Australian National University

Improved Avoided Clearing of Native Regrowth (ACNR) Method

Abatement Analysis

Don Butler, Andrew Macintosh, Dean Ansell and Marie Waschka

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Correspondence:

Professor Don Butler
The Australian National University
ANU Law School
Email: donald.butler@anu.edu.au

Professor Andrew Macintosh
The Australian National University
ANU Law School
Email: andrew.macintosh@anu.edu.au

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1. Introduction

Over the past decade, re-clearing of secondary forests in Australia has averaged almost 350,000 ha yr^{-1}.[1] This re-clearing results in significant greenhouse gas emissions through the loss of sequestered carbon and methane and nitrous oxide emissions associated with post-clearing biomass burning. Average direct emissions alone from re-clearing have averaged >11 million tonnes of CO_2-e over the decade to 2021-22.[2]

Despite the levels of re-clearing and abatement opportunities they present, there has been few projects registered under the Australian carbon credit units (ACCU) scheme's Avoided Clearing of Native Regrowth (ACNR) Method.[3] At the time of writing, there were only 14 registered projects, which had received 516,398 ACCUs.[4] The low levels of uptake are partly due to the overly restrictive eligibility requirements under the method.

For secondary native forests to be eligible under the ACNR method, they must have been cleared on at least two previous occasions and the project must be registered within a 7-year window based on the age of the forest at the last clearing event. These restrictive land eligibility requirements have impeded project uptake.

In order to address these barriers, a proposal has been prepared for an improved ACNR method to broaden the eligibility requirements, while managing the associated integrity risk of crediting secondary forests that were unlikely to be re-cleared in the absence of the incentive provided by the ACCU scheme (non-additionality). Under the proposed varied method, eligibility will be confined to:

- lands that have been comprehensively cleared within the last 25 years and currently support secondary native forest,
- where the landholder has the unrestricted legal freedom to comprehensively re-clear the land for agricultural purposes and where the risk of re-clearing is higher because there is limited risk of land degradation from clearing (e.g. low slope).

To help facilitate consideration of the proposal, an analysis was undertaken of the potential abatement that could be generated under the improved ACNR method. This report presents the results of this analysis. Section 2 summarises the method used to estimate abatement and ACCU generation under the proposed method. Section 3 presents the results of the

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[1] Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024) Australia's National Greenhouse Accounts, Activity tables 1990-2022 – LULUCF. Commonwealth of Australia, Canberra. Available at: https://www.greenhouseaccounts.climatechange.gov.au/ (21 June 2024).

[2] Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024) Australia's National Greenhouse Accounts, Activity tables 1990-2022 – LULUCF. Commonwealth of Australia, Canberra. Available at: https://www.greenhouseaccounts.climatechange.gov.au/ (21 June 2024).

[3] Carbon Credits (Carbon Farming Initiative—Avoided Clearing of Native Regrowth) Methodology Determination 2015.

[4] Clean Energy Regulator (2024) ERF project register. Commonwealth of Australia, Canberra. Available at: https://cer.gov.au/markets/reports-and-data/accu-project-and-contract-register?view=Projects (19 June 2024).

analysis for Queensland. Section 4 discusses the potential in other jurisdictions and provides preliminary estimates of the abatement and ACCUs that could be generated by improved ACNR projects in these jurisdictions. Section 5 provides conclusions.

2. Method summary

The analysis was undertaken in accordance with the high-level design principles for the proposed improved ACNR method, noting that this analysis preceded final decisions about how eligibility should be defined for the method EOI. For instance, the EOI proposal includes an eligibility window (in respect of past clearing events) of 8-25 years. For the analysis, it was assumed that eligible land will be confined to areas:

- that have previously been subject to human-induced conversion of native forest to a non-forest land use;
- that have native forest cover at the date of the application for project registration;
- that were comprehensively cleared for agricultural purposes 10 to 25 years prior to the date of the application for project registration;
- where the landholder has the unrestricted legal freedom to comprehensively re-clear the land for agricultural purposes; and
- where the risk of re-clearing is higher because there is limited risk of land degradation from re-clearing (i.e. low slope).

For the purposes of the analysis, it was assumed that net abatement in each reporting period would be calculated as the difference between long-term (100-year) average baseline carbon stocks and project carbon stocks at the end of the reporting period. The included carbon pools for these purposes were confined to live biomass and dead organic matter (i.e. exclude soil organic carbon). The baseline scenario in the analysis used 15-year re-clearing intervals.

In the improved ACNR method, alternative approaches could be used to calculate the net abatement amount (see Attachment E for a case study). Similarly, the ACCUs could be allocated over shorter time periods to help reduce barriers to project uptake, without sacrificing integrity. A longer eligibility window could also be used; for example, extending the window from 10-25 years to 8-25 years.[5] While there are good policy reasons for

[5] The 8-25 year eligibility window has been included in the expression of interest for the improved ACNR method. The longer eligibility window was ultimately preferred because it will promote uptake without materially affecting the risk of gaming. The rules that exclude recently cleared land are intended to address the risk of gaming, whereby landholders clear land to make it eligible under the method. Moving from an 8- to 10-year exclusion period is unlikely to materially affected this risk. Note also that the proposed 8-year exclusion period is more comprehensive and conservative that the existing approach, which allows for a shorter exclusion period (5-years) for transferred land and only applies to land that is deforested (the exclusion under the proposed improved ACNR method applies to the clearing of native vegetation, regardless of whether it meets the thresholds for deforestation).

adopting these approaches, the analysis adopted a simplified approach that is similar to the arrangements in the existing ACNR method.

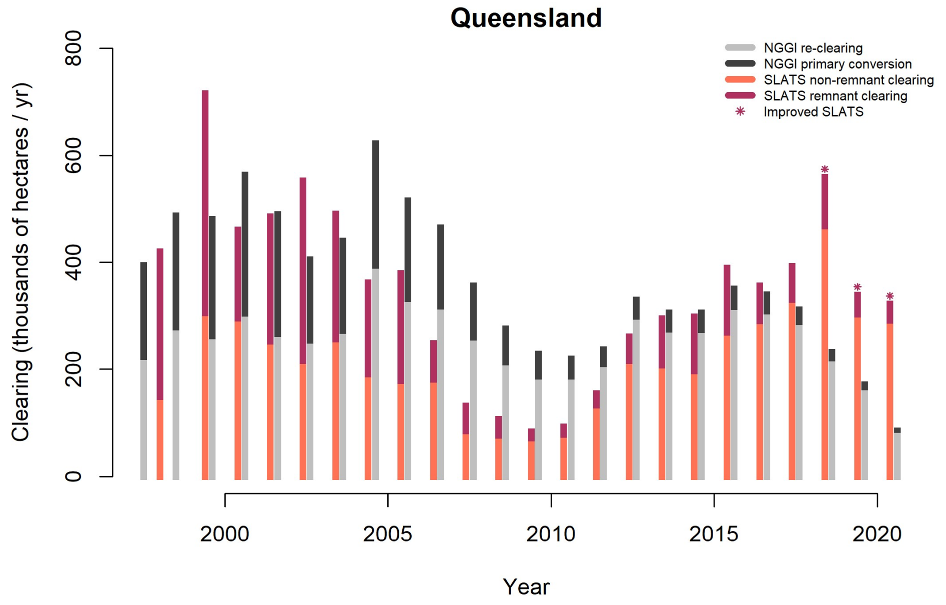
The concept of avoided regrowth clearing, as outlined above, can be applied in all Australian states and territories. However, the majority of the opportunity lies in Queensland and New South Wales because those jurisdictions have the most regrowth forest on land that has been cleared within the last 20-25 years. Data from the National Greenhouse Accounts support this, showing that, over the past 5- and 10-years, Queensland and New South Wales have accounted for approximately 66-67% and 17-18% respectively of total national secondary forest clearing (Table 1).

