Indicator 1.1a: Area of forest by forest type and tenure

This indicator uses the area for each forest type over time as a broad measure of the extent to which forest ecosystems and their diversity are being maintained. Reporting on forest tenure aids our understanding of how different land management regimes may impact on forest biodiversity.

1.1a.iv Forest area change over time (2023)

This part of Indicator 1.1a presents the change in forest area over time.

The three other parts of Indicator 1.1a are:

1.1a.i Forest area by forest type

1.1a.ii Forest area by tenure

1.1a.iii Forest area in Regional Forest Agreement regions

Context

The net change in Australia's forest area over time presented here, and the losses and gains that comprise that net change, are derived from area change figures published in Australia's *National Inventory Report* series.

Key points

- Australia's total forest area increased by 0.75 million hectares over the five-year period from 2016 to 2021.
- Australia's total forest area has continued to increase since 2008.
- Forest area change is calculated by applying forest area change data from Australia's greenhouse gas inventory reporting to Australia's total forest area of 133.6 million hectares.
- The total area of both primary (first-time) clearing and secondary clearing (re-clearing) of forest has been progressively reducing over time.

Change in total forest area over time

Australia's forest area increased by 0.75 million hectares over the 5-year period from 2016 to 2021. This maintained the rise in total forest area that has been observed since 2008 (Figure 1.1a.iv-1A,B).

The annual change in Australia's forest area is calculated by application of forest area change data from Australia's *National Inventory Report 2021* (DCCEEW 2023a,b) to the total forest area figure of 133.6 million hectares determined by ABARES using the Multiple Lines of Evidence process (see Indicator 1.1a.i Forest area by forest type).

Trends in forest area over the period from 1989 to 2021 differ between states and territories:

- in New South Wales and Queensland, forest area decreased from 1989 to 2008, by a combined total of 6.6 million hectares, but there was no substantial change after 2008
- in South Australia and Western Australia, forest area increased progressively over the whole period from 1989 to 2021, by a combined total of 4.9 million hectares

- in the Australian Capital Territory, Victoria, Tasmania and the Northern Territory, there was minimal change in forest area over the whole period from 1989 to 2021.

**Figure 1.1a.iv-1: Australia's forest area change over time**
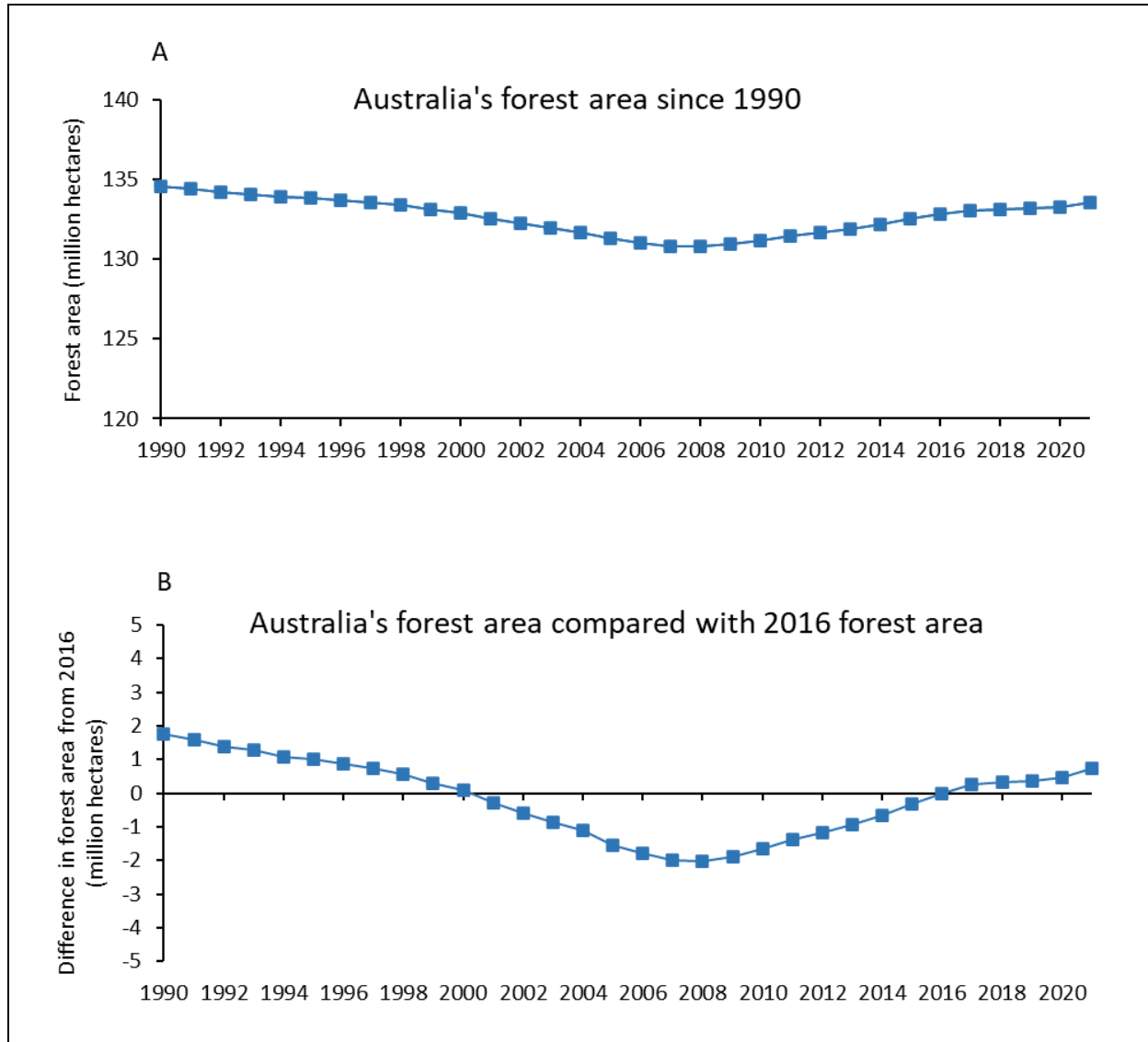
Source: ABARES *Forests of Australia (2023)* dataset as published in Indicator 1.1a.i (2023); *National Inventory Report 2021* (DCCEEW 2023a), Table 6.2.2. Figures as at June each year.
Click here for a Microsoft Excel workbook of the data for Figure 1.1a.iv-1.

