

Prospects for biodiversity conservation: Lessons from Atlantic Forest



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www.ufpe.br/ecoplan/

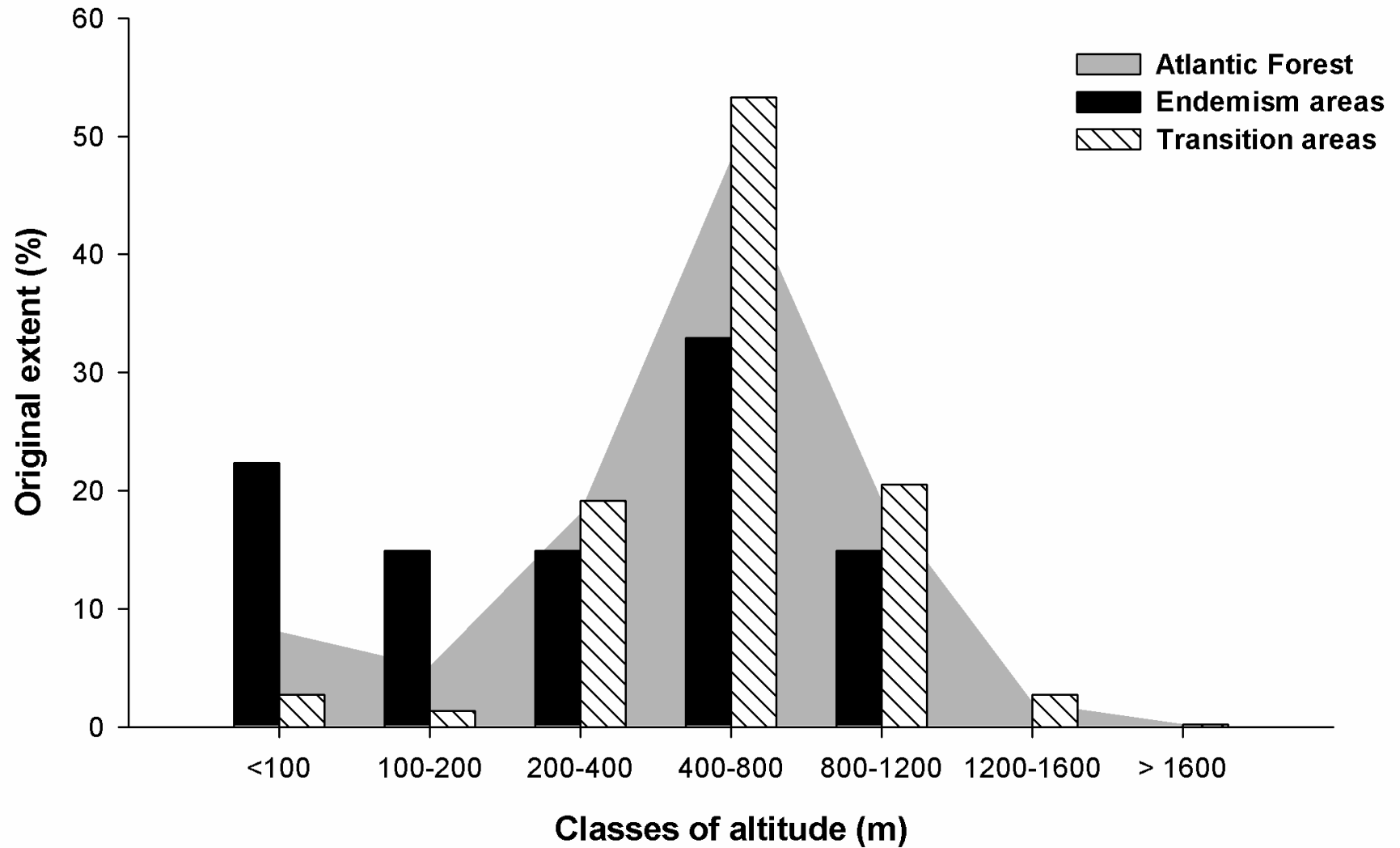
Talk content

- Major findings from the Atlantic Forest research;
- Forest response to human disturbances;
- Forces modulating forest response;
- Prospect for biodiversity in human-modified landscapes;
- Implications for conservation and research agenda.



**Finding 1: Biodiversity is not distributed
randomly**

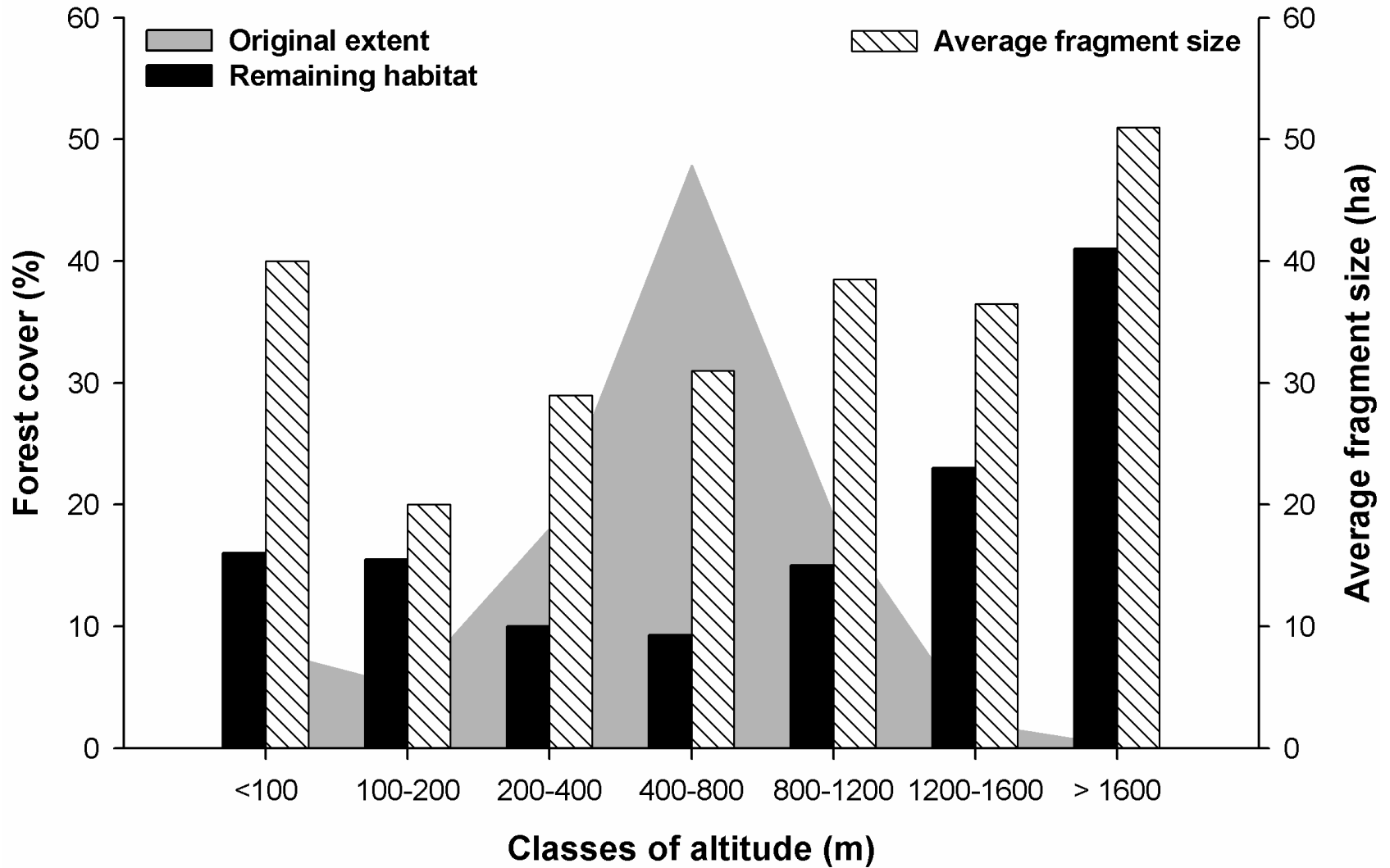
Altitudinal distribution



An aerial photograph showing a landscape with rolling green hills and a dense forest. A winding road or path is visible, cutting through the green fields. The background shows more distant hills under a clear sky.