Table 1. Average annual secondary forest re-clearing, 2017-18 to 2021-22, and 2012-13 to 2021-22, and proportion of national total ('000 ha yr^{-1})

	5-year average annual forest re-clearing	% of total	10-year average annual forest re-clearing	% of total
QLD	190.0	66%	231.4	67%
NSW	52.5	18%	57.8	17%
WA	15.6	5%	20.7	6%
VIC	13.2	5%	16.6	5%
SA	7.0	2%	9.9	3%
TAS	4.5	2%	5.0	1%
NT	3.5	1%	4.7	1%
ACT	0.1	0%	0.1	0%
Total	**286.4**	**100%**	**346.3**	**100%**

Source: Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024) Australia's National Greenhouse Accounts, Activity tables 1990-2022 – LULUCF. Commonwealth of Australia, Canberra. Available at: https://www.greenhouseaccounts.climatechange.gov.au/ (21 June 2024).

Both Queensland and New South Wales have established Statewide Landcover and Tree Study Programs (SLATS) that track the clearing of woody vegetation in their jurisdictions. Figure 1 shows overall woody vegetation clearing rates for New South Wales and Queensland from the SLATS programs, alongside deforestation data (split between primary conversion and re-clearing) from the National Greenhouse Accounts.



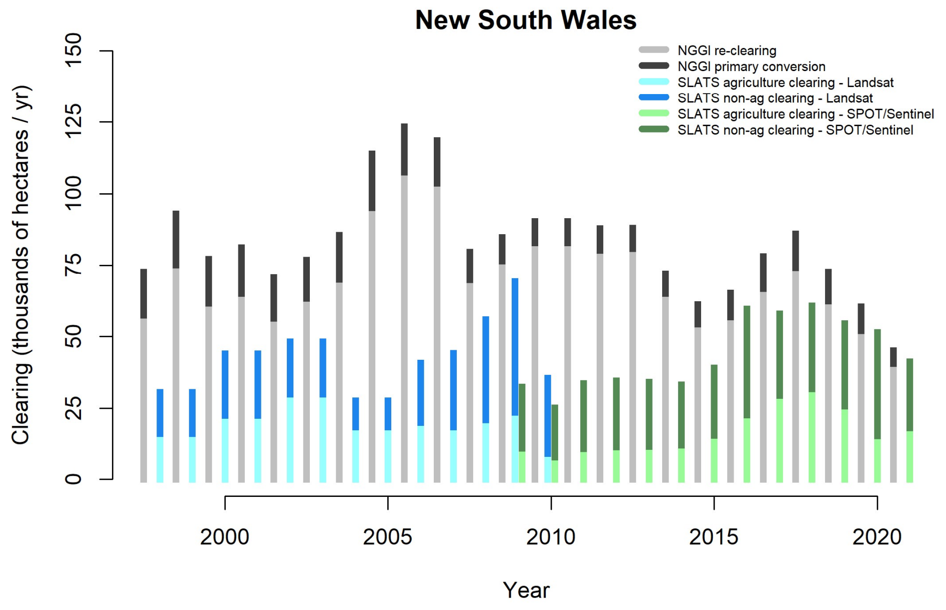


Figure 1. Clearing data for Queensland and New South Wales: for forests reported through Australia's National Greenhouse Accounts (NGGI); and for woody vegetation from state-based landcover monitoring programs (SLATS).[6]

The data indicate that most forest clearing in both jurisdictions has been re-clearing, at least for the last decade. They also show that annual estimates of clearing are variable and

[6] DCCEEW 2023. Australia's National Greenhouse Accounts 2021: Land use, land use change and forestry (LULUCF) Activity Tables 2021. Commonwealth of Australia, Canberra. Available at: https://www.greenhouseaccounts.climatechange.gov.au/ (9 October 2023); Queensland Government (2018) 'Statewide Landcover and Trees Study 1988-2018'. Available at: https://www.data.qld.gov.au/dataset/land-cover-change-in-queensland (9 October 2023); Queensland Government (2023) '2020–21 SLATS Report'. Available at: https://www.data.qld.gov.au/dataset/2020-21-slats-report (9 October 2023); NSW Department of Planning and Environment (2023) '2021 NSW Vegetation clearing report'. Available at: https://www.environment.nsw.gov.au/topics/animals-and-plants/native-vegetation/landcover-science/long-term-trends-in-woody-vegetation-clearing (9 October 2023).

somewhat uncertain. There are substantial differences between the reported clearing of forests in Australia's National Greenhouse Accounts (NGGI) and the reported clearing of woody vegetation in the SLATS programs. The differences between programs are partly due to their different focuses: the deforestation data from the NGGI is limited to clearing of forests (defined as areas with trees at least 2m tall, with crown cover of at least 20%, over an area of at least 0.2 hectares (ha)),[7] while the SLATS programs track clearing of all native woody vegetation. However, notwithstanding the different focuses, the extent of the discrepancies and the level of year-to-year variation demonstrate a material level of uncertainty in any remote image-based estimates of clearing. The data from the state-based SLATS programs are generally subject to higher levels of operator oversight and error correction, and therefore are likely to be more reliable than those from the NGGI, which are predominantly derived from image classification algorithms. However, other factors such as the resolution of imagery used are known to have an effect. The differences between NGGI and SLATS have historically been particularly large for New South Wales, although estimates have converged more in recent years.

While most clearing in both Queensland and New South Wales is re-clearing, there are material differences in the proportion of the re-clearing that is likely to be eligible under the proposed improved ACNR method. Agricultural clearing in total, including clearing for crops and pastures, makes up around a third of clearing in New South Wales (Figure 1), but more than 90% of clearing in Queensland. Clearing for pasture alone has consistently accounted for 80-90% of clearing in Queensland reported by SLATS. Forestry activities also account for a large share of detected clearing in New South Wales, but that clearing is not relevant to the proposed improved ACNR method. This reinforces that potential uptake of the improved ACNR method is likely to be concentrated in Queensland, despite the expectation that all jurisdictions will have eligible native forest regrowth.

The method for estimating abatement and ACCU potential under the improved ACNR method focused on Queensland. This was because:

- Queensland accounts for most of the agricultural-related re-clearing; and
- the Queensland SLATS program publishes extensive data on re-clearing, which facilitates more comprehensive analysis.

The relative absence of data for other jurisdictions impedes analysis of the location and drivers of re-clearing. Owing to the absence of data, only high-level estimates were able to be developed for the other states and territories, based on the assessed abatement potential in Queensland. These high-level estimates were developed using re-clearing and emission data from the NGGI and having regard to differences in clearing restrictions.

