Refining timber harvesting and reservation approaches to maximise biodiversity outcomes

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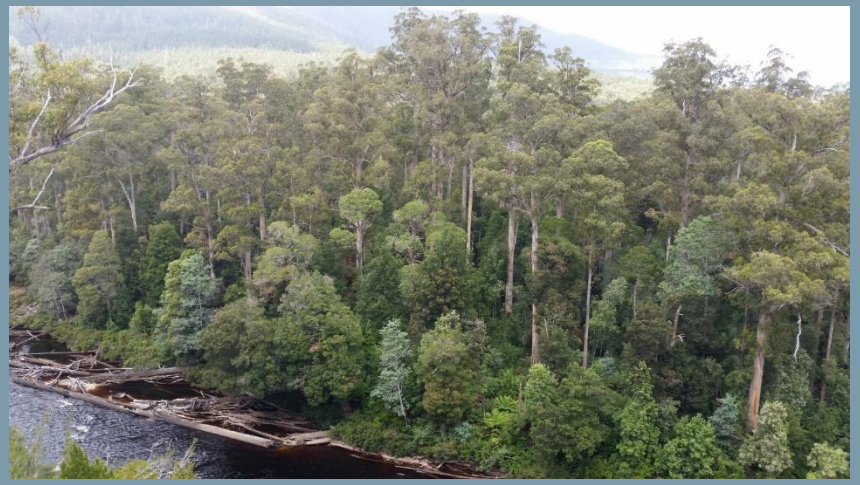
UNIVERSITY of TASMANIA AUSTRALIA



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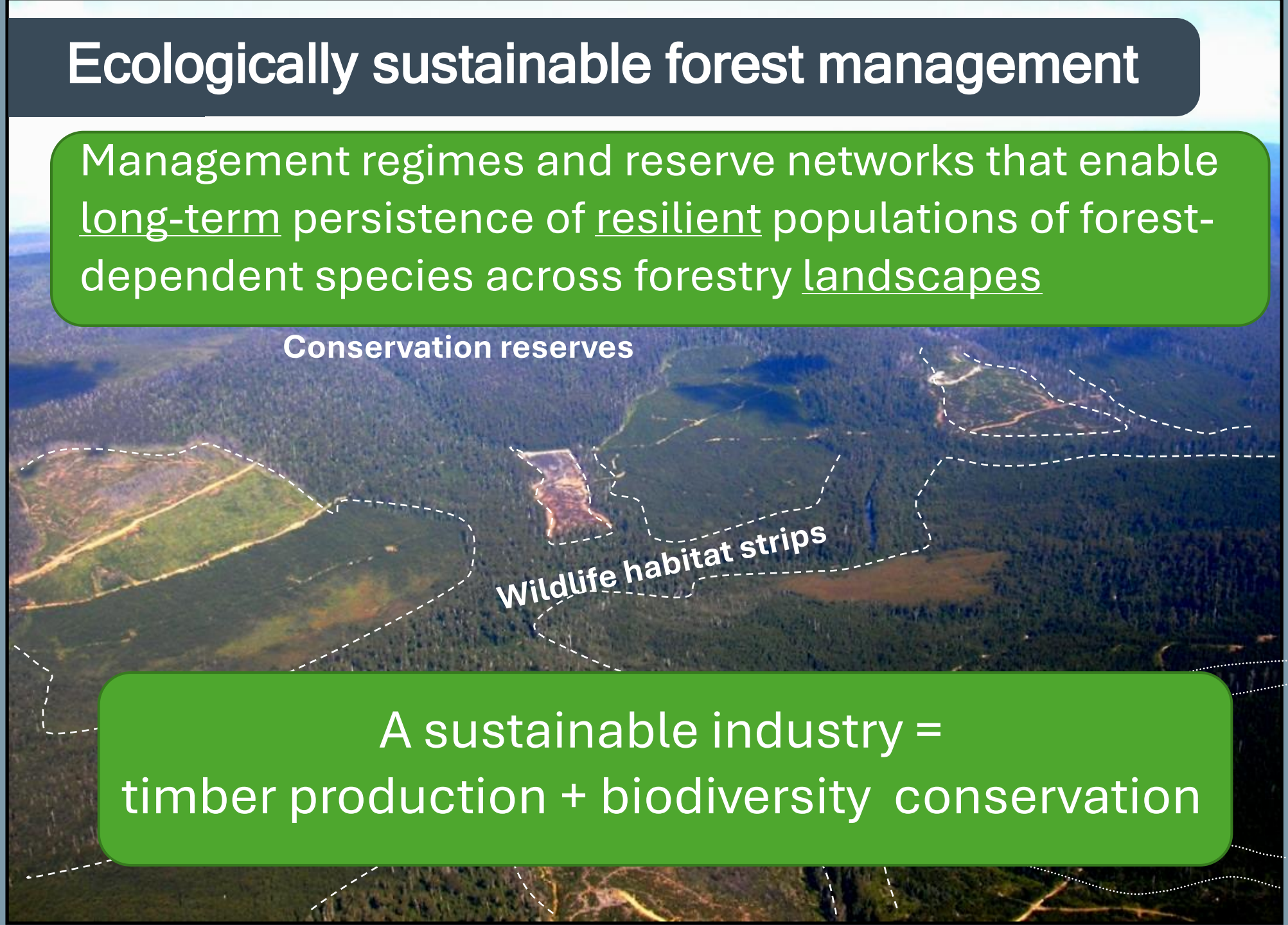
- This research was conducted in lutruwita, on the traditional lands of the palawa and pakana people