Finding 2: Habitat loss is highly deterministic

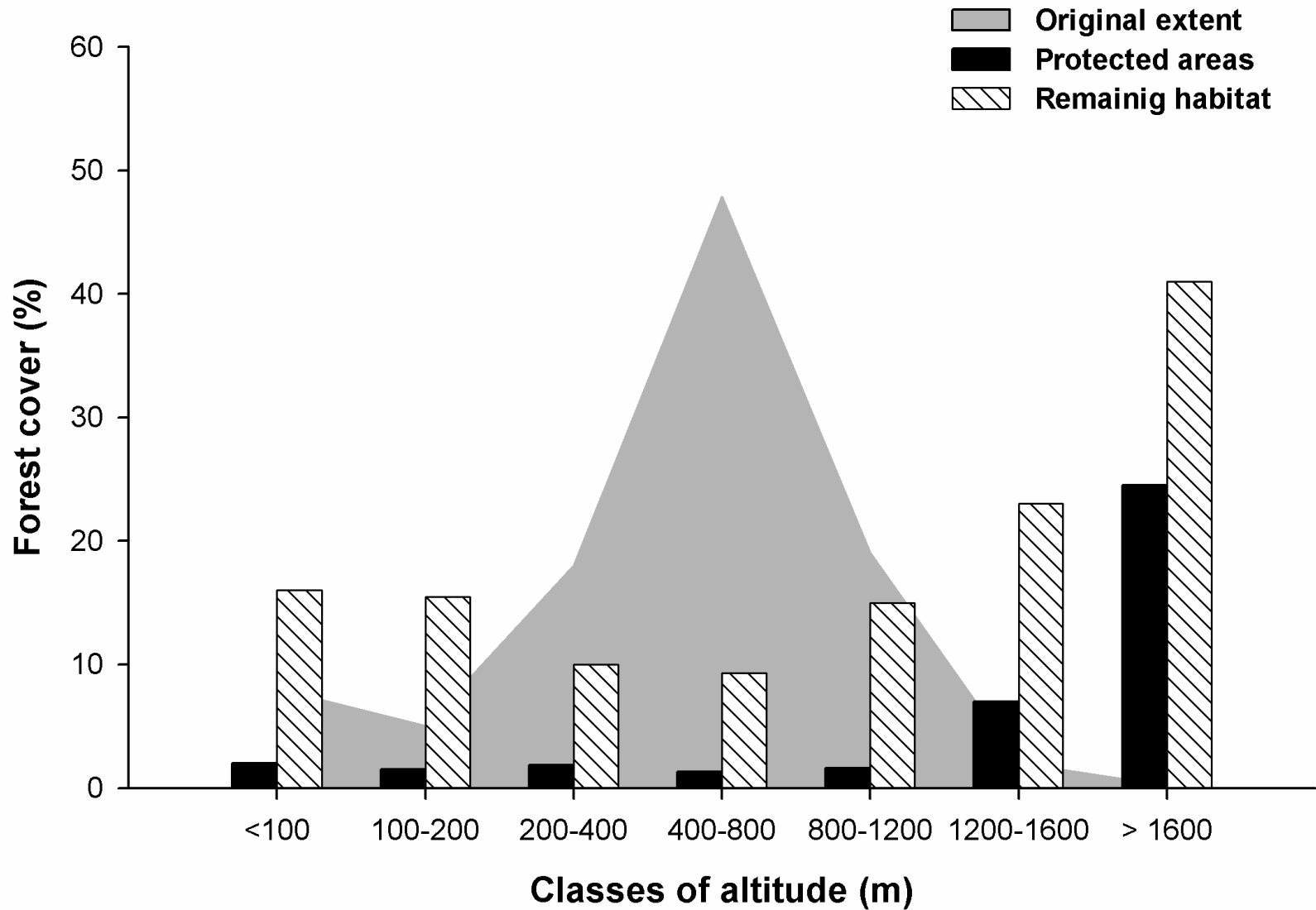
Habitat loss



An aerial photograph of a landscape. The foreground and middle ground show rolling green hills with a winding dirt road. The hills are partially covered with dense, dark green forest. In the background, there are more hills and a range of mountains under a blue sky with light clouds. A white, rounded rectangular box is overlaid on the left side of the image, containing the text.

Finding 3: Habitat protection is biased

Distribution of forest protection effort





Finding 4: Human disturbances drive tropical forests to hyper-fragmented landscapes

Human disturbances

Intact forest
landscapes

Land-use intensification

Human-modified
Hyper-fragmented landscapes
(HML)

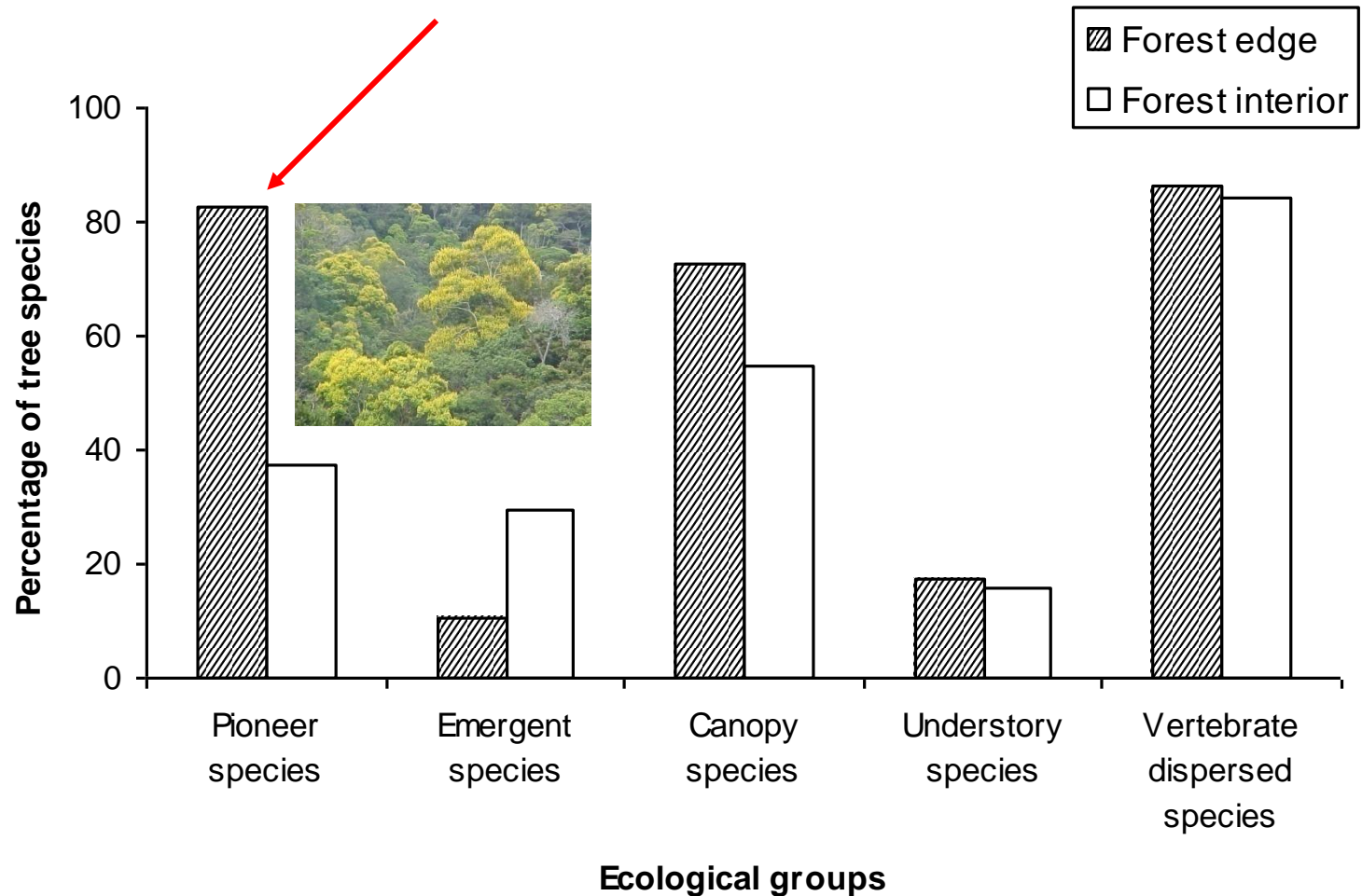


+ Forest cover and structural connectivity -

An aerial photograph of a landscape featuring rolling green hills and a dense forest. A winding road or path is visible, cutting through the green fields. The background shows more distant, hazy hills under a clear sky.

**Finding 5: Disturbance-adapted species
proliferate in HML**

Proliferation of pioneer species on edge-affected habitats of Atlantic Forest



Proliferating species (winners!)

- Birds
- Reptiles
- Non-flying mammals
- Bats
- Ants

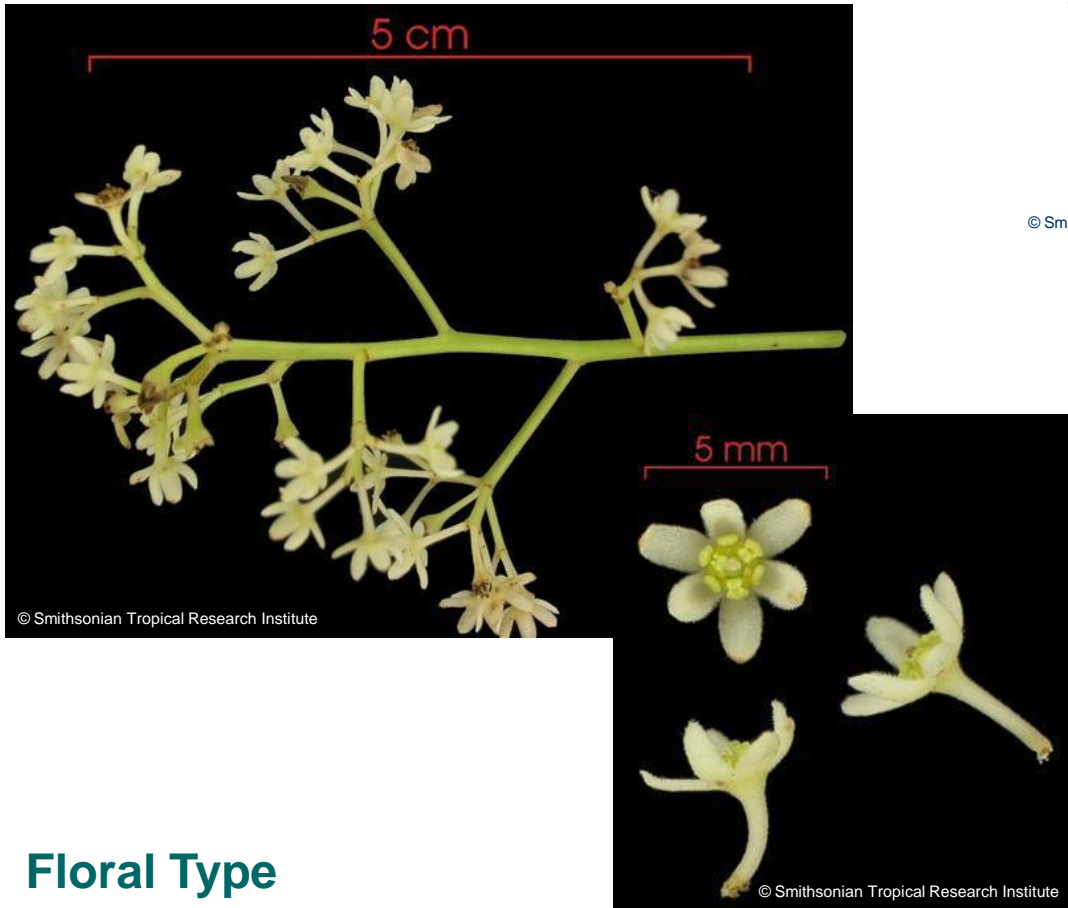


8 col/ha ←

An aerial photograph of a landscape featuring rolling green hills and a dense forest. A winding road or path is visible, cutting through the green fields. The background shows more distant hills under a clear sky.