[7] Clearing of sub-forest woody vegetation is reported as sparse woody clearing, predominantly in the grassland remaining grassland section of the National Inventory Report.

Clearing regulations that apply under state, territory and federal laws will materially affect eligibility, by determining whether landholders have an unrestricted legal freedom to comprehensively re-clear their land for agricultural purposes. Further analysis on the nature and scope of these regulations would be required to develop more detailed abatement estimates.

3. Assessment of potential in Queensland

Detailed data on the Queensland distribution of regrowth that would be eligible under the proposed improved ACNR method is published by Queensland's Department of Environment, Science and Innovation. The data were developed as part of enhancements to the State's SLATS program, and associated science capacity in remote sensing and land cover monitoring, since 2018. SLATS reporting transitioned from a tight focus on losses of woody vegetation up to 2018, through clearing detection and classification, to a more comprehensive accounting for woody vegetation changes across the state. A woody vegetation extent was defined for the state for 2018, after which SLATS reporting began to account for both losses and gains of woody vegetation. 'Woody vegetation' is defined for these purposes as areas with a crown cover of woody plants greater than 10% and a stand size of at least 0.5ha. It includes native and non-native woody vegetation, and woody vegetation is included regardless of its height or age.[8] The enhanced program has also published supplementary data for spatially explicit estimates of the density, and time since woody vegetation has undergone significant canopy disturbance. These data, which are available for each year from 2018 to 2021, when combined with the more familiar spatial data such as land use, regional ecosystems and vegetation management classes, allow for detailed assessment of regrowth stocks in Queensland in terms of age, clearing rates, land use, and clearing regulation.

There was 95.4 million (M) ha of woody vegetation in Queensland at the end of the latest SLATS reporting period, in 2021. 7.6 M ha of this occurred in areas shown as category X on the State's regulated vegetation management map, which means they are effectively exempt from Queensland's primary controls on agricultural clearing.[9] Three-quarters of that area, 6 M ha, had an estimated canopy density sufficient to qualify as forest (i.e. >10% foliage projective cover, which is generally equivalent to >20% crown cover). Figure 2 shows the distribution of category X forest aged between 10 and 25 years since disturbance. Table 2 breaks down that 6 M ha by geography (bioregions) and land use.[10]

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[8] For comparison, the definition of forest for Australia's greenhouse inventory and carbon market includes areas with trees at least 2m tall, with crown cover of at least 20%, over an area of at least 0.2 ha.

[9] *Planning Act 2016* (Qld); *Vegetation Management Act 1999* (Qld).

[10] The SLATS data summaries do not include a land use classification, to differentiate agricultural clearing, but instead provide 'replacement cover' classes for cleared locations or areas with new regrowth (pasture, crop, mine, forestry, infrastructure and settlement being the most important). The SLATS data summaries do not provide replacement cover codes for any area that has not been classed as cleared or regrown. Replacement

Eligible regrowth is concentrated in central and south-west Queensland, mainly in the Brigalow Belt and Mulga Lands bioregions. In some regions, including the New England Tableland and Brigalow Belt, forests on category X land represent a substantial portion of the region's woody vegetation. Coastal regions, including southeast Queensland, the Wet Tropics and Central Queensland Coast, support significant areas of category X forest on land used for purposes other than agriculture, principally forestry. At the state scale, 90% of forest on category X land is on land used for agriculture, and 91% of clearing of that forest between 2018 and 2021 was for pasture. The area of category X forest cleared in the three years from 2018 to 2021 is equivalent to about 15% of the 2021 forest extent, and is more than 70% of all woody clearing in Queensland during that period.

Data on the age structure of category X forests, and the interaction of age with clearing rates, shows that the proportion of each age cohort cleared each year, declines with cohort age from around 5 or 6 years since disturbance onward (Figure 2). Clearing rates in years 0-5 since disturbance (not shown in figure) were highly variable, although from years 5 onwards the clearing rates (as a percentage of each cohort) were generally lower.

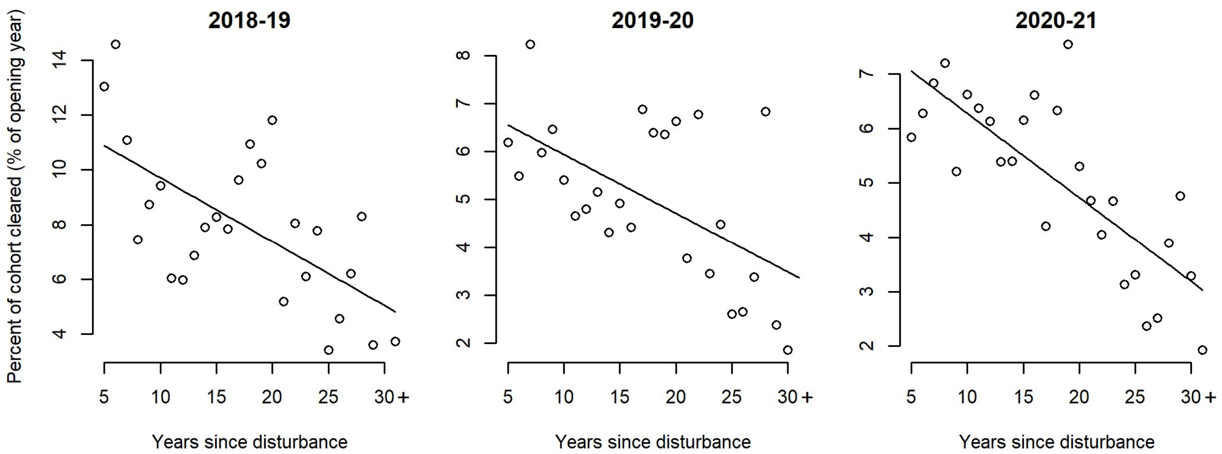

Figure 2. Proportions of regrowth cohorts (age since last disturbance) cleared in the three most recent years for which clearing data are published. Lines are linear fits to the data in each plot, Pearson's correlation coefficients were -0.63,- 0.47 and -0.77 (from left to right).

Yearly risk of clearing roughly halves between category X forest on more recently disturbed land and long uncleared category X forest. There is also considerable variation in risk between the 2018-19 interval, with higher clearing rates, and the later years. Figure 4 presents the frequency of age since disturbance for category X forest in 2020, the start of the 2020-2021 SLATS account. The 2020-21 representation of the regrowth pool is the focus of carbon abatement analyses because 2021 is the latest year for which data are published, and the method for age estimation has developed along with the time series, so older data are likely to be less reliable. Changes to the SLATS method prior to the 2018-19 report make it difficult to confidently judge whether the clearing rate in 2020-21 is high or low relative to

cover is available for most regrowth, but not all woody category X, therefore, the agricultural class in Table 2 is an estimate from spatial data on woody extent, category X and land use, not a result from the SLATS reporting.

rates over the longer term. However, comparison with NGGI reporting, and the three reporting intervals since 2018, suggest that the rates in 2020-21 are likely to be slightly below the long-term average (Figure 1).