The gains and losses in forest area each year, and the resultant net annual change in forest area, are shown in Figure 1.1a.iv-2. The net annual area changes are the net result of a number of processes:

- natural expansion of forest onto areas of grassland that have not held forest for many years
- clearing of forest for agriculture, regrowth of forest onto recently cleared land, and re-clearing of regrowth forest
- clearing of forest for urban expansion, mining or other infrastructure
- changes in the area of commercial plantations
- new environmental plantings
- changes in the area of mangroves.

Figure 1.1a.iv-2: Annual gains and losses and net change in Australia's forest area, 1990 to 2021
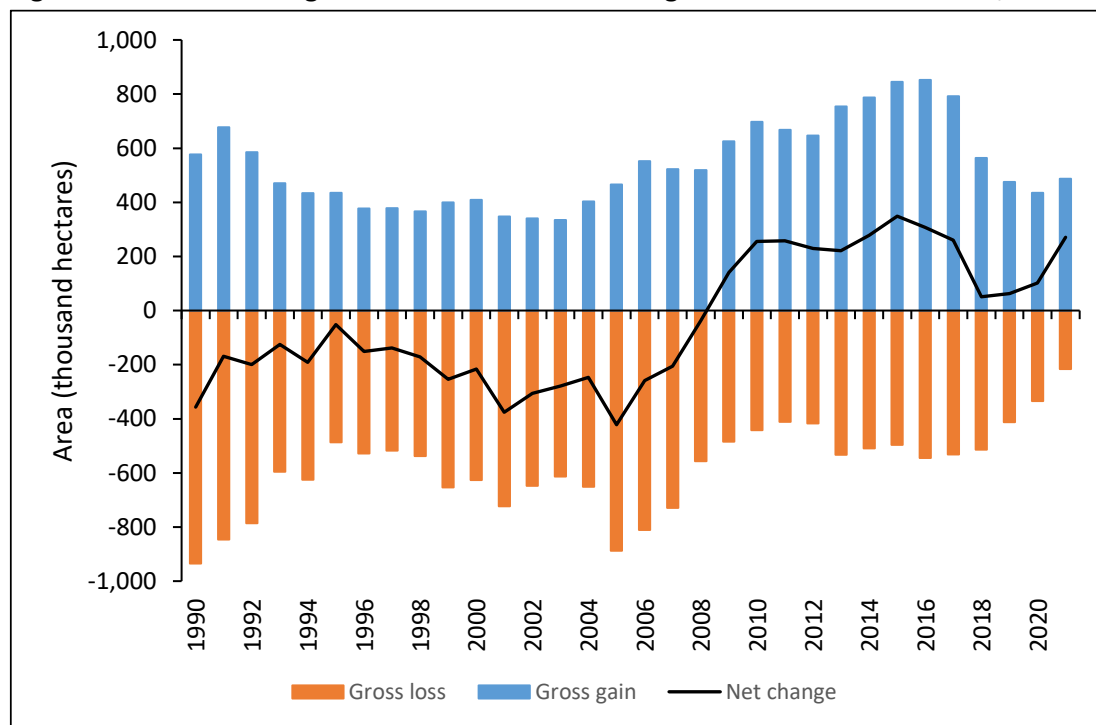
Gross loss is sum of Forest land converted to Cropland, Forest land converted to Grassland, Forest land converted to Wetlands, and Forest land converted to Settlements. Gross gain is sum of Cropland converted to Forest land, Grassland