**Finding 6: Few biological strategies tend to
persist in HML**

Inconspicuous flowers, pollinated by “diverse small insects” (DSI) are more frequent in **edge-affected habitats and within pioneers**

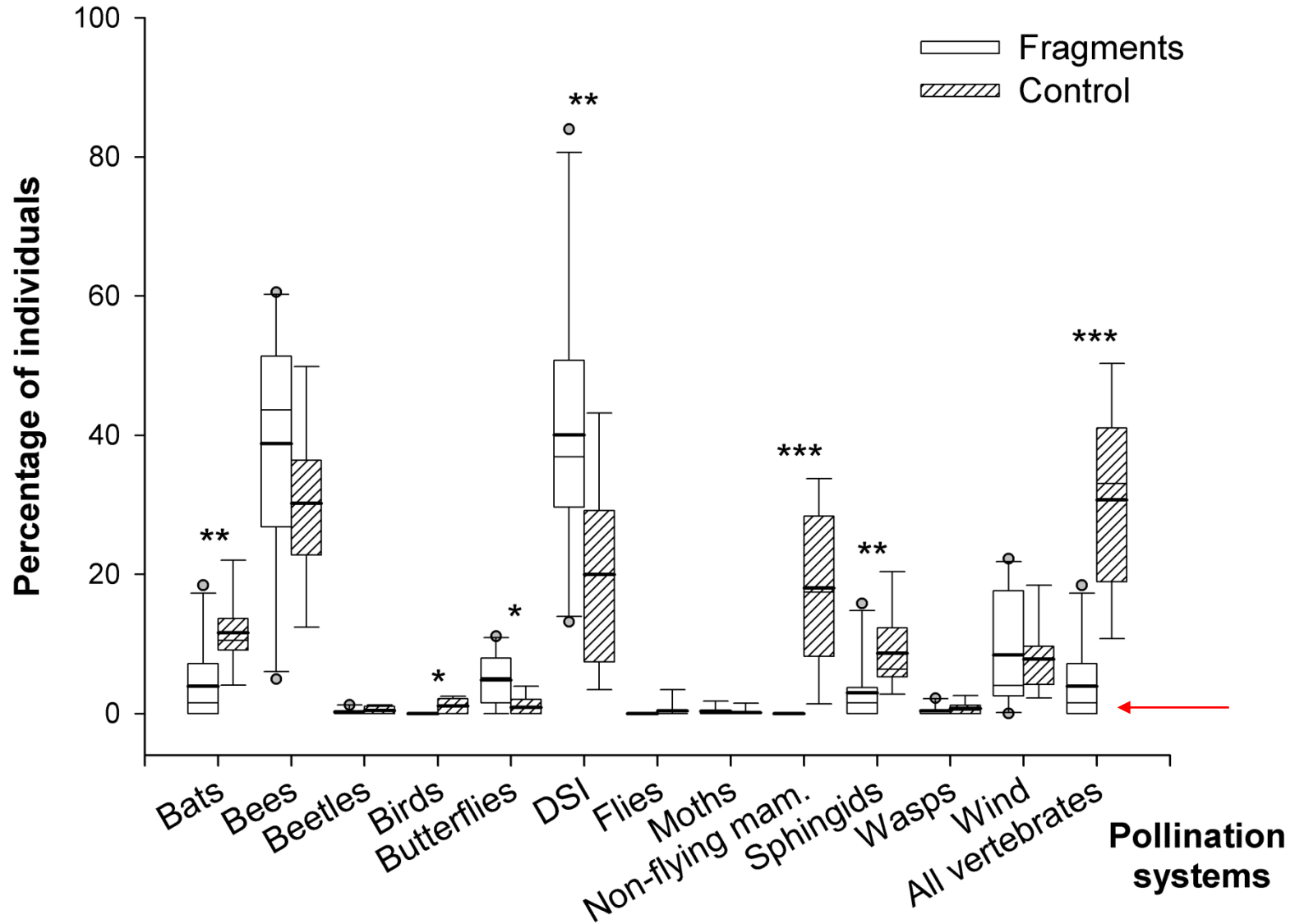


Floral Type



Finding 7: Biological strategies typical of the old-growth flora tend to disappear

Extirpation of sensitive tree functional groups



Non-inconspicuous/open flowers are more frequent in forest interior plots and within old-growth flora



Brush flowers



Tube flower



Camera flower

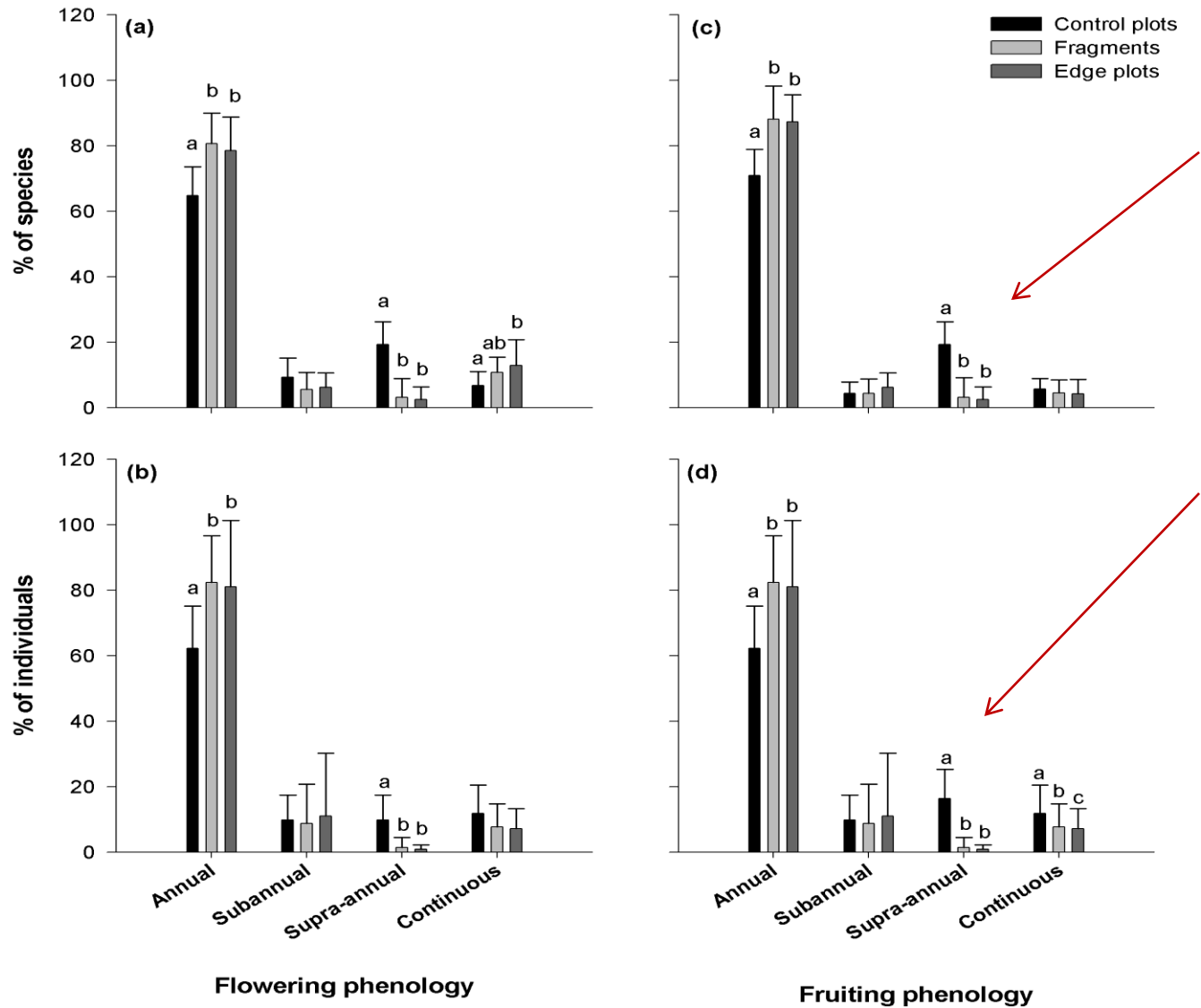


Flag flowers



Floral Types

Reproductive strategies of tree species



Small fragments support...

- 50% of tree species richness;
- 30% of large-seeded species;
- 40% of shade-tolerant species;
- 25% of emergent tree species;
- < 25% tree species pollinated by vertebrates.

Santos et al. 2008 Biol. Conserv.

