Nature-based Interventions for Climate Change:

State of the Evidence

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Global Science - World Wildlife Fund

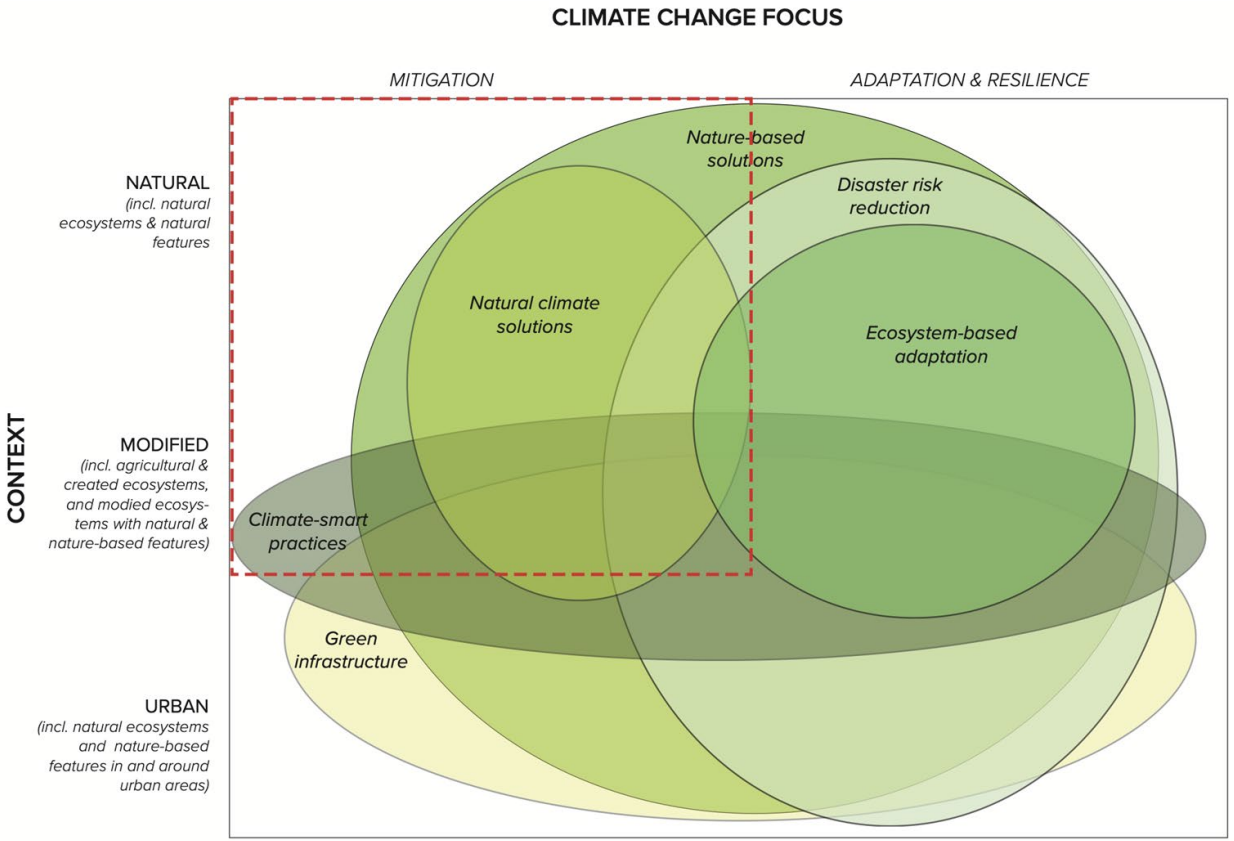
May 14, 2024

World Bank Land Conference

0. Background

Accelerating progress towards global goals for nature, climate, and people will require a robust and dynamic evidence base

Nature-based Interventions for Climate Change



Suite of interventions to protect, sustainably manage and restore natural or modified ecosystems,- nature-based interventions (NbIs) for climate change that specifically aim to address climate change mitigation whilst delivering on people and nature co-benefits

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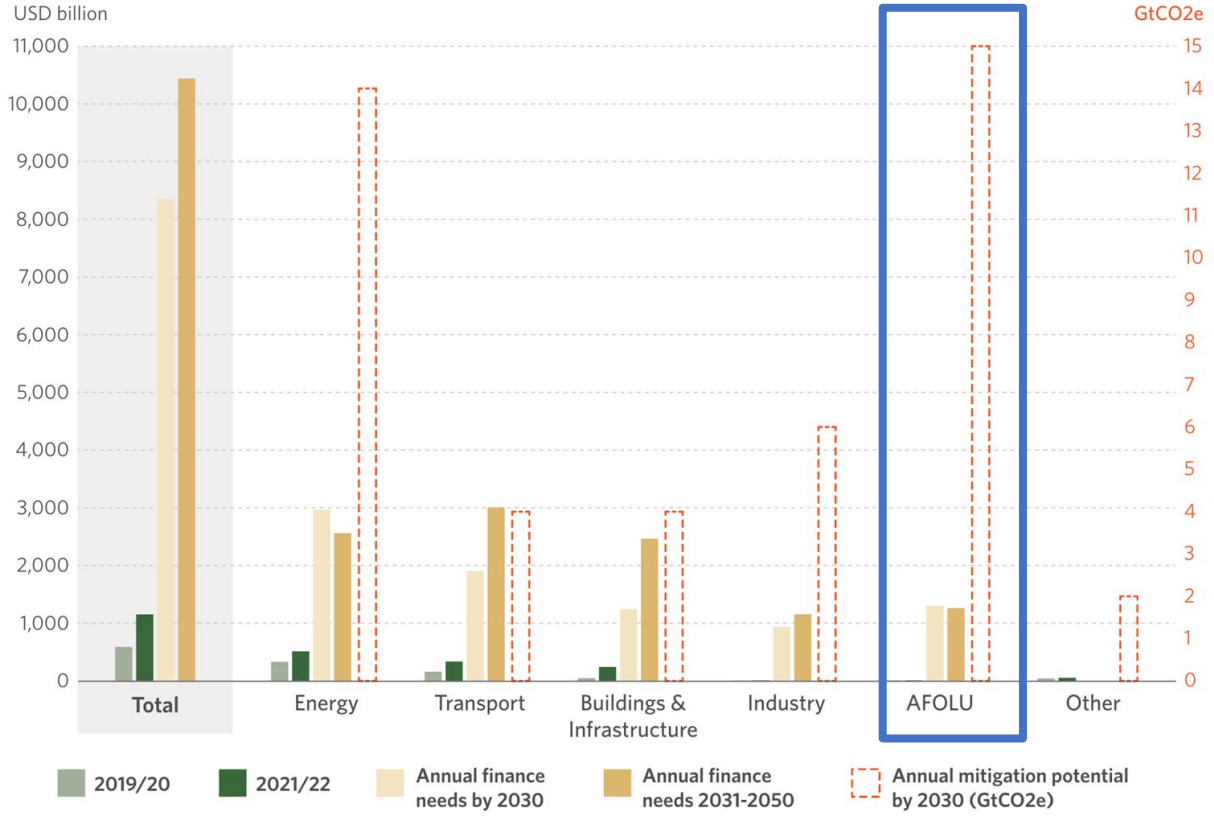
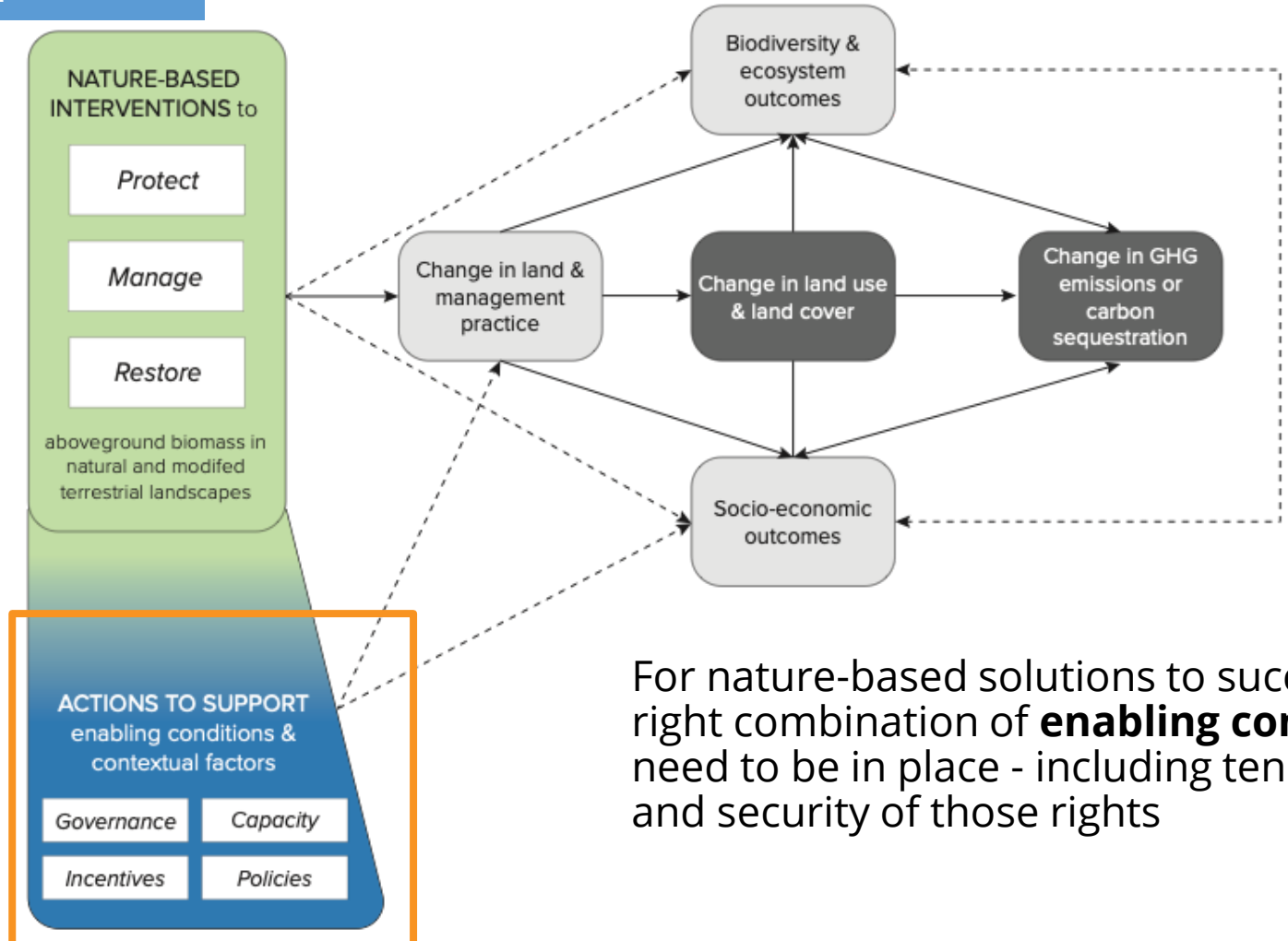
Horizon for NbIs to achieve 2030

- Significant mitigation potential of NbIs in the AFLOU sector
- Investment gap and growing interest in filling it - $43 billion invested from the climate finance sector in 2021/2022
- Need robust evidence to inform effective and equitable investment & implementation – particularly to avoid trade-offs for local communities and nature



0. Background



For nature-based solutions to succeed - the right combination of **enabling conditions** need to be in place - including tenure rights and security of those rights

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Accelerating evidence-informed decision-making for investment, implementation, and scaling of Nbls

Key questions:

- What is the evidence base for links between Nature-Based Interventions and climate change mitigation outcomes in tropical and subtropical forests, grasslands, mangroves, and agricultural systems?
- How often are co-impacts on climate, nature, and people outcomes examined?
- How often are interventions to strengthen enabling conditions for nature-based interventions examined?

What are key bright spots and gaps and their implications for research, policy, and practice?

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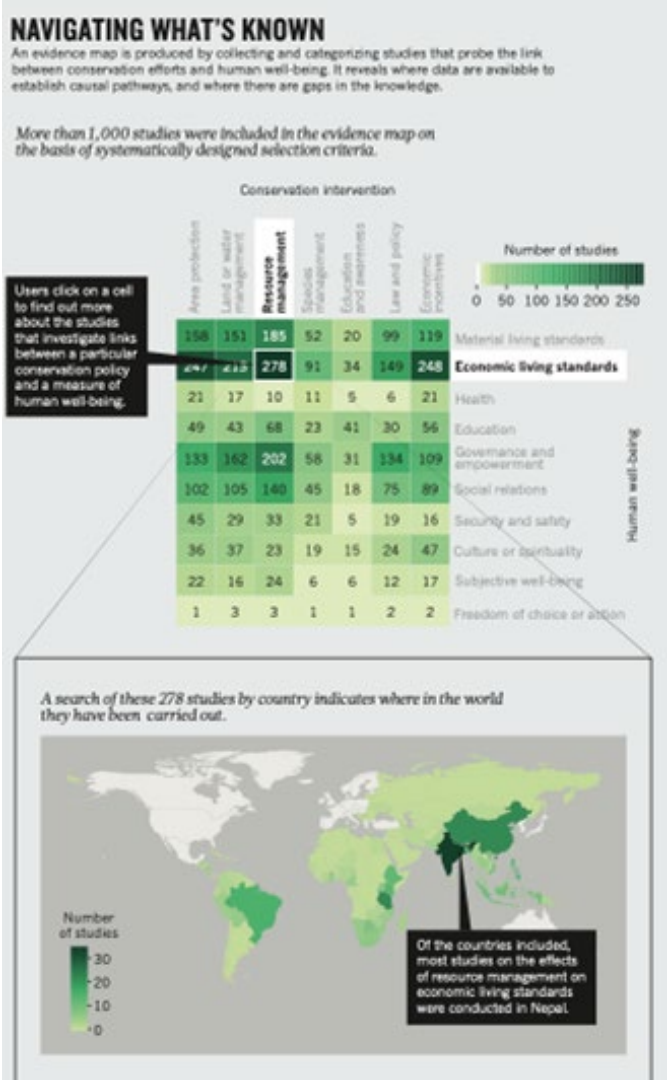
What is a systematic evidence map?

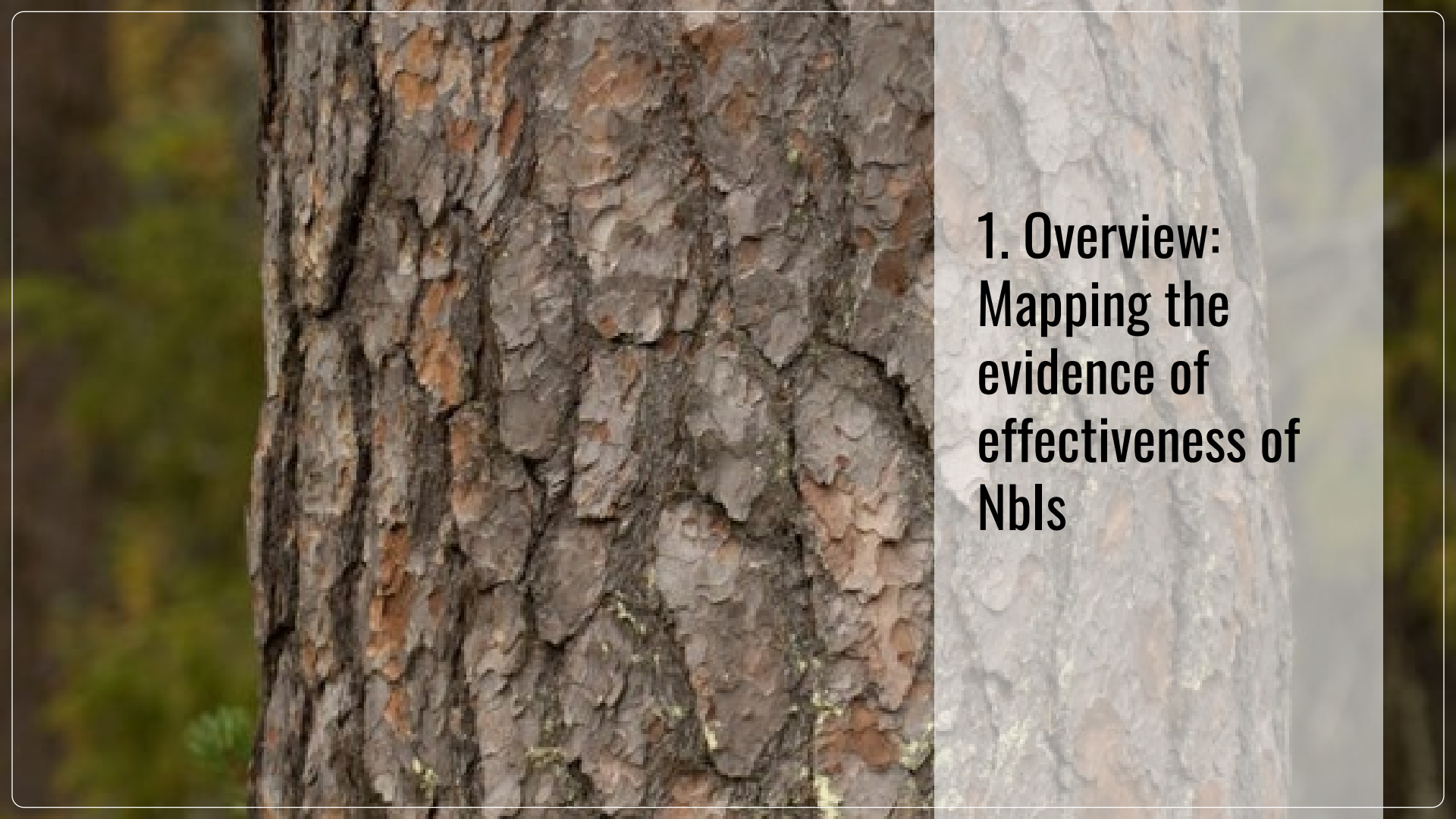
- A **rigorous, systematic, and transparent** method for collating and assessing research articles, evaluations, and reports.

- Aims to characterize the **distribution and occurrence** of existing evidence related to multifaceted elements of a **broad question** .

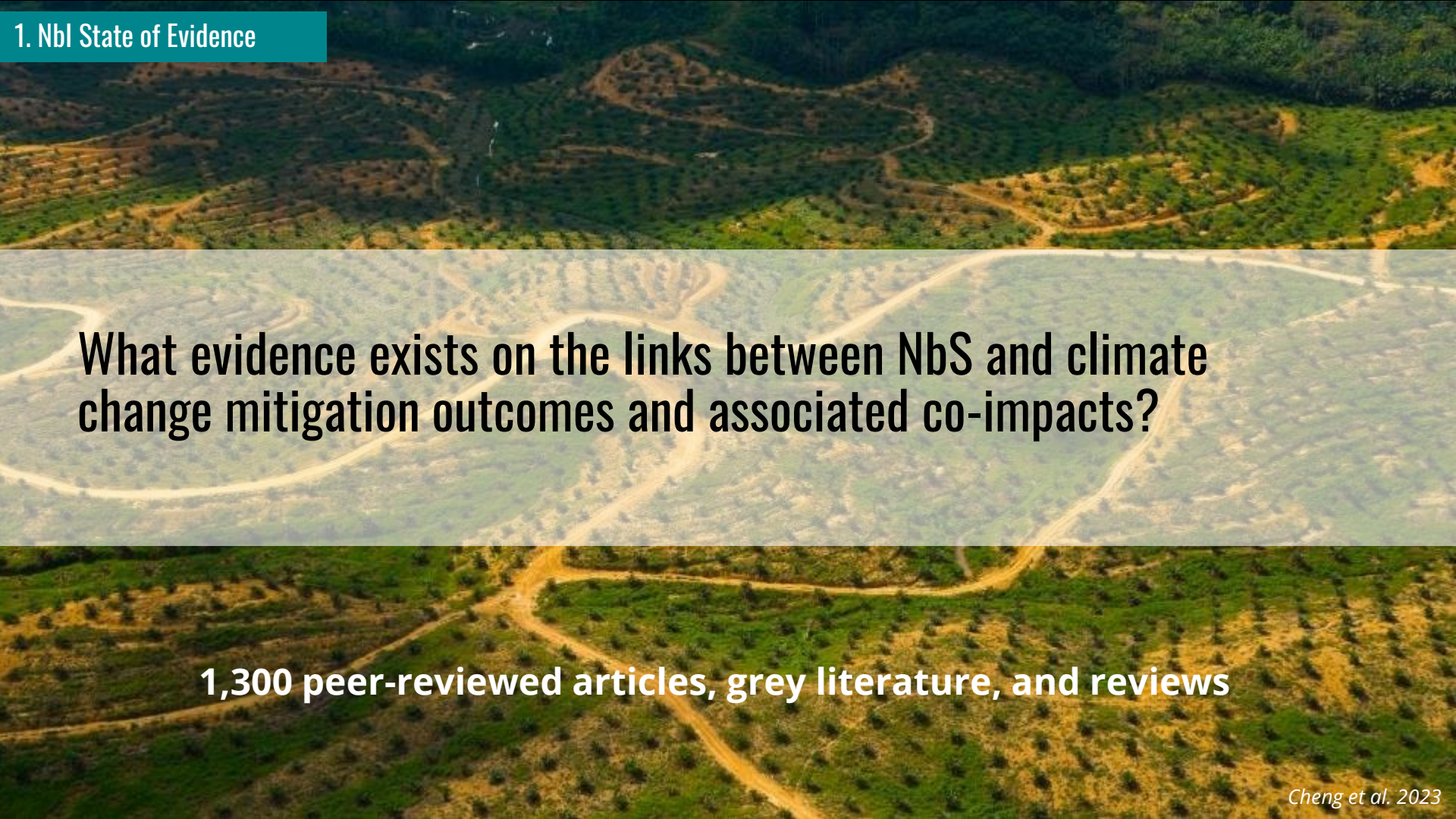
- Displayed as a visual graphic that "maps" existing evidence and gaps using a **policy-relevant framework of interventions and outcomes.**



Snilstveit et al. 2013, James et al. 2016, McKinnon et al. 2015



1. Overview: Mapping the evidence of effectiveness of Nbls



What evidence exists on the links between NbS and climate change mitigation outcomes and associated co-impacts?

1,300 peer-reviewed articles, grey literature, and reviews

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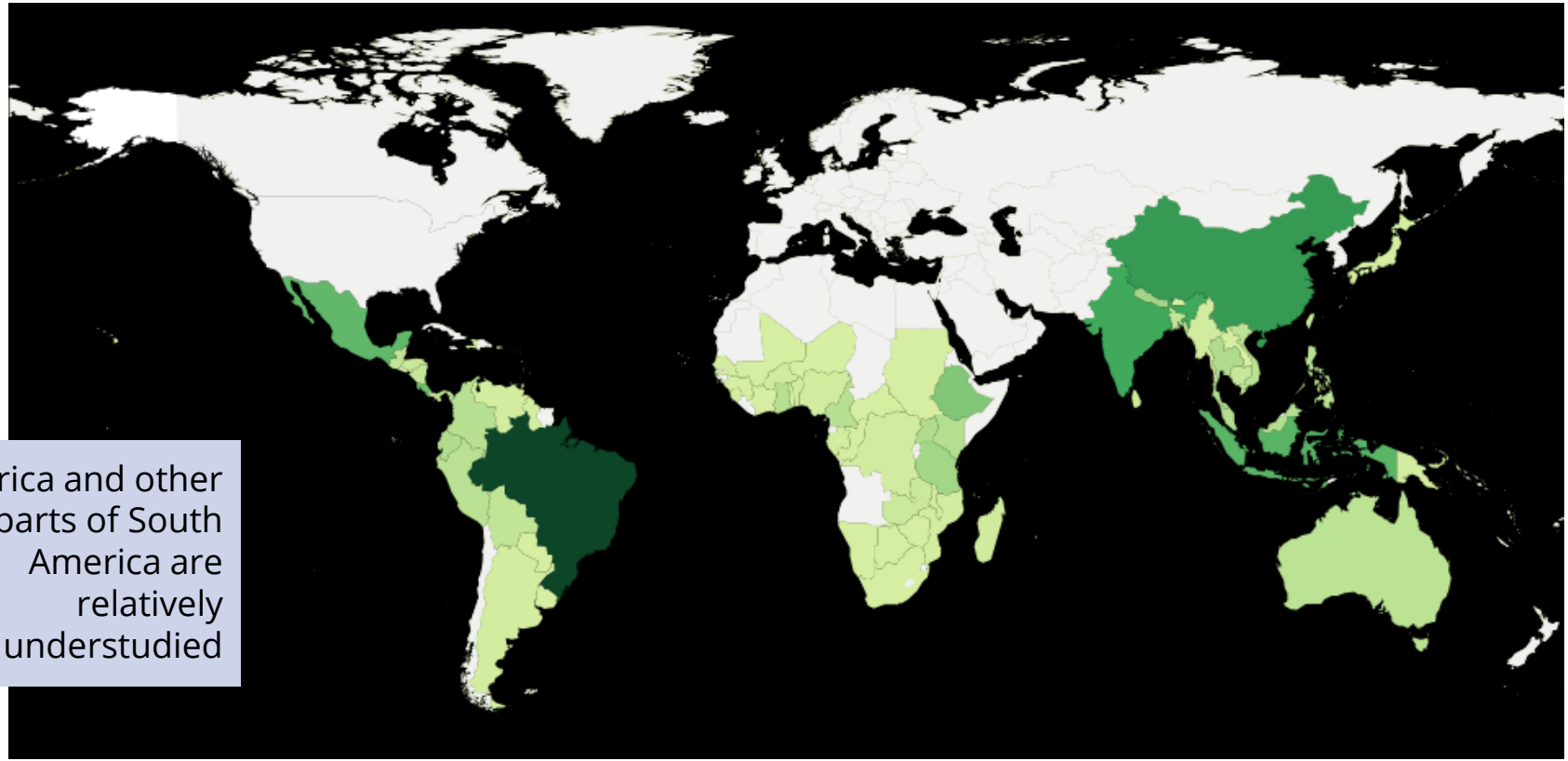
Geographic distribution of evidence of NbIs



Africa and other parts of South America are relatively understudied

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What does the evidence base look like?

Most of the evidence base is focused on:

- Interventions in Tropical Moist Forests (~700 articles)

Cheng et al. 2023

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Most of the evidence base is focused on:

- Interventions in Tropical Moist Forests (~700 articles)
- Local and sub-national scales

75%

articles assessed interventions taking place at local and sub-national scales

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What does the evidence base look like?

Most of the evidence base is focused on:

- Actions in the 'protect' & non-agricultural 'manage' pathways

NATURE-BASED INTERVENTIONS												
PROT	FOLU MGMT	AGRICULTURAL MGMT							RESTORE			
Protection	Site/areamanagement	Natural resource management	Conservation agriculture	Nutrient management	Improved rice cultivation	Trees in croplands	Grazing (optimal intensity)	Manure management	Restoration of existing ecosystems	Creating newecosystems		
172	64	98	17	2		20	2		44	10	Land use/ Land cover	CLIMATE CHANGE MITIGATION OUTCOMES
70	64	108	20	9		80	9	1	145	21	Land condition	
29	32	76	21	18		87	3	1	57	24	Carbon storage & sequestration	
7	3	17	11	11	8	6	1	1	6	2	Greenhouse gas emissions	

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What does the evidence base look like?

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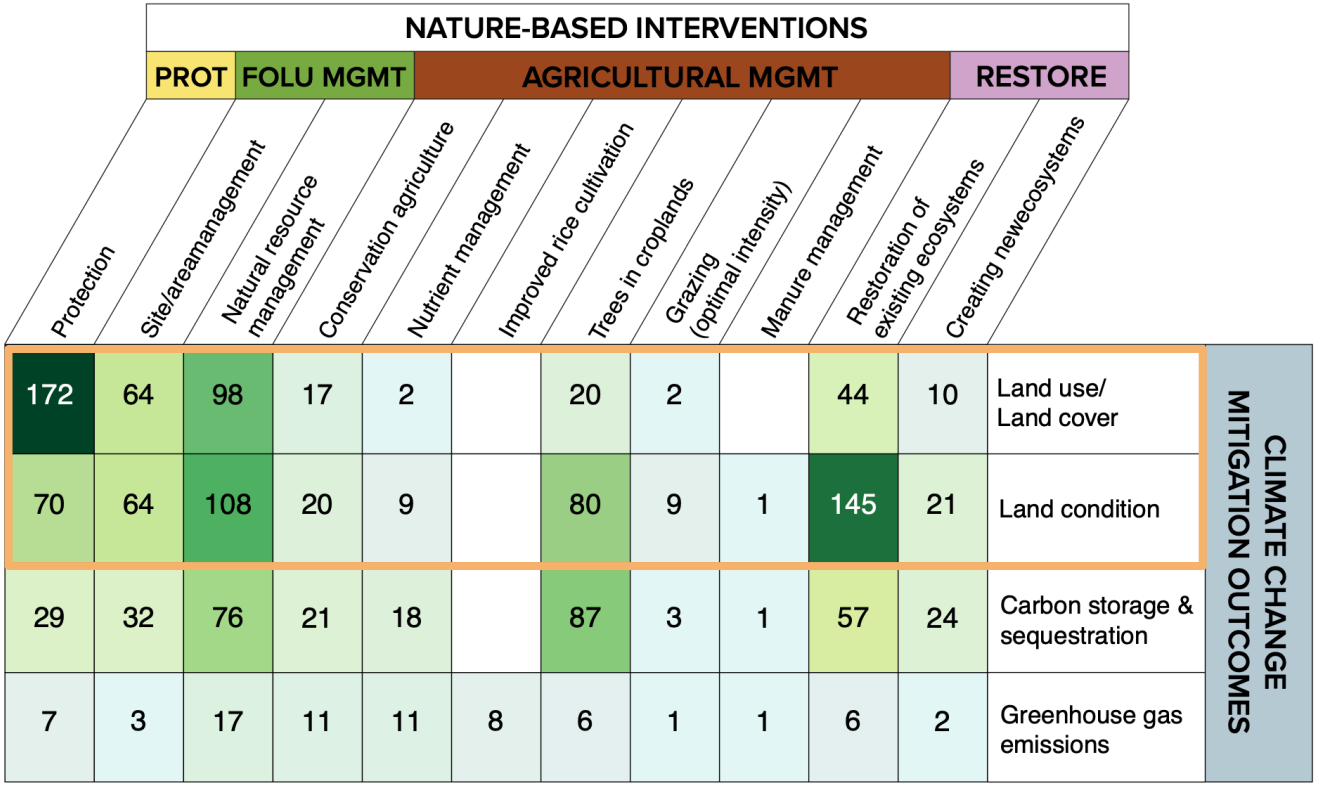
- Actions in the 'protect' & non-agricultural 'manage' pathways
- Proxy outcomes for mitigation



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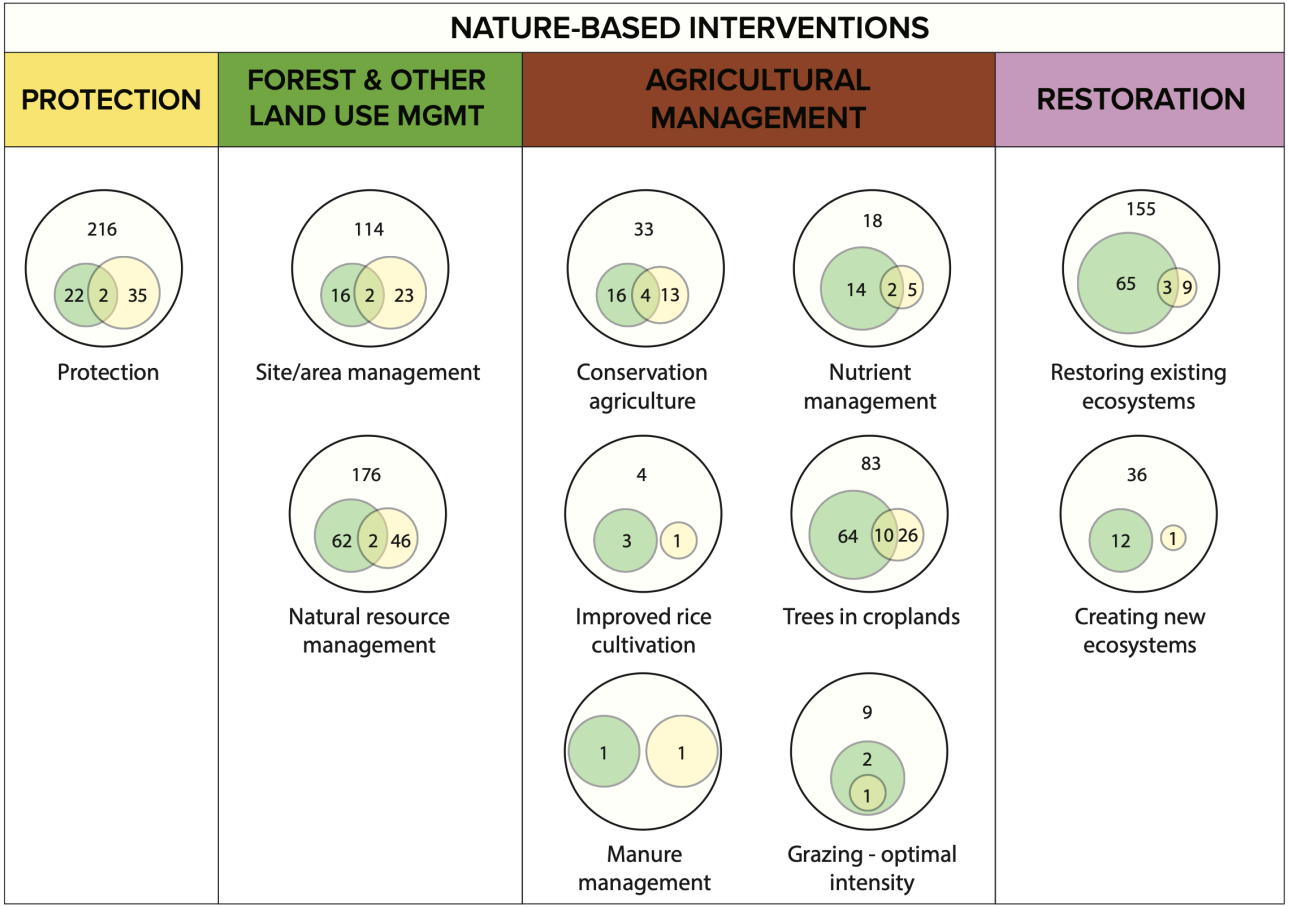
Only 30% of articles examined co-impacts for nature and people

Of those that did, very few looked at co-impacts for people



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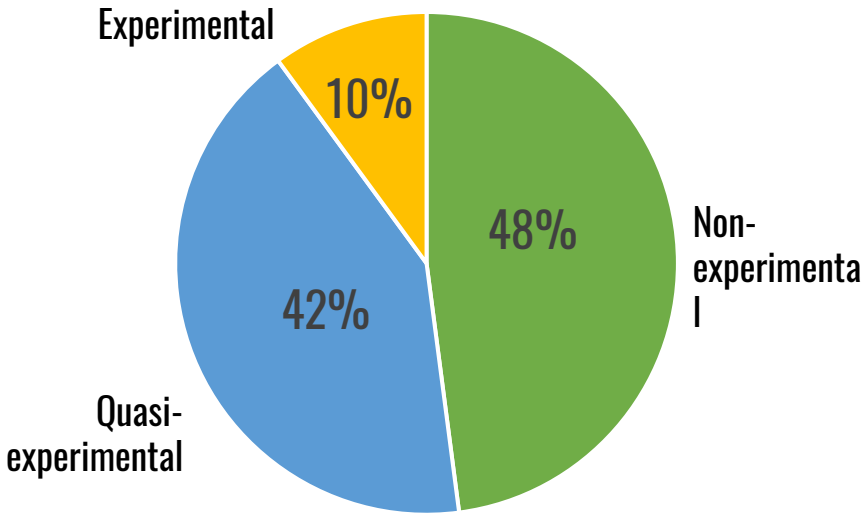
What does the evidence base look like?

