



Using threat forecasts to guide proactive conservation action

Glenn Moncrieff

Global Science, The Nature Conservancy



Conserved

113M

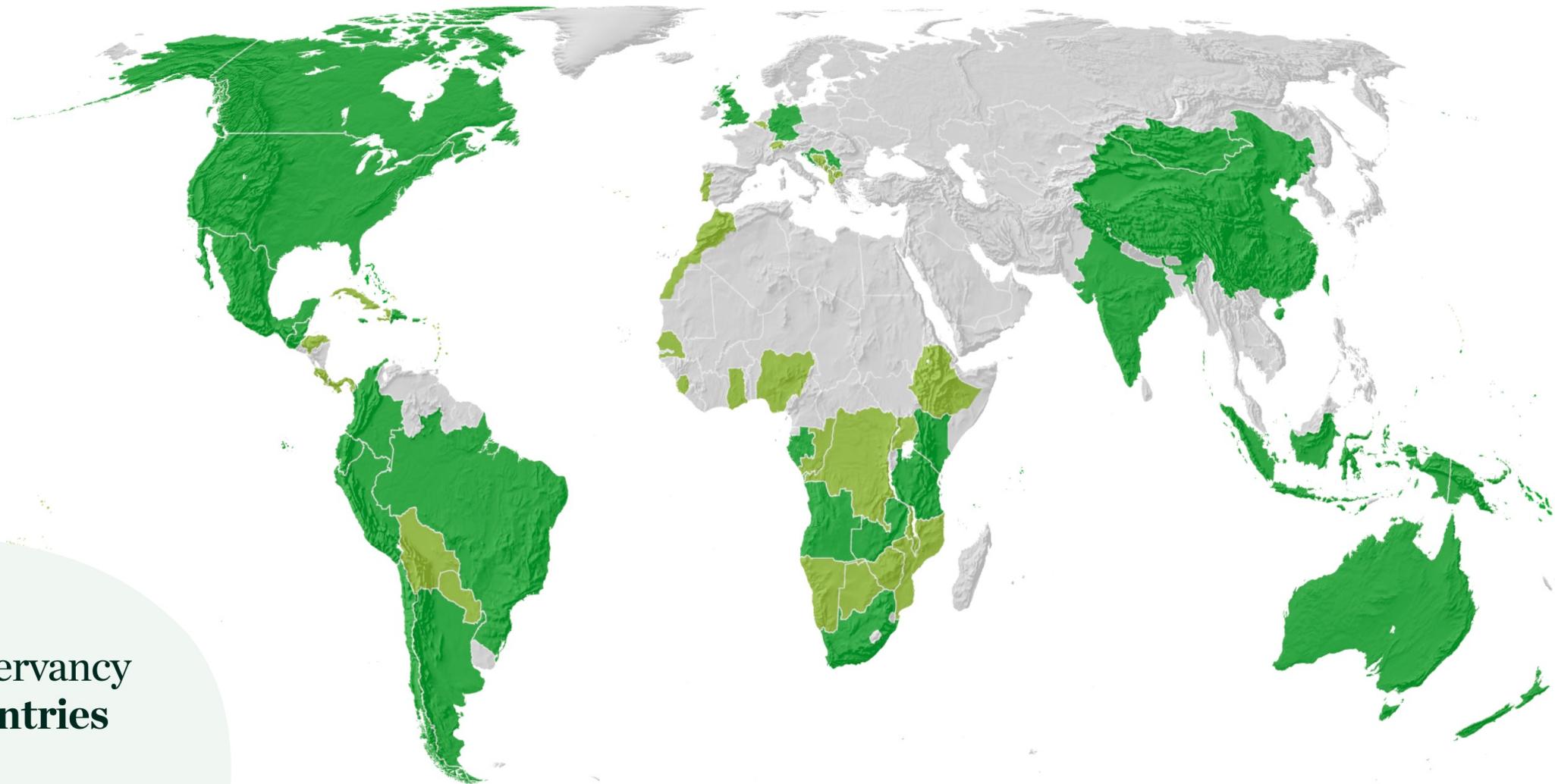
hectares of ocean
(280m acres)

50+M

hectares of land
(125m acres)

The Nature Conservancy
works in **80+ countries**
and territories.

- 40 by direct conservation impact
- 41 through partners





Tackle Climate Change

Clean Energy Transition

Accelerating the renewable energy transition for a clean, green, and equitable energy future and driving policy to decarbonize critical sectors.

Natural Climate Solutions

Protecting, managing, and restoring ecosystems to maximize the mitigation potential from nature.

Adaptation

Supporting communities in building greater resilience as they adapt to a changing climate.



Protect Ocean, Land and Fresh Water

Transformative Management and Protection

Supporting strong national policy commitments and mobilizing the funding needed to protect 30% of the world's land, freshwater and marine habitats.

Nature Bonds Program

Helping nations meet their climate and conservation goals by refinancing sovereign debt to unlock funds for conservation and climate action.

Enduring Earth

Protecting 600 million hectares through a global partnership that leverages collaboratively designed, locally led and sustainably financed projects.



Provide Food and Water

Resilient Fresh Water

Investing in watershed health by developing partnerships that quicken the pace and scale of conservation.

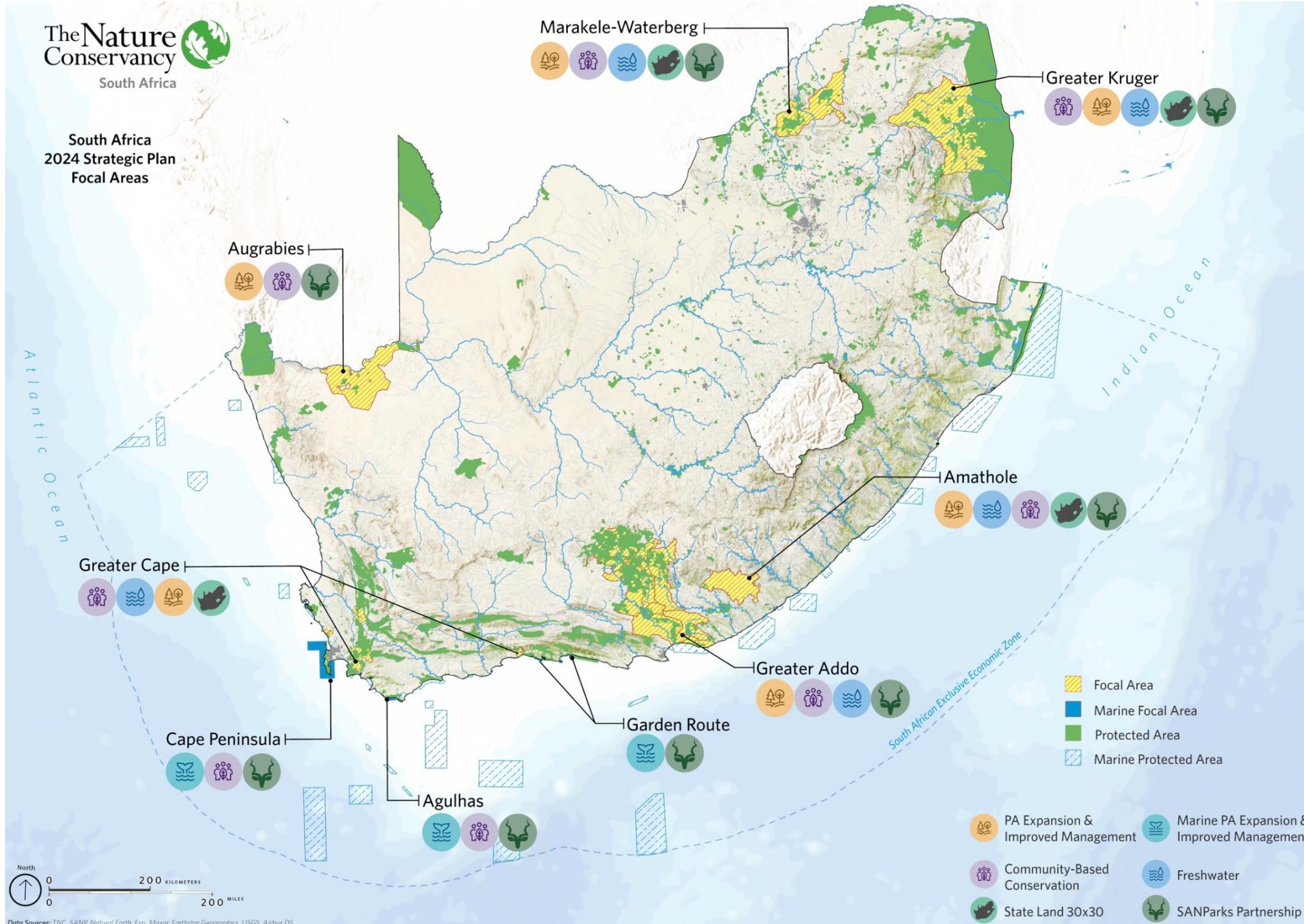
Regenerative Food

Transitioning food systems from extractive and degrading to productive and restorative and eliminating habitat loss from key food supply chains.

Thriving Fisheries and Aquaculture

Addressing gaps to ensure sustainably managed fisheries for ecosystem and human benefit.

South Africa
2024 Strategic Plan
Focal Areas





Mainstreaming nature-based solutions for water security
The Greater Cape Town Water Fund

The Nature
Conservancy



Two-thirds of the region's catchments are invaded by alien trees



GCTWF Business Case



GREATER CAPE TOWN WATER FUND

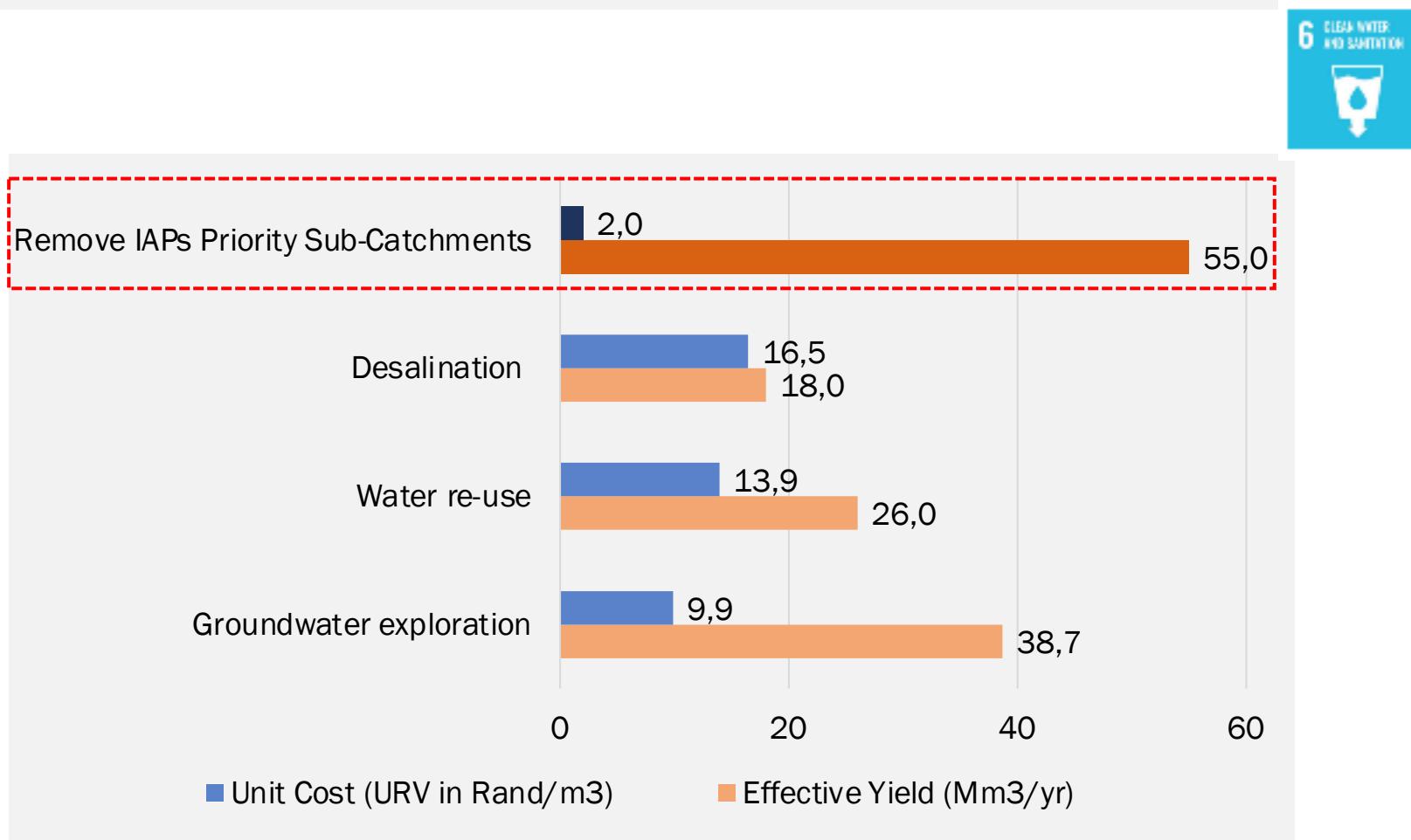
BUSINESS CASE | ASSESSING THE RETURN ON INVESTMENT
FOR ECOLOGICAL INFRASTRUCTURE RESTORATION | APRIL 2019

The Nature Conservancy

WaterFunds for Africa



Nature-Based Solutions cheapest water augmentation option



Increases dry season water availability by
24%

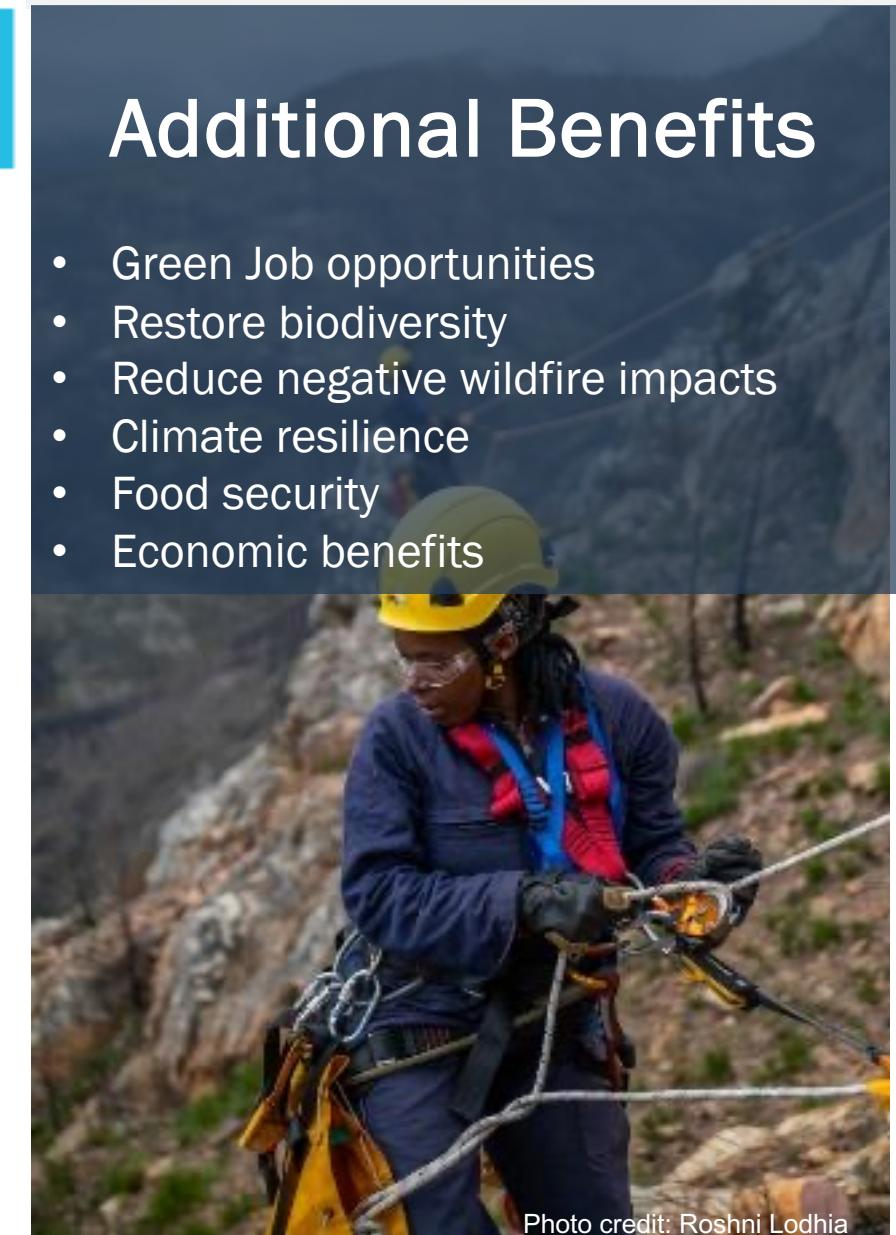


Photo credit: Roshni Lodhia



© Sharon McComb



What Are We Monitoring?



