Tropical Managed Forests: Why do They Matter in Restoration Programs

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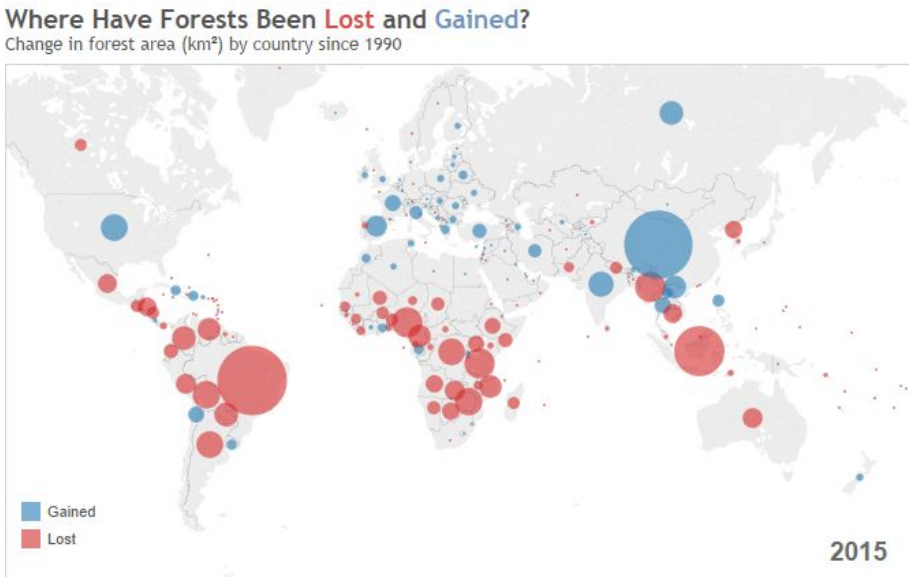
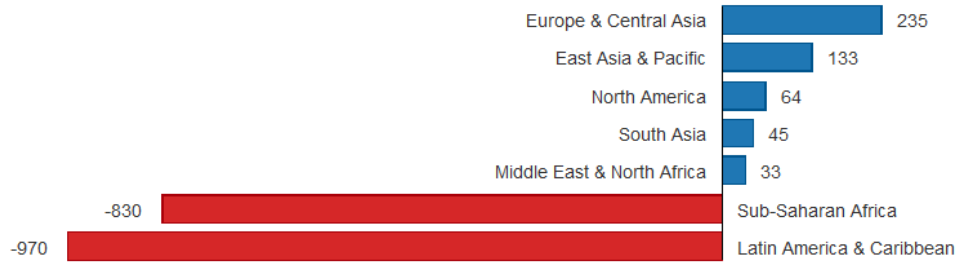
- Deforestation and forest degradation in the tropics
- Impact of logging on Carbon stocks, biodiversity and Timber volume
- How tropical forests recover from logging
- Recommendations for tropical landscape restoration taking into account natural forests