Ecologically sustainable forest management

Management regimes and reserve networks that enable long-term persistence of resilient populations of forest-dependent species across forestry landscapes



A sustainable industry =
timber production + biodiversity conservation

Demand for wood products is increasing

Betts et al 2021 Biological Reviews

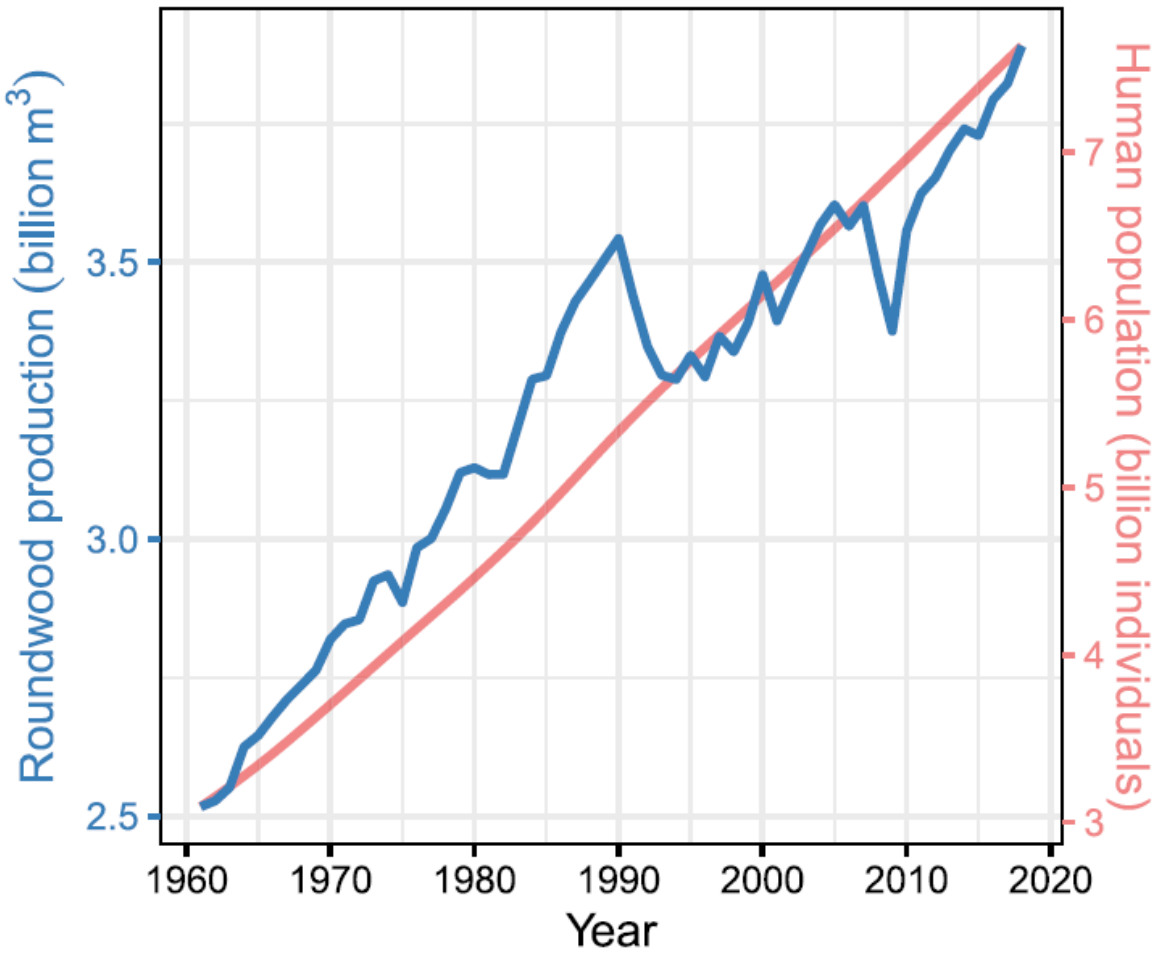


Fig 1. Global roundwood production (blue) and human population size (red). Data sources: FAOSTAT (2019*a*,*b*).

