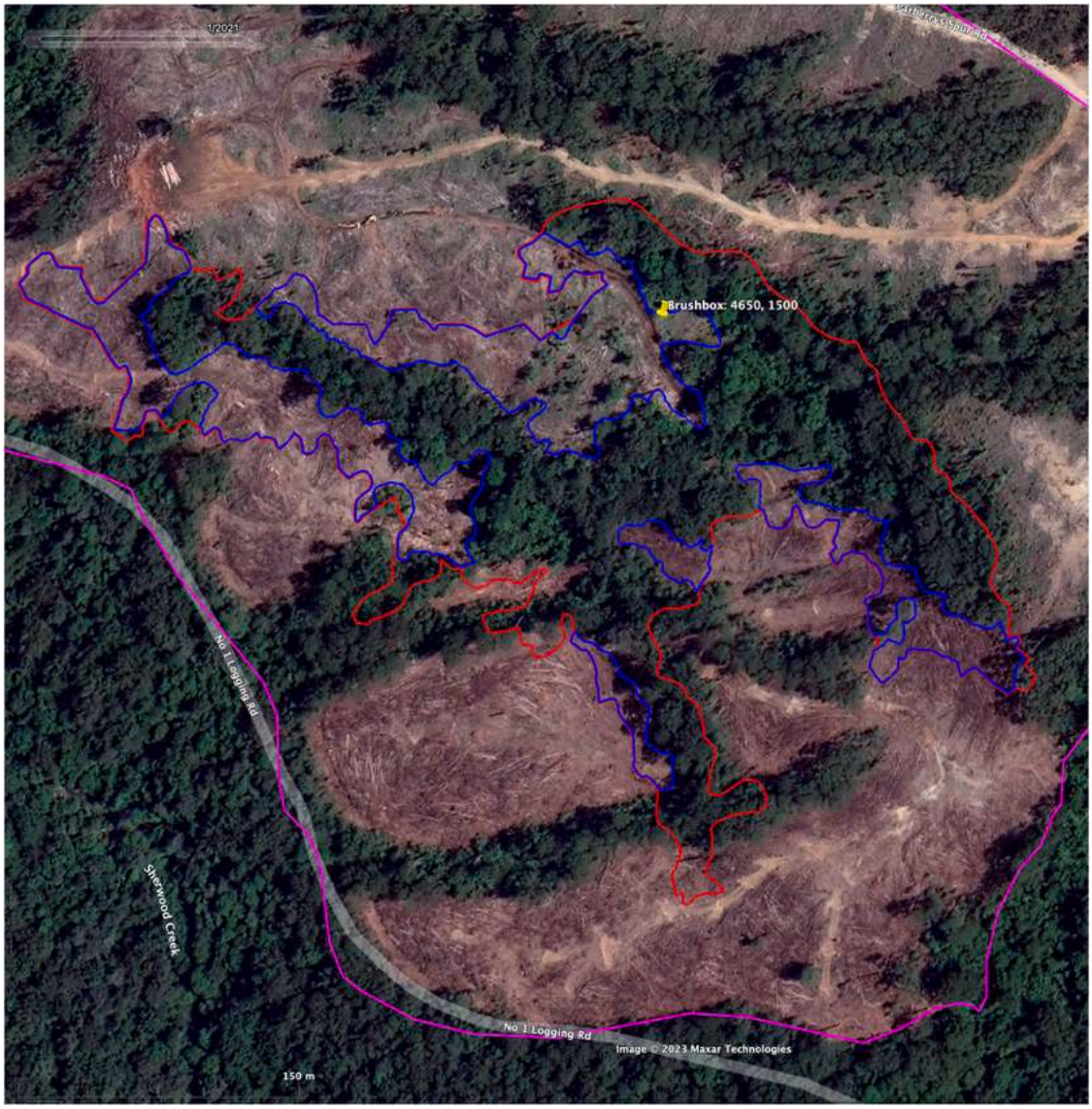

Fig. 4c. (FCNSW, 2021a). Maps data: Google, copyright 2023 Maxar Technologies. Screenshot captured 14 June 2023. [colour].

Management Principles was released in December 2021 by Responsible Wood and replaces AS 4708:2013 and NZS AS 4708:2014. This standard now serves as the foundation for the Responsible Wood sustainable forest management scheme in Australia and the PEFC sustainable forest management scheme in New Zealand (Responsible Wood, 2021a). The new standard defines remnants as "original native vegetation remaining in a landscape after the original land clearance/plantation establishment" (Responsible Wood, 2021b). Significantly, these remnants can be of any condition and size and remnants in substantially cleared landscapes and mature forest in degraded landscapes are recognised as having significant biodiversity values (SBV) in their own right. Forest managers are required to ensure remnants are preserved, improved, and restored and ecological connectivity is maintained or increased for the purposes of habitat diversity at catchment- and landscape levels. Managers must also restore habitat if forestry has impacted biological diversity (Responsible Wood, 2021b). It is worth noting that the requirements regarding the retention of remnant forest and forest conversion have changed quite significantly between the 2013 and 2021 standards. Transition arrangements have been put in place to allow companies seeking recertification to update their systems and processes, and they had until 10 March 2024 to do so (Responsible Wood, 2022).