Most of the evidence base is focused on:

- Interventions in Tropical Moist Forests (~700 articles)
- Local and sub-national scales
- Actions in the 'protect' & non-agricultural 'manage' pathways
- Proxy outcomes for mitigation and less on co-impacts for nature and people
- Using quasi-experimental designs to assess co-impacts



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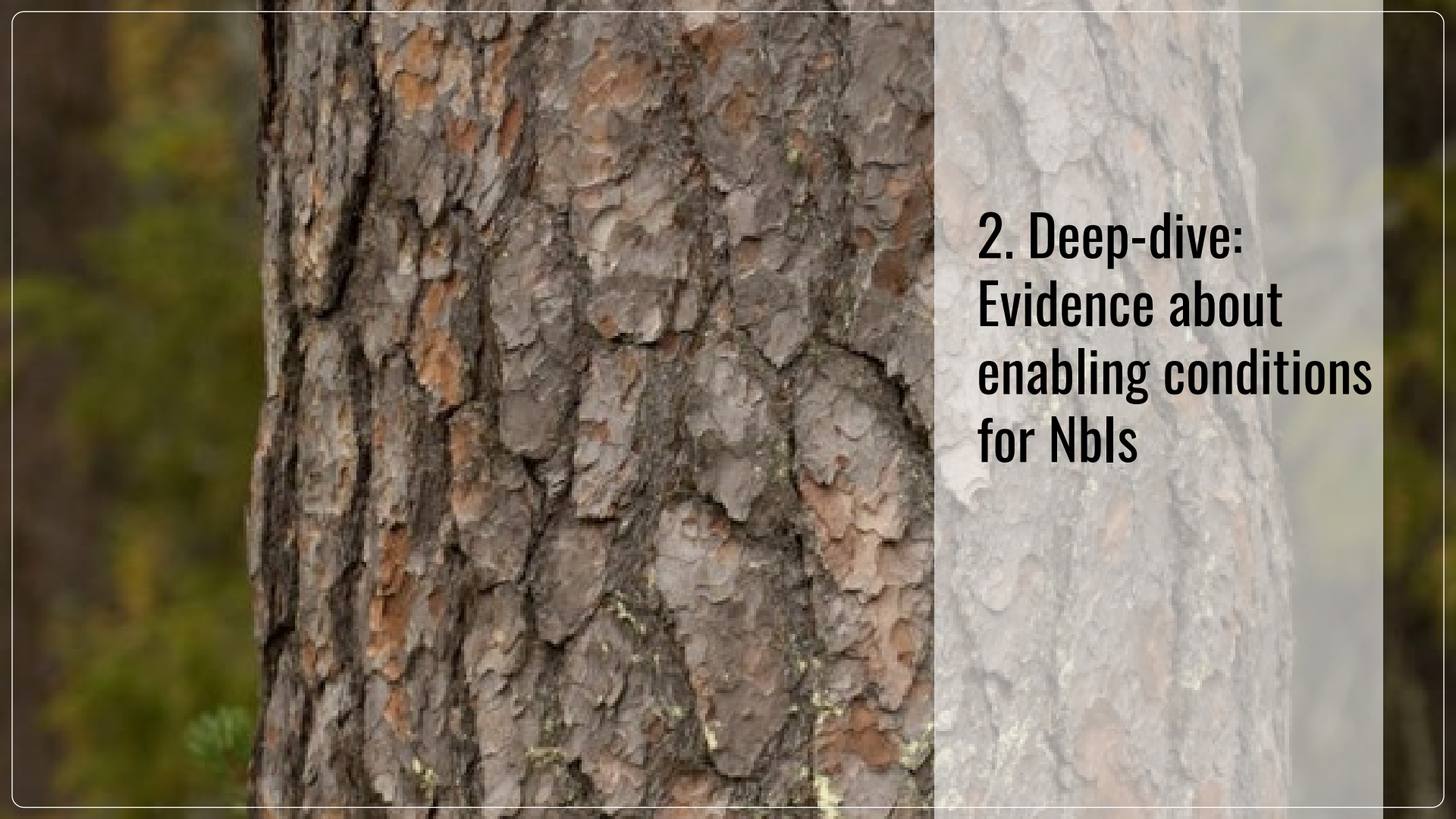

2. Deep-dive: Evidence about enabling conditions for NbIs

Evidence about enabling conditions for Nbls

16%

of the evidence base described actions to address enabling conditions for Nbls

(168 articles)

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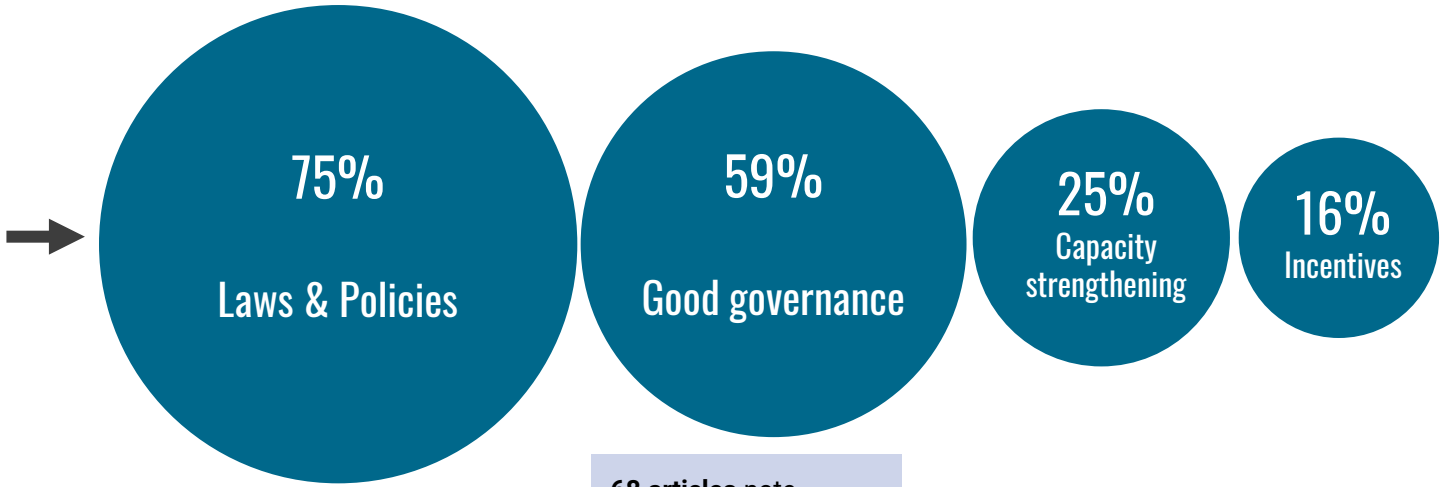
Evidence about enabling conditions for Nbls

16%

of the evidence base assessed actions to address enabling conditions for NbS *(168 articles)*



68 articles note actions to strengthen rights to resources integrated with or occurring alongside Nbls

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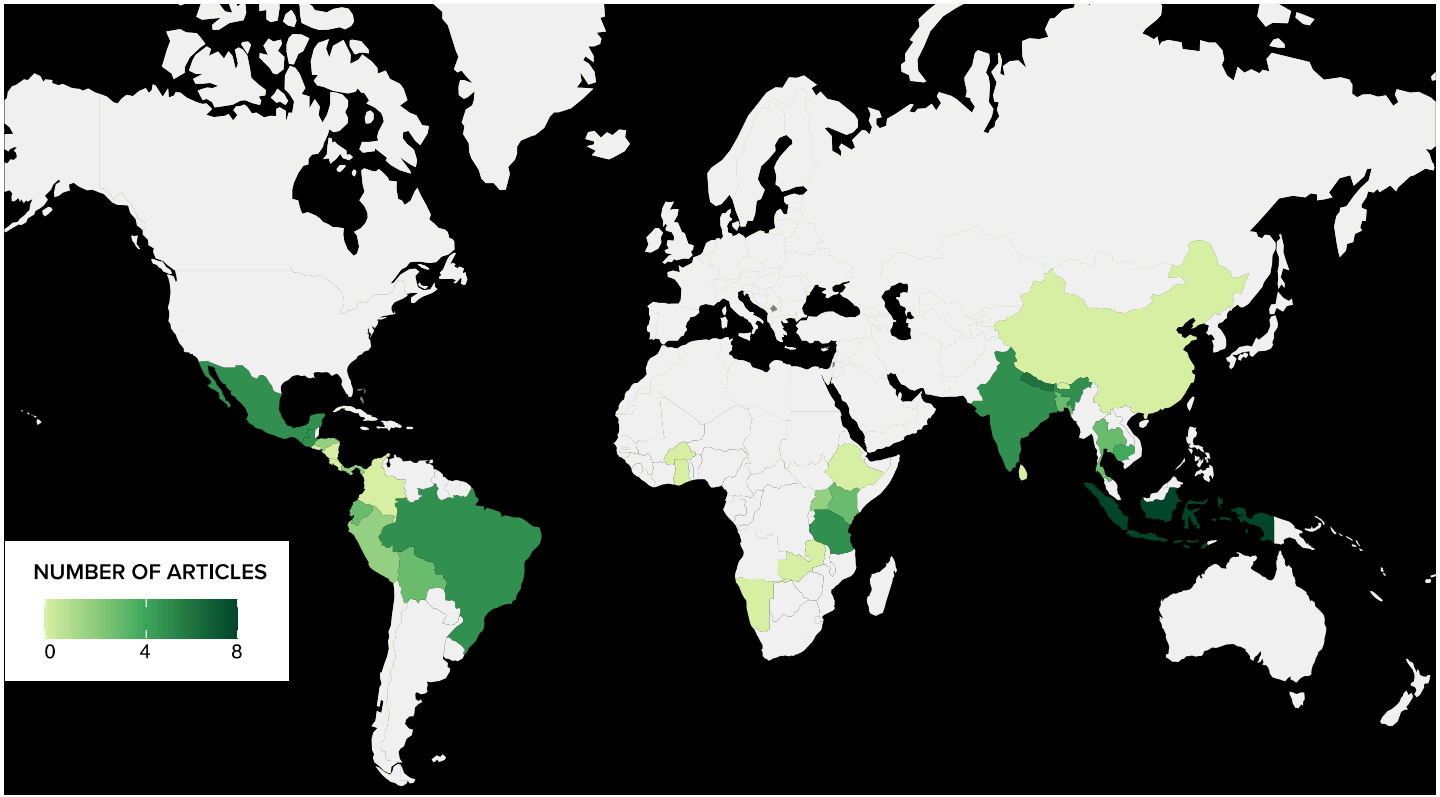
Focus: Governance and securing rights to resources



Many articles are in Indonesia, Brazil, Mexico, India, and Nepal – reflecting areas with a long history of tenure rights and national scale policies for natural resource governance

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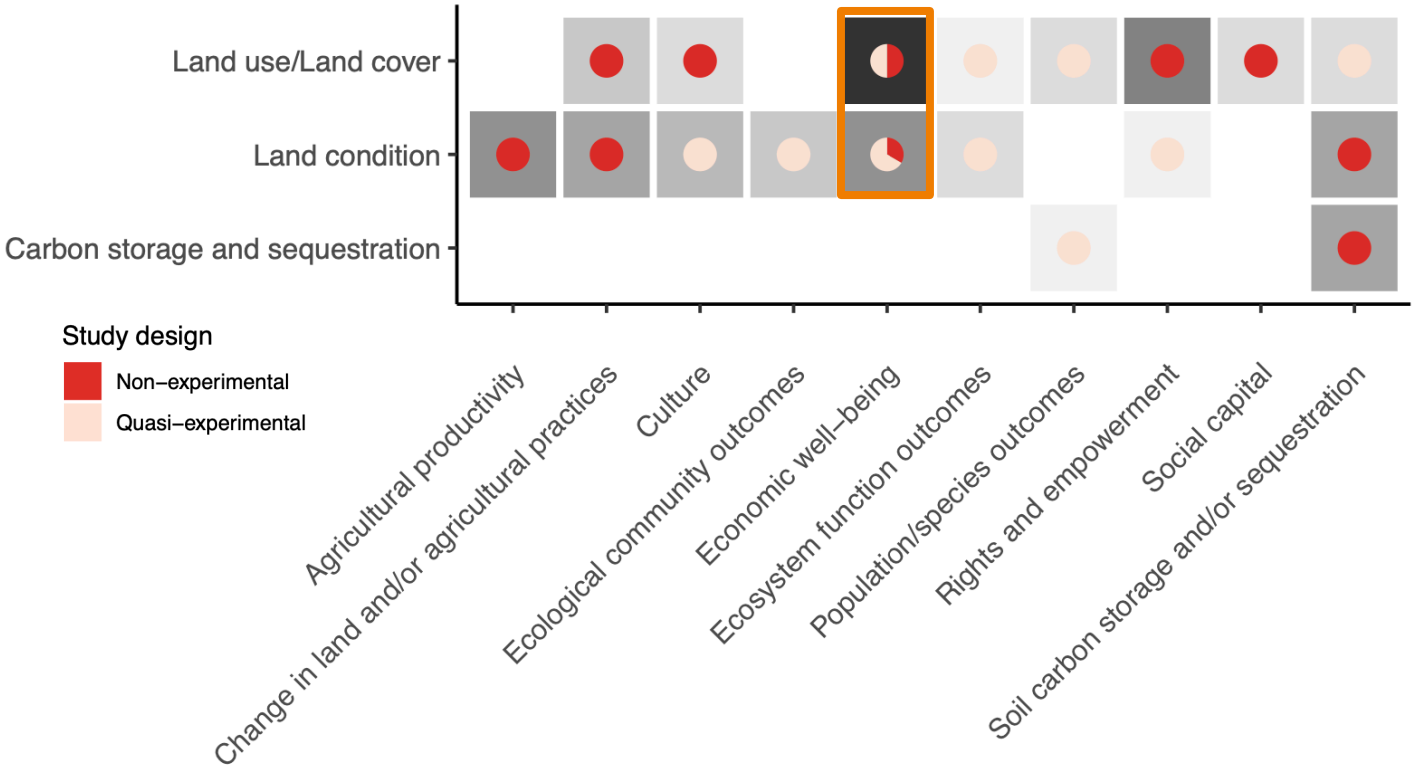
Focus: Governance and securing rights to resources



Fewer quasi-experimental studies when looking at co-impacts for people, except for economic well-being

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3. Implications for Research, Practice, and Policy

Where do we go from here?

- The **evidence is uneven** across interventions and outcomes, suggesting we do not have a complete evidence base.

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- **More trans-disciplinary collaboration** is needed to assess impacts across social-ecological systems and the carbon cycle - to generate evidence that goes beyond proxy measures and aims to assess realized impacts

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Where do we go from here?

- The **evidence is uneven** across interventions and outcomes, suggesting we do not have a complete evidence base.
- **More trans-disciplinary collaboration** is needed to assess impacts across social-ecological systems and the carbon cycle - to generate evidence that goes beyond proxy measures and aims to assess realized impacts
- Encouragingly, there are bright spots for evaluating the impacts on rights (even if there are few studies). However, **impact evaluation research** efforts, generally, need to be scaled up

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Conservation International

WWF

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Thank you!

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Backup slides

ACKNOWLEDGEMENTS

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Use these core branded colors (and lightened versions). The colors are embedded into this template.

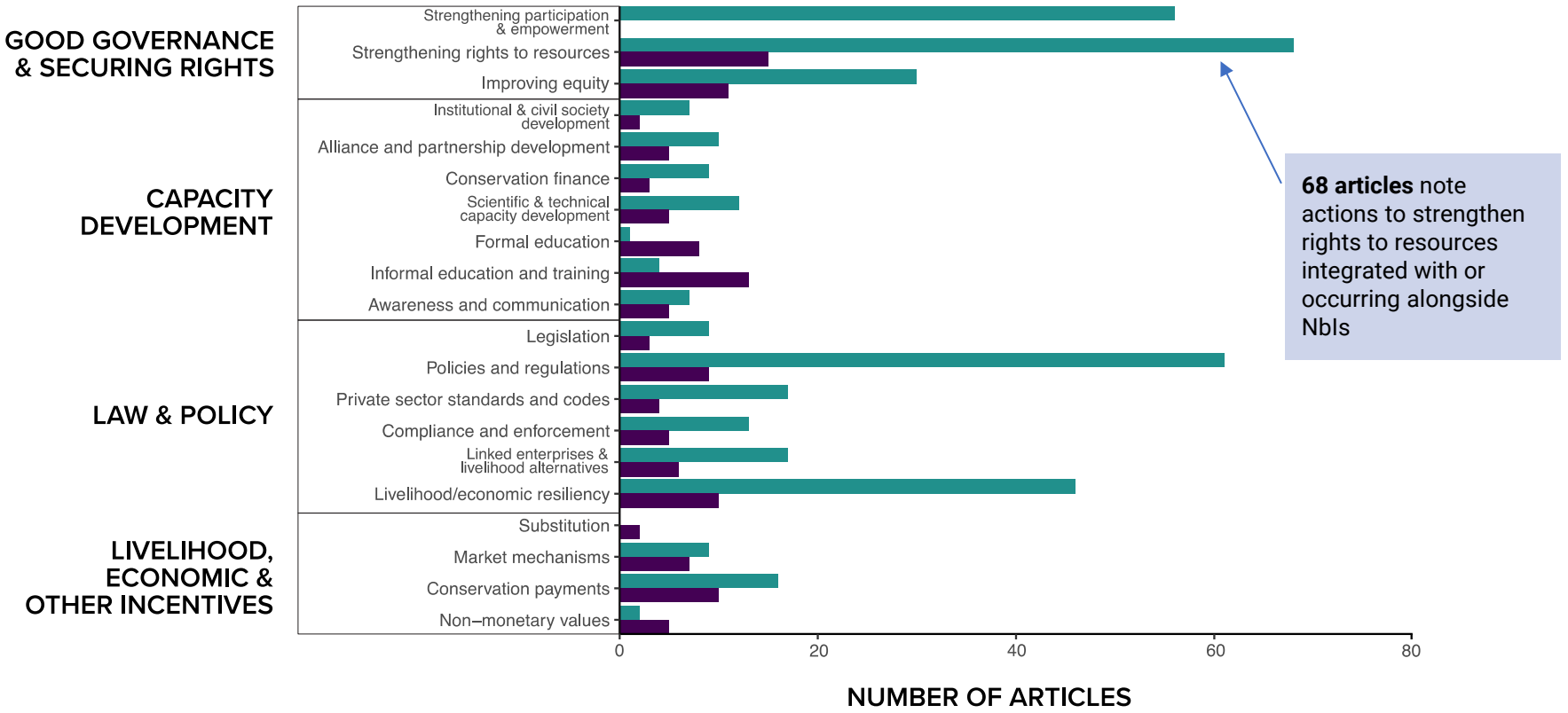
Tip: If you want to make one of these colors the background color of your slide, you could copy and paste a color rectangle onto your slide and expand it to fit.

Palette for Backgrounds & Highlights

Additional Highlight Colors

- Click to edit Master text styles
  - Second level

Evidence about enabling conditions for Nbls



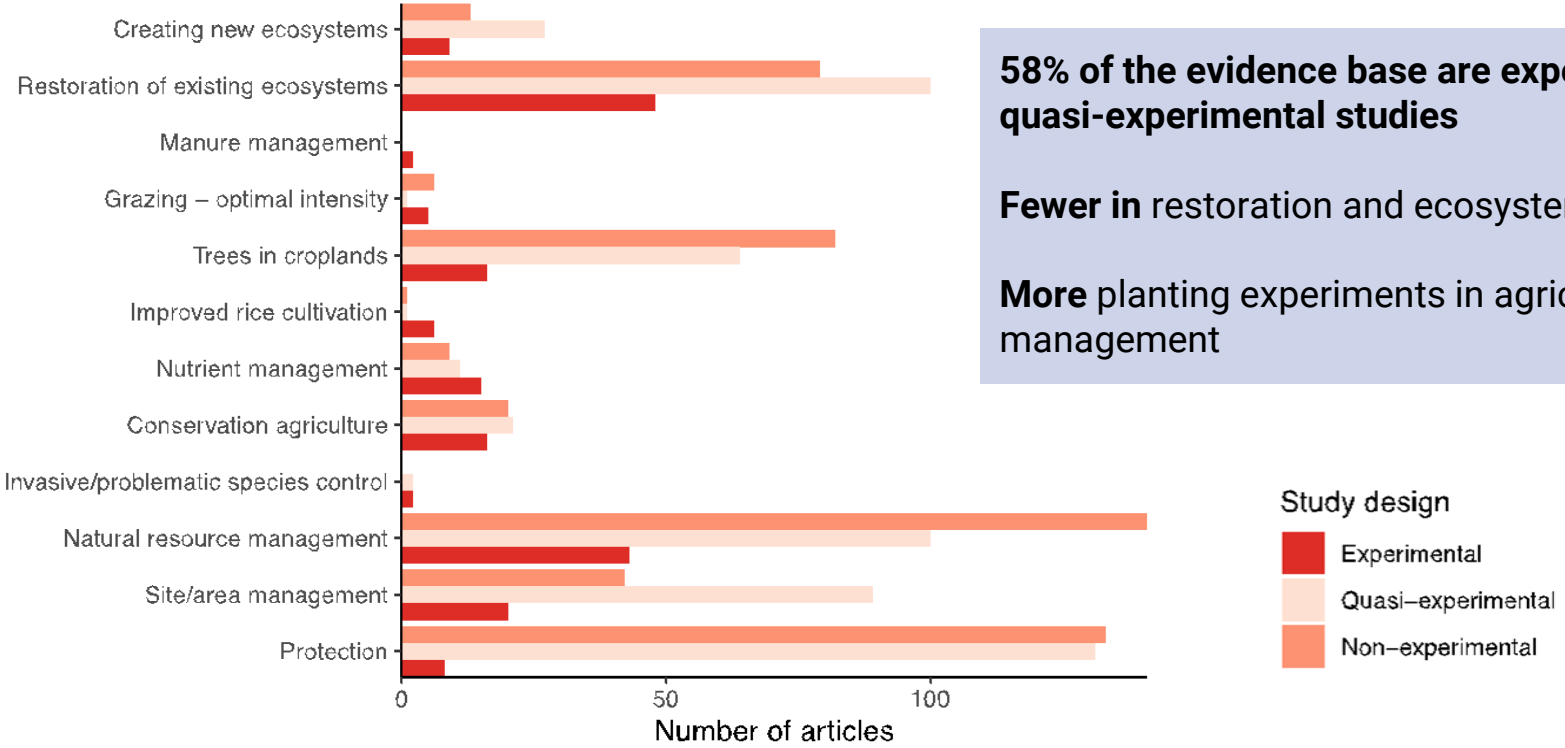
How can the map support decision-making for NCS investment, implementation, and policy?

Questions

- What do you see as a gap for your practice?
- What gaps should be addressed in priority? Who should generate this evidence?
- How, to whom, and through which format should we disseminate our findings?
- How might these findings support decision-making and investment around NCS?

Area of opportunity:
Increase impact evaluations to assess mitigation outcomes

1



58% of the evidence base are experimental and quasi-experimental studies

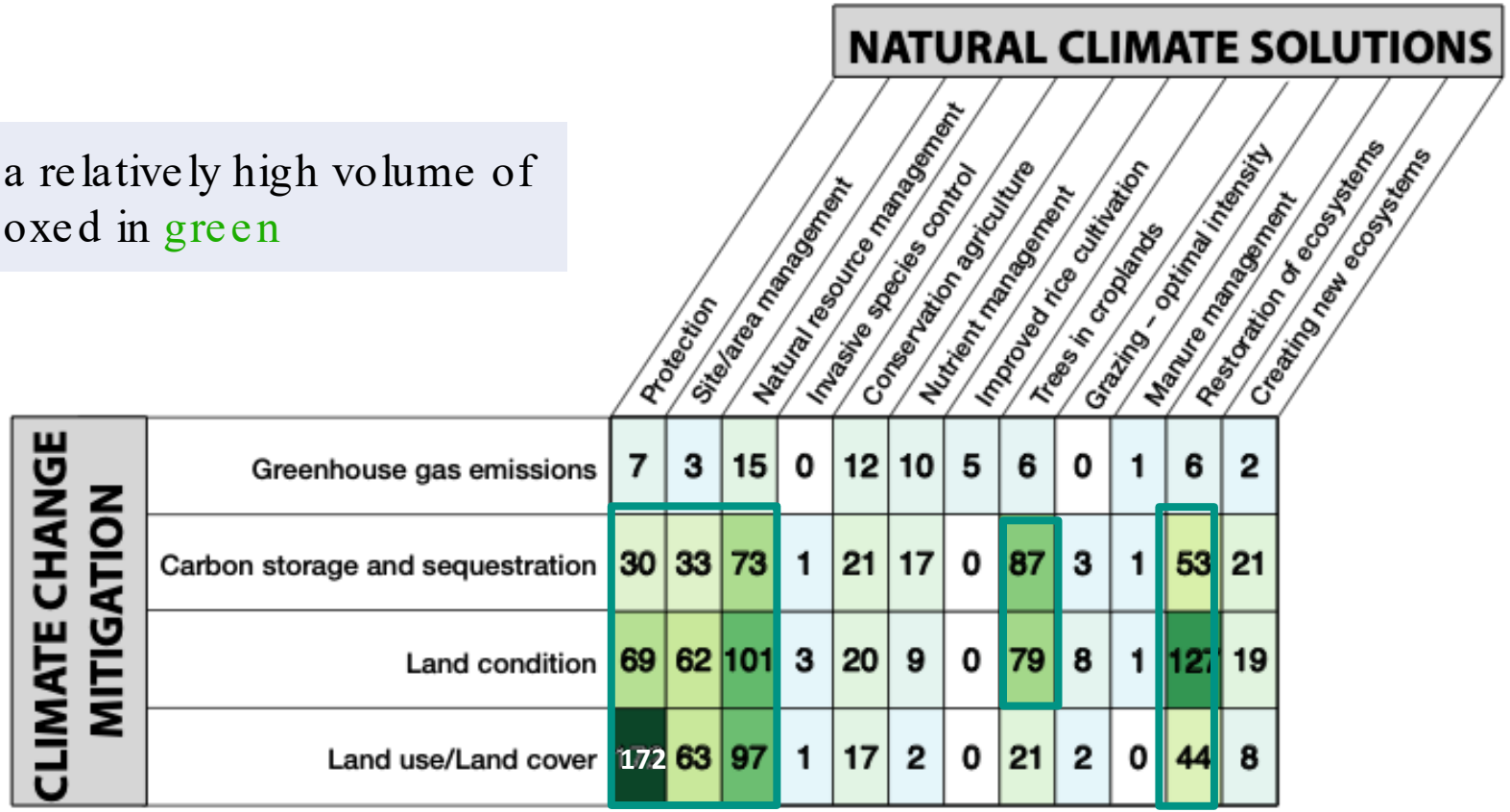
Fewer in restoration and ecosystem creation

More planting experiments in agricultural management

Mapping the Evidence

Base

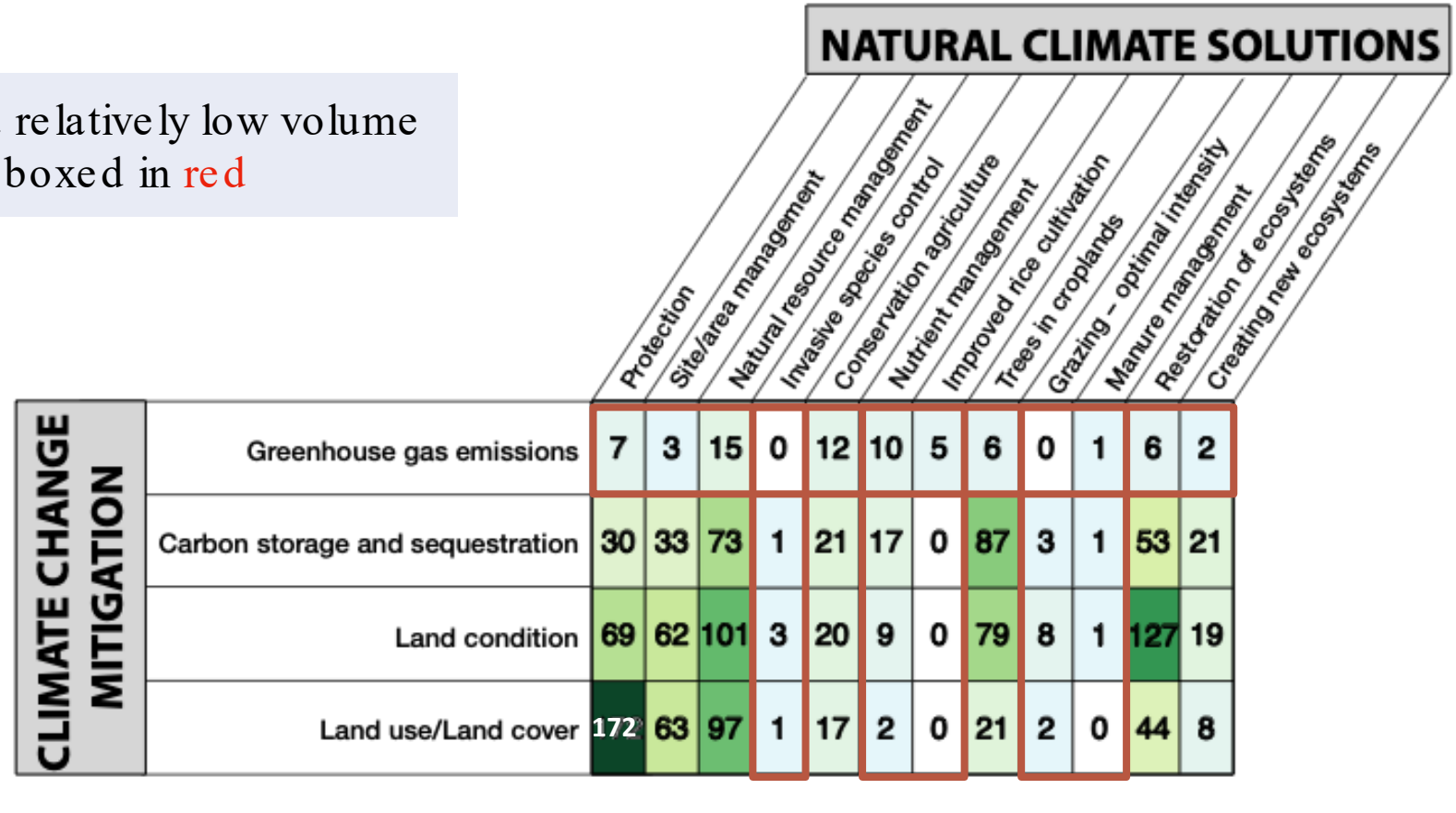
Areas with a relatively high volume of evidence boxed in green

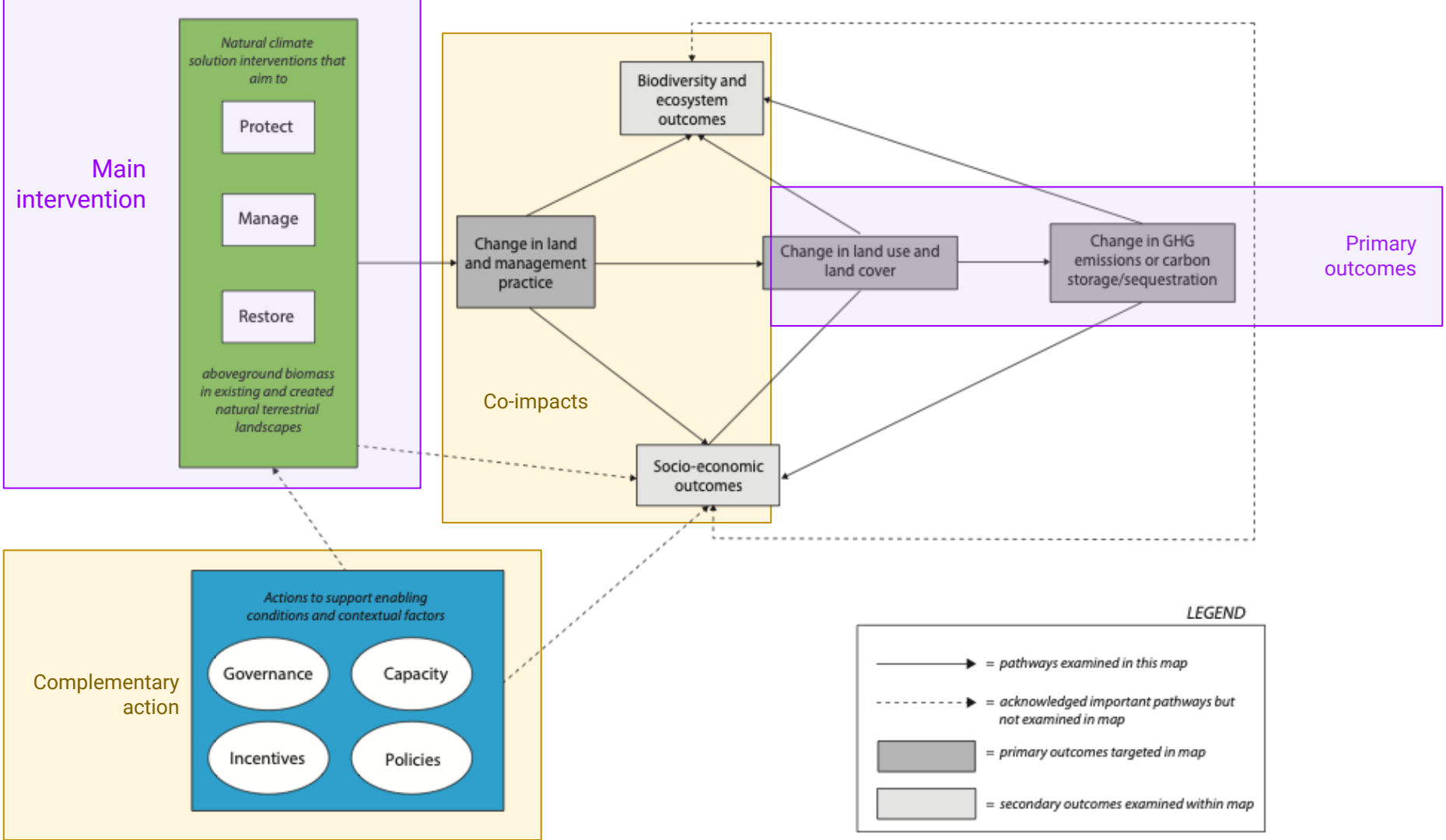


Mapping the Evidence

Base

Areas with a relatively low volume of evidence boxed in red

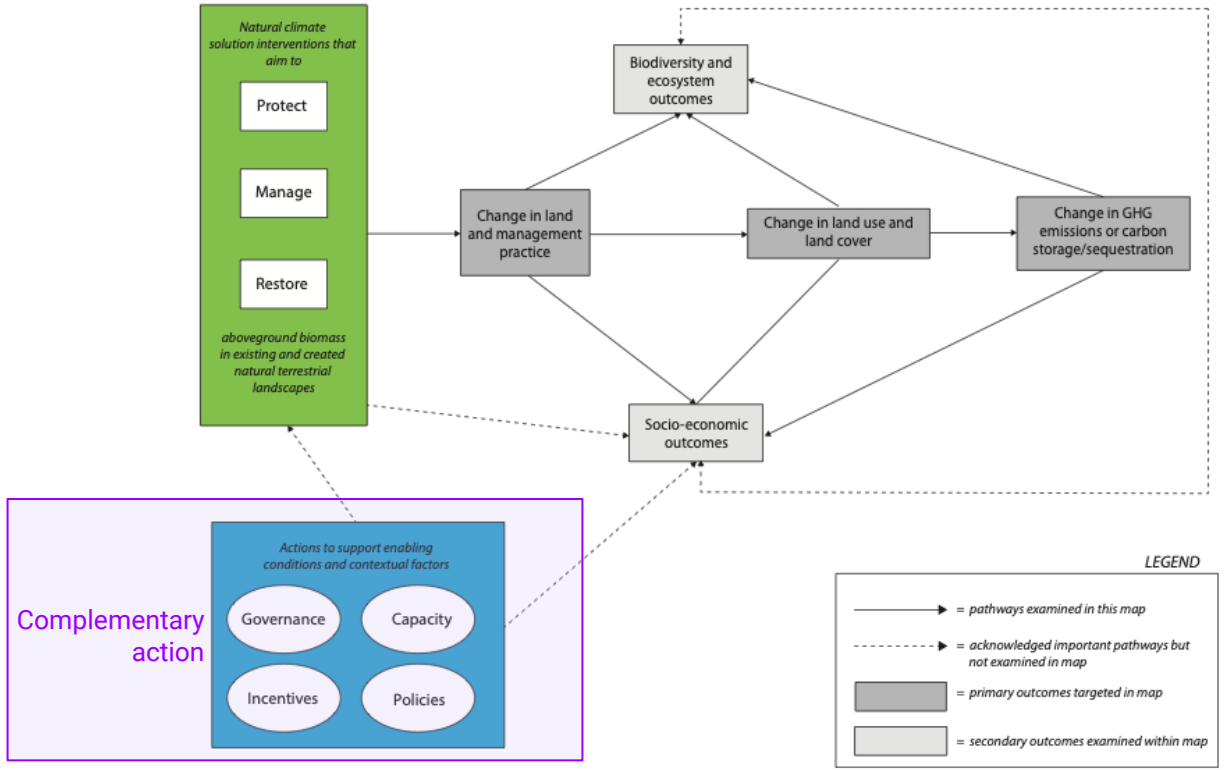



Main intervention
Natural climate solution interventions that aim to
Protect
Manage
Restore
aboveground biomass in existing and created natural terrestrial landscapes
Biodiversity and ecosystem outcomes
Change in land and management practice
Change in land use and land cover
Change in GHG emissions or carbon storage/sequestration
Primary outcomes
Co-impacts
Socio-economic outcomes
Complementary action
Actions to support enabling conditions and contextual factors
Governance
Capacity
Incentives
Policies
LEGEND
= pathways examined in this map
= acknowledged important pathways but not examined in map
= primary outcomes targeted in map
= secondary outcomes examined within map

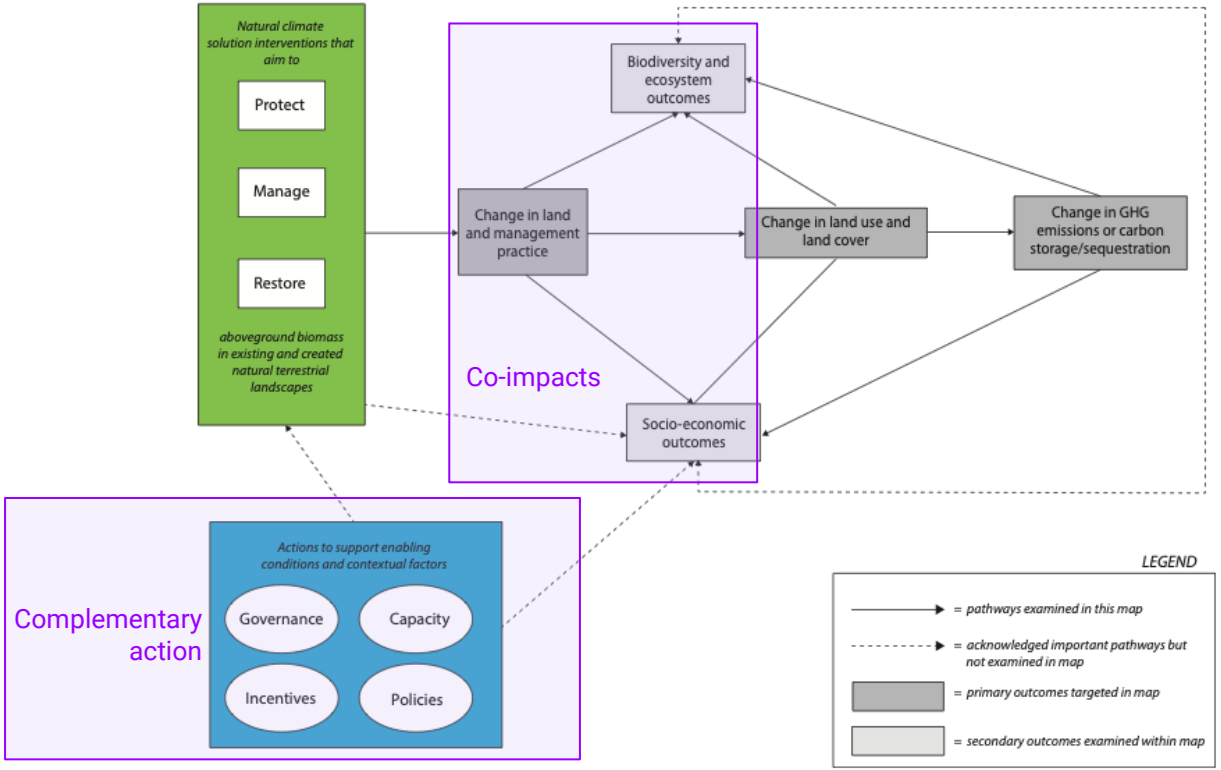
Area of opportunity:
Better understanding of system-wide impacts

2

Only **11% of studies** explicitly examine complementary actions alongside NCS



What is the state of evidence on behavioral, ecological, and social co-impacts?



