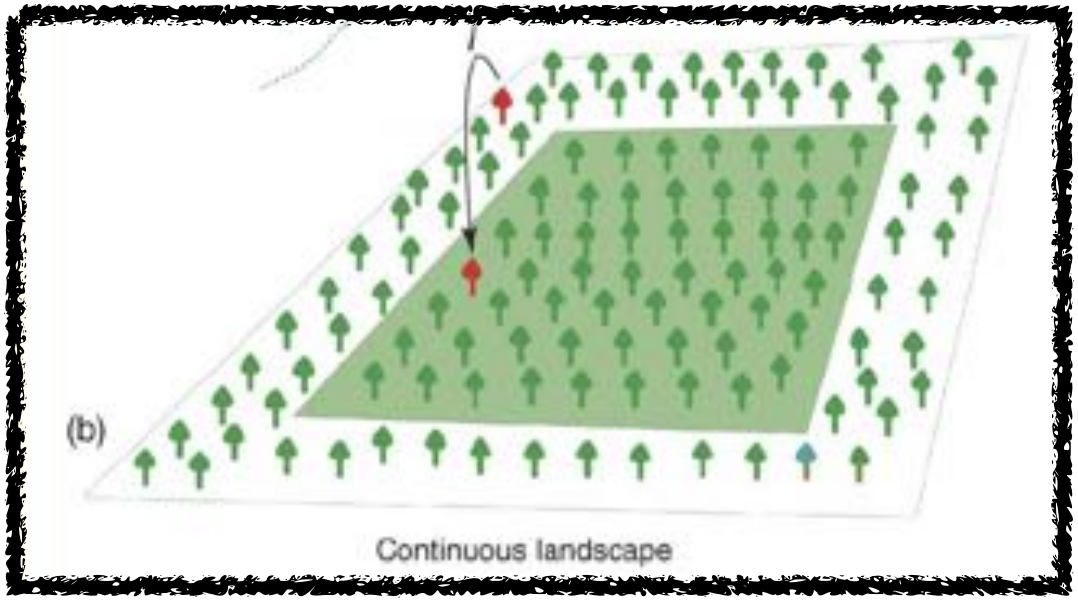
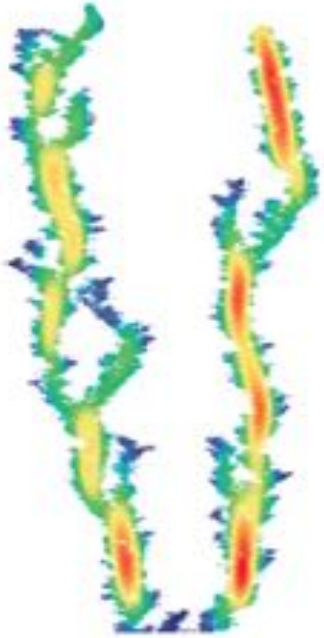

French Roulette
31 9 22 18 29 7 28 12 35 3 26 0 32 15
1 33 16 24 5


(b)
Continuous landscape



Conservação de comunidades

Paulo R. Guimarães Jr (Miúdo)

www.guimaraes.bio.br

Conservação de comunidades ecológicas

1. Definição e motivos
2. A dinâmica da destruição
3. Estados estáveis alternativos
4. Resumo
5. Sugestão de leitura

Ao final da aula, nós deveremos saber:

1. os diferentes motivos para conservar a biodiversidade
2. como comunidades são atingidas pelas ameaças `a diversidade
3. o que são estados estáveis alternativos

Conservação de comunidades ecológicas

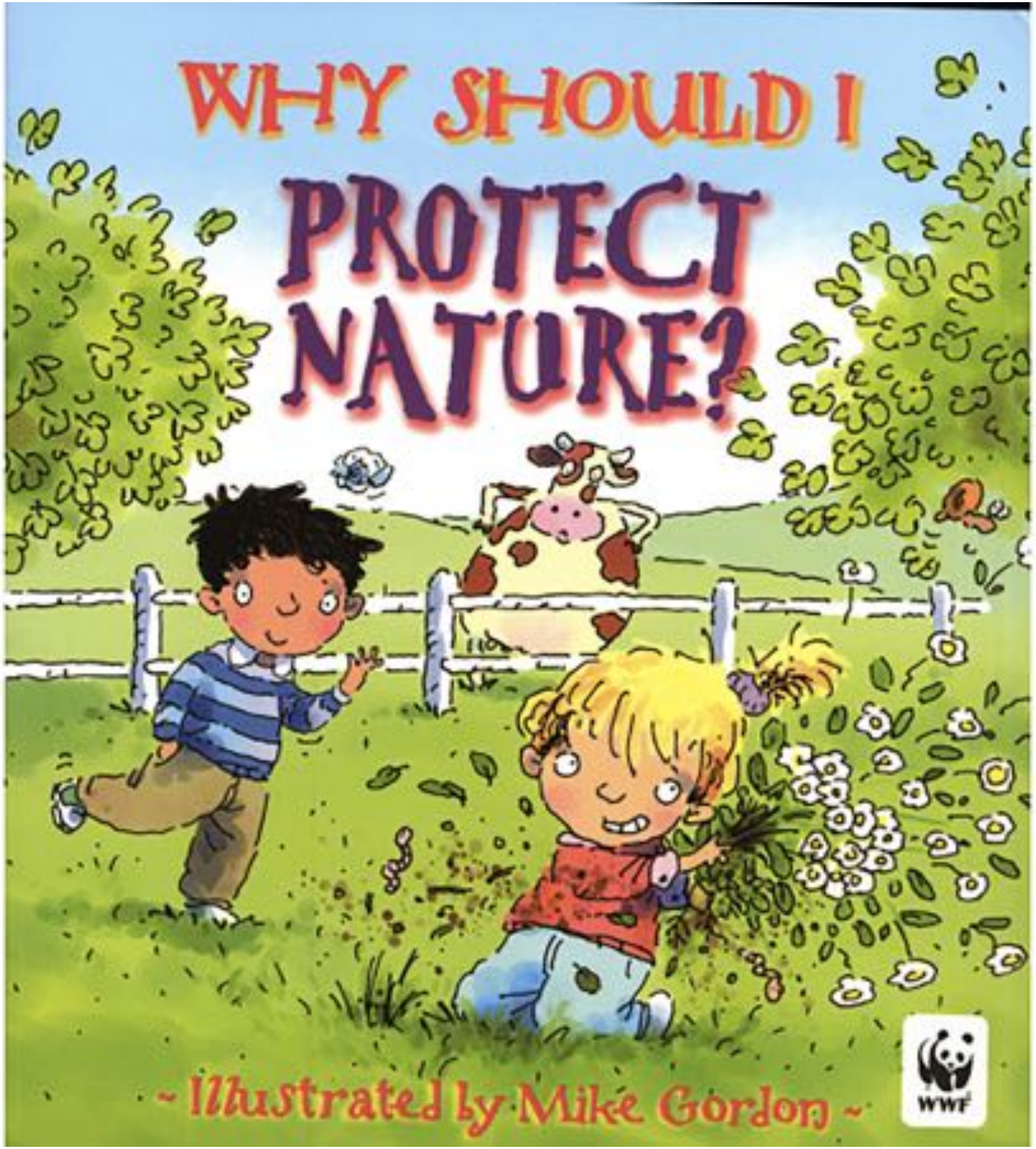
1. **Definição e motivos**
2. A dinâmica da destruição
3. Estados estáveis alternativos
4. Resumo
5. Sugestão de leitura

