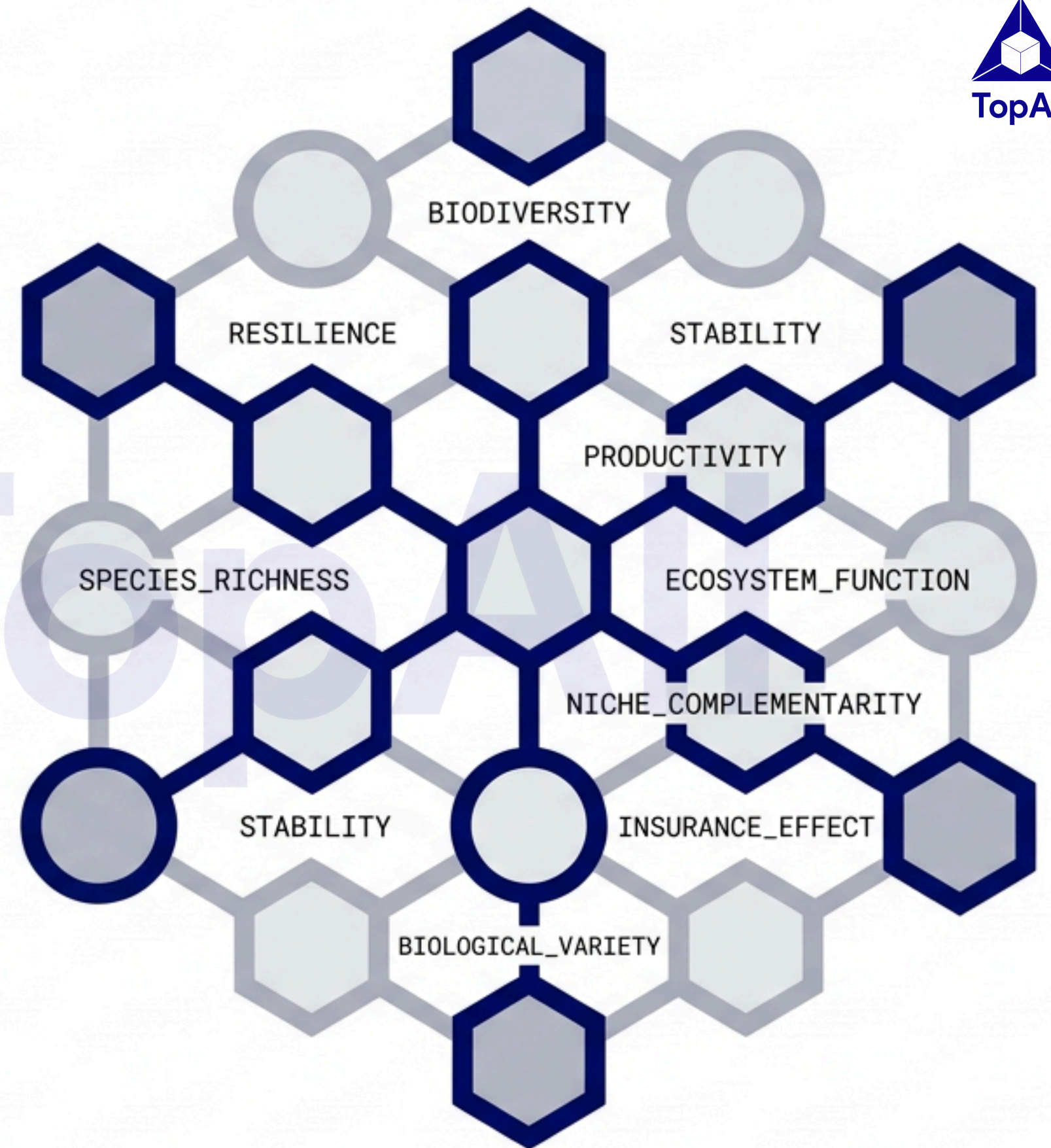


Why Species Diversity Keeps Ecosystems Stable

Unpacking the empirical link between biological variety, productivity, and ecological resilience.



The Three Pillars of a Stable Community



METRIC_01: PRODUCTIVITY

The community must not show excessive variation in productivity from year to year.



METRIC_02: DISTURBANCE

The ecosystem must be equipped to handle occasional natural or man-made shocks.