converted to Forest land, Wetlands converted to Forest land and Settlements converted to Forest land. The majority of area transitions are from and to Grassland.
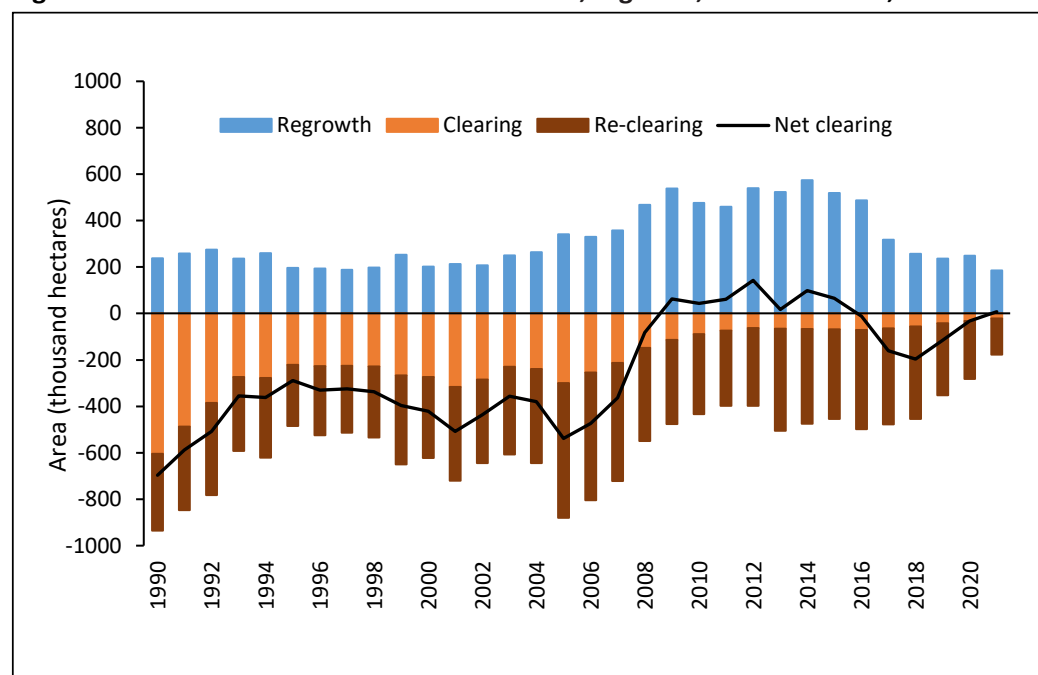Source: Land Transition Matrix for *National Inventory Report 2021* (DCCEEW 2023b).
[Click here for a Microsoft Excel workbook of the data for Figure 1.1a.iv-2.](#)

Clearing, regrowth and re-clearing

One component of change in Australia's forest area is clearing of forest, followed over time by regrowth of forest onto recently cleared land, then by re-clearing of that regrowth forest. This pattern of land management can be found in some of Australia's grazing lands, mostly in Queensland and New South Wales. The national area of forest cleared, regrown and re-cleared is shown in Figure 1.1a.iv-3. Harvesting and replanting of native forest or plantations, as temporary changes in canopy cover in forest remaining forest, are not considered clearing or regrowth.