Deforestation in the World

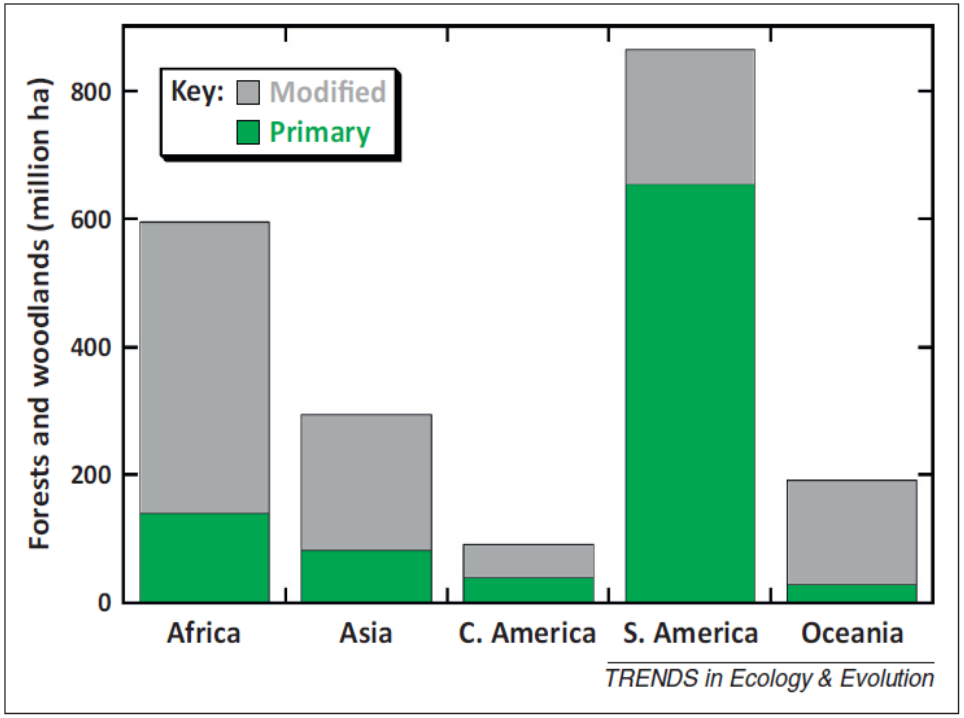




- Between 1990-2012, the world lost **130 Millions ha** of forests (> size of South Africa)
- 2000-2012, mean deforestation rate in tropical region = **2 millions ha/yr** (Hansen et al. 2014)
- Selective logging affects **20% of tropical forests (Asner et al. 2005)**
- Production forests = **400 millions ha** (Blaser et al. 2011)
- Primary forests = 24 % AND **76 % of "degraded forests"** (Lewis et al. 2015)
- **1.2-1.5 Billions people depend on forests for wood, food, ntfps (Vira et al. 2015)**

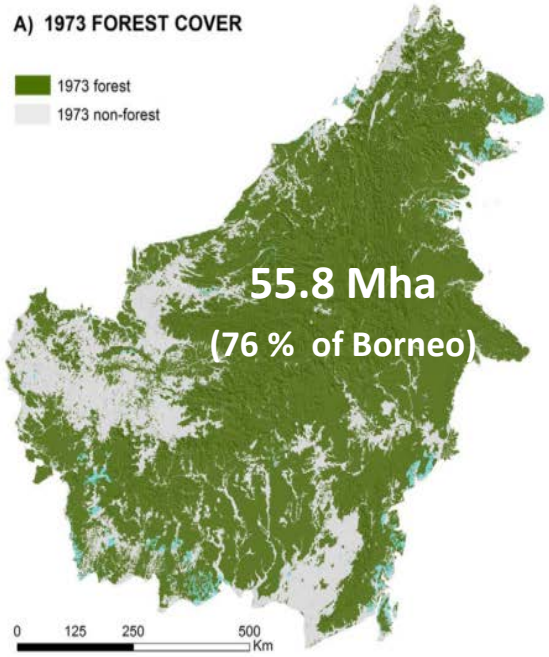
Source: Worldbank http://data.worldbank.org/indicator/AG.LND.FRST.K2

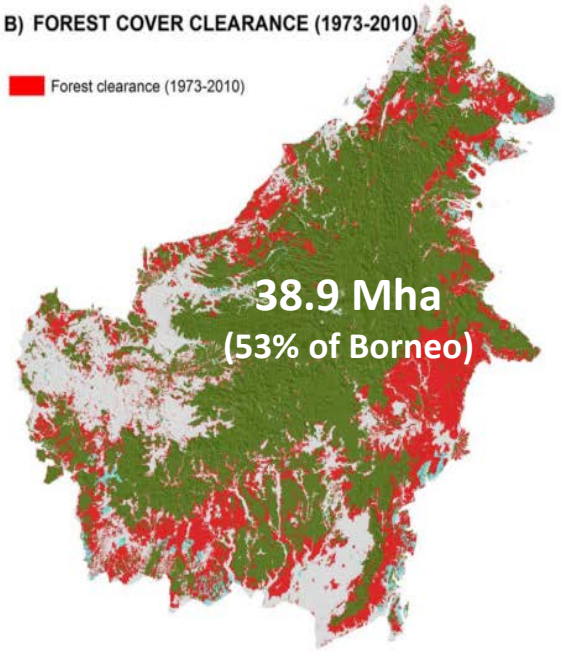
Tropical pristine forests are no more dominant in the landscapes