METRIC_03: INVASION

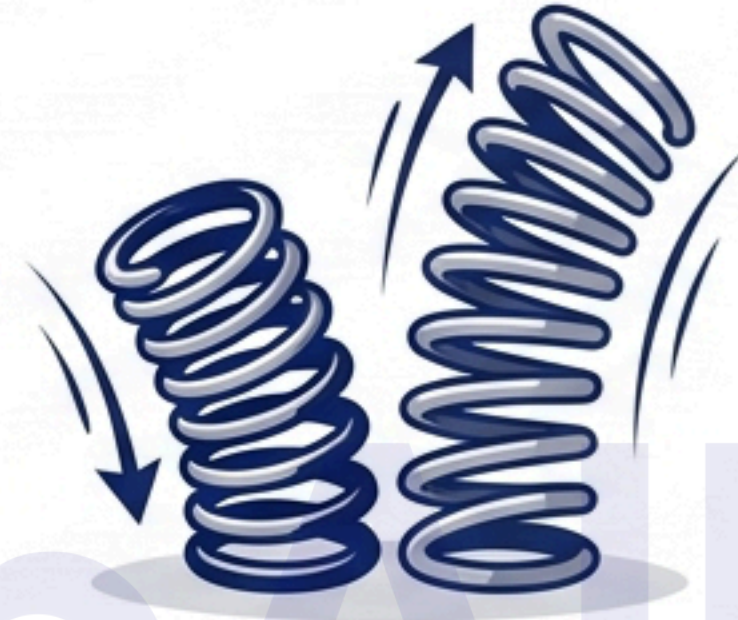
The native structure must successfully resist invasions by alien species.

Ecosystem Defense: Resistance vs. Resilience



Resistance

The ability of a community to remain unchanged when subjected to a disturbance. It repels the shock entirely without internal alteration.



Resilience

The ability of a community to quickly recover, rebound, and return to its original functional state after a disturbance has temporarily altered it.

A highly diverse ecosystem relies on both mechanisms to survive occasional natural and man-made environmental perturbations.



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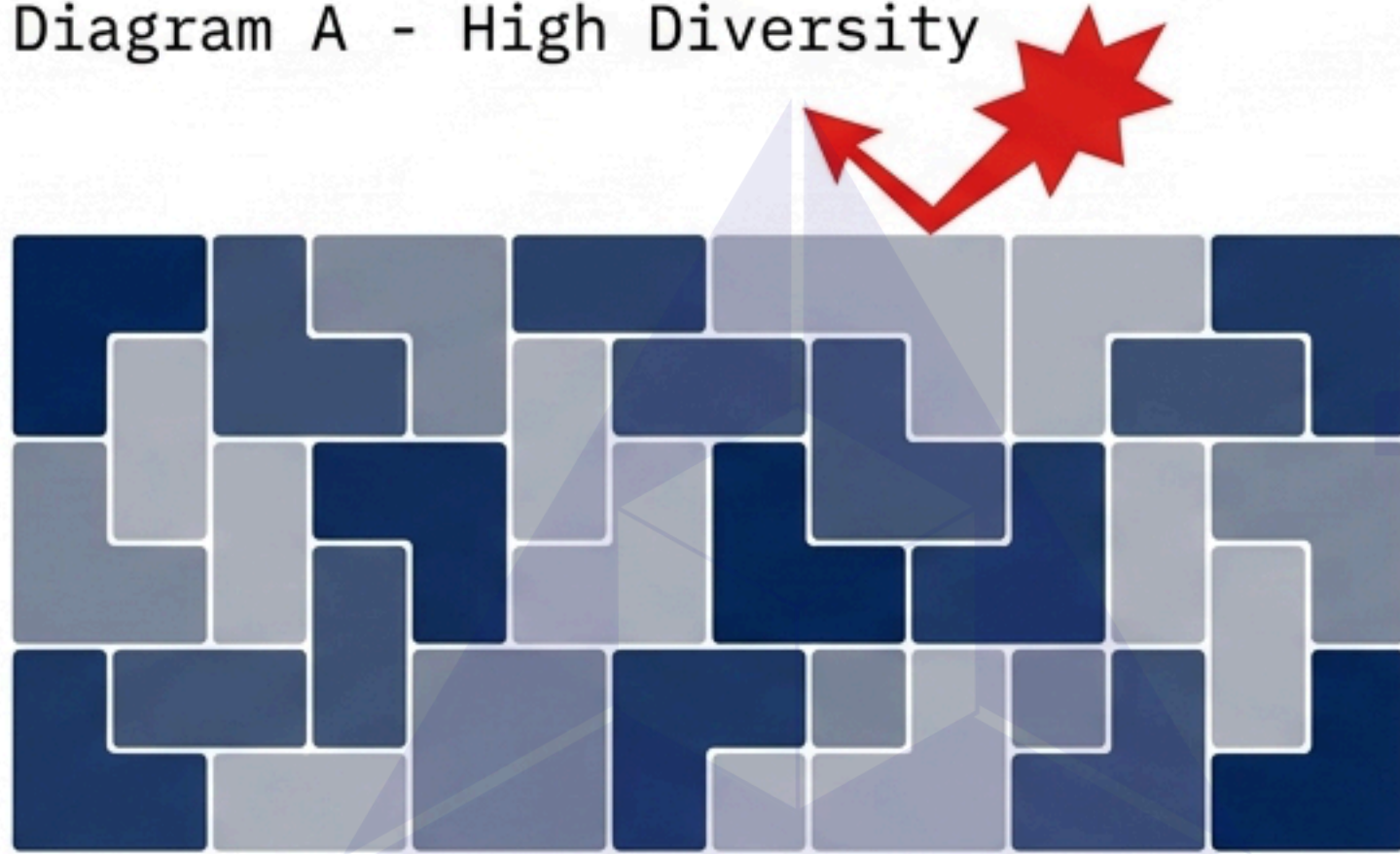
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The Invasion Barrier: Why Diversity Blocks Alien Species