Australian imports of wood products are increasing

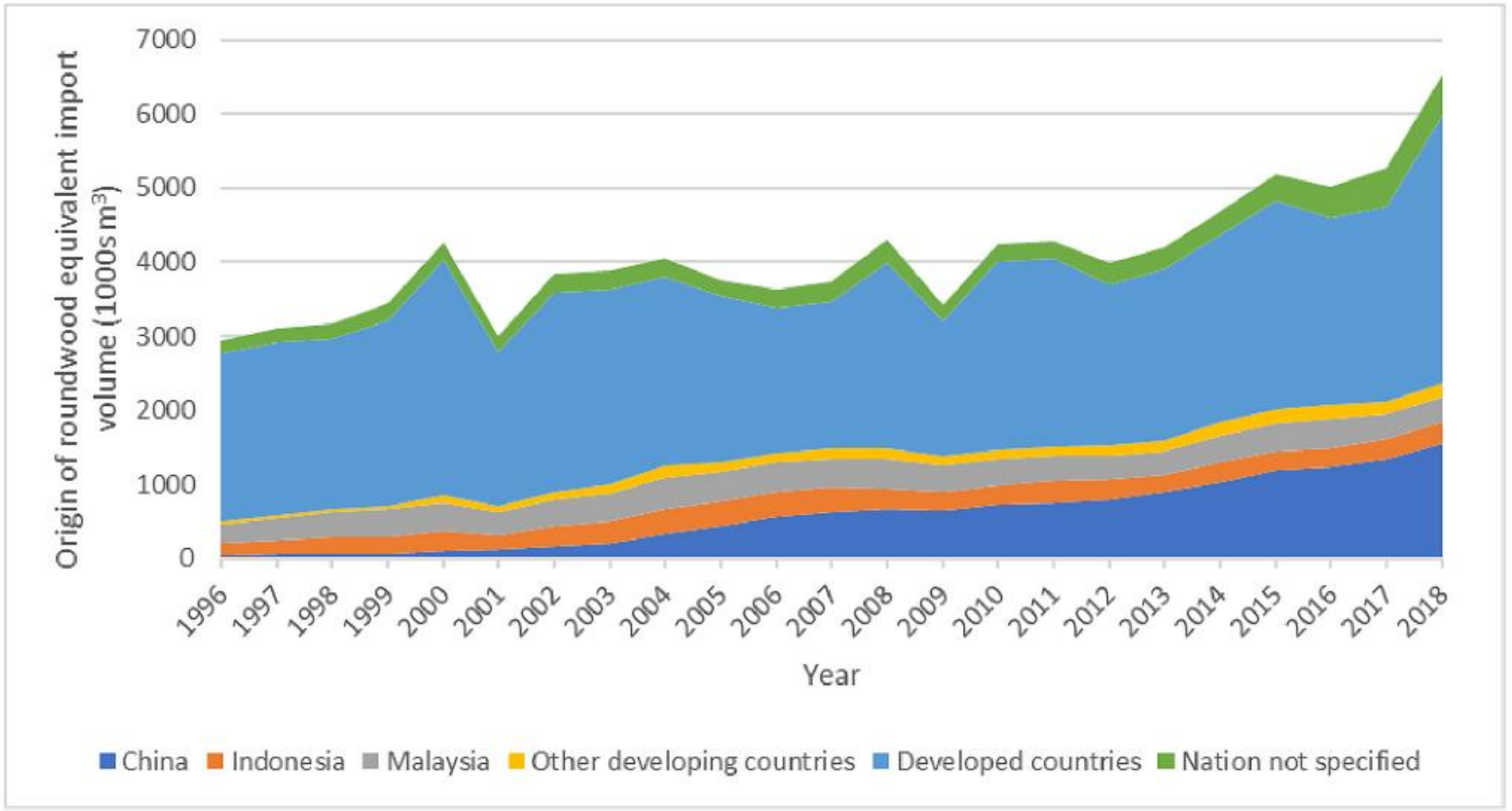


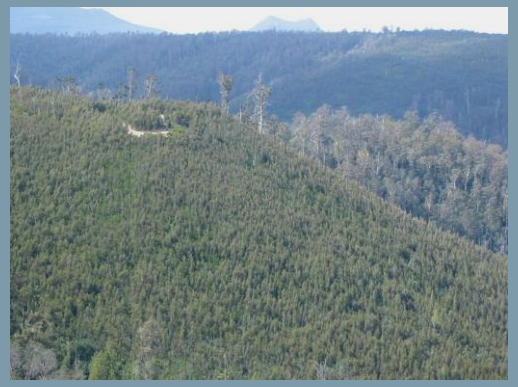
Fig. 2. Australian roundwood equivalent import volume by country of origin from 1996 to 2018.

Tyron Venn et al 2023

Natural disturbance guiding ecologically sustainable forest management

Wildfire

Clearfell, burn and sow



- Clearfell, burn and sow results in regrowth with broadly similar species composition to same-aged wildfire regeneration
- BUT … some species & habitats are disadvantaged: inc. certain vascular plants, bryophytes, soil bacteria & fungi, habitat trees, CWD

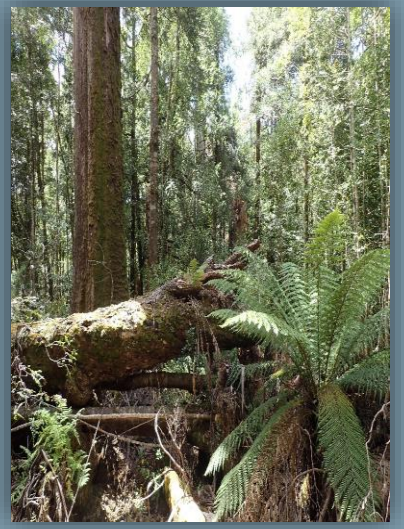
Hickey 1994; Turner 2009; Baker 2004, 2020; Grove 2009; Ammitzboll in prep

Succession of biodiversity following clearfelling

Young ~7 y.o.

Mid ~27 y.o.

Late ~45 y.o.



Mature

Birds: Andrew Hingston

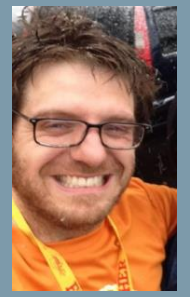
Hingston et al 2014, Glob. Ecol. Conserv.