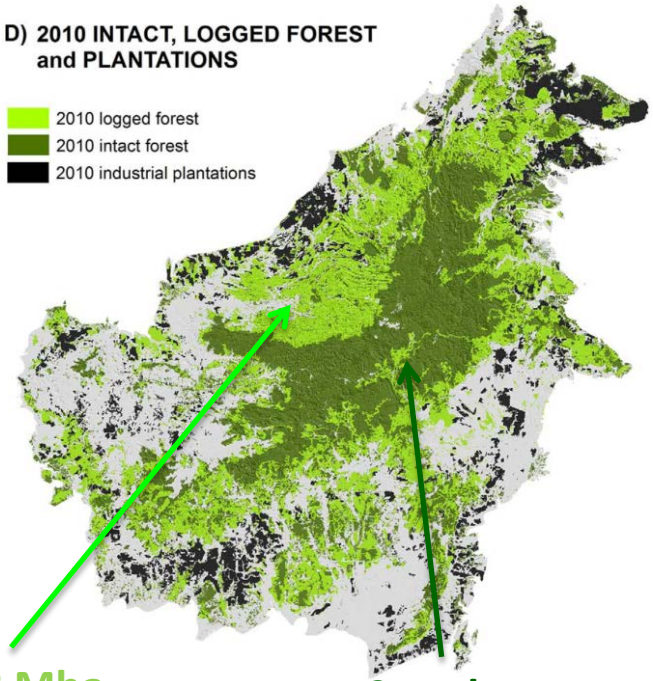


Laurance et al. 2014

Forest Degradation and Deforestation in Borneo





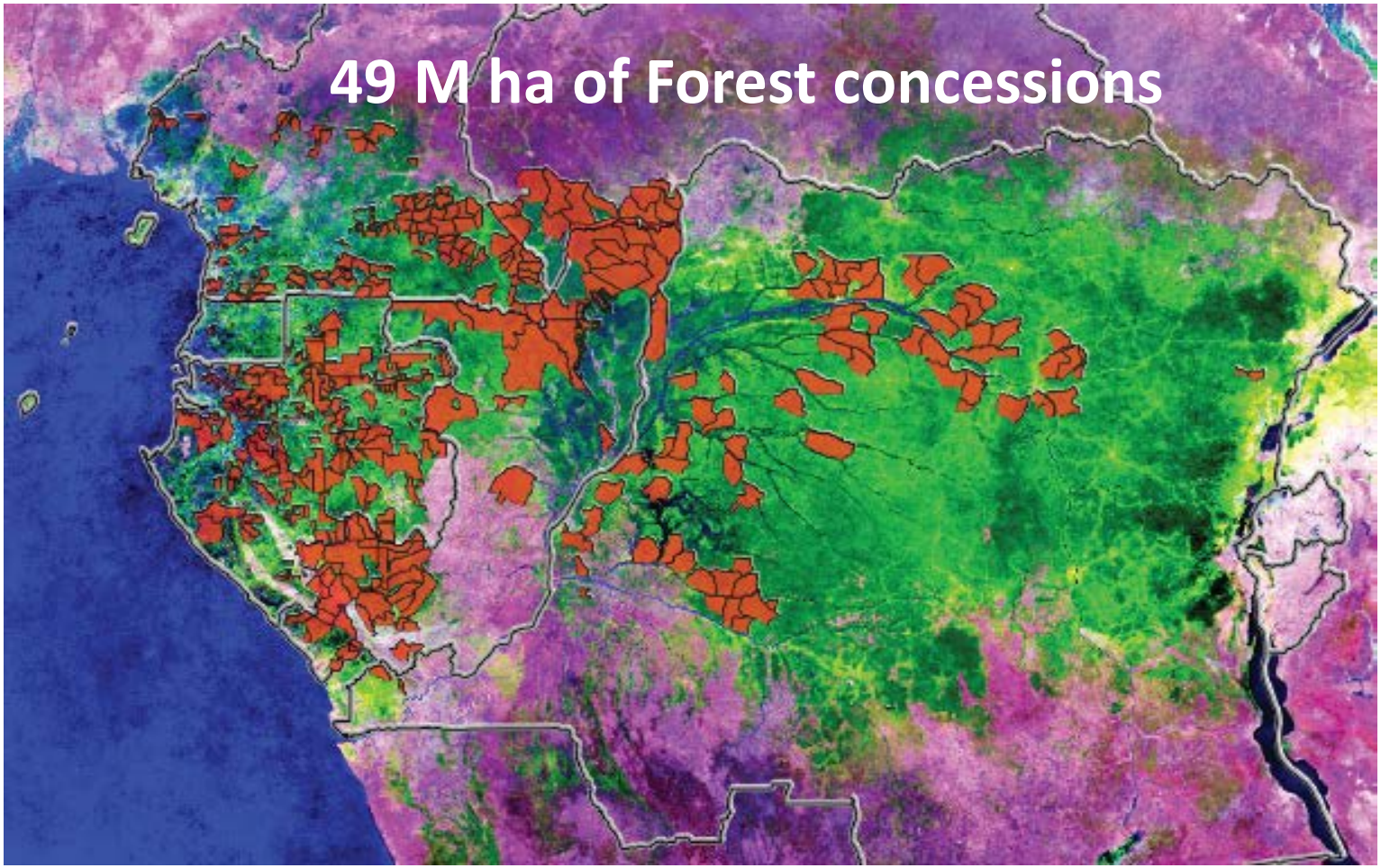


Gaveau et al. 2014

17.8 Mha
Logged Forests

21 Mha
(42% production forests)

The Example of Africa



Deforestation and Degradation in the Brazilian Amazon

Logging Companies

Farmers (big & small)