Definição

Conservation biology is defined as a “mission-oriented crisis discipline” studying the nature and status of Earth’s biodiversity, with the aim to understand, protect, and perpetuate biological diversity at all scales and all levels of biological organization.

Definição

Conservation biology is defined as a "**mission-oriented crisis discipline**" studying the nature and status of Earth's biodiversity, with the aim to understand, protect, and perpetuate biological diversity at all scales and all levels of biological organization.


WHY SHOULD I
PROTECT
NATURE?
~ Illustrated by Mike Gordon ~
WWF

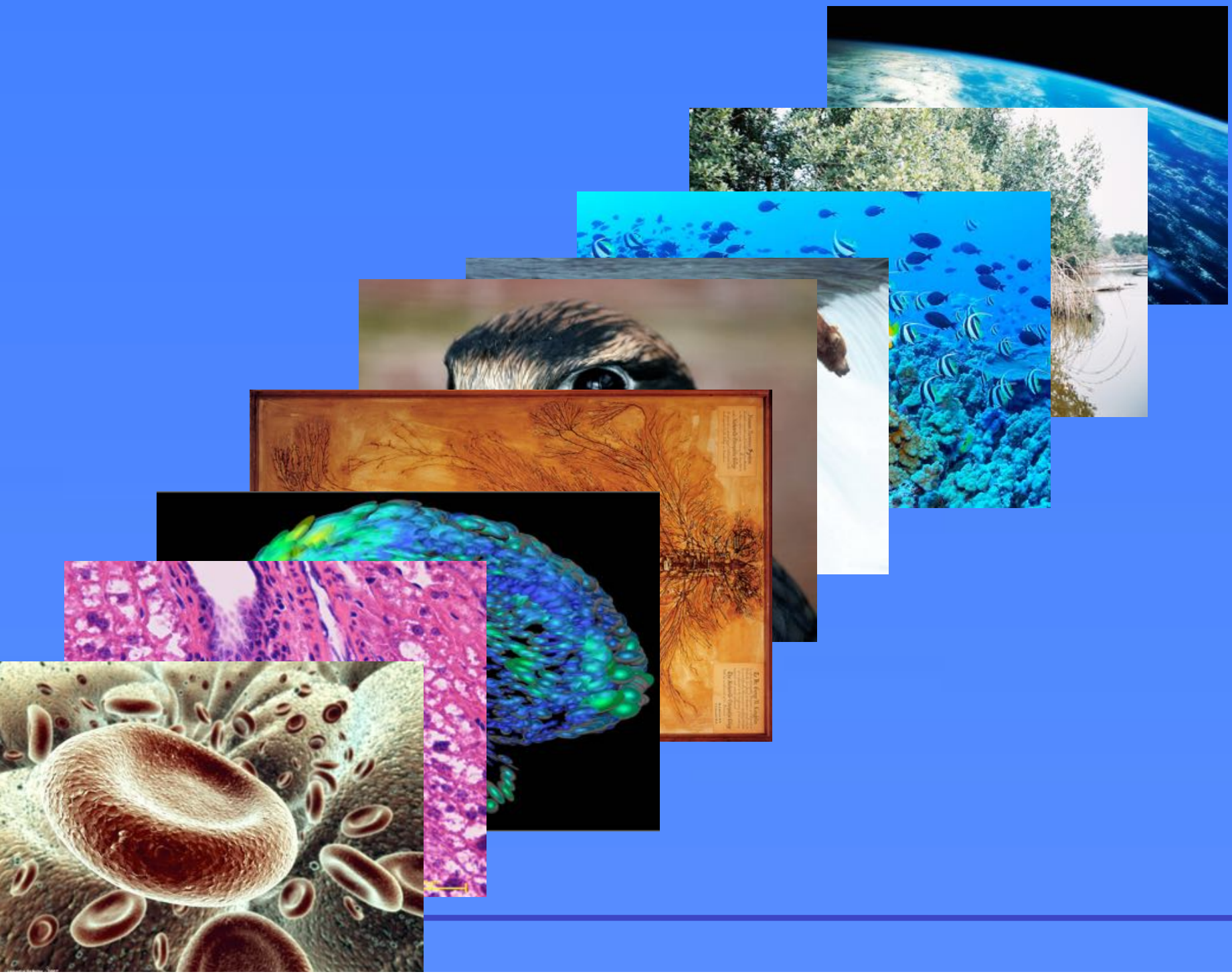

Premissa: a biodiversidade tem
um valor e deve ser protegida

Definição

Conservation biology is defined as a "mission-oriented **crisis** discipline" studying the nature and status of Earth's biodiversity, with the aim to understand, protect, and perpetuate biological diversity at all scales and all levels of biological organization.