Figure 1.1a.iv-3: Annual areas of forest cleared, regrown, and re-cleared, 1990 to 2021

These data use annual 'Identified regrowth' figures from *National Inventory Report 2021*, Table A5.6.12.1a-b, to allow comparison to the annual clearing and re-clearing figures. The 'Sustained regrowth' figures from *National Inventory Report 2021*, Table A5.6.12.6, use an algorithm to combine data from multiple years to determine the area of long-term sustained regrowth.
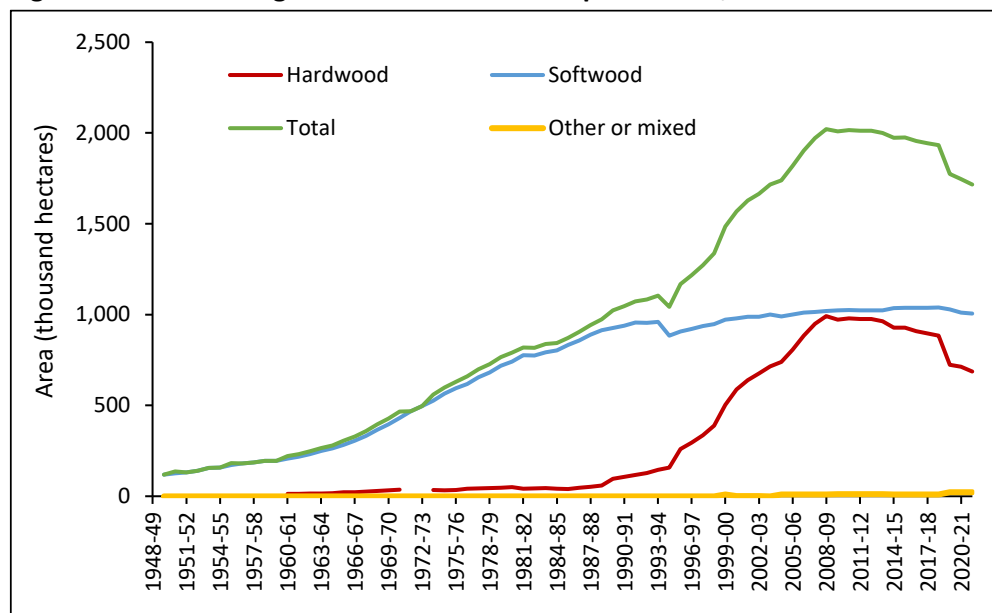Source: *National Inventory Report 2021* (DCCEEW 2023b).
Click here for a Microsoft Excel workbook of the data for Figure 1.1a.iv-3.

The total area of both primary (first-time) clearing and secondary clearing (re-clearing) of forest has been progressively reducing over time. The areas of forest cleared and re-cleared in 2020–21 were the lowest in this data series, at 22 thousand (cleared) and 155 thousand (re-cleared) hectares; and in that year the area of forest cleared or re-cleared was exceeded by the area of forest regrowing from previous clearing (185 thousand hectares). The average annual area of first-time forest clearing in the 5-year period 2016–21 was 43 thousand hectares.

Change in Commercial plantation area over time

The area of Commercial plantations decreased by 239 thousand hectares (12%) over the period 2016–17 to 2021–22 (Figure 1.1a.iv-4), mostly due to a decrease of 221 thousand hectares (24%) in the area of hardwood plantations. Some of this area was returned to agriculture or other uses upon the expiration of hardwood plantation lease arrangements, while some still carries plantation trees now judged not to be commercial (so classified as 'Other forest', not 'Commercial plantation') and likely to be converted to agriculture in the future. Only a small area of new plantations was established (see Indicator 2.1b).

Figure 1.1a.iv-4: Change in area of Commercial plantations, 1948-2021

Source: ABARES (2023)

Click here for a Microsoft Excel workbook of the data for Figure 1.1a.iv-4.

References

ABARES (Australian Bureau of Agricultural and Resource Economics and Sciences) (2023). *Australian plantation statistics 2023 update*, ABARES, Canberra, August. CC BY 4.0. doi.org/10.25814/hhk8-4x26

DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2023a). *National Inventory Report 2021. Volume 1.* Commonwealth of Australia, Canberra. dcceew.gov.au/climate-change/publications/national-inventory-report-2021

DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2023b). *National Inventory Report 2021. Volume 2.* Commonwealth of Australia, Canberra. dcceew.gov.au/climate-change/publications/national-inventory-report-2021

Supporting information for Indicator 1.1a.iv Forest area change over time

This section presents some examples of on-ground change in forest area that were identified during creation of the 2023 update to Australia's forest coverage.