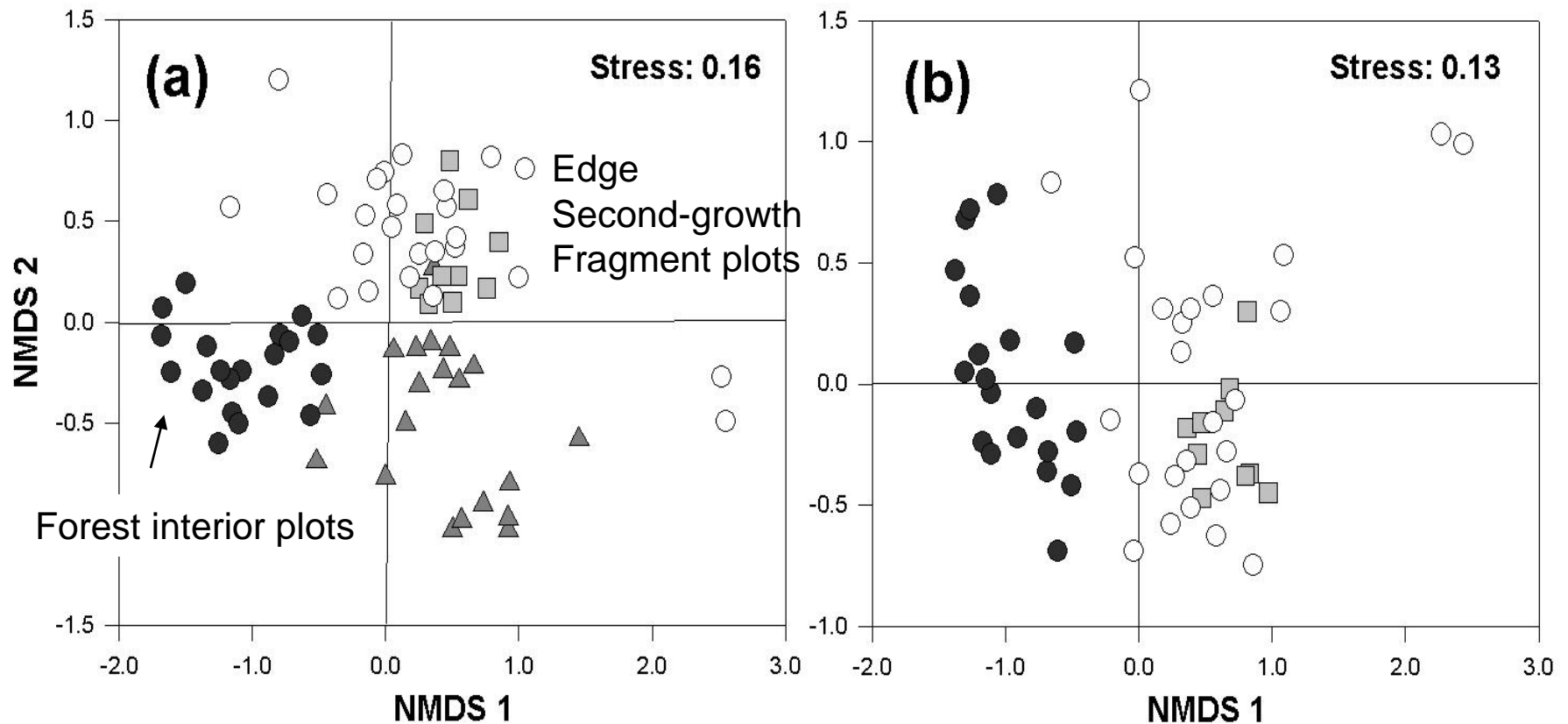
Girão et al. 2007 PLoS One

Oliveira et al. 2008 Forest Ecol & Manag

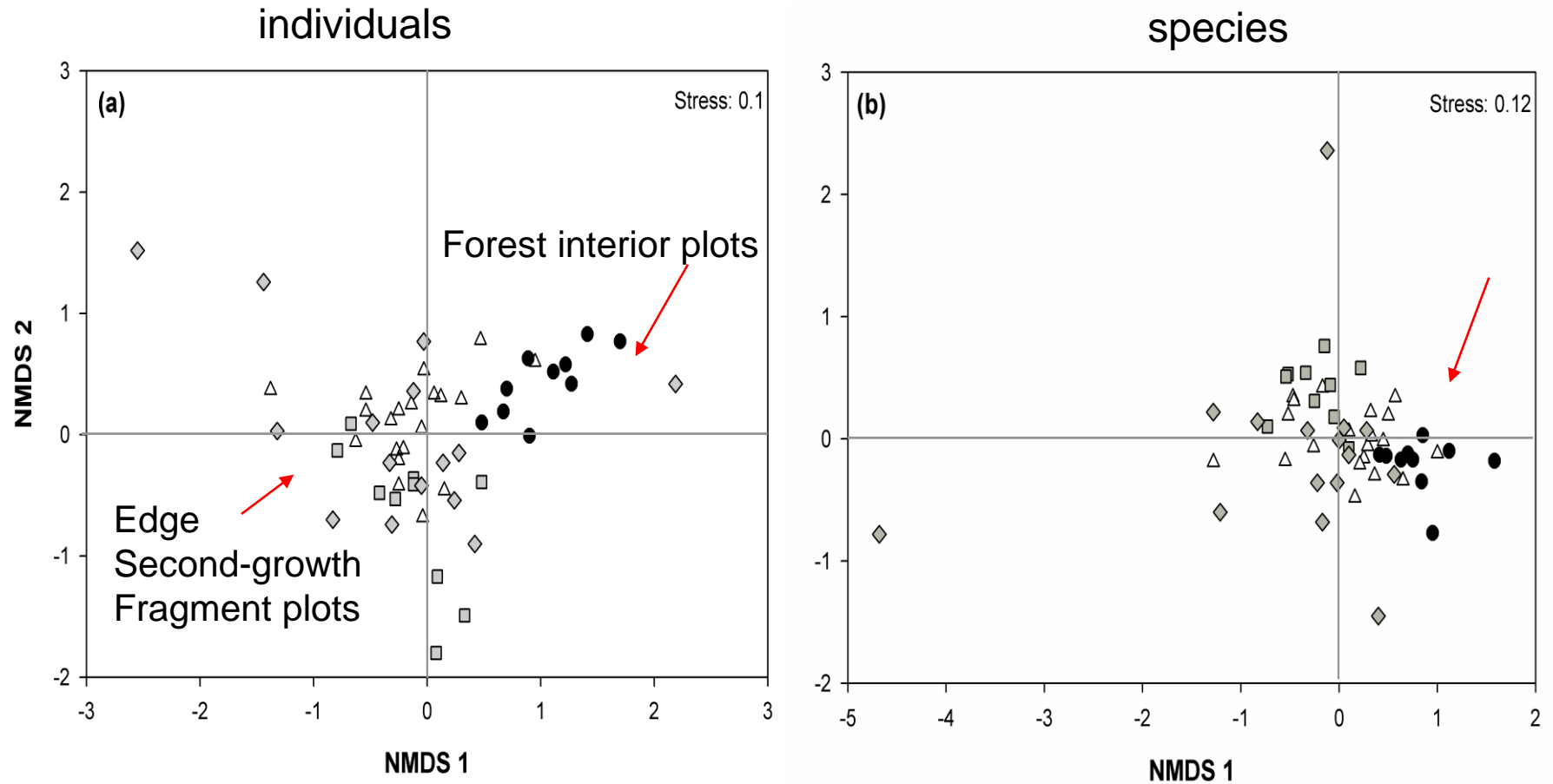
An aerial photograph showing a landscape with a winding river, green fields, and dense forest. The river flows through a valley, surrounded by lush green vegetation. The terrain is hilly, with patches of forest and open fields. The sky is clear and blue.

