Natural Resources Commission

Welcome

Coastal IFOA Monitoring Program 2023
Webinar 3: Forest Carbon

The webinar will start shortly

NSW Forest Monitoring Steering Committee

Department of Primary Industries

Forestry Corporation

Planning and Environment

National Parks & Wildlife Service N.S.W.

Natural Resources Commission

nsw epa

Aboriginal Affairs

Local Land Services

The University of Melbourne

Australian National University

The University of Sydney

FLINTpro

NSW Forest Carbon

Update FLINTpro Results

December 2023

NRC

NSW Forest Carbon Assessment

A specific simulation process involving the use of different FLINTpro capabilities is used for modeling forest carbon across NSW.

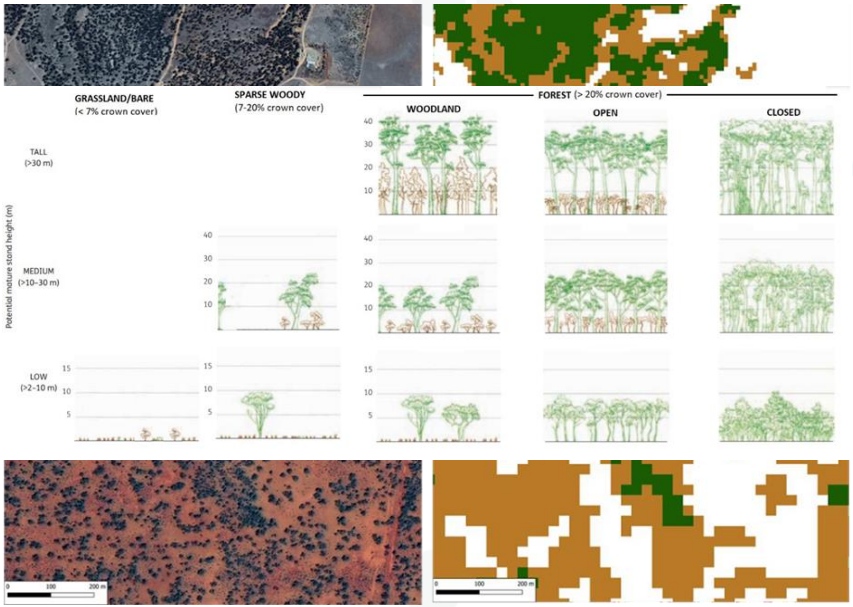
BUT FIRST - What is a forest

The Theory

An area that is dominated by trees with a mature stand height that is more than 2 metres and crown cover equal to or greater than 20 per cent.

In Practice

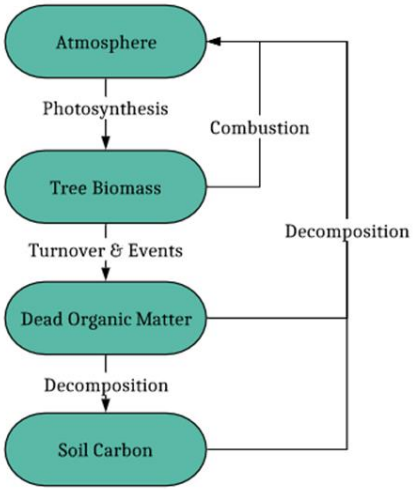
An area of land that is mapped as ‘forest’ by the National Forest and Sparse Woody Vegetation Data