Plants: Jayne Balmer

Bryophytes: Tom Baker

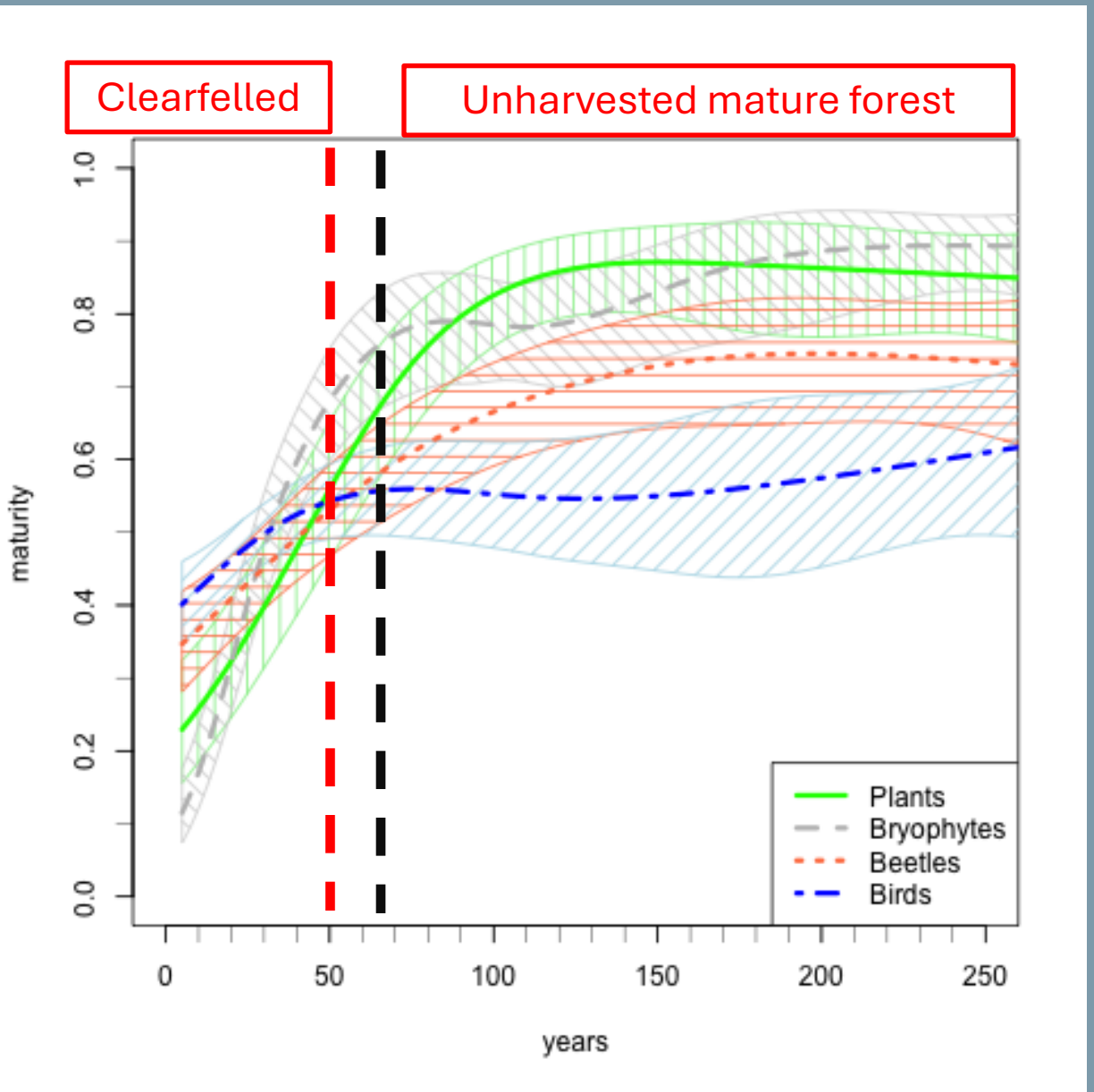
T Baker et al 2016, For. Ecol. Manage.

Ground-active beetles: Nick Fountain-Jones



Fountain-Jones et al 2015, Ecol. Appl.

Relationship between plant/animal maturity and time since disturbance



Rates of succession to mature forest vary among taxa

Maturity metric calculation:

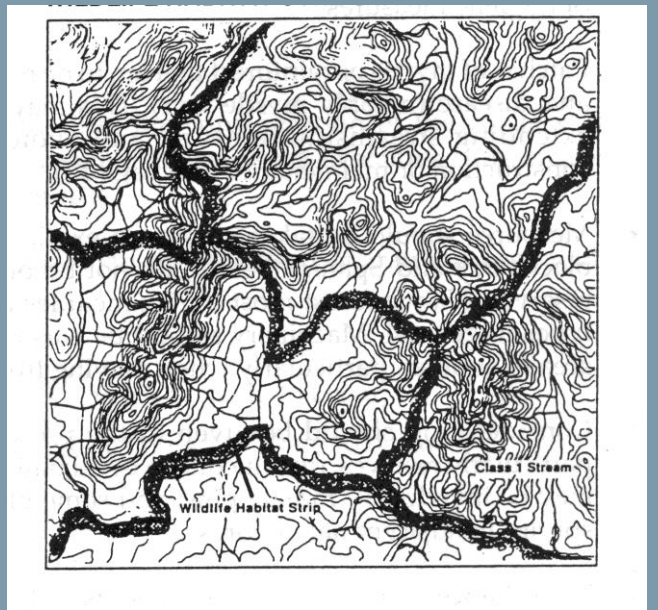
- Ratio of mature forest species richness to total species richness
- Scaled from 0-1, 1 = maximum maturity

- Caveat: based on pres-abs data, ∴underestimating functional maturity
- Paper in prep.