**Finding 8: Biological communities converge
at local and landscape scales**

Floristic convergence among edge-affected habitats

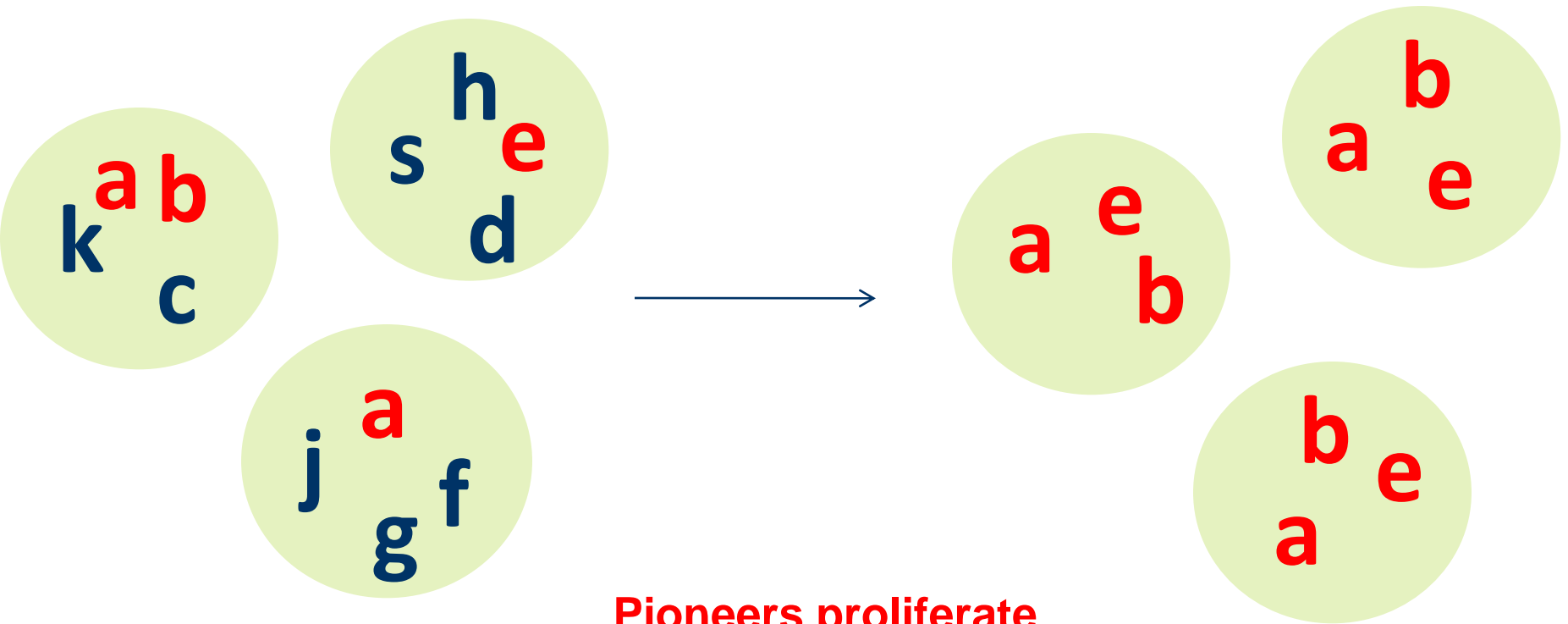


Functional convergence among edge-affected habitats



Tree plot ordination based on reproductive trait abundance

Forest fragments



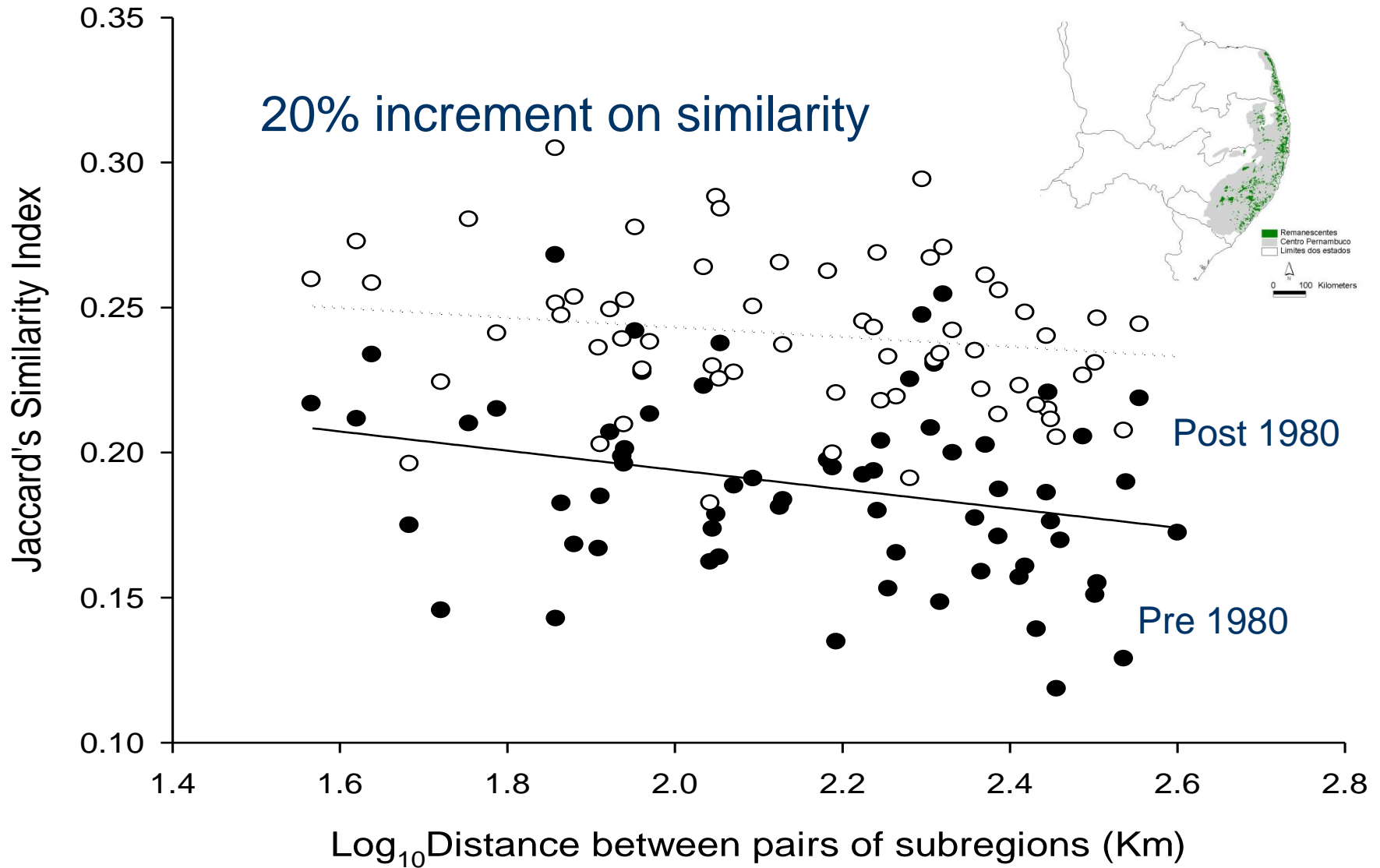
Pioneers proliferate

Old-growth flora collapses



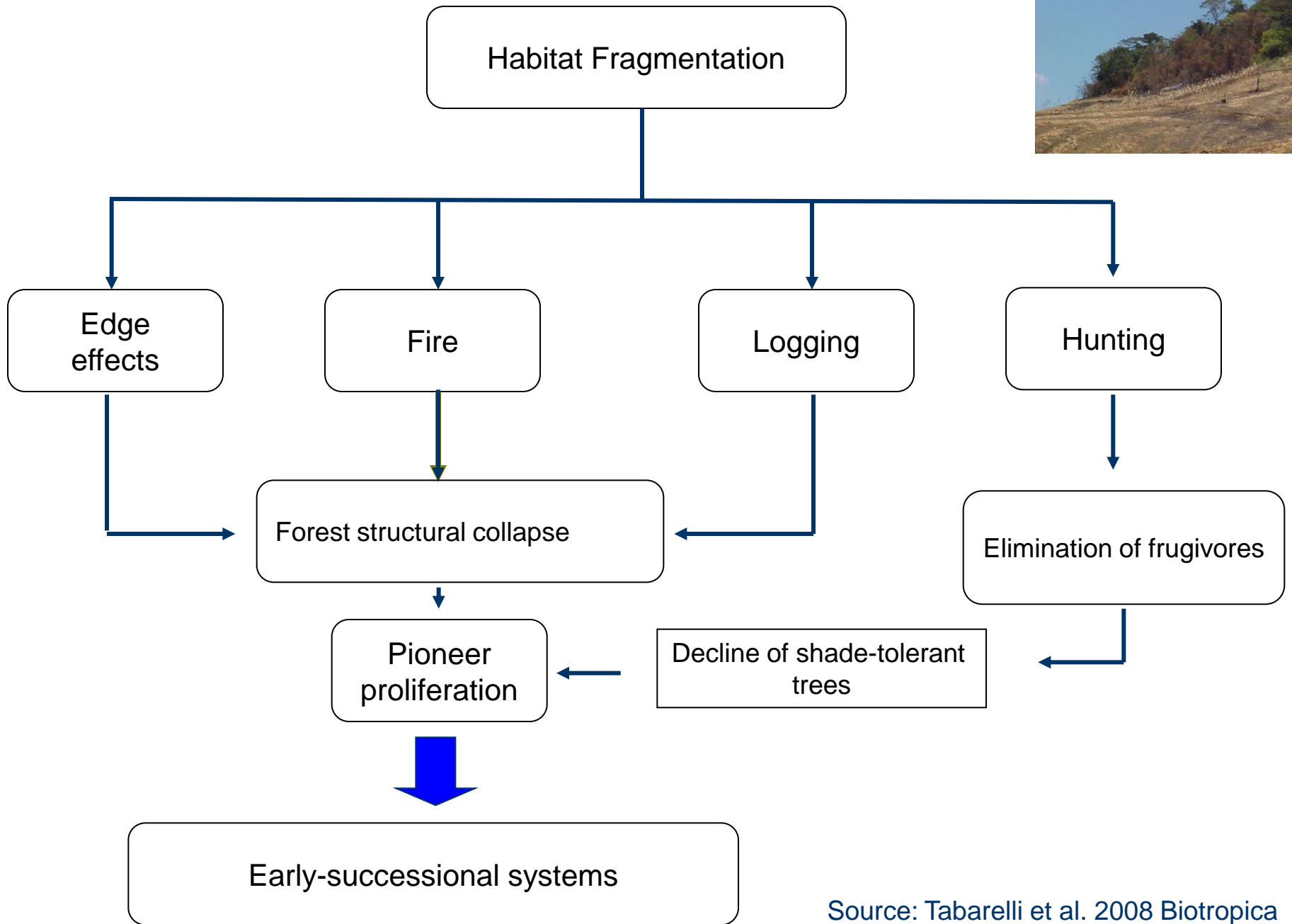
Convergence or biotic homogenization

Taxonomic similarity across sub-regions of Atlantic Forest



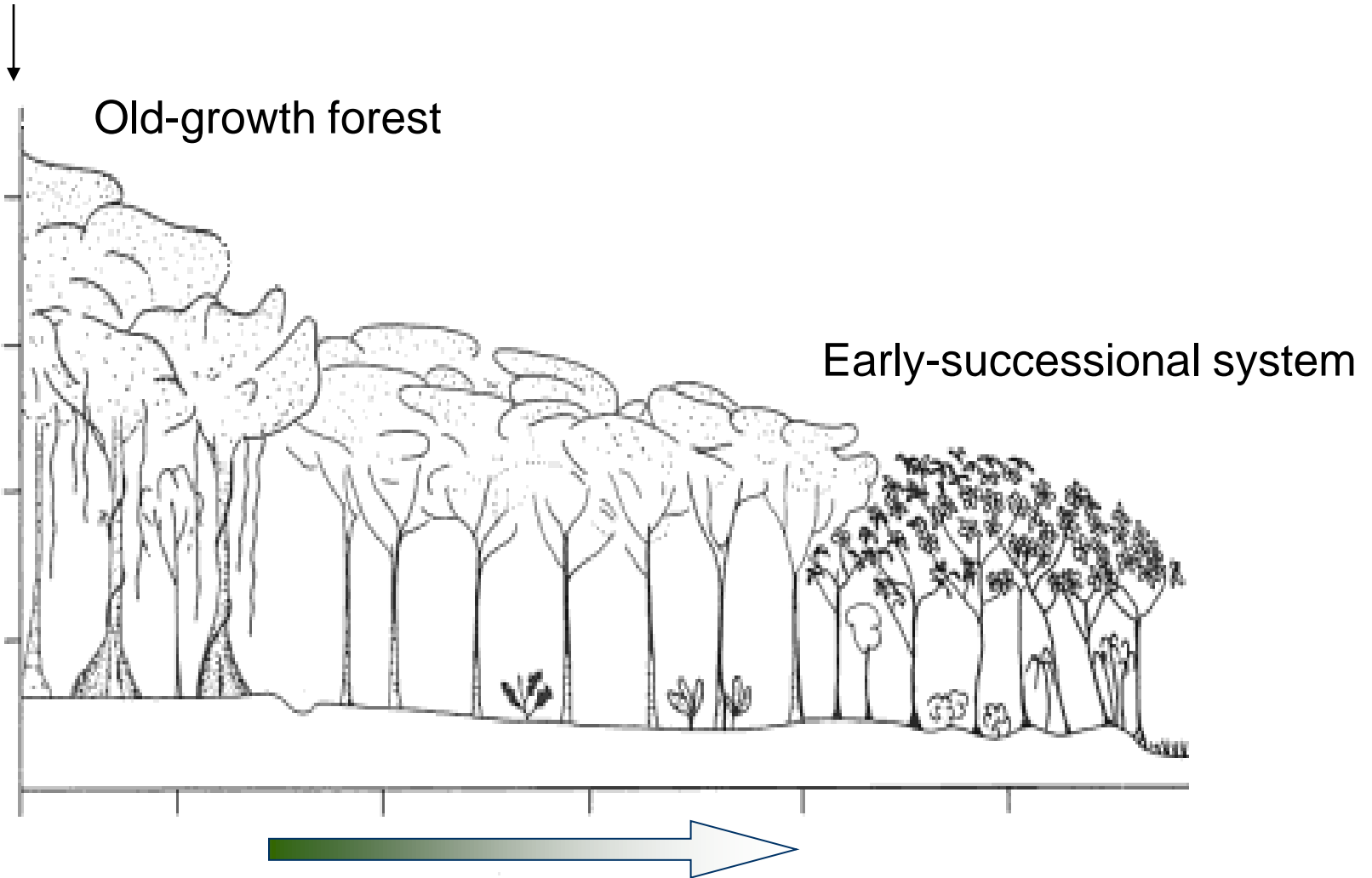
An aerial photograph of a landscape. A winding, reddish-brown dirt road or path cuts through a valley. The valley floor is a mix of dense, dark green forest and cleared, bright green fields. The surrounding hills are also covered in forest, with some areas appearing more open or less dense. The sky is a pale blue with some light clouds. The overall scene suggests a rural or agricultural area where human activity (clearing for fields) is integrated with natural forest cover.