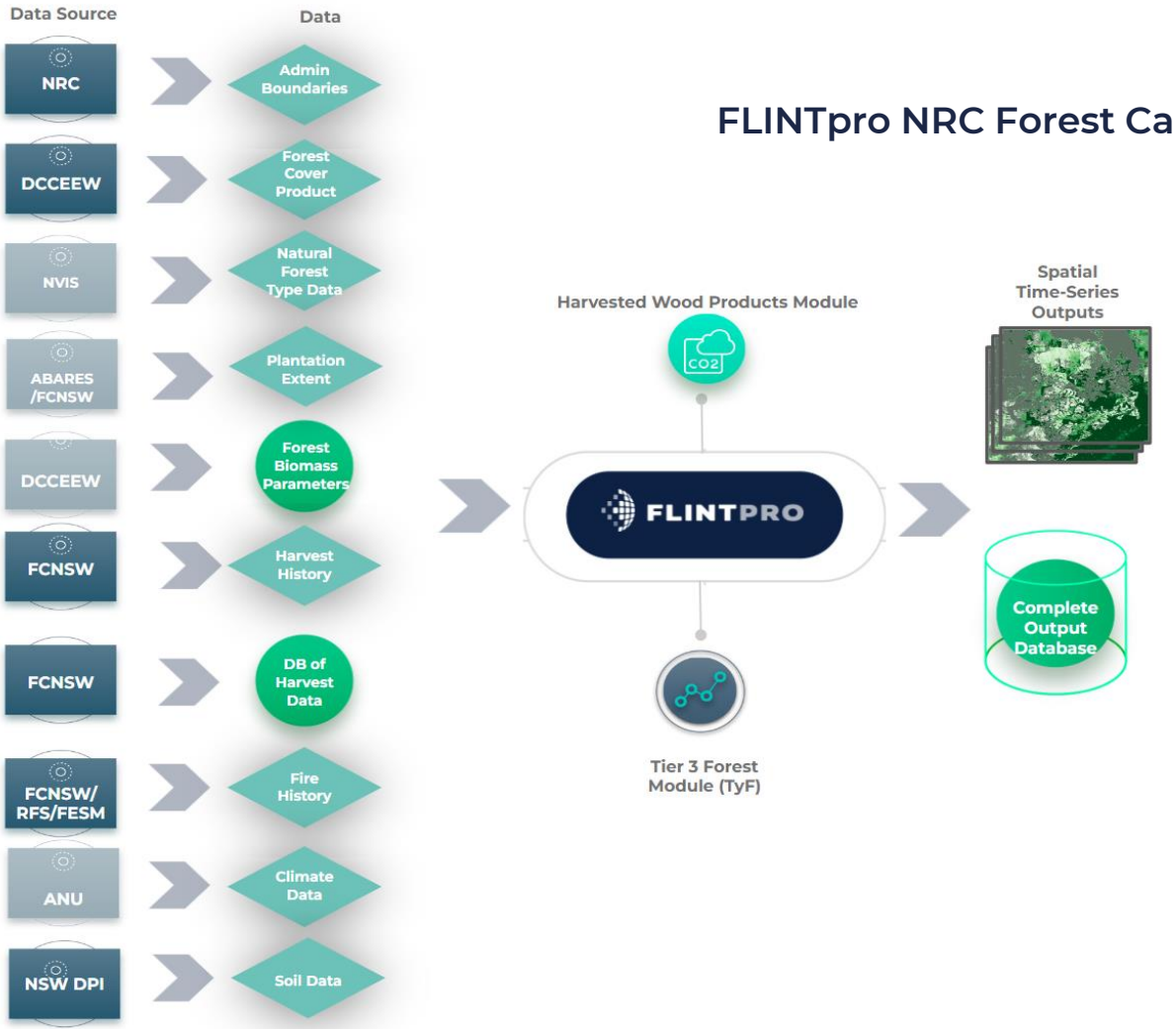
(Adapted from Australian Land Information Group and JA Carnahan (1990))

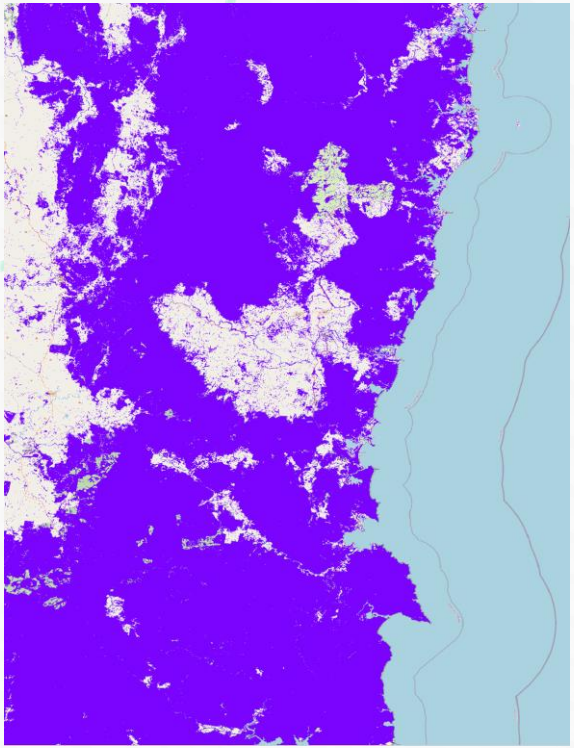
What do we care about?