Definição

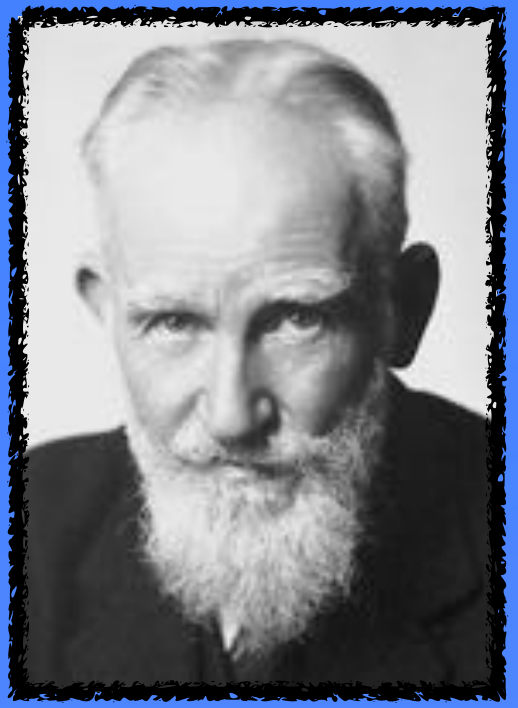
Conservation biology is defined as a "mission-oriented crisis discipline" studying the nature and status of Earth's biodiversity, with the aim to understand, protect, and perpetuate biological diversity at **all scales and all levels of biological organization.**




ONE HUNDRED DOLLARS
100

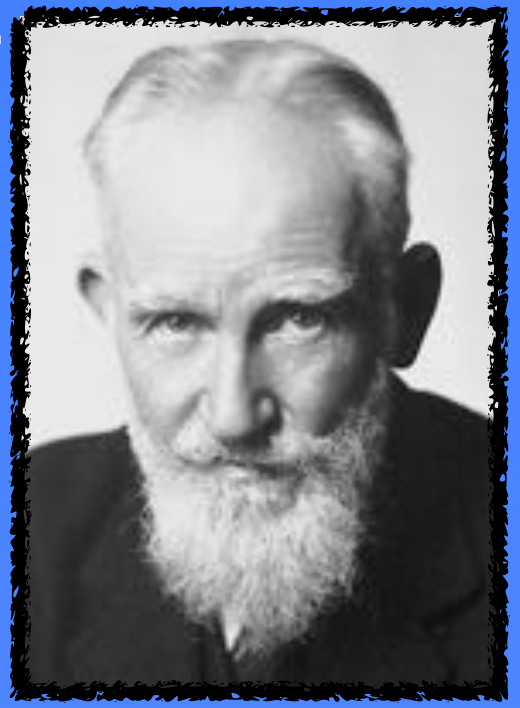

POLITICIAN

The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man.



George Bernard Shaw

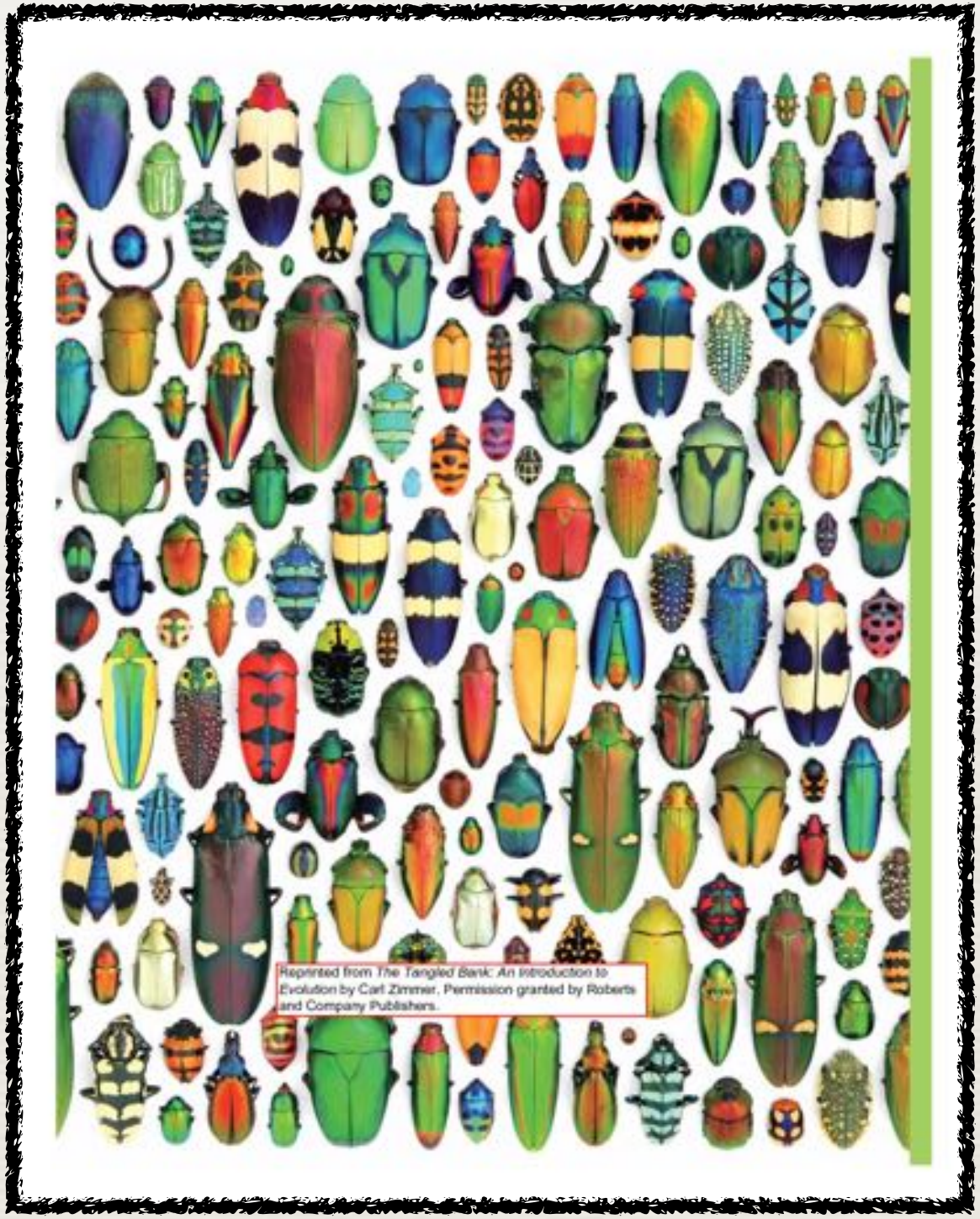
The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man.