Table 2. Summary statistics for forests on category X land in Queensland's bioregions in 2021

Queensland Bioregion	**Bioregion extent (kha)**	**Bioregion woody extent (kha)**	**Forest on category X land:**					
			extent in 2021 (kha)	% of woody in region	cleared 2018-21 (kha)	net change 2018-21 (kha)	% cleared to pasture	% on agricultural land uses
Brigalow Belt	36,528	17,754	**3,275**	**18%**	**520**	-489	91%	93%
Southeast Queensland	6,248	4,142	**1,171**	**28%**	56	-37	**48%**	**67%**
Mulga Lands	18,607	12,065	**781**	6%	**207**	-204	99%	99%
New England Tableland	775	524	199	**38%**	9.3	-9.0	80%	96%
Desert Uplands	6,942	4,931	168	3%	61	-45	98%	98%
Mitchell Grass Downs	24,166	4,851	133	3%	30	-30	99%	99%
Einasleigh Uplands	11,625	10,524	78	1%	3.6	-2.1	64%	87%
Wet Tropics	1,993	1,610	65	4%	2.2	2.1	**33%**	**42%**
Central Queensland Coast	1,484	1,083	63	6%	3.3	-1.2	58%	68%
Cape York Peninsula	12,305	11,755	27	0%	0.9	-0.1	**20%**	**26%**
Gulf Plains	21,914	15,941	24	0%	4.5	-4.2	96%	95%
Channel Country	23,219	5,131	4	0%	0.02	-0.01	95%	98%
Northwest Highlands	7,341	5,099	2	0%	0.01	0.00	**44%**	**80%**
State	**173,148**	**95,409**	**5,990**	**6%**	**898**	**-819**	**91%**	**90%**

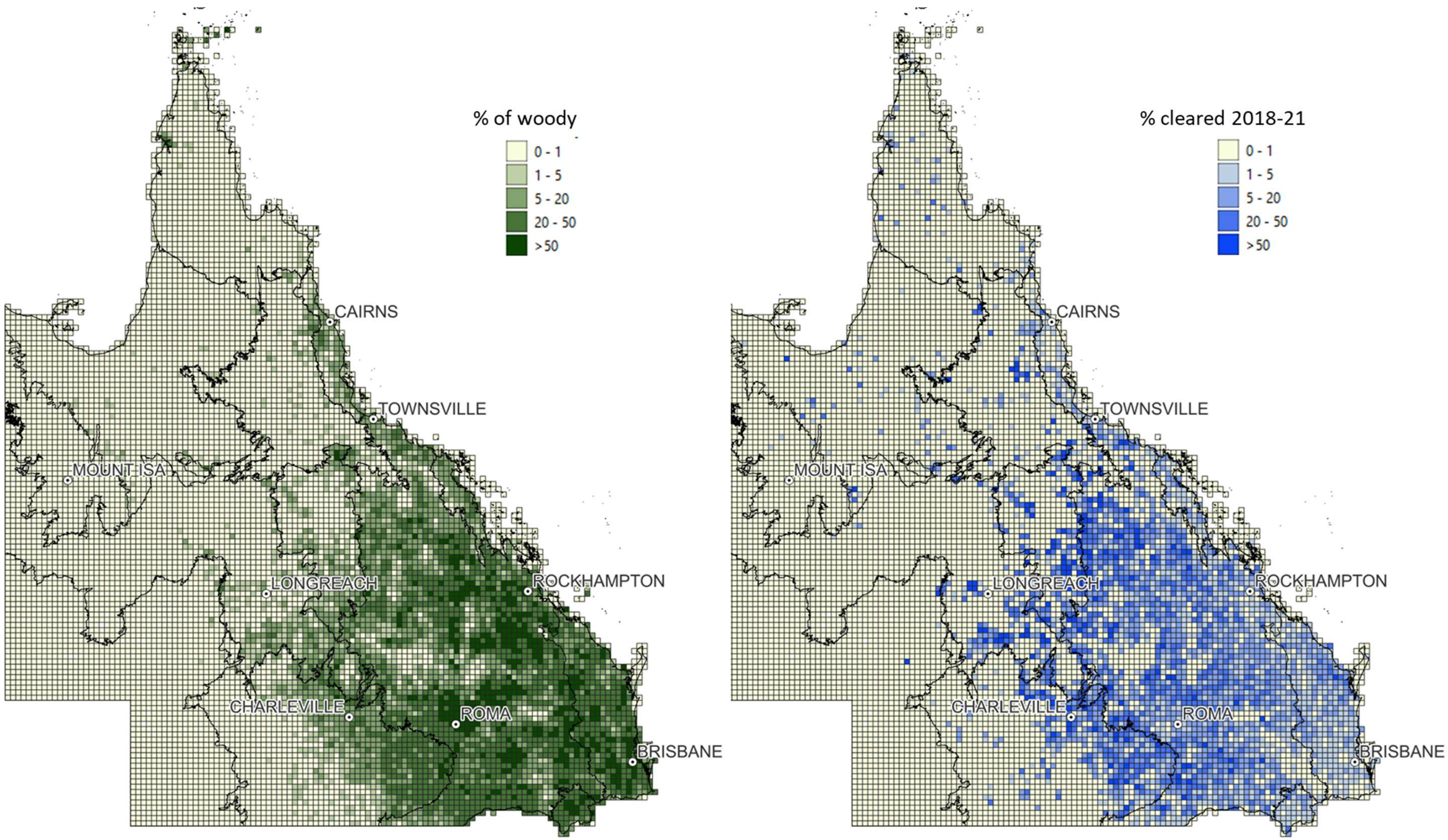

Figure 3. Distribution of forest on category X land (left – as a percentage of all woody vegetation in tiles), and clearing of forest on category X land between 2018 and 2021 (right - as a percentage of the 2018 extent of category X forest). Bioregion boundaries in black (Appendix A).

For the purposes of this analysis, the age range for regrowth to be eligible for the improved ACNR method is approximately 10 to 20 or 10 to 25 years after clearing, which includes 36% of category X forest with an age estimate for 2020-2021. Adding forests less than 10 years old increases the pool of potential eligibility (now or in future years) to 49% of category X forest. There is a bulge in the age distribution of regrowth between 13 and 18 years since disturbance shown in Figure 4, which presumably relates to the 2010-2012 La Niña event. Note that these figures do not include discounts for the extent of non-agricultural land in coastal bioregions including southeast Queensland.