Diagram A - High Diversity



Fully Occupied Niches

A rich variety of native species utilizes all available resources, leaving zero structural room for invaders to establish themselves.

Diagram B - Low Diversity

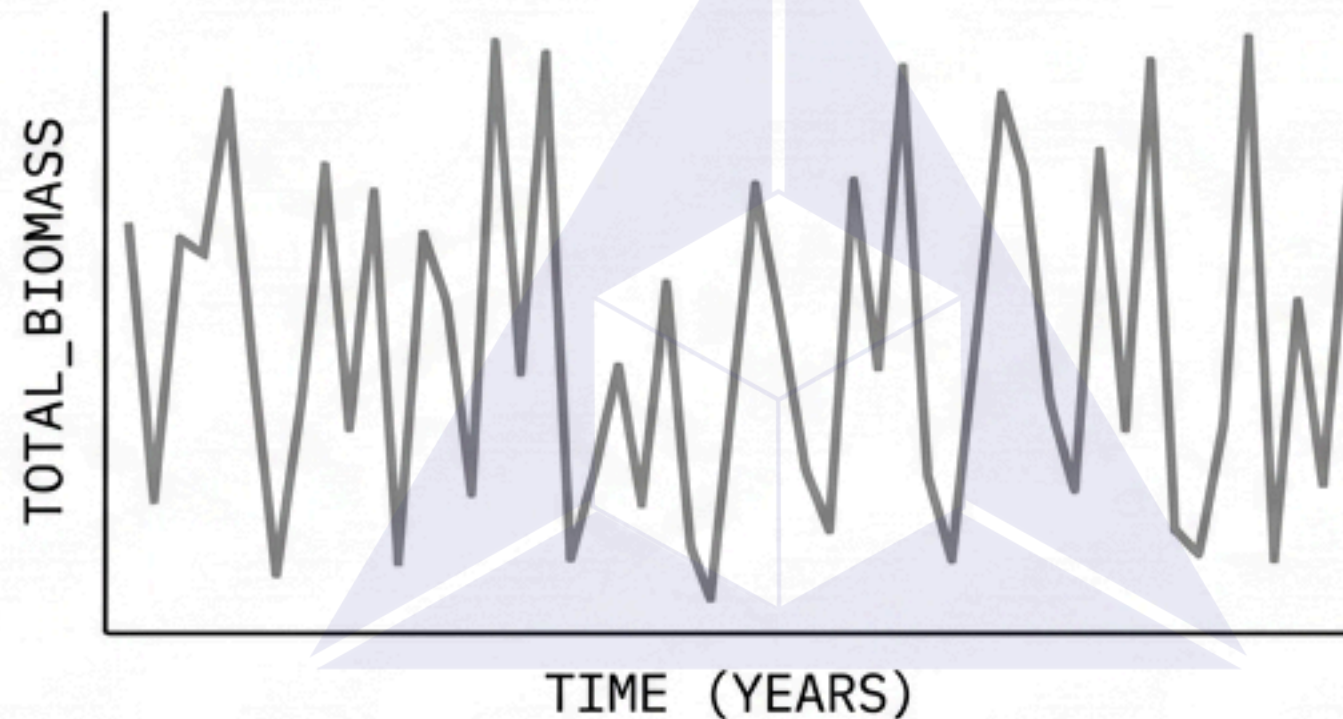