Management Effectiveness



© Nyani Quarmyne

Water



© Jeremy Shelton



Socio-Economic Impacts

Terrestrial and Freshwater Biodiversity



Partnership Satisfaction

What Are We Monitoring?



Management Effectiveness



Water



Socio-Economic Impacts

Terrestrial and Freshwater Biodiversity



Partnership Satisfaction

Spatial Biodiversity Science

Spatial Prioritization



Spatial Planning



Biodiversity Monitoring and Measuring



Critical Science

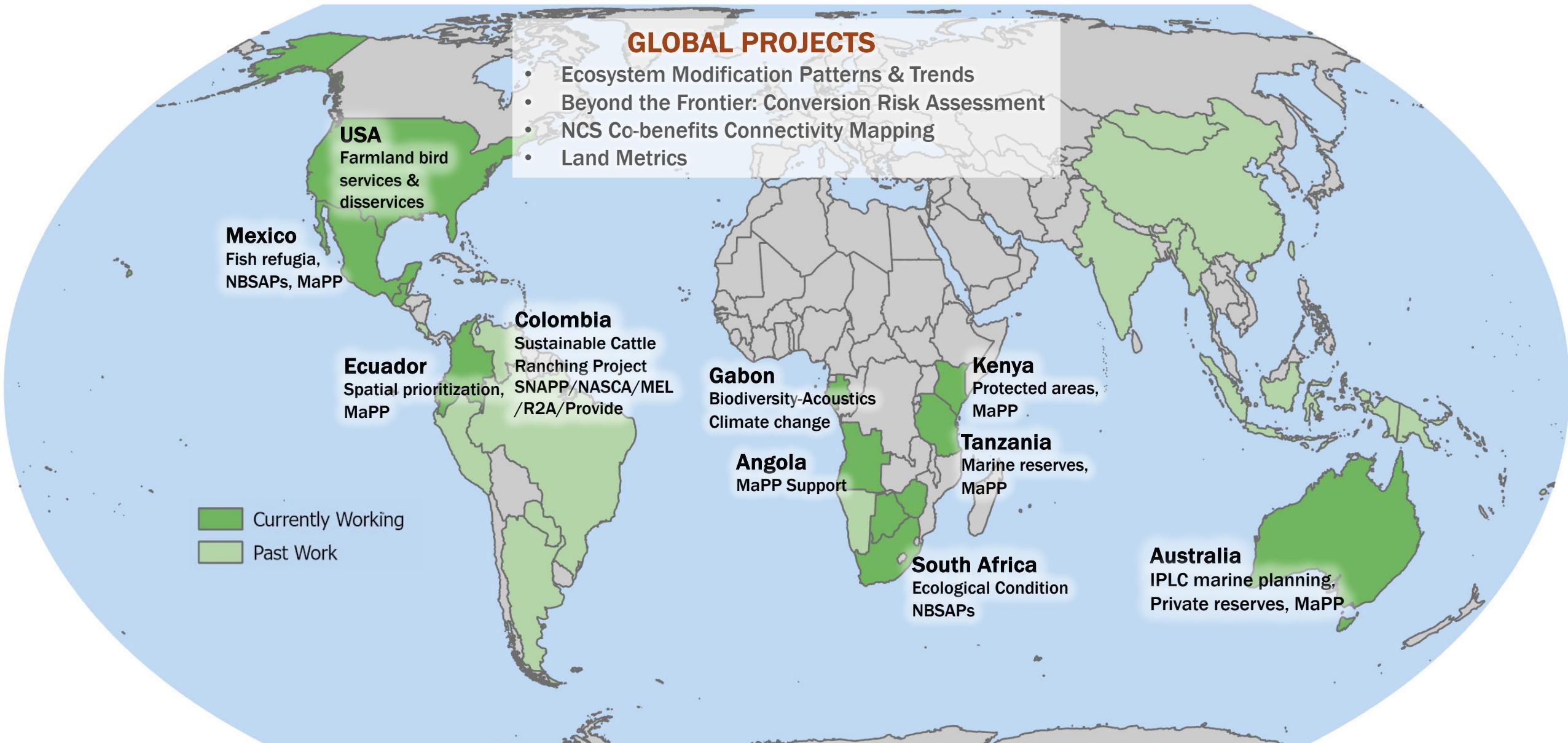


Technical Support



Capacity Building

Where we work



Planning for impact

- Are we making a difference with our efforts?



Planning for impact

- Are we making a difference with our efforts?



The
Guardian

Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows

Overstated carbon emission reductions from voluntary REDD+ projects in the Brazilian Amazon

Thales A. P. West^{a,b,c,1} , Jan Börner^{c,d} , Erin O. Sills^e , and Andreas Kontoleon^{b,f} 

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Edited by Eric F. Lambin, Stanford University, Stanford, CA, and approved August 12, 2020 (received for review March 6, 2020)

Planning for impact

- Are we making a difference with our efforts?



nature communications

Article

Published online:



than 90% of rainforest
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Mixed effectiveness of global protected areas in resisting habitat loss

<https://doi.org/10.1038/s41467-024-52693-9>

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Guangdong Li^{a,1,2}, Chuanglin Fang^{a,1,2}✉, James E. M. Watson^{b,3}, Siao Sun^{b,1,2},
Wei Qi^{a,1,2}, Zhenbo Wang^{a,1,2} & Jianguo Liu^{a,4}✉

Accepted: 18 September 2024

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³Department of Forestry and Environmental
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Planning for impact

- Are we making a difference with our efforts?

DOI: 10.1111/cobi.14225

CONTRIBUTED PAPERS

Understanding variation in impacts from private protected areas across regions and protection mechanisms to inform organizational practices

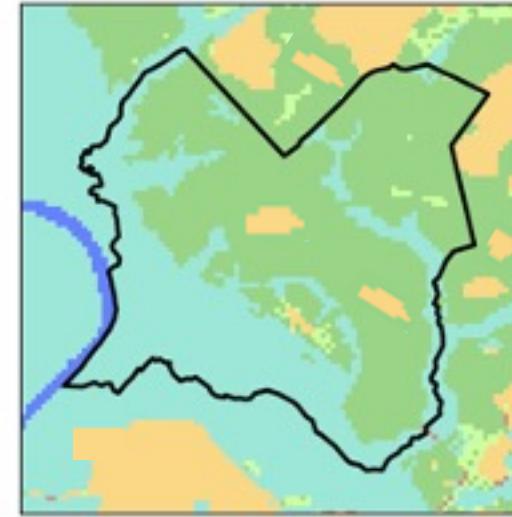
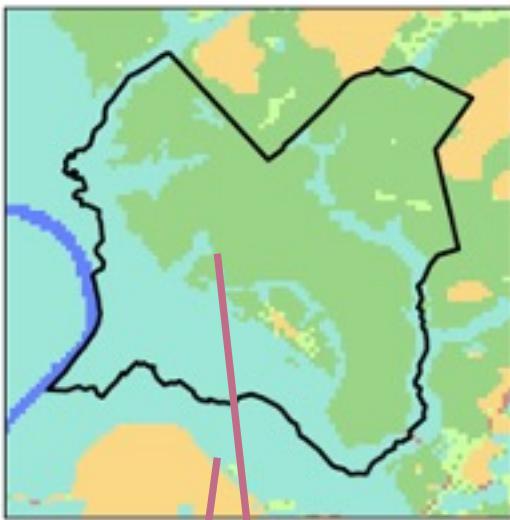
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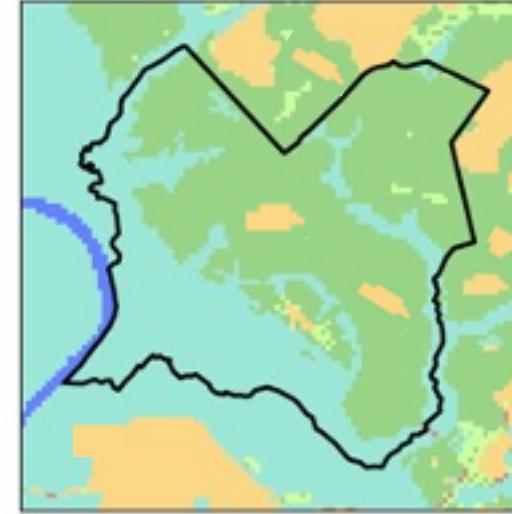
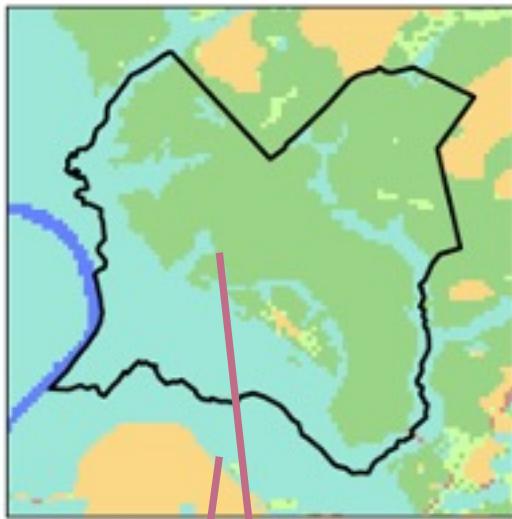
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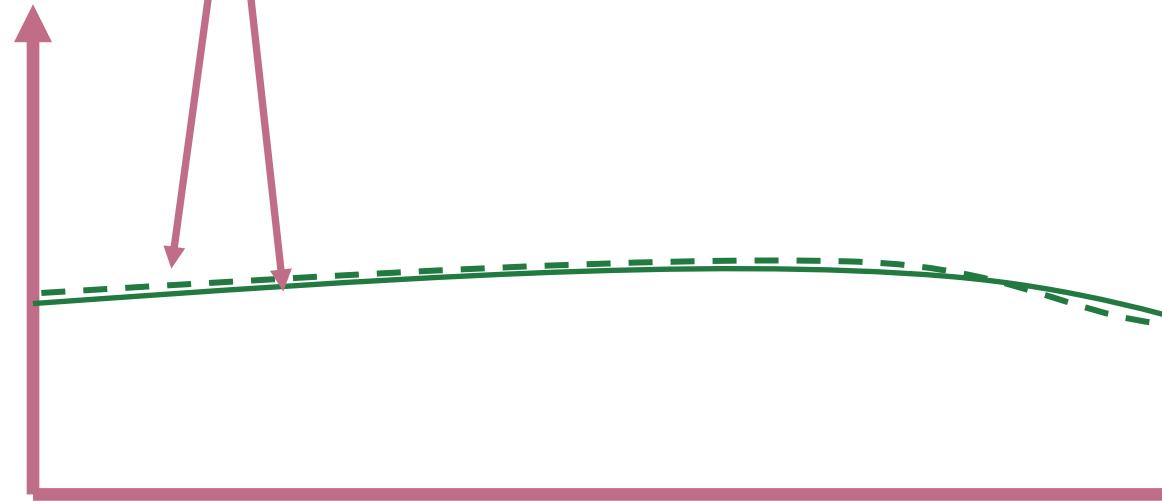


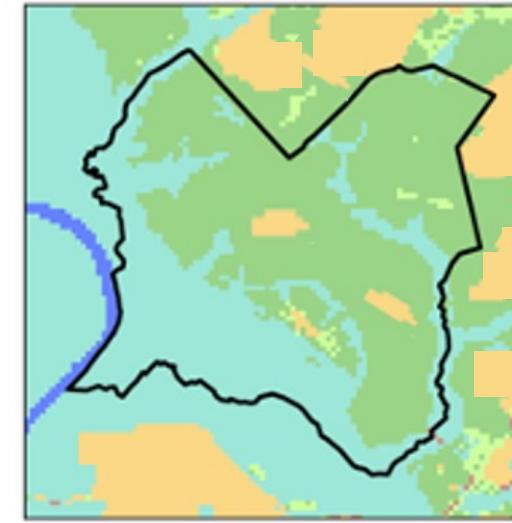
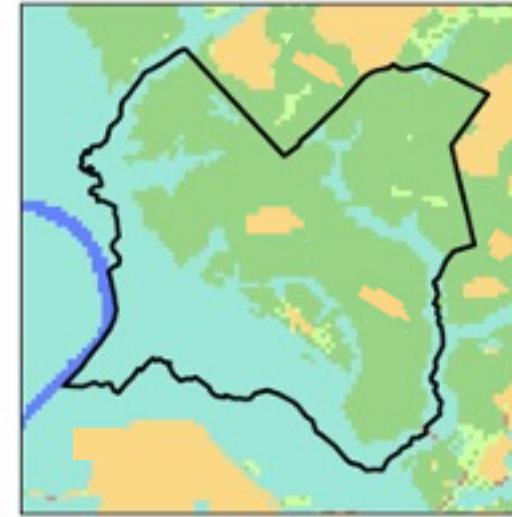
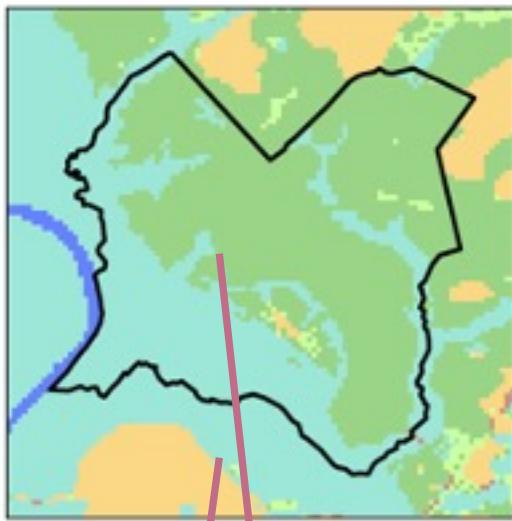
Threat
e.g. deforestation





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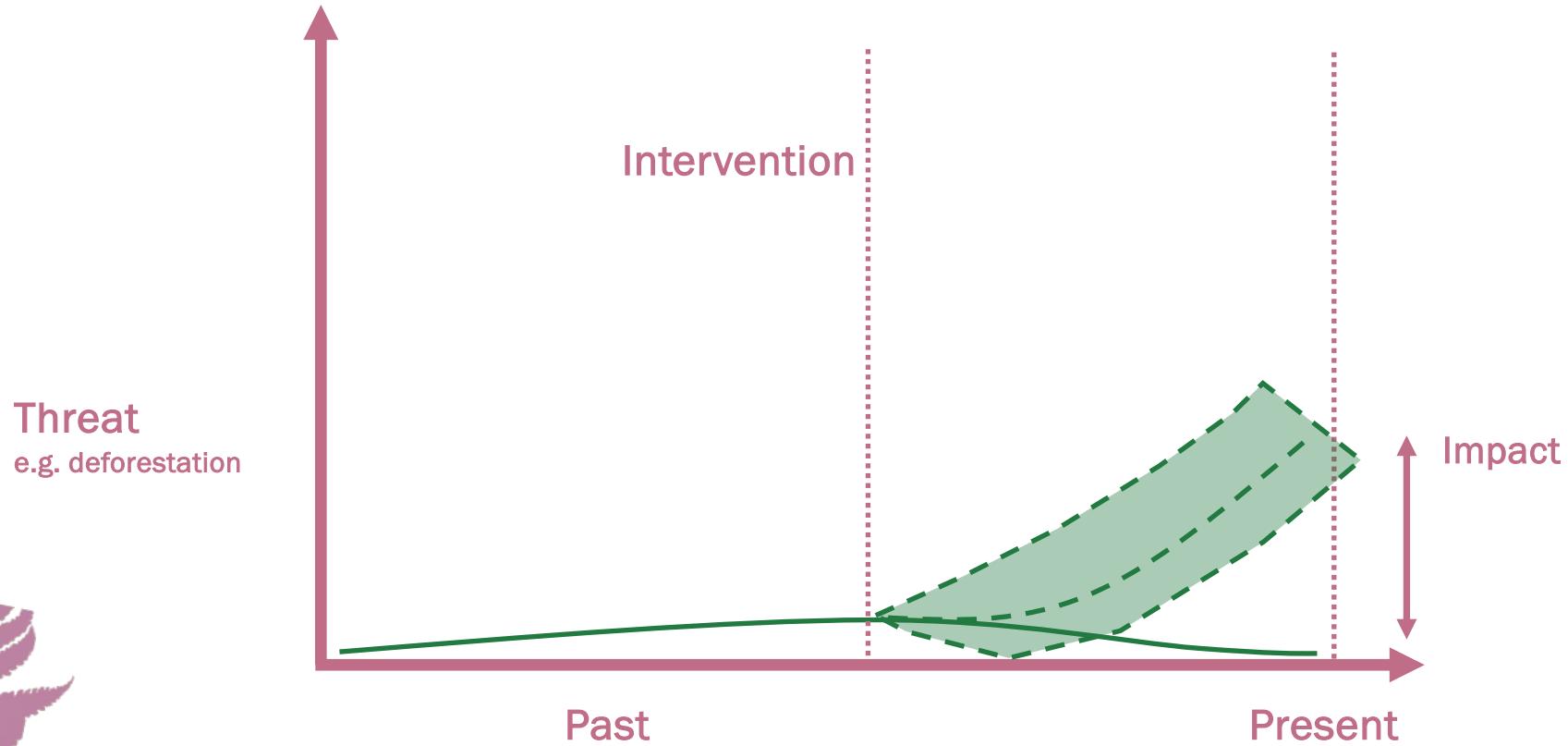