Edge effects on biodiversity

Edge effects of nearby harvest into mature forest

- Negative effects on disturbance-sensitive species
- Estimated depth for beetles; ~25 m into upslope forest and possibly further in riparian areas
- → Guidelines for minimum widths of retention



Landscape context and forest influence

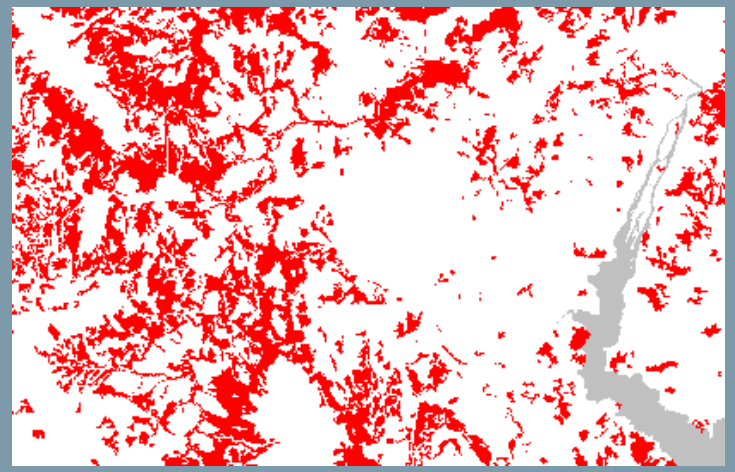
Landscape context

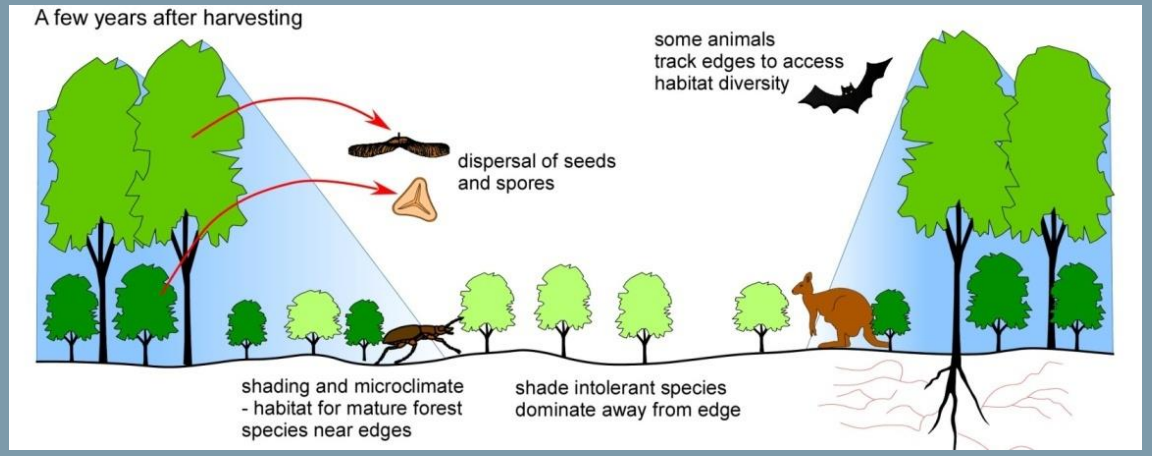
- More mature forest at local-landscape scale (1 km radius) results in more mature species of plants and animals in previously harvested areas

Forest influence: +ve edge effects of nearby mature forest into harvest area

- Source populations & microclimate buffering accelerate species to recolonise nearby harvested forest
- Distance and rates of re-establishment differ among plant and animal taxa