The conversion rules applying to both FSC FM certification, Controlled Wood FM certification and Controlled Wood chain of custody certification internationally and in Australia are going through a major revision, with new indicators to become fully normative from July 1st 2023 (FSC, 2023a, FSC, 2023b). Currently, the Australian FSC National Forest Stewardship Standard contains two criteria which deal with conversion. In summary, Criterion 6.9 proscribes conversion except in extremely limited circumstances and has to demonstrate conservation benefits without damaging high conservation values. Criterion 6.10 identifies that plantations established on areas of natural forest after 1994 are not eligible for certification with a number of exceptions, the most significant of which is if evidence is provided that the organisation seeking certification was not responsible for the conversion, or that a conservation benefit can be demonstrated and only a limited portion of the management area is affected (FSC, 2018).

FSC Controlled Wood is governed under a National Risk Assessment framework (FSC Australia, 2023), a standard for forest managers (CW-FM) (FSC, 2006) and a chain of custody standard (CW-CoC) (FSC, 2017). The emphasis is on control measures being used to exclude wood arising from conversion entering the FSC system. A further safeguard with respect to conversion is provided by the FSC Policy For Association.

Fig. 5a. Screenshot, captured 22 August 2022 (FCNSW Forestry Information and Planning Unit, Undated). [colour].

There are two versions currently effective. These proscribe conversion, and have increased in stringency over time from a method which identifies what constitutes significant conversion (FSC, 2009), to one based on minimal conversion. Minimal conversion prohibits conversion of any area, regardless of size, with some minor exceptions (FSC, 2022a). In August 2022, FSC International revised the requirements around FSC's original 1994 cut-off to 31 December 2020, effective as of 1 July 2023, from which point the revised definition of minimal conversion regulated any conversion activities under the new policy (FSC, 2022b).

Remnant native vegetation specifically is protected by the policies that deal with conversion and via FSC Australia's high conservation values (HCV) framework, created for specific application to controlled wood standards (FSC Australia, 2021), as well as the national standard (FSC, 2018). The HCV framework specifically identifies and refers to remnant vegetation in cleared landscapes and mature forest in degraded landscapes as values to be maintained and enhanced (HCV 3.4); under the controlled wood system values only have to be maintained.

The status of remnant native vegetation within plantations in NSW and related issues, notably concerning koalas, has been problematic, and has impacted the credibility of certification as a market-based intervention for sustainable forest management. In 2021 FSC-affiliated investigative organisation Assurance Services International (ASI) undertook an assessment of an FSC CW certificate that covered both Northern NSW and Southern Queensland plantations, which identified the potential for conversion inside these plantations as a possible risk (ASI, 2023). This, together with the recent negative change of conservation status of the Koala from threatened to endangered by the Federal Government (Government of Australia, 2022) led to a review of the National Risk Assessment and related documents, which is currently ongoing, and include the definition of remnant vegetation, creation of definitions for levels of risk of conversion of remnants within the NRA, and the creation of control measures (FSC Australia, 2022) to manage conversion.

3.4. Case study: Expansion of NSW public hardwood plantations and forest conversion

As the above discussion indicates, forest managers in NSW face a number of complicating factors complying with the requirements of PRA and Code, and meeting standards of private environmental governance, if they wish to be independently certified as sustainable.

The Act defines plantations in such broad terms as to include native forest; certification schemes on the other hand proscribe the conversion of native forest to plantations and have tightened provisions in their standards to avoid the risk of conversion. An examination of the expansion of the public plantation estate in NSW demonstrates the extent to which the resource base has been, and is being expanded into areas of native vegetation. Table 1 below situates the NSW public plantation estate within the broader national context, and shows a considerable increase in hardwood plantations in NSW in recent years.

In 2000, the NSW hardwood plantations consisted of approximately 27,000 ha, with an increase of some 2000 ha by 2016. By 2022 this area had increased considerably to over 36,000 ha. NSW public hardwood and softwood plantations – of which there are approximately 225,000 ha

Fig. 5b. Screenshot, captured 18 November 2022 (FCNSW Forestry Information and Planning Unit, Undated). [colour].

(FCNSW, Undated-c) – are mostly situated within what is referred to as the plantable area, which is authorised to be planted as timber plantations under the PRA, and overseen by DPI (DPI, 2023). Some areas of plantation also exist outside the plantable area. As of 2021 almost 36, 000 ha, or around nine percent of the plantable area was identified as retained vegetation. As the table above indicates, there is a significant amount of the plantable area that is not identified as either plantation or retained vegetation.

4. Conglomerate state forest

Conglomerate State Forest is situated on the Mid North Coast of NSW, 560 km north east of Sydney (Fig. 1).