- Forest carbon is stored in ‘Pools’, and moves between ‘pools’ as ‘fluxes’
- Forest Carbon Stock is important information, but Stock Change is generally more so.
- Changes in forest carbon is driven by:
  - Processes
  - Events
- This means tracking processes and events for every forest in NSW
  - Forest Growth
  - Decomposition
  - Land clearing
  - Reforestation
  - Fire
  - Timber harvest

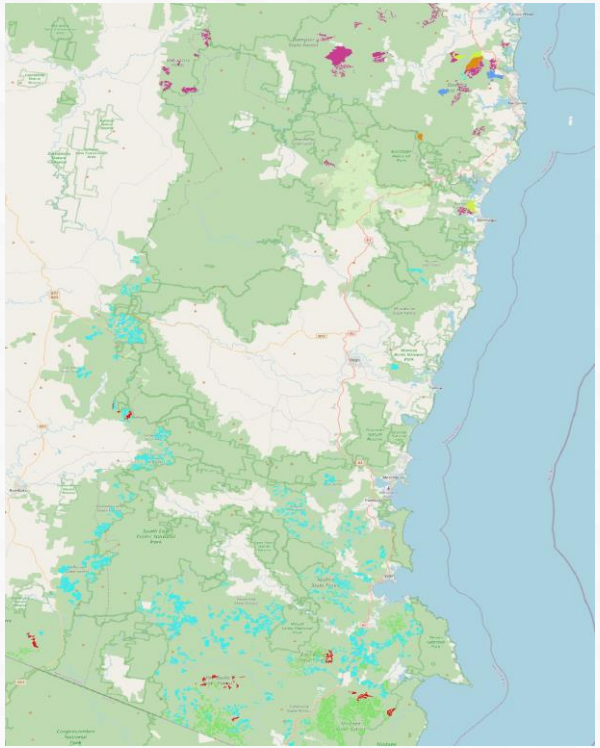


FLINTpro NRC Forest Carbon system

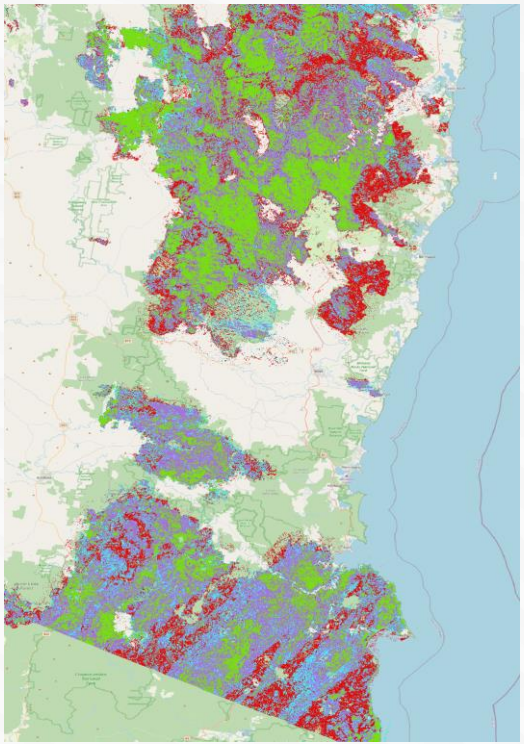




Example 1 year of forest data



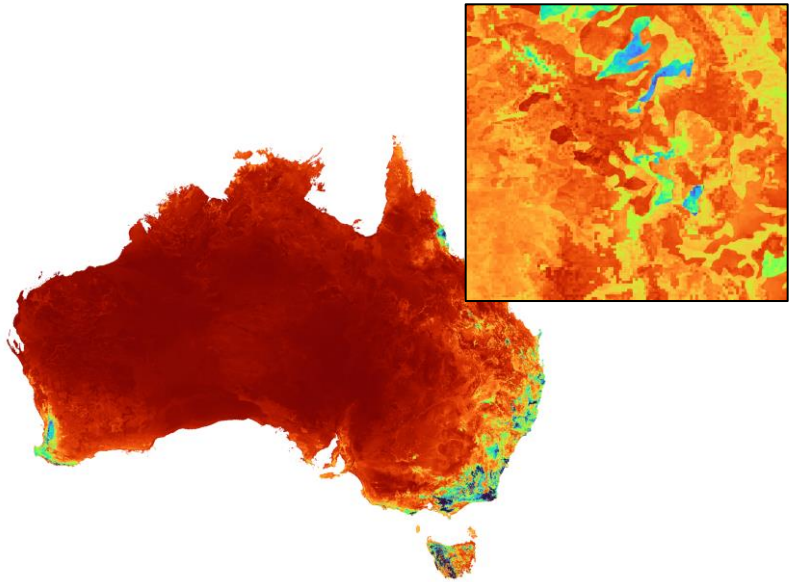
Example 15 years of harvest data



Example 4 years of fire data

Tree Growth in FullCAM

Tree Yield Formula (Equation 1) that underpins FullCAM and is represented in FLINTpro. There are two main inputs M and G. M is spatial (see side image), G relates to the forest type.