Mature forest in red





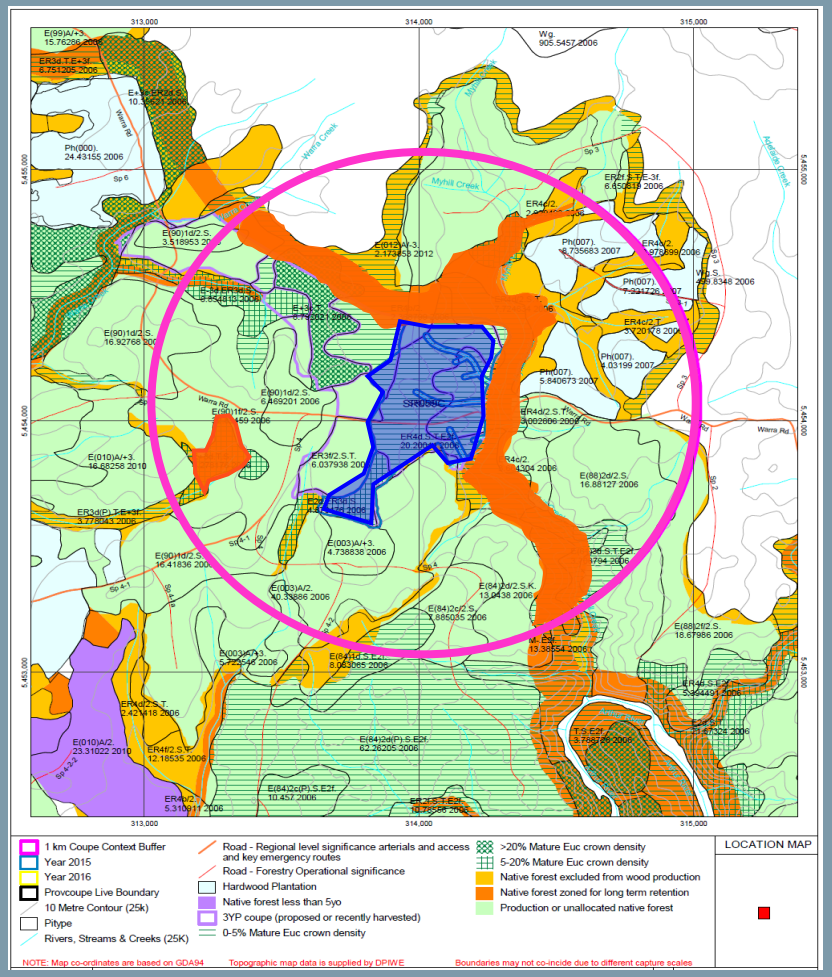
Wardlaw et al 2018; Liu et al 2021

Landscape context and operational planning

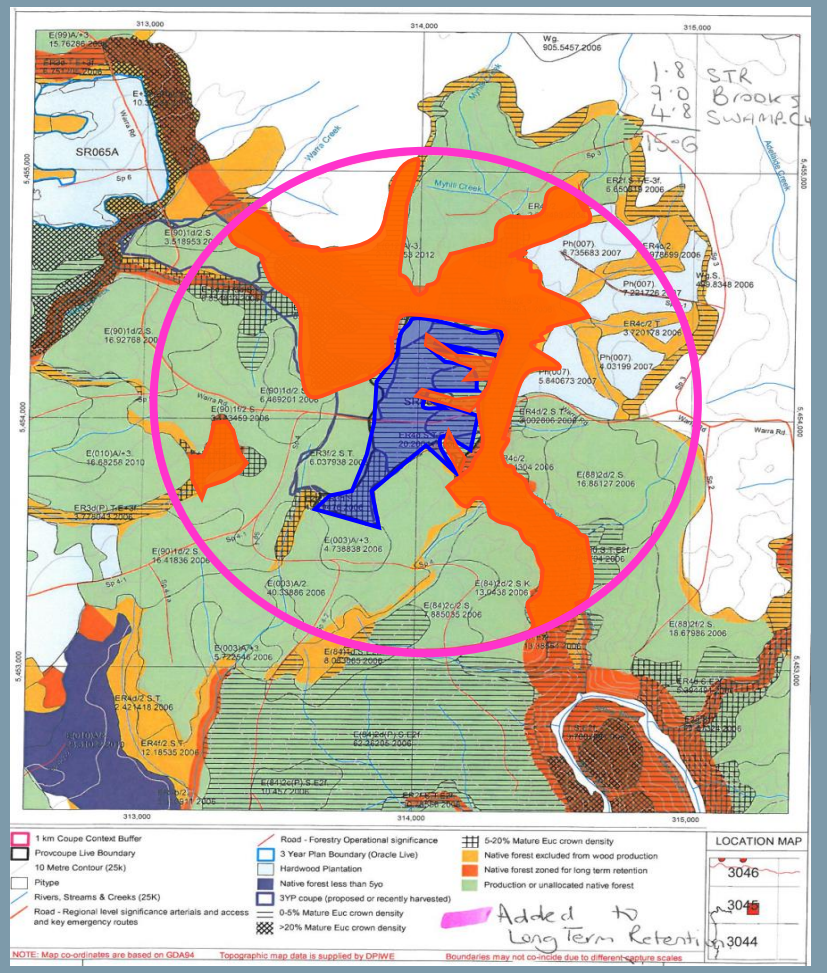
Sustainable Timber Tasmania

Slide: Marie Yee

- Supported by STT's Landscape Context Planning System Map and Report
- Target for >20% long-term retention (LTR) in 1 km radius local landscape (wet forests)



15% LTR before planning



24% LTR after planning

Long-term retention in orange

Basis for retention forestry

- An approach to silviculture and harvesting guided by natural disturbance
- Variable retention maintains mature-forest values (species, structures, habitats) and ecosystem processes within sites for the long-term
- Retained aggregates provide forest influence, accelerating biological succession in harvested areas

Traditional clearfelling

Variable retention

Timeline of STT's journey with retention forestry

Sustainable Timber Tasmania

Slide: Marie Yee

1998-2006

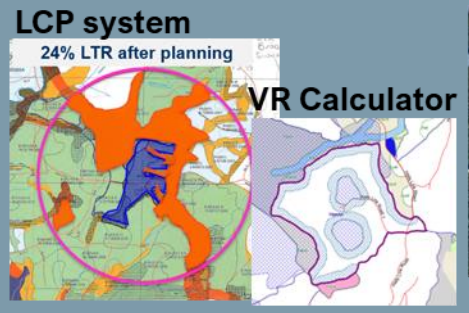
- Researching alternatives to clearfelling

2005-2009

- Operational trials to implement variable retention

2010-2014

- Refining implementation of aggregated retention
- >200 coupes harvested



2014-2018

- Landscape retention
- No clearfelling of coupes containing >25% oldgrowth

2019 onwards

- Operational trials to implement and monitor dispersed retention of habitat trees
- No clearfelling of mapped oldgrowth
- Retaining large (>2.5 m dbh) trees in all coupes

Site- and local-landscape-scale approaches for ecologically sustainable native forest management