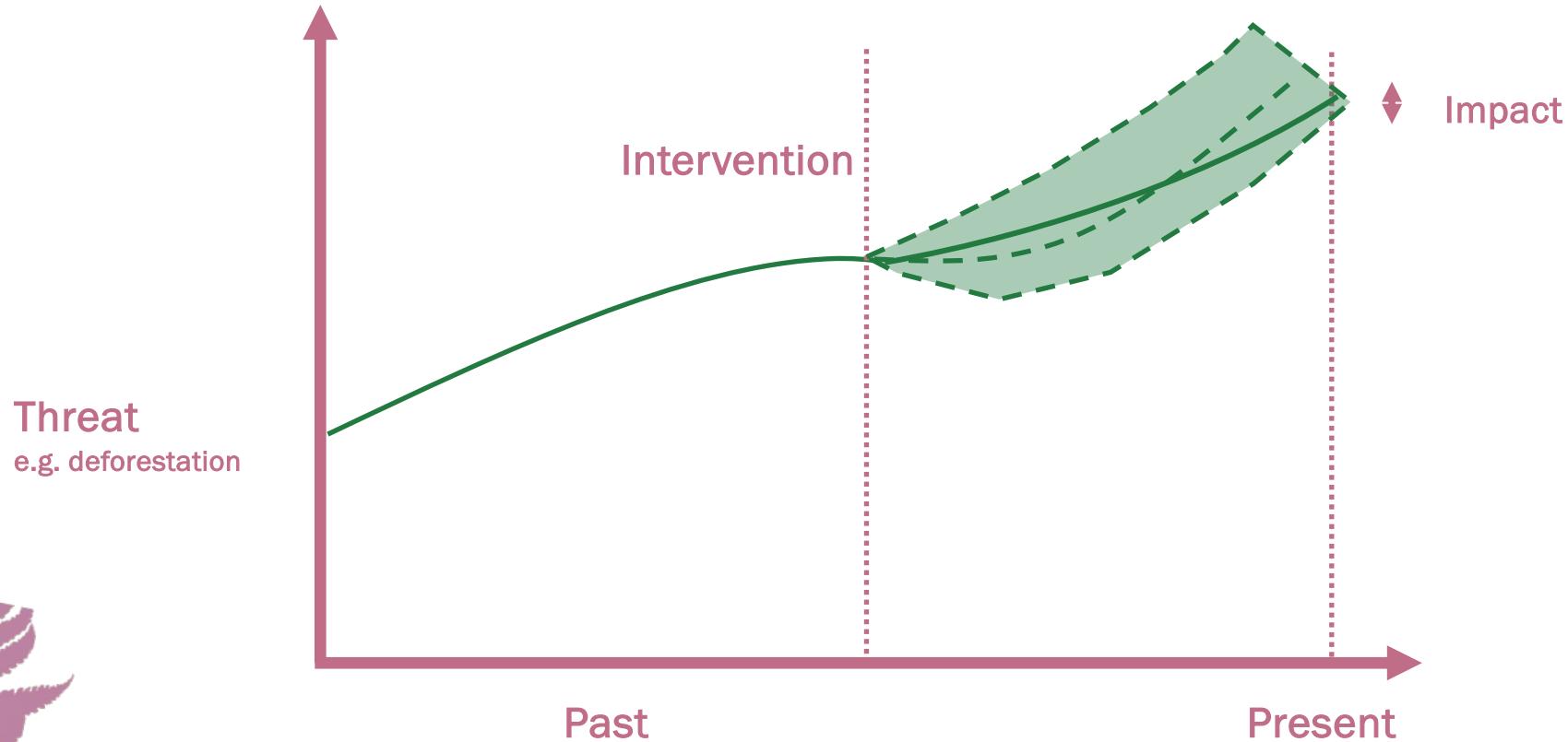
Threat
e.g. deforestation

Impact

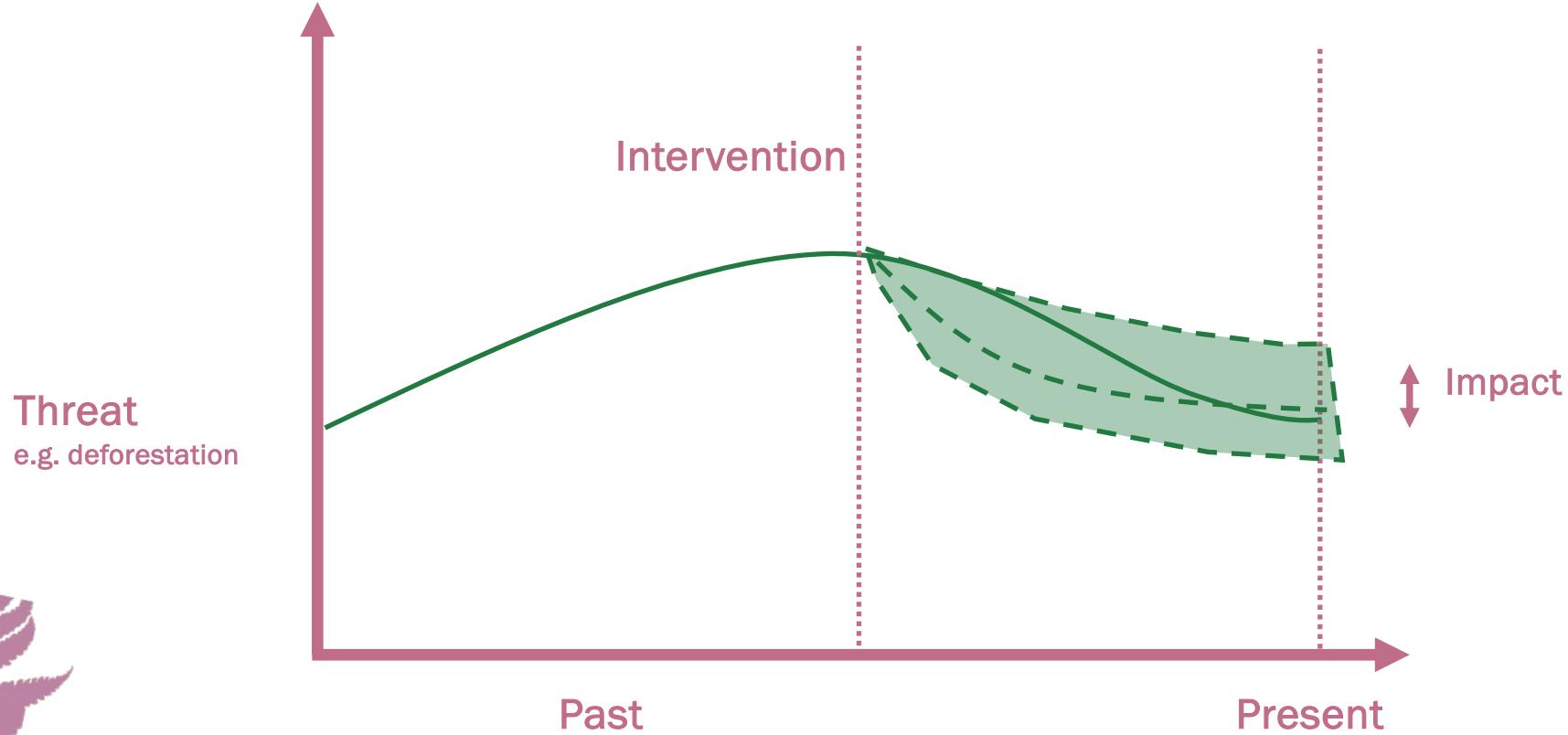
Measuring impact



Measuring impact



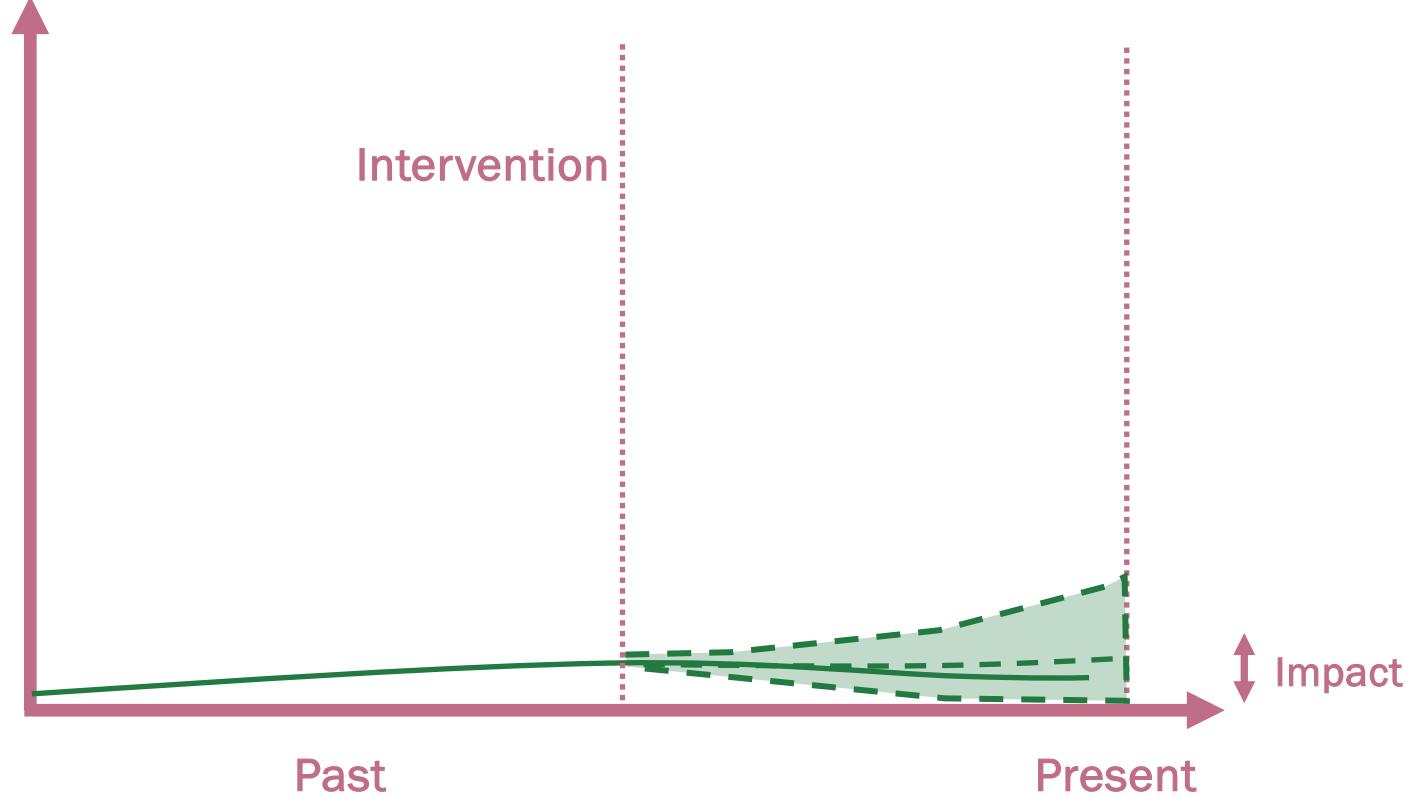
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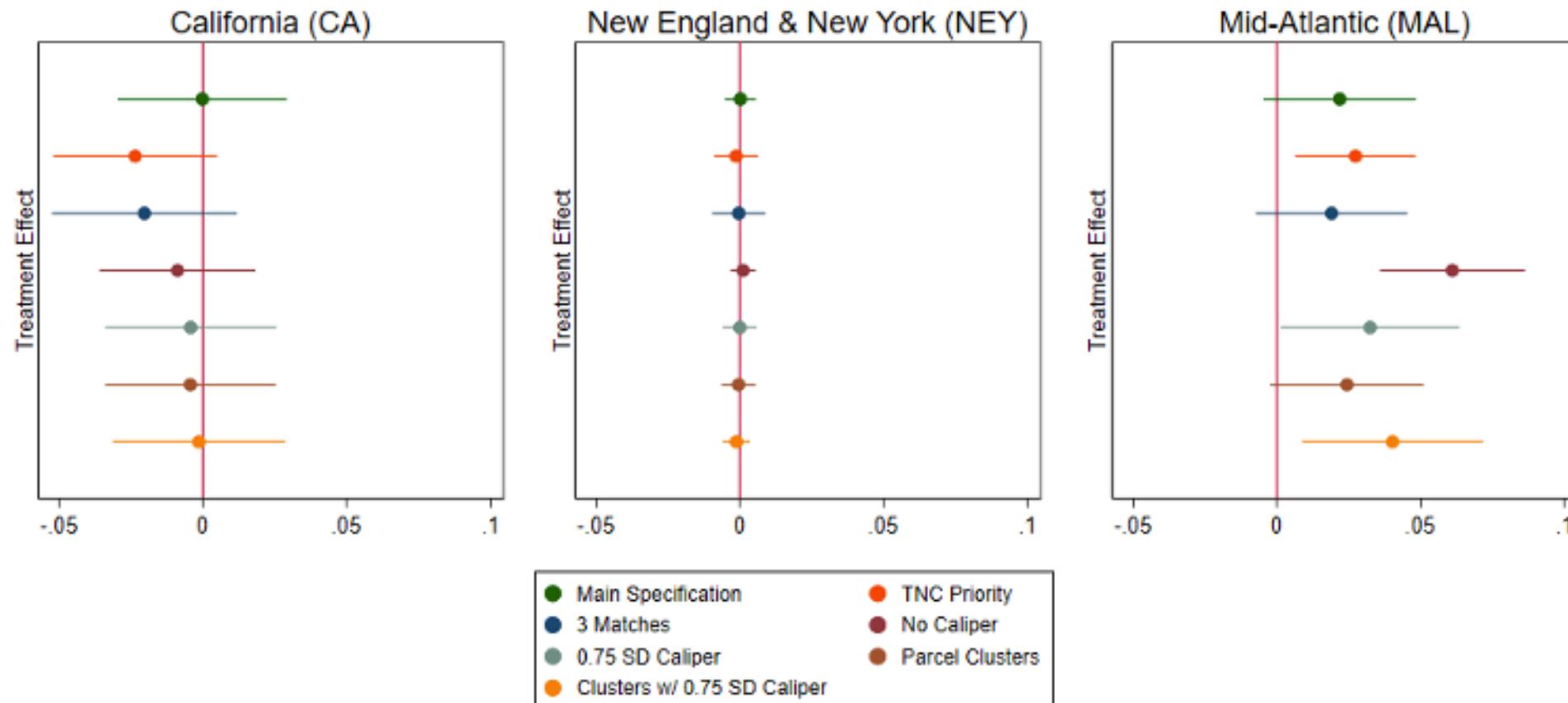


Threat
e.g. deforestation

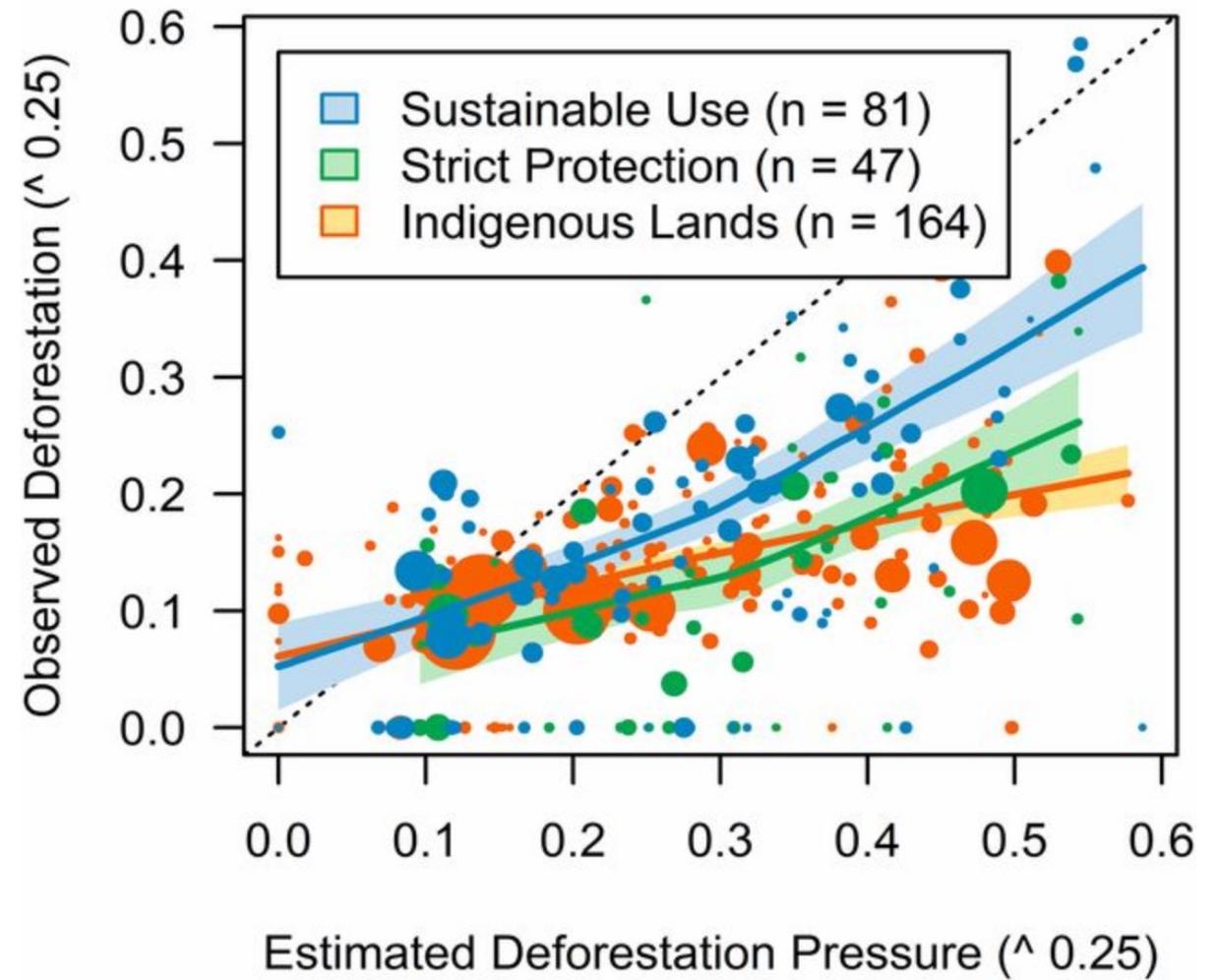


Understanding variation in impacts from private protected areas across regions and protection mechanisms to inform organizational practices