Transitions from forest to non-forest (typically due to land clearing) generally happen at a single point in time and are therefore easy to identify in datasets and imagery time-series. The examples of detected loss in forest cover shown here are associated with mining development (Figure 1.1a.iv-5), urban development (Figure 1.1a.iv-6) and plantation clearing or agriculture (Figure 1.1a.iv-7).

Transitions from non-forest to forest (due for example to forest establishment or regrowth) can be gradual and are less easy to identify or associate with a particular time-point. The examples of detected gain in forest cover shown here are associated with plantation establishment (Figure 1.1a.iv-8), other forest planting (Figure 1.1a.iv-9) and native forest expansion or thickening (Figure 1.1a.iv-10).

Native forest clearance for mine development

Figure 1.1a.iv-5: Forest clearance due to mine infrastructure development. Gunnedah, New South Wales: example area reported as forest in SOFR 2018 but as non-forest in the 2023 forest coverage. Individual green and pink squares on images **B** and **D** have an area of 1 hectare (100 m x 100 m).

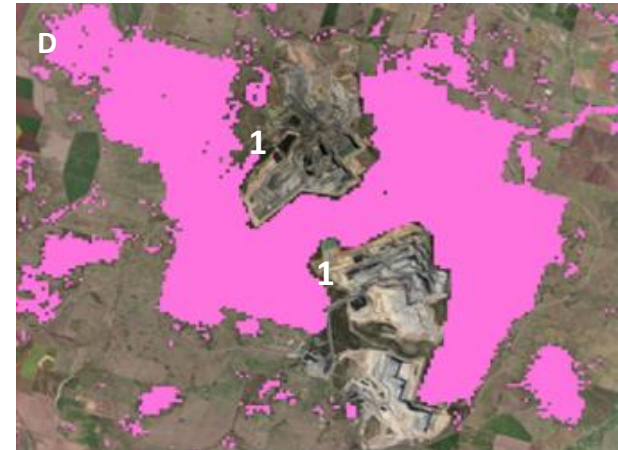|	
A ESRI World Imagery 2015, showing mine areas in forest setting. Area **1**, mine. Area **2**, forest (Callitris forest type).	**B** ESRI World imagery 2021. Green squares, areas reported as forest in SOFR 2018.
C Google EarthPro imagery 2022, showing areas of mine expansion and remaining forest. Area **1**, mine expansion. Area **2**, remaining forest (Callitris forest type).	**D** ESRI World imagery 2021. Pink squares, areas reported as forest in 2023 forest coverage update. Area **1** reclassified as non-forest, reflecting forest removal and land-use change from mining expansion.

Native forest clearance for urban expansion

Figure 1.1a.iv-6: Forest clearance due to urban residential expansion. Coomera, south-east Queensland: example area reported as forest in SOFR 2018 but as non-forest in the 2023 forest coverage. Individual green and pink squares on images **B** and **D** have an area of 1 hectare (100 m x 100 m).

A Google EarthPro imagery 2016, showing areas of initial urban development in forest setting.	**B** Green squares, areas reported as forest in SOFR 2018. Backdrop is ESRI World imagery 2022.

C ESRI World Imagery 2022, showing urban expansion and forest clearance.	**D** Pink squares, areas reported as forest in 2023 forest coverage update. Backdrop is ESRI World imagery 2022.

Expansion of urban development has resulted in further clearing of forest. Following incorporation of the SLATS 2018 and NGGI 2016-20 datasets, the 2023 forest coverage reports these recently cleared areas as non-forest.

Plantation clearance and conversion to agriculture

Figure 1.1a.iv-7: Plantation clearance and conversion to agriculture. Capel, south-west Western Australia: example area reported as forest in SOFR 2018 but as non-forest in the 2023 forest coverage. Individual green and pink squares on images **B** and **C** have an area of 1 hectare (100 m x 100 m).

A Google EarthPro imagery circa 2014, showing landscape before plantation clearing and land-use change.