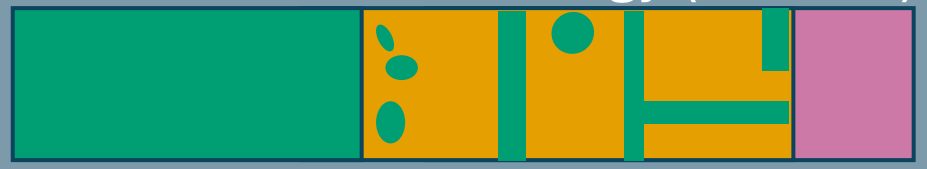
- Retain mature forest in managed landscapes as habitat for biodiversity dependent on older forests
- More mature forest (→STT's Landscape Context Planning System) and closer proximity to mature forest (→ forest influence targets for variable retention) assists re-establishment into harvested ares
- Minimise edge effects with larger/wider retention patches and corridors
- Longer-rotation lengths benefit mature forest species
- Variable retention retains mature forest species, habitats and ecological processes within coupes

Land sparing vs. land sharing forestry

Land sparing

Land sharing

Mixed land-use strategy (current)



Possible forest land-uses

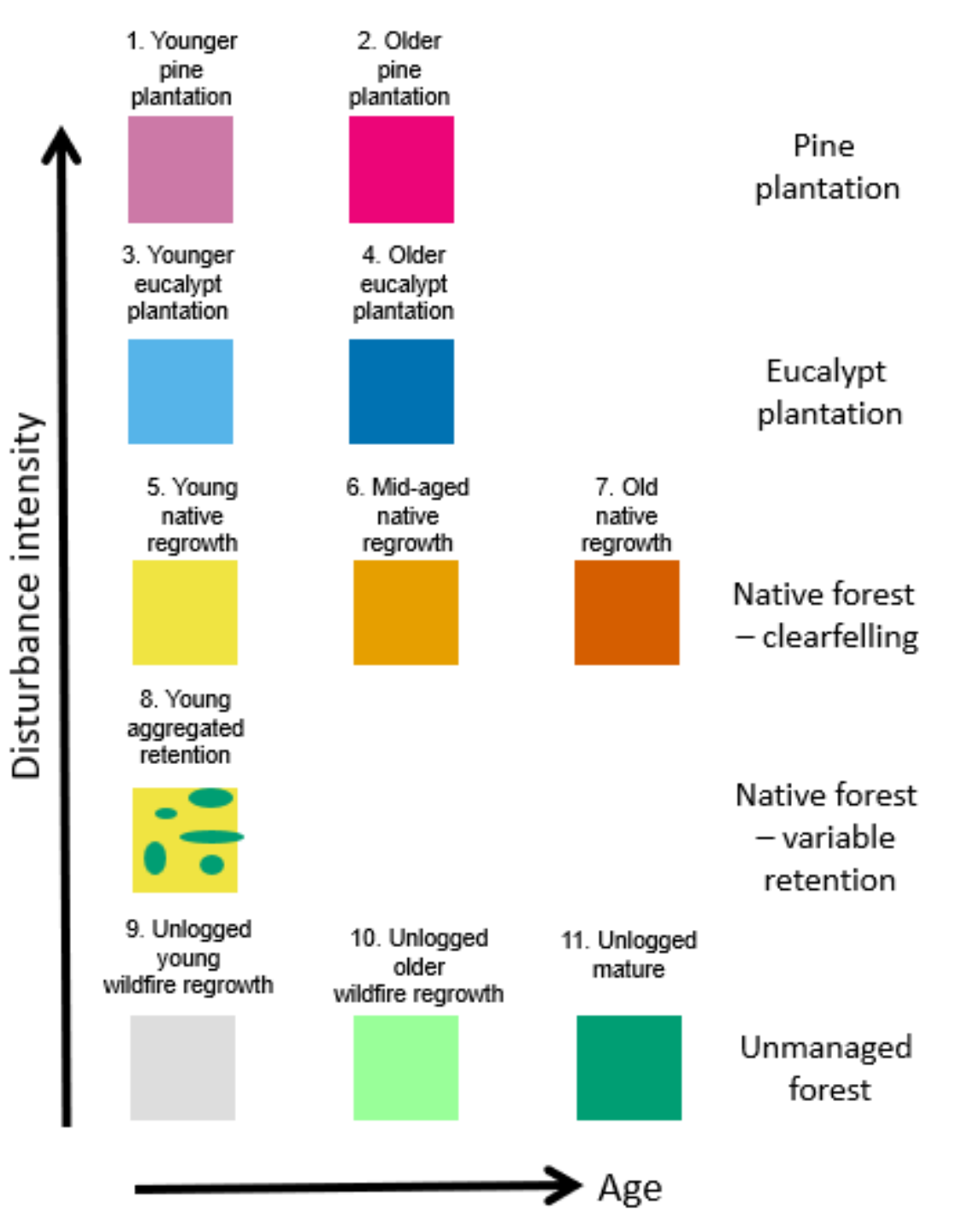
Unmanaged forest	Native forest silviculture	Plantations

- Premise: Different landscape configurations can produce the same yield/value of food or timber
- Land sparing – more unmodified habitat + intensive production
- Land sharing – less unmodified habitat + low intensity management

Table Cape, Tasmania

Tasmanian study

- 66 sites: 11 land-use classes x 6 replicates
- 330 plots (5/site)
- Mammals, birds, ground-active beetles, plants, habitat variables