Conglomerate contains areas designated as native forest, managed by FCNSW, and overseen by the Environmental Protection Authority (EPA), under the NSW Coastal Integrated Forest Operations Approval process (EPA, 2023), and plantations, managed under the provisions of PRA and Code, discussed above. A harvest and haul plan for the plantations contained within compartments 18 and 22, covering a harvest area of 196.6 ha was prepared by the Hardwood Forests Division, and approved in January 2020 (FCNSW Hardwood Forests Division, 2020b). The plan is of a standard format, stating the areas in question were established between 1974 and 1983, as do other data sources (FCNSW, 2021a, FCNSW, 2023), and that the area is covered by a Responsible Wood AS4708:2013. Management prescriptions include clearfall, with some exceptions on steep slopes, as well as the retention of some native habitat trees, although there is a caveat observing that these "do not include crop trees or plantation ingrowth from native species" (FCNSW Hardwood Forests Division, 2020b). Although there is no reference to this term within the PRA and Code it is common throughout FCNSW harvest plans, and refers to non-planted trees that regenerated naturally after plantation establishment, and which are also removed during operations, if they are of a useable size (FCNSW, Undated).

The Figures below outline the history of one of the areas of remnant forest within Conglomerate State Forest, cleared 2020–2021, as an exemplar of land-use change over time.

Fig. 2a contains historical aerial photography from 1974 (Government of NSW, Undated), matched to the currently available state cadastral and imagery data (Government of NSW Spatial Services, 2023b), with the plantation boundaries from 2000 (light blue); the metadata from the 2000 internal, star-shaped, sub-unit of 5.1 ha is also displayed. There is no information to indicate the area was planted. A pin has also been added showing the location of an oversize brush box (*Lophostemon confertus*), a non-plantation tree, found in moist forest and rainforest ecotones, with a circumference at stump height of approx. 4650 mm and a diameter of 1500 mm over bark, cut during the 2020 operations (see Figure 5 below).

Fig. 2b contains the same imagery with the associated metadata from the adjacent plantation sub-unit, which indicates the area around the star-shape was planted in 1974.

Fig. 2c contains the same imagery with the plantation boundary and metadata from 2021 included. The internal sub-unit has been absorbed into the larger plantation and is no longer visible.

Fig. 3a is a screenshot of the area in question from 2017 from Google Earth Pro. The 2000 (light blue) and 2021 (magenta) plantation subunits are superimposed. Note the size of the trees, and the diversity of canopy

Fig. 6. Stills image, screenshot captured 19 June 2023 (Cadman, 2022). [colour].

structure and species inside and adjacent to the light-blue boundary, which indicates the area was not planted.

Fig. 3b is a screenshot of the same area from 2021, using the function *Historical Imagery* from Google Earth Pro, with the 2021 plantation and 2000 boundaries. The removal of native species within and around the original 2000 boundary is visible.

Fig. 4a is a screenshot of the same area. The historical aerial photography from 1974 has been overlaid, as have the 2000 and 2021 boundaries. The remnant vegetation of approx. 6.8 ha, has been manually delineated (red) using the function *Add Polygon* in Google Earth Pro. Note the expansion of the 2021 boundary in the south east *cf.* 2000.

Fig. 4b is a further screenshot of the same area. The historical aerial photography from 1974 has been overlaid, as have the 2000 (light blue) and 2021 (magenta) boundaries. The outline of the original extent of remnant vegetation has been retained (red), and the areas of vegetation cleared (dark blue) have been added.

Fig. 4c is a screenshot of the same area from 2021, using the function *Historical Imagery* from Google Earth Pro. The original extent of remnant vegetation (red) and the cleared areas (dark blue) have been delineated over the imagery. The removal of original vegetation is clearly visible.

Fig. 5a is a screenshot of the Defined Forest Area (DFA), used for identifying forest management zones, for the purposes of certification under the Australian Forestry Standard (FCNSW, Undated-b), captured shortly before the expiry of FCNSW's certification against the 2013 standard (BSI, 2022). The remnant forest is zoned Northern Coastal Hardwood (i.e. native forest).

Fig. 5b, a screenshot of the DFA taken three months later, has the whole area zoned as plantation and the remnant has been removed. Both Figs. 4a and 4b were captured after operations were completed.

Fig. 6 shows the stump of a brush box that was cut inside the boundary of the 2000 plantation sub-unit and within the footprint of the remnant forest as it existed in 1974. The tree was over the size of 140 cm diameter at stump height over bark, requiring retention as a giant tree (NSW Environment Protection Authority, 2020). An investigation undertaken by FCNSW led to the conclusion it "was clearly not a planted tree" and its removal was not compliant with the prescriptions of the harvest plan (FCNSW, 2021b).

Fig. 7 is a partial screenshot of the Conglomerate plantation Harvest Plan Operational Map (HPOM), showing the area in question (south of Parberrys Spur Road, and below 22/2 Rd), and the management prescription (clearfall blackbutt).