Equation 1: $AGB = M \times r \times [\exp(-k/A_2) - \exp(-k/A_1)] \times (FPI_t/FPI_{avg})$

Where:

AGB = Current annual increment in above-ground biomass (AGB, Megagram Dry Matter per Hectare Per Year (Mg DM per ha^{-1} $year^{-1}$))

M = Maximum AGB in undisturbed native vegetation (Mg DM ha^{-1})

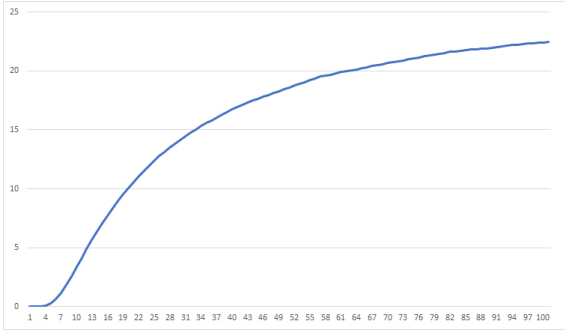
r = value of the Type 2 multiplier to account for factors that increase growth potential at a given site (e.g. planting configuration, Snowdon 2002)

A_1, A_2 = age (years) in year 1 and 2, respectively, etc.

k = 2 x G - 1.25, where G = tree age of maximum growth rate (years),

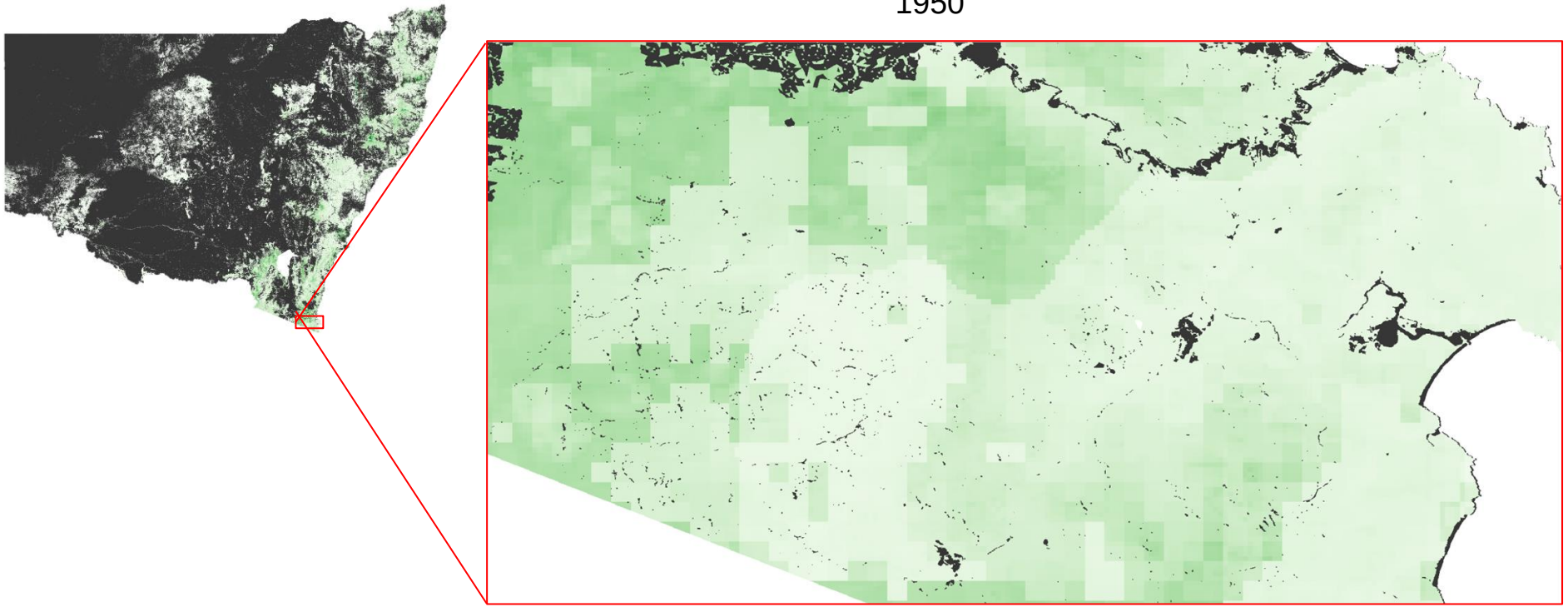
FPI_t = Annual Forest Productivity Index over the period A_1 to A_2, and is the sum of site factors (soil type, fertility and climate) driving growth, regardless of the type of planting or its age (Kesteven and Landsberg 2004); and

FPI_{avg} = mean long-term average annual forest productivity index based on data, which is independent of age (Kesteven and Landsberg 2004).