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FPA FOREST PRACTICES AUTHORITY TASMANIA AUSTRALIA

SFM

reliance FOREST FIBRE

forico future fibre

Tasmanian Government

Simulating landscape composition

- Integrate timber yield/revenue data with density data for numerous species
- Simulate landscapes with different combinations of reserves and management systems
- Determine which scenarios are better overall for biodiversity for defined timber yield

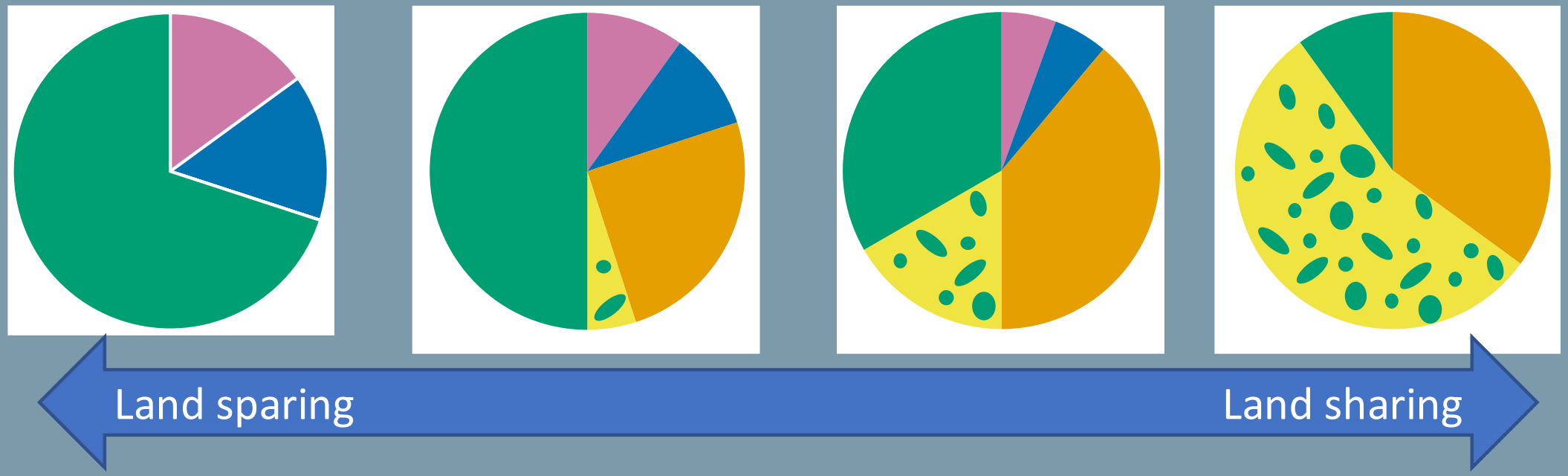
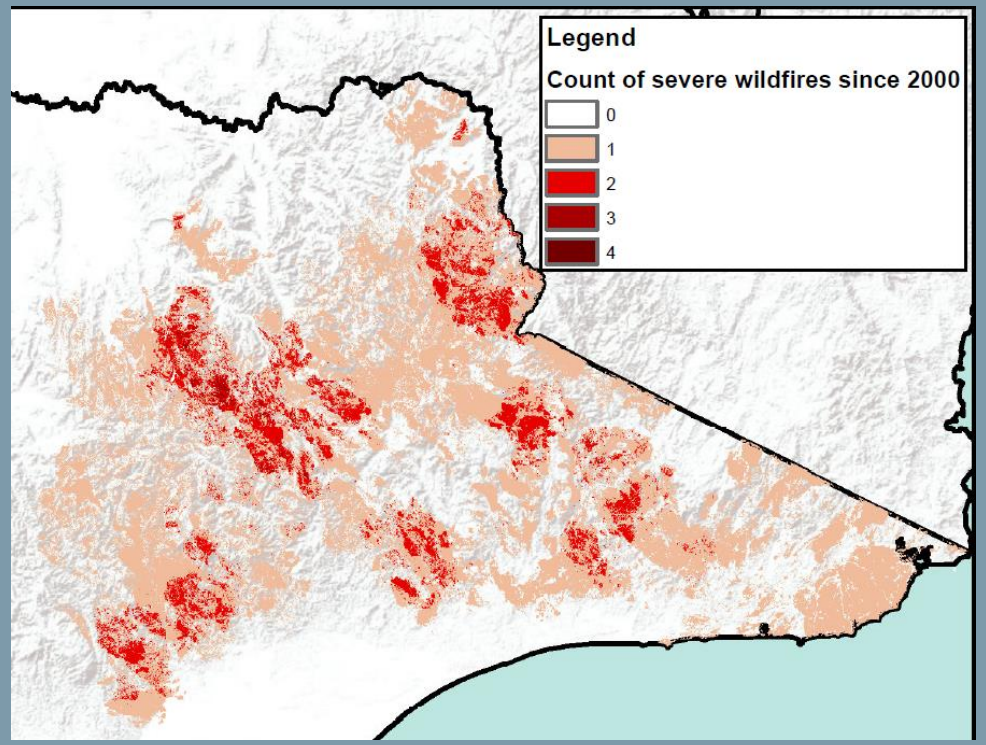


Photo:
Yoav Barness

Climate change and old-growth forest

- ~1.2 M ha of old-growth in Tasmania (88% reserved)
- Climate change impacts wildfire regimes: increasing extent, severity, frequency of fires
- May make mature forests rarer in the future



Images of severe fire in East Gippsland Vic in 2020; Tom Fairman, UniMelb