Forests Communities

Private lands

Concessions

Colonization

Conservation units

Concessions

Partnerships or/and Conflicts

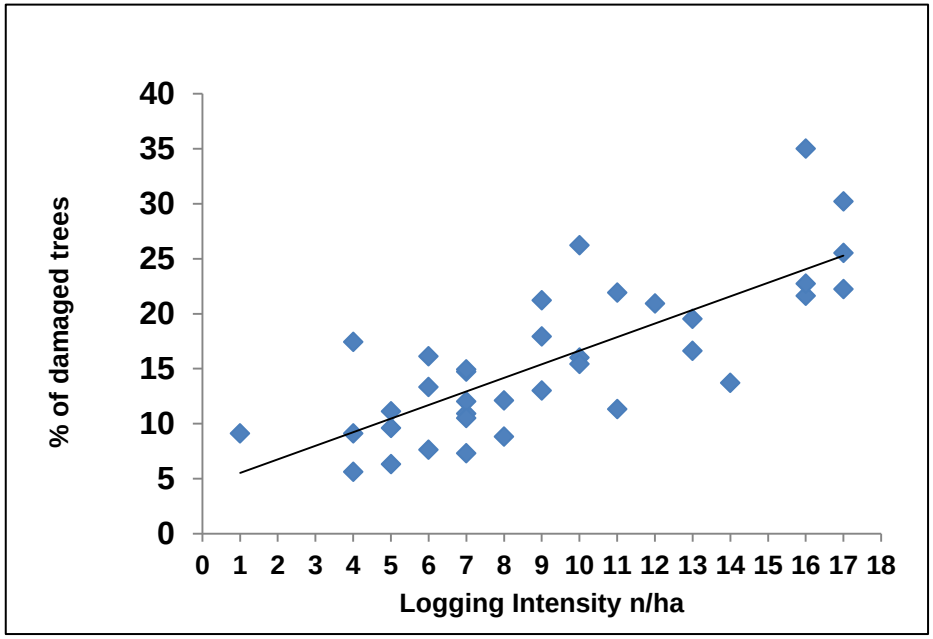
Different Logging Techniques
Different Impacts

Conventional

RIL

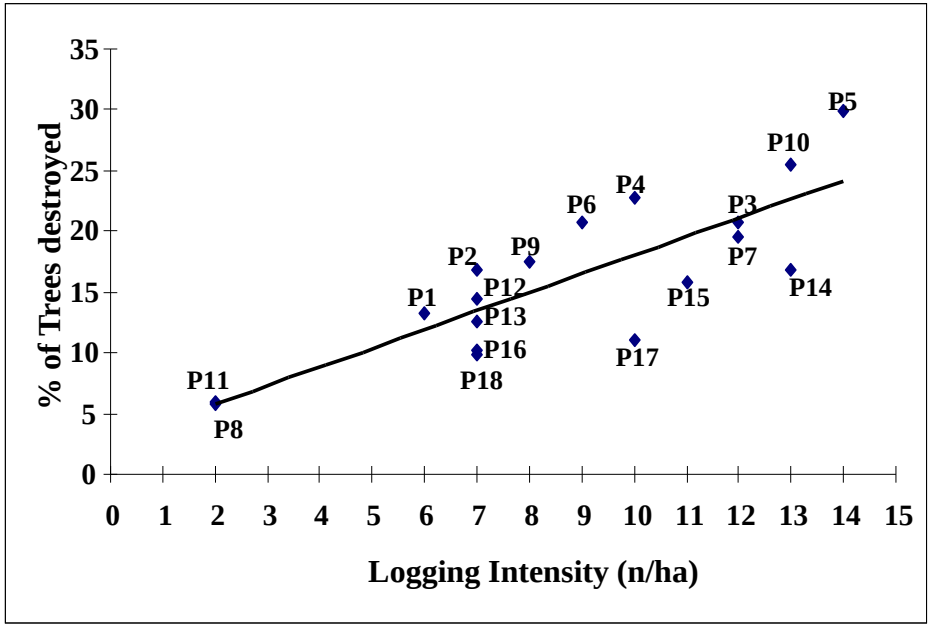
Selective Logging vs Logging Intensity

Indonesia, East Kalimantan



(Sist et al. 1998)