Open Ecological Gaps

Fewer native species leave unused resources and physical space, creating open vulnerabilities for aggressive alien species to exploit and overtake the community.

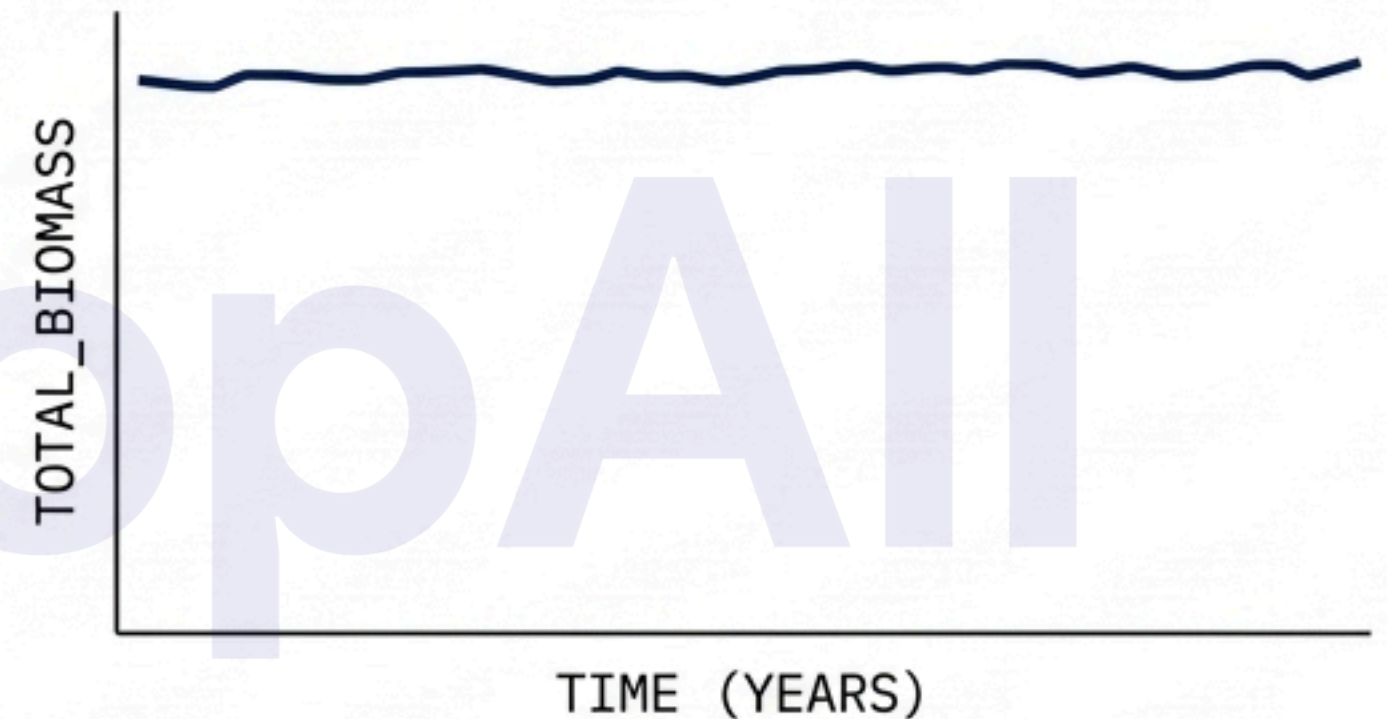
Empirical Proof: David Tilman's Outdoor Plots