Forest response to human-disturbances



Source: Tabarelli et al. 2008 Biotropica

Creation of forest edges

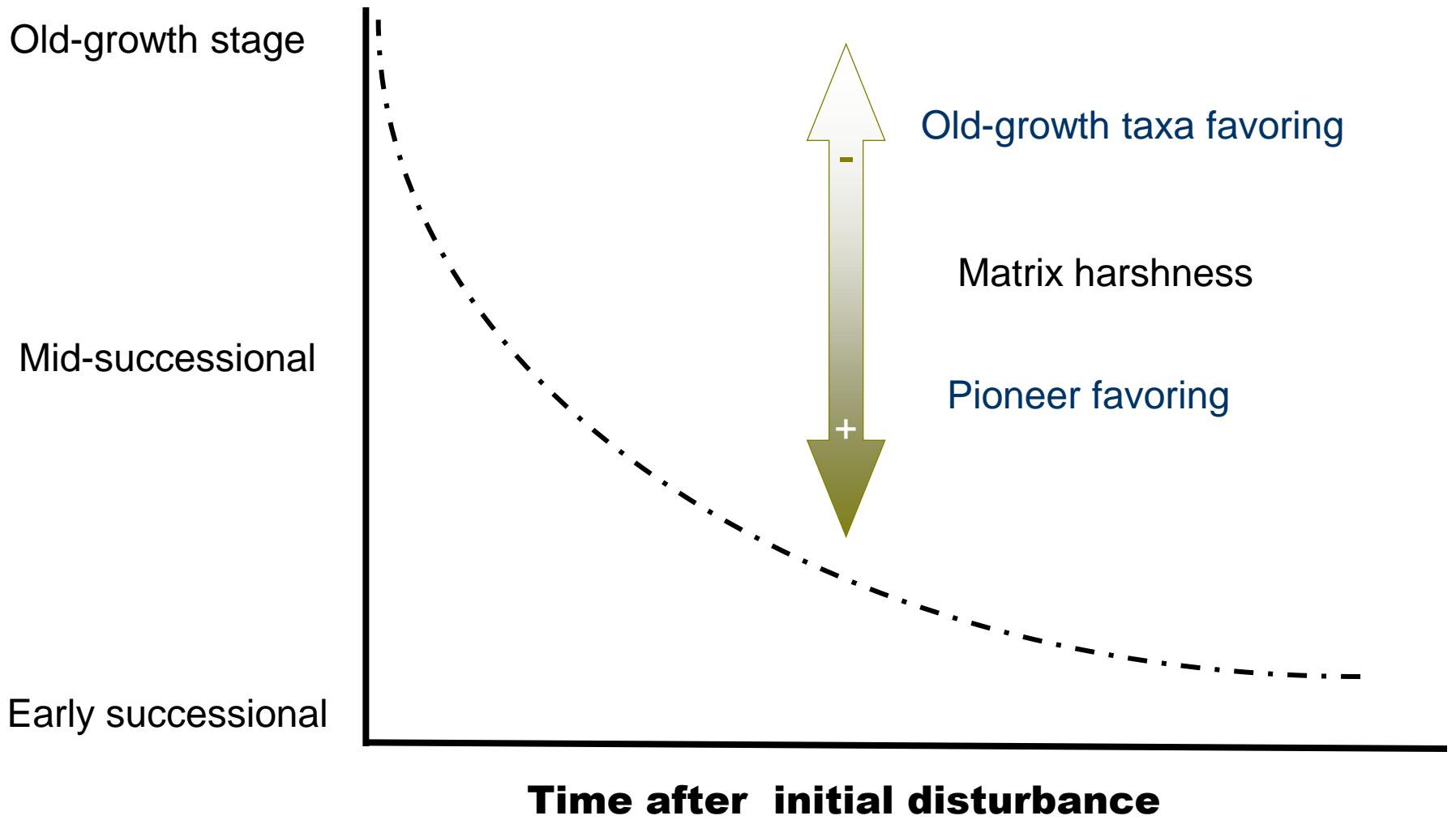


Secondary succession of edge-affected habitats

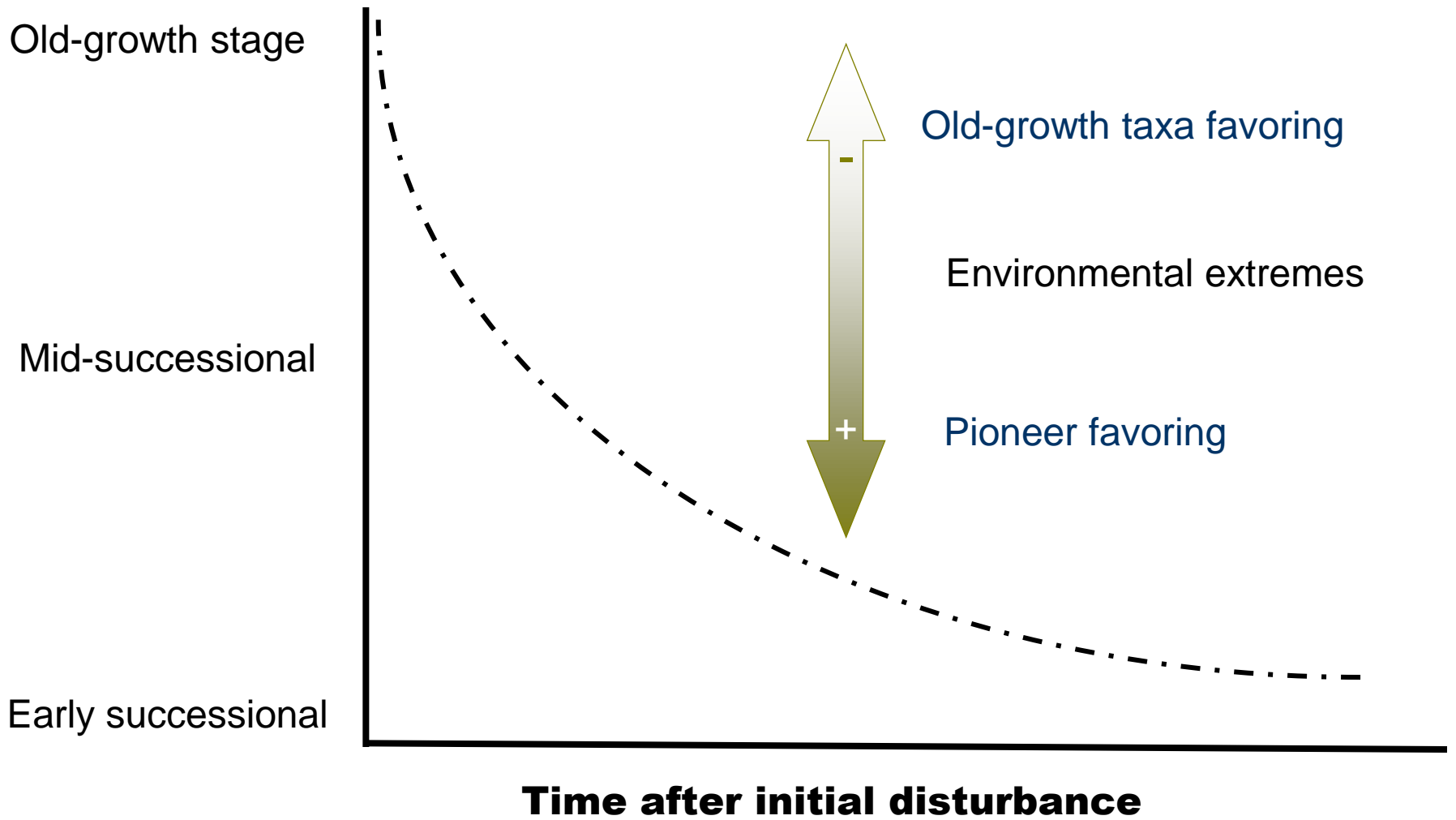
An aerial photograph of a landscape. The foreground and middle ground show rolling green hills, some of which are covered in dense, dark green forest. A winding, light-colored road or path cuts through the greenery. In the background, there are more hills and a range of mountains under a clear blue sky with some light clouds. The overall scene depicts a natural, undisturbed environment.