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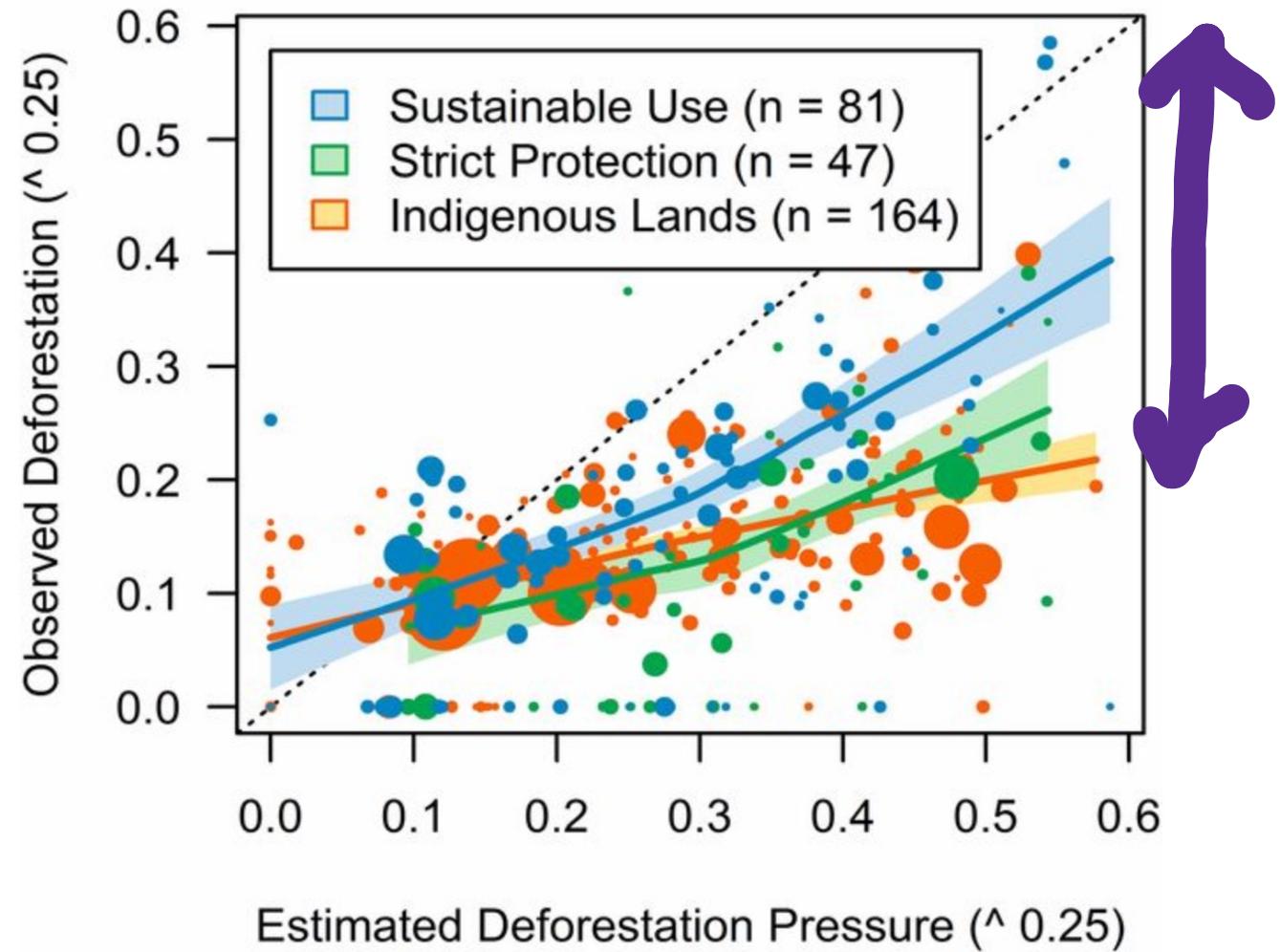


More conversion
pressure
leads to more
impact

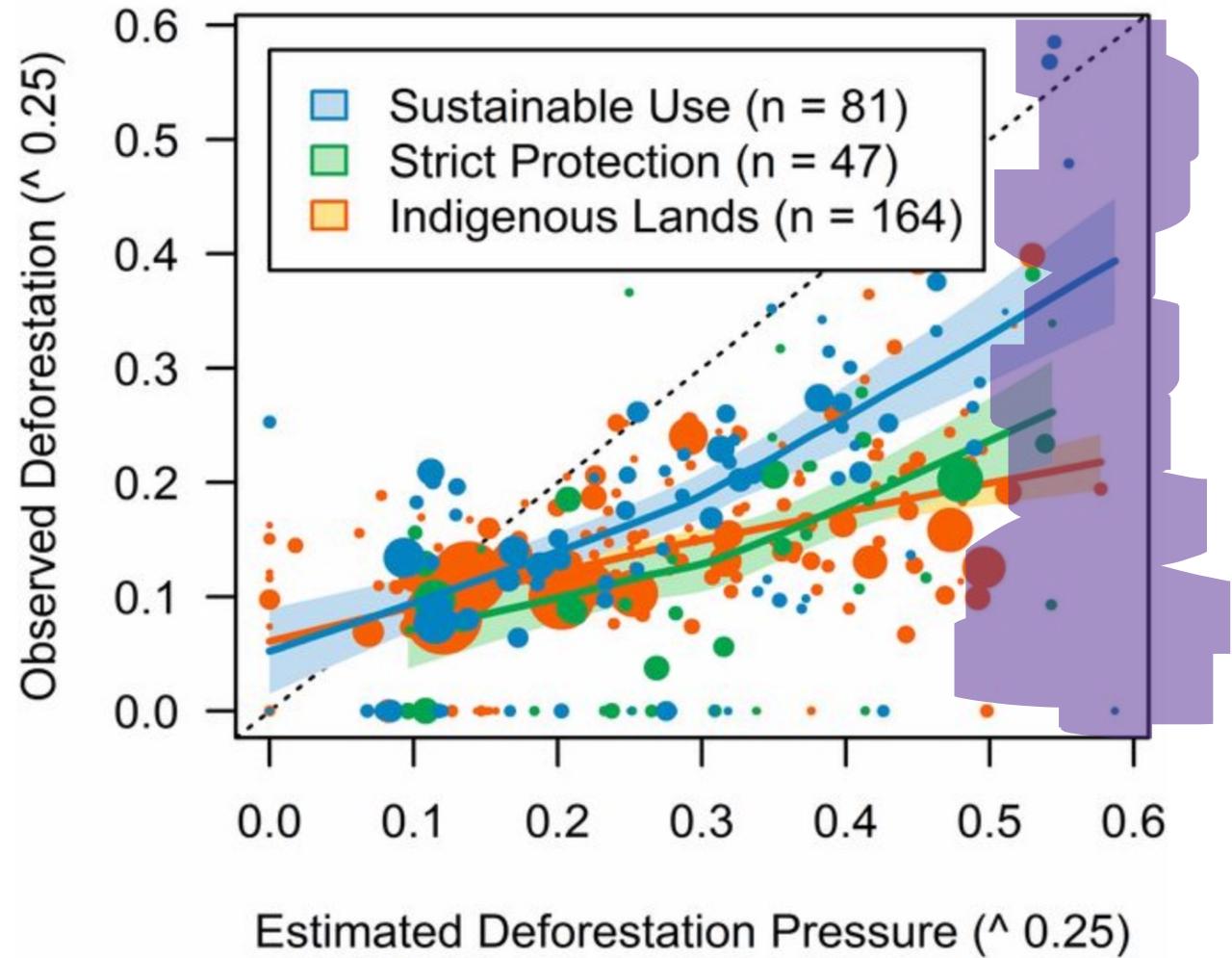


Nolte et al (2013). PNAS

More conversion
pressure
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We need threat
forecasts to plan
for impact



Nolte et al (2013). PNAS

But there are differing views on this and caveats

- Protecting wilderness
- High Forest – Low Deforestation
- Conflicts/costs of working in highly threatened landscapes
- Sometimes our actions cannot mitigate threats
- Planning and decision science required

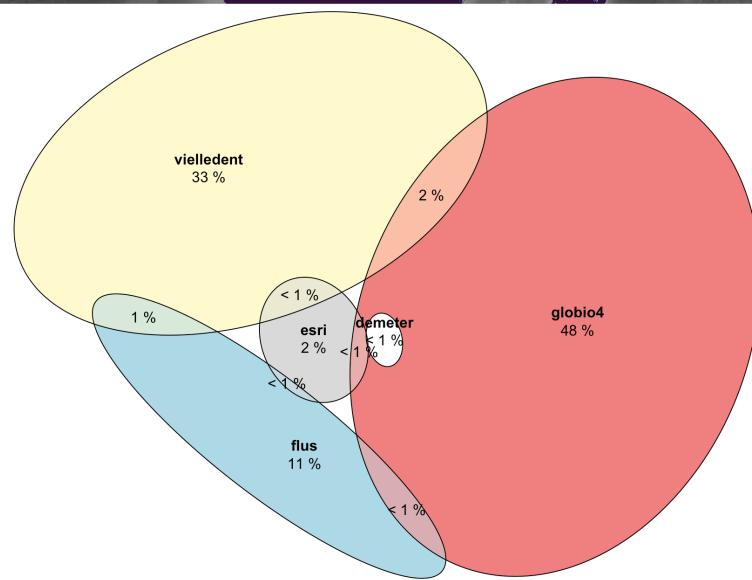
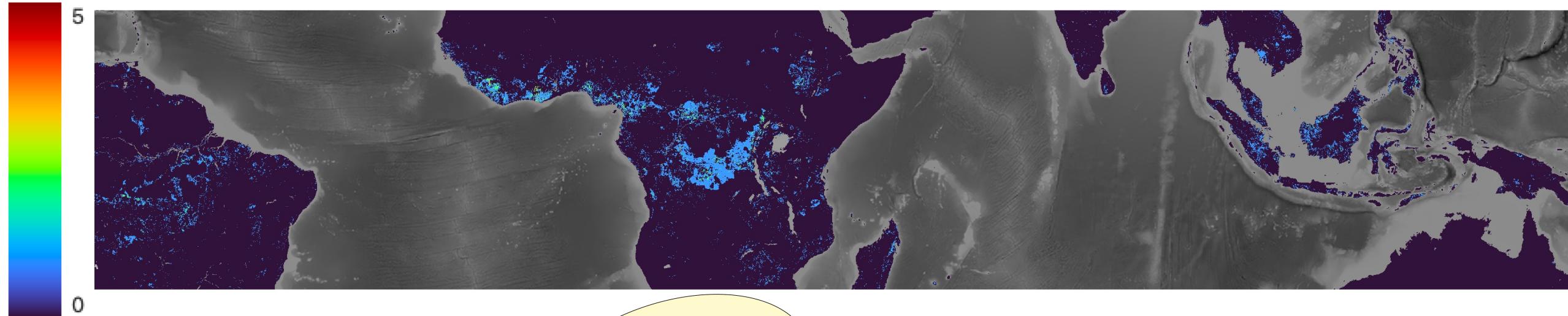