Fig. 8 is a screenshot of the same area from 2023, using the function *Historical Imagery* from Google Earth Pro. The original extent of remnant vegetation (red) and the cleared areas (dark blue) have been delineated over the imagery. The ongoing removal of original vegetation during site preparation for conversion to plantation, in the form of piled windrows of native vegetation, is clearly visible.

Fig. 9 A composite of two stills images showing the plantation seedlings waiting to be planted, and being planted – the final stage in forest conversion.

5. Discussion: Implications of the research

Public regulation has been passive, indulgent, and non-responsive to non-commercial stakeholder concerns whereas private governance, especially FSC, has been active, restrictive, and responsive. What appears to have made the FSC system mores responsive is that it enables stakeholders to not only raise issues, but have them explicitly addressed – although this can be slow and create opportunity costs for stakeholders (e.g. time, and financial expenditure) as a consequence. While initial attempts to use Responsible Wood's formal complaint processes were unsuccessful in bringing about change, feedback from stakeholders on this matter was subsequently considered by the AFS Standards Development Committee which incorporated a tightened definition of remnant vegetation, and a revised standard was published in December

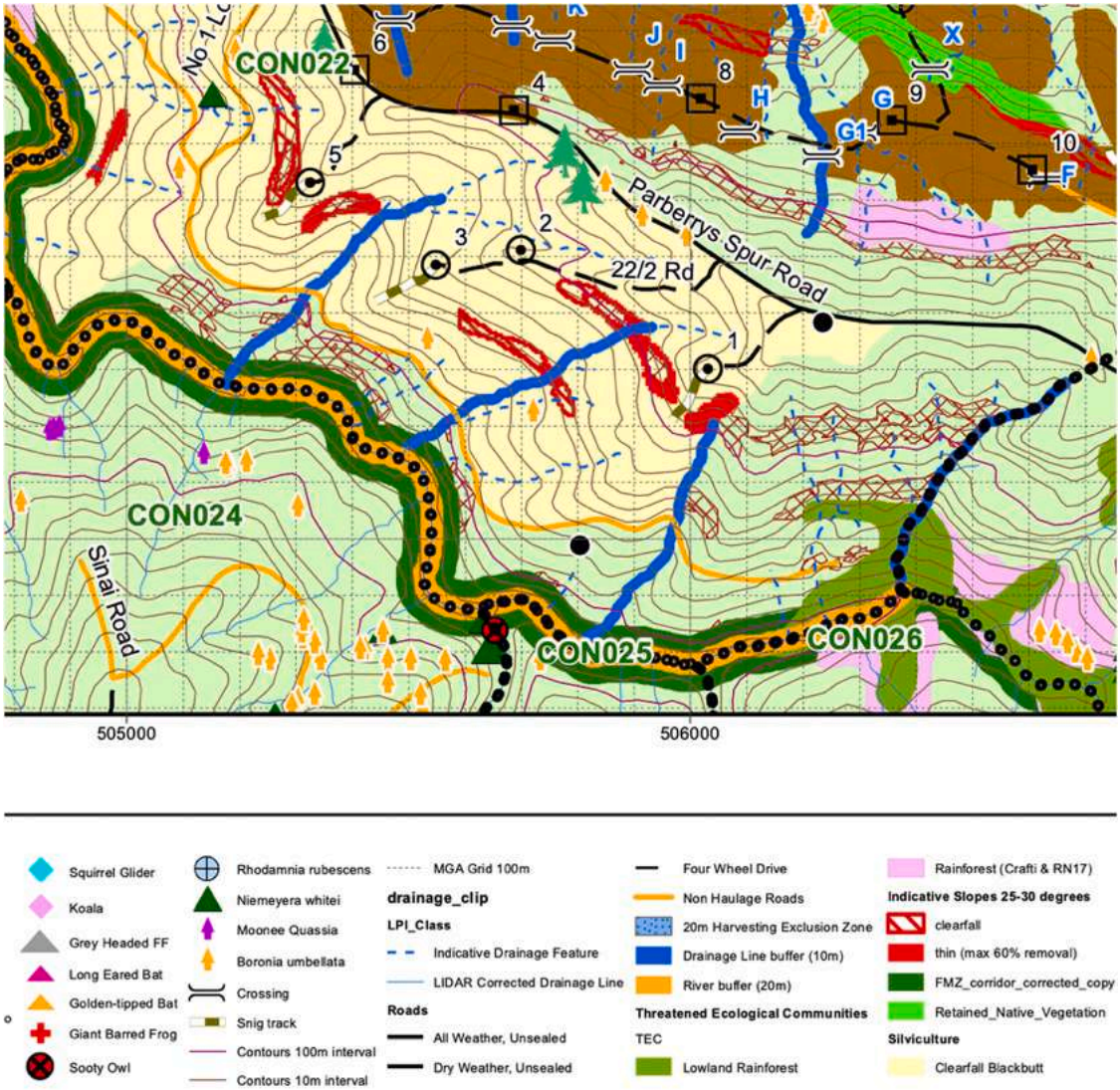

Fig. 7. Screenshot, captured 19 June 2023 (FCNSW Hardwood Forests Division, 2020a). [colour].