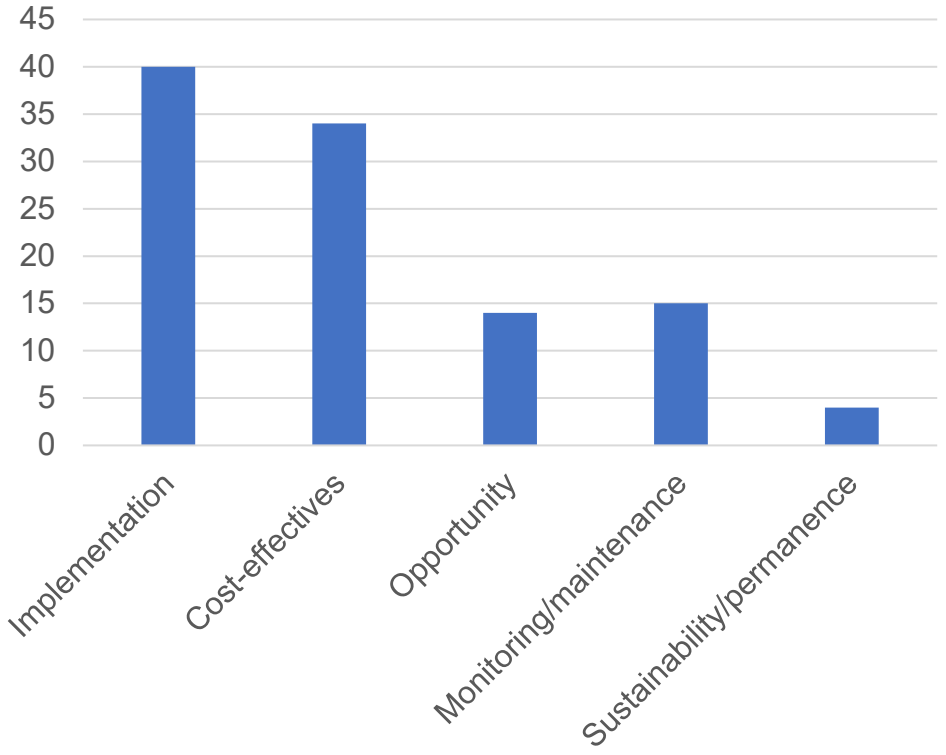
Area of opportunity:
Daylighting and sharing of cost data

3

Only 6% of studies reported costs associated with interventions

Implementation costs and cost-effectiveness were commonly reported; while costs of post-project cycle costs were rarely reported

Costs presented were often:
- Comparisons of costs between different types of interventions
- Costs of payments or incentives

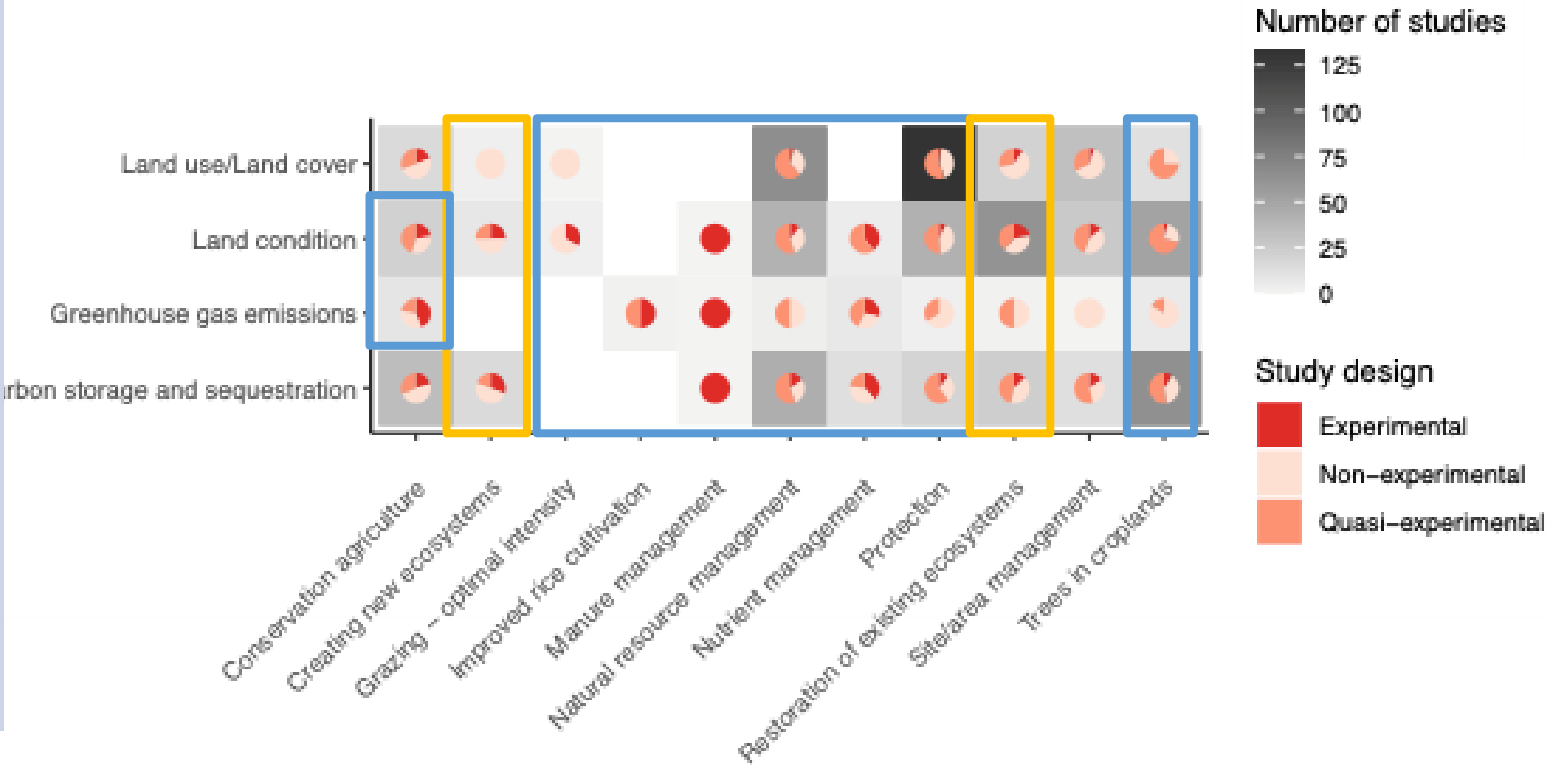


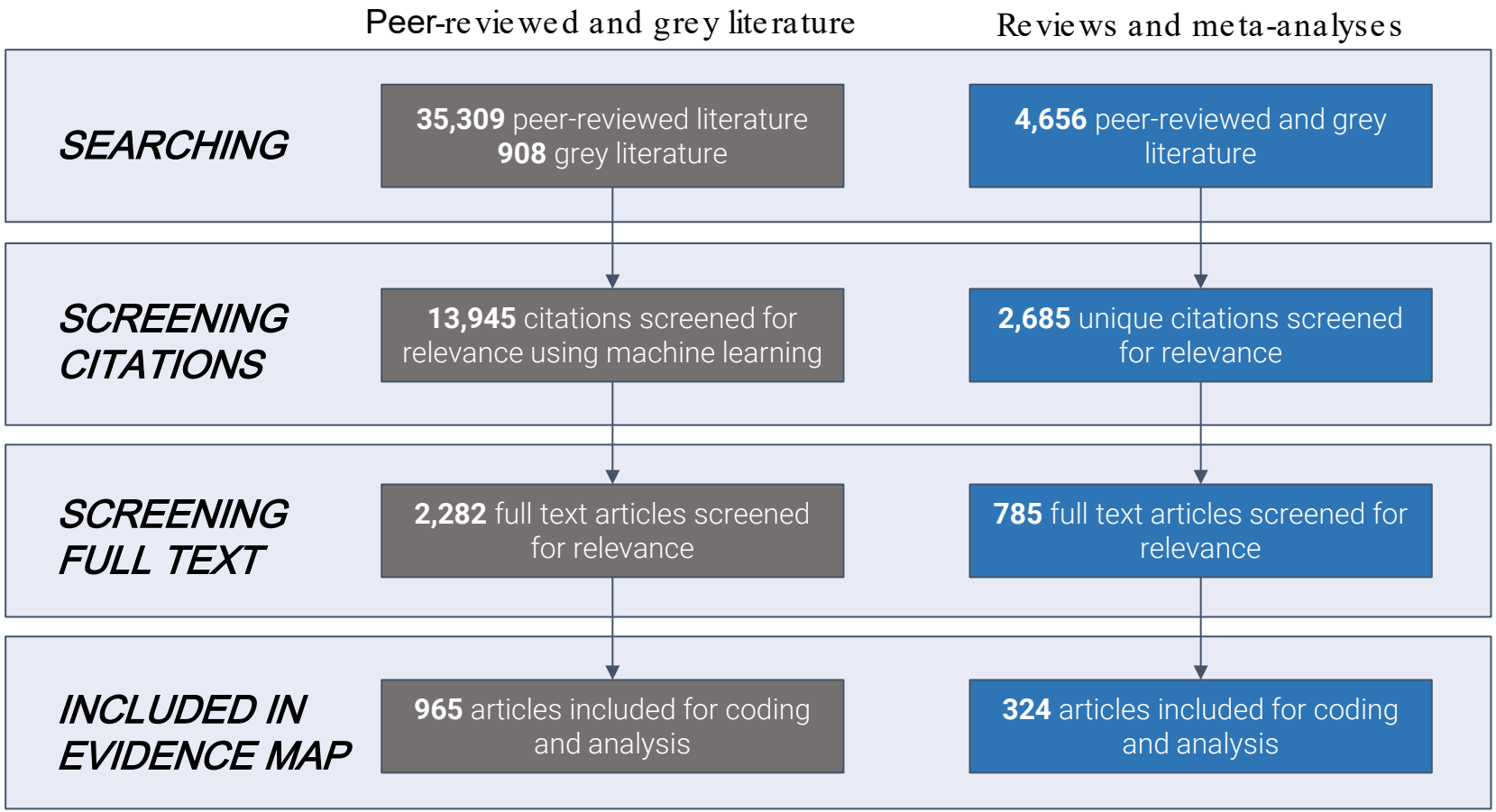
Area of opportunity:
Increase impact evaluations to assess mitigation outcomes

1

58% of the evidence base are experimental and quasi-experimental studies
Comparatively, restoration and ecosystem creation had fewer robust study designs

Agricultural management had relatively more experiments, however, often these were planting experiments




Peer-reviewed and grey literature
Reviews and meta-analyses
SEARCHING
35,309 peer-reviewed literature
908 grey literature
4,656 peer-reviewed and grey literature
SCREENING CITATIONS
13,945 citations screened for relevance using machine learning
2,685 unique citations screened for relevance
SCREENING FULL TEXT
2,282 full text articles screened for relevance
785 full text articles screened for relevance
INCLUDED IN EVIDENCE MAP
965 articles included for coding and analysis
324 articles included for coding and analysis

Why do we need a systematic map for NCS?

- We know NCS can contribute **significant mitigation potential** across different ecosystem types.

- We know there is a growing and potentially **rich and multidisciplinary empirical evidence base** from which to guide existing efforts.

- Yet a **comprehensive assessment** of existing evidence across the sector **does not yet exist** to guide research, practice, and policy.

Cheng et al. 2022

Moving towards evidence-informed high-quality NCS

Communication and sense-making

- Convene with NCS practitioners and researchers to discuss implications of our findings.
- Develop an evidence dashboard for the broader NCS community.

Policy-making and investment

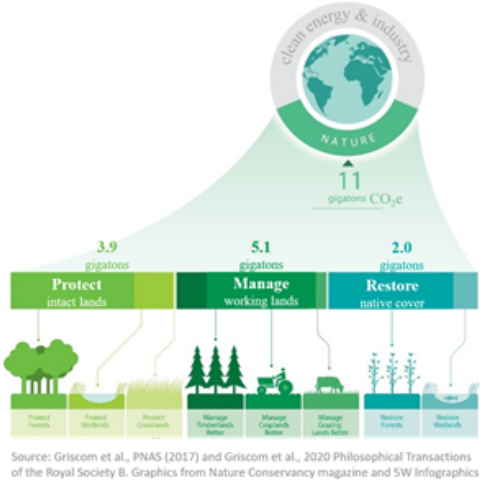
- Engage decision makers to prioritize investments for evidence-based NCS including adequate funding for monitoring, evaluation, and learning.

Future research

- Inform priorities for impact evaluation.
- Scan needs for synthesis efforts for a broader (and/or deeper) range of interventions, outcomes, and ecosystems.
- Explore dynamic updating of the evidence map with AI.

Evidence Systematic Map for NCS

Impact Evaluation



Source: Griscom et al., PNAS (2017) and Griscom et al., 2020 Philosophical Transactions of the Royal Society B. Graphics from Nature Conservancy magazine and SW Infographics

Informed Research and Funding Decisions

New evidence to inform and shape NCS interventions and financing for

- Donors and Investors
- Countries and financial institutions
- Scholars and practitioners

Impact Evaluation for NCS (IE4NCS)
Evidence and **F**eedback for **F**easible **E**ffective **C**limate **T**ransformational **S**olutions (EFFECTS)

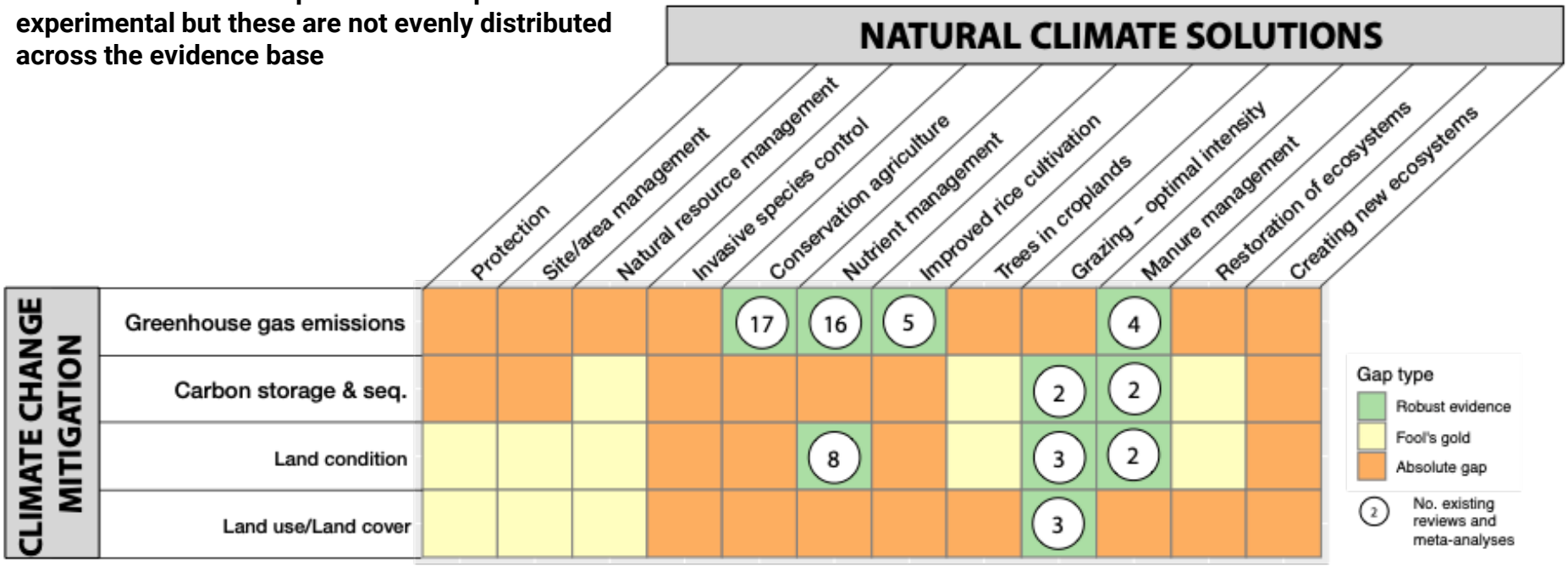
Portfolio

Quasi-experimental Design

Experimental Design

Investing in impact evaluations to inform NCS

58% of studies were experimental or quasi-experimental but these are not evenly distributed across the evidence base



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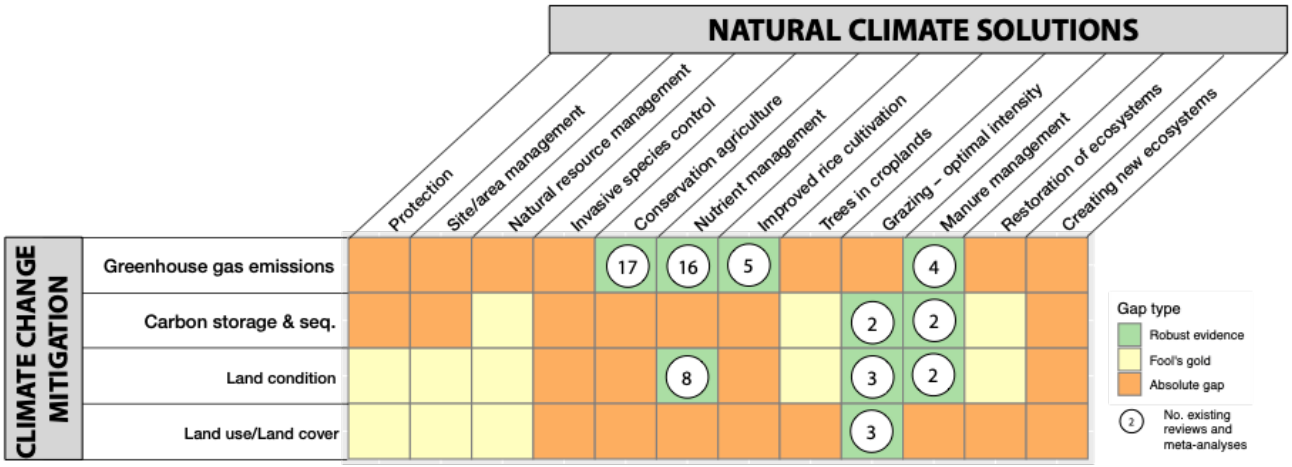


Areas for impact evaluation

Impact evaluations are needed where the evidence base is not sufficient or reliable enough to understand effectiveness

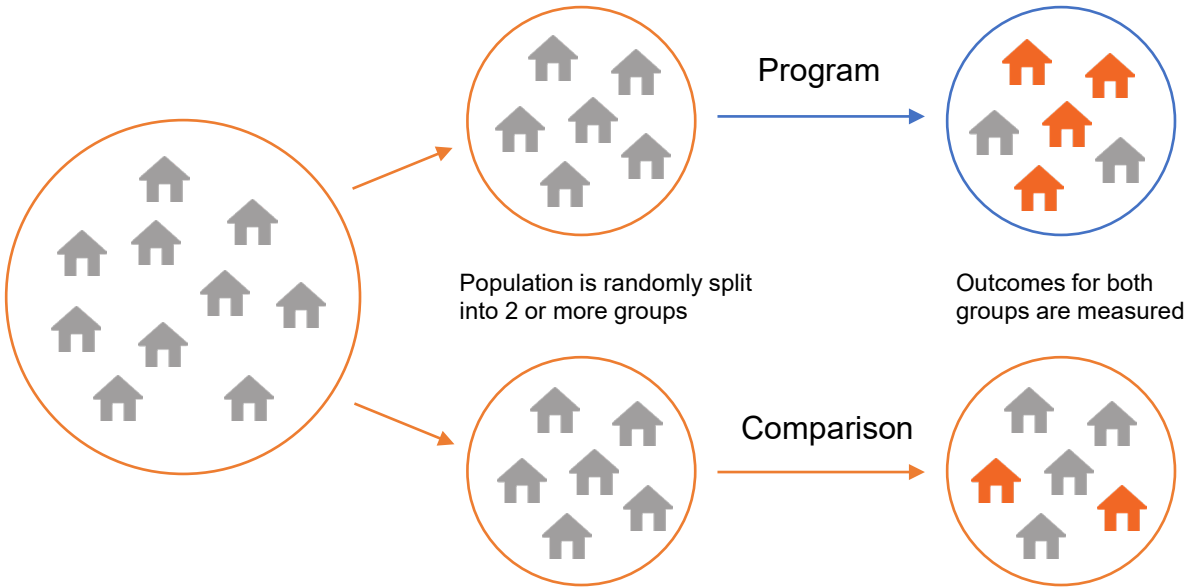
Areas for deeper assessment

Deeper assessment is need for determining the impact NCS has across contexts and scales to inform investments

Impact evaluations help us establish causal impact

One example: Randomized evaluation

Before the program starts: random assignment of eligible participants in two groups

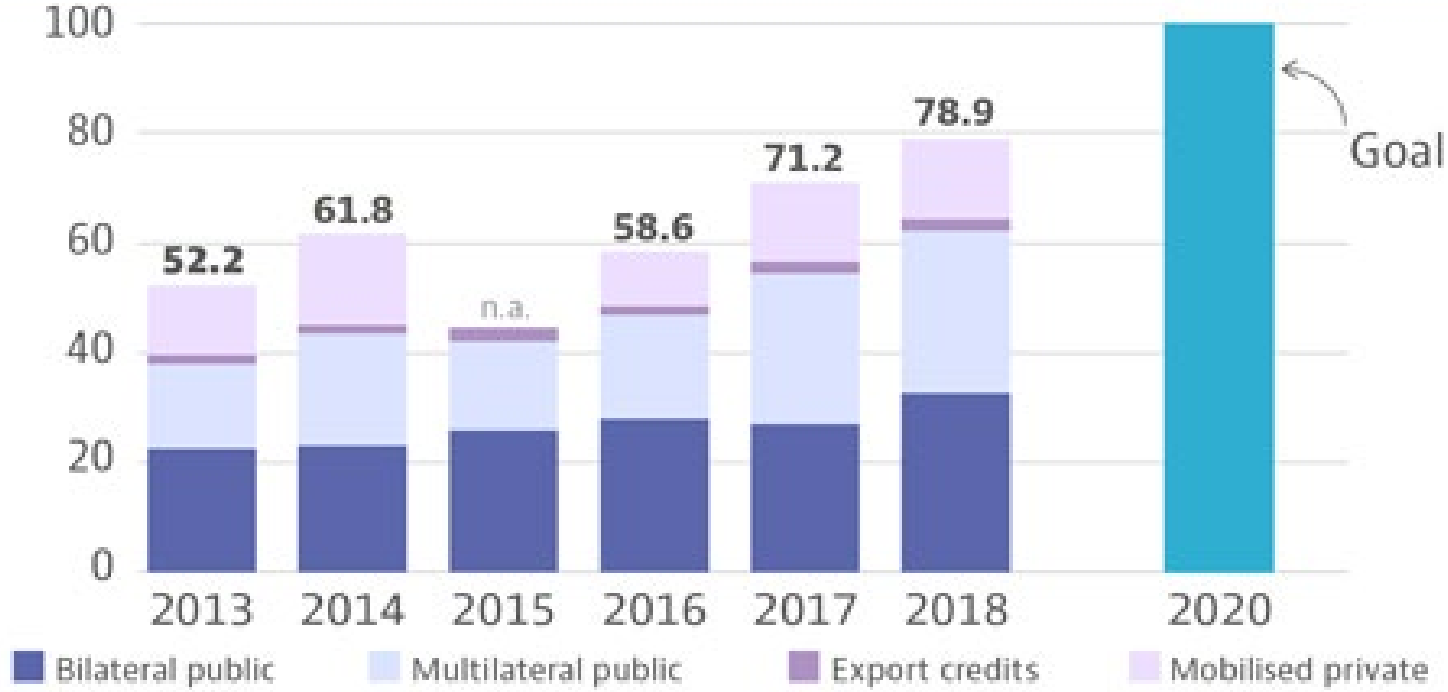


Two groups continue to be identical, except for one group receives the program

Any differences in outcomes between the groups can be attributed to the program

Climate finance for developing countries is rising

Climate finance provided and mobilised by developed countries, in USD billions

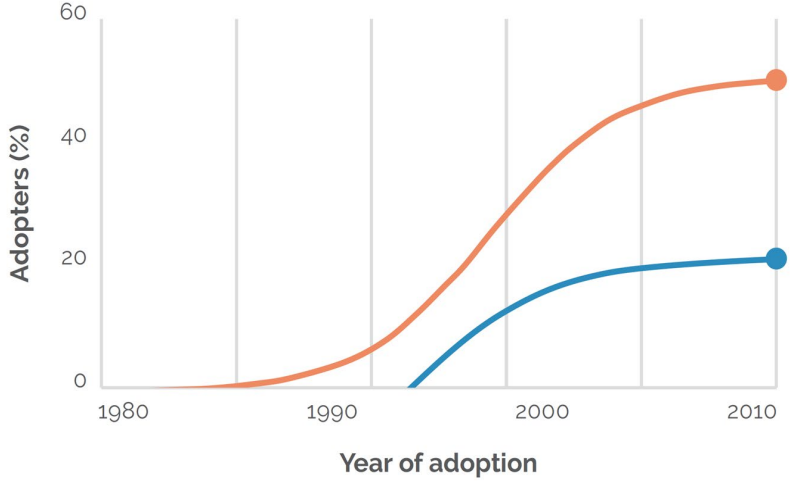


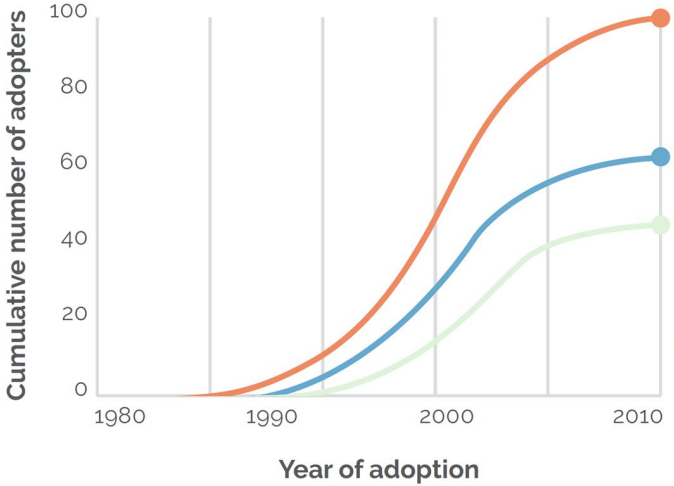
The gap in the private finance time series in 2015 is due to the implementation of enhanced measurement methodologies. As a result, private flows for 2016-18 cannot be directly compared with private flows for 2013-14.

Source: (OECD 2020), Climate Finance Provided and Mobilised in Developed Countries

OECD

IE LINKAGES TO DIFFUSION THEORY





Mills et al. 2019, Nature

Sustainability

SUSHMA SHRESTHA
CONSERVATION INTERNATIONAL
MAY 2024

The State of Indigenous and Community Territories Under Legally Recognized Tenure

Indigenous Peoples and Local Communities (IPs & LCs) govern and or hold an estimated 50-65% of global land[1,2]

Much of IPs & LCs lands co-occur with places critical for biodiversity and climate mitigation, adaption, and resilience[,4]

- 36% (4.2M Km2) of the global intact forests [5].

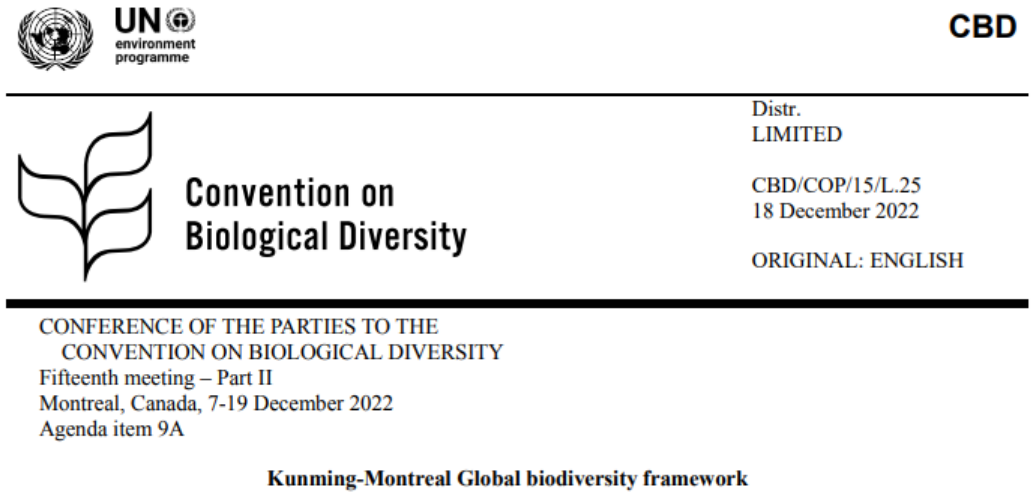
[1] RRI, 2020; [2]Wily 2012; [3] Dinnerstein et al. 2020; [4]Garnett et al. 2018;
[5] Fa et al., 2021; [6]WWF et. al., 2021

BACKGROUND

Fostering stewardship of IPs & LCs through legal recognition of their territories and tenure is increasingly recognized as a strategy to address global climate and biodiversity crisis [8,9,10]

CONSERVATION INTERNATIONAL

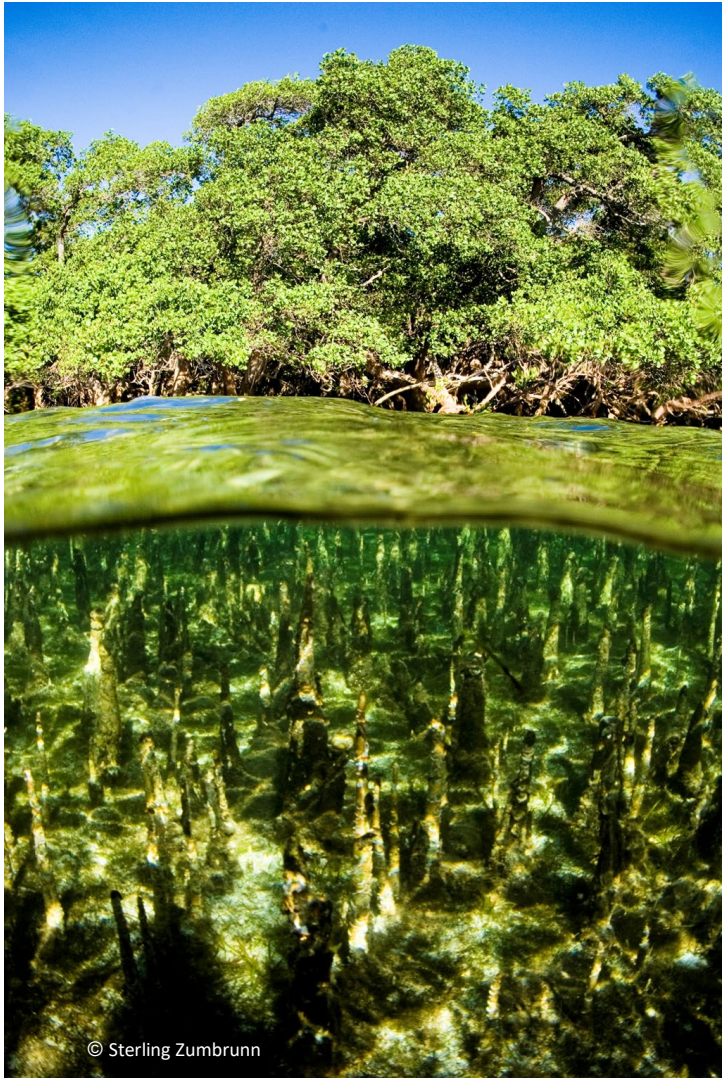
[7] IPBES, 2020; [8]IPCC, 2019; [9] RRI, 2020; [10]GBF, 2022;



TARGET 3 Ensure and enable that by 2030 at least 30 percent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, **recognizing indigenous and traditional territories**, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, **recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories**.

To inform environmental actions and channel investments to support IPs & LCs' stewardship requires understanding of environmental conditions and trends within IPs & LCs' territories.

Need foundational data on IPs & LCs lands and water rights



CONSERVATION INTERNATIONAL

Building a spatially explicit, and open-access database of:

Legally recognized, collectively governed, and managed terrestrial and marine territories of IPs & LCs, and the associated rights

Rights	Tenure Types			
	Owner	Holder	Manager	User
Access	■	■	■	■
Use	■	■	■	
Management	■			
Exclusion	■			
Alienation	■			

Schlager & Ostrom, 1992

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ADDITIONAL TENURE ATTRIBUTES (EXAMPLES)

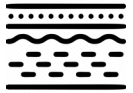
Tenure duration

Rights to due process and compensation

Free, Prior, Informed Consent (FPIC)

Governance type

Carbon rights



Subsoil rights

National legislation, policies, decrees, etc.

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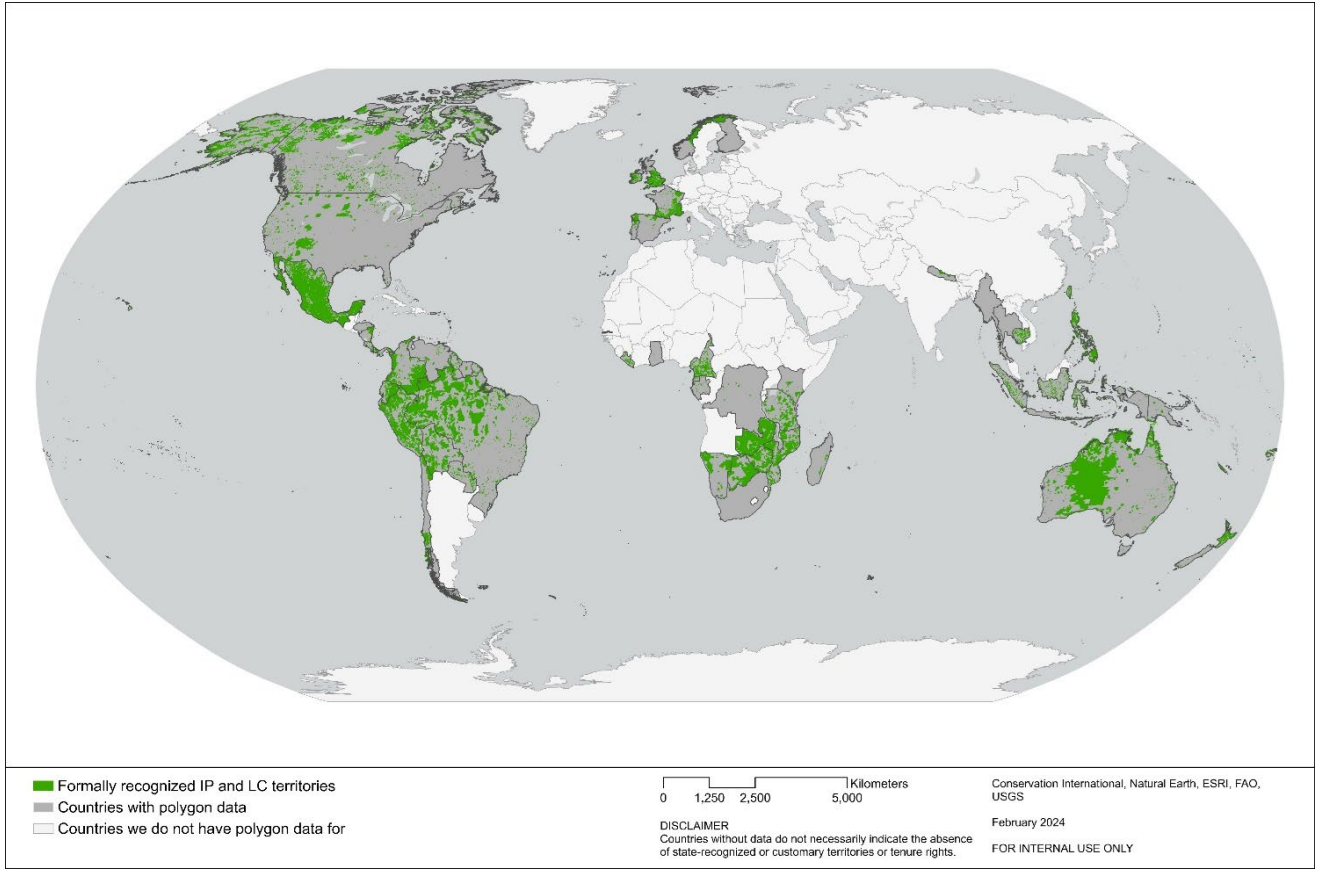
EXTENT AND DIVERSITY

- 57 countries
- Covers an estimated 9.8 million km^2



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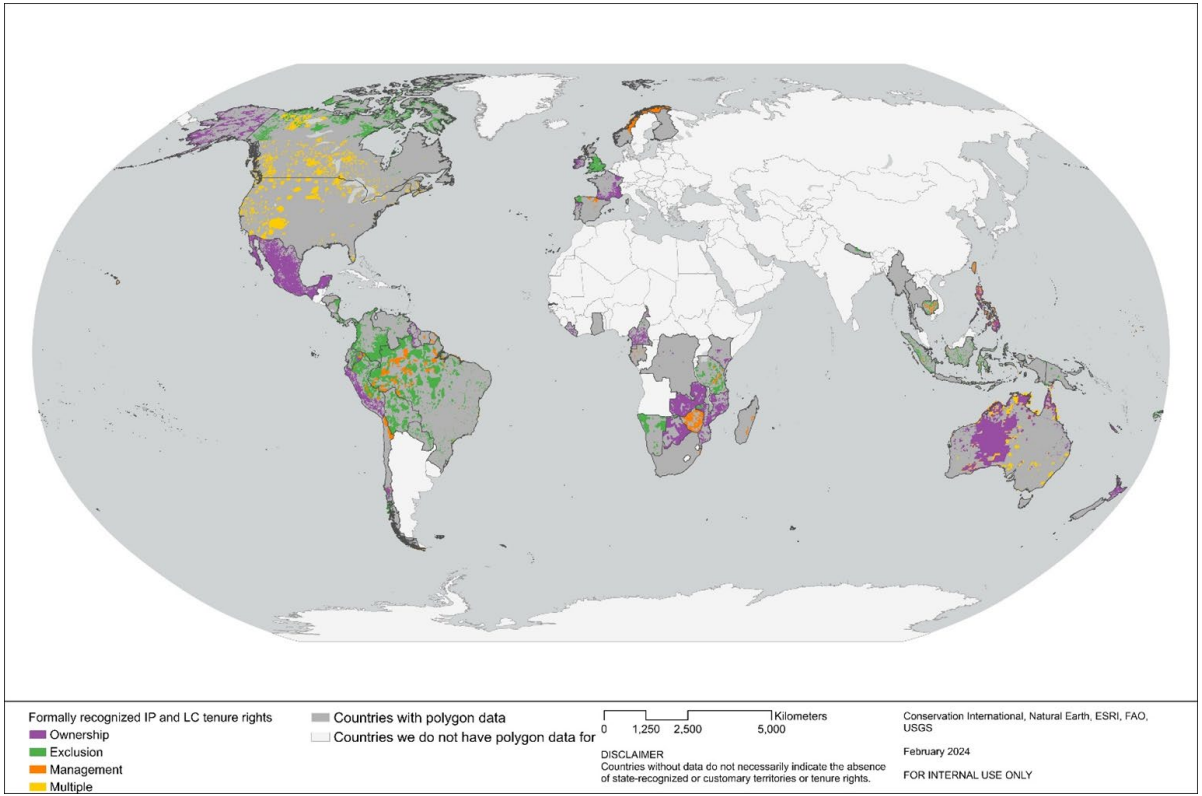
TENURE LEVEL/ POSITION



Overall greater areas with exclusion and management rights than ownership right

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TRENDS IN ENVIRONMENTAL INDICATORS
IN IPs & LCs LANDS

- How are environmental conditions within recognized lands faring over time?
  OR
- Do environmental status and trends mirror those of the jurisdiction within which they occur?