Existing threat forecasts fall short

- Little agreement



Existing threat forecasts fall short

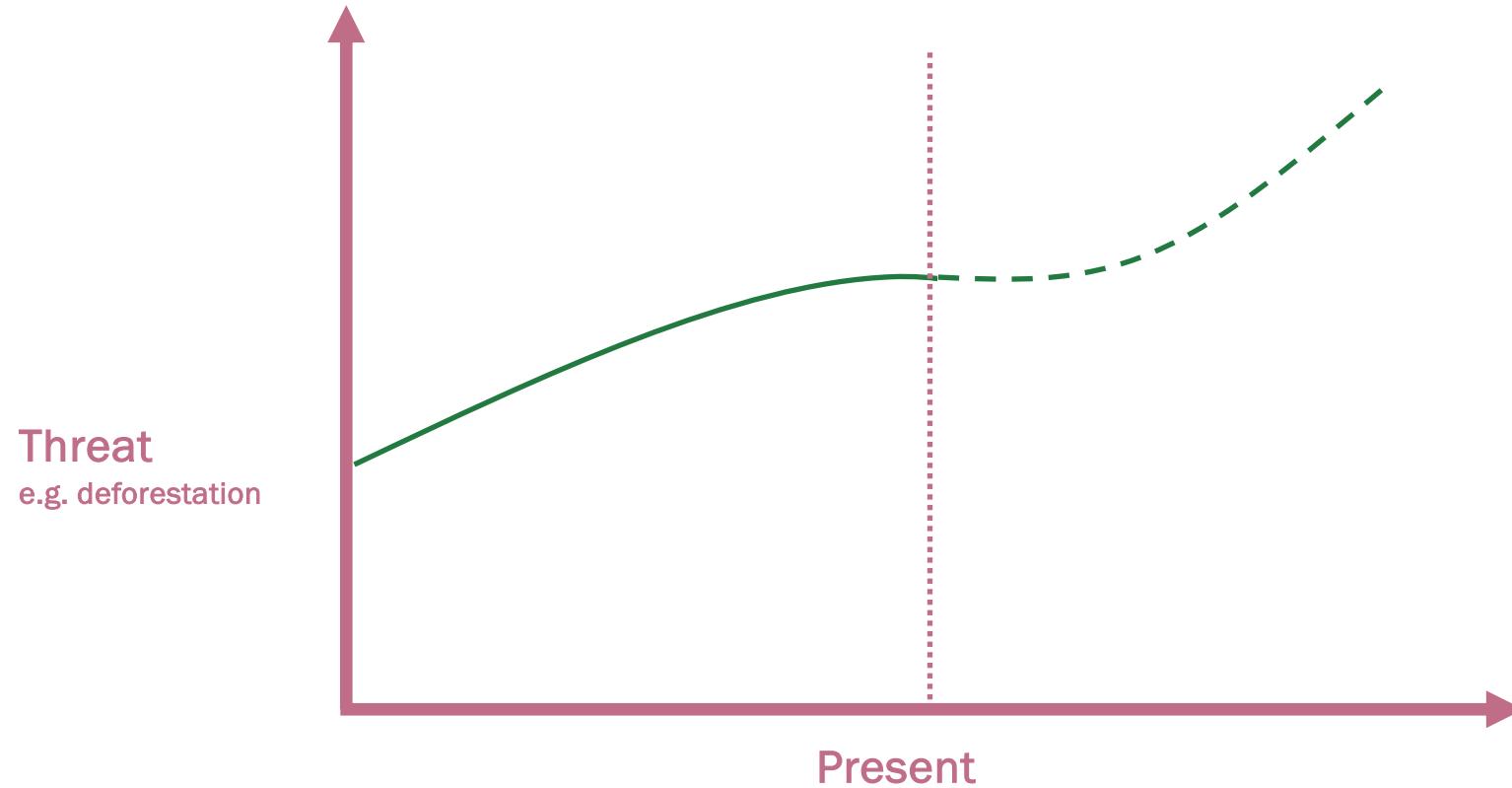


Existing threat forecasts fall short

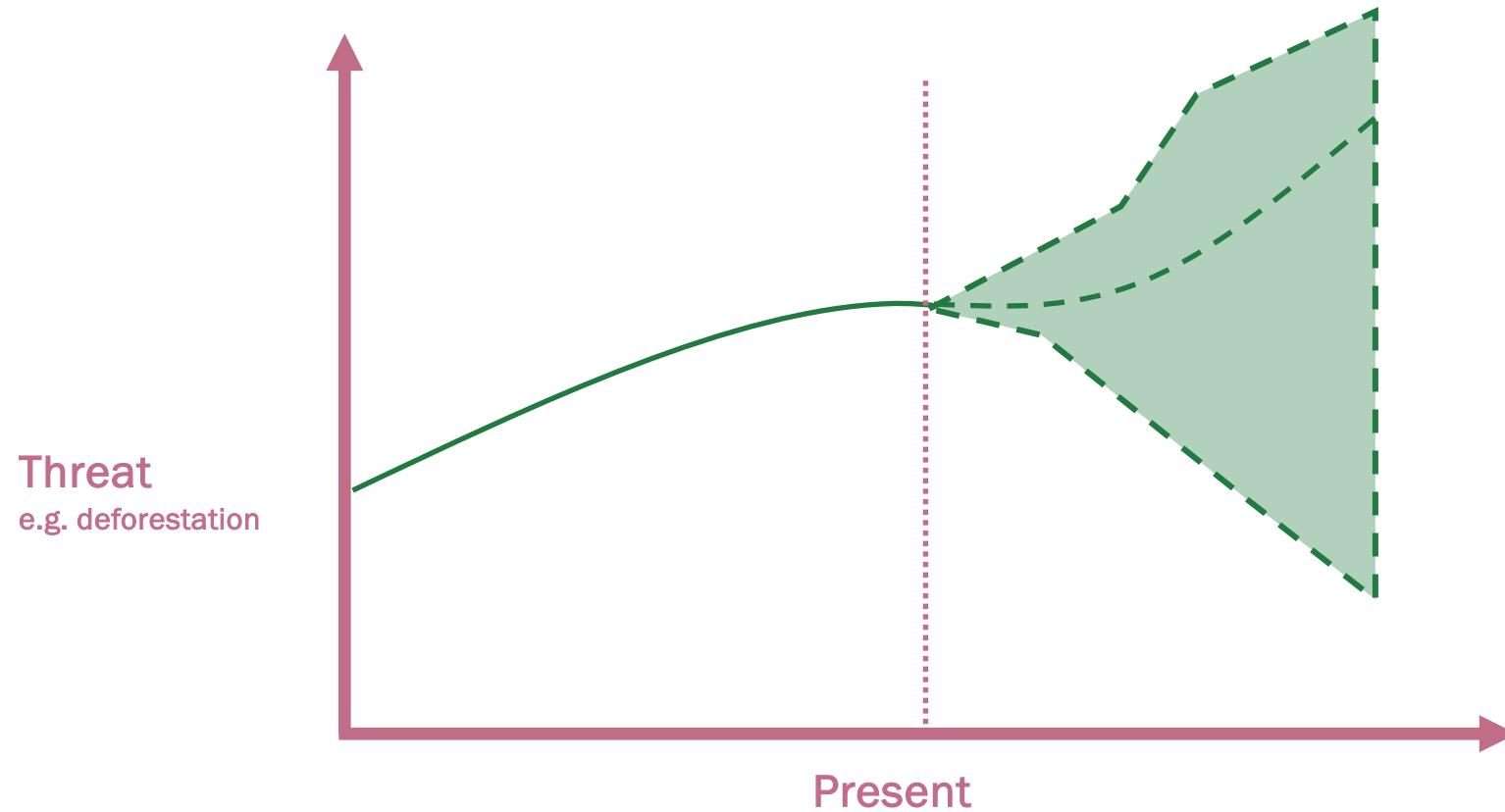
- Little agreement
- No uncertainty



Existing threat forecasts fall short



Existing threat forecasts fall short



Existing threat forecasts fall short

- Little agreement
- No uncertainty
- Often just land cover change

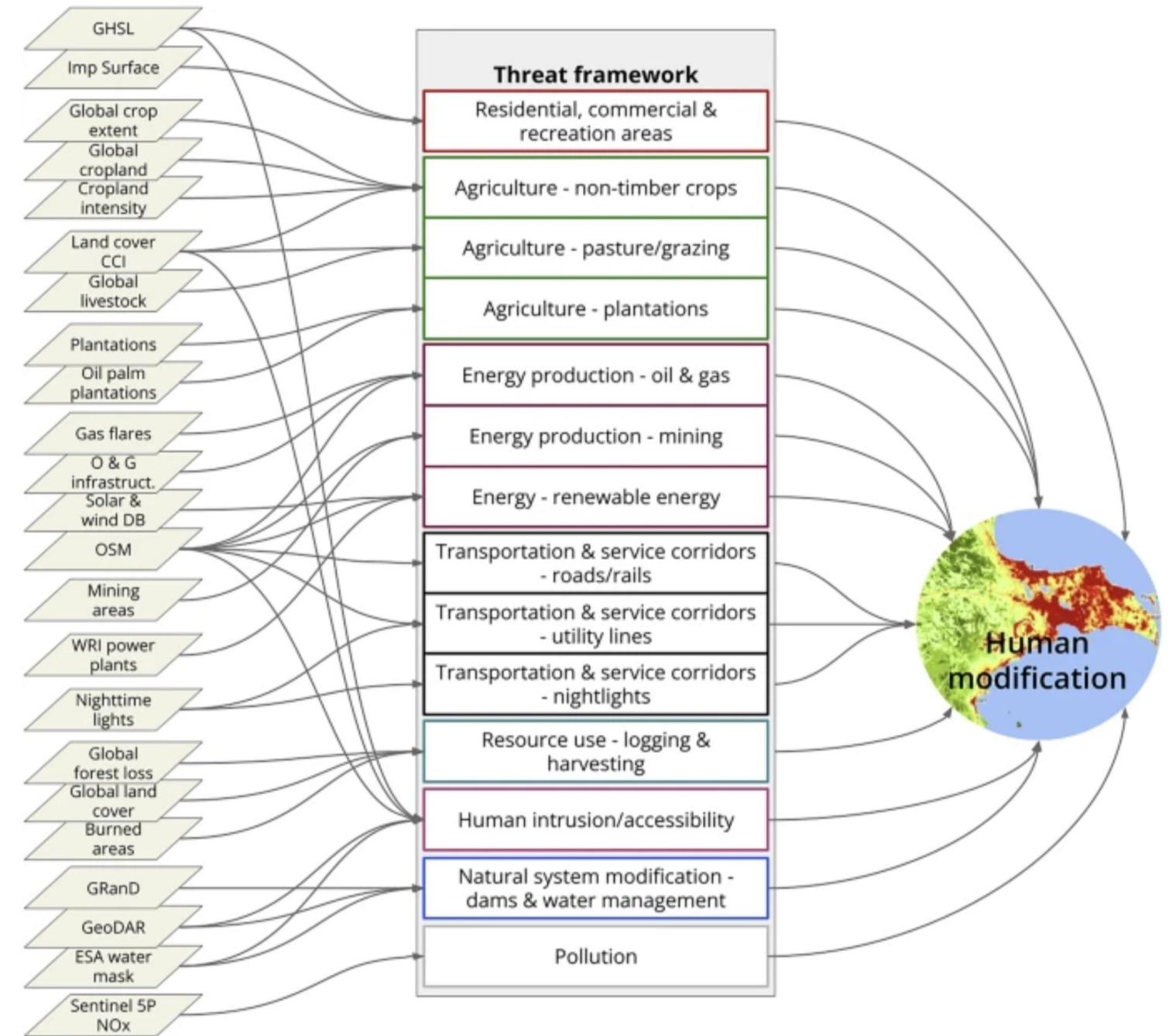


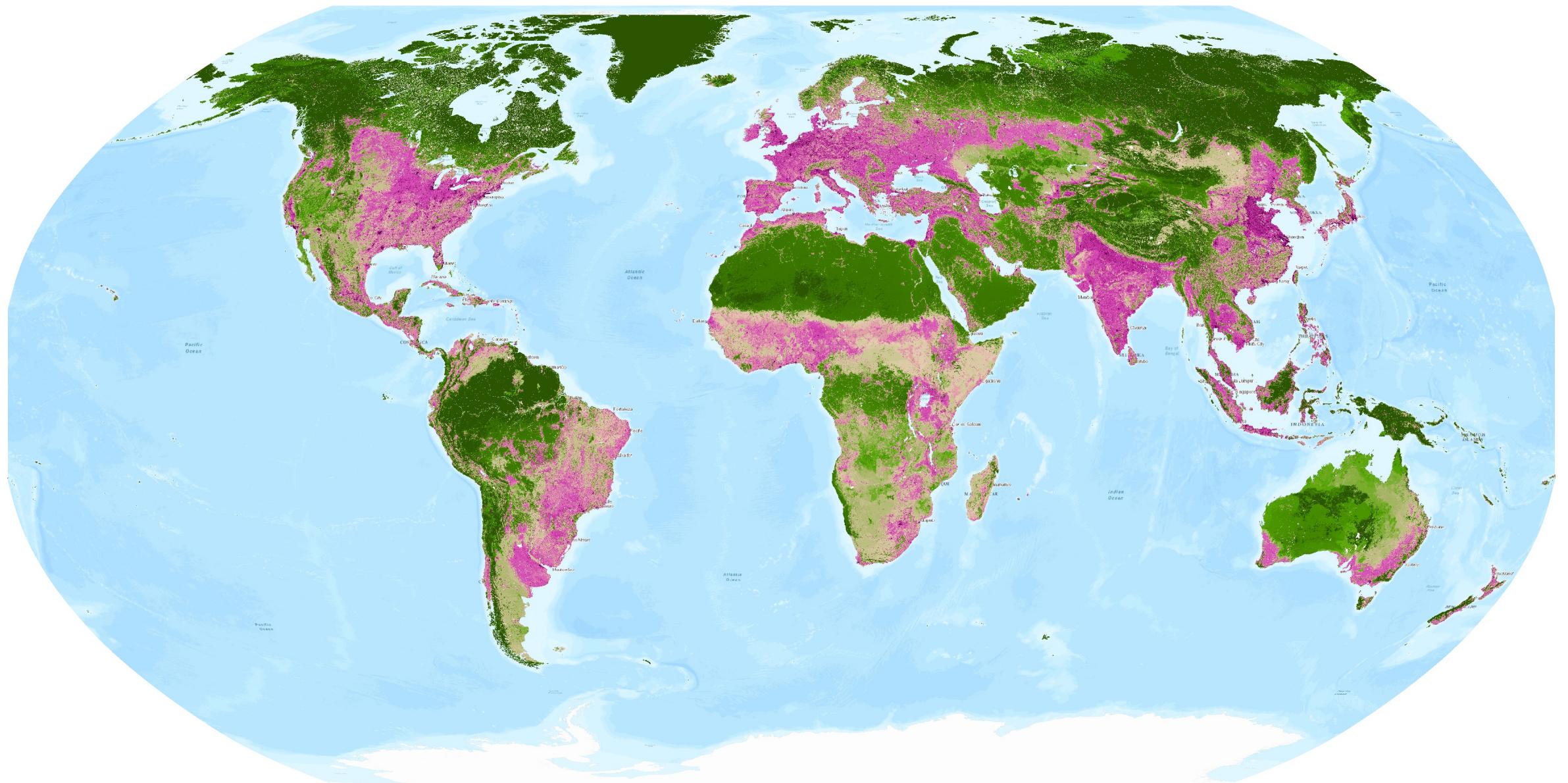
Human Modification Index moves beyond landcover

- Integrating data from 16 threats
- We can examine changes in the full range of condition
- Provides consistent time series from 1990

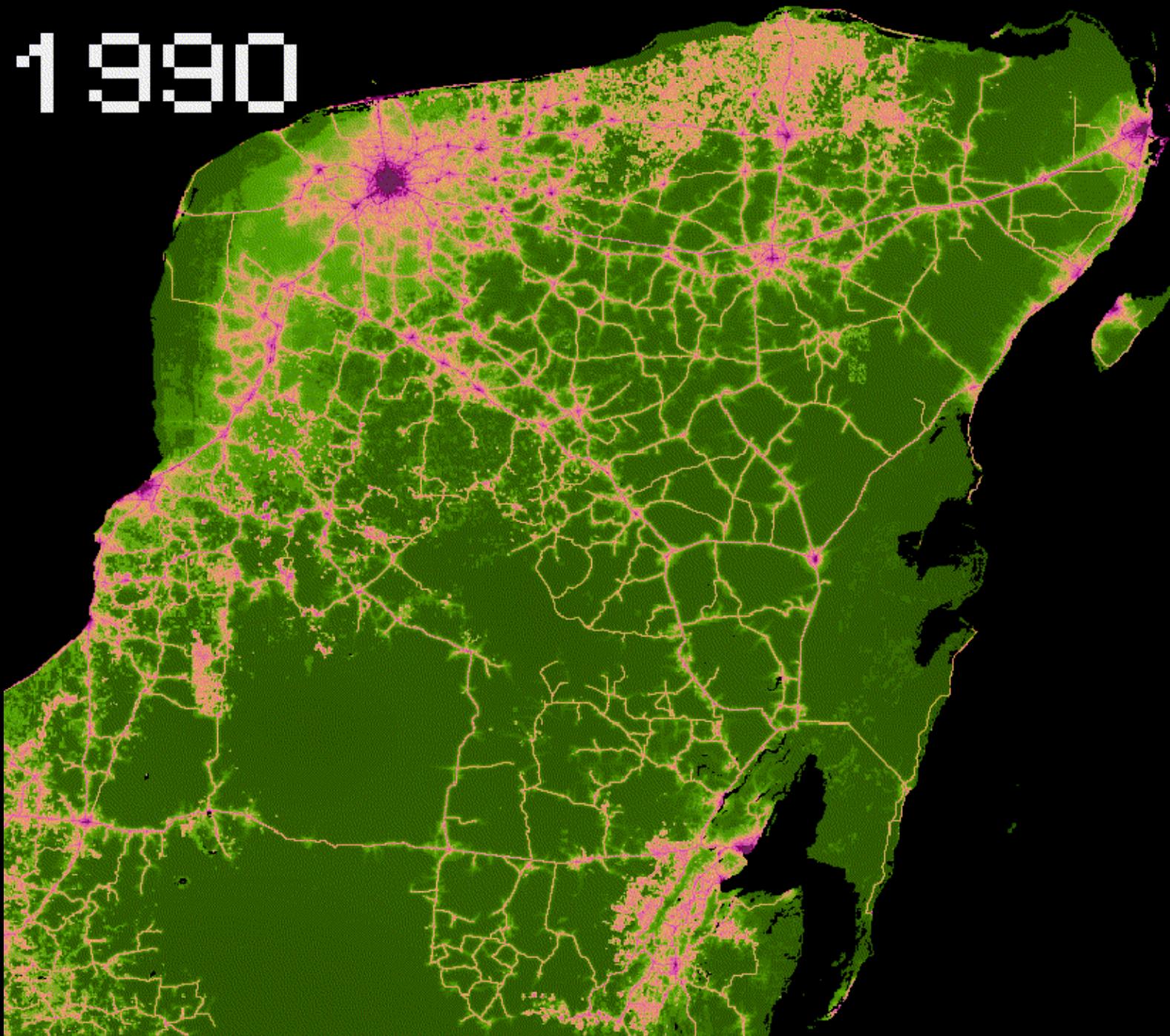
Global extent and change in human modification of terrestrial ecosystems from 1990 to 2022

David M. Theobald^{1,2}✉, James R. Oakleaf³, Glenn Moncrieff⁴, Maria Voigt⁵, Joe Kiesecker³ & Christina M. Kennedy⁶





1990



Human Modification forecasting

- Full range of condition
- Forecasts with uncertainty
- Rigorous accuracy assessment
- ~~• Multiple threats~~



Human Modification forecasting

High detail - actionable but hard to predict

Will a specific 300m pixel be converted to housing between 2095 and 2100?