B Green squares, areas reported as forest (mostly commercial plantation) in SOFR 2018. Backdrop is ESRI World imagery 2022.
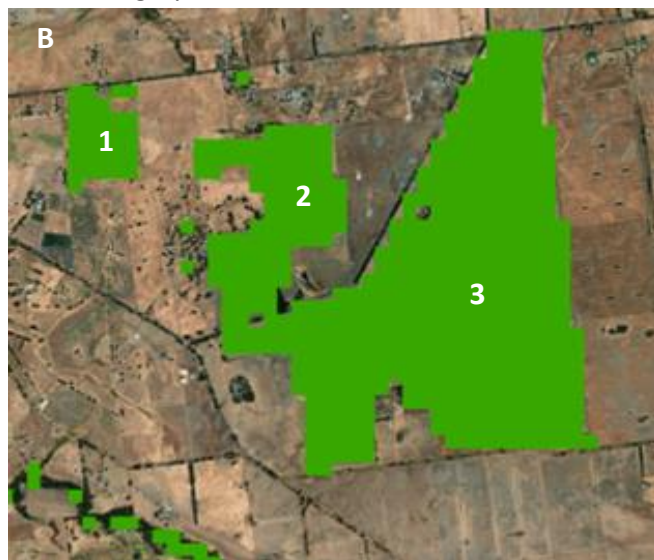
Areas **1**, **2** and **3** are reported as commercial plantation (Hardwood) in SOFR 2018.
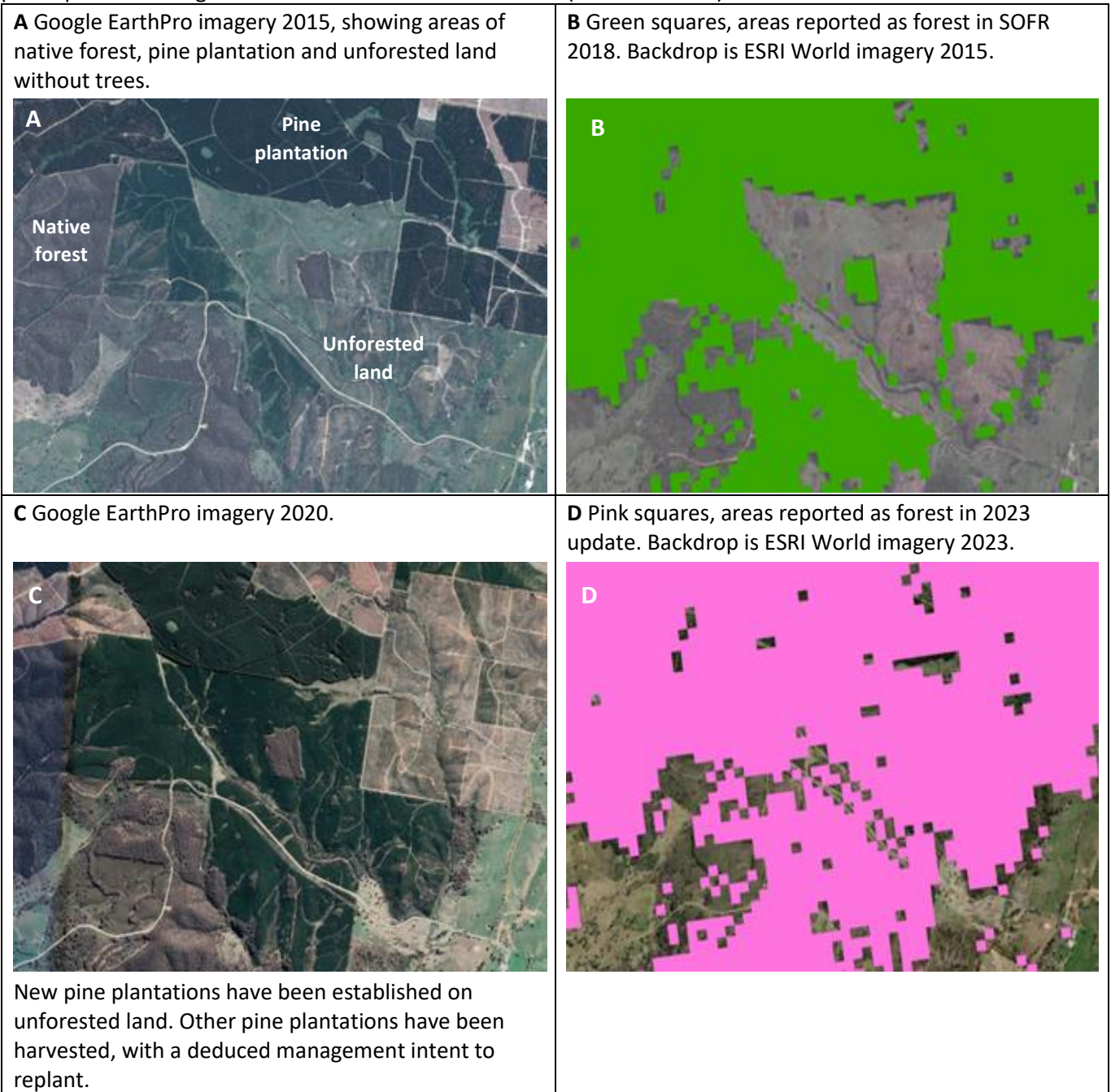
C Pink squares, areas reported as forest in 2023. Backdrop is ESRI World imagery 2022