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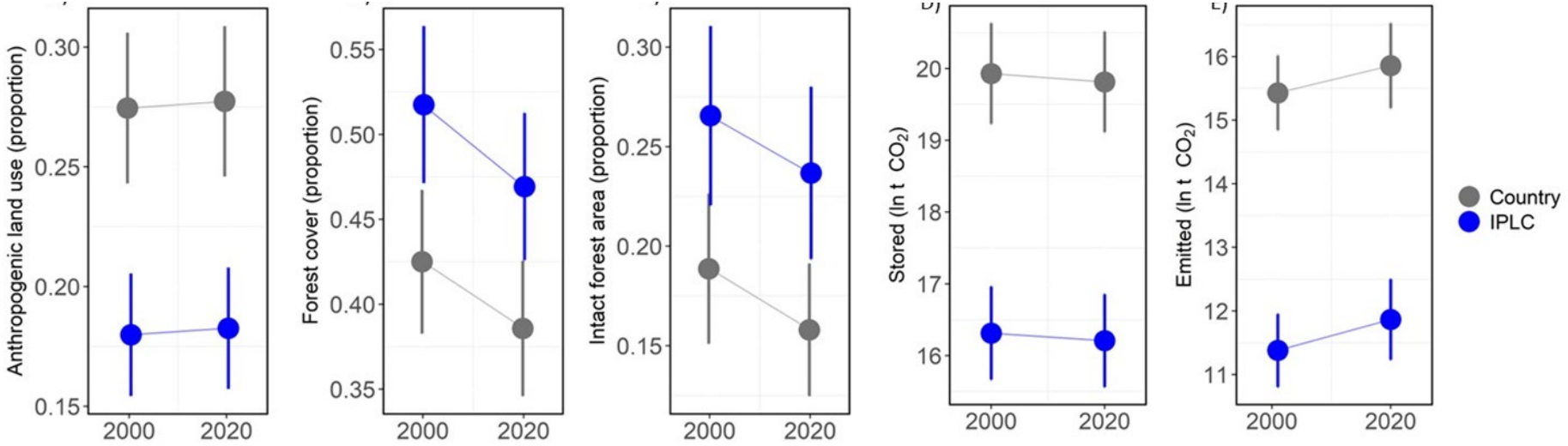
Environmental trends in recognized IPs & LCs territories largely mirror broader national trends though these territories typically have greater ecological integrity



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SUMMARY

- Recognized IPs & LCs territories are under diverse tenure systems and vary in levels of rights
- Recognized IPs & LCs territories are not immune from the broader forces of anthropogenic change
- Tenure recognition is vital but alone is not sufficient
- Synergistic actions needed to [illegible]hen recognized tenure

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Data Caveat

- Recognized only- tells part of the story of IP & LC governance /misses other data
- Varying data sources come with their own limitations
- Rights on the paper may not be implemented or exercised in practice
- Tenure based on national and subnational level information rather than the site
- Overlaps between various tenure systems
- Bundle of rights- only one way to categorize data

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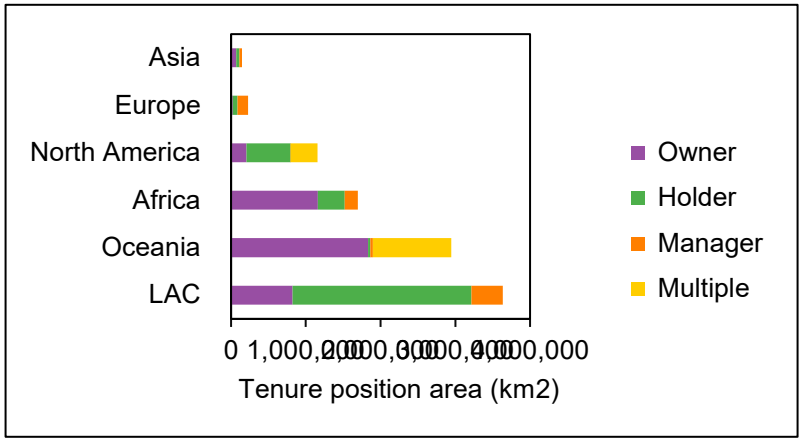
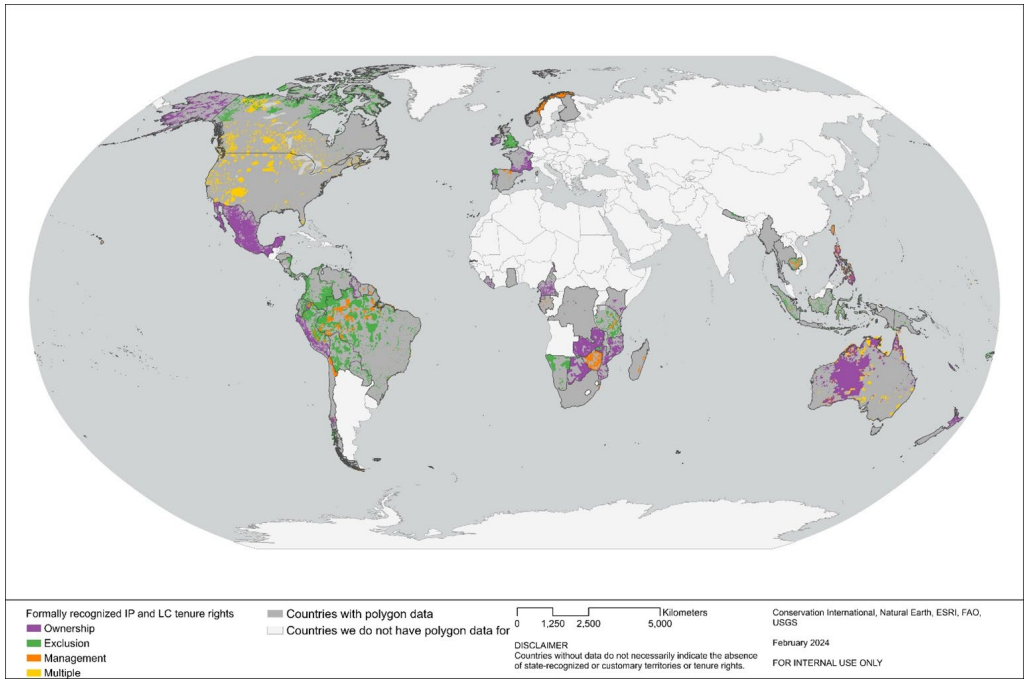
TENURE LEVEL/
POSITION



Tenure position	Area (km2)
Owner	4. 1 M
Holder	3.5 M
Manager	811,808.9
Multiple	1.4 M



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https://app.powerbi.com/links/QBgeBxedNx?ctid=c4de61a9-99b4-4c6a-962e-bd856602e8be&pbi_source=linkShare

Tenure recognition and forest cover change in Central and South America

A. Justin Nowakowski

Smithsonian

Conservation International

Tenure recognition and forest cover change in Central and South America

Collaborators:
Sushma Shrestha, Erik Olsson,
Jonathan Drescher-Lehman, Ruchi Patel

Smithsonian

PennState

Conservation International

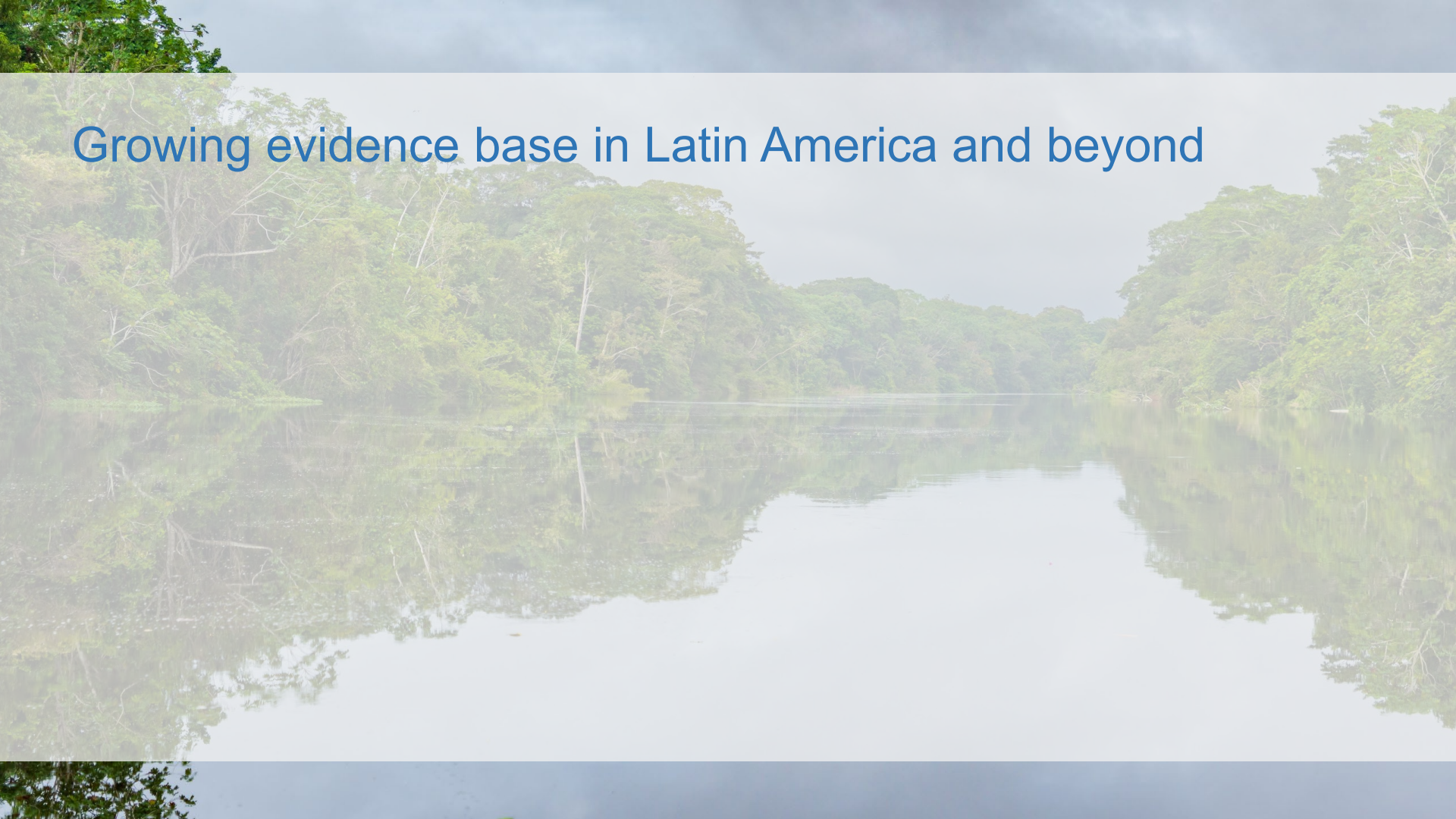
Increasing recognition of key role of IPs & LCs in conservation

- International frameworks (e.g., GBF) highlight the need to strengthen the role of IPs & LCs in policy formulation and stewardship through securing and respecting tenure rights

- IPs & LCs lands overlap extensively with the existing protected areas network (~40%) with varying legal status and governance structures for these areas

- IPs & LCs manage and have rights to >25% of terrestrial areas, including intact forest landscapes that are critical for biodiversity conservation and carbon storage

Growing evidence base in Latin America and beyond



Growing evidence base in Latin America and beyond

- **Counterfactual studies demonstrate that IPs lands in Brazil, Panama, and Peru reduced deforestation rates compared to unprotected lands** (Alejo et al 2022, Pacheco and Meyers 2022, Schleicher et al. 2017, Soares-Filho et al. 2010, Vergara-Asenjo and Potvin 2013)

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- **Titling or granting of property rights reduced deforestation rates on IPs lands in the Atlantic Forest and Amazon region of Brazil, and Peru** (Baragwanatha and Bayi 2020, Benzeev et al. 2022, Blackman et al. 2017, but see BenYishay et al. 2017, Buntaine et al. 2015)

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- Most counterfactual research in Latin America focuses on a single country, and rights are often considered uniform

Objectives of ongoing study

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- Assess trends in forest loss and associated CO_2 emissions in IPs & LCs lands with tenure recognition in 13 Latin American countries
  - Mean overall impact
  - Spatial variation in forest loss (spillover and country-level variation)
  - Determine whether forest loss varies with different bundles of rights – owner, holder, and manager

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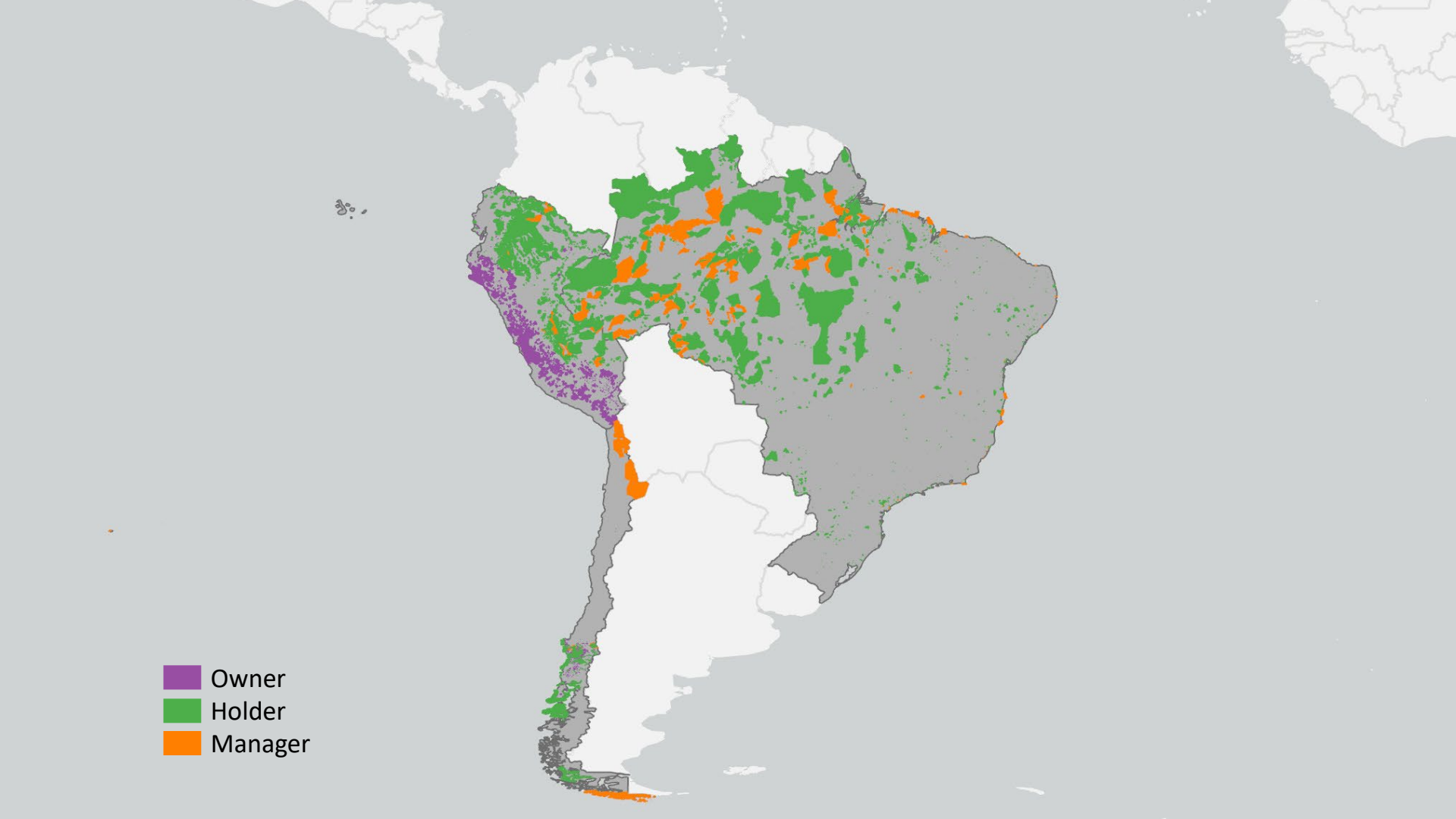
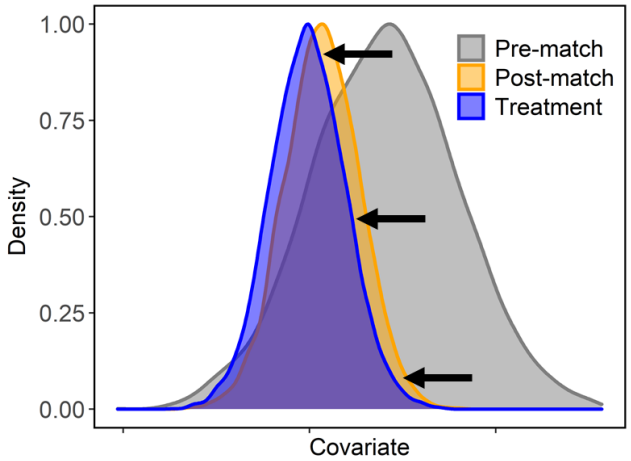

Owner
Holder
Manager

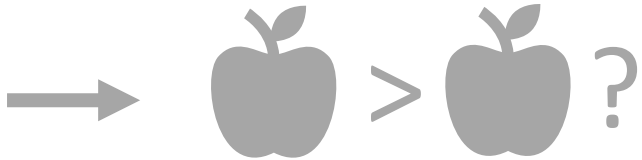
Approach in a nutshell

1) Sample grid cells inside and outside (potential controls) of IPs & LCs lands
2) Measure forest cover and potentially confounding spatial covariates
3) Conduct statistical matching
4) Assess differences with Bayesian hierarchical models

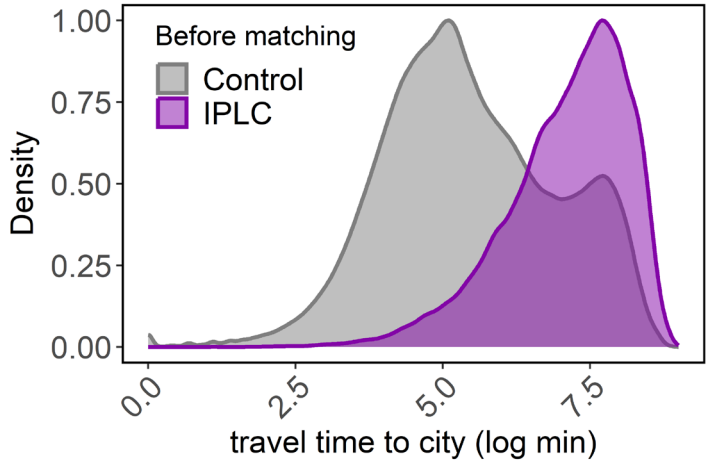
Approach in a nutshell

Goal of matching: reduce bias in estimates by improving balance in the *distributions* of potentially confounding variables between samples inside and outside IPs & LCs lands





Unmatched cells



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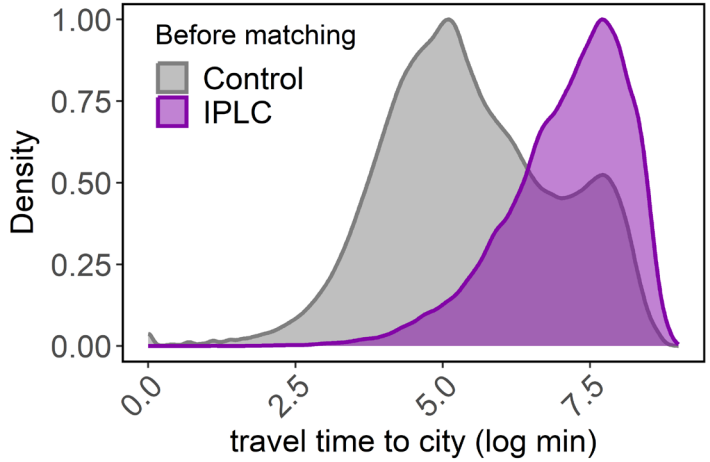
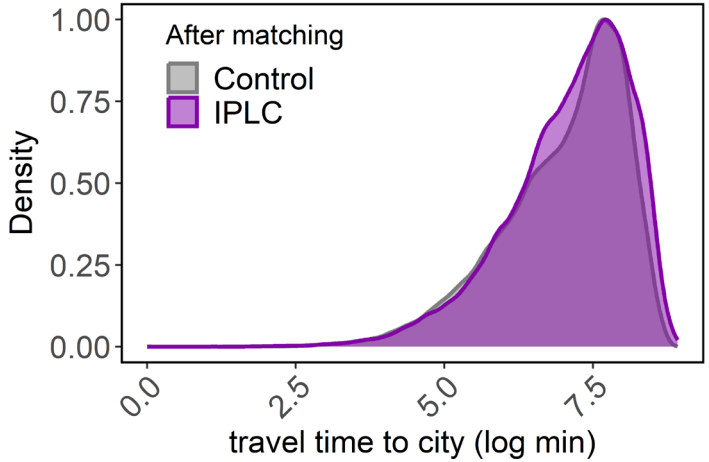
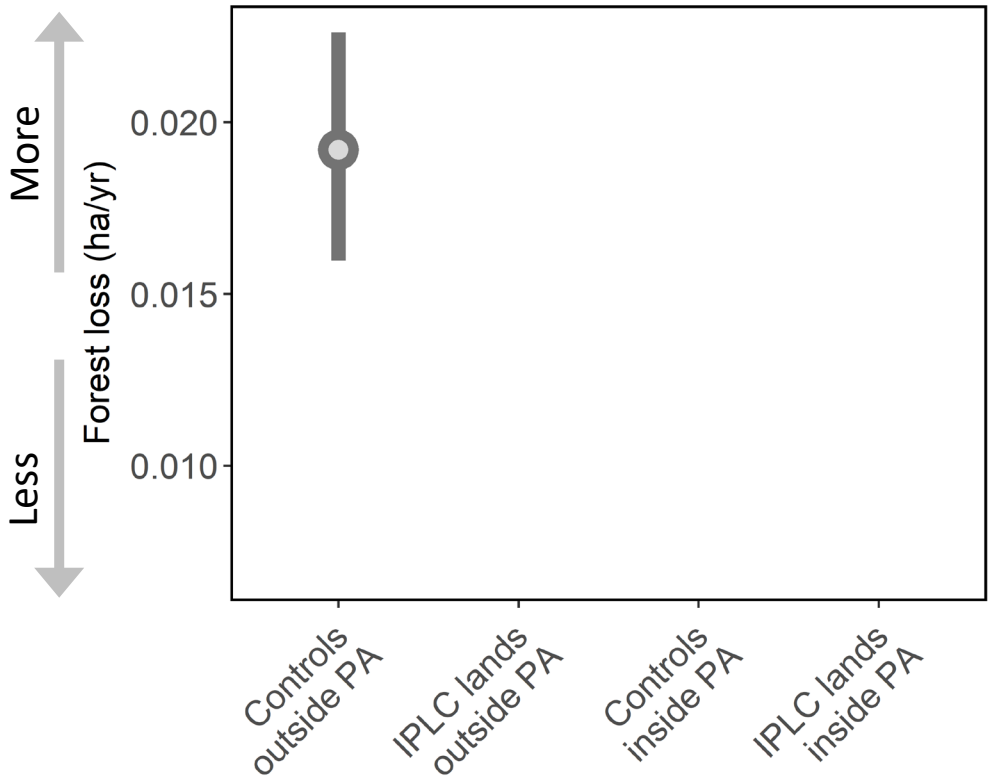
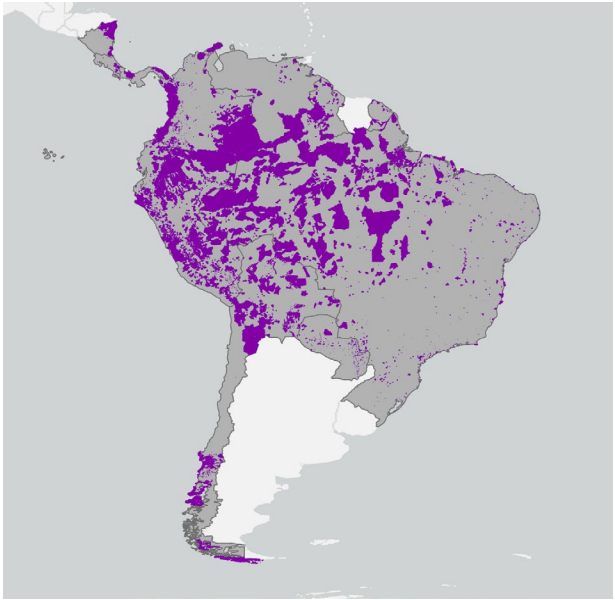


Matched cells



Preliminary results





Shrestha et al. in prep. (Please do not distribute)

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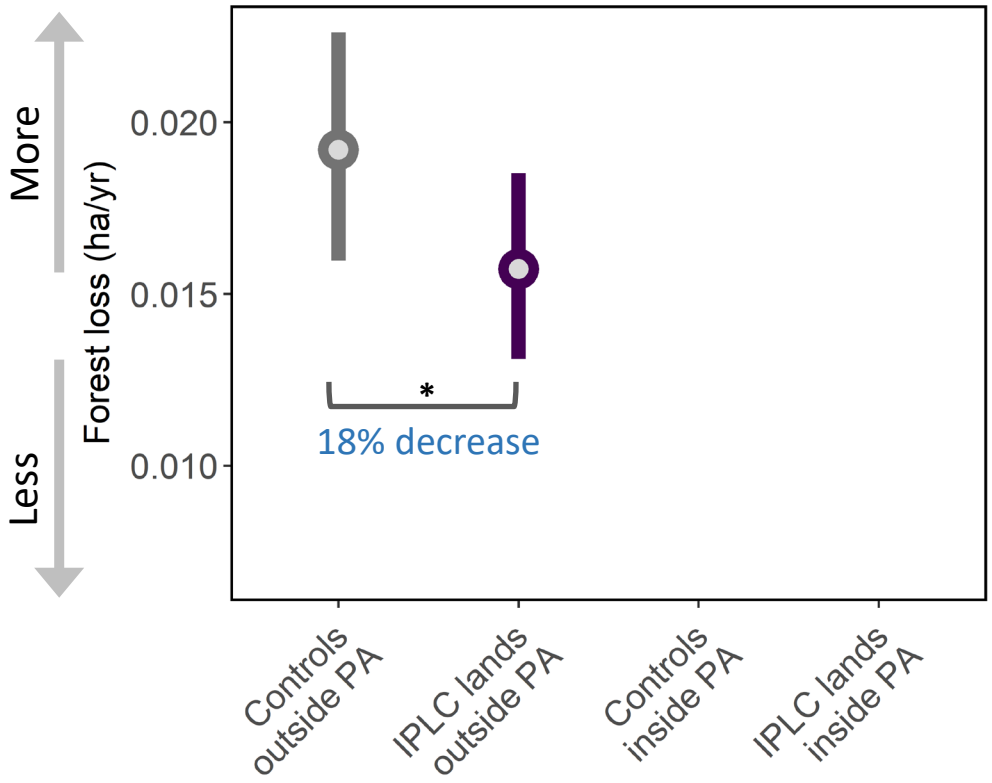

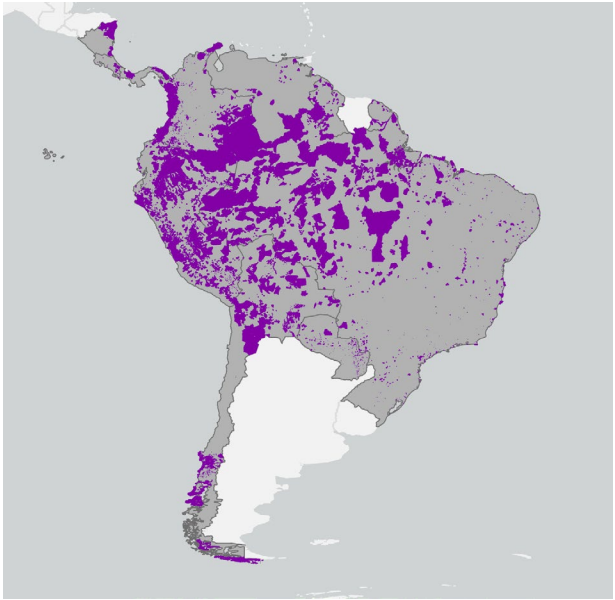

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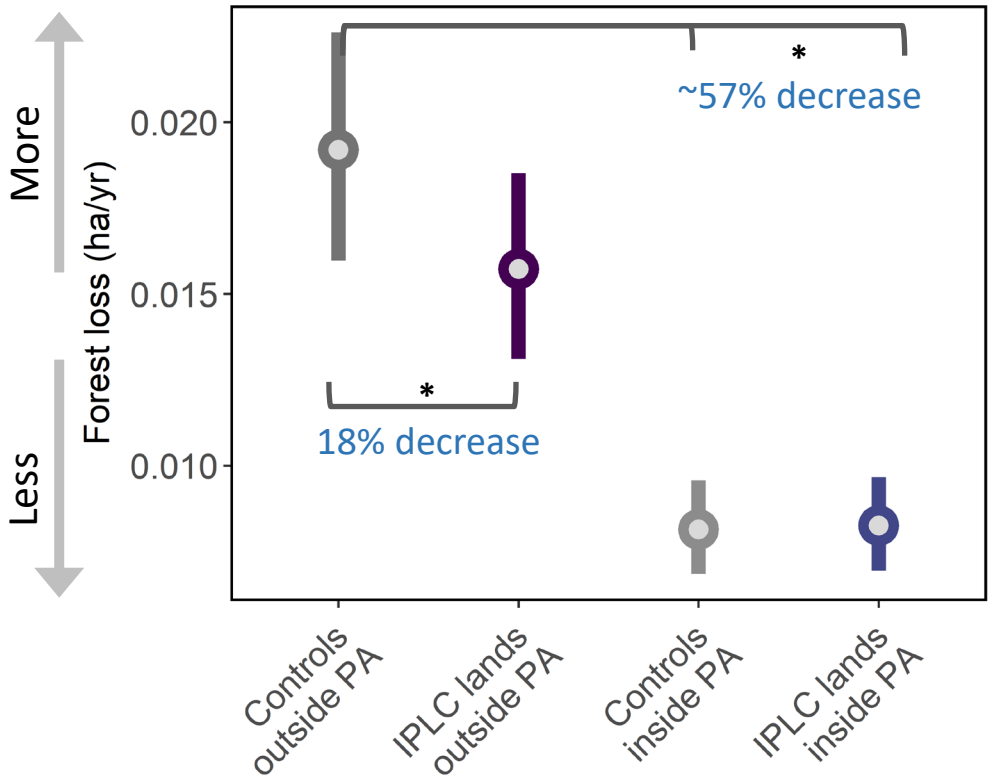

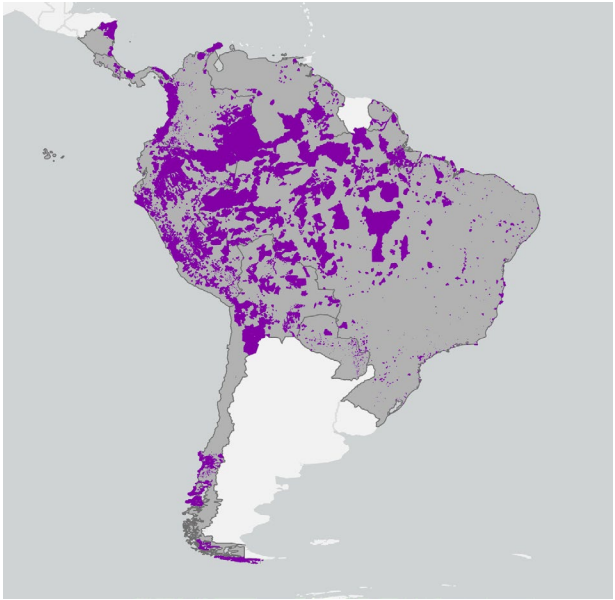

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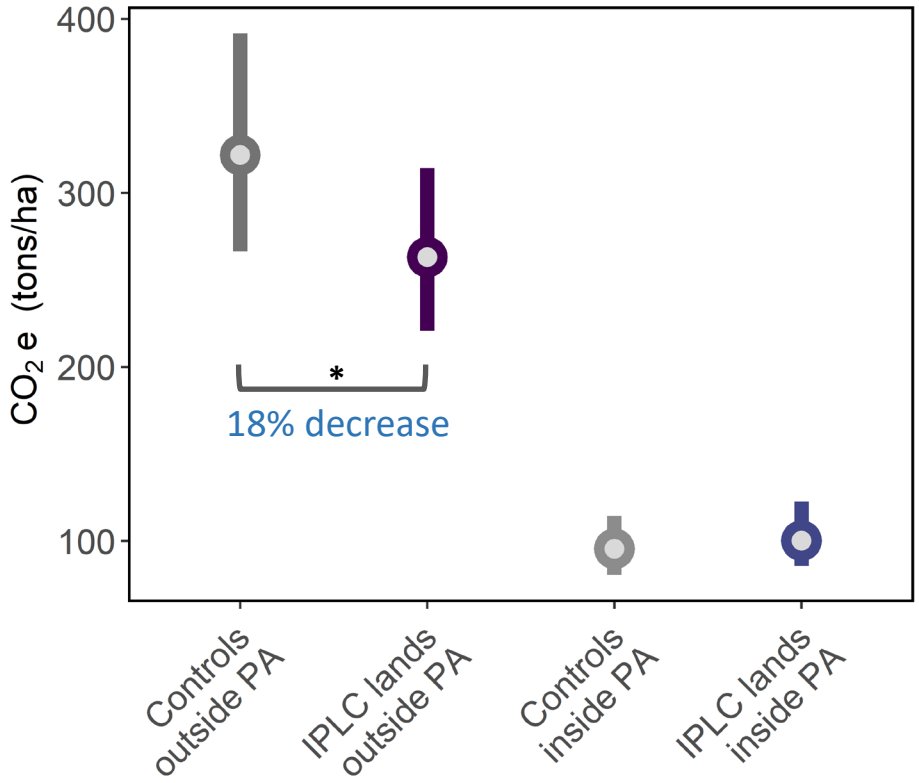

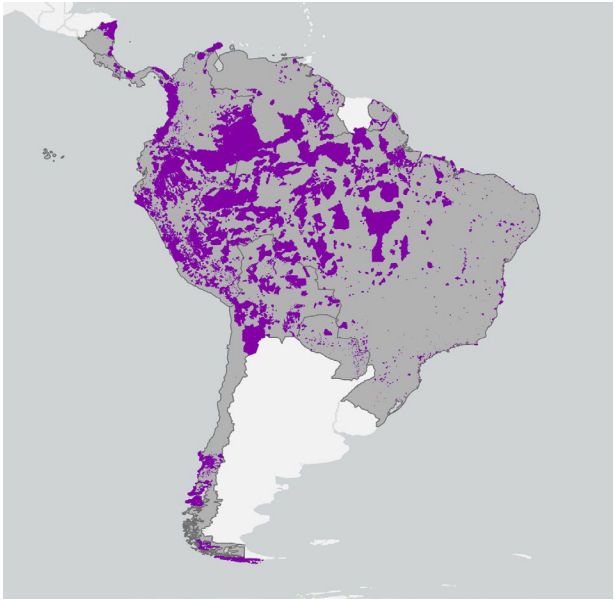

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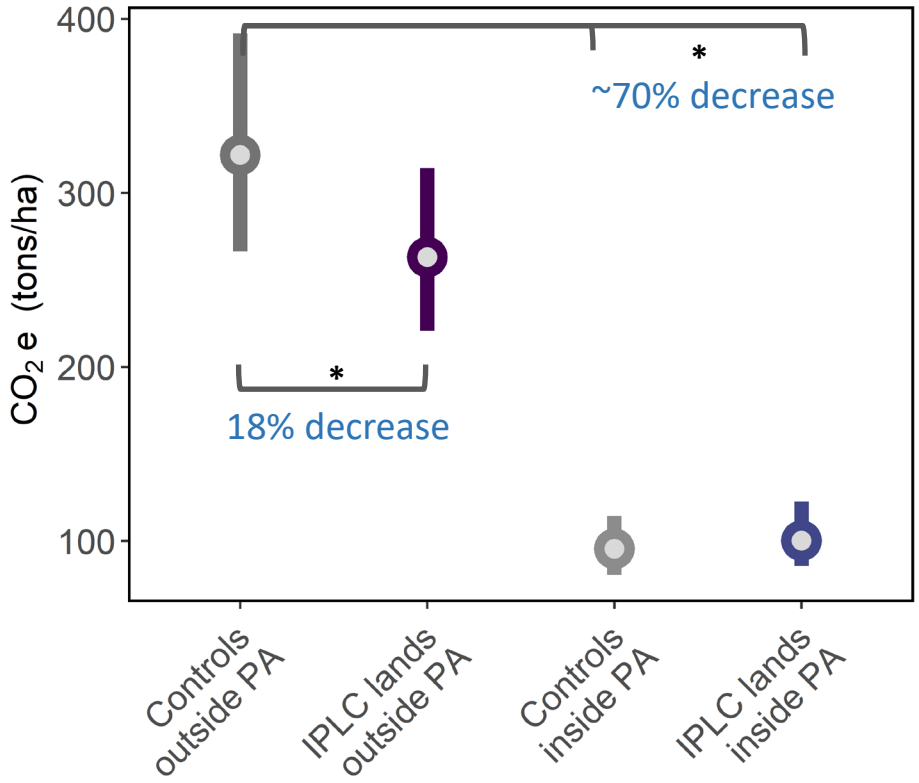