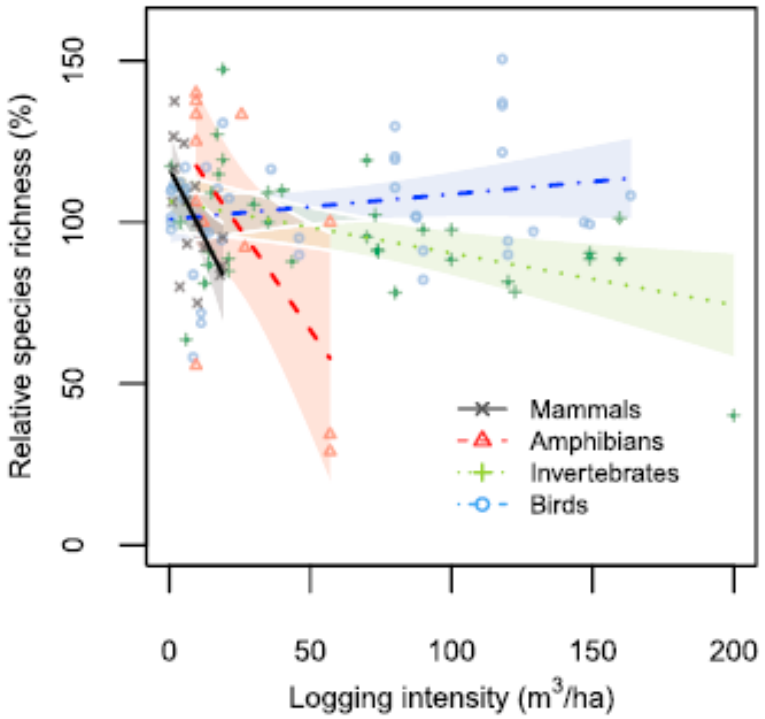
Brazil, Amazon



Sist & Ferreira 2007

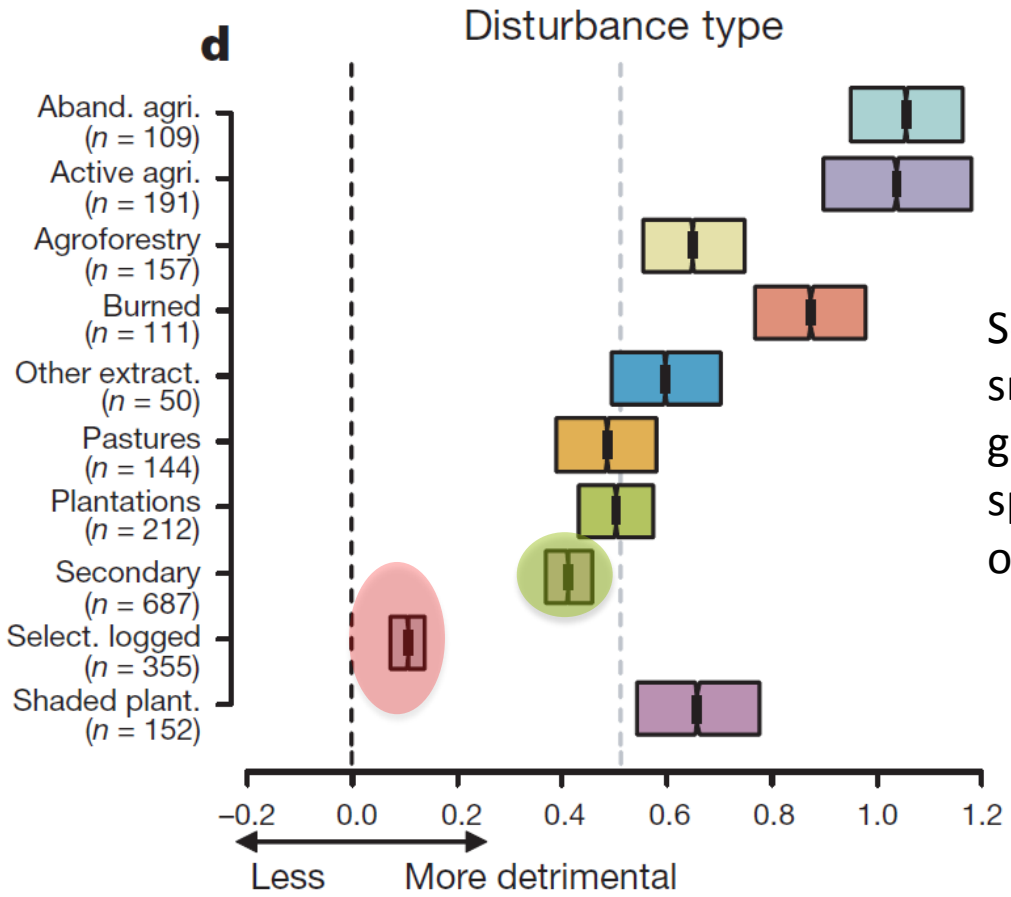
Logging Intensity and Biodiversity

Pantropical Analysis (Burivalova et al. 2015)



Species richness reduced by 50% at
38m^3/ha for Mammals
63m^3/ha for Amphibians