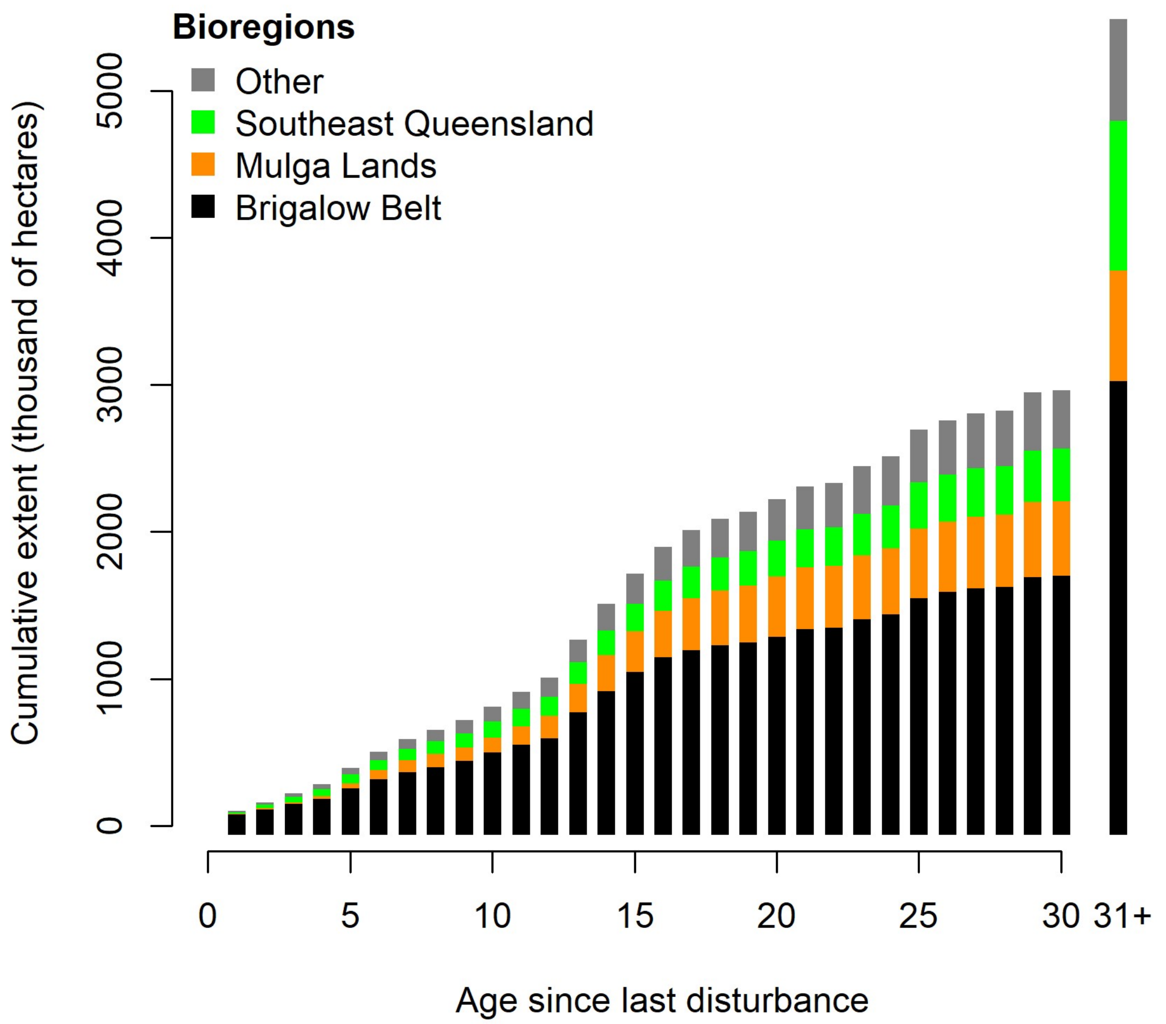

Figure 4. Cumulative extent of forest on category X land in Queensland with increasing age since disturbance, for 2021. Final column on right of figure is for ages >30 years. Figure excludes 0.5 Mha of forest with no estimate for age since disturbance.

Potential for abatement through an improved ACNR method was modelled by estimating emissions from clearing, and carbon uptake through ongoing growth of eligible category X forest. Forest carbon stocks were modelled using an emulation of the FullCAM model used in Australia's National Greenhouse Accounts. Age is one important variable for FullCAM's forest growth model. The other key variable is called 'maximum potential biomass', and varies spatially with biophysical drivers such as average rainfall and soil characteristics.

Maximum biomass values used in FullCAM are published as a spatial dataset.[11] The maximum biomass values for this study were bioregional averages for areas of category X forest with ages since disturbance between 1 and 30 years.

Initially, attempts were made to model the distribution of age since disturbance, for category X forests in 2021, as a function of historical clearing rates and rainfall. However, no useful models could be identified.[12] Such a model would have allowed assessment of explicit scenarios for clearing rates and even rainfall on regrowth supply. Instead, additions to the regrowth pool were assumed to occur at a constant rate, which was estimated as the average extent of regrowth in the age cohorts from 5 to 10 years since disturbance in the 2020-2021 SLATS account (87,439 ha statewide).

Regrowth and carbon models were built for each of the three bioregions with the most regrowth (Brigalow Belt, Mulga Lands and SEQ), and one for the remainder of the state. The models commenced in 2021, with the 2021 age profile from SLATS. From there, yearly timesteps were modelled, with clearing reducing the size of each cohort at the same rate as the linear models fit through the clearing data shown in figure 2. Each year, a new cohort of regrowth was also added to the pool, at age 5.

Two business-as-usual scenarios, applying 2018-19 and 2020-2021 clearing rates, were compared to three other scenarios involving reductions of 10%, 25% and 50% on the 2020-21 rates of regrowth clearing for cohorts aged between 10 and 25 years. Consequences of each scenario for carbon stocks were evaluated across the entire regrowth pool as a whole, and also in terms of ACCU's that could be issued. ACCU issuances were calculated as the difference between the carbon stocks in additional regrowth retained under each scenario and the long-term average carbon stock under the default baseline proposed for the improved ACNR method (recurrent re-clearing on 15 year cycles with regrowth after each clearing).

Discounts were applied to the extent, carbon and ACCU estimates from each regional model, to reflect the percentage of clearing for pasture in each region (Table 3). ACCU estimates in Table 4 were discounted by a further 5%, reflecting the risk of reversal buffer applied to sequestration projects. No permanence period discounts were applied, reflecting the proposed method design (i.e. mandatory 50 or 100-year permanence periods for all improved ACNR projects).

[11] Roxburgh, S.H. et al. (2019) A revised above-ground maximum biomass layer for the Australian continent, Forest Ecology and Management,432, 264-275. https://doi.org/10.1016/j.foreco.2018.09.011.

[12] The best model, with an r^2 of 0.5, included rainfall in the 3 years following last disturbance along with non-remnant clearing 10-15 years after the year of last disturbance. Clearing rates in the year of last disturbance, or up to 3 years before that, were not useful for the models. Nor were efforts to estimate the 'original' regrowth area, accounting for subsequent clearing.

Table 3. Key parameters for regions in models of category X forest extent and carbon stocks under various clearing scenarios.

Bioregion	Maximum biomass (tonnes of dry matter per ha)[13]	2021 extent of category X forest	Extent of 5 year old forest added annually to model (ha)	% Agriculture	ACCU baseline carbon stock (average over default 15 year clearing cycle) t CO_2-e/ha
Brigalow Belt	71	3,275,164	52,000	91	12.8
Mulga Lands	45.1	780,807	13,380	99	8.15
SEQ	136.4	1,171,484	10,570	48	20.9
Others	57.6	762,698	11,445	93	10.4

Figure 5 shows that the projections for regrowth extent and carbon stocks are highly sensitive to assumptions about future clearing rates. Ongoing clearing of category X forest at rates reported for 2020-21 is projected to further reduce the extent of forest in category X to around 4.5 Mha, while clearing at rates from 2018-19 are projected to result in ongoing decline in the extent of category X forest, falling below 3.5 M ha by the early 2040s. Halving the clearing rates for forests between 10 and 25 years is projected to stabilise category X forest extent, assuming new regrowth continues to develop.