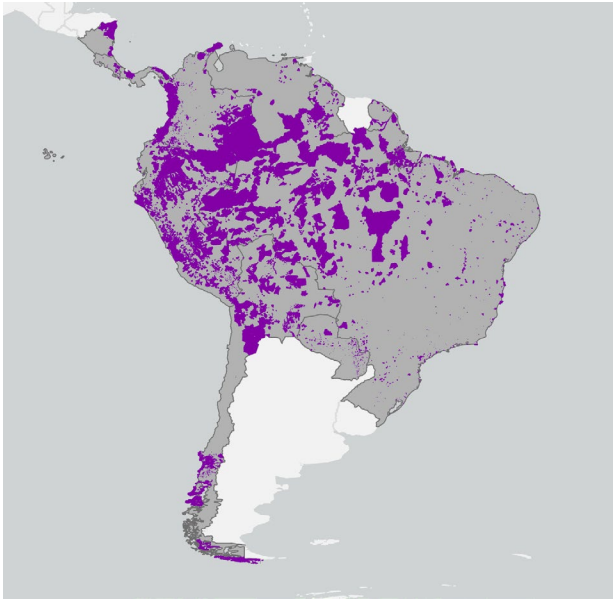

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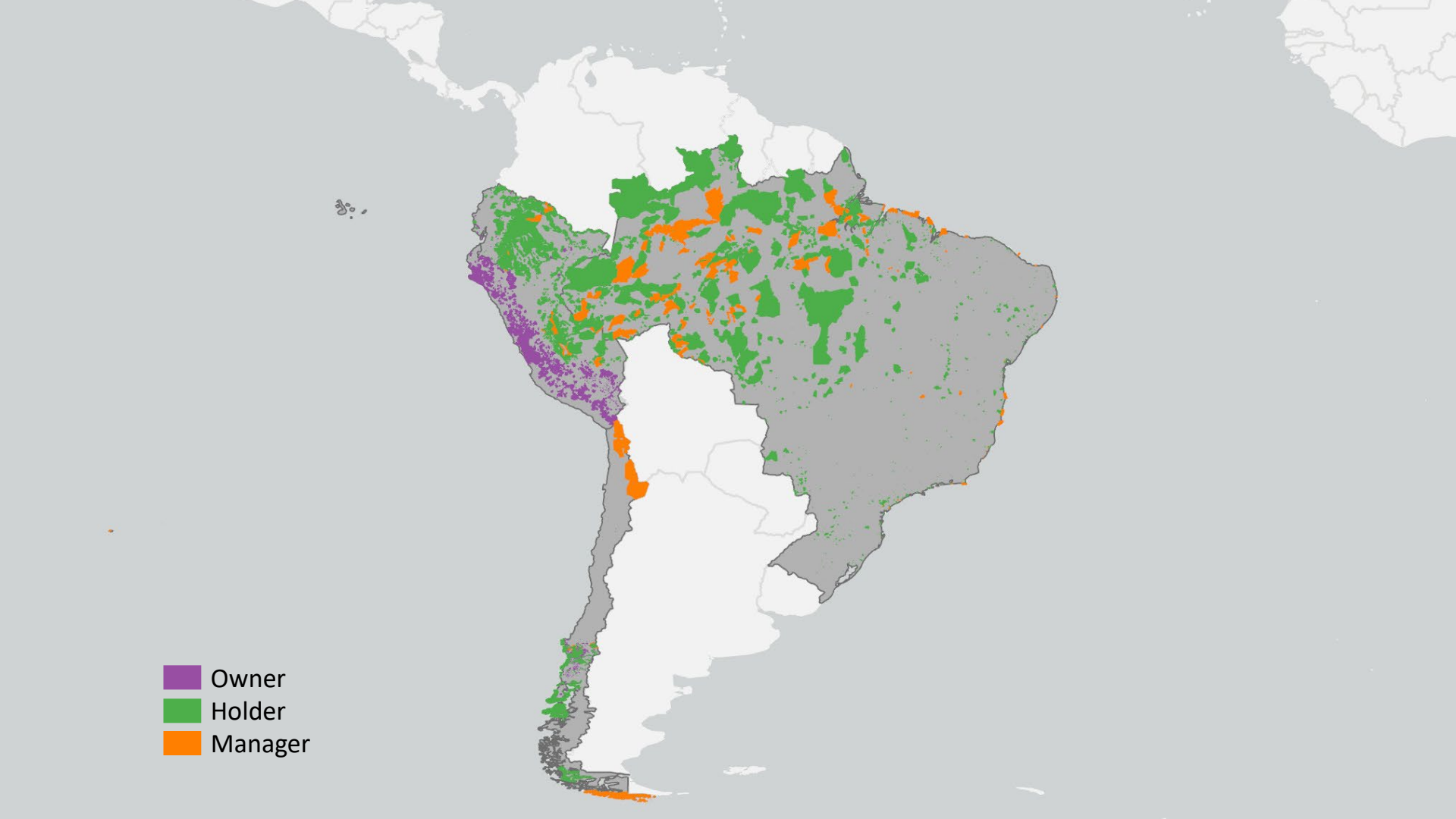
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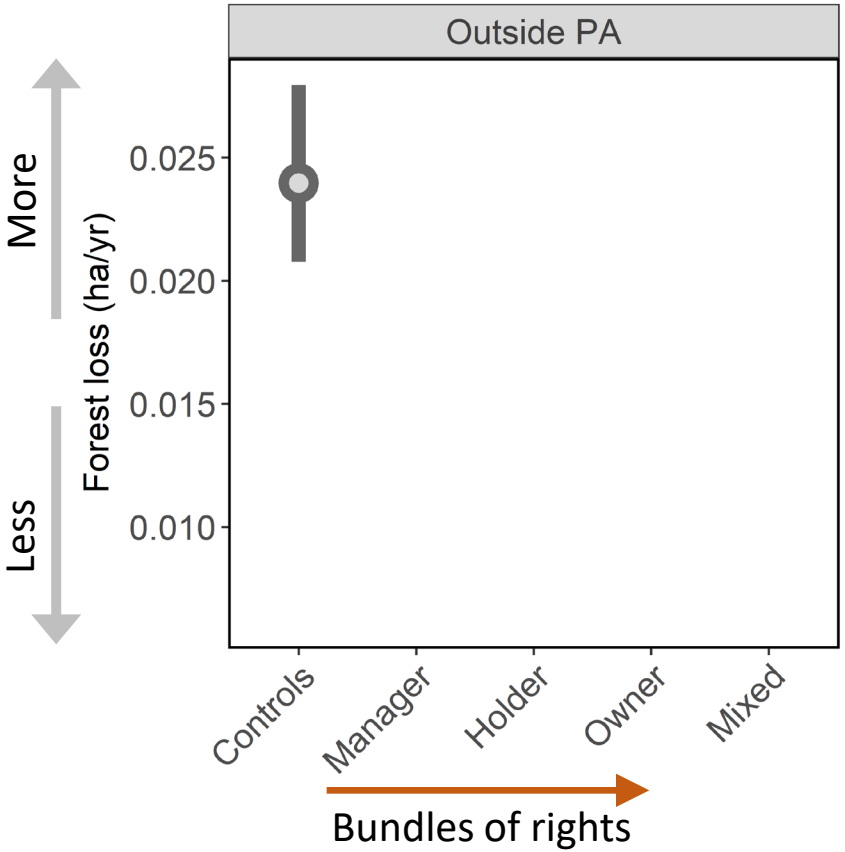

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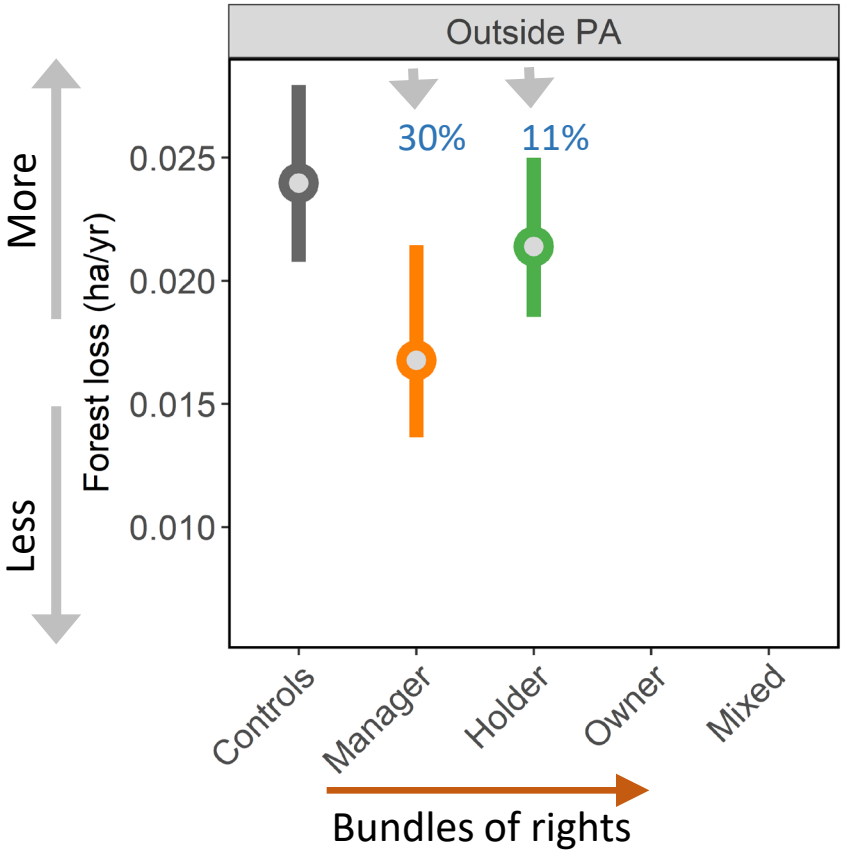

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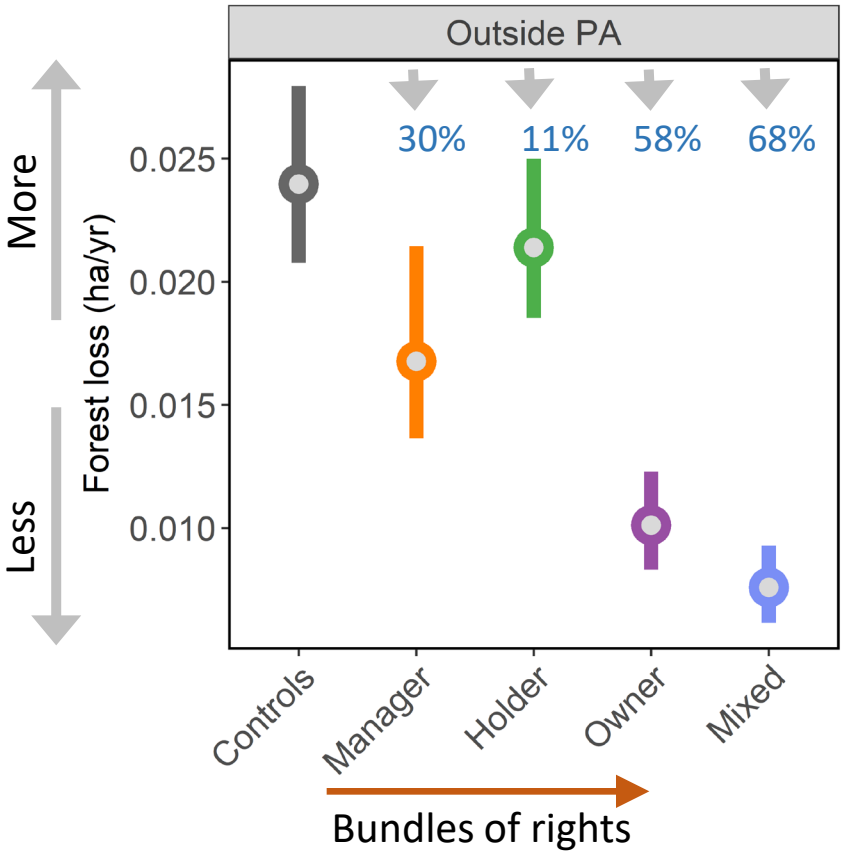

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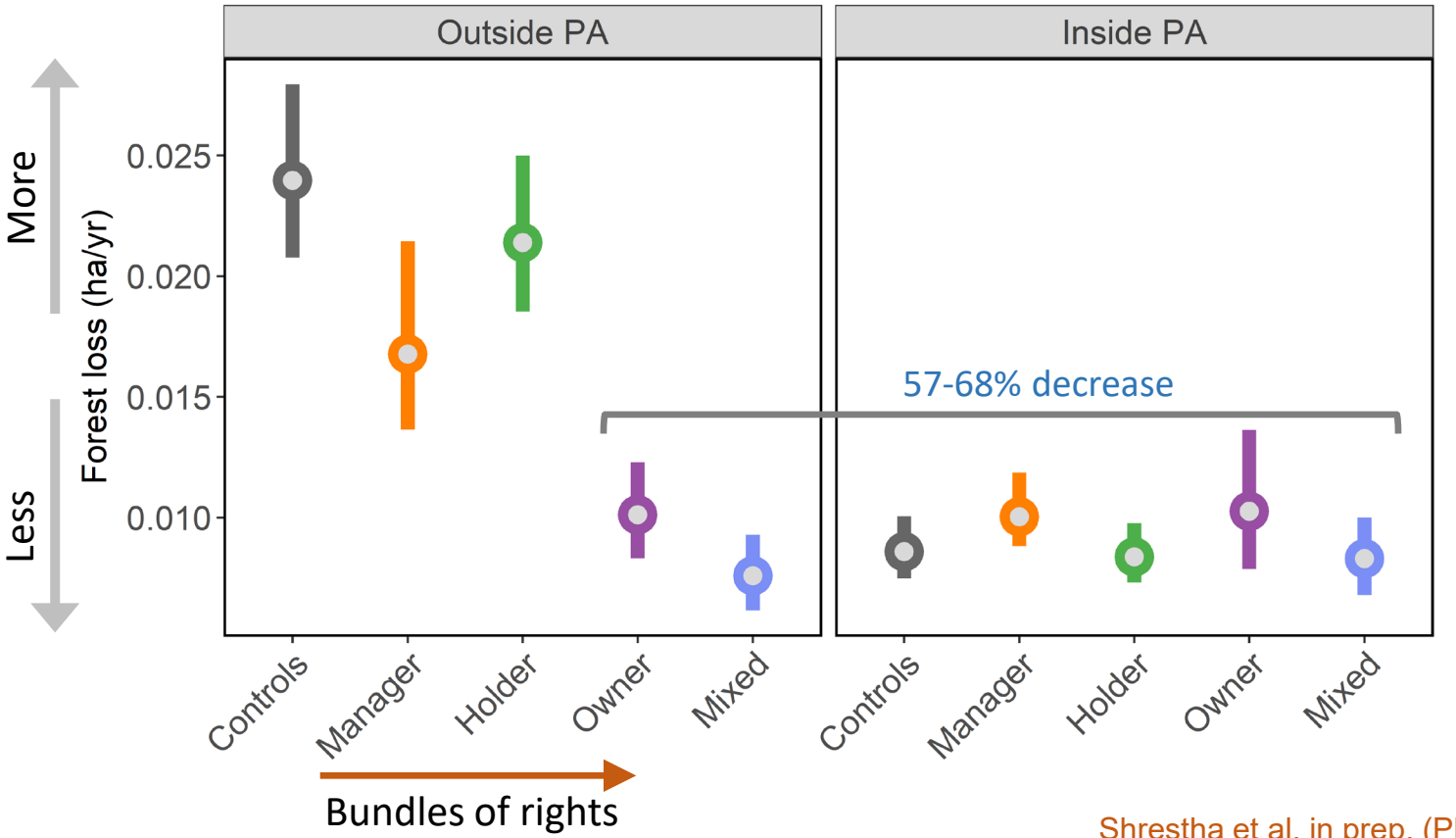


Shrestha et al. in prep. (Please do not distribute)

Some caveats

- Large-scale assessments provide 20,000 ft view, allows generalizability focused on ecological outcomes

- Complementary to place-based approaches that provide context around social outcomes and mechanisms underlying causality

Next steps

- Drivers of spatial variation in trends within (e.g., spillover) and among (e.g., national governance) countries

- Assess impacts in relation to time since legal tenure recognition

Conclusions

- This work adds to growing evidence that stewardship by IPs & LCs is broadly effective in reducing forest loss across scales

- Tenure recognition is a key pathway for advancing human rights, conservation, and climate goals – enabling condition for other interventions (e.g., PES)

Thank you

Conservation International

Cost-effective climate mitigation via conservation incentives targeting poverty: Bolsa Verde's impact in Brazilian Amazonia agrarian reform settlements

Sebastien Costedoat, Alex Pfaff,

Bruno Coutinho, and Michael Mascia

Strengthening Land Tenure and Community-Driven Conservation

World Bank Land Conference 2024

CONSERVATION INTERNATIONAL

Outline

- Case study: Bolsa Verde program in Brazilian Agrarian Reform Settlements (2011-2018)
- Evaluating the social impacts of Bolsa Verde
- Evaluating the impact of Bolsa Verde on tree cover and CO2 emissions

Agrarian Reform Settlements and the evolving deforestation trends in the Brazilian Amazon

- Settlements in Amazonia were established since the 1970s to allocate land to landless people
- They consist of a set of agricultural land units that are destined for the families of rural producers without economic conditions to acquire a rural property, who must reside in the settlement projects and develop agricultural activities
- Most settlers lacked farming skills and had no access to credit, markets, and technical support: strong increase in deforestation in those areas
- Newer settlements have to follow in principle stricter rules regarding the preservation of forests, but the objectives of most settlements remain aligned only with social and economic policies
- **Between a third and a fourth of deforestation in Amazonia occurs in Agrarian Reform Settlements**

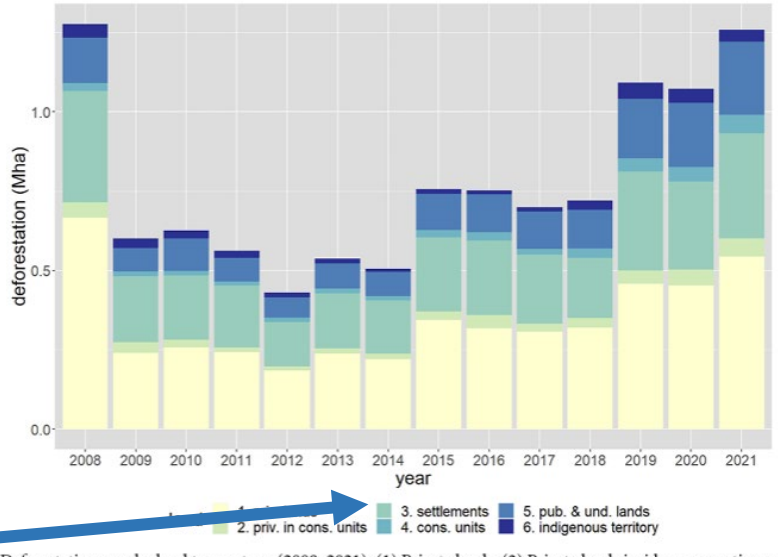


Figure 5. Deforestation area by land tenure type (2008–2021): (1) Private lands; (2) Private lands inside conservation units; (3) Settlements; (4) Conservation units; (5) Public and undesignated lands; (6) Indigenous territories.

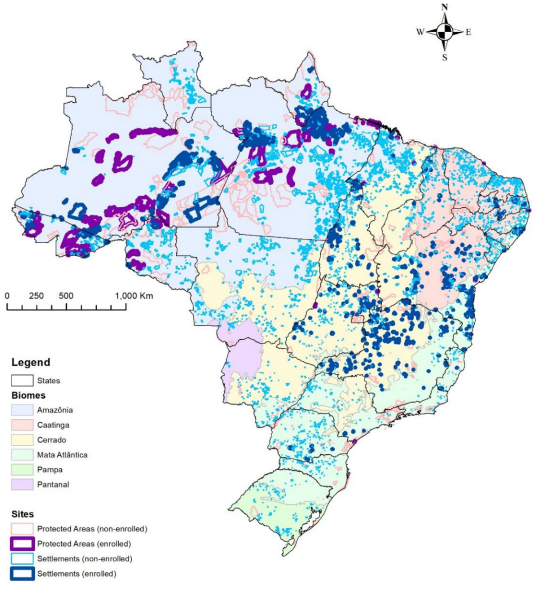
Gilberto Camara et al 2023 Environ. Res. Lett. 18 065005

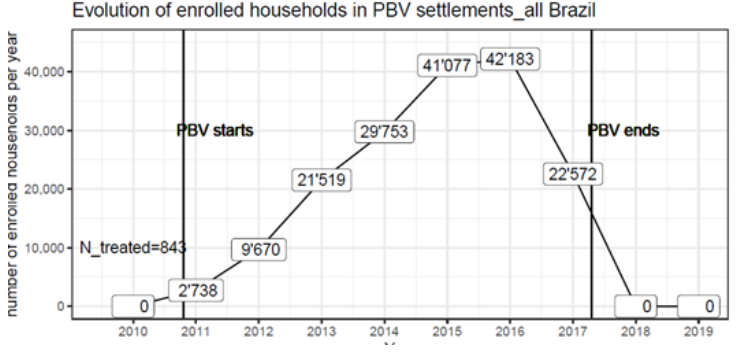
The *Bolsa Verde* (“Green Grant”) Program 2011-2018

- Emerged from the governmental poverty alleviation agenda (*Brasil Sem Miséria*), as an extension of *Bolsa Familia* conditional cash transfers
- Targeted households in extreme poverty already receiving *Bolsa Familia* AND located in conservation sites
  - Mixed-used Protected areas
  - **Agrarian Reform Settlements**
  - Other traditional communities living on federal lands
- Operated as a conditional cash transfer capacity building
  - quaterly payments in exchange for better natural resources management (~USD 160 quarterly for 2 years)
  - Trainings on environmental rules, forest management plans, and new production techniques, income diversification…

The *Bolsa Verde* ("Green Grant") Program v1 2011-2018

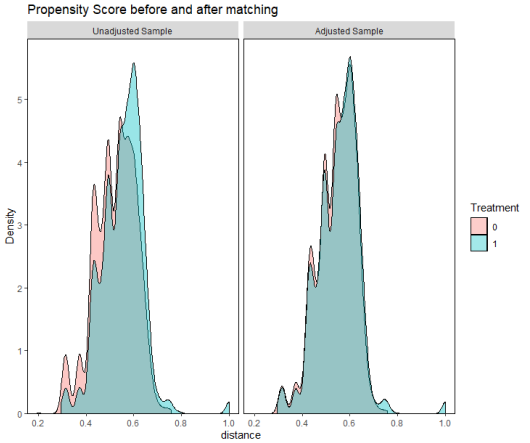
- The program has been piloted in Amazonia and scaled to most biomes of Brazil after 2012
- The Bolsa Verde program v1 ended in early 2018
- *Since 2023:Ongoing efforts to implement a new Bolsa Verde v2*



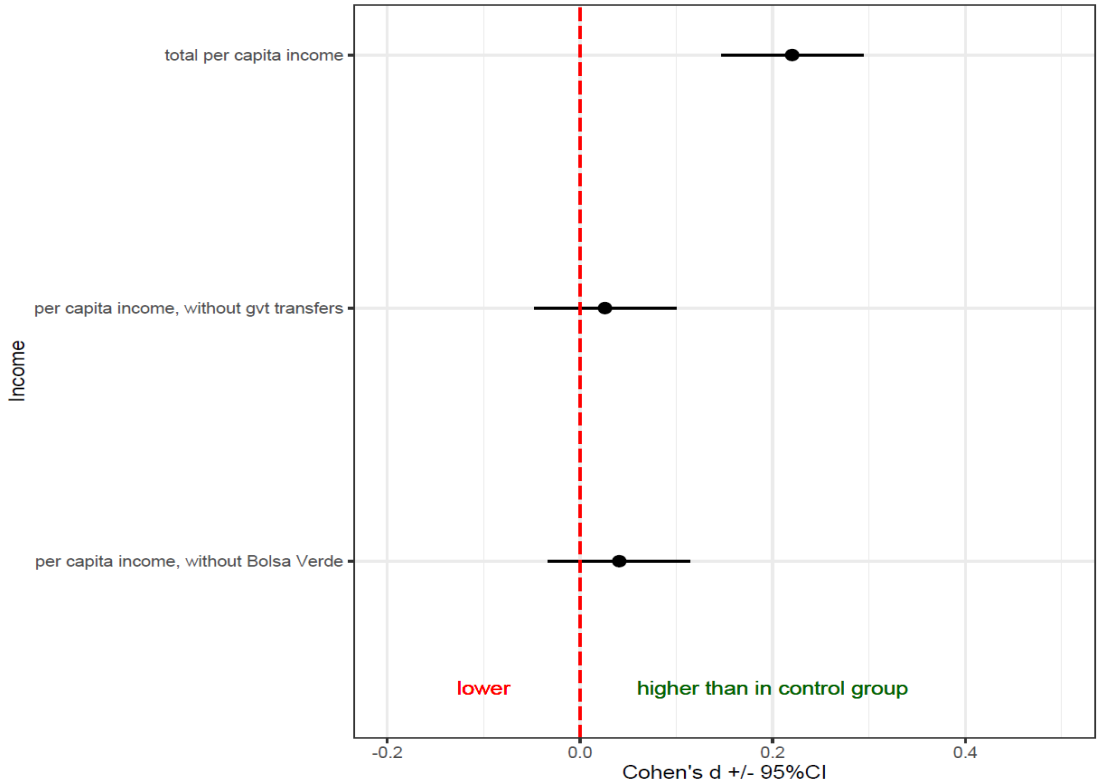


Evaluating the social impacts of Bolsa Verde

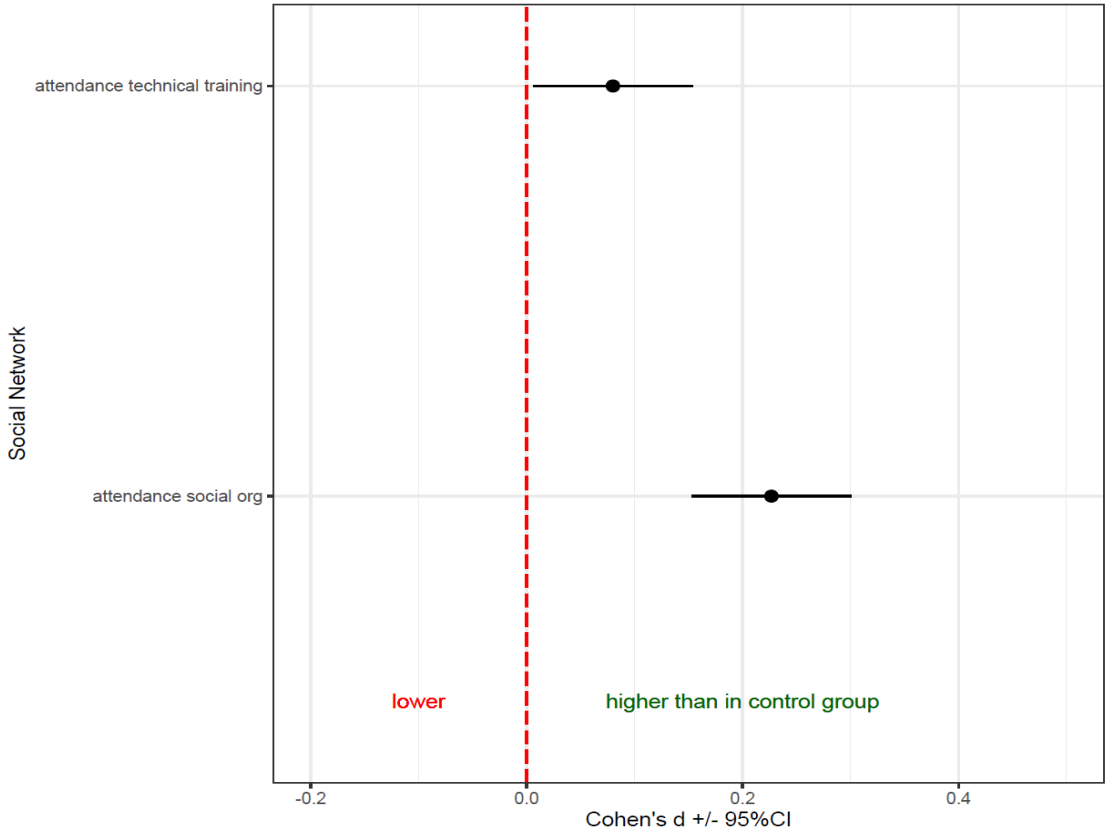
- Data source: 3 rounds of surveys performed by CI Brazil (2014-2016) with enrolled and non-enrolled individuals living on enrolled sites
- We restrict the non-enrolled sample to
  - only individuals living in participating sites AND
  - potentially eligible to Bolsa Verde (already receiving other government transfers)
- **Propensity Score Model**: Estimating the probability of receivir Bolsa Verde based on observed characteristics:
  - Household size
  - plot size
  - agricultural production
  - access to market
  - same type of land governance
  - access to market
  - access to electricity
  - individual vs collective house



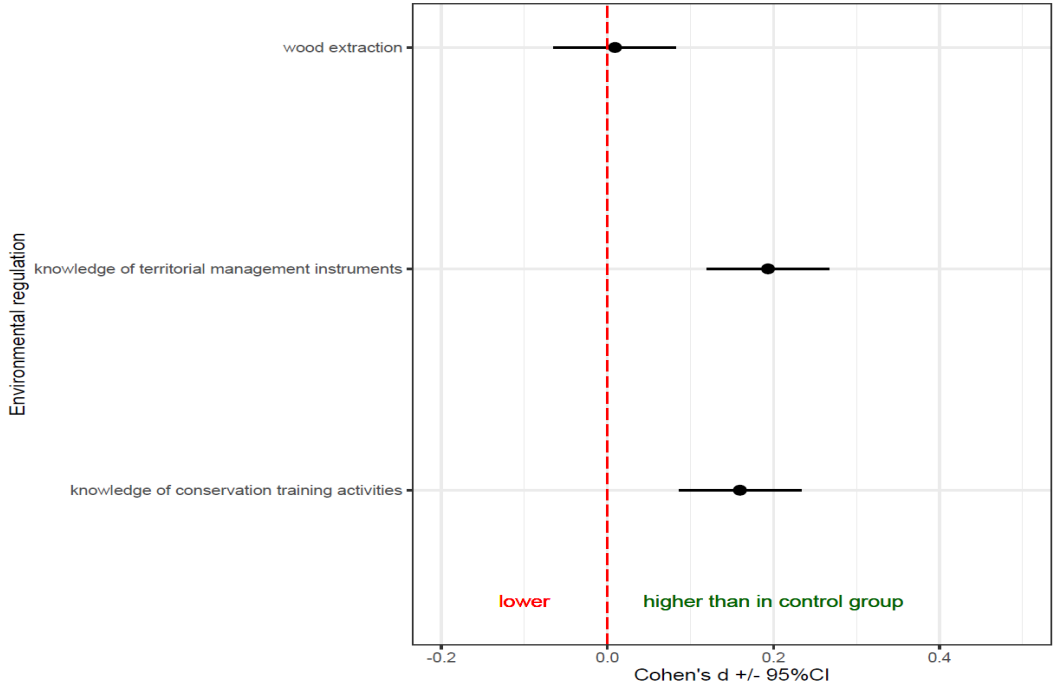
Result 1: the program has an impact on income (but not a multiplier effect)



Result 2: the program has an impact on access to training and social networks

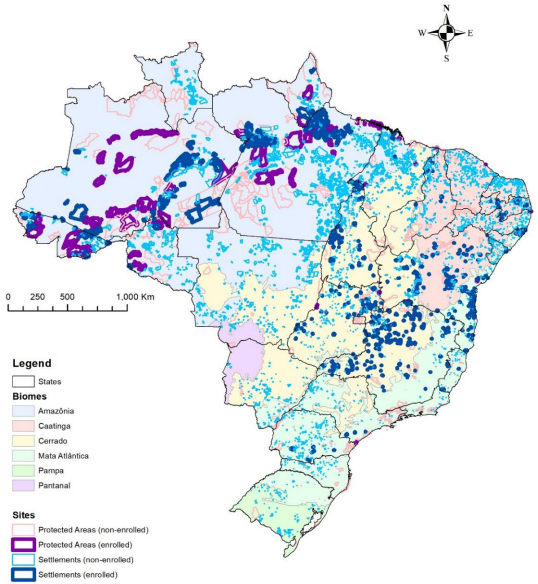


Result 3: No impact on wood extraction, despite better awareness of regulations



Link between social and environ

- PBV has potentially an impact on tree cover through a better understanding of and compliance with environmental regulation, in exchange for payments to eligible households
- We then rely on the assumption that incentives and training affects opportunity costs and the social norms preventing illegal deforestation
- It enables the identification of treatment effect at site level by comparing similar enrolled and never enrolled sites



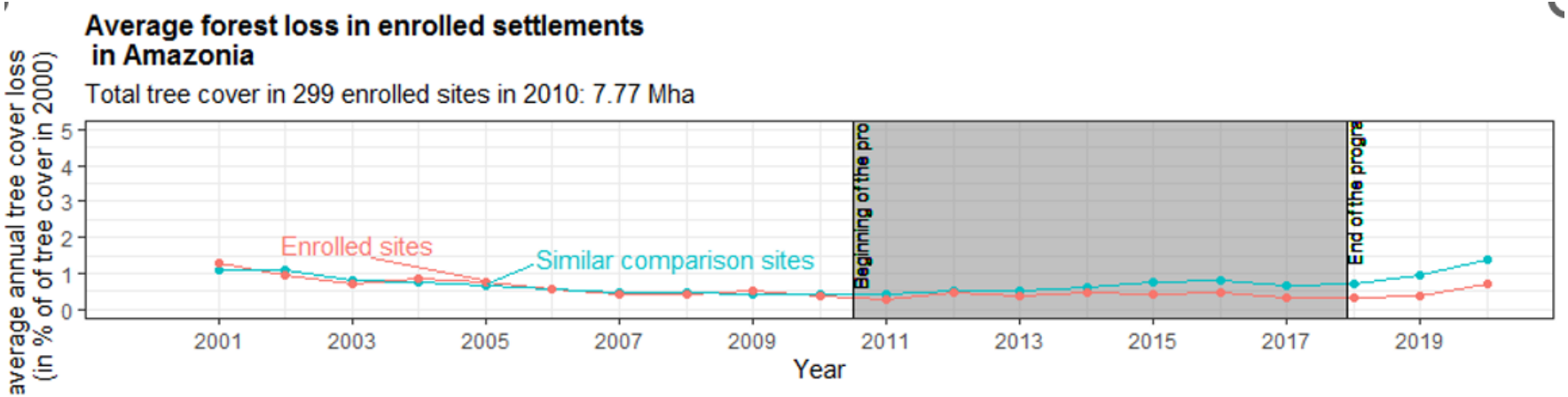
Evaluating the impact of Bolsa Verde on tree cover

- Unit of analisis and treatment status: Polygons of enrolled (at least two years) and never enrolled Settlements

- Outcome: anual forest cover loss in % of forest cover in 2010 (derived from MapBiomas Collection 5)

- Generalized Difference-in-Differences adjusted by a Propensity Score :
  - distance to roads,
  - distance to rivers,
  - distance to nearest city,
  - elevation,
  - slope,
  - forest area in 2010 in hectare,
  - biome,
  - population density and
  - forest cover lost 2007-2010 in hectare

Postmatching loss in enrolled and comparison sites



Similar tree loss trend before the beginning of the program

Reduced tree cover loss since ~2013 compared to the comparison groups

Effect size on forest and CO_2

- Without *Bolsa Verde*, the total forest cover loss in 2011-2017 would have been about 37% higher in the enrolled sites
- -> *Bolsa Verde* avoided a total of ~ 79,897 ha of forest loss in enrolled settlements of Amazonia, an area about half the size of the city of São Paulo
- But it represents only about 1.86 % of the total forest cover lost in Brazilian Amazonia between 2011 and 2017
- -> *Bolsa Verde* avoided ~ 35 megatons of CO_2 emissions within enrolled Amazonia Settlements between 2011 and 2018
- This cumulative 7-year additionally avoided emissions amount is roughly equivalent to the annual carbon footprint of the city of São Paulo during the single year 2015
- -> ~ USD 1.73 per ton of avoided aboveground CO_2

Conclusion

- There is a cost-effective potential to further reduce deforestation in titled collective land through conditional cash transfers
- Conditional cash transfers can increase compliance with site natural resource management regulations while increasing social outcomes, even programs that are short-lived
- Yet incentives are not a “one-size-fits-all silver bullet”!
- Need adaptive management and policy mixes to permanently prevent loss while improving social outcomes, but difficult when regulation is weakening and drivers and magnitude of deforestation is changing

Article

Cost-effective climate mitigation via conservation incentives targeting poverty: Bolsa Verde's impact in Brazilian Amazonia settlements

Sebastien Costedoat, Alexander Pfaff, Bruno Coutinho, Michael Mascia

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Thank you!