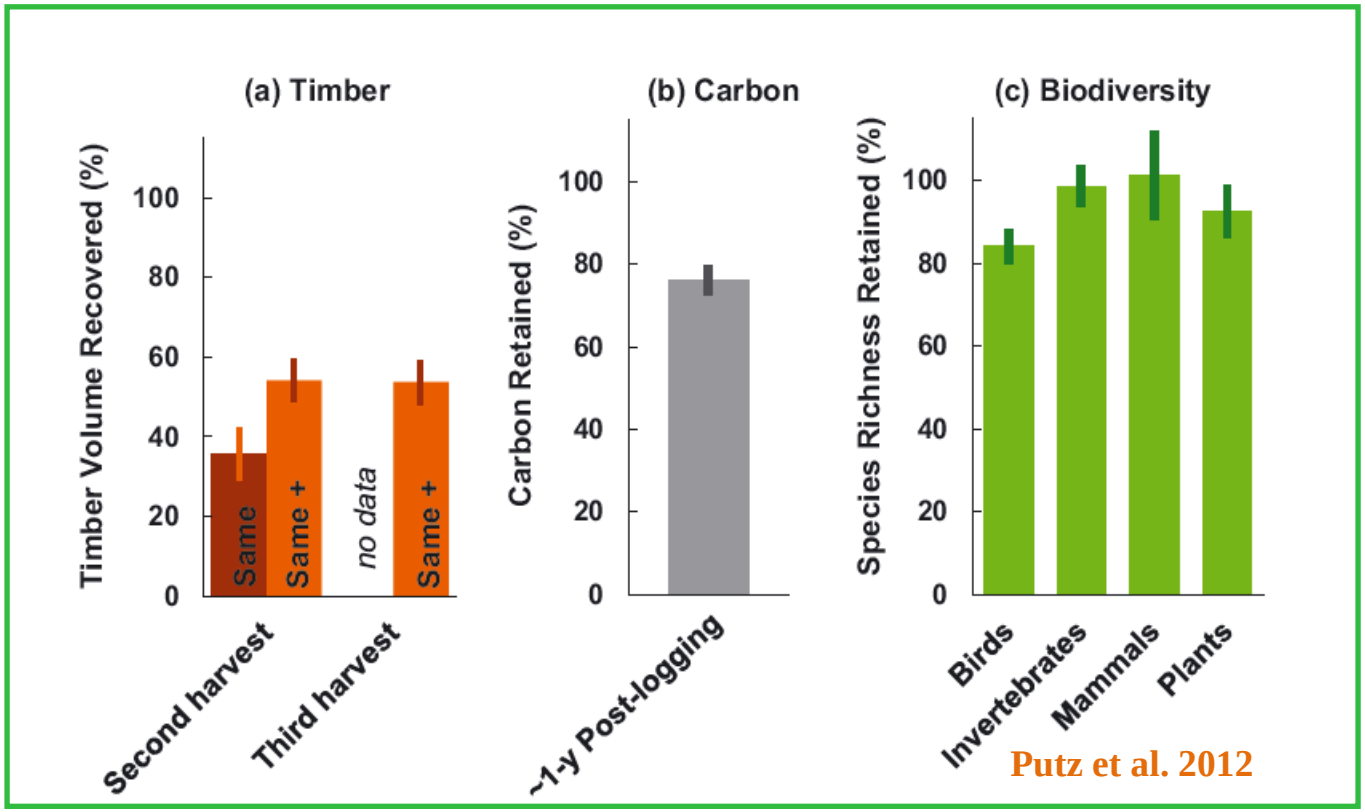
Biodiversity vs Land Use Type



Selectively logged forests have by far the smallest negative impact compared to old-growth forest and they are far better for species richness than are all other forms of disturbed environment.