How much will it rain in my neighborhood park on the 3rd Monday in July in 2028

Medium detail - informative and somewhat predictable

Overall change in human pressure at 1km resolution between 2020 and 2040

Likelihood the maximum monthly temperature in July 2050 in Denver will exceed 90F /32C in 2050

Low detail - less useful but more predictable

Overall pressure at Country scale in 2030

The global average temperature in 2030



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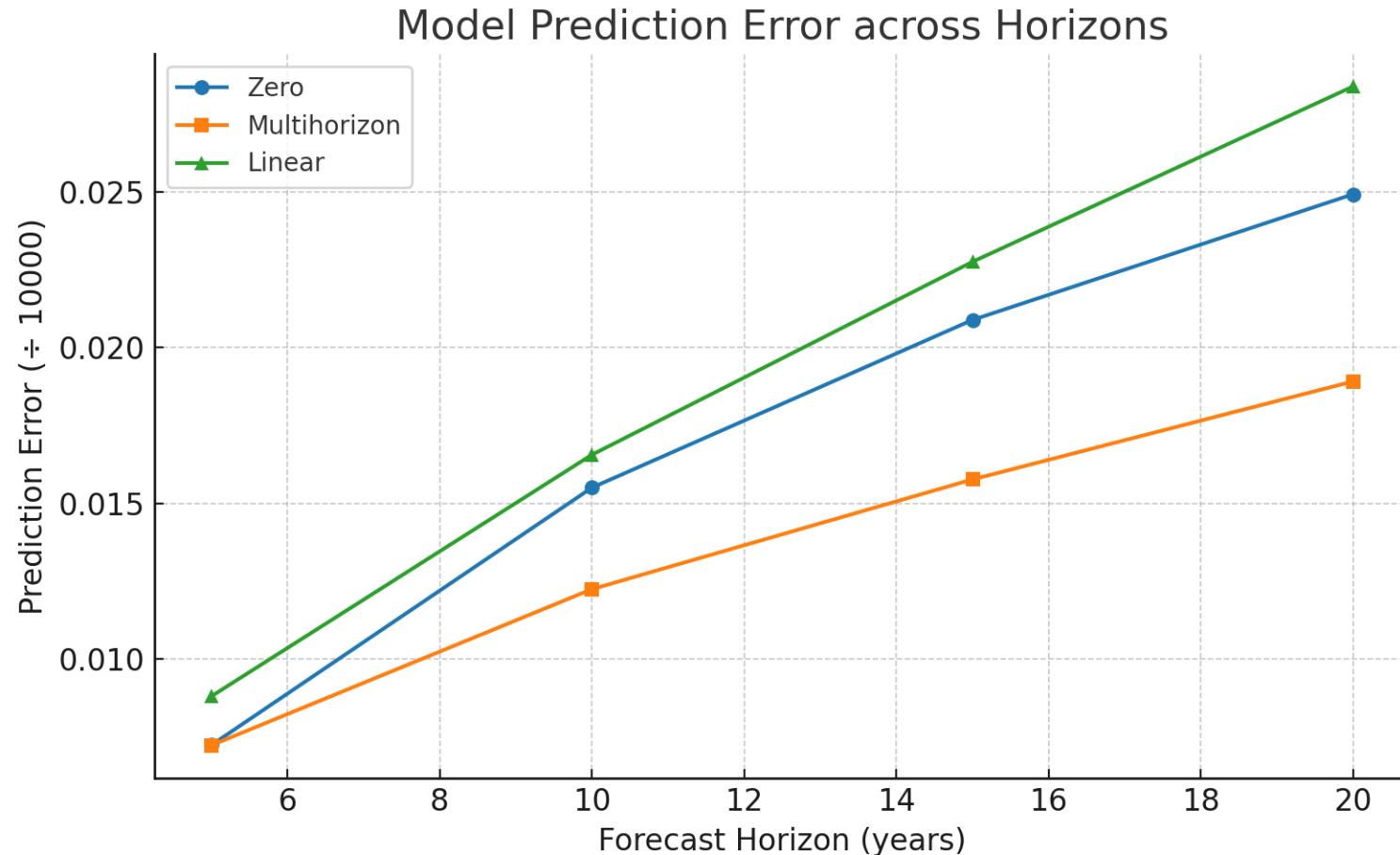