Questions ?

-Bruno Coutinho and CI Brazil team for collecting the data
-Laura Villalobos for cleaning the social outcomes datasets
-Many CI colleagues for comments and feedback

Sebastien Costedoat
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SUSHMA SHRESTHA
CONSERVATION INTERNATIONAL
MAY 2024

The State of Indigenous and Community Territories Under Legally Recognized Tenure

Indigenous Peoples and Local Communities (IPs & LCs) govern and or hold an estimated 50-65% of global land[1,2]

Much of IPs & LCs lands co-occur with places critical for biodiversity and climate mitigation, adaption, and resilience[,4]

- 36% (4.2M Km2) of the global intact forests [5].
- 36% of the global Key Biodiversity Areas [6].

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[1] RRI, 2020; [2]Wily 2012; [3] Dinnerstein et al.,2020; [4]Garnett et al. 2018;
[5] Fa et al., 2021; [6]WWF et. al., 2021

Fostering stewardship of IPs & LCs through legal recognition of their territories and tenure is increasingly recognized as a strategy to address global climate and biodiversity crisis [8,9,10]

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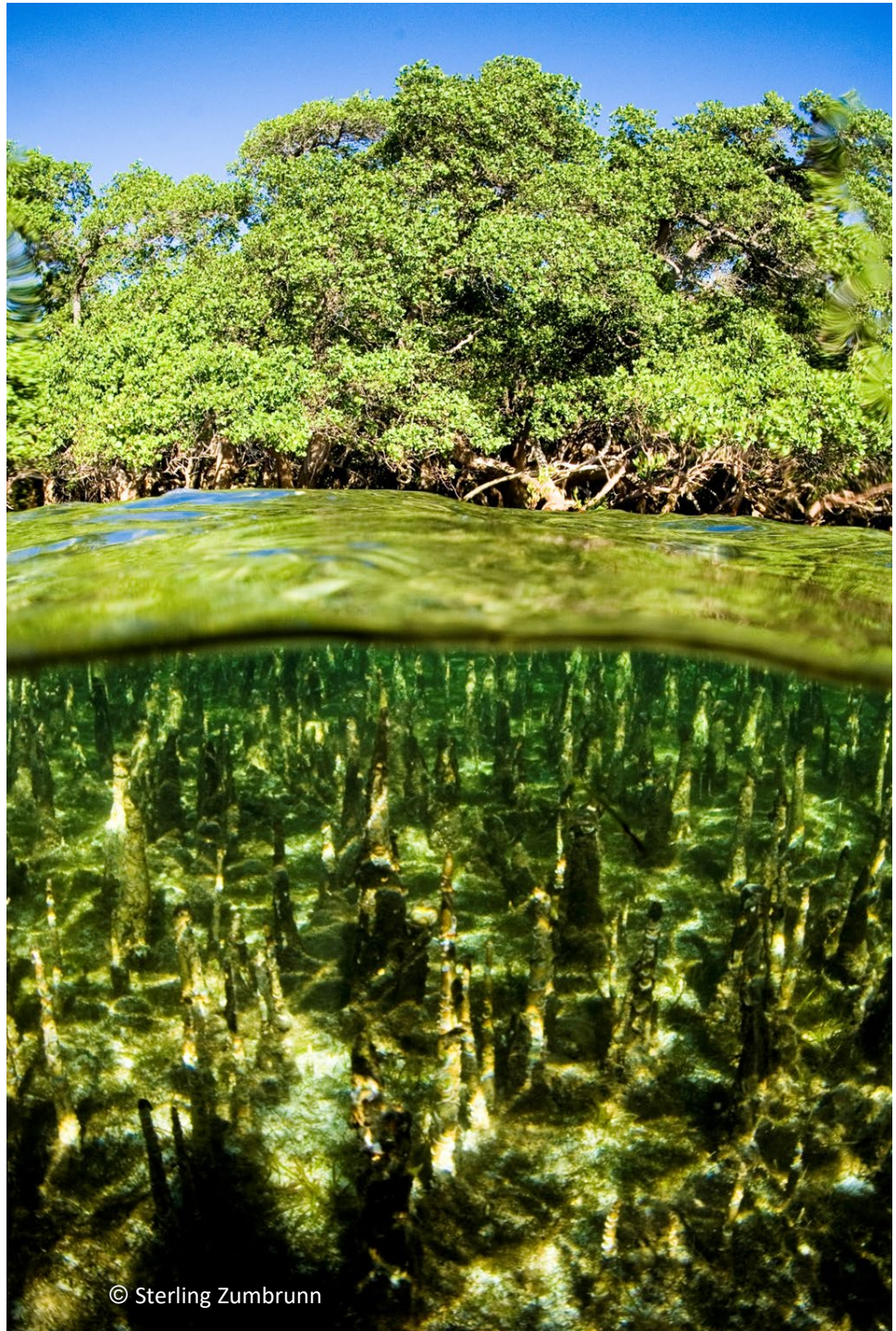
[7] IPBES, 2020; [8]IPCC, 2019; [9] RRI, 2020; [10]GBF, 2022;

TARGET 3 Ensure and enable that by 2030 at least 30 percent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, **recognizing indigenous and traditional territories**, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, **recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories**.

BACKGROUND

To inform environmental actions and channel investments to support IPs & LCs' stewardship requires understanding of environmental conditions and trends within IPs & LCs' territories.

Need foundational data on IPs & LCs lands and water rights



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Building a spatially explicit, and open-access database of:

Legally recognized, collectively governed, and managed terrestrial and marine territories of IPs & LCs, and the associated rights

Rights	Tenure Types			
	Owner	Holder	Manager	User
Access	■	■	■	■
Use	■	■	■	
Management	■	■		
Exclusion	■			
Alienation	■			

Schlager & Ostrom, 1992

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ADDITIONAL TENURE ATTRIBUTES (EXAMPLES)

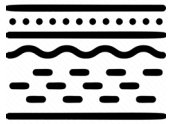
Tenure duration

Rights to due process and compensation

Free, Prior, Informed Consent (FPIC)

Governance type

Carbon rights



Subsoil rights

National legislation, policies, decrees, etc.

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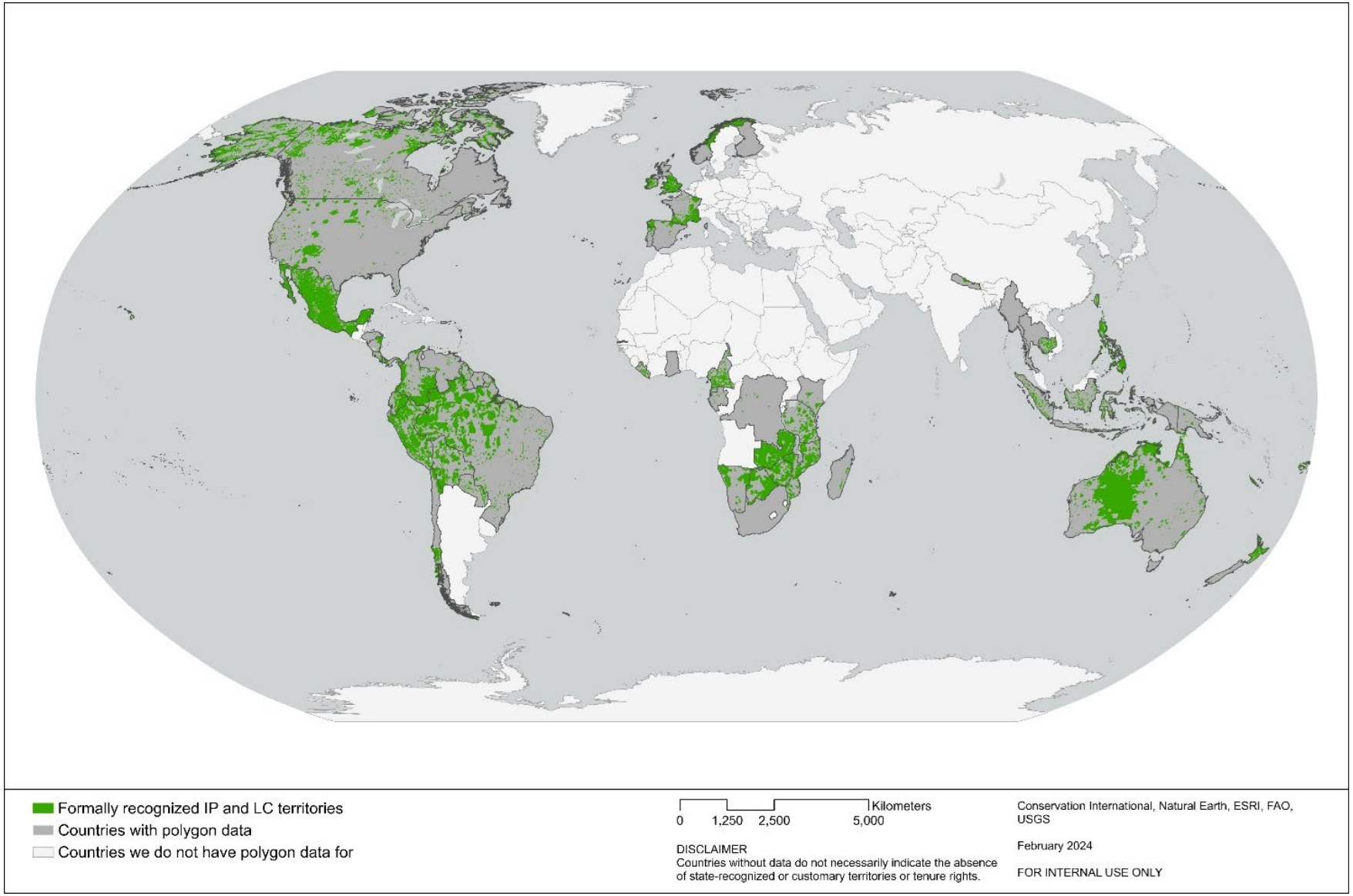
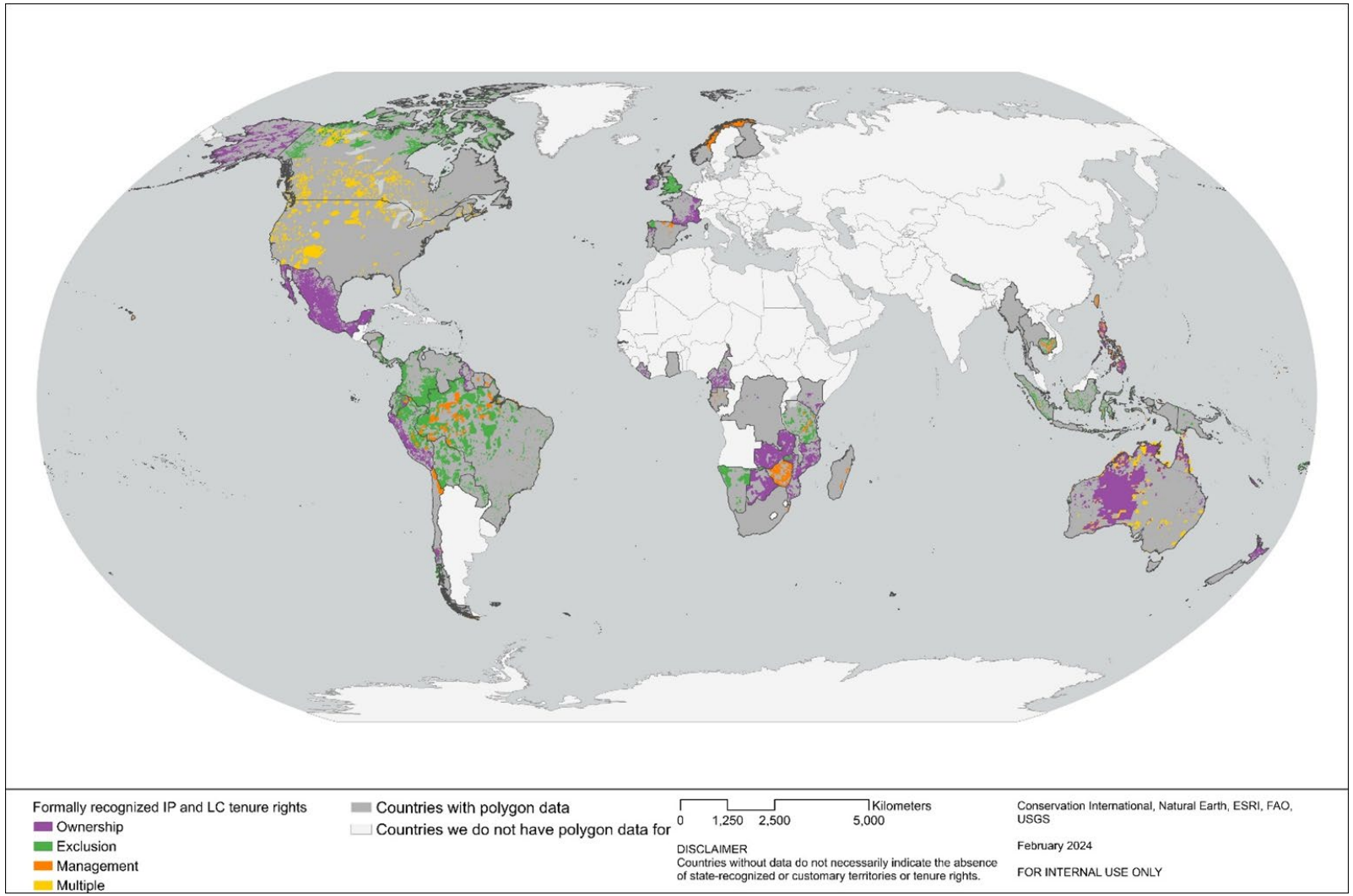
EXTENT AND DIVERSITY

- 57 countries
- Covers an estimated 9.8 million km^2



TENURE LEVEL/ POSITION



Overall greater areas with exclusion and management rights than ownership right

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TRENDS IN ENVIRONMENTAL INDICATORS
IN IPs & LCs LANDS

- How are environmental conditions within recognized lands faring over time?
  OR
- Do environmental status and trends mirror those of the jurisdiction within which they occur?

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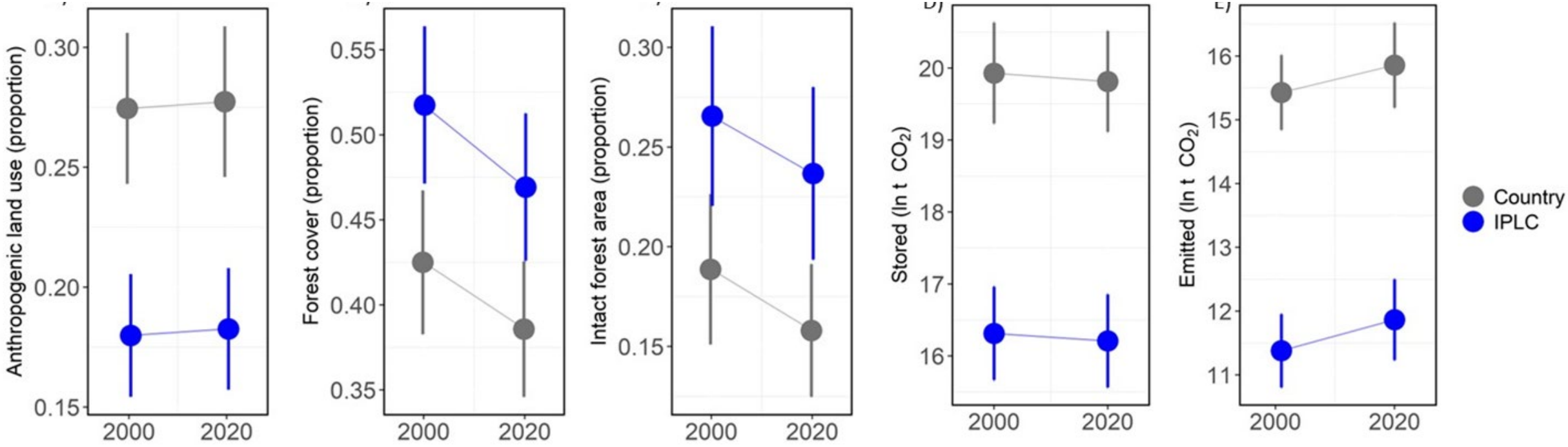
Environmental trends in recognized IPs & LCs territories largely mirror broader national trends though these territories typically have greater ecological integrity



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SUMMARY

- Recognized IPs & LCs territories are under diverse tenure systems and vary in levels of rights
- Recognized IPs & LCs territories are not immune from the broader forces of anthropogenic change
- Tenure recognition is vital but alone is not sufficient
- Synergistic actions needed to strengthen recognized tenure
  - Direct access to finance
  - Capacity development /enhancement

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Data Caveat

- Recognized only- tells part of the story of IP & LC governance /misses other data
- Varying data sources come with their own limitations
- Rights on the paper may not be implemented or exercised in practice
- Tenure based on national and subnational level information rather than the site
- Overlaps between various tenure systems
- Bundle of rights- only one way categorize data

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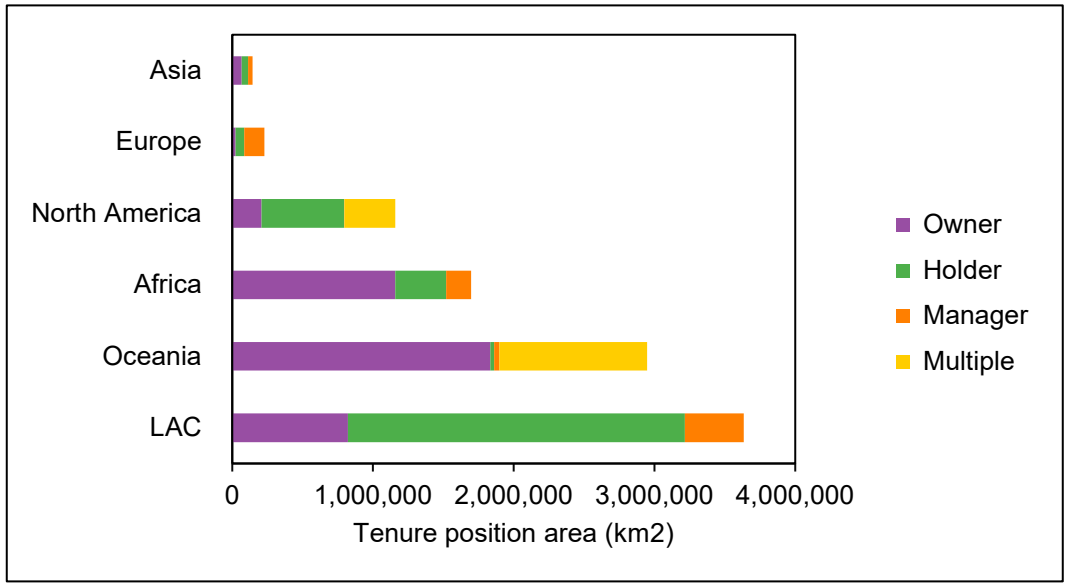
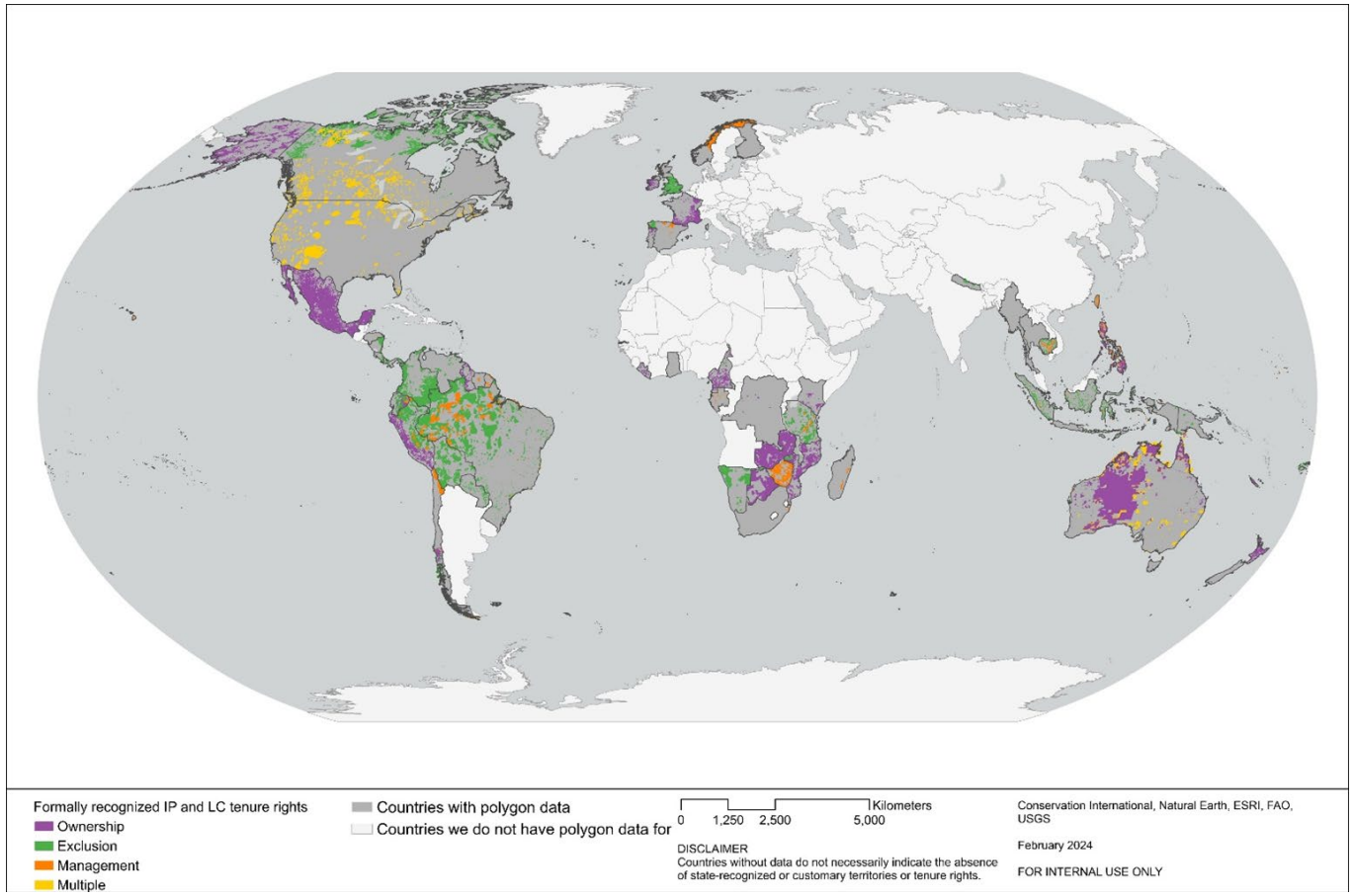
TENURE LEVEL/ POSITION





Tenure position	Area (km2)
Owner	4. 1 M
Holder	3.5 M
Manager	811,808.9
Multiple	1.4 M

Overall greater areas with exclusion and management rights than ownership right

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https://app.powerbi.com/links/QBgeBxedNx?ctid=c4de61a9-99b4-4c6a-962e-bd856602e8be&pbi_source=linkShare

Tenure recognition and forest cover change in Central and South America

A. Justin Nowakowski

Smithsonian

Conservation International

Tenure recognition and forest cover change in Central and South America

Collaborators:
Sushma Shrestha, Erik Olsson,
Jonathan Drescher-Lehman, Ruchi Patel

Smithsonian

PennState

Increasing recognition of key role of IPs & LCs in conservation

- International frameworks (e.g., GBF) highlight the need to strengthen the role of IPs & LCs in policy formulation and stewardship through securing and respecting tenure rights
- IPs & LCs lands overlap extensively with the existing protected areas network (~40%) with varying legal status and governance structures for these areas
- IPs & LCs manage and have rights to >25% of terrestrial areas, including intact forest landscapes that are critical for biodiversity conservation and carbon storage

Growing evidence base in Latin America and beyond

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- **Counterfactual studies demonstrate that IPs lands in Brazil, Panama, and Peru reduced deforestation rates compared to unprotected lands** (Alejo et al 2022, Pacheco and Meyers 2022, Schleicher et al. 2017, Soares-Filho et al. 2010, Vergara-Asenjo and Potvin 2013)

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- **Titling or granting of property rights reduced deforestation rates on IPs lands in the Atlantic Forest and Amazon region of Brazil, and Peru** (Baragwanatha and Bayi 2020, Benzeev et al. 2022, Blackman et al. 2017, but see BenYishay et al. 2017, Buntaine et al. 2015)

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- Most counterfactual research in Latin America focuses on a single country, and rights are often considered uniform

Objectives of ongoing study

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- Assess trends in forest loss and associated CO_2 emissions in IPs & LCs lands with tenure recognition in 13 Latin American countries
  - Mean overall impact
  - Spatial variation in forest loss (spillover and country-level variation)
  - Determine whether forest loss varies with different bundles of rights – owner, holder, and manager

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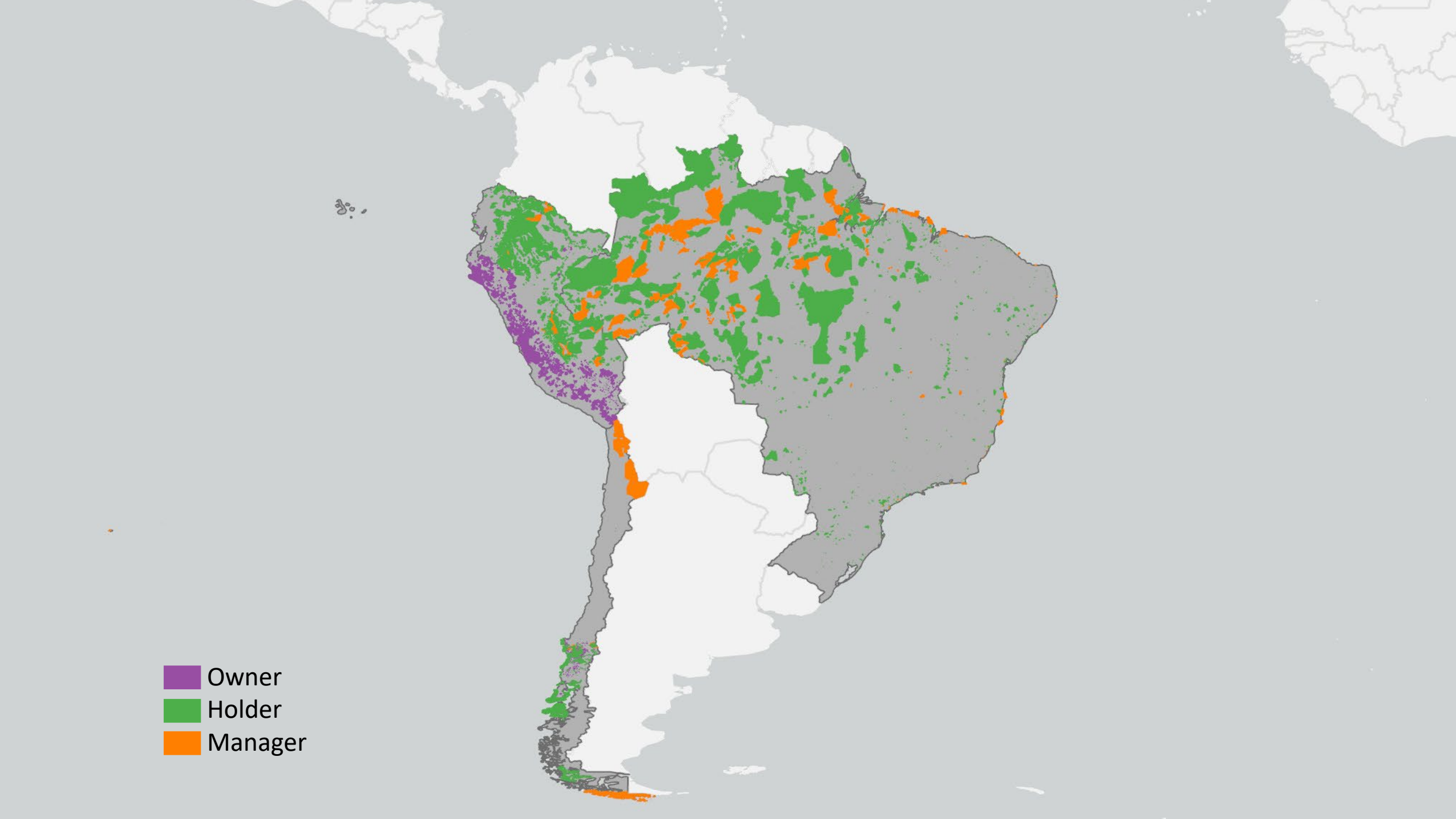
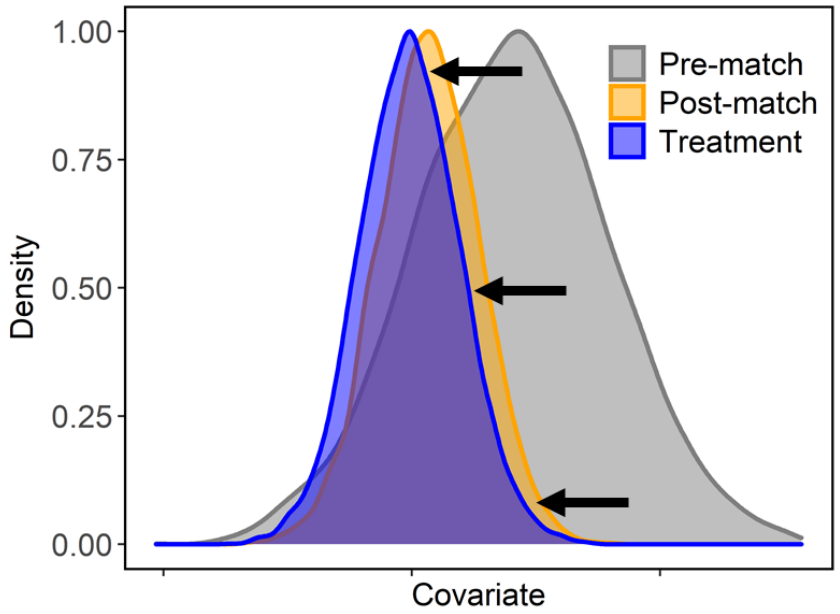

Owner
Holder
Manager

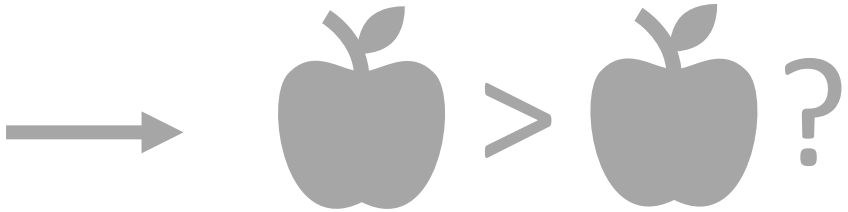
Approach in a nutshell

1) Sample grid cells inside and outside (potential controls) of IPs & LCs lands
2) Measure forest cover and potentially confounding spatial covariates
3) Conduct statistical matching
4) Assess differences with Bayesian hierarchical models

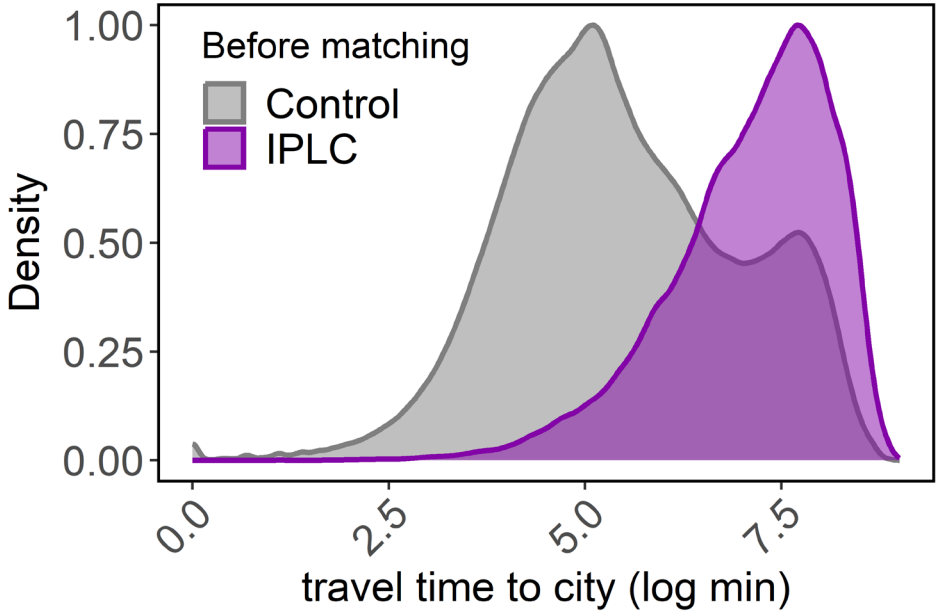
Approach in a nutshell

Goal of matching: reduce bias in estimates by improving balance in the *distributions* of potentially confounding variables between samples inside and outside IPs & LCs lands





Unmatched cells



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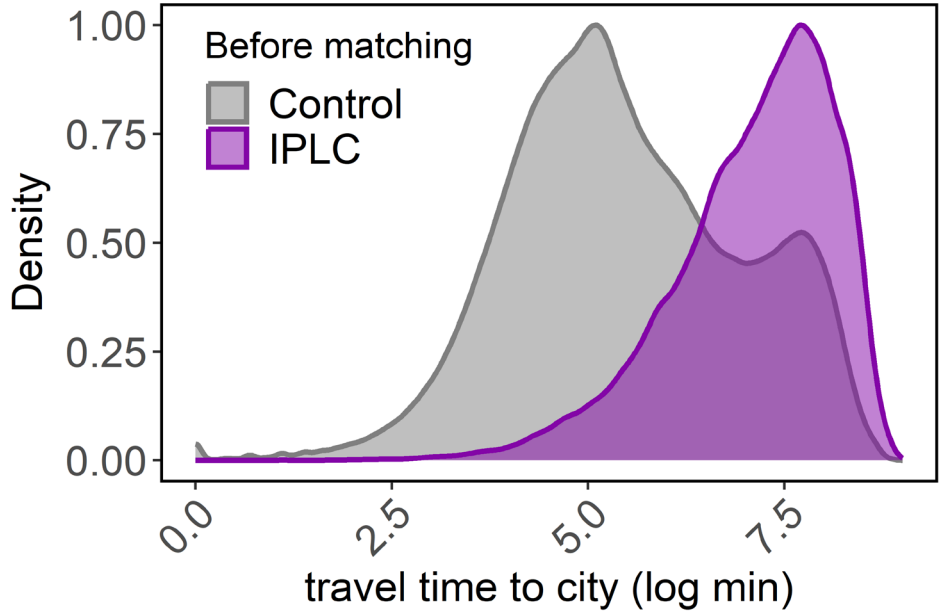
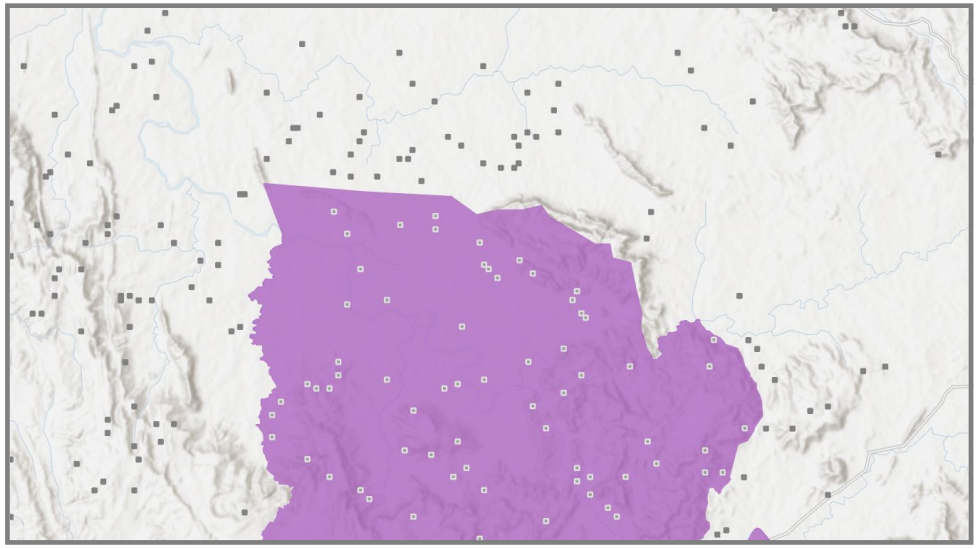
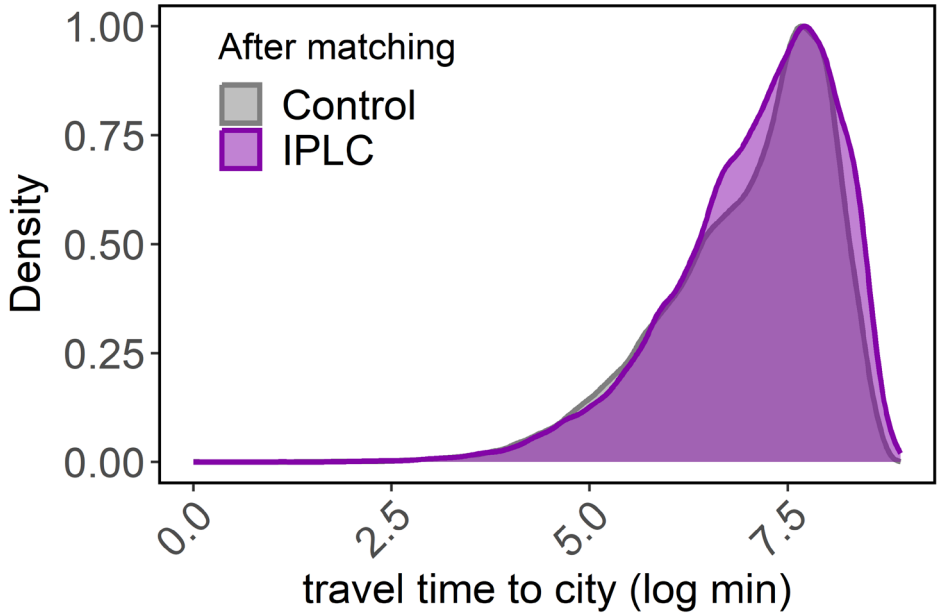
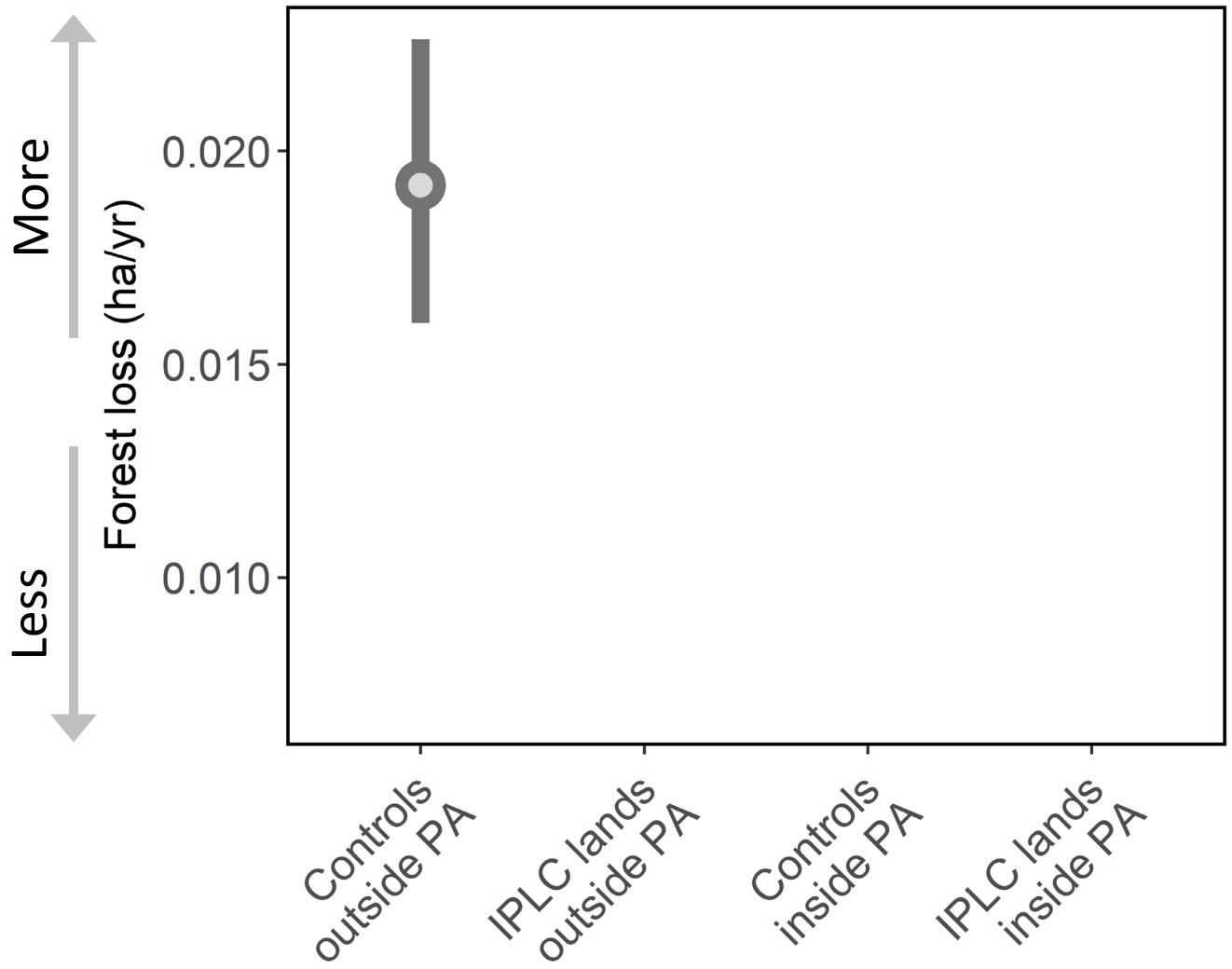