George Bernard Shaw

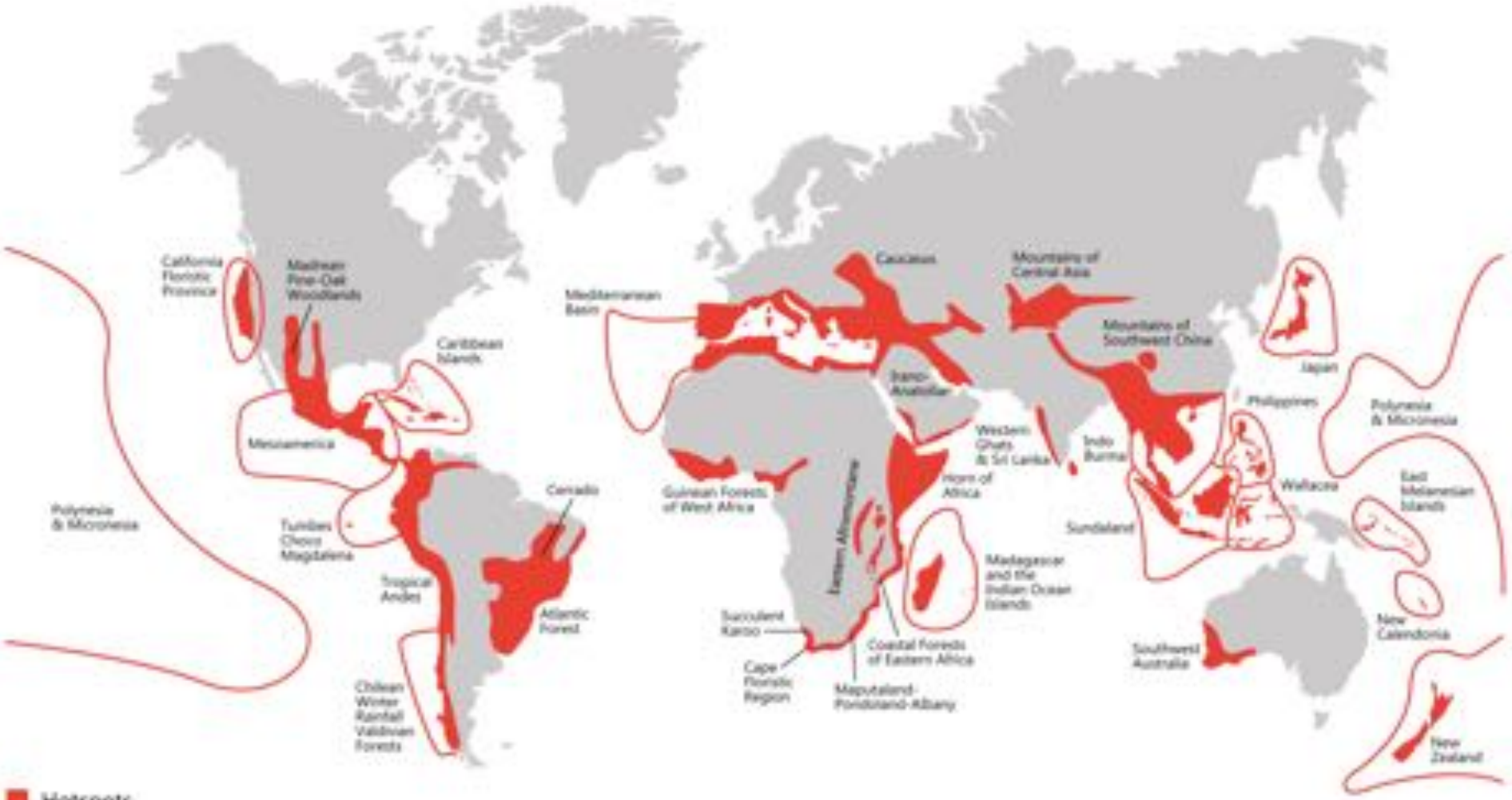
For myself, I am an optimist — it does not seem to be much use being anything else

Winston Churchill



Reprinted from *The Tangled Bank: An Introduction to Evolution* by Carl Zimmer. Permission granted by Roberts and Company Publishers.