2021 (Responsible Wood, 2021a). This move pre-empted the potential for significant reputational damage that could have resulted from Responsible Wood becoming isolated on this issue.

Spatial data reveals an expansion of the plantation estate, and the case study demonstrates the removal of remnant forest during operations in Conglomerate. The point to be made here is not that the Conglomerate operation was illegal, although some aspects were non-compliant with the harvest plan, but that neither the PRA or Code was able to prevent the loss of original forest. The conversion of natural forests to tree crops and associated forest loss and degradation is an activity more normally associated with developing countries and is not considered compatible with sustainable development (Kartodihardjo, 2000, Nurrochmat et al., 2022).

FCNSW is certified to the Australian Forestry Standard, and has previously supplied plantation timber to companies with FSC controlled wood and chain of custody accreditation (Australia, 2020). While both schemes require legal compliance, they are not legality verification schemes, but rather sustainability certification programmes (Cadman et al., 2015). At present, the legislative and regulatory environment for plantations can provide the former, but it cannot provide the latter. The current situation in NSW allows for the legal conversion of native forest, including forest remnants, to plantation. This has implications at the landscape level, for private environmental governance systems, such as forest certification, and for public policy and legislation. These are discussed below.

5.1. Implications of research at a landscape level

Ecosystem integrity, strong governance and effective planning have been identified key principles underlying environmental sustainability at scale (Morgan et al., 2021). Current management actions in NSW hardwood plantations appear to be reducing ecosystem integrity, weakening ecosystem structures and processes, and impact ecosystem stability and adaptive capacity (Rogers et al., 2022). The loss of remnant forest results in the reduction of ecosystem integrity, effectively reducing the availability of ecosystem services, and ecosystem value (Morgan et al., 2022, Buckwell and Morgan, 2022).

Strong governance ensures that decisions are legitimate at the landscape level (Morgan et al., 2021, Cadman, 2011). Formal government regulations and legislation have failed to protect remnant areas, despite their importance. The private governance systems by contrast have shown some responsiveness. However, the voluntary nature of the standards means they are reliant on market signals to encourage changes to practices. Nonetheless, the governance structures and importance of

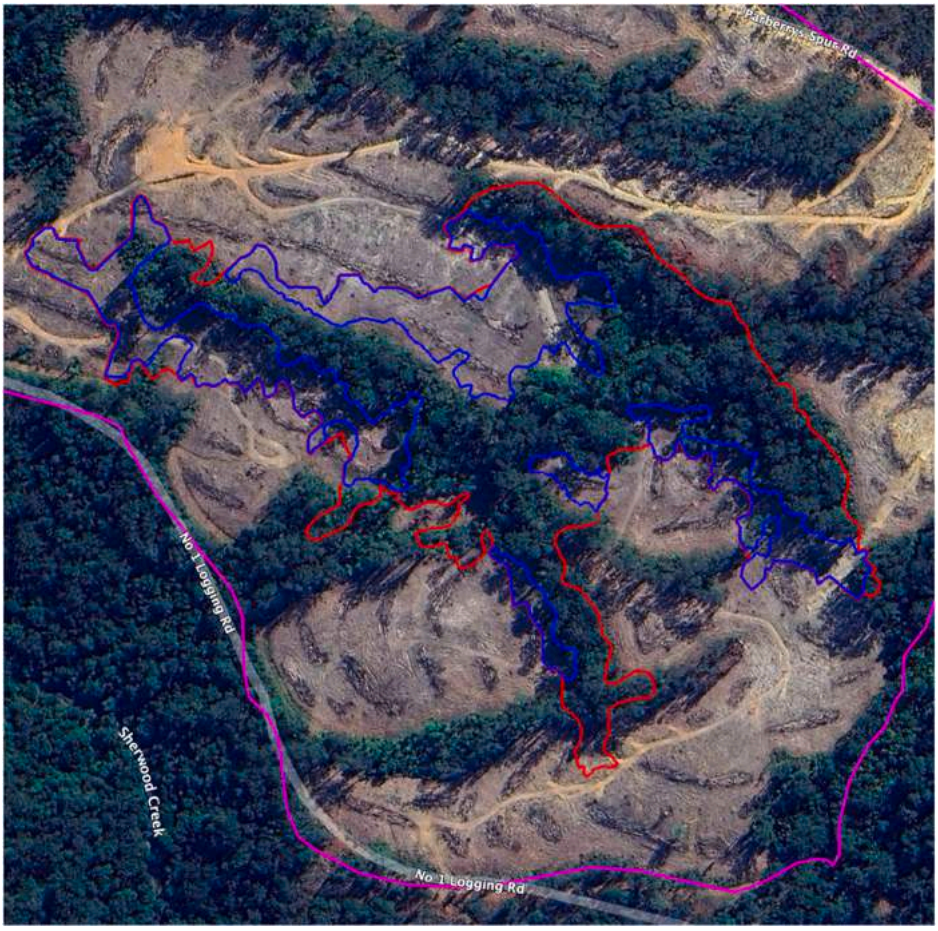

Fig. 8. (FCNSW, 2021a). Maps data: Google, copyright 2023 Airbus. Screenshot captured 10 April 2024. [colour].

voluntary bodies in creating change is clearly a key element.