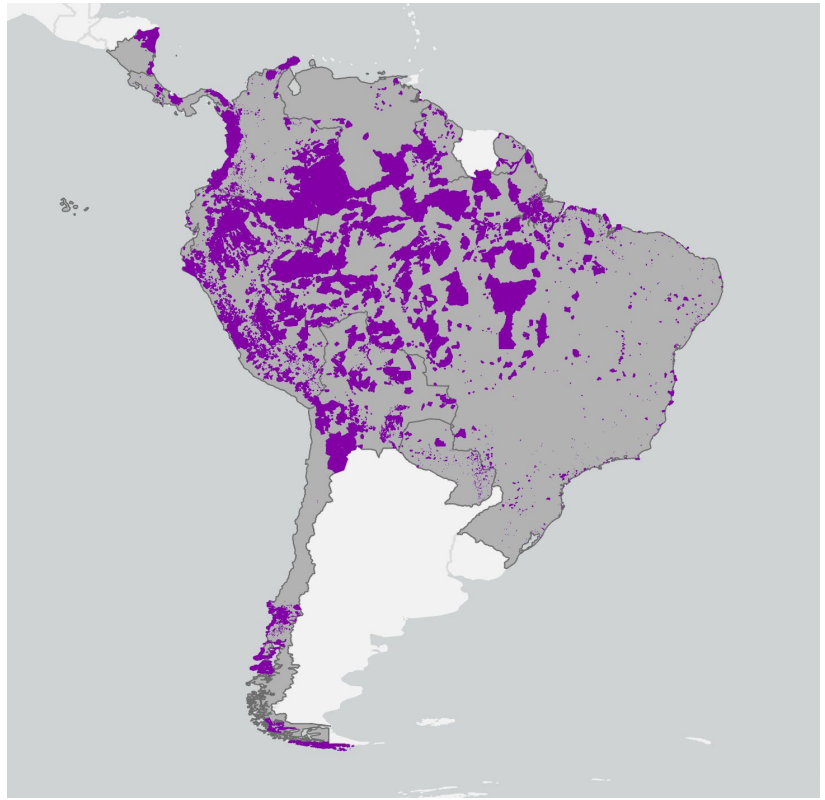
Matched cells





Preliminary results





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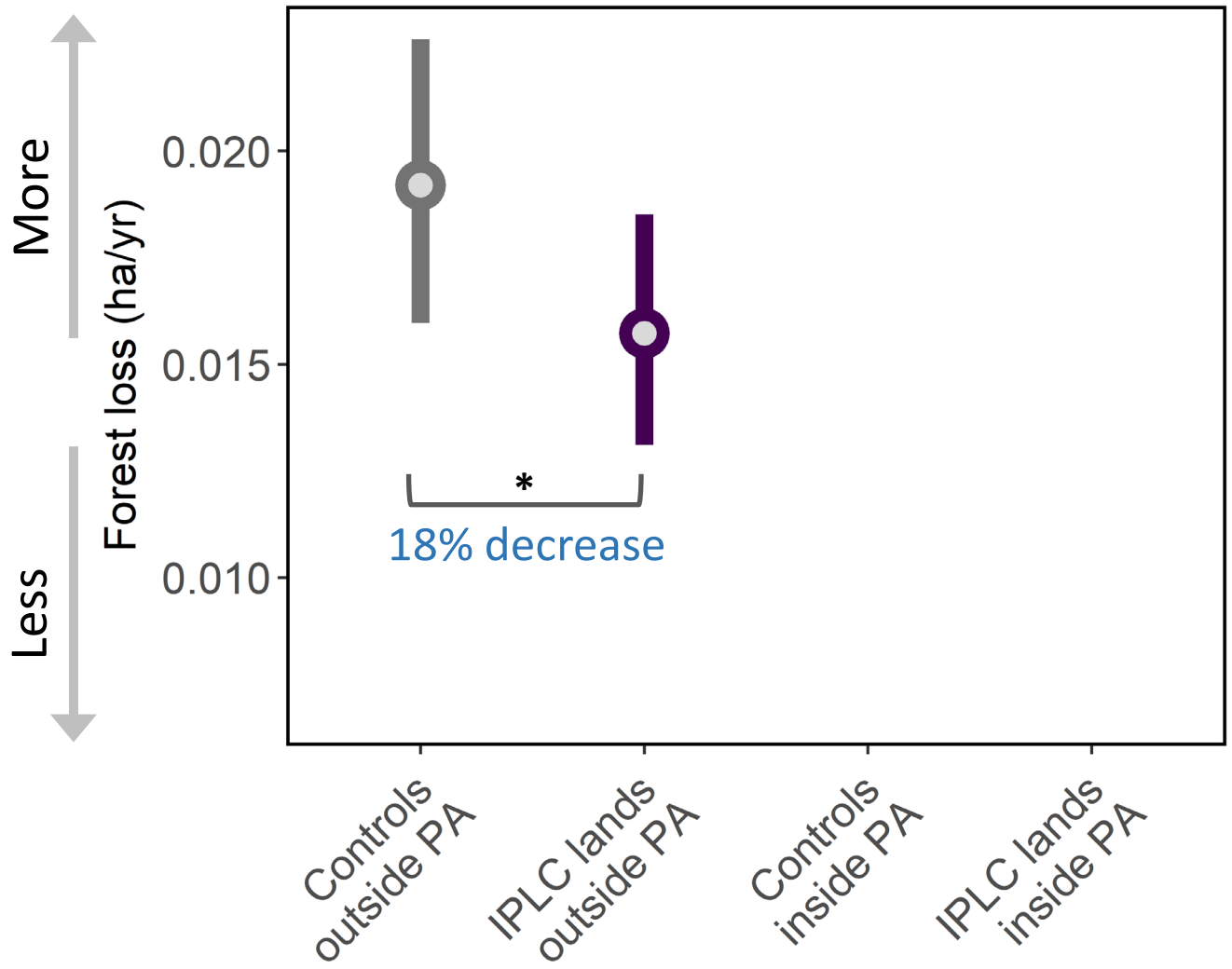

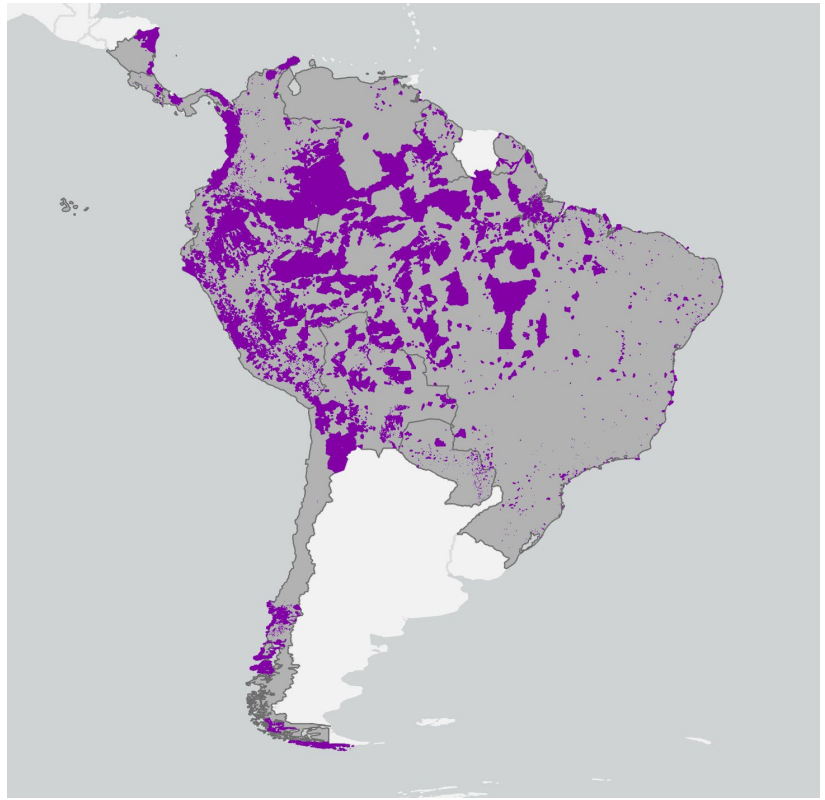

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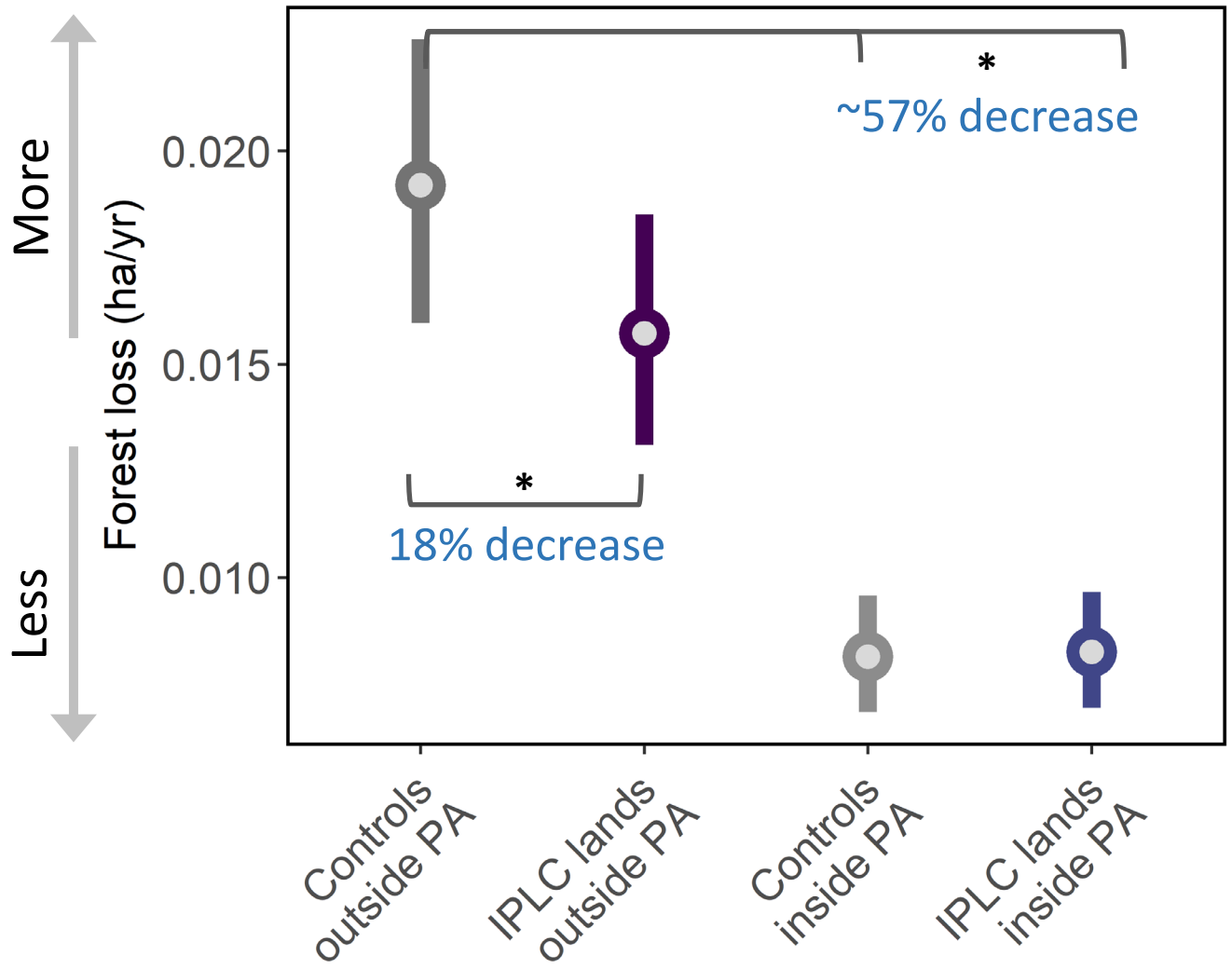

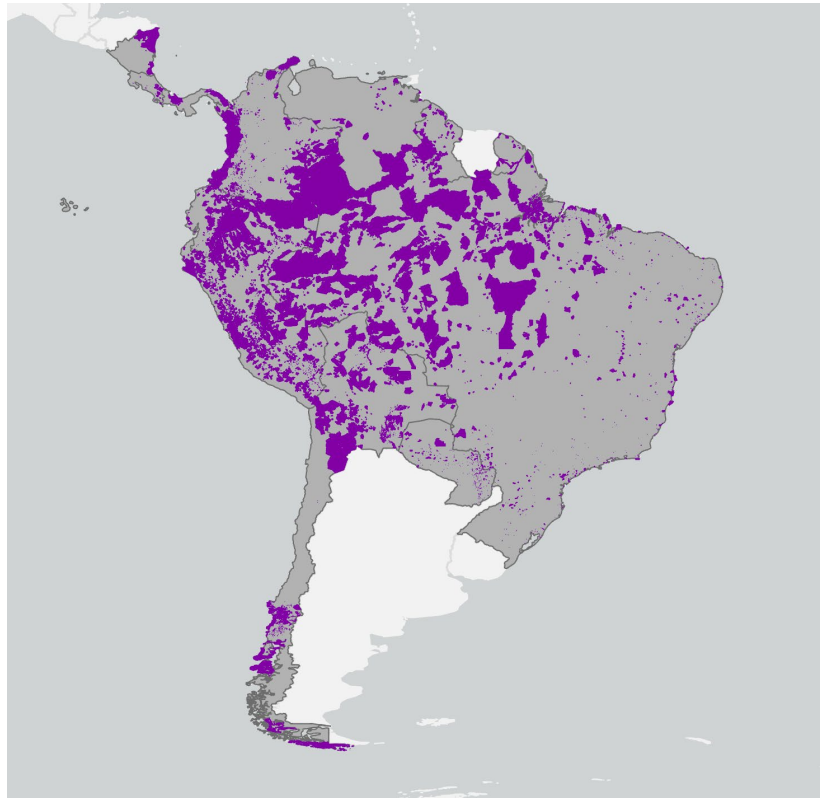

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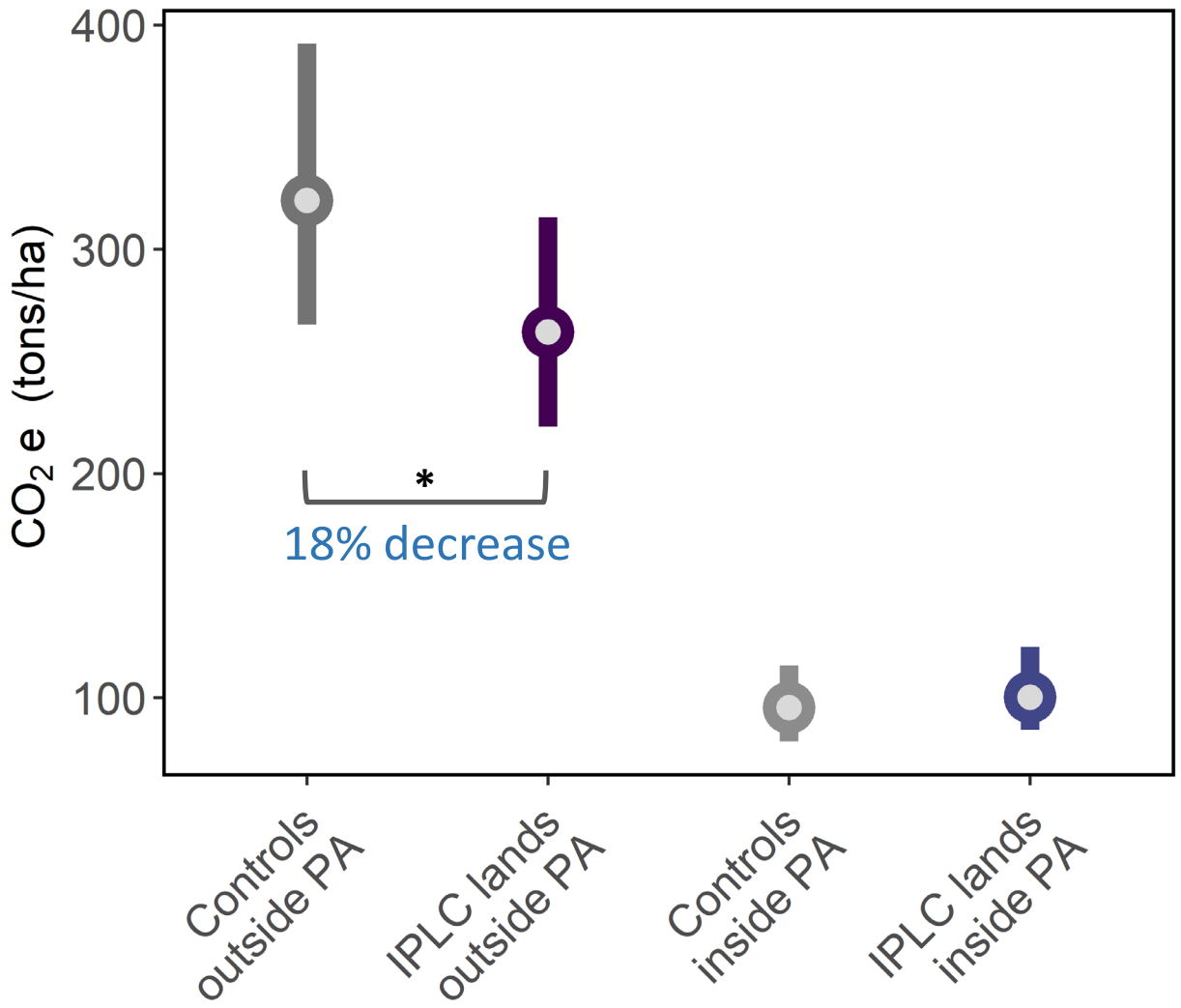

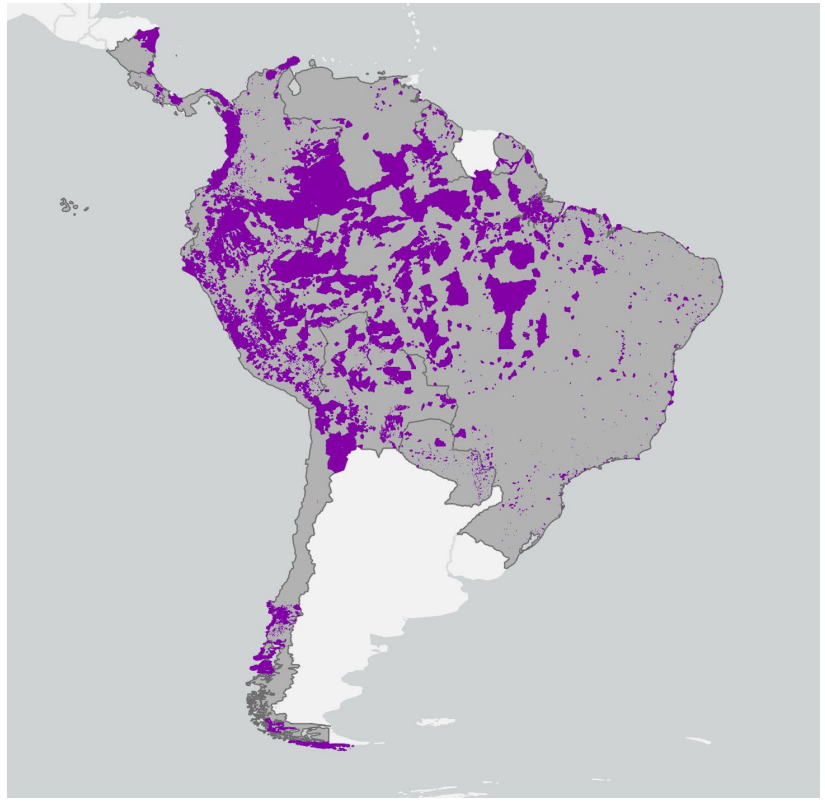

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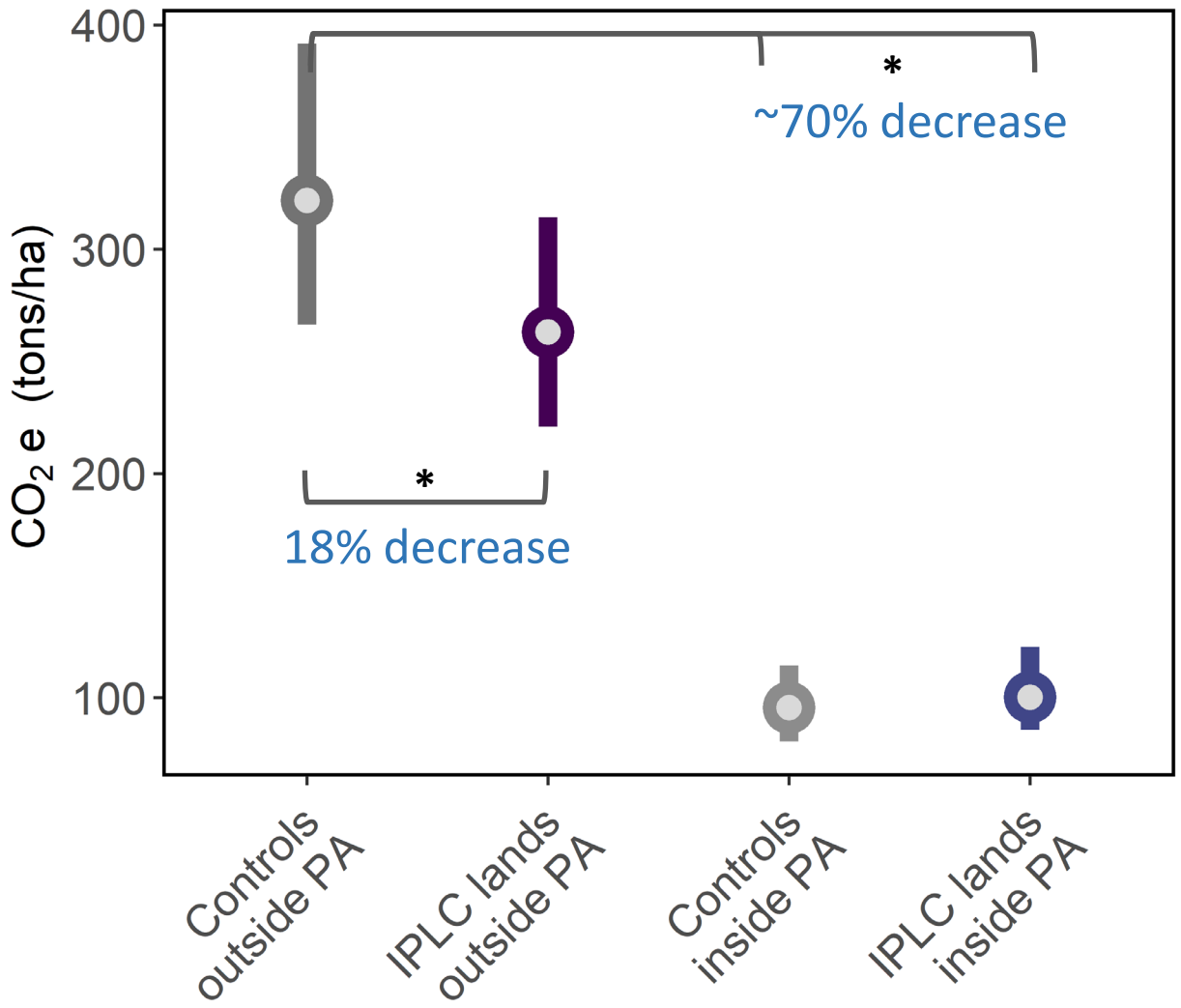

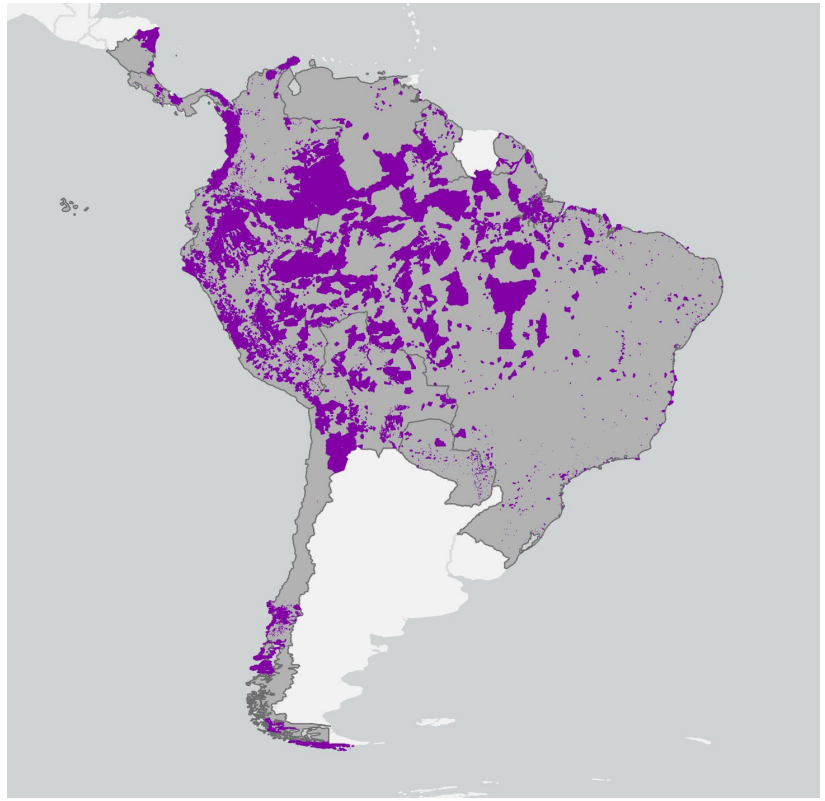

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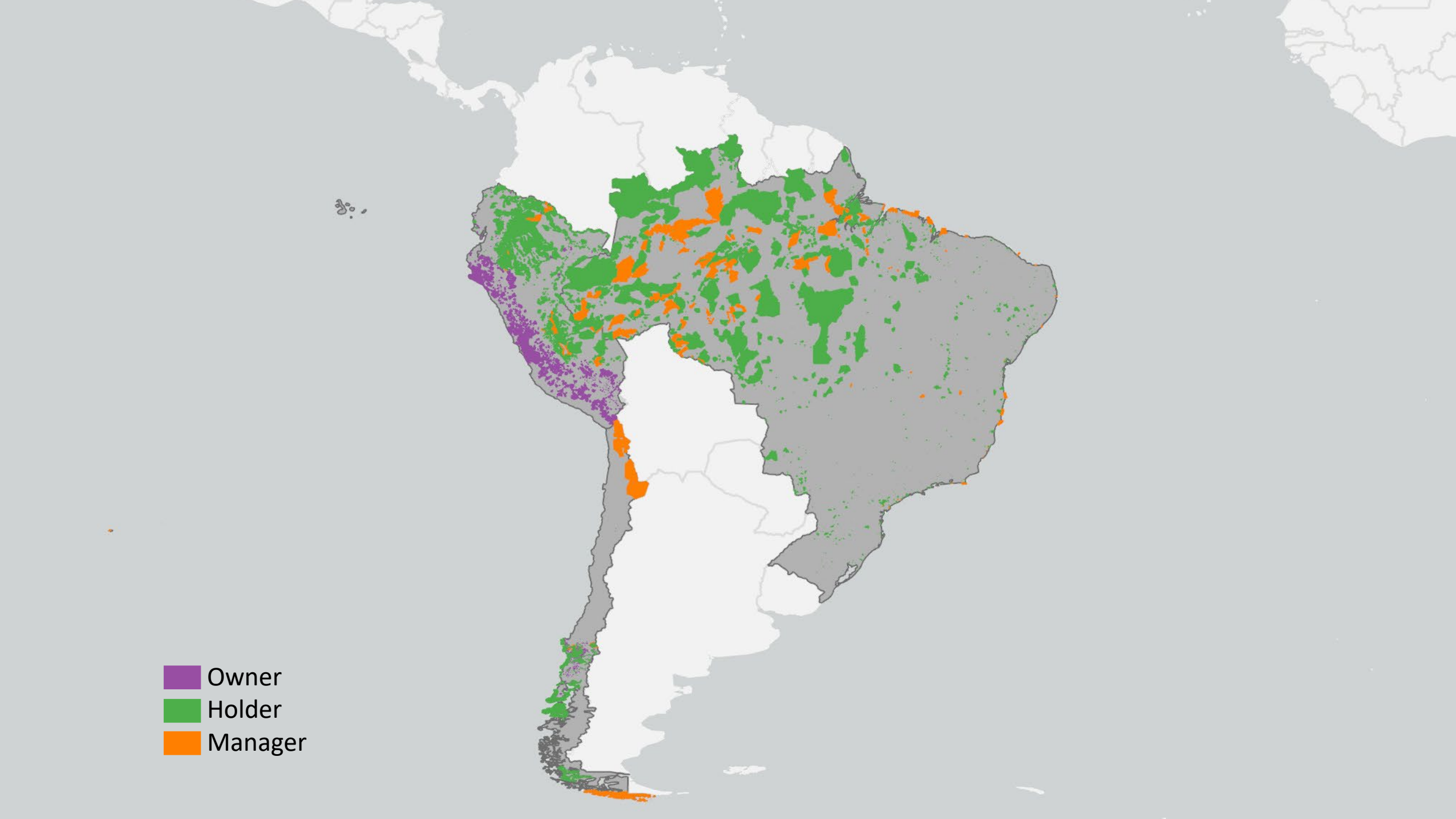
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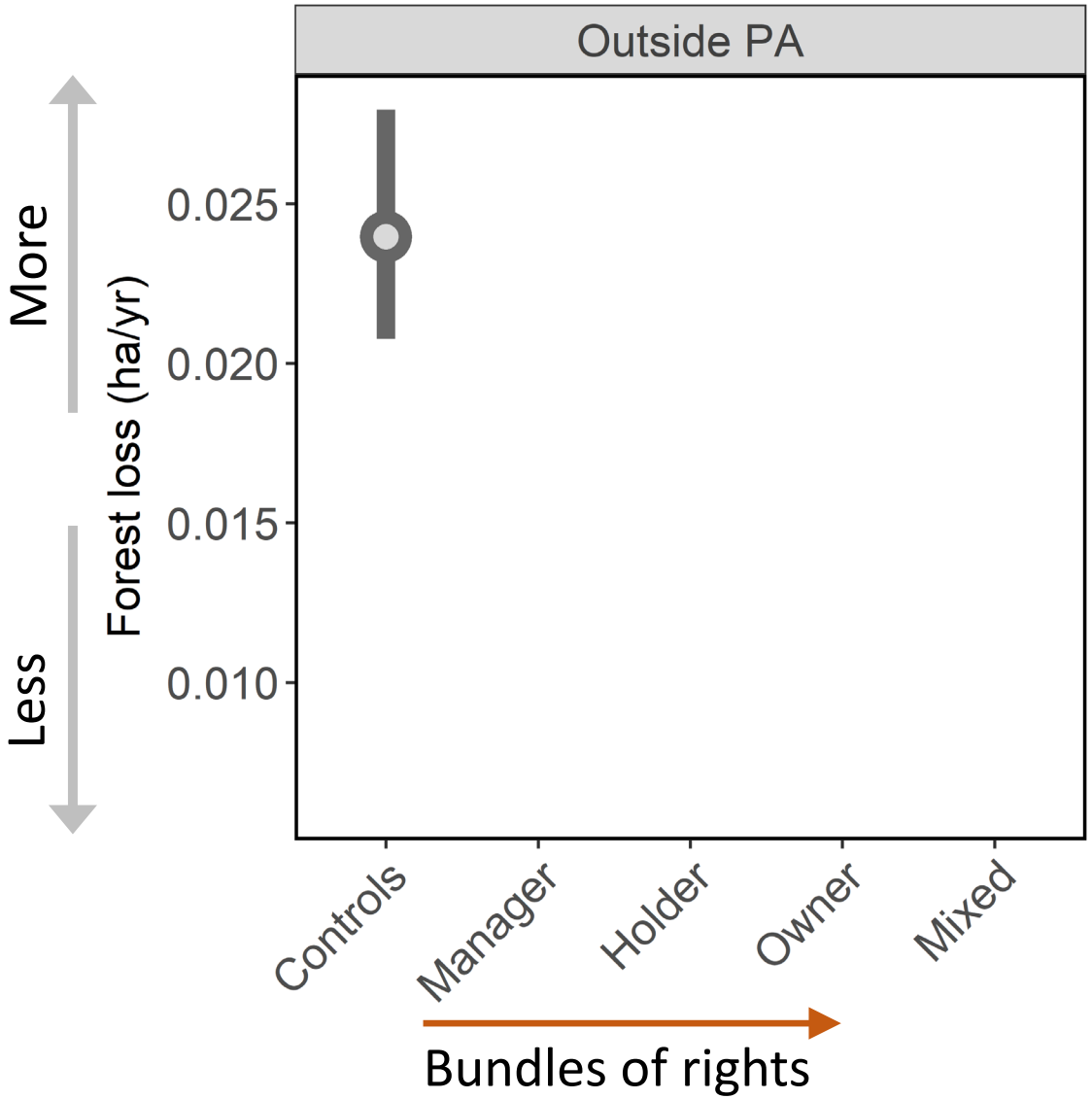