No commercial plantation was reported within the area in the 2023 forest coverage.
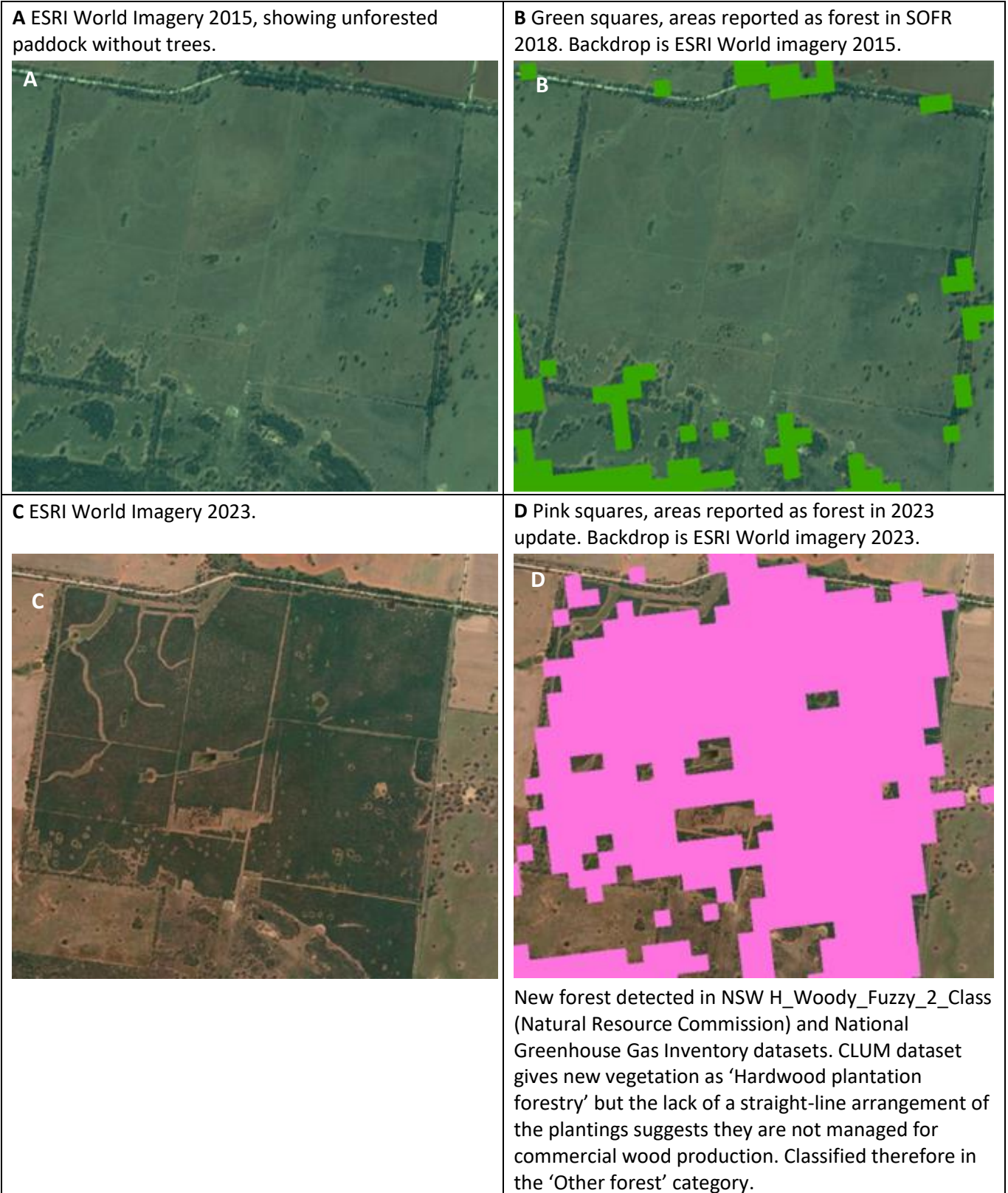
Plantation establishment

Figure 1.1a.iv-8: Plantation establishment on unforested land. Burraga, central tablelands, New South Wales: example area reported as non-forest in SOFR 2018 but as forest in the 2023 forest coverage. Individual green and pink squares on images **B** and **D** have an area of 1 hectare (100 m x 100 m).