Carbon stocks in category X forests are projected to increase, provided clearing rates are similar to 2020-21 or lower. The ongoing growth of existing forest and focus of clearing on younger regrowth means that higher clearing rates, such as those observed in 2018-19, have a much smaller impact on carbon stocks relative to current levels, than they do on forest extent. The impact of high clearing rates on carbon stocks is mostly the missed opportunity to store more carbon that comes with reduced clearing.

[13] The number reported in Table 3 is for above-ground live biomass only. However, the carbon modelling accounted for above- and below-ground live biomass and debris. The reported number for above-ground live biomass in Table 3 is an average over extent of category X forest on agricultural land in each bioregion.

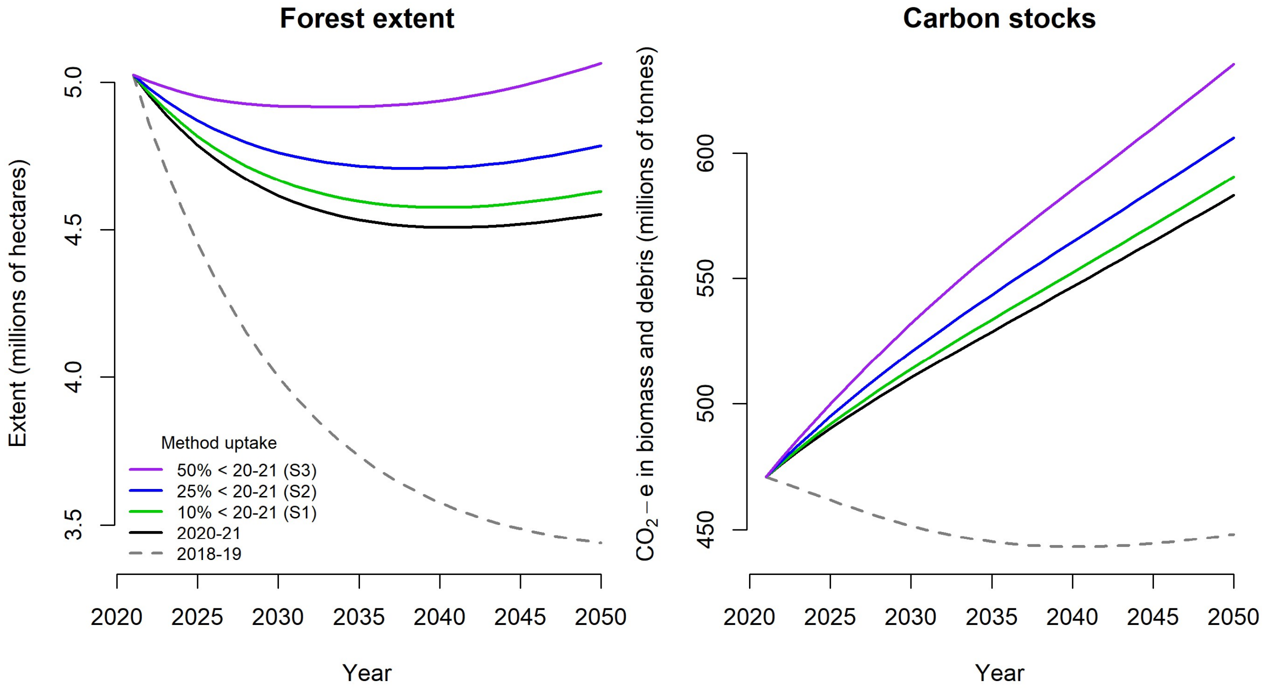

Figure 5. Projections for forest extent (left) and carbon stocks (right) on category X agricultural land in Queensland under various clearing scenarios. Clearing rates for scenarios reducing clearing rates relative to 2020-21 were only changed for cohorts aged between 10 and 25 years, clearing percentages were unchanged for all other cohorts.

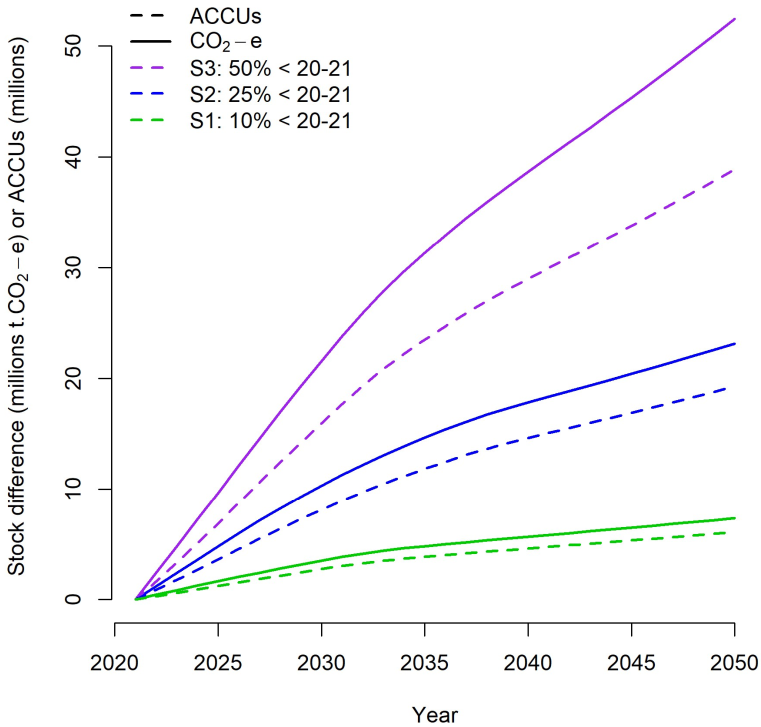

Figure 6. Differences between projected changes in carbon stocks and ACCUs issuances under 3 clearing scenarios for forest on category X agricultural land in Queensland.

Estimates for ACCU issuances are lower than the projected difference between carbon stocks under the three reduced clearing scenarios and business-as-usual scenarios representing ongoing clearing at 2020-21 rates (Figure 6). The difference is larger than the 5% risk of reversal buffer, with ACCU estimates ranging between 75% and 95% of the estimated difference between the stocks. This difference would dwindle if background clearing rates (the counterfactual) were lower than those in 2020-21. However, it does suggest that the approach to calculating abatement proposed for the improved ACNR is appropriately conservative.

Table 4. Key outcomes after 10 years or 25 years of clearing reductions that are plausible under ACNR method changes. Differences between baseline 2020-21 clearing rates and reduced clearing scenarios for regrowth aged 10 to 25 years.