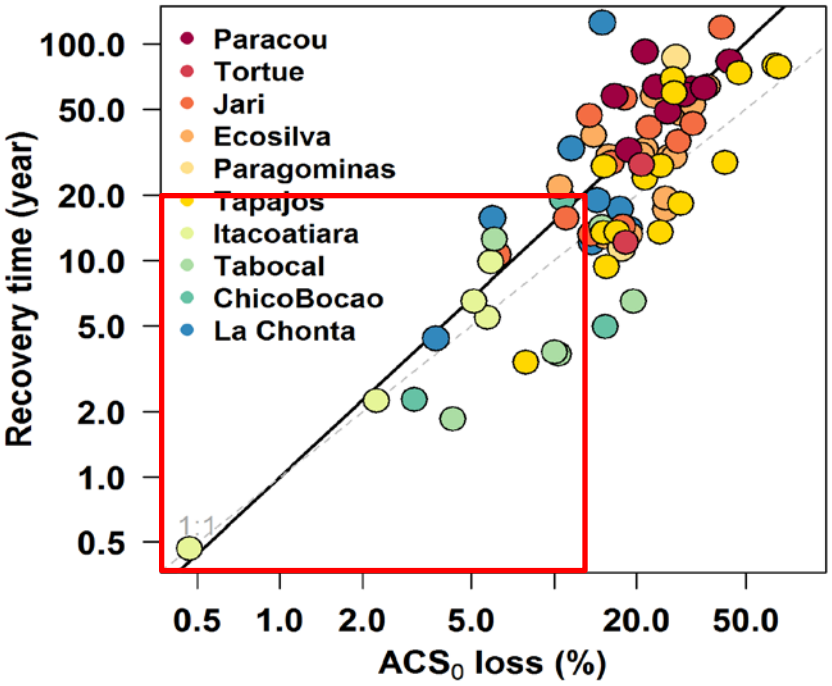
The biological value of different land-use systems (Gibson et al. 2011)
Each habitat is weighted against the species richness of an old-growth forest (black broken line

Not Only Timbers



Putz et al. 2012

Above Carbon Stock Recovery in the Amazon Basin

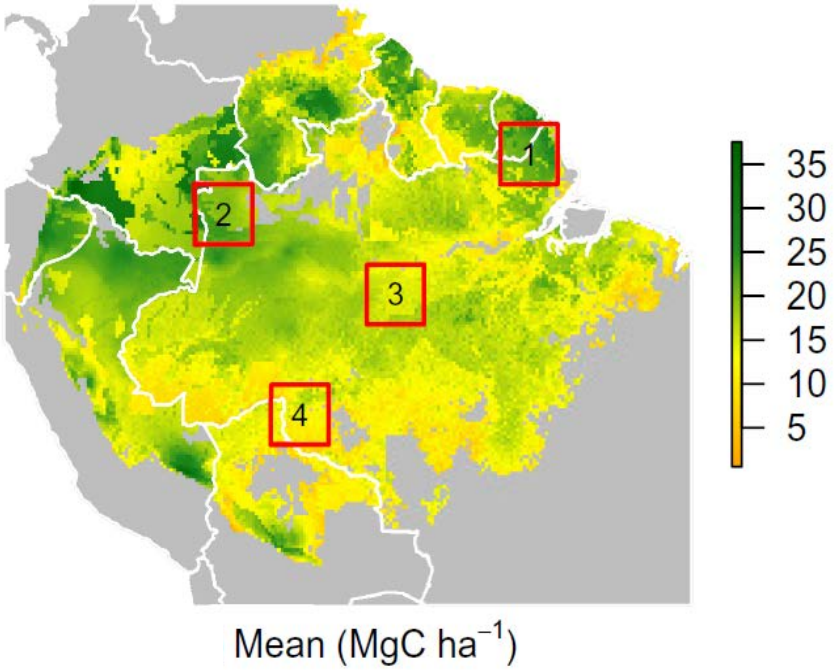


Linear Mixed Model (Biomass recovery time) with the following explanatory variables:

(1) ACS Loss by logging (%)
(2) average pre-logging ACS stock
(3) Basal Area-weighted wood density (or community wood density, WDBA in $g.cm^{-3}$);
(4) Stem density (ha^{-1});
(4) Average annual rainfall ($mm\ yr^{-1}$)
(5) Rainfall seasonality (annual standard deviation, WorldClim
(6) Soil properties (Harmonized World Soil): Texture, drainage, water content (range), Clay, silt and sand content (%), CEC cation-exchange capacity (CEC, cmol/kg) Bulk density (kg/dm^3)