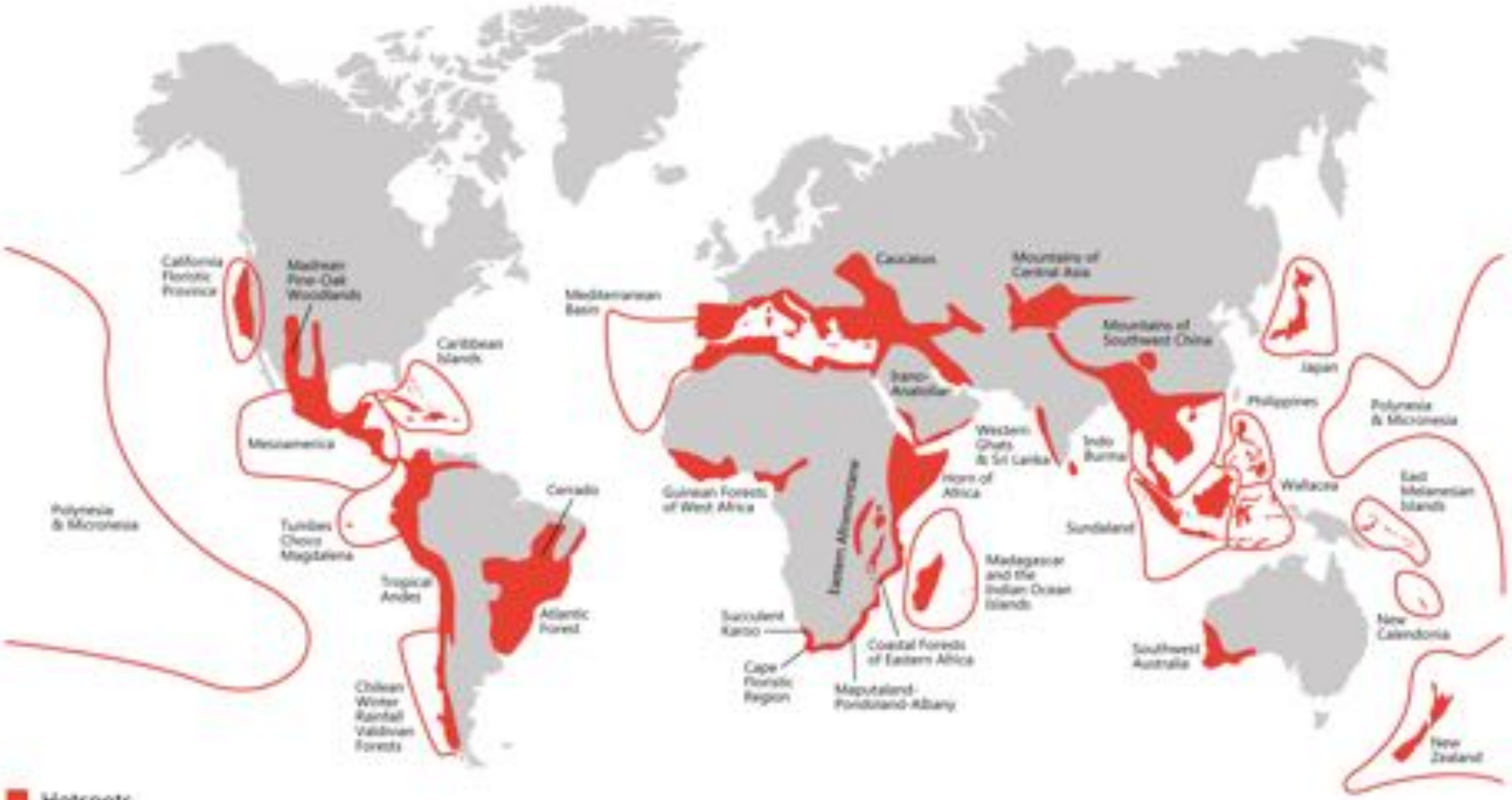
CONSERVATION INTERNATIONAL



February 2005

CONSERVATION INTERNATIONAL

1,4% da área do planeta




CONSERVATION INTERNATIONAL
1,4% da área do planeta
44% das plantas vasculares
California Floristic Province
Madrean Pine-Oak Woodlands
Caribbean Islands
Mesoamerica
Tumbes Choco Magdalena
Tropical Andes
Cerrado
Atlantic Forest
Chilean Winter Rainfall Valdivian Forests
Polynesia & Micronesia
Mediterranean Basin
Caucasus
Mountains of Central Asia
Irano-Anatolian
Mountains of Southwest China
Western Ghats & Sri Lanka
Indo-Burma
Guinean Forests of West Africa
Horn of Africa
Eastern Afromontane
Madagascar and the Indian Ocean Islands
Succulent Karoo
Cape Floristic Region
Coastal Forests of Eastern Africa
Maputaland-Pondoland-Albany
Sundaland
Wallacea
Philippines
Japan
Polynesia & Micronesia
East Melanesian Islands
New Caledonia
Southwest Australia
New Zealand
Hotspots
February 2005

Charcos na costa - sem endemismos - < 30 espécies

Charcos na costa - sem endemismos - < 30 espécies

Regula cheias e enchentes

Purifica a água

Estoca carbono

Produz recursos para pesca

Serviços ecossistêmicos

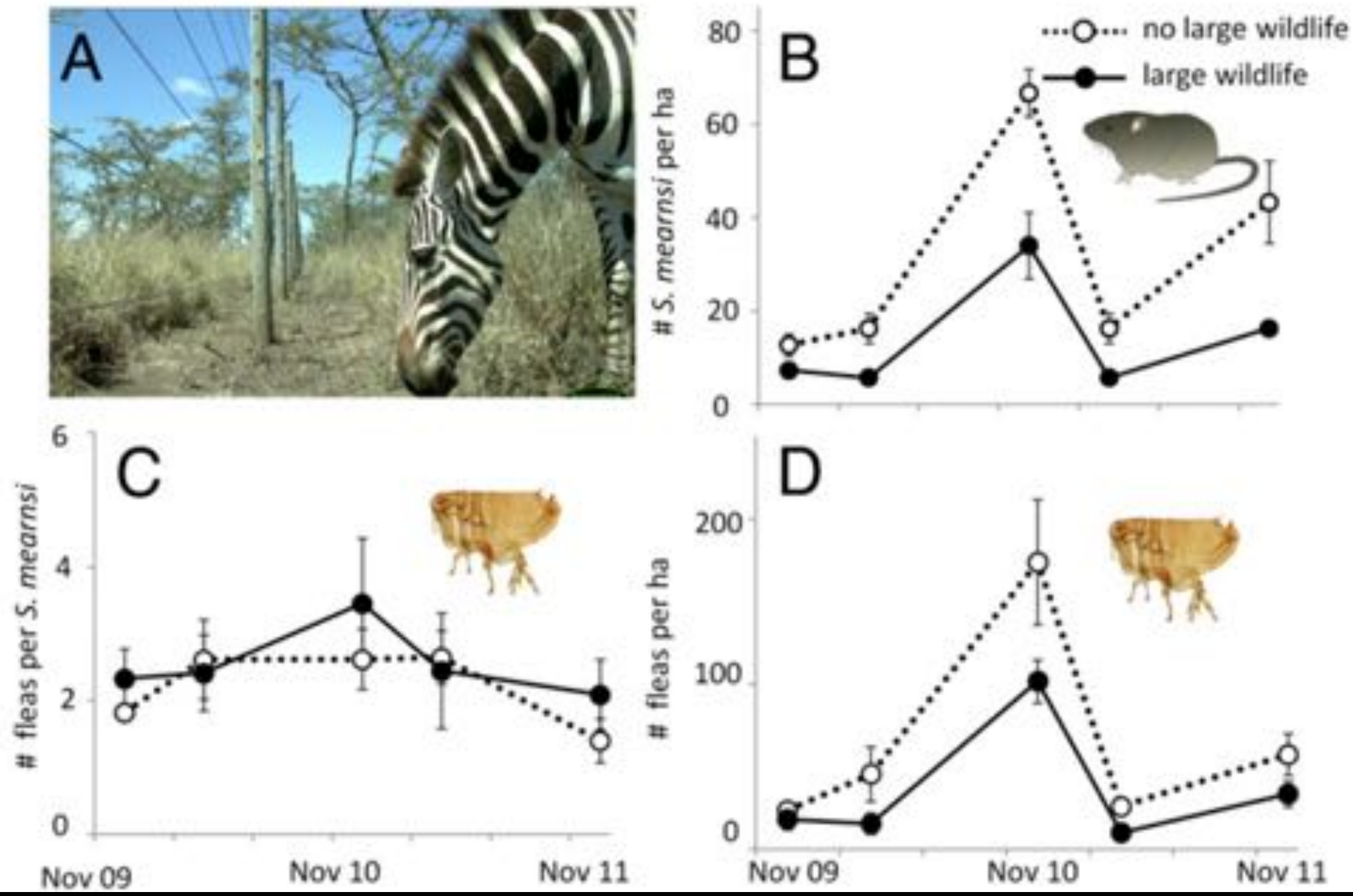
The essential goods and services, including food, medicine, building materials, clean water and flood control, that ecosystems provide to humanity (Daily, 1997).