	Change in forest extent (ha x 1000)		Change in biomass and debris carbon stocks (Mt CO_2-e)		ACCUs (millions)	
	10 yrs	25 yrs	10 yrs	25 yrs	10 yrs	25 yrs
S1: Clearing 10% less than 2020-21 for regrowth aged between 10 and 25 years since disturbance	55.5	73.0	3.8	6.6	3.0	5.5
S2: Clearing 25% less than 2020-21 for regrowth aged between 10 and 25 years since disturbance	155.8	219.8	11.3	20.9	8.9	17.3
S3: Clearing 50% less than 2020-21 for regrowth aged between 10 and 25 years since disturbance	324.8	477.7	23.8	46.7	17.7	34.8

The demographic bulge in regrowth aged around 10-15 years in 2021, as well as declining rates of carbon sequestration per hectare with aging forest, mean that ACCU yields will decline over time for a given level of uptake (Figure 7). For example, uptake of an improved ACNR method at around 15,000 ha per year (i.e. scenario 2; equivalent to a 25% reduction in the 2020-21 clearing rate for category X forest aged 10-25 years) would yield nearly a million ACCUs per year over the first 10 years, but that rate is projected to decline by about 50% by 2040. The plausible range is from 0.3 to 1.8 million ACCUs per annum into the 2030s, with 25-year averages ranging from 0.22 to 1.4 million ACCUs.

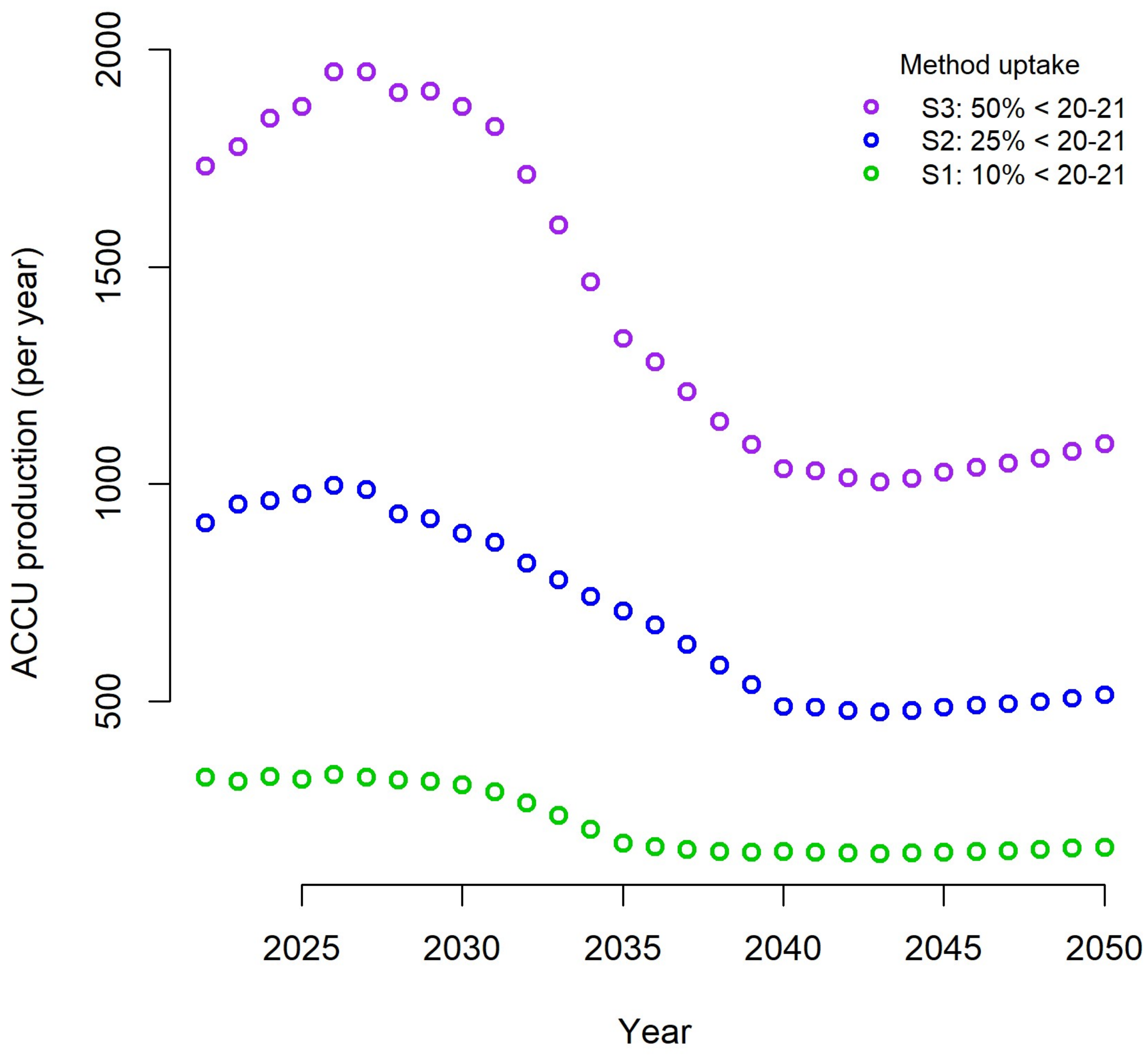

Figure 7. Annual ACCU issuances for 3 scenarios of ACNR uptake (expressed as % reduction in 2020-21 clearing rates) for category X forest on agricultural land in Queensland.

Other benefits to consider from the uptake of improved ACNR projects include the potential value of additional native forest extent in some of the regions most heavily impacted by clearing in recent decades. The catchments of the Great Barrier Reef (Reef) also feature prominently in the potential area eligible under an improved ACNR method. Total clearing in Reef catchments 2020-2021 was 157 291 ha (47% of the statewide figure), of which 87% (136,553 ha) was category X. Within the cleared category X area, 94% (128,152 ha) had canopy cover sufficient to qualify as forest. There were 3.1 million ha of forest in category X in reef catchments in 2021, 1.4 M ha has an estimated age since last major disturbance more than 25 years, a further 373,000 ha have no age estimate. So there is 1.3 to 1.7 M ha of category X forest in Reef catchments likely to be eligible now or when it gets to 10 years after clearing (392,642 ha were less than 10 years old), with more growing every year.

4. Potential in other jurisdictions

Figure 8 presents data on the extent of newly identified and sustained regrowth on previously deforested land in each jurisdiction compiled for Australia's National Greenhouse Accounts.[14] As noted previously, Queensland has the majority of regrowth, and regrowth clearing, nationally. The share of regrowth on agricultural land, as opposed to forestry, is also far higher in Queensland than in NSW. The same is likely to be true for Victoria, Tasmania and Western Australia, because all have had significant native forestry through the national time series.