Forces modulating secundarization

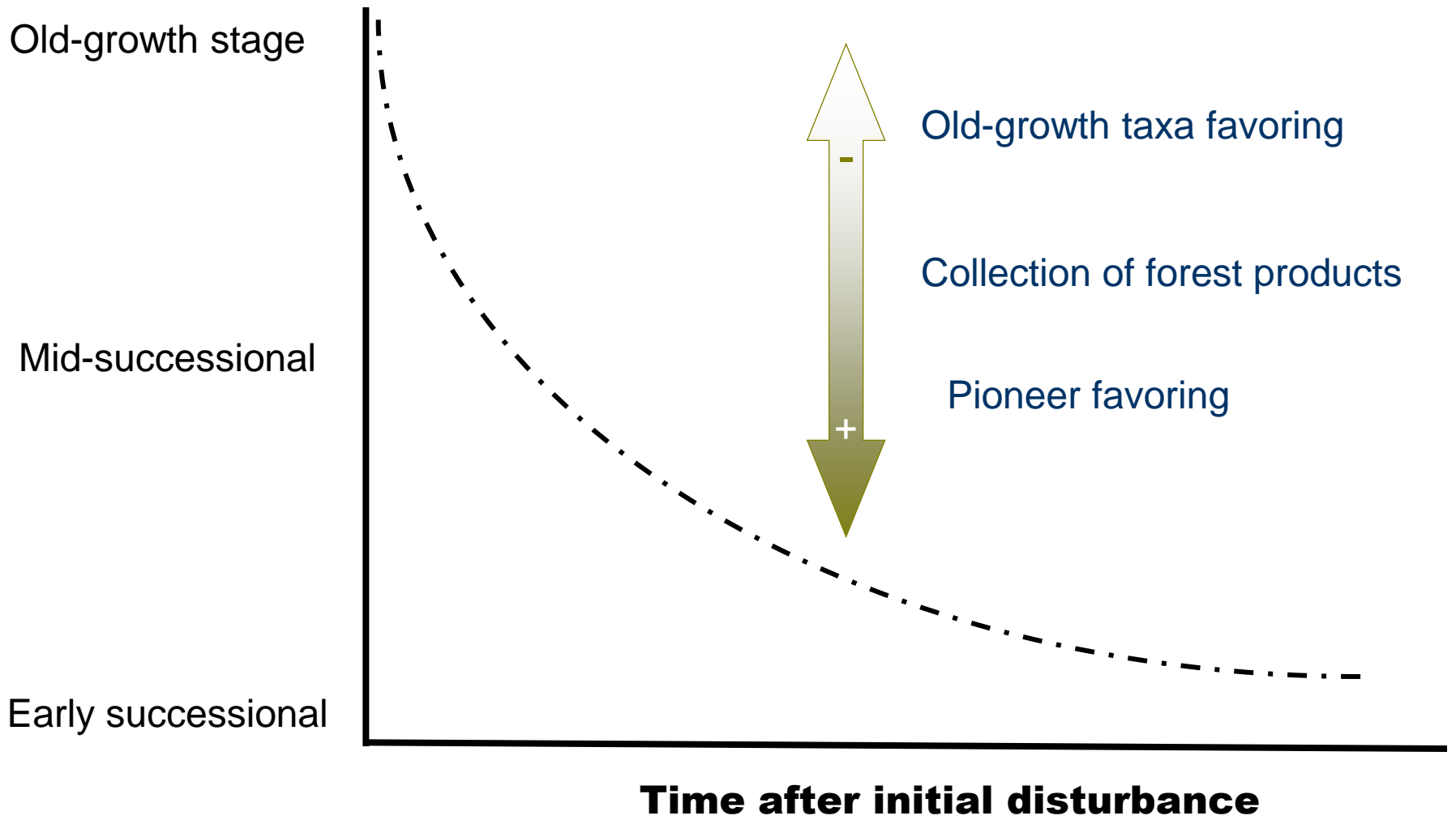
Forest response to human disturbances



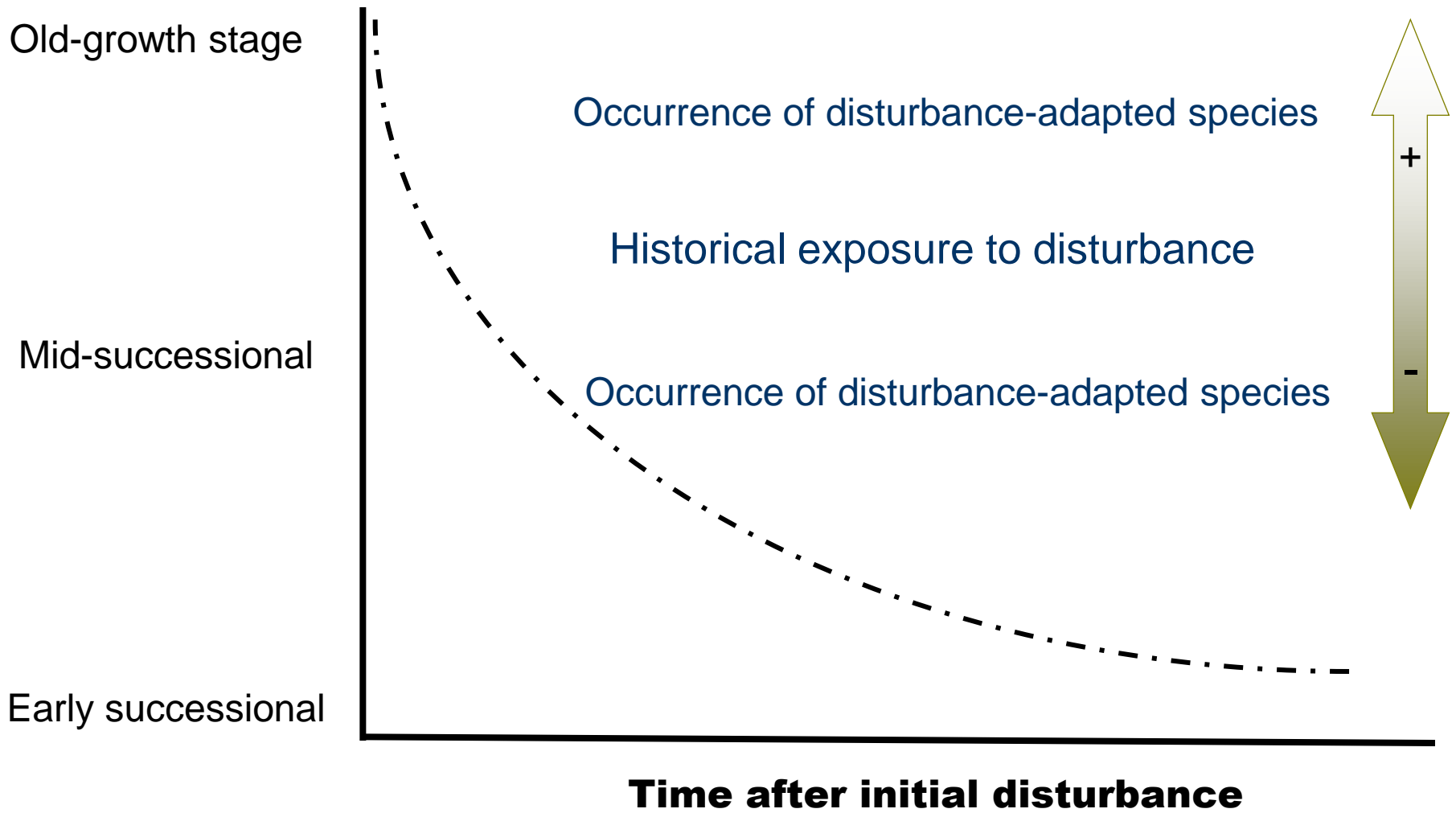
Forest response to human disturbances



Forest response to human disturbances



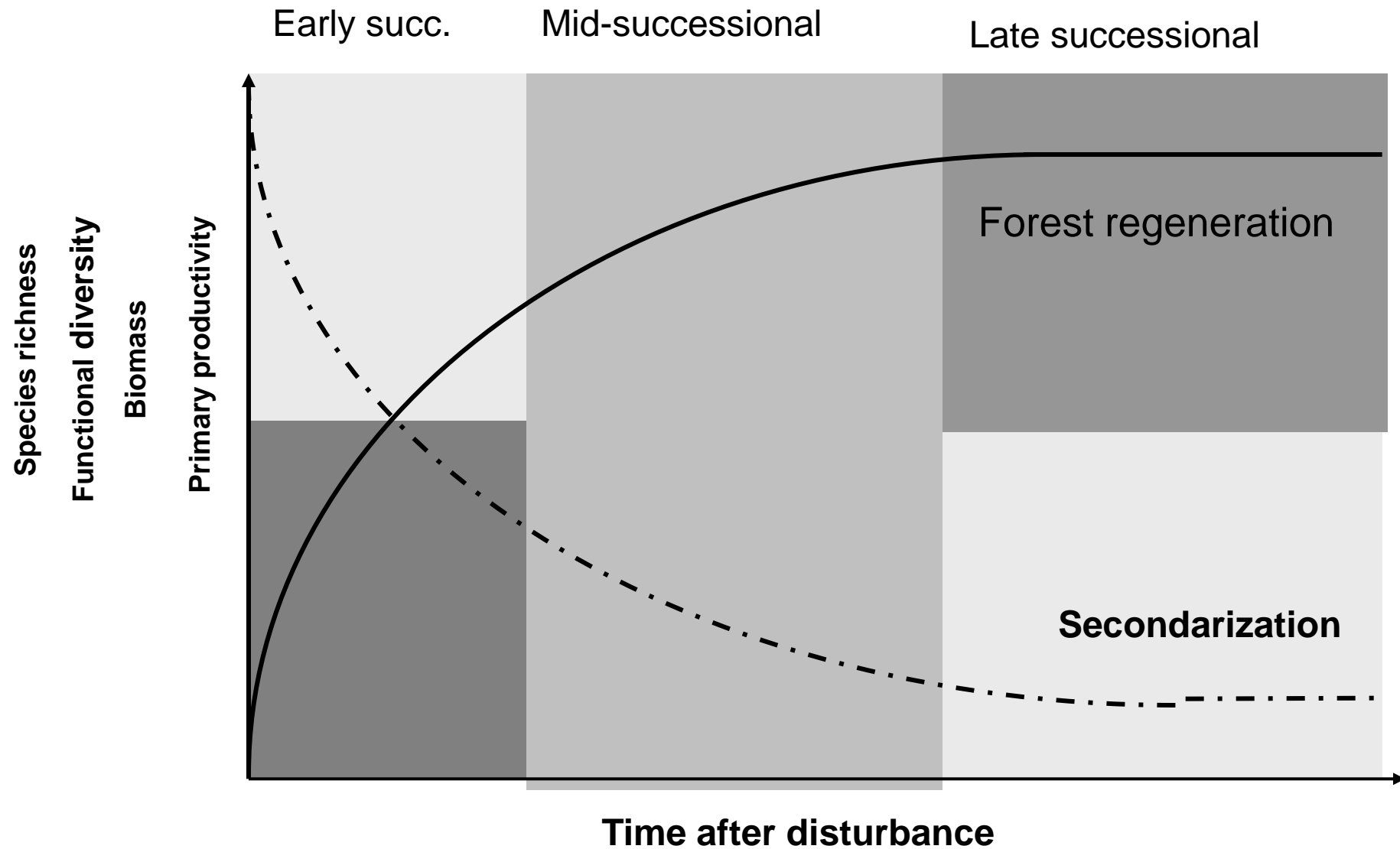
Forest response to human disturbances



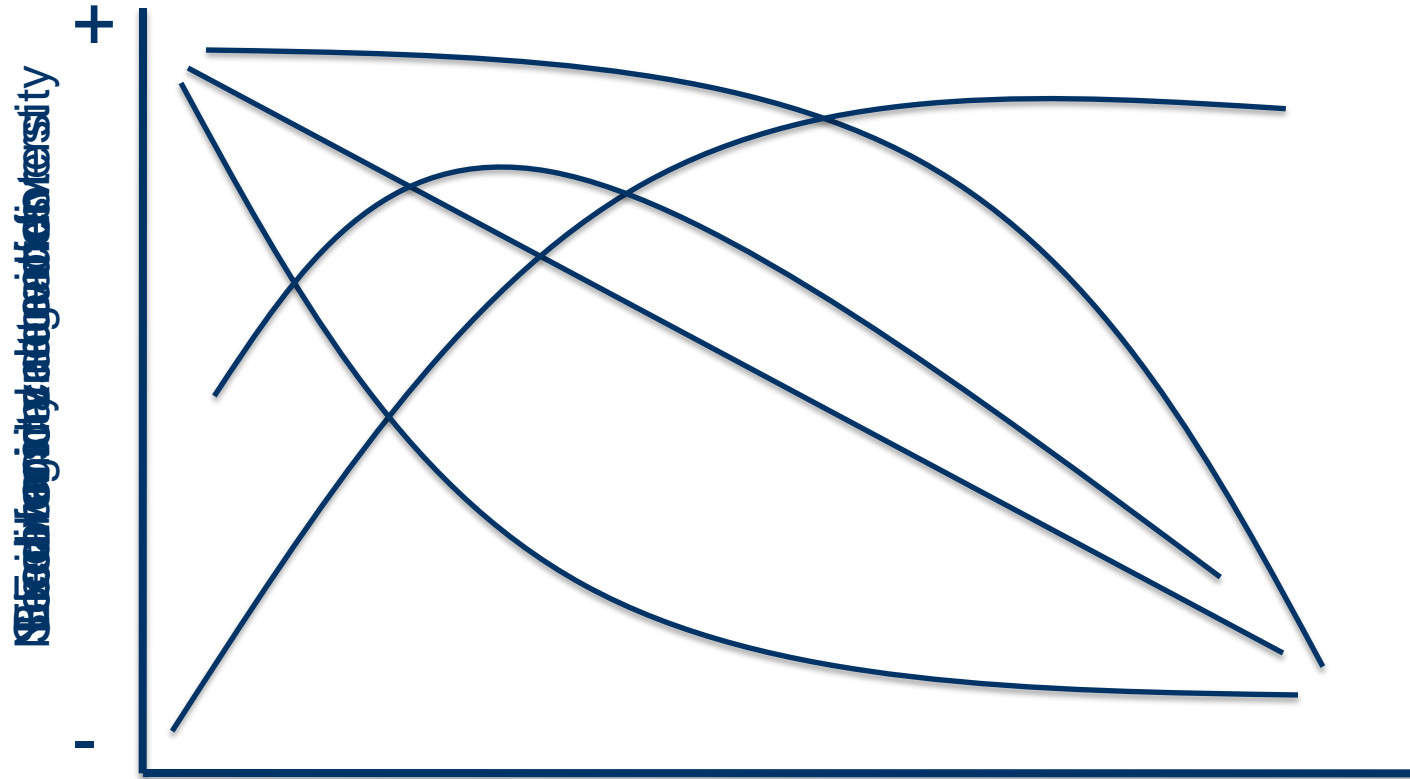
An aerial photograph of a landscape featuring rolling green hills, a winding dirt road, and dense forest. The hills are covered in lush green vegetation, and the forest is a deep, dark green. The road winds through the landscape, connecting different areas. The overall scene is a mix of natural and human-modified elements.