Serviços ecossistêmicos

1. **Culturais e religiosos**

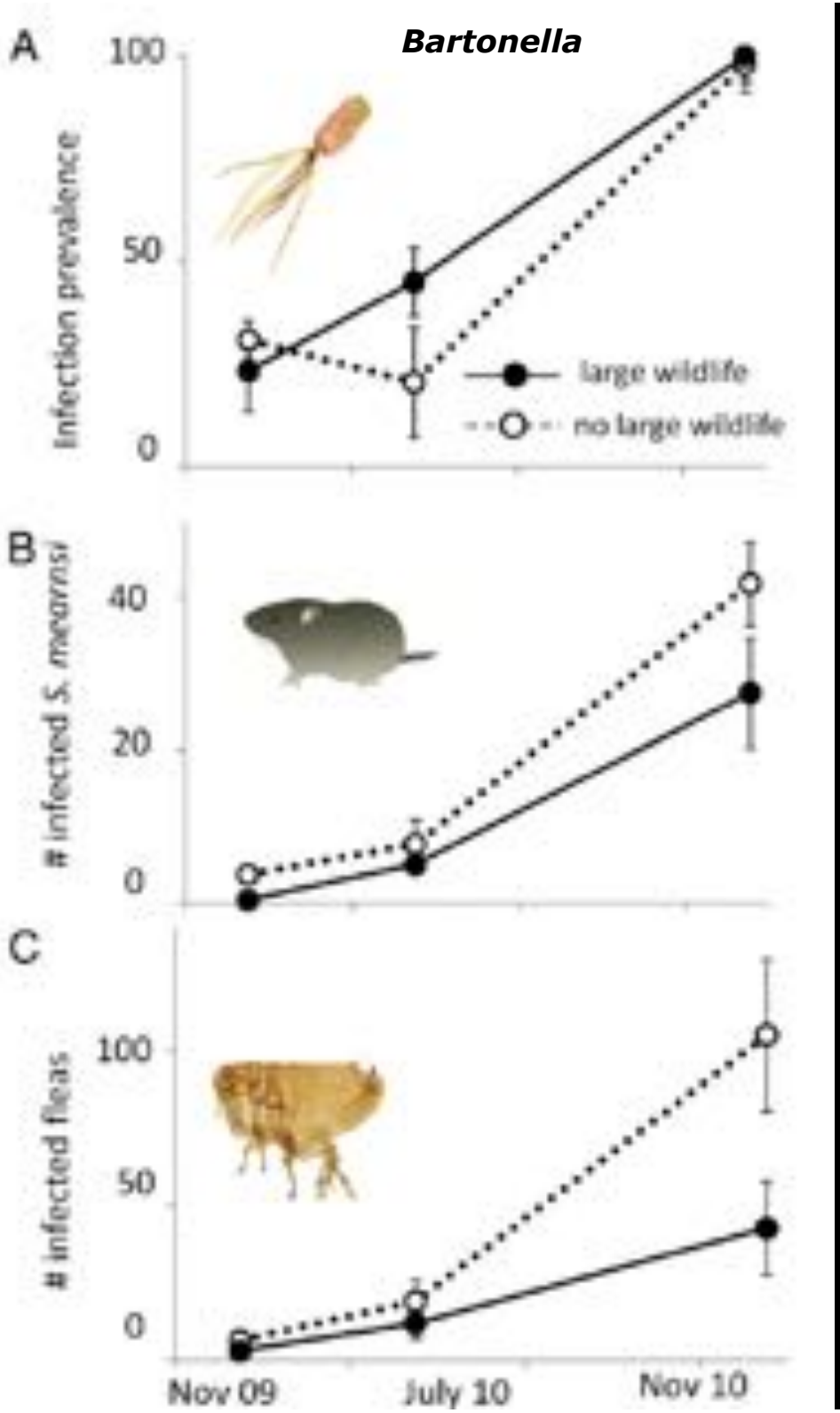
Serviços ecossistêmicos

1. Culturais e religiosos
2. **Reguladores**


A
B
no large wildlife
large wildlife
S. mearnsi per ha
80
60
40
20
0
C
fleas per S. mearnsi
6
4
2
0
Nov 09
Nov 10
Nov 11
D
fleas per ha
200
100
0
Nov 09
Nov 10
Nov 11