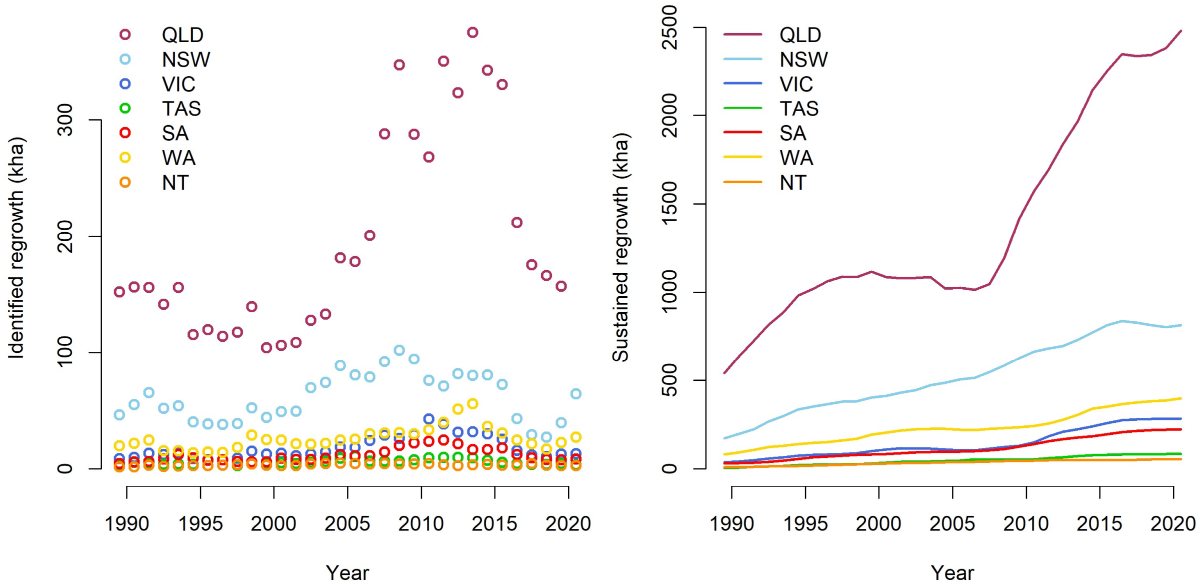

Figure 8. Newly identified and sustained regrowth in Australia, by jurisdiction, 1990 to 2021 (thousands of hectares).

This combination of issues suggests that the potential in New South Wales is likely to be around 25% of the estimates for Queensland (75,000-440,000 ACCUs per year), with potential in other states smaller again (5-10% of Queensland potential). In aggregate, the national potential is likely to be more than one million ACCU per year, but less than three million.

5. Conclusions

The modelling demonstrates the proposed improved ACNR method has the potential to generate significant abatement and ACCUs, with most of the potential centred in Queensland. Based on the three modelled scenarios – reductions in re-clearing of 10-25 year regrowth of 10%, 25% and 50% relative to 2020-21 levels – abatement from Queensland

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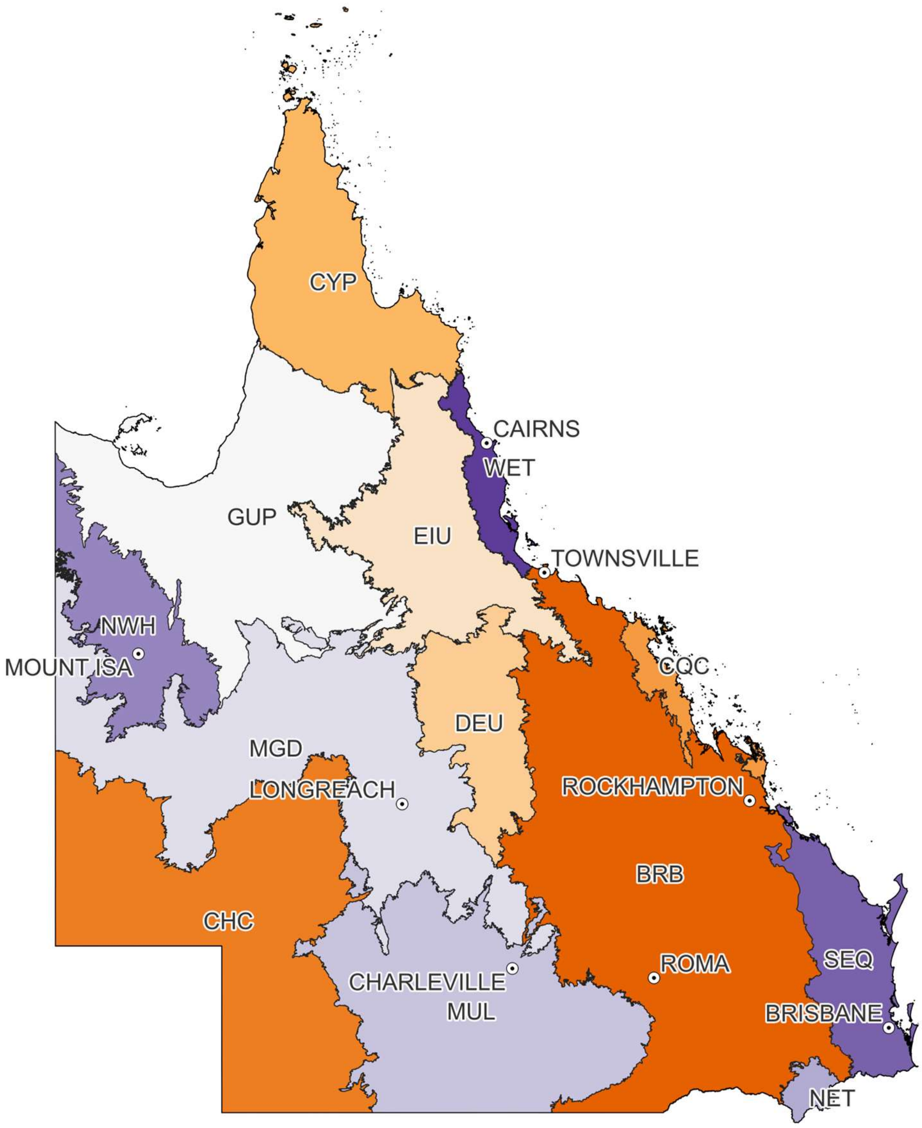
[14] DCCEEW 2023. Australia's National Greenhouse Accounts 2021: Land use, land use change and forestry (LULUCF) Activity Tables 2021. Commonwealth of Australia, Canberra. Available at: https://www.greenhouseaccounts.climatechange.gov.au/ (9 October 2023).

alone was estimated at between 0.38 $MtCO_2$-e yr^{-1} and 2.38 $MtCO_2$-e yr^{-1} over 10 years (0.26-1.9 $MtCO_2$-e yr^{-1} over 25 years). The number of associated ACCUs was estimated at 0.3 to 1.8 million yr^{-1} over 10 years, with 25-year averages ranging from 0.22 to 1.4 million ACCUs.

Data limitations prevented a more thorough analysis of other jurisdictions. However, based on the data that are available, it is estimated that improved ACNR projects in New South Wales could generate a further 75,000 to 440,000 ACCUs per year over 10 years (95,000-595,000 tCO_2-e yr^{-1} of abatement). The remaining jurisdictions could provide in the order of 5-10% of the estimated potential for Queensland (maximum of 177,000 ACCUs per year, or abatement of 240,000 tCO_2-e yr^{-1}).

While most of the abatement potential is to be found in Queensland, this method proposal, and even moreso the integrated method option (outlined in Attachment D to this EOI), has abatement potential at a nationally-significant scale.

Appendix A. Bioregions of Queensland



Map label	Bioregion name
BRB	Brigalow Belt
CYP	Cape York Peninsula
CQC	Central Queensland Coast
CHC	Channel Country
DEU	Desert Uplands
EIU	Einasleigh Uplands
NWH	Northwest Highlands
GUP	Gulf Plains
MGD	Mitchell Grass Downs
MUL	Mulga Lands
NET	New England Tableland
SEQ	Southeast Queensland
WET	Wet Tropics

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