Prospect for biodiversity-regulated processes in human-modified landscapes

Ecosystem functioning across forest regeneration/retrogressive succession



Land-use intensification



Forest cover

>90%

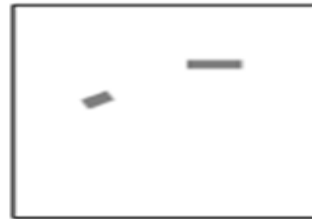
< 50%

< 30%

< 10%

undisturbed

disturbed



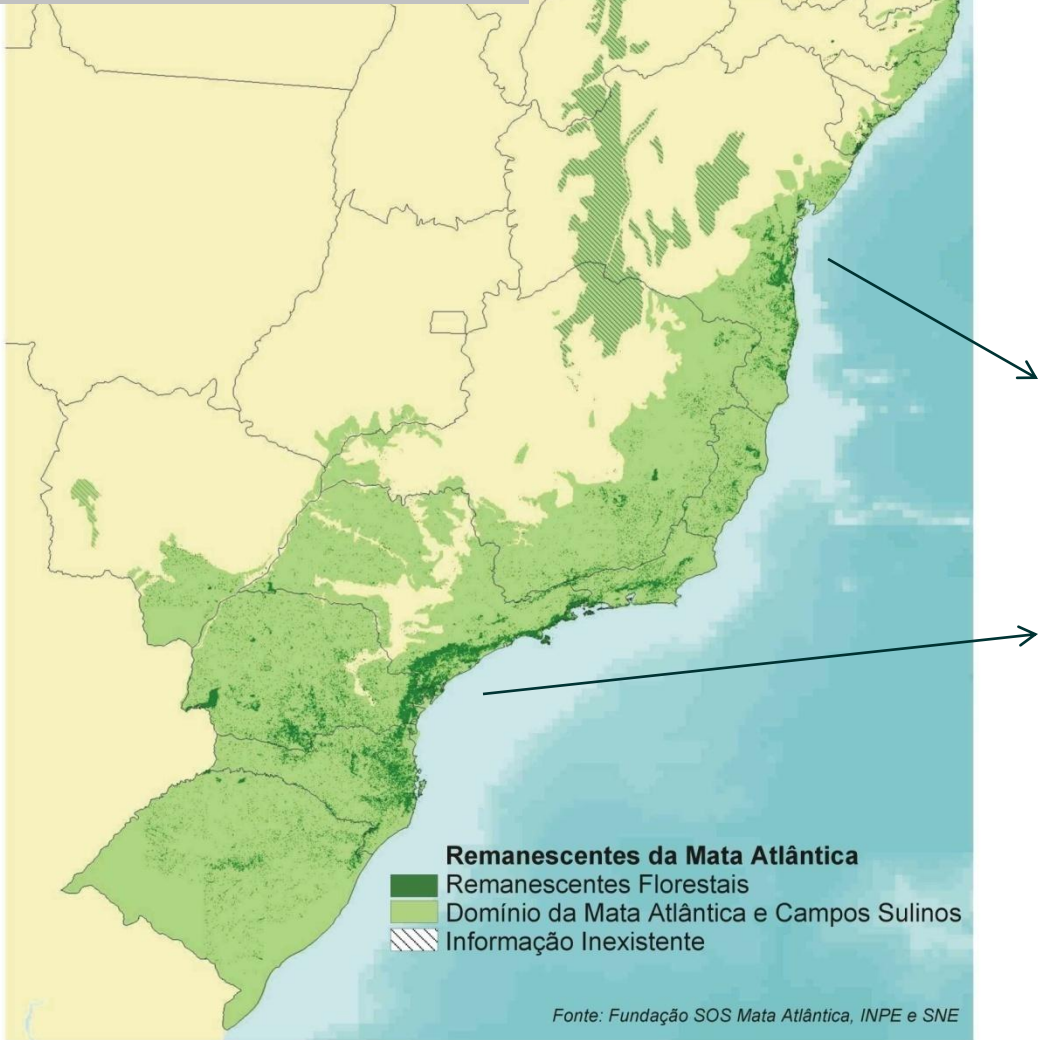
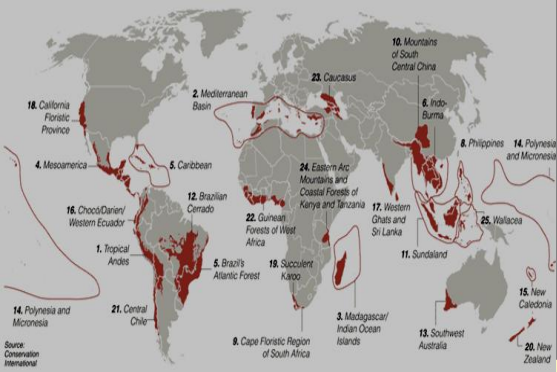
Intact

Variegated

Fragmented

Relictual

Landscape type



How much biodiversity is expected to persist in the Atlantic Forest?



It depends on..

- Number of proliferating species;
- Secundarization level experienced by the remaining forest.



Prediction...

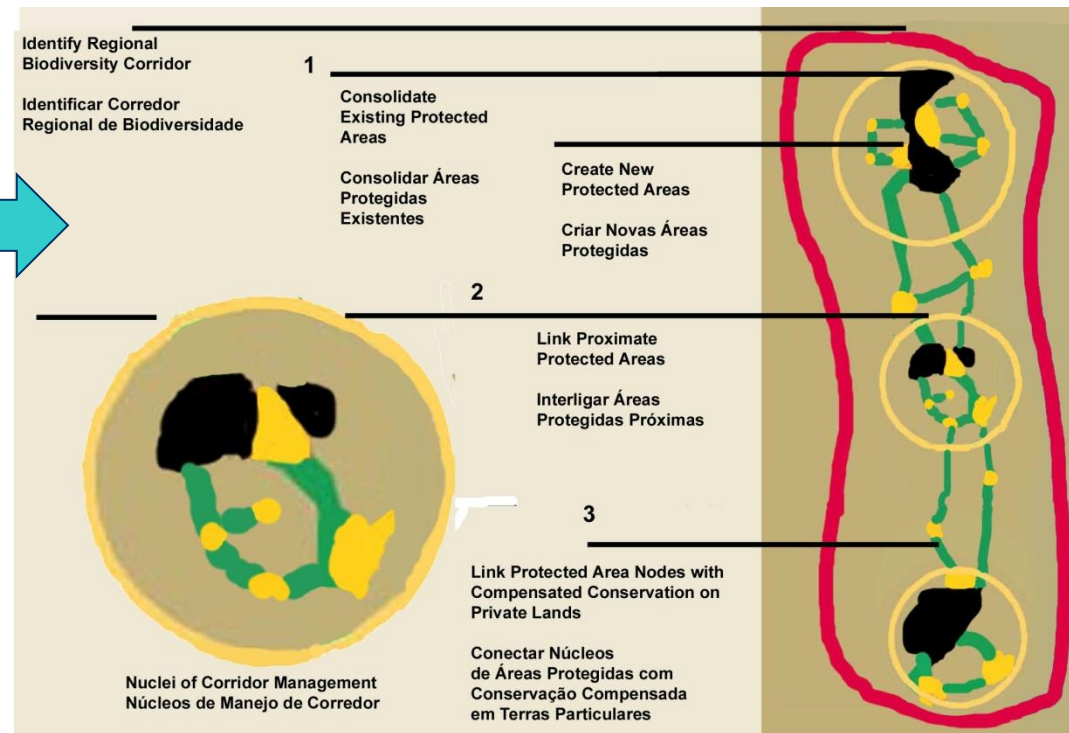
Few species will persist across
tropical human-modified
landscapes!!!!
(secondary-forest dwellers)

An aerial photograph of a landscape. In the foreground and middle ground, there are rolling green hills. A winding river or stream flows through the center of the image, cutting through the green fields. The river is surrounded by dense, dark green forest. In the background, there are more hills and mountains under a clear blue sky with some light clouds. The overall scene is a mix of natural greenery and human-made agricultural fields.

Theoretical implications for conservation

Biodiversity Corridor Approach

Any conservation strategy that fails to safeguard large blocks of core primary forests has limited potential for biodiversity conservation, provision of ecological services, and long-term human well-being based on forestry activities.





Research Agenda



A promising approach

Human disturbances

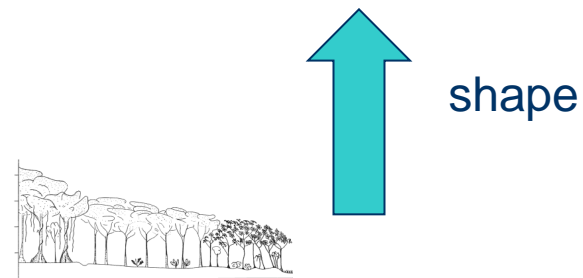
- Habitat loss and fragmentation;
- Edge effects;
- Disruption of species interactions
- Over-exploitation;
- Fire;
- **Climate change (climatic extremes).**



Secundarization

Biodiversity-controlled processes

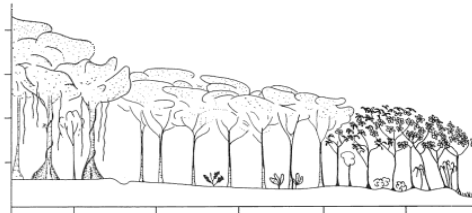
- Ecological services;
- Goods provision;
- Conservation services;
- Human cultural diversification;
- Human well-being;
- Human-society vulnerability to global changes.



Secundarization

The big question!

- To which extent do tropical forest approach early-successional systems in response to human disturbances?
- By approaching such a system the negative impacts on biodiversity-controlled processes are inevitable and irreversible



Acknowledgements!

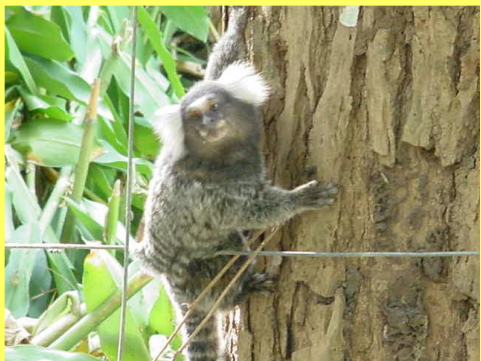
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Thanks for your attention !!!