The need for the integration of environmental planning into management practice ensures that decisions are both adapted to and guided by the best available knowledge (Petak, 1980, Morgan et al., 2021). The case study shows an example of how the classification of areas of natural forest change over time, resulting in an incremental loss of original forest. The reasons for these changes are unclear, but point to inconsistent planning that fails to properly account for, and value, these areas of natural forest.

By contrast, both private governance systems have updated their standards, in response to new information about planning failures. This suggests a more responsive approach to planning, although the outcome of these changes is yet to be seen, and is discussed in more detail in the next section.

Table 2 provides a comparative evaluation of governmental and voluntary approaches in the light of the discussion above.

5.2. *Implications of the research for forest certification*

Legislative loopholes within state forest regulation in NSW have enabled ongoing conversion of native vegetation to plantation areas, despite such practices conflicting with increasingly influential global norms on forest conversion. When such practices were initially brought to light in NSW, private regulatory processes operated by both FSC and Responsible Wood also suffered from gaps and inconsistencies in regulatory standards regarding conversion of forest remnants and had failed to identify and redress these practices through routine systems of monitoring and certification, highlighting parallel weaknesses in the stringency and enforcement capacity of private regulation (Van Der Ven et al., 2018 ;Ruysschaert and Salles, 2014). The responsiveness of certification schemes stands in stark contrast to the persistent unresponsiveness of the state regulatory regime to stakeholder scrutiny. Private regulatory responses to stakeholder feedback have been facilitated both by institutionalized accountability mechanisms and by more informal processes of social accountability—the relative influence of formal and informal accountability processes varying between FSC and Responsible Wood.

Formal oversight and accountability mechanisms within the private governance realm played a particularly important role in facilitating responsiveness to stakeholders in the case of the FSC. External stakeholder allegations of non-compliance with FSC controlled wood standards triggered a formal complaint to the FSC in May 2021, following a longer period of informal engagement beginning in October 2020. In response, an incident investigation was conducted by the oversight body Assurance Services International (ASI), and public release of the ASI findings in November 2021 helped to trigger a more systematic review and proposed revision of the FSC's national risk assessment process (ASI, 2023). Formal accountability mechanisms were supplemented by informal social accountability processes, which played a particularly important role in triggering changes to Responsible Wood standards. While initial attempts to use Responsible Wood's formal complaint processes were unsuccessful in bringing about change, the CEO of Responsible Wood intervened to expedite standards revisions incorporating a tightened definition of remnant vegetation—a revised Sustainable Forest Management principles standard being published in December 2021. This move pre-empted the potential for significant

Fig. 9. Stills image, screenshot captured 10 April 2024 (Cadman, 2024). [colour].

Table 2
Summary evaluation against the three pillars of landscape management in the case study.

Principle	Governmental legislation/ regulation	Voluntary standards
Ecosystem integrity	*Low integrity*: historical and continued loss of natural forest across landscape	*Low integrity*: historical and continued loss of natural forest across landscape
Strong governance	*Low integrity*: governance structures and processes have not resulted in changes to management	*Medium integrity*: governance structures and processes have resulted in changes to standards, but outcomes still unclear
Effective planning	*Low integrity*: failure to consistently map and zone areas of natural forest; limited response to new information	*Medium integrity*: Changes of standards in response to stakeholders, but outcomes of these changes unclear due to lack of integration with state management regimes

reputational damage that could have resulted from Responsible Wood becoming isolated on this issue.

Such dynamics resonate with governance interactions documented in other national and transnational contexts, whereby interactions between social accountability processes, private certifications and state regulation have contributed to strengthening regulatory standards (Auld and Gulbrandsen, 2010, Bartley, 2011, Gulbrandsen, 2014). Such work has further shown that attention in forest governance to procedural dimensions of legitimacy such as transparency and stakeholder inclusion can also contribute to managing persistent conflicts over plantations in processes of forest governance (Lacey et al., 2016, Johansson, 2012, Johansson, 2014).

Analysts of private governance have often highlighted the risk of competition between private schemes inducing weakened regulatory standards (Overdevest and Zeitlin, 2014, Cashore et al., 2007, Gulbrandsen, 2005). In this case, however, it appears interactions between the FSC and Responsible Wood may have helped leverage stronger outcomes in both systems, partly due to the need for action in the context of the legislative environment: while forest conversion is technically legal under PRA, it is not sustainable. While private regulatory schemes remain flawed in important ways, their vulnerability to public perceptions and evolving global norms proscribing conversion of native forest to plantations has proven an important driver of regulatory change. Rather than being empty, decoy, institutions (Dimitrov, 2005), private governance systems can thus provide crucial channels for stakeholder input to shape regulatory change (Gulbrandsen, 2014, Eberlein et al., 2014) in ways that complement state regulatory processes that themselves remain deeply flawed.