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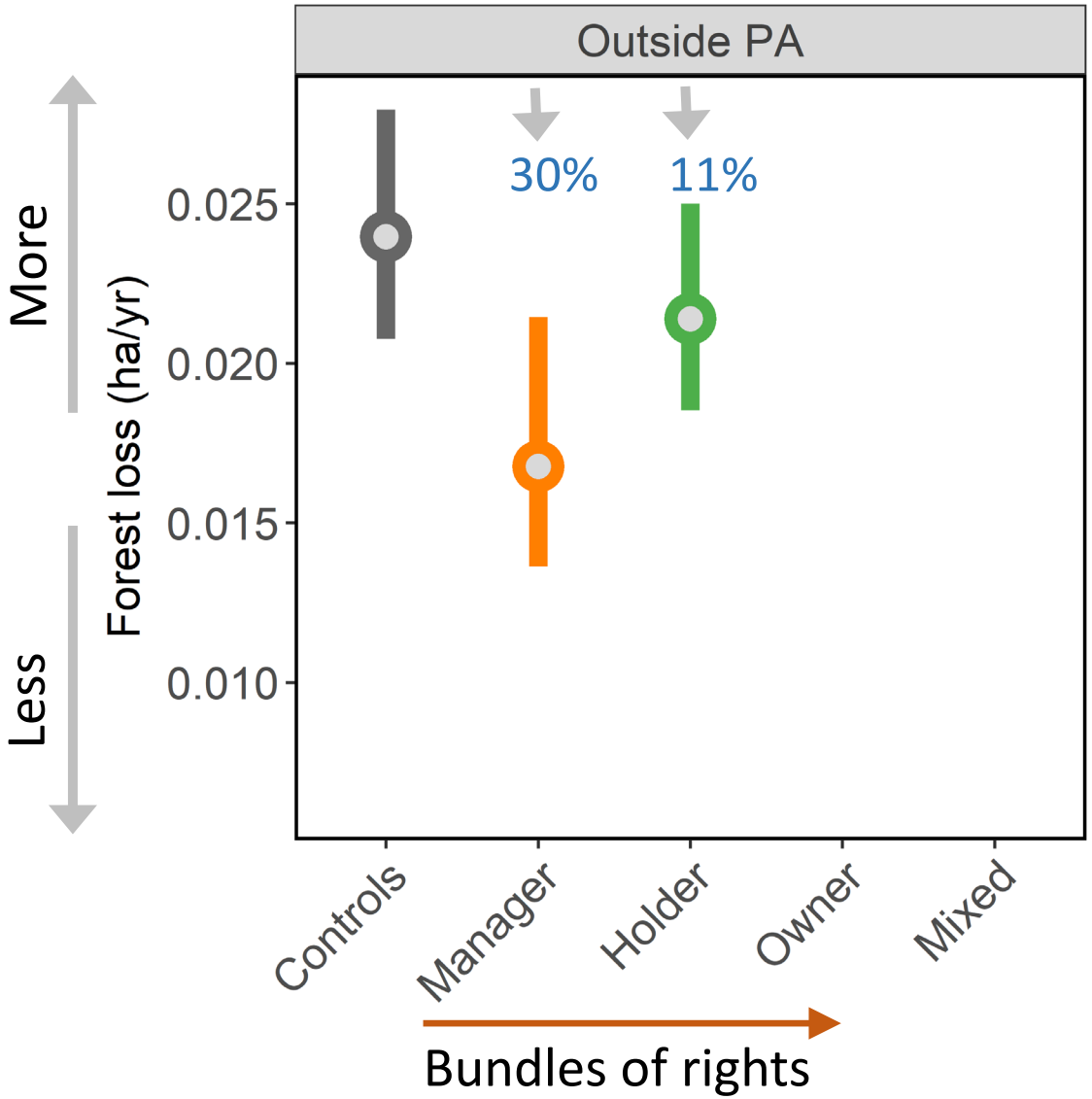

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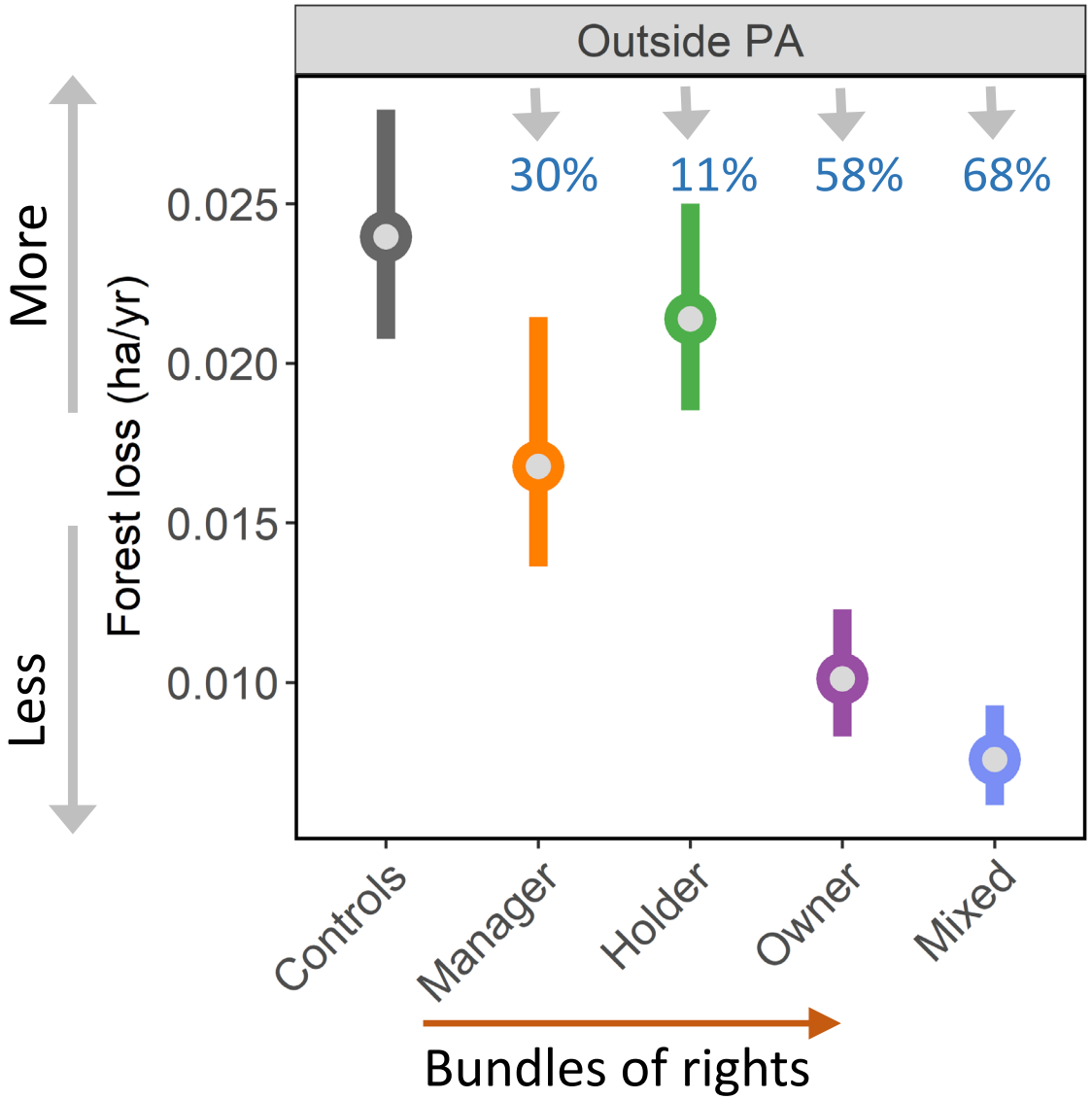

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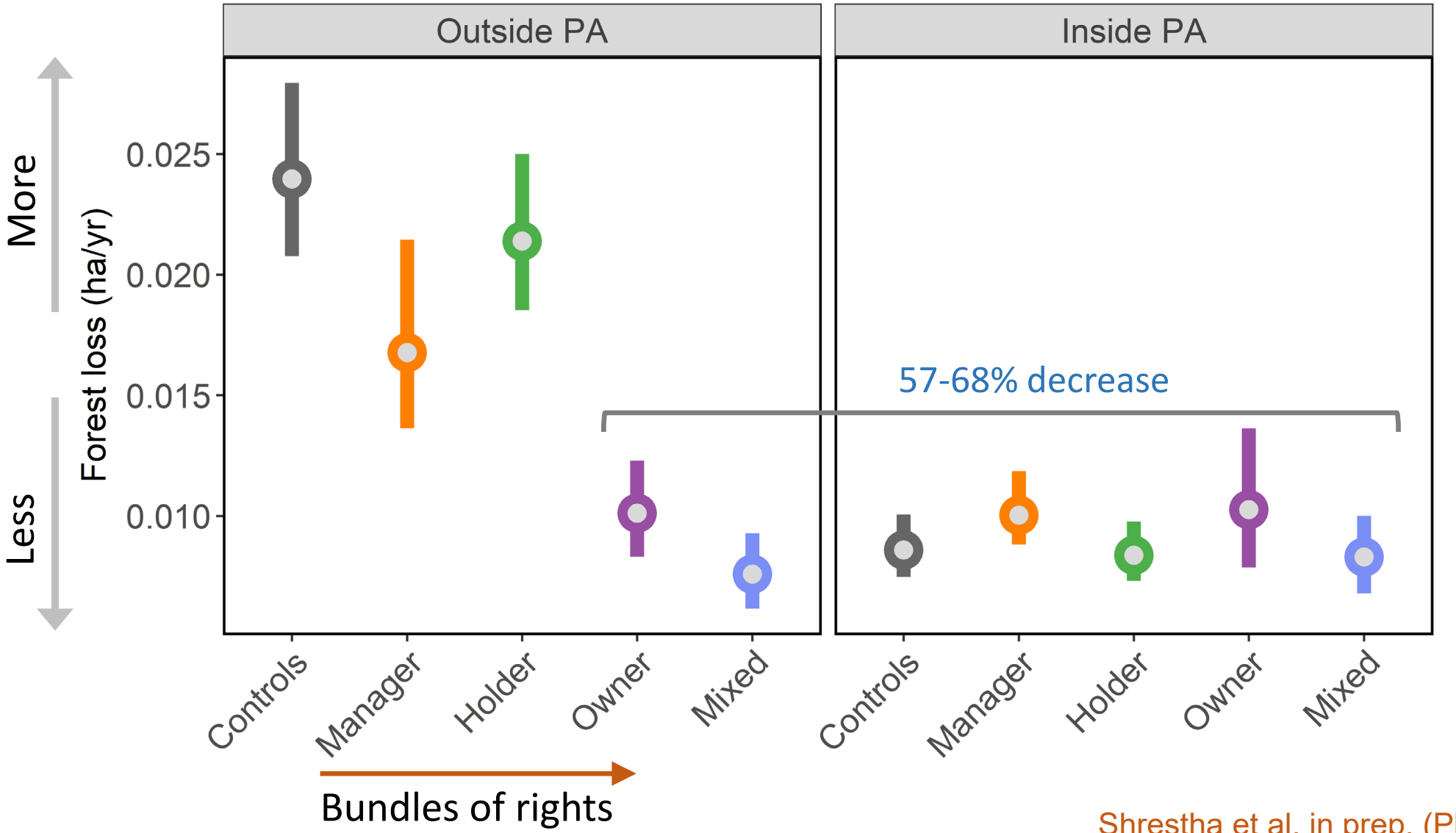

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Some caveats

- Large-scale assessments provide 20,000 ft view, allows generalizability focused on ecological outcomes

- Complementary to place-based approaches that provide context around social outcomes and mechanisms underlying causality

Next steps

- Drivers of spatial variation in trends within (e.g., spillover) and among (e.g., national governance) countries

- Assess impacts in relation to time since legal tenure recognition

Conclusions

- This work adds to growing evidence that stewardship by IPs & LCs is broadly effective in reducing forest loss across scales

- Tenure recognition is a key pathway for advancing human rights, conservation, and climate goals – enabling condition for other interventions (e.g., PES)

Thank you

Conservation International

WORLD BANK LAND CONFERENCE

Cost-effective climate mitigation via conservation incentives targeting poverty: Bolsa Verde's impact in Brazilian Amazonia agrarian reform settlements

Sebastien Costedoat, Alex Pfaff,

Bruno Coutinho, and Michael Mascia

Strengthening Land Tenure and Community-Driven Conservation

World Bank Land Conference 2024

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Outline

- Case study: Bolsa Verde program in Brazilian Agrarian Reform Settlements (2011-2018)
- Evaluating the social impacts of Bolsa Verde
- Evaluating the impact of Bolsa Verde on tree cover and CO2 emissions

Agrarian Reform Settlements and the evolving deforestation trends in the Brazilian Amazon

- Settlements in Amazonia were established since the 1970s to allocate land to landless people
- They consist of a set of agricultural land units that are destined for the families of rural producers without economic conditions to acquire a rural property, who must reside in the settlement projects and develop agricultural activities
- Most settlers lacked farming skills and had no access to credit, markets, and technical support: strong increase in deforestation in those areas
- Newer settlements have to follow in principle stricter rules regarding the preservation of forests, but the objectives of most settlements remain aligned only with social and economic policies
- **Between a third and a fourth of deforestation in Amazonia occurs in Agrarian Reform Settlements**

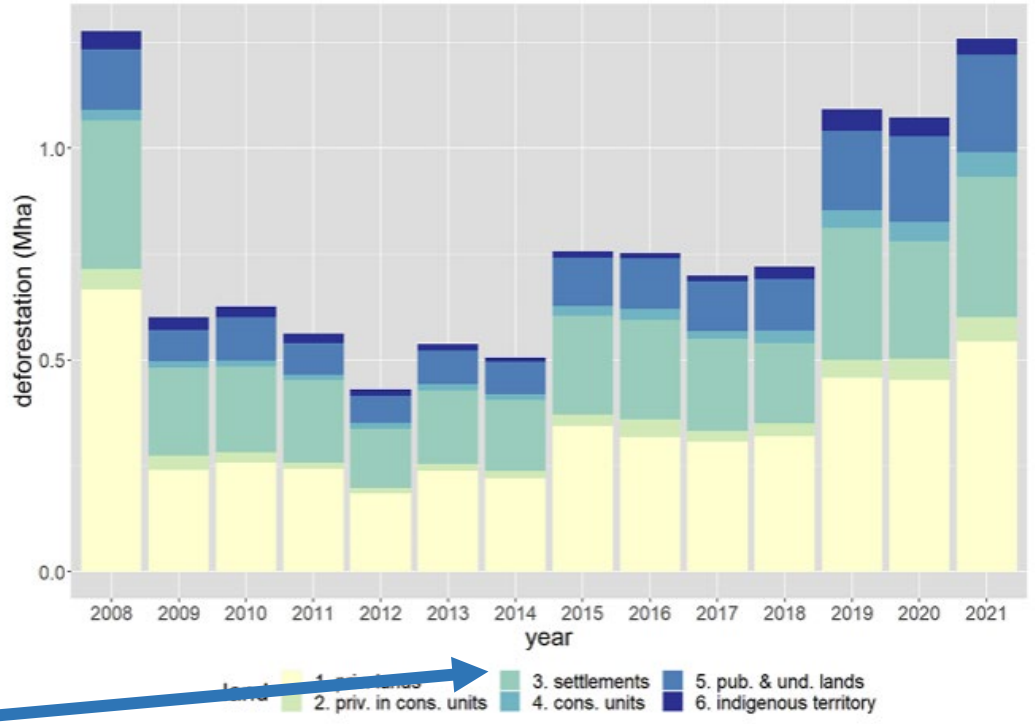


Figure 5. Deforestation area by land tenure type (2008–2021): (1) Private lands; (2) Private lands inside conservation units; (3) Settlements; (4) Conservation units; (5) Public and undesignated lands; (6) Indigenous territories.

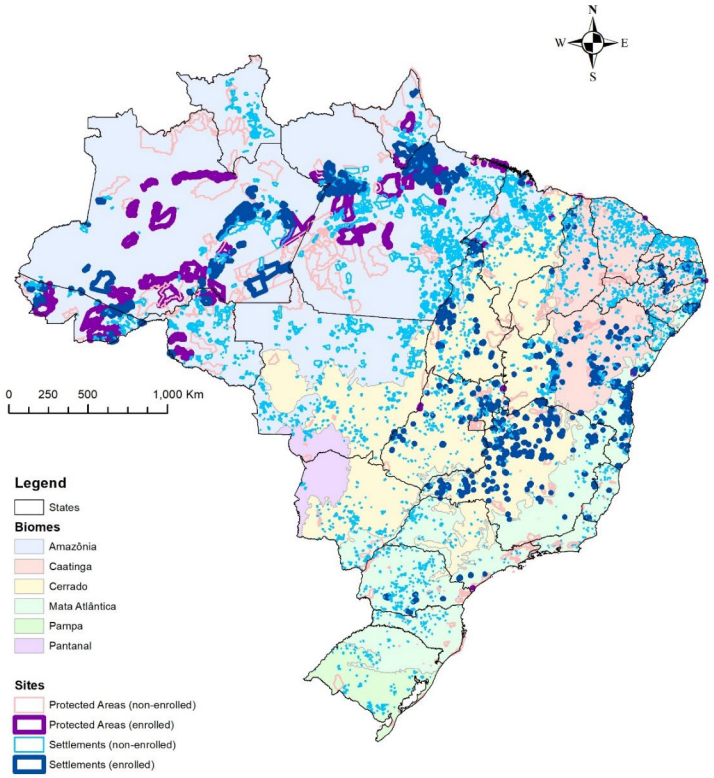
Gilberto Camara et al 2023 Environ. Res. Lett. 18 065005

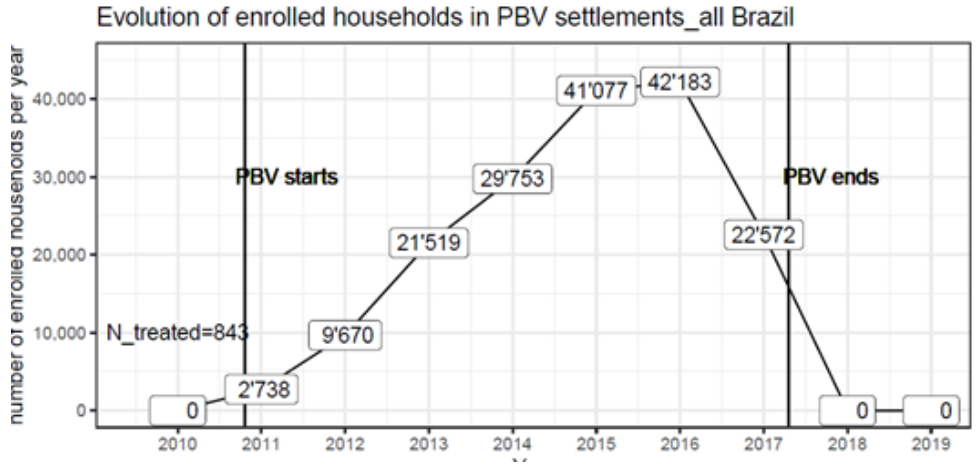
The *Bolsa Verde* ("Green Grant") Program 2011-2018

- Emerged from the governmental poverty alleviation agenda (*Brasil Sem Miséria*), as an extension of *Bolsa Familia* conditional cash transfers
- Targeted households in extreme poverty already receiving *Bolsa Familia* AND located in conservation sites
  - Mixed-used Protected areas
  - **Agrarian Reform Settlements**
  - Other traditional communities living on federal lands
- Operated as a conditional cash transfer capacity building
  - quaterly payments in exchange for better natural resources management (~USD 160 quarterly for 2 years)
  - Trainings on environmental rules, forest management plans, and new production techniques, income diversification…

The *Bolsa Verde* ("Green Grant") Program v1 2011-2018

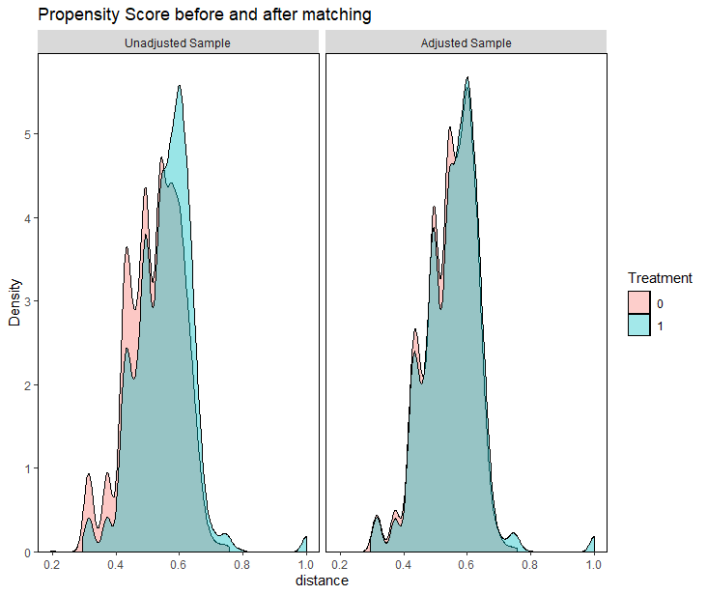
- The program has been piloted in Amazonia and scaled to most biomes of Brazil after 2012
- The Bolsa Verde program v1 ended in early 2018
- *Since 2023:Ongoing efforts to implement a new Bolsa Verde v2*



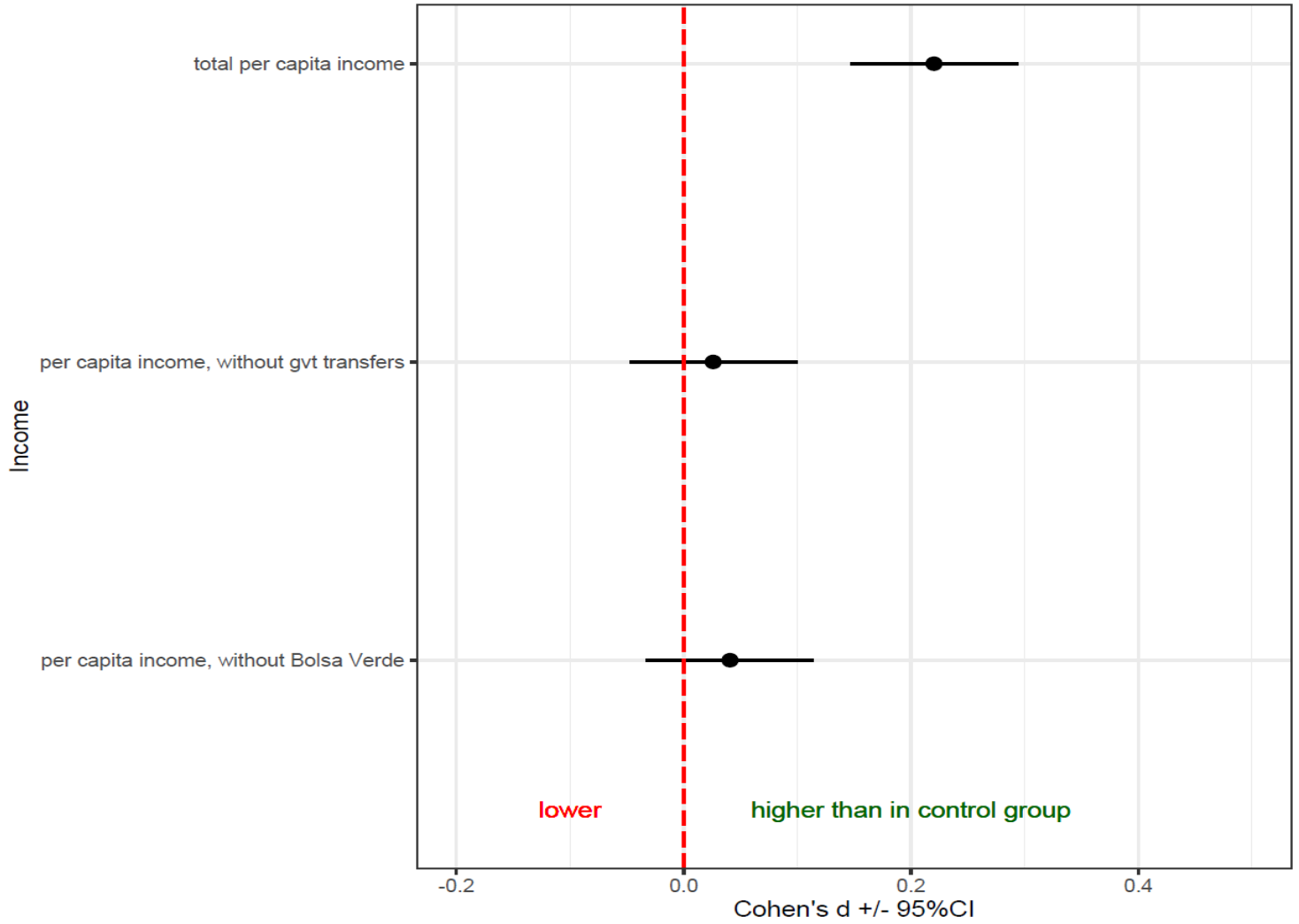


Evaluating the social impacts of Bolsa Verde

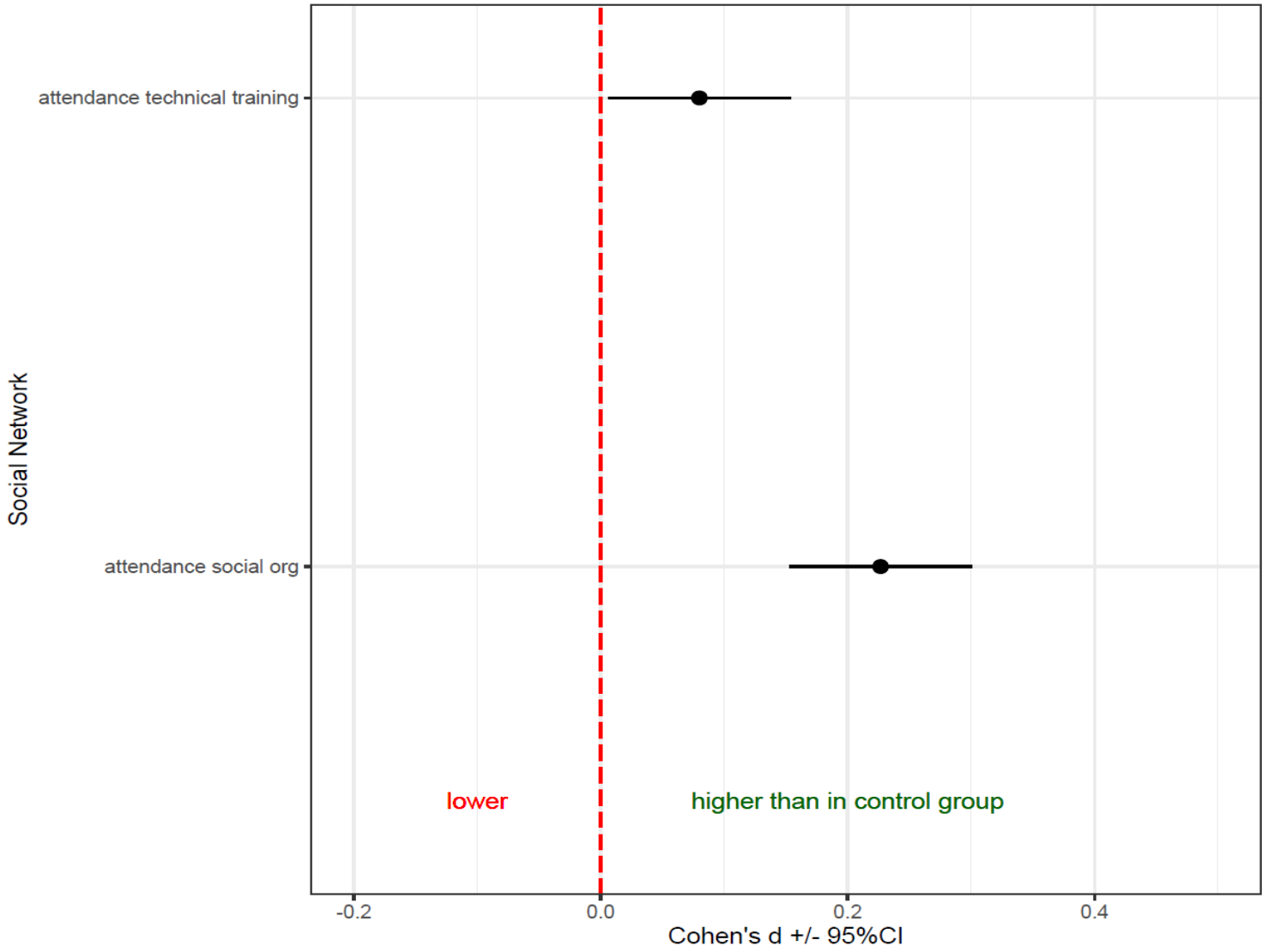
- Data source: 3 rounds of surveys performed by CI Brazil (2014-2016) with enrolled and non-enrolled individuals living on enrolled sites
- We restrict the non-enrolled sample to
  - only individuals living in participating sites AND
  - potentially eligible to Bolsa Verde (already receiving other government transfers)
- **Propensity Score Model**: Estimating the probability of receivin Bolsa Verde based on observed characteristics:
  - Household size
  - plot size
  - agricultural production
  - access to market
  - same type of land governance
  - access to market
  - access to electricity
  - individual vs collective house



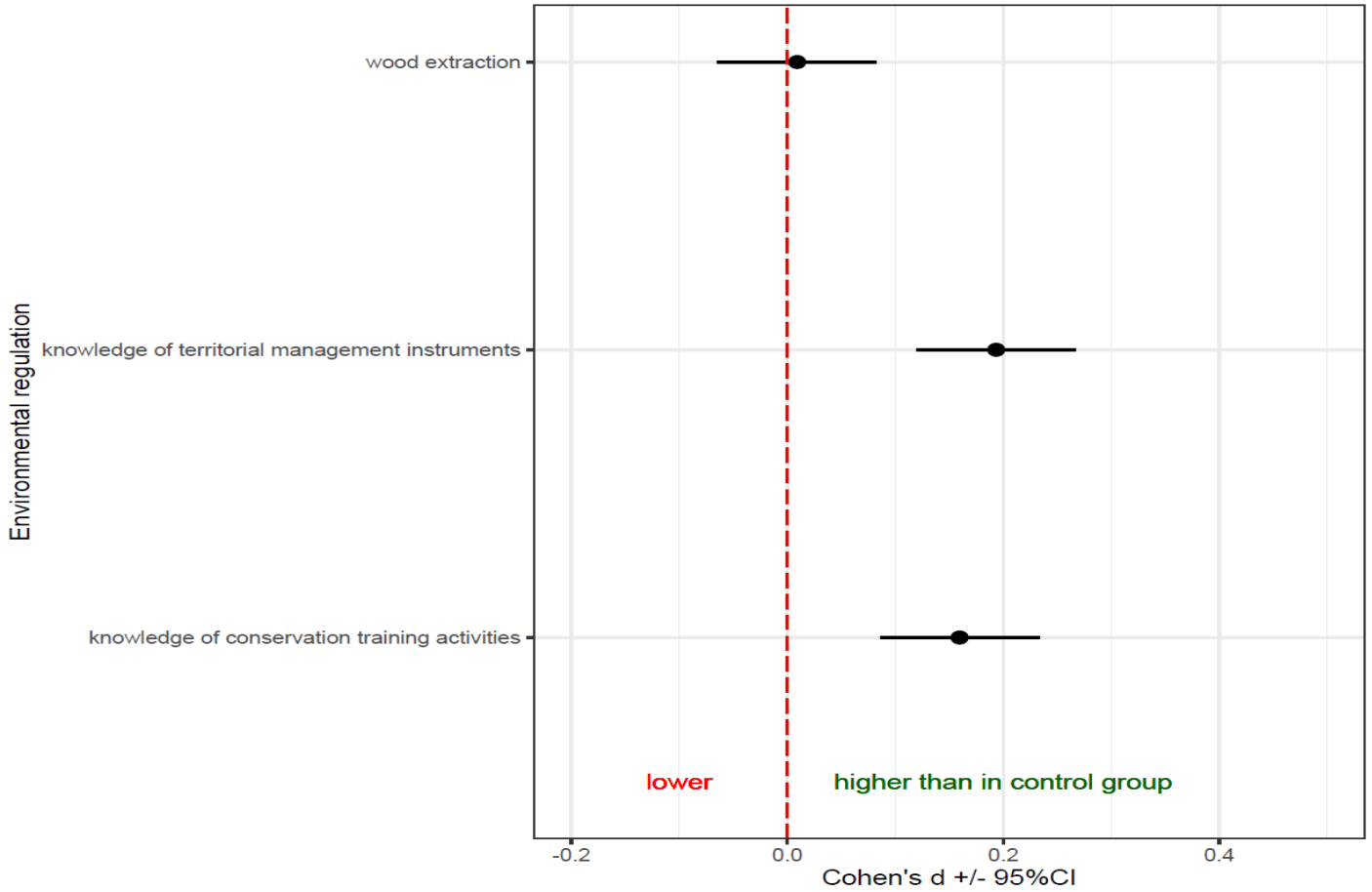
Result 1: the program has an impact on income (but not a multiplier effect)



Result 2: the program has an impact on access to training and social networks

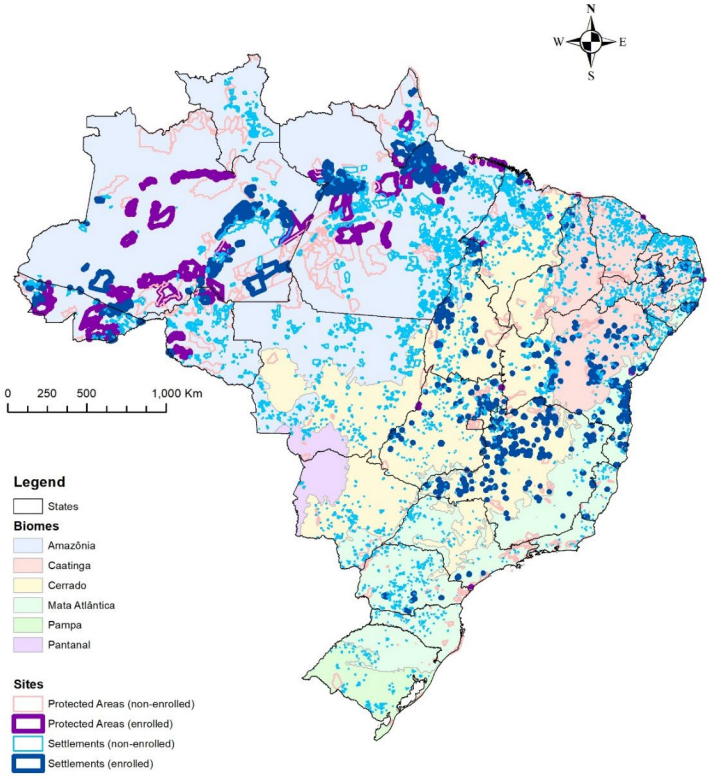


Result 3: No impact on wood extraction, despite better awareness of regulations



Link between social and environmental outcomes

- PBV has potentially an impact on tree cover through a better understanding of and compliance with environmental regulation, in exchange for payments to eligible households
- We then rely on the assumption that incentives and training affects opportunity costs and the social norms preventing illegal deforestation
- It enables the identification of treatment effect at site level by comparing similar enrolled and never enrolled sites



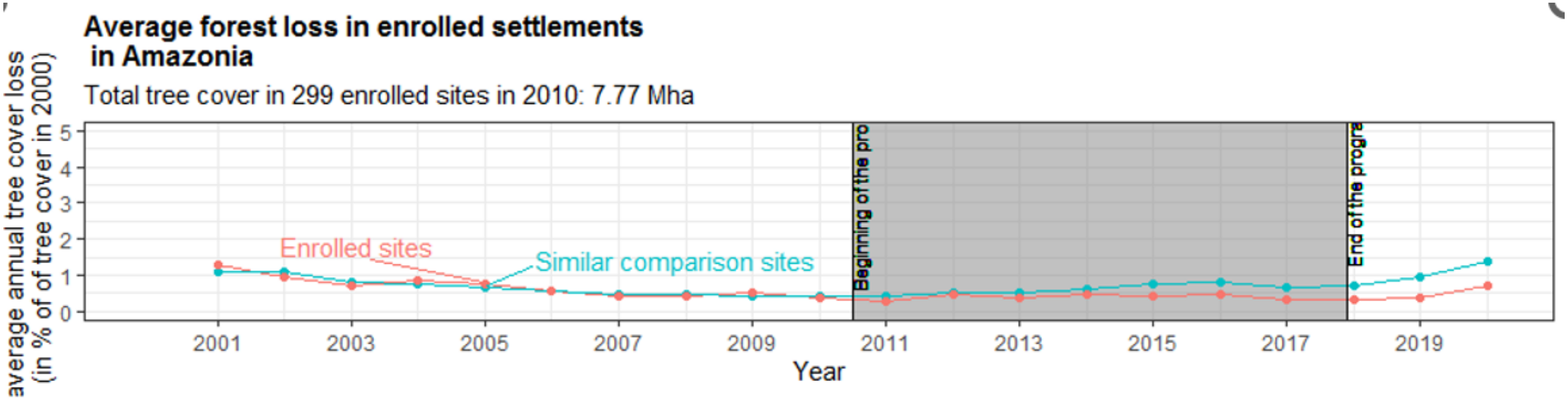
Evaluating the impact of Bolsa Verde on tree cover

- Unit of analisis and treatment status: Polygons of enrolled (at least two years) and never enrolled Settlements

- Outcome: anual forest cover loss in % of forest cover in 2010 (derived from MapBiomas Collection 5)

- Generalized Difference-in-Differences adjusted by a Propensity Score :
  - distance to roads,
  - distance to rivers,
  - distance to nearest city,
  - elevation,
  - slope,
  - forest area in 2010 in hectare,
  - biome,
  - population density and
  - forest cover lost 2007-2010 in hectare

Postmatching loss in enrolled and comparison sites



Similar tree loss trend before the beginning of the program

Reduced tree cover loss since ~2013 compared to the comparison groups

Effect size on forest and CO_2

- Without *Bolsa Verde*, the total forest cover loss in 2011-2017 would have been about 37% higher in the enrolled sites
- -> *Bolsa Verde* avoided a total of ~ 79,897 ha of forest loss in enrolled settlements of Amazonia, an area about half the size of the city of São Paulo
- But it represents only about 1.86 % of the total forest cover lost in Brazilian Amazonia between 2011 and 2017
- -> *Bolsa Verde* avoided ~ 35 megatons of CO_2 emissions within enrolled Amazonia Settlements between 2011 and 2018
- This cumulative 7-year additionally avoided emissions amount is roughly equivalent to the annual carbon footprint of the city of São Paulo during the single year 2015
- -> ~ USD 1.73 per ton of avoided aboveground CO_2

Conclusion

- There is a cost-effective potential to further reduce deforestation in titled collective land through conditional cash transfers
- Conditional cash transfers can increase compliance with site natural resource management regulations while increasing social outcomes, even programs that are short-lived
- Yet incentives are not a “one-size-fits-all silver bullet”!
- Need adaptive management and policy mixes to permanently prevent loss while improving social outcomes, but difficult when regulation is weakening and drivers and magnitude of deforestation is changing

Article

Cost-effective climate mitigation via conservation incentives targeting poverty: Bolsa Verde's impact in Brazilian Amazonia settlements

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Thank you!

Questions?

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