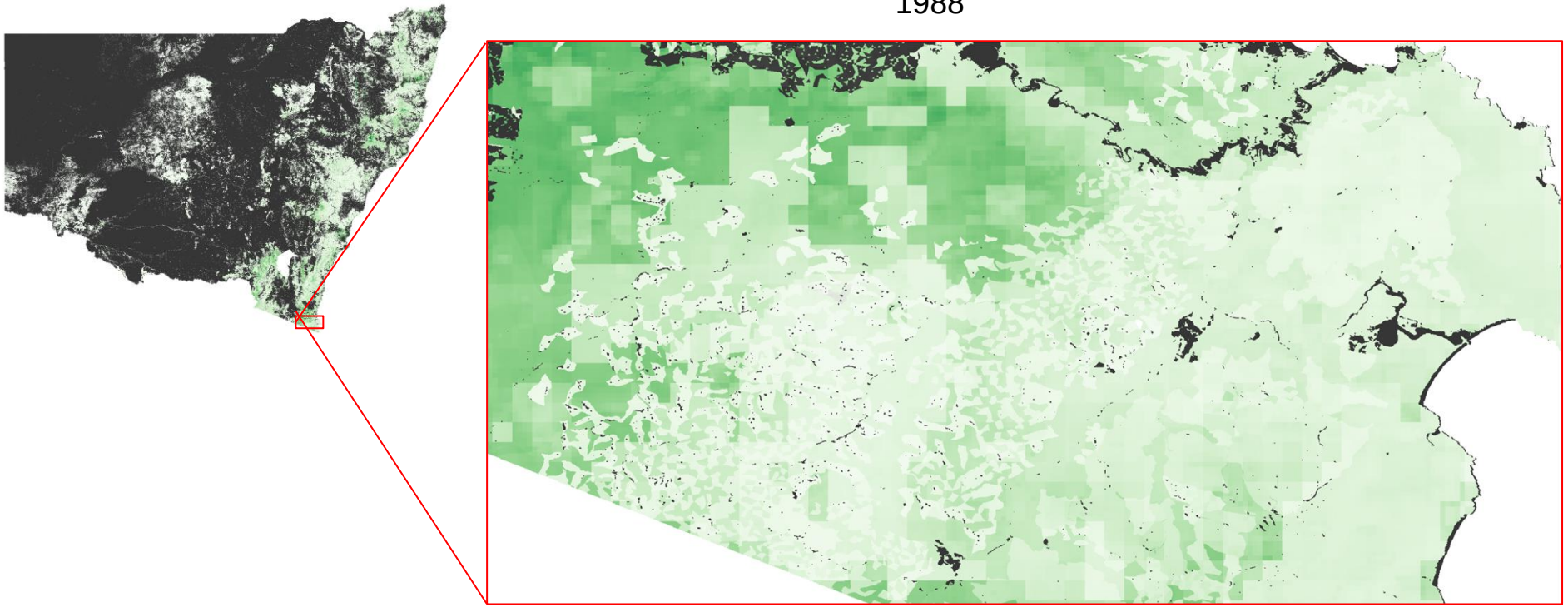
Spatial Outputs - Influence of Events

1950



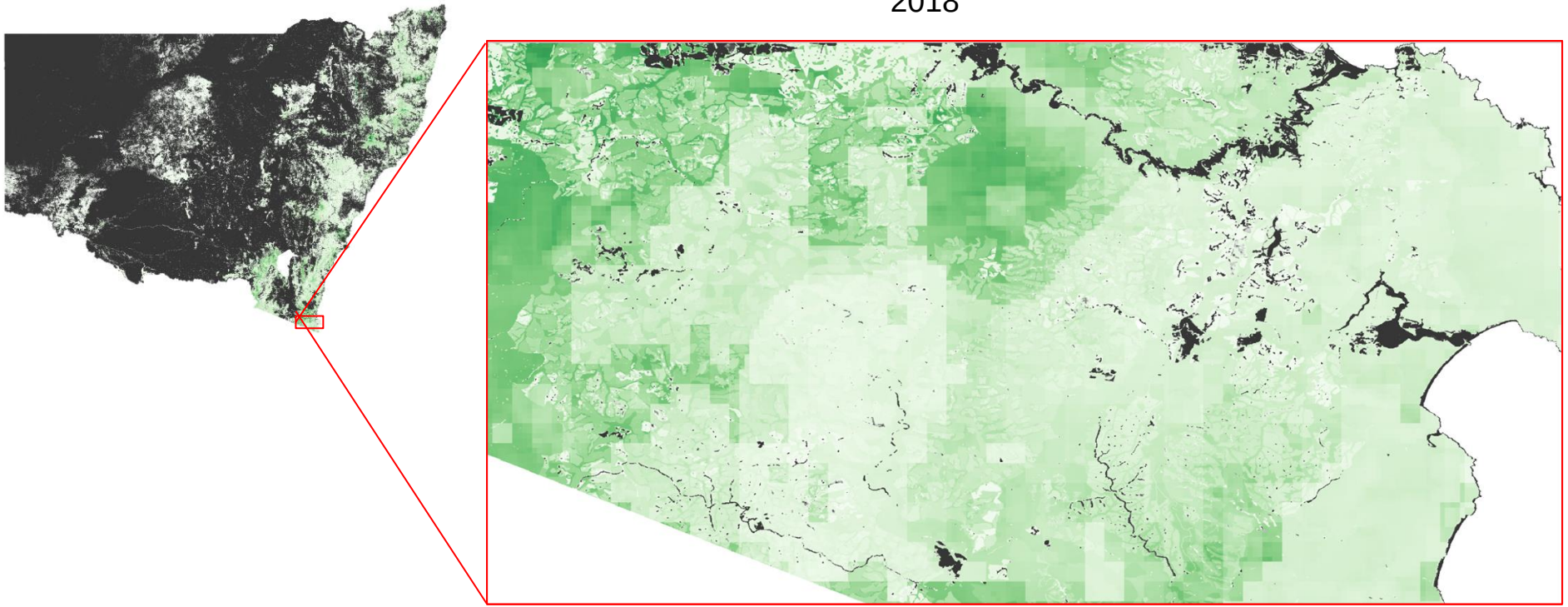
Spatial Outputs - Influence of Events

1988



Spatial Outputs - Influence of Events

2018



Key Assumptions

- Model Started in 1935
  - If forest in 1988, initial age at 19355 was 15 for natural forests and zero for plantation forests
- Natural Forests were harvested according to harvest data, or burn according to fire data
  - Remote sensing used to identify forest cover loss and gain events
  - Forests Modelled using Tree Yield Formula, as used in FullCAM

- Plantations were managed on a standard management regime by species.
  - Pre 1988, harvests were implemented using standard management ages (i.e. Harvest after 35 years for radiata), post 1988 remote sensing was used to trigger harvest events.
  - Initial age of plantations was adjusted
  - Uses 2020 FullCAM Plantation Calibrations

- These assumptions can be adjusted by the Users through modifying the input data
- As assumptions are replaced with data, there is an improvement in the spatial representation of the data.

Key Updates

- Fire & Forest extent data was updated
- Forest loss with fire was adjusted to burn, but not clear the forest
- Harvesting data was expanded
- Fire parameters were extended to killing belowground biomass
- Plantation growth parameters were updated
- Initial age of plantations was adjusted using current age class data
- Additional filters were applied to flux types