A Google EarthPro imagery 2015, showing areas of native forest, pine plantation and unforested land without trees.

B Green squares, areas reported as forest in SOFR 2018. Backdrop is ESRI World imagery 2015.

C Google EarthPro imagery 2020.

New pine plantations have been established on unforested land. Other pine plantations have been harvested, with a deduced management intent to replant.

D Pink squares, areas reported as forest in 2023 update. Backdrop is ESRI World imagery 2023.

Establishment of environmental plantings

Figure 1.1a.iv-9: Environmental planting on unforested land. Bogan Gate, north-west of Parkes, New South Wales: example area reported as non-forest in SOFR 2018 but as forest in the 2023 forest coverage. Individual green and pink squares on images **B** and **D** have an area of 1 hectare (100 m x 100 m).

A ESRI World Imagery 2015, showing unforested paddock without trees.

B Green squares, areas reported as forest in SOFR 2018. Backdrop is ESRI World imagery 2015.

C ESRI World Imagery 2023.

D Pink squares, areas reported as forest in 2023 update. Backdrop is ESRI World imagery 2023.

New forest detected in NSW H_Woody_Fuzzy_2_Class (Natural Resource Commission) and National Greenhouse Gas Inventory datasets. CLUM dataset gives new vegetation as 'Hardwood plantation forestry' but the lack of a straight-line arrangement of the plantings suggests they are not managed for commercial wood production. Classified therefore in the 'Other forest' category.

Native forest expansion

Figure 1.1a.iv-10: Expansion of native forest onto unforested land. Emmavale, northern New South Wales: example area reported as non-forest in SOFR 2018 but as forest in the 2023 forest coverage. Individual green and pink squares on images **B** and **C** have an area of 1 hectare (100 m x 100 m).

A Google EarthPro imagery 2010. Red polygon shows area in panels **B** and **D**.

B Green squares, areas reported as forest in SOFR 2018. Backdrop is ESRI World imagery 2014.
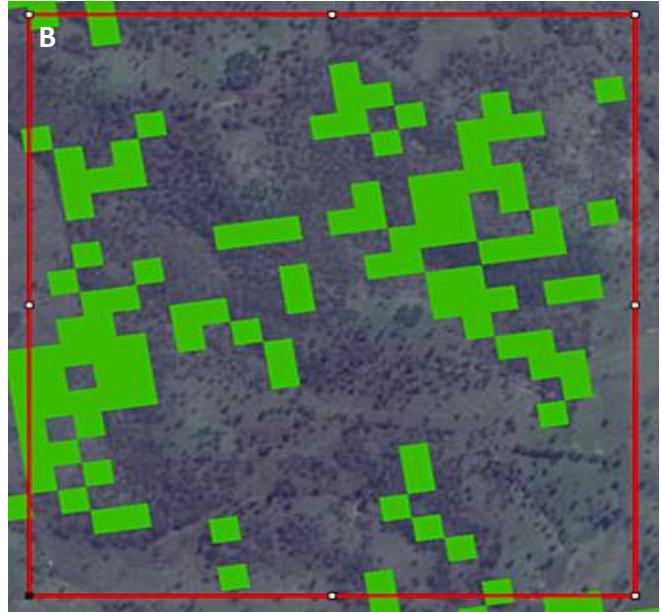
C) Google EarthPro 2023. Red polygon shows area in panels **B** and **D**.

D) Pink squares, areas reported as forest in 2023 update. Backdrop is ESRI World imagery 2023.

Imagery shows progressive thickening of native forest regrowth over time.

The new forest was detected in the NSW H_Woody_Fuzzy_2_Class (Natural Resource Commission) and National Greenhouse Gas Inventory datasets. The allocated forest type is Eucalypt Medium Open forest, from NVIS information which gave dominant eucalypt species as by *Eucalyptus blakelyi, E. melliodora, E. moluccana* and *Angophora floribunda*.

More information

Learn more about the [Criterion 1 of Australia's State of the Forest Report](#).

Web [agriculture.gov.au/abares/forestsaustralia/sofr/](#)

Download a [Microsoft Excel workbook of the data presented in Indicator 1.1a.iv](#).

Email [Info.ABARES@aff.gov.au](#)

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