Human Modification forecasting

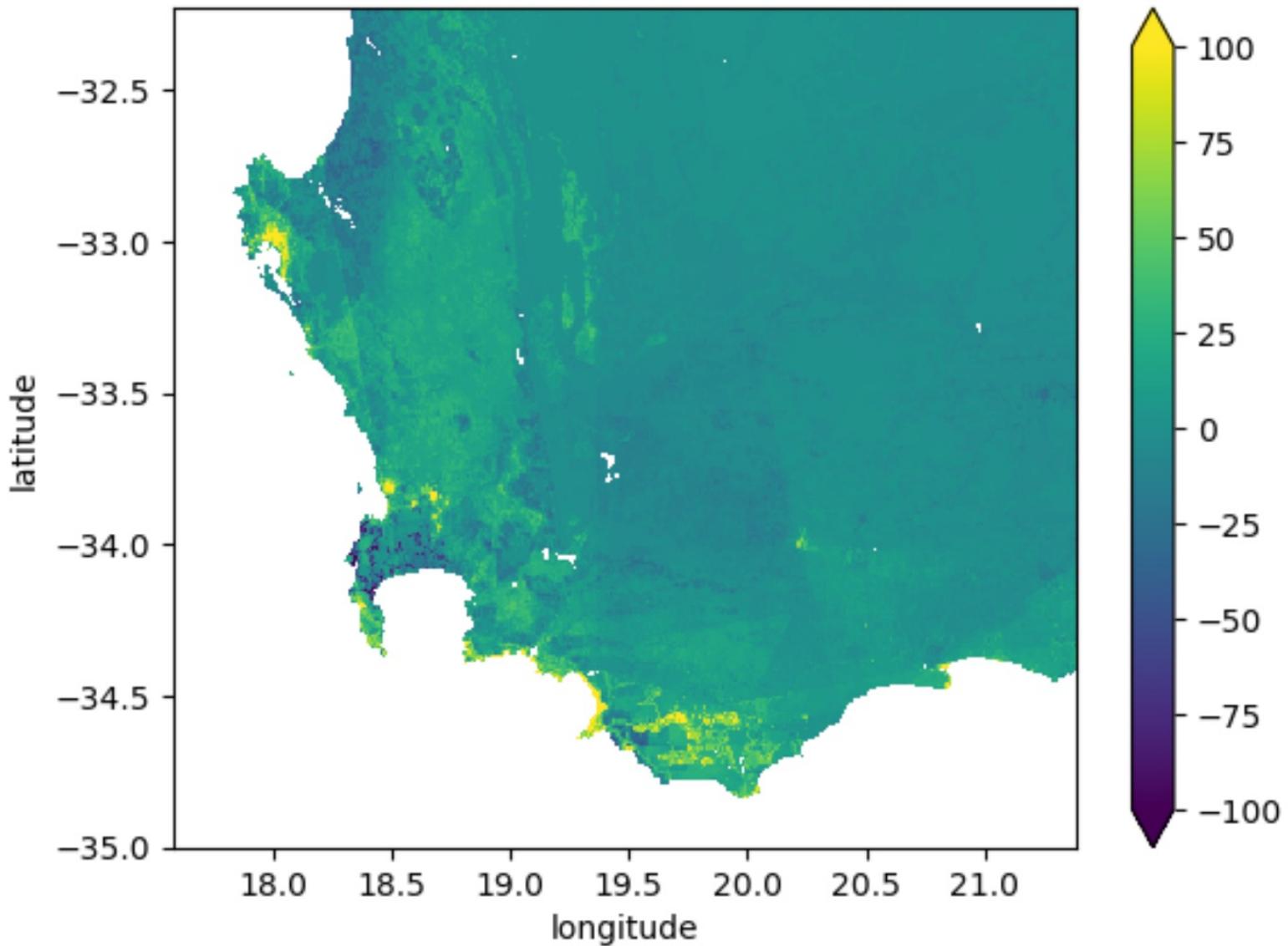
HM overall at 1km

1990 1995 2000 2005 2010 2015 2020

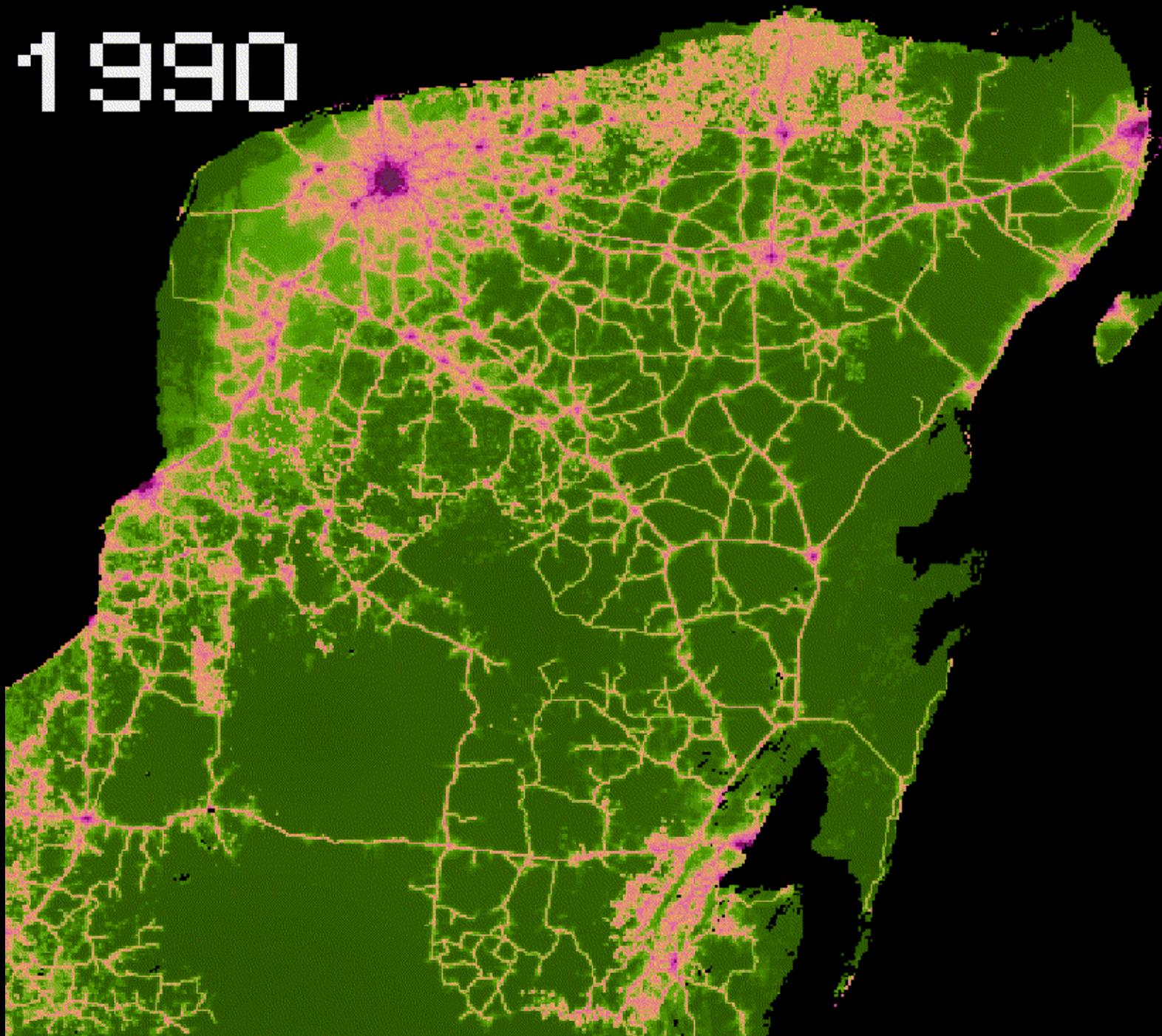
Human Modification forecasting



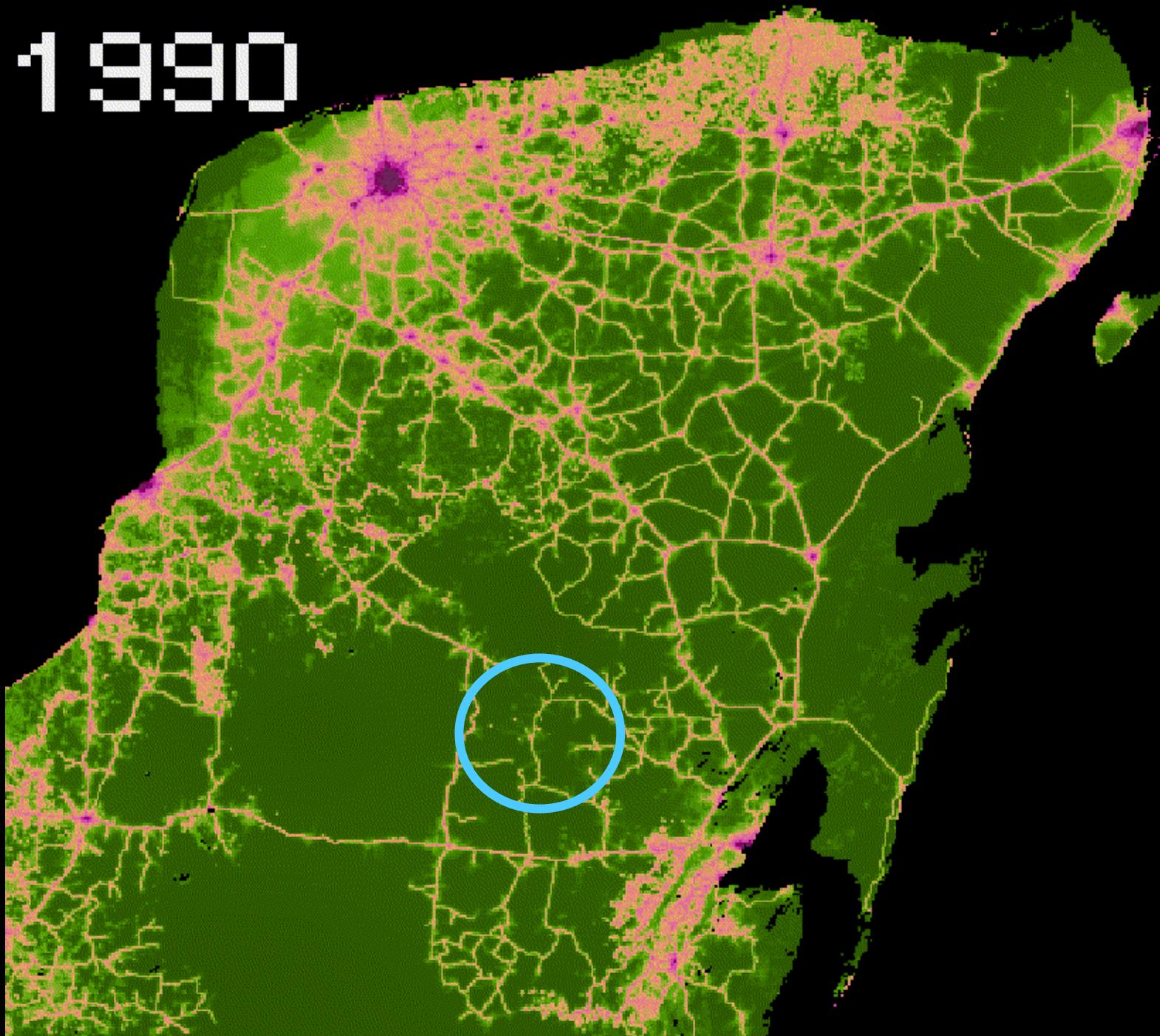
Human Modification forecasting



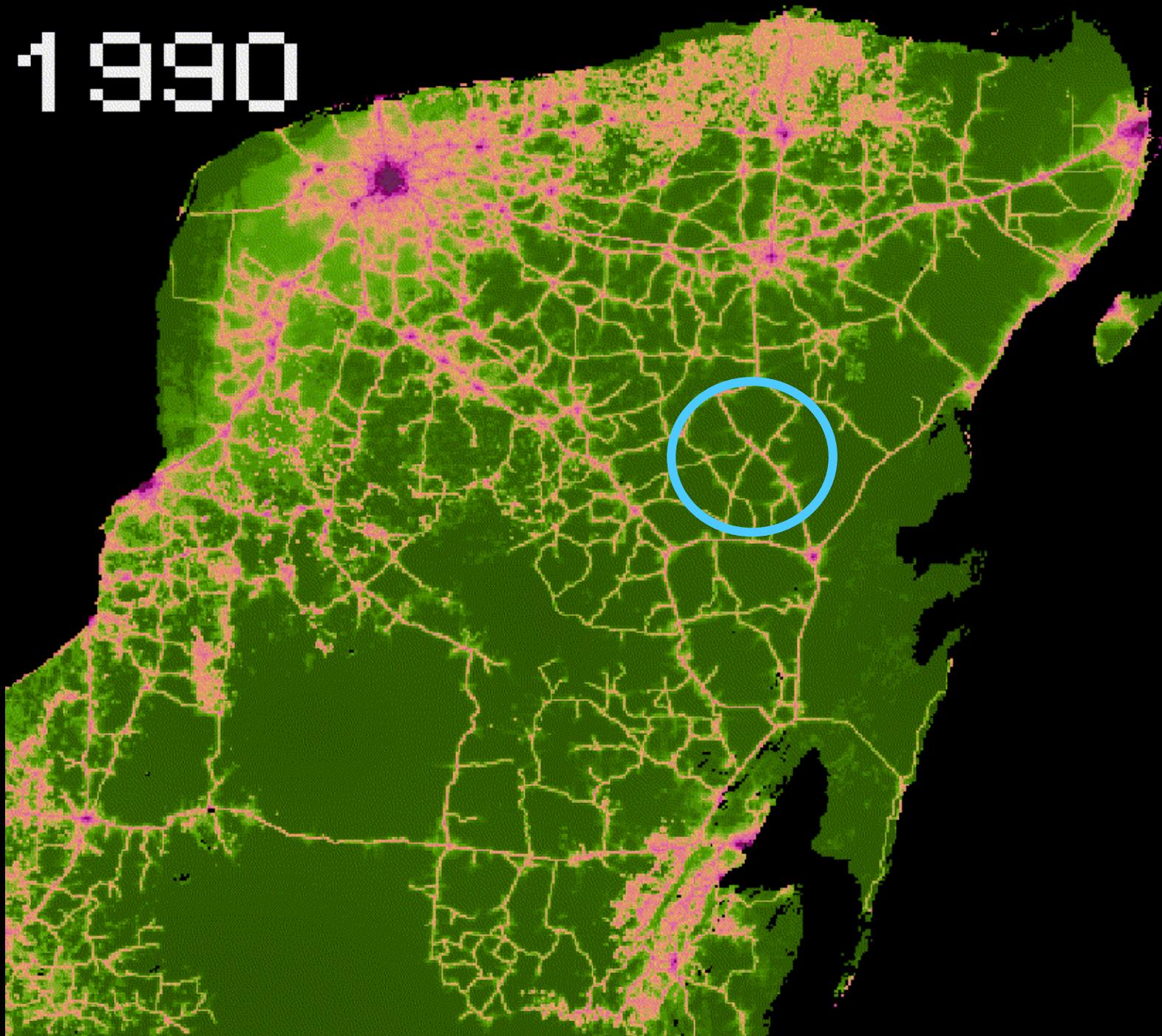
1990



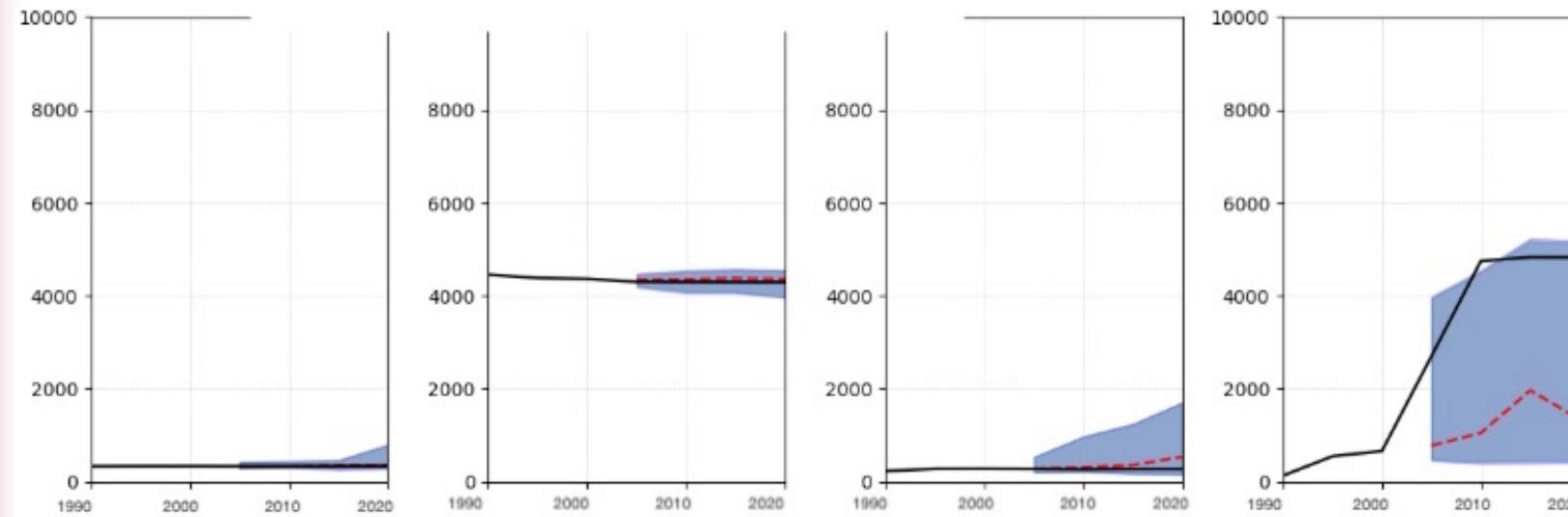
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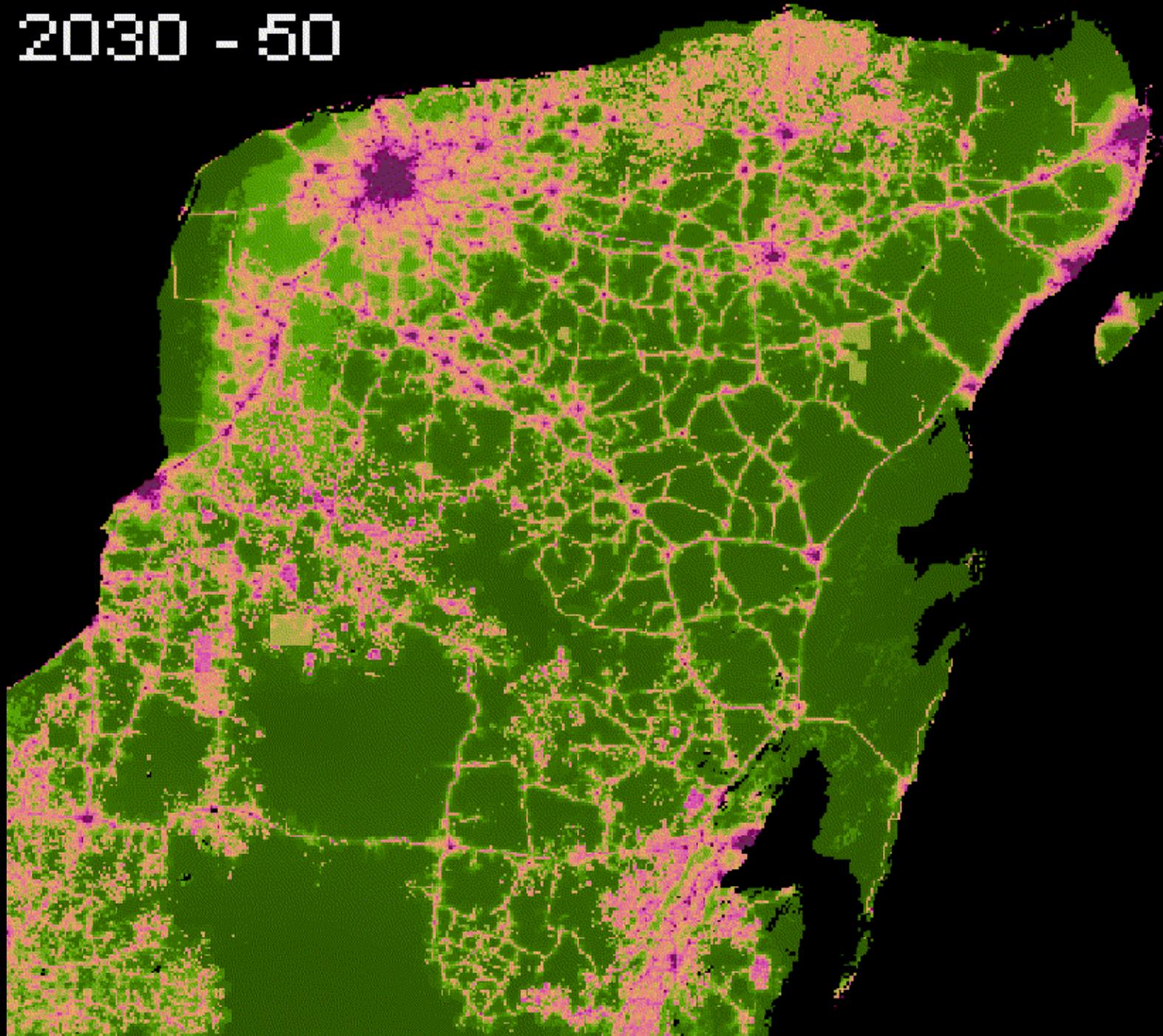
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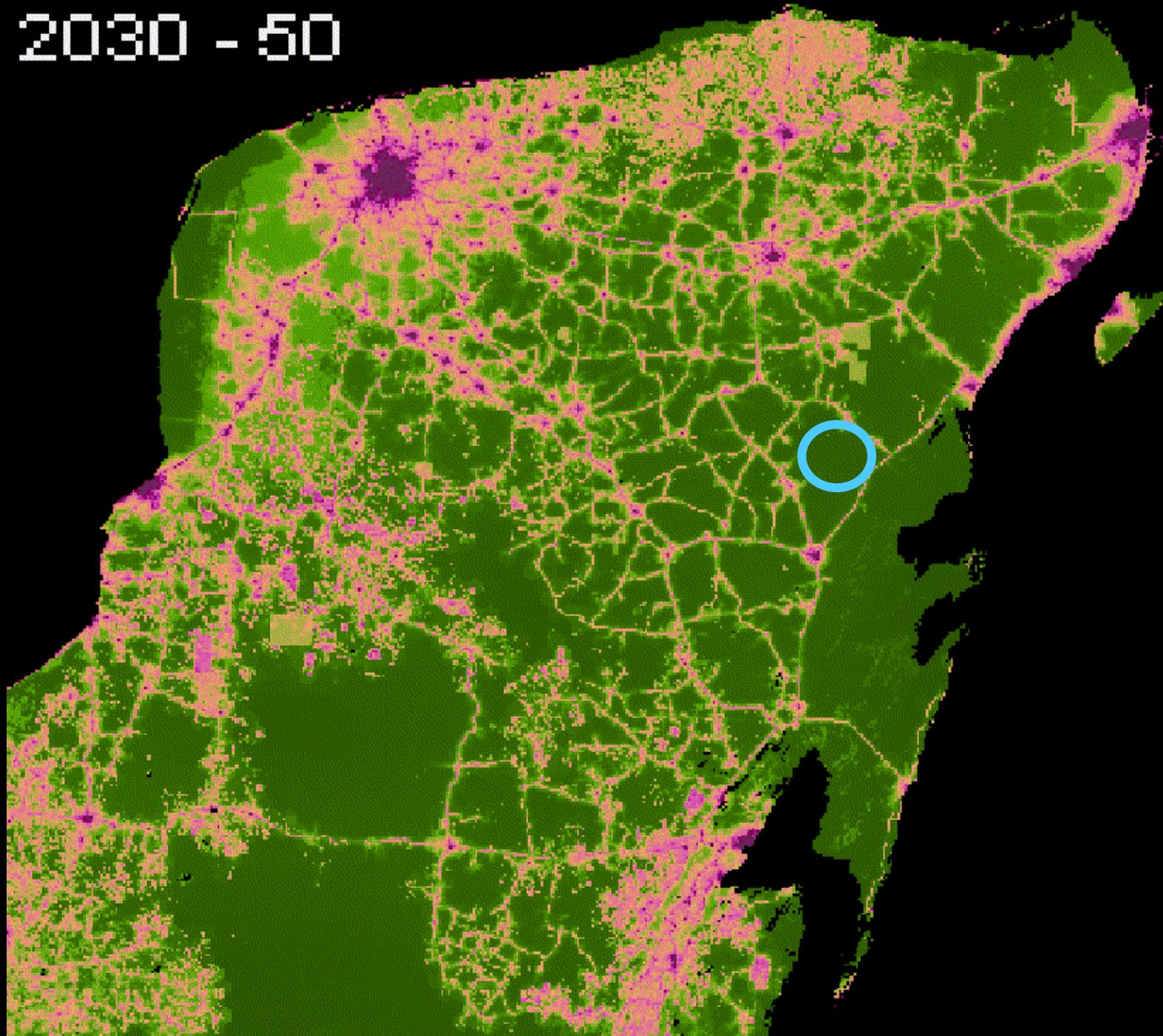
Human Modification forecasting