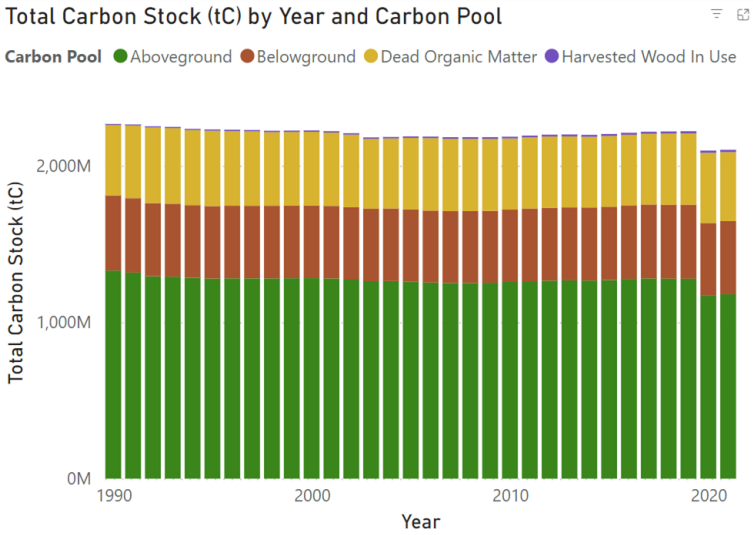
NRC

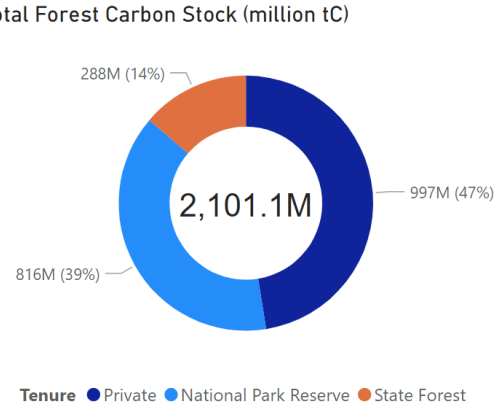
NSW Forest Carbon Assessment

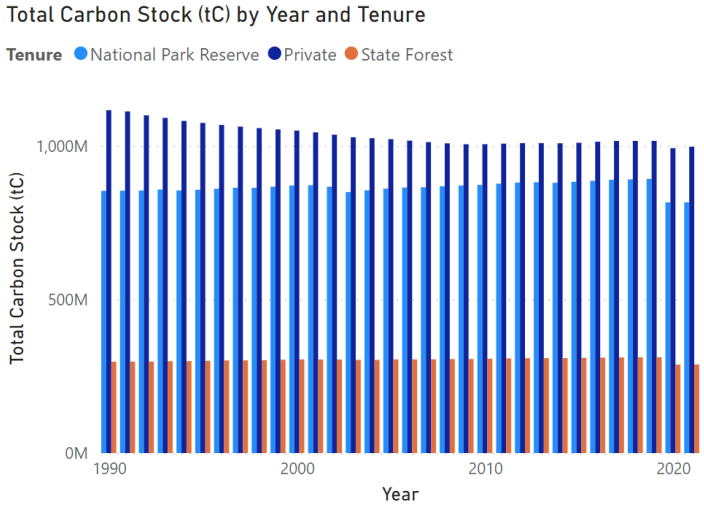
Sample of Outputs

Carbon Stock Reports

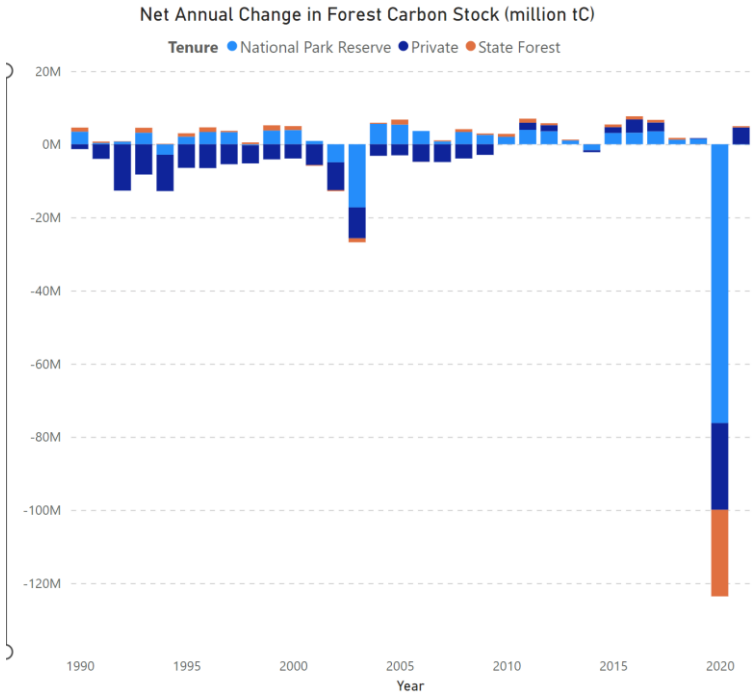
Results available in PowerBI

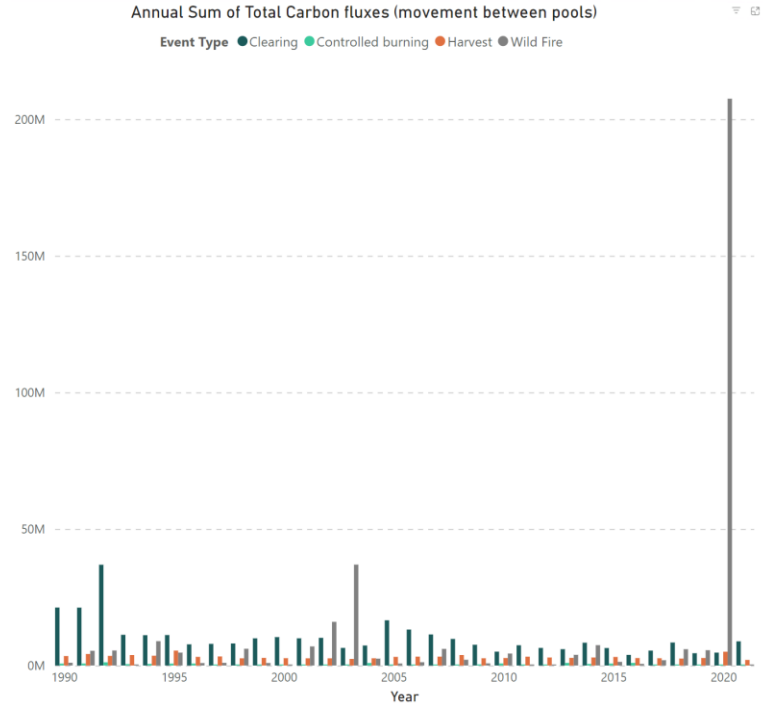






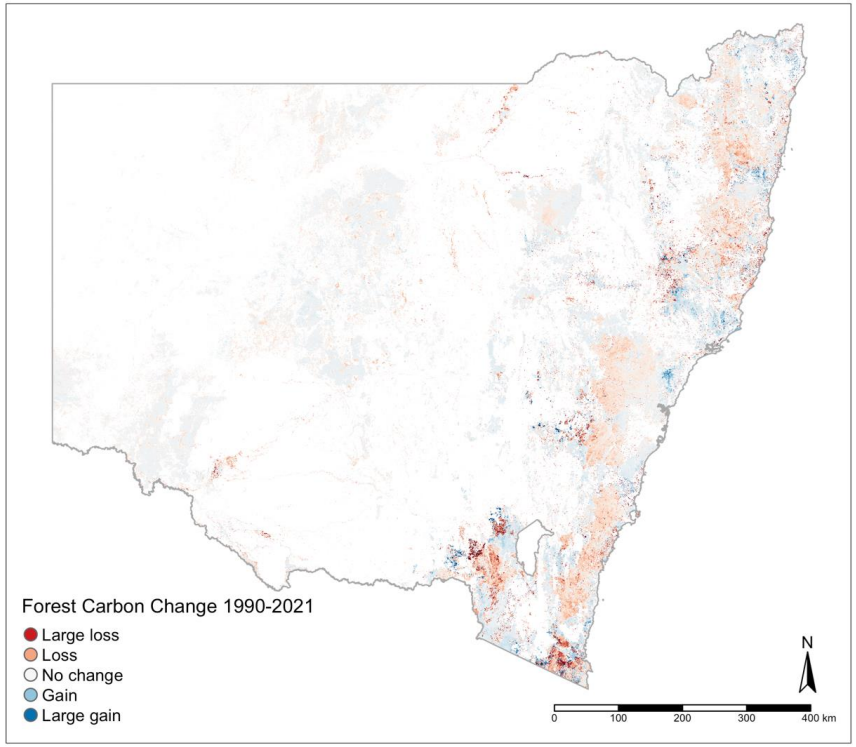
Change in Forest Carbon Stock





Spatial Outputs - Losses and Gains

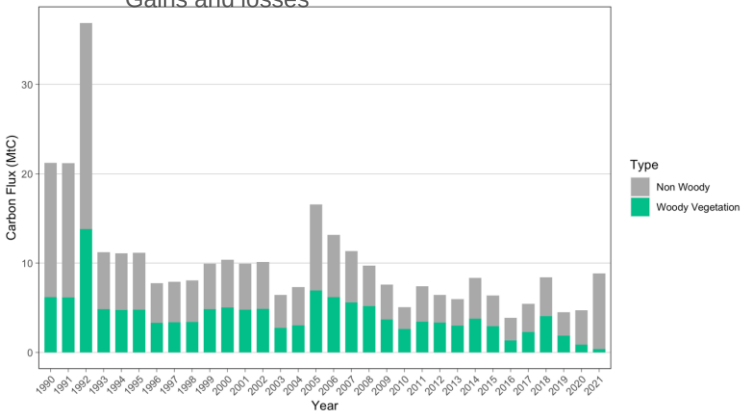
Different drivers of change occur across the state



Harvesting/Plantations

Clearing

Gains and losses



Conclusions

- The outputs represent the most comprehensive spatial and temporal assessment of carbon stock in NSW to date; however
- There are limitations in the outputs due to limitations in the input data. This could be greatly improved through, for example:
    - Reducing gaps in the forest cover data
    - Extending forest cover data to pre-1988
    - Replacing assumed management of plantations with actual
    - Including carbon in harvested wood products in landfill
    - Expanding harvest types
    - Improving the data for fire impacts
- Build on the functionality to incorporate:
    - Improve the modelling of sparse woody vegetation/forest transitions
    - Soil Carbon
    - Non-carbon matrix (habitat quality etc.)

Disclaimer

The data used in this presentation has been compiled from both public and restricted access data sources. While care has been taken to compile and present the results, a validation audit of the data has not been undertaken and the Mullion Group does not warrant or guarantee the results. You must not rely on the information in the presentation as an alternative to specialist advice from an appropriately qualified professional. To the extent permitted by law, the Mullion Group excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this presentation (in part or in whole) and any information or material contained in it.


FLINT pro
Natural Capital Solutions for Climate Action

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Q&A

Mr Geoff Roberts, Director of Forests and Supply Chains FLINTpro

Professor Patrick Baker, Silviculture and Forest Ecology University of Melbourne

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Thank you for joining us today!

This webinar will be available shortly on the Commission's website nrc.nsw.gov.au

The Commission will post responses to unanswered questions on the Commission's website.

Any further questions or feedback please contact us nrc@nrc.nsw.gov.au