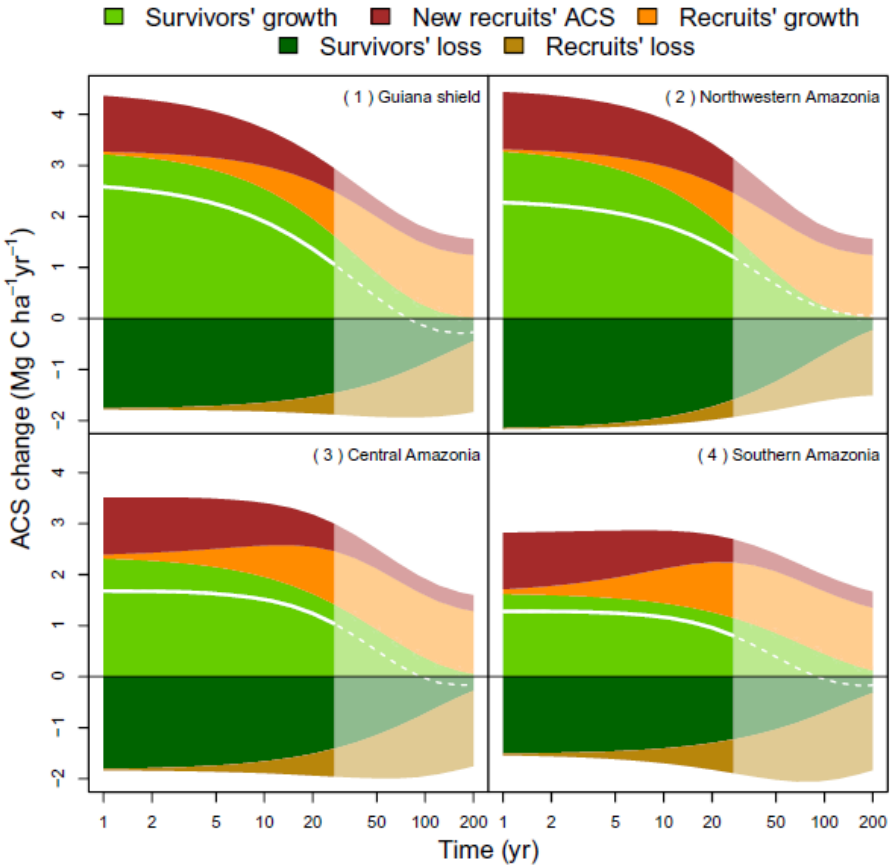
- ✓ Above Ground Carbon recovery time mainly depends on logging intensity
- ✓ **Mean recovery time 32 yrs**
- ✓ Within the logging intensities occurring in the Amazon (10-30 m^3/ha), biomass will recover in 7 to 21 years

Different ACS recovery rates in the Amazon basin



Predicted net ACS recovery over the first 10 year after losing 40%

Mean recovery rate 1.7 TC ha^{-1}/yr^{-1}



Predicted contribution of annual ACS changes in ACS recovery

Piponiot et al. 2016

Comparison with Secondary and Old Growth Amazonian Forests

	Managed Forests (dbh>20)[1]	Secondary Forests (dbh>5cm)[2]	Old growth Forests (dbh>20 cm)[1]
AGB (Mg ha^{-1})	236	123	309
% AGB Old Growth Forests	76	-	-
AGB Loss (%)	25	-	-
Recovery time yrs	31 (100%)	66 (90%)	-
Recovery rate Mg C ha^{-1} yr^{-1}	1.3	3.05	0.28

[1] Data from TmFO network, Rutishauser et al. 2015

[2] Poorter et al. 2016

Conclusions

- Restoration programs should consider **managed tropical forests** as **key ecosystems to be preserved, restored and sustainably managed** as they **recover rapidly** towards level of Carbon stocks and biodiversity closed to the one recorded in **old growth forests**
- Actions towards restoration of managed forests is likely to **be cheap and with rapid results** (natural regeneration, light silviculture)
- Restoration programs must promote **sustainable multiple use of managed tropical forests** conciliating conservation of managed forests and economic use of their resources for the benefit of the society
- We need to better understand **the resilience of the so called "degraded forests"** (which usually include logged and secondary forests) in the context of **climate change**. For this, **research collaboration between different PSP** networks which monitor the dynamics of primary (rainfor), managed (TmFO), secondary forests and of agroforests **must be urgently promoted**