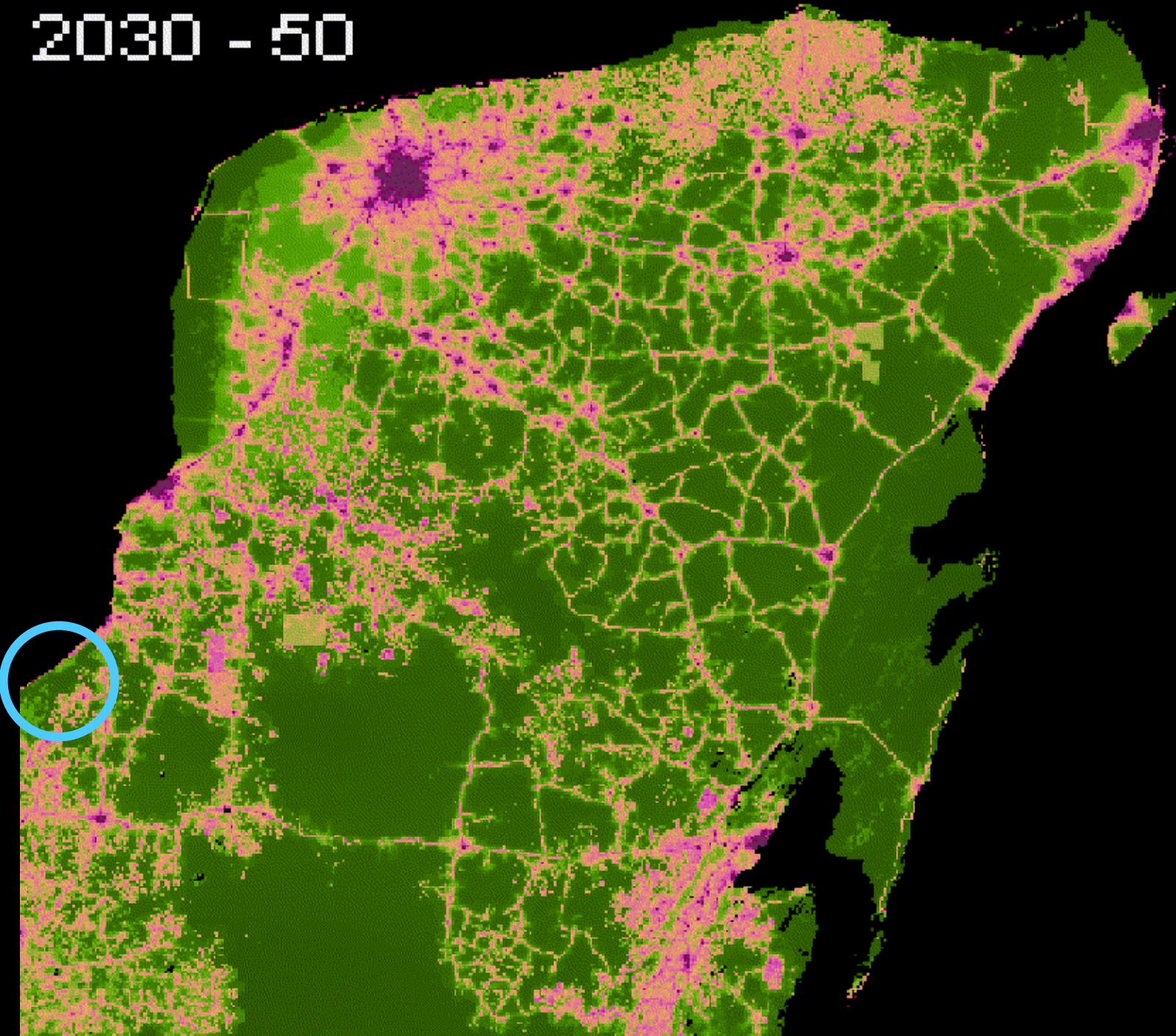
2030 - 50

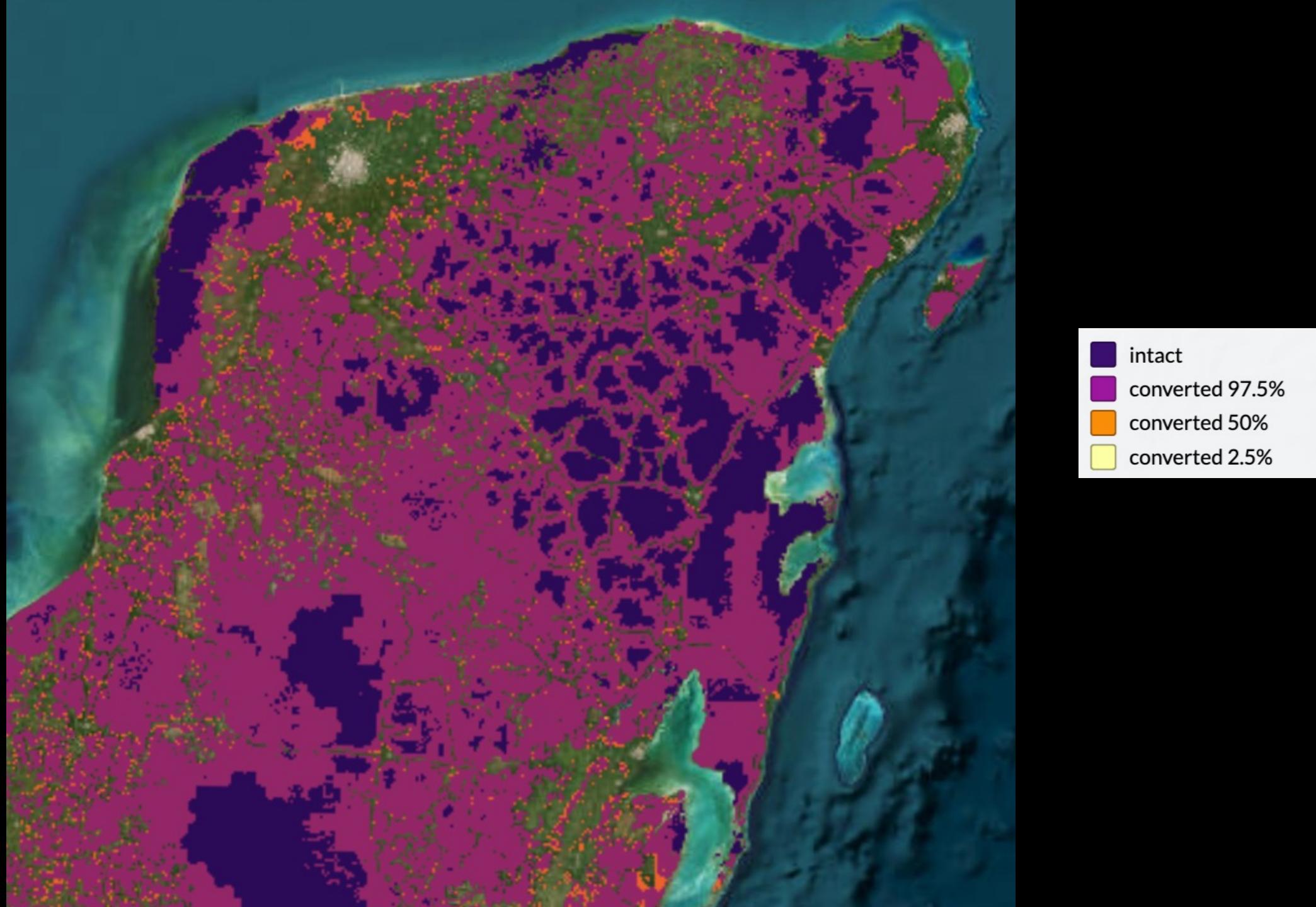


2030 - 50



2030 - 50





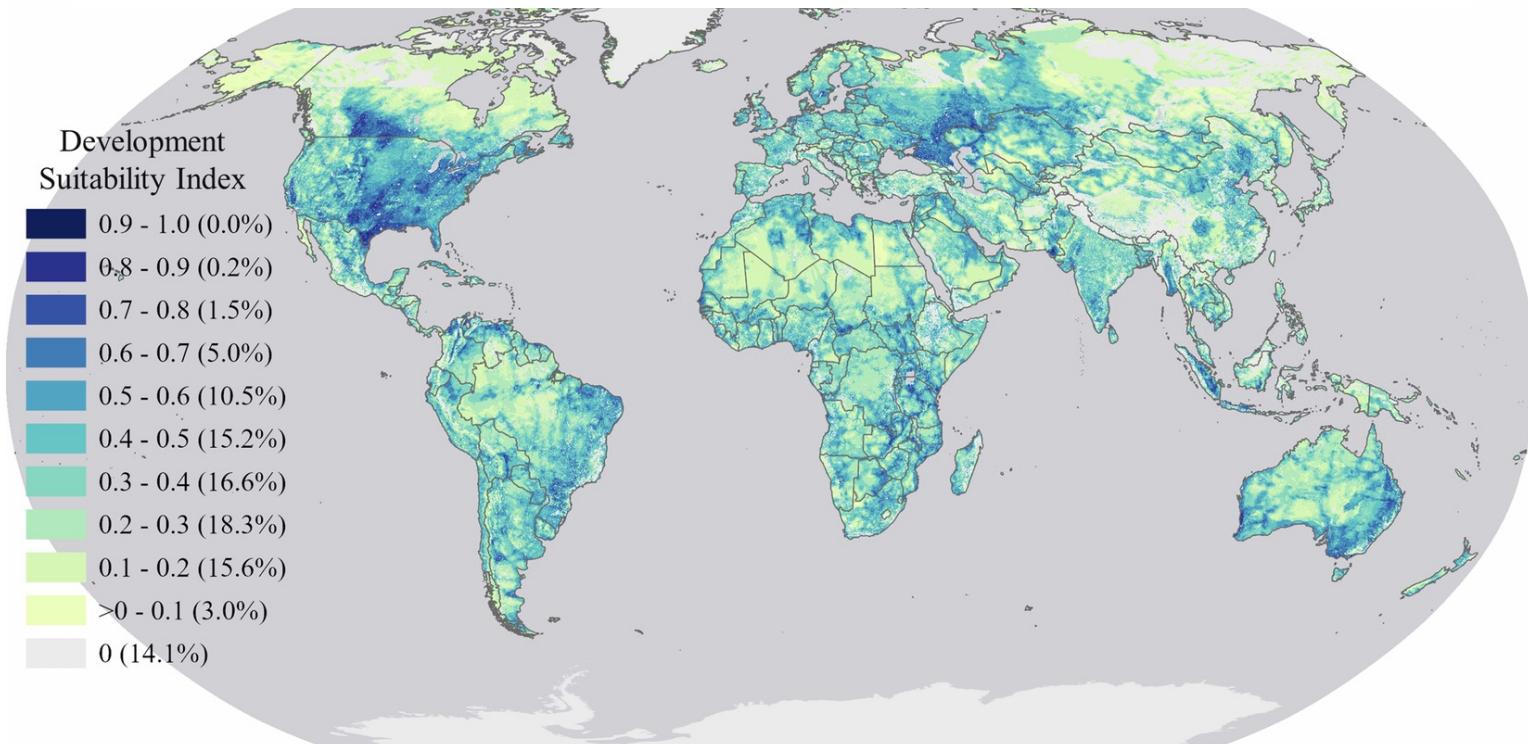
What about the distant future?

- Threats become very uncertain
- Scenarios
- Efforts to quantify development suitability
- But we can still determine some areas with high certainty



Mapping global development potential for renewable energy, fossil fuels, mining and agriculture sectors

James R. Oakleaf¹, Christina M. Kennedy¹, Sharon Baruch-Mordo¹, James S. Gerber^{ID 2},
Paul C. West^{ID 2}, Justin A. Johnson³ & Joseph Kiesecker¹



Treating threat forecasts like forecasts

- Horizons and Baselines
- Ensembles
- Evaluation
- Assimilation



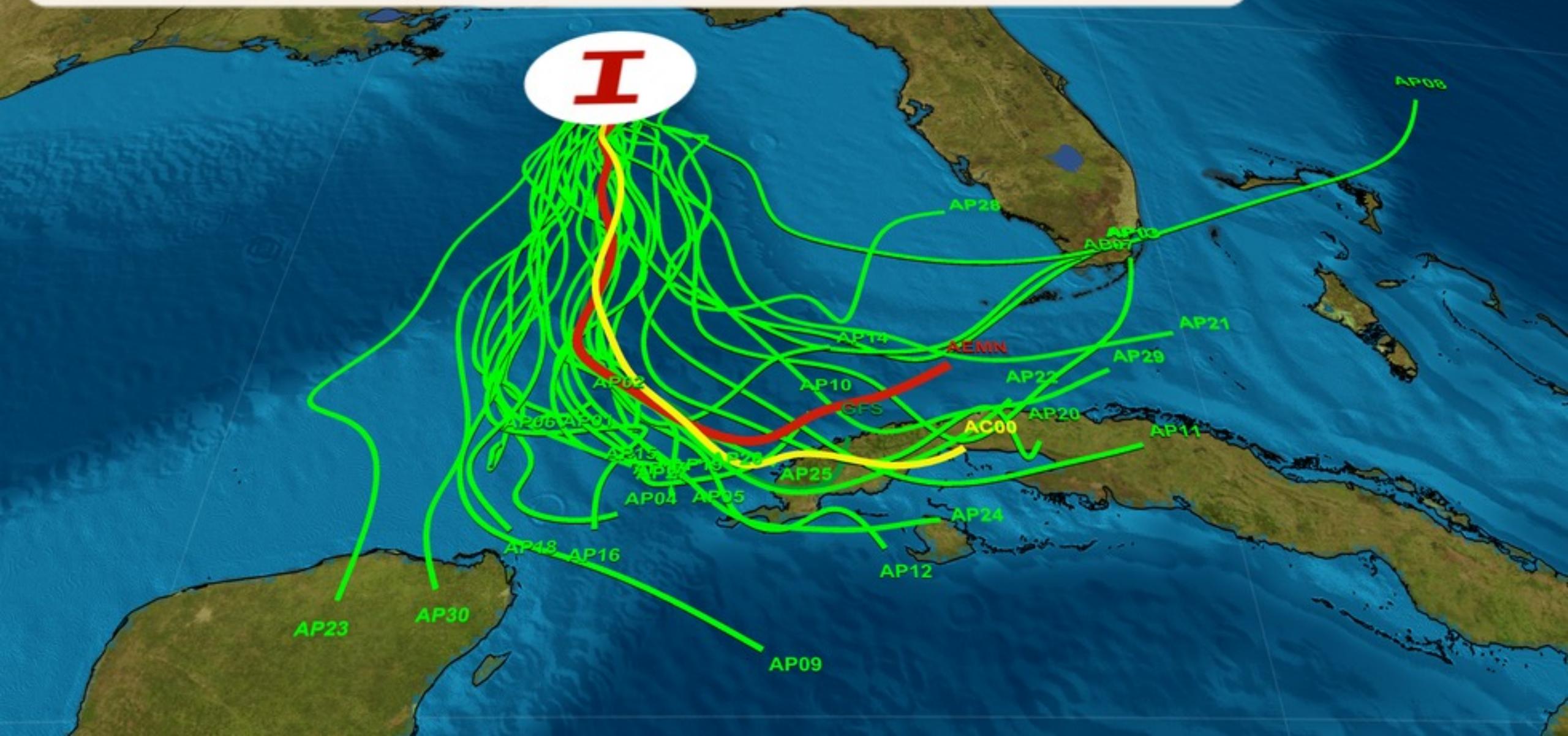
Ecological Forecasting Initiative
UNDERSTAND · MANAGE · CONSERVE

ecoforecast.org
ecoforecast.africa

Global Forecast System Ensemble Suite

8:00 A.M.

Models Operational GFS Ensemble Average Ensemble Members



Treating threat forecasts like forecasts

- Horizons and Baselines
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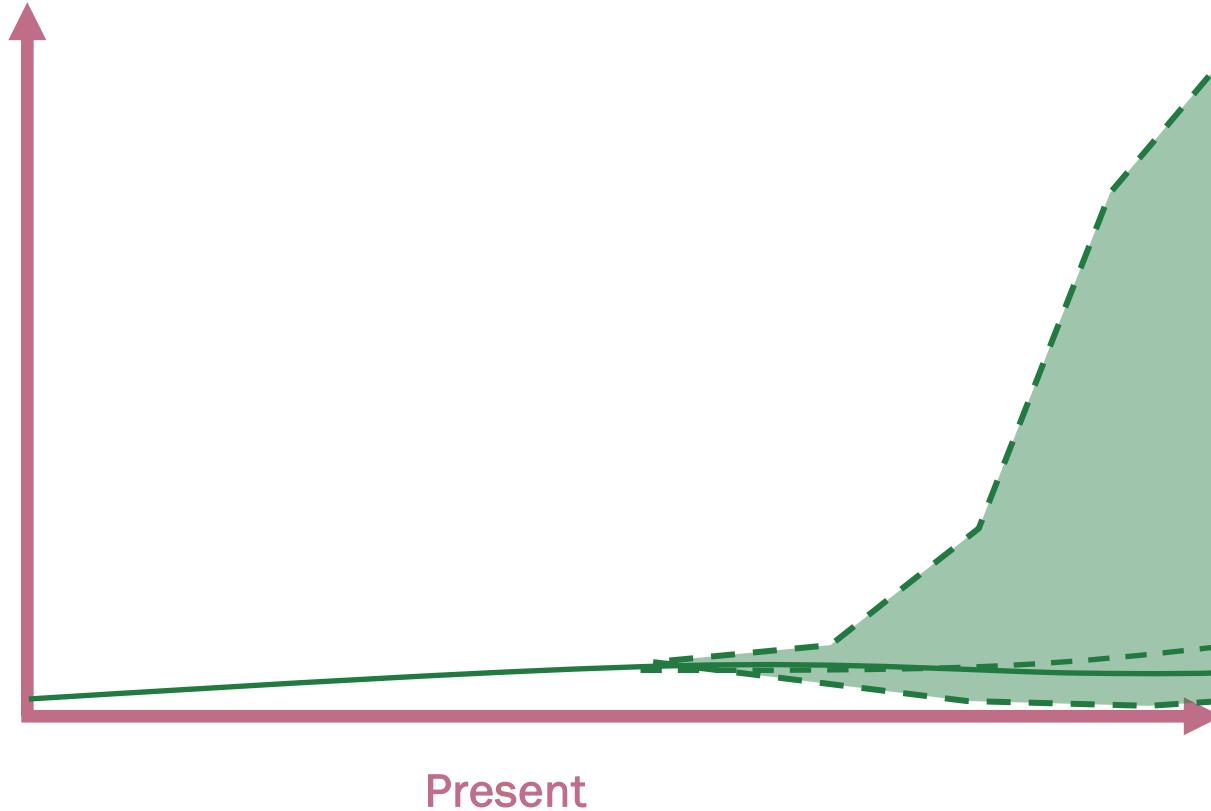


Ecological Forecasting Initiative
UNDERSTAND · MANAGE · CONSERVE

ecoforecast.org

Threats and frontier vs wilderness conservation

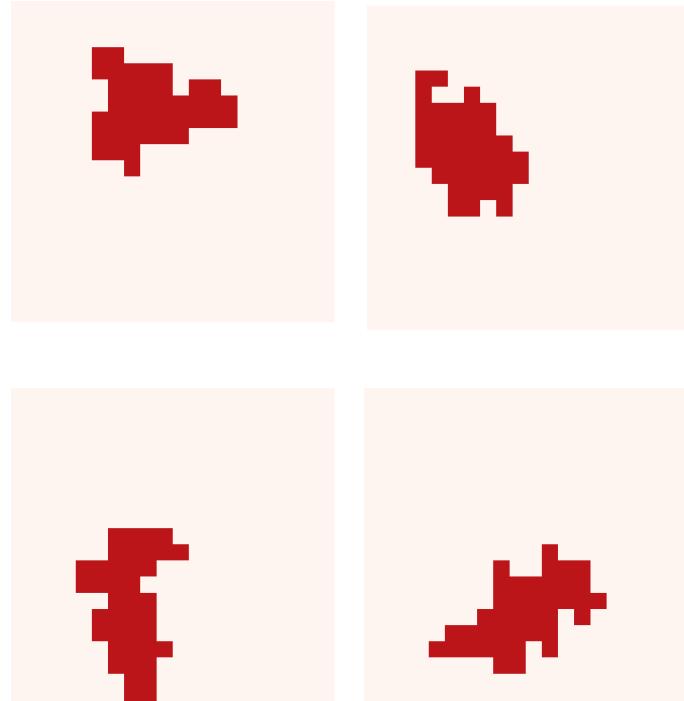
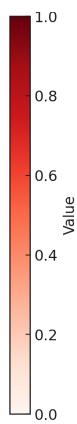
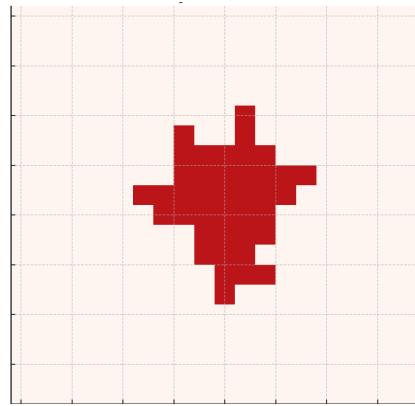
- Better threat forecasts can help
- Forecasts can help us identify the frontier
- They can help us identify the regions where uncertainty is high
- Where is there no risk under any reasonable set of assumptions



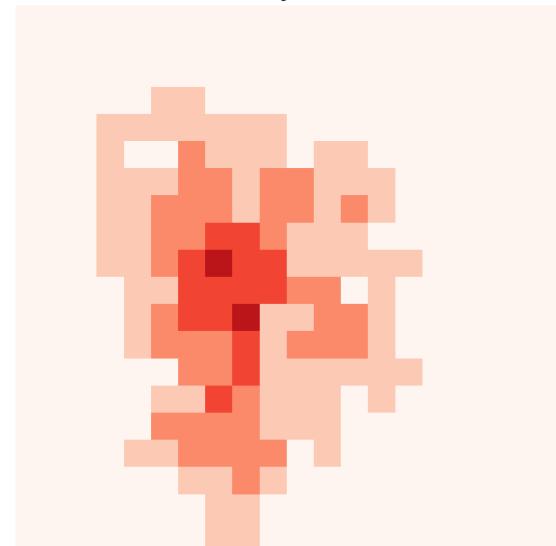


Thank you

glenn.moncrieff@tnc.org



Exceedance Probability (>0.7) Across 5 Grids



Pixels Exceeding 0.7 in Average Grid