H. S. Young

Rodolfo Dirzo

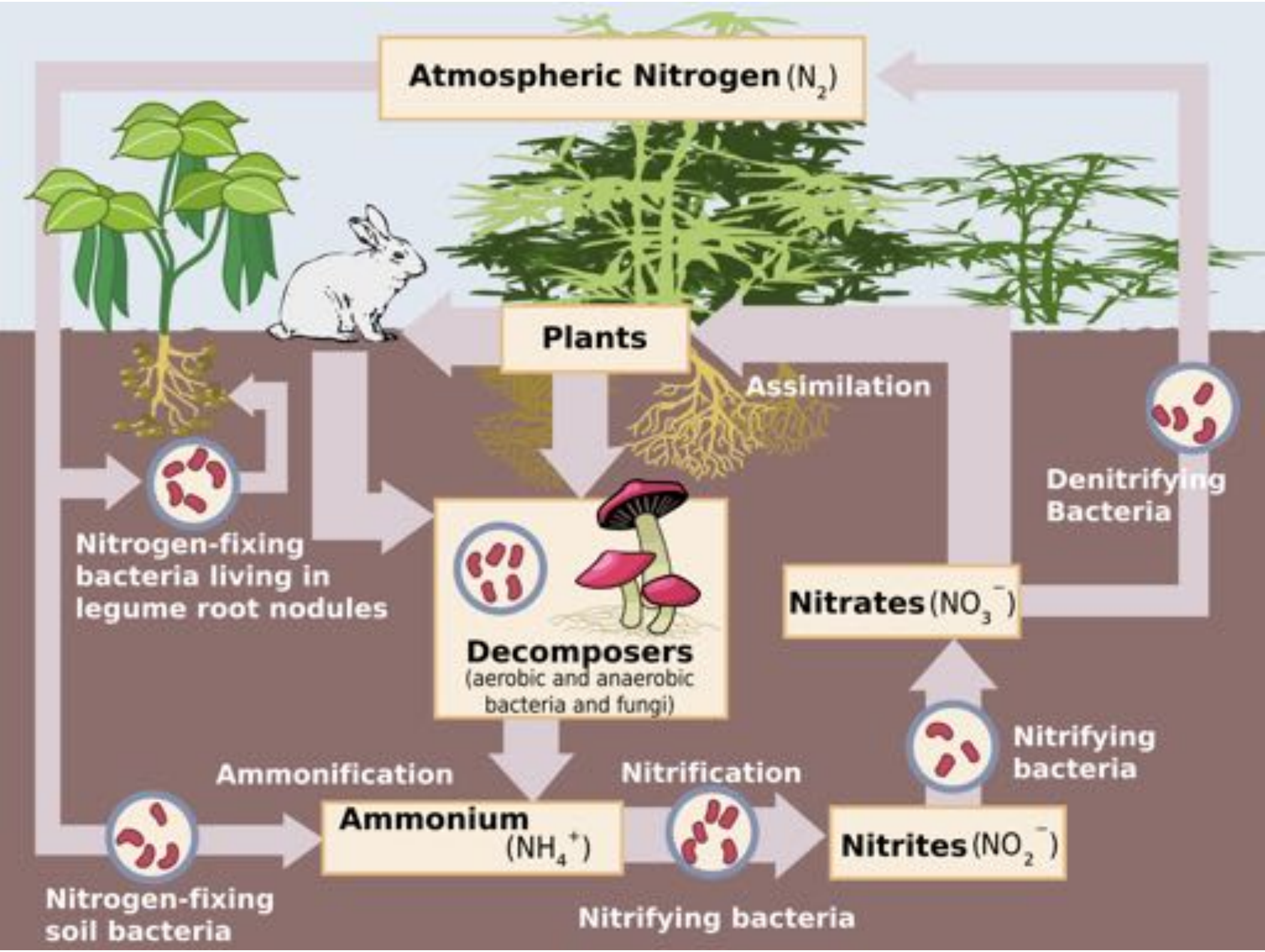


Serviços ecossistêmicos

1. Culturais e religiosos
2. Reguladores
3. **De fornecimento**

Serviços ecossistêmicos

1. Culturais e religiosos
2. Reguladores
3. De fornecimento
4. **De apoio**

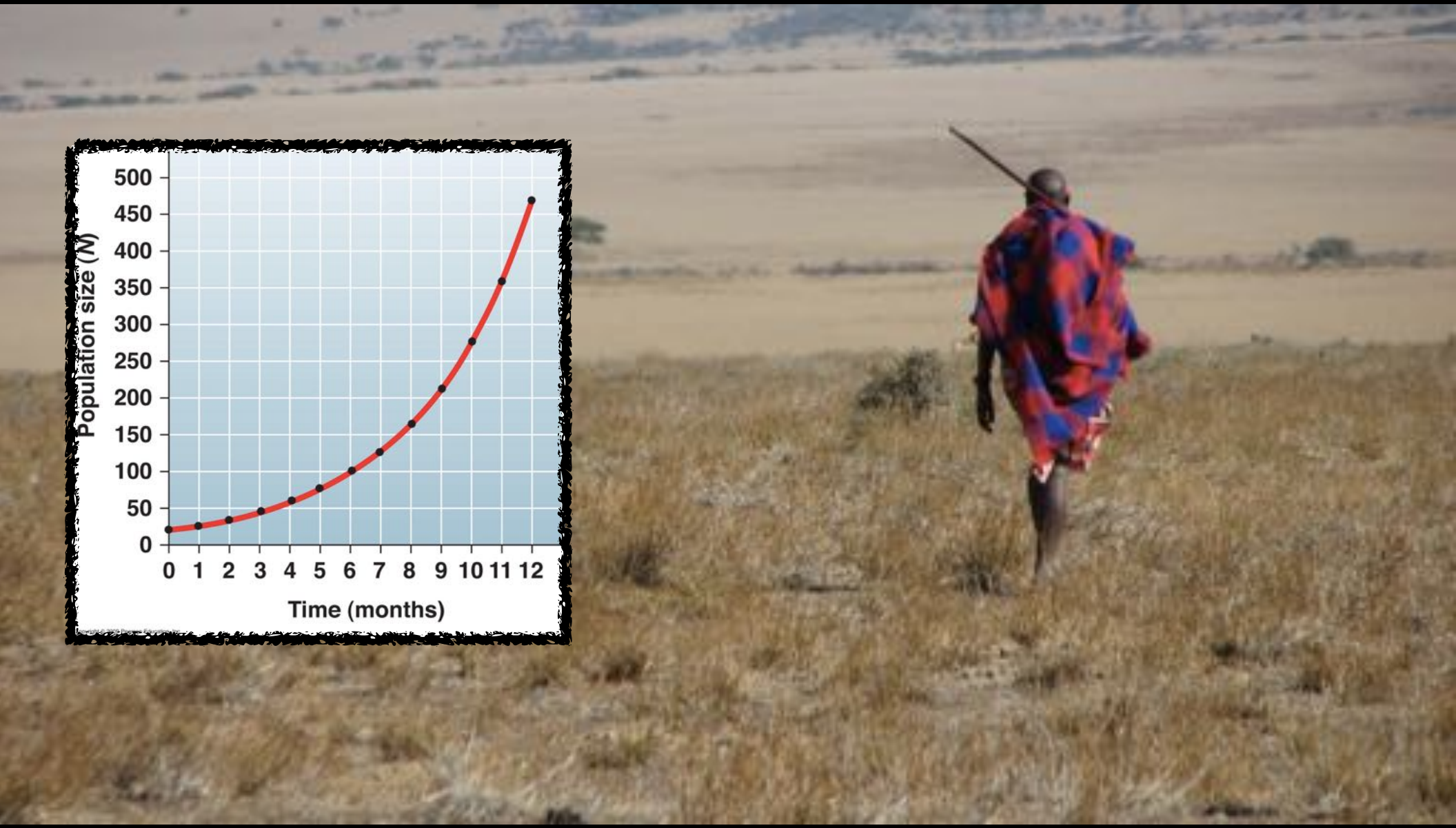