Low Diversity Plot



High Year-to-Year Fluctuation

High Diversity Plot



Stable, Consistent Biomass

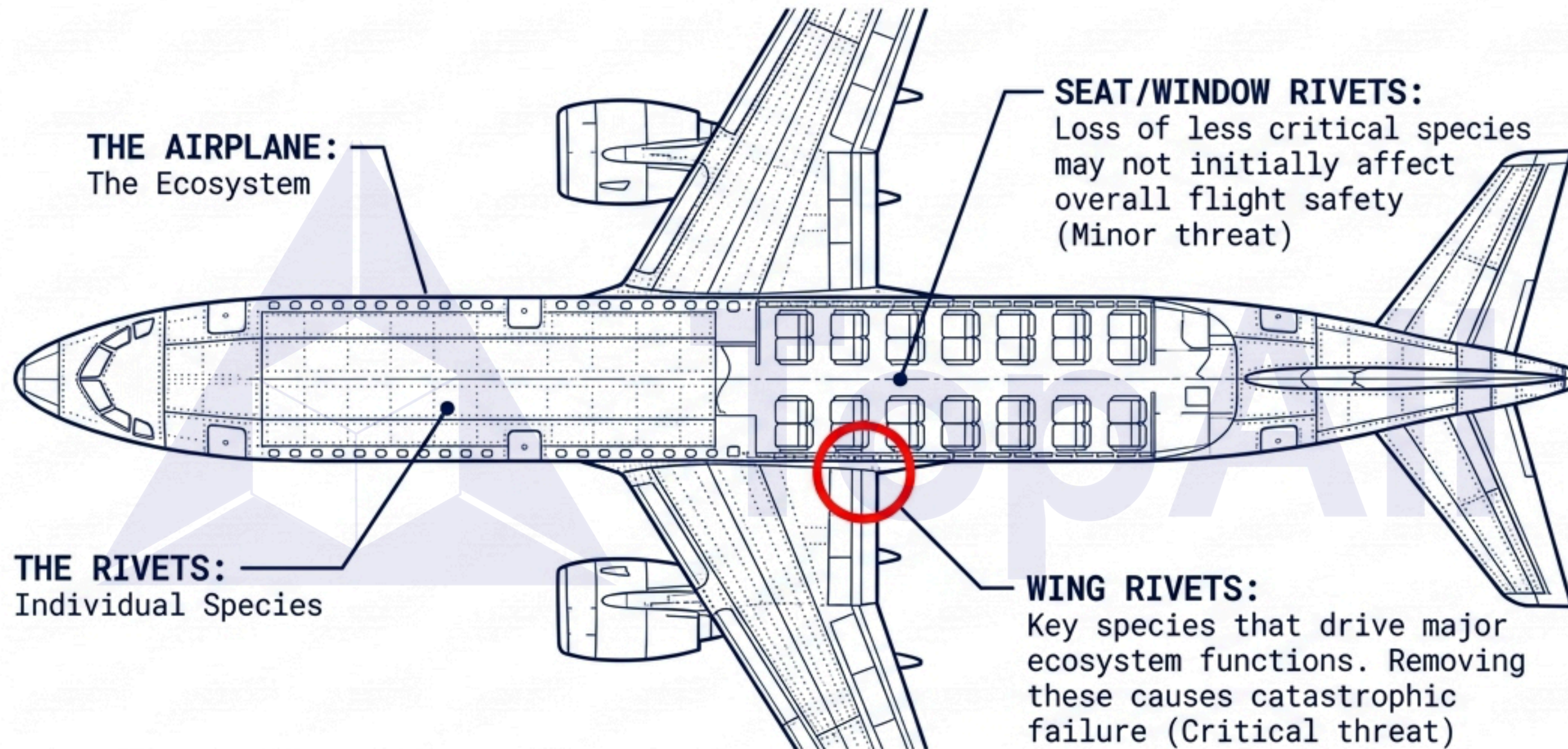
Key Finding: Tilman's long-term ecosystem experiments demonstrated that plots with more species showed significantly less year-to-year variation in total biomass.

The Productivity Dividend



Beyond stabilizing the ecosystem against yearly fluctuations, Tilman's experiments proved that **increased species richness directly contributes to higher overall productivity**. More species **systematically generate more biological output**.

The Rivet Popper Hypothesis



Stanford ecologist Paul Ehrlich's analogy reveals the hidden danger of biodiversity loss: we are actively popping rivets out of our own airplane, dangerously weakening the ecosystem without knowing exactly which rivet will cause the wings to fall off.



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