5.3. Implications for public policy and legislation

The various States of Australia have recognised the importance of native vegetation, including remnants, to a greater and lesser extent, but in most instances have developed policies and frameworks to ensure they are identified and protected (Australian And New Zealand Environment Conservation Council, 2001, Environment Australia, 2001, Land Water Resources Research Development Corporation, 2002, Lindenmayer et al., 2010, Productivity Commission, 2004, Saunders, 1987, Slee and Associates, 1998). To avoid confusion as to what constitutes a plantation, other states have introduced laws, policies and guidelines that emphasise the planting of trees as a central attribute (Kitchener and Harris, 2017, Government of Queensland, 2023, Smethurst et al., 2012b, Raison et al., 2012). The Food and Agriculture Organisation (FAO) makes a distinction between forests (in this paper, in an Australian

context, called native forests) and planted forests (FAO, Undated). The Australian Government reports forest statistics to the FAO as part of the Global Forest Resources Assessment (FAO, 2024) which uses these FAO definitions. Also, the new EU regulation on deforestation and forest degradation (EUDR) includes a definition on the degree to which a forest is naturally regenerating or planted (European Union, 2023). Nevertheless, ambiguities remain in the legislative frameworks of other states, and further research is required to determine if there is a broader problem beyond NSW.

New South Wales remains an outlier, however, as it permits forest areas, which in other states would be understood as native forests, to be included within the plantation estate, as the Conglomerate case study shows. The PRA, rather than addressing the protection of native vegetation by putting limits on clearing inside plantations as originally intended, makes no mention of conversion or deforestation, and instead provides a whole series of exceptional circumstances, which allow conversion to occur. Areas of less than one hectare may be cleared, larger areas may be cleared and offset, trees of minimum and maximum diameters may also be removed, native forest may be included for plantation design purposes, and so forth. By the time these exceptions are taken into consideration, few areas that are not available for plantation establishment remain.

While the (agriculture) Minister may intervene if special biodiversity values are affected, determining those values depends on regional vegetation schedules, and preclude interventions if exceptional circumstances are invoked. In a similarly problematic arrangement, the Environmental Protection Authority has a restricted role within plantations, while the Department of Primary Industry does not have commensurate powers to address the removal of native forest, other than under the provisions of the Act and Code, nor is there a formal, legally clarified role for public stakeholder consultation regarding plantation management.

In addition, to its hardwood plantations NSW has around 225,000 ha of public softwood plantations (FCNSW, Undated-c), and a plantable area of over 395,000 ha containing approximately 35,000 ha of hardwood plantation and 35,000 ha of retained vegetation, leaving a considerable area of native forest and native vegetation, including remnants, potentially available for conversion. In short, NSW has created for itself a spatial and definitional dilemma which threatens to impact significantly on biodiversity values, impact Australia's international reputation as a signatory to the Glasgow Declaration, and potentially affect sales of otherwise sustainable plantation timber. Without changes to the PRA and Code to bring them up to date with national and international norms, there is no guarantee native vegetation in plantations will be protected into the future. The rules governing regrowth (secondary native forest) within plantations – not defined in the Act and Code, and referred to simply as 'ingrowth' by the State manager, are similarly problematic. Consequently, forest conversion will continue, as the regulatory environment allows it, as not all managers are certified.

It should be borne in mind that this is not a situation unique to NSW. Certification is partly a response to the lack of stringency in governmental policy, and the private sector, of necessity to maintain or gain market access has adopted certification as a non-state market-driven alternative (Schlyter et al., 2009). Conversely, governmental regulation may be more strict than voluntary approaches (Buliga and Nichiforel, 2019). It is not impossible for the state to manage conflicting interests in the forest conservation and management space across different tenures and jurisdictions by means of a different planning options for the multiple use of forest resources across the landscape (Stjernström et al., 2017). Recently the NSW Environment Minister Penny Sharpe stated the Government of NSW supports plantation forestry, on the basis that the trees were "put in the ground to be harvested", but further stating the Government "must be very clear about what is plantation and what is native forestry and the way in which that is managed" (Legislative Council, 2023). Regrettably, the current regulatory environment in the NSW plantation estate does not allow for this, but rather facilitates incremental deforestation and forest degradation, with cumulative impacts at the landscape level.

6. Conclusions and policy recommendations

6.1. Conclusions

Existing legislative, regulatory and private environmental governance frameworks will need to be updated to prohibit forest conversion, or it will remain an impediment to sustainable forest management, as the entry of such timber into the market risks contaminating supply chains, resulting in reputational impacts. Reform is needed to ensure strong governance, effective planning, and ecosystem integrity at the landscape level to avoid forest conversion, however large or small, across the landscape.