Atmospheric Nitrogen (N_2)
Plants
Assimilation
Denitrifying Bacteria
Nitrogen-fixing bacteria living in legume root nodules
Decomposers
(aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrogen-fixing soil bacteria
Nitrifying bacteria

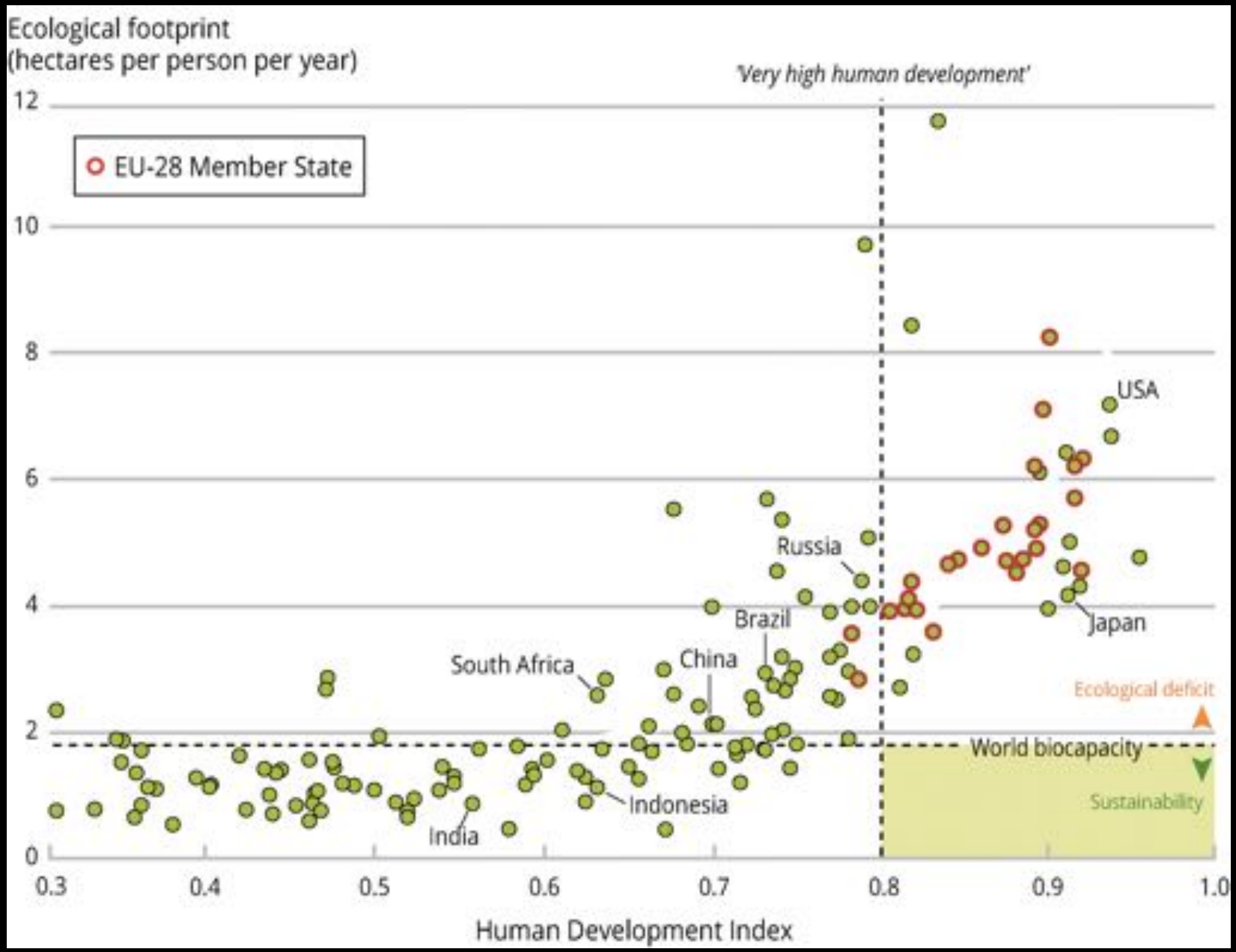
Conservação de comunidades ecológicas