Given this situation, private systems of environmental governance, most notably timber certification, have moved relatively quickly since being alerted to this problem, and have put standards in place to ensure remnant forest and native vegetation is protected, and areas of regrowth with high conservation value (notably koala habitat) are also set aside. In the case of one certification scheme, companies in receipt of plantation timber from NSW forest managers must demonstrate what measures they have in place to ensure supply chains are not contaminated with conversion timber ('controlled wood'), while another has now mandated the protection of remnants regardless of size, or condition. As a consequence, plantation managers are relying on private certification schemes to provide international and national markets with quality assurance, and managers who are not certified, while legally compliant, are still engaging in plantation conversion, resulting in both deforestation (wholesale removal of remnants and regrowth native forests) and forest degradation (damaging forest remnants). It is important to emphasise the limitations of the research, however, notably the extent to which Conglomerate is typical of forest conversion in the plantation estate or a normative outlier. The focus on the hardwood plantations also makes it difficult to determine if similar trends might be detected in the softwood estate. Therefore, some caution is required when determining whether this is indicative of what has been occurring at a broader scale, whether in NSW, or Australia more generally.

6.2. Policy recommendations

Consequently, the authors recommend that Government of NSW investigates the public and private plantation estate of NSW to identify and map remnant native forest, other remnant native vegetation, and areas of native forest and other vegetation of high conservation value in the plantation estate to ensure they are protected. Changes to the PRA and Code are required to make it consistent with international and national definitional norms, to ensure only trees expressly planted for wood production are established and zoned for plantation.

This is not just a problem in NSW, however, and has national-level implications. Despite the fact that Australia's national policy frameworks and international commitments have for the last 30 years expressed nominal commitments to principles of forest conservation, these frameworks have been operationalised through passive approaches to management that have in practice proved permissive of ongoing conversion of forest remnants. All states need to ensure that all remnant- and high conservation value vegetation within plantations, regardless of condition or size, are recognised as having significant biodiversity value, and are not permitted to be removed or converted. The Commonwealth Government also needs to include the recognition of remnant vegetation and its conservation status and management requirements under the national Environmental Protection and Biodiversity Conservation Act and associated standards. Subsidies, grants or other incentives to encourage plantation establishment should only be provided on the condition that no native forest or forest remnants are

converted within plantation boundaries and if such areas exist, they are expressly mapped and protected. Collaboration with the States is required to ensure a nationally consistent definition of plantation which excludes native forests and native vegetation from conversion. This is particularly important for koala habitat, impacted as it has been by recent bushfires, and inconsistent planning at the municipal, state and federal levels (Schlagloth et al., 2022). With the creation of a national park for koalas on the NSW Mid North Coast a stated policy of the current government (Government of NSW, 2023b), the integrity and legitimacy of landscape governance will be central to regulating the currently conflicting interests of forestry and conservation – notably when koalas live in areas zoned both plantation and native forest. This highlights the problems of plantation definitions in NSW as well as demonstrating a lack of understanding of koala ecology, and habitat needs (Cadman and Clode, 2023). This has national implications for koala management and related policy.

Finally, it is crucial that attention to these policy changes occurs within an overarching governance system that prioritizes the participation of multi-stakeholders in land use planning. This can facilitate better integration and consistency across actors and scales, and help ensure that the knowledge and experiences of diverse interests can be effectively channelled into governance structures and processes (Cadman, 2011). In turn, this will increase the likelihood that regulatory loopholes, inconsistencies and enforcement failures are exposed and remedied, and the legitimacy and effectiveness of the overall forest governance system bolstered (Biermann and Gupta, 2011, Bernstein and Cashore, 2004).

Without these changes, the reputation of Australia, and NSW in particular, as a provider of sustainably managed plantation wood products will continue to be adversely affected: native flora and fauna will be impacted; and the nation will not be in alignment with the aspirations of the 2021 Glasgow Declaration, nor the EUDR.

In the light of this research a larger, systematic study of patches of remnant forest in NSW, and potentially across Australia, both hardwood and softwood, to confirm and extend the current study's findings, is required. The authors recommend further research is also needed to determine if forest conversion of the types outlined in this paper are occurring in other countries, which are signatories to the Glasgow Declaration and the EUDR.

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CRediT authorship contribution statement

Barber Greg: Methodology, Formal analysis, Data curation. **Upama Koju:** Methodology, Formal analysis, Data curation. **Edward Morgan:** Writing – review & editing, Writing – original draft. **Sean Cadman:** Writing – review & editing, Writing – original draft. **Sikha Karki:** Writing – review & editing, Writing – original draft. **Matthew Dell:** Methodology, Formal analysis, Data curation. **Tim Cadman:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Funding acquisition, Conceptualization. **Kate Macdonald:** Writing – review & editing, Writing – original draft.

Declaration of Competing Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Data Availability

Data will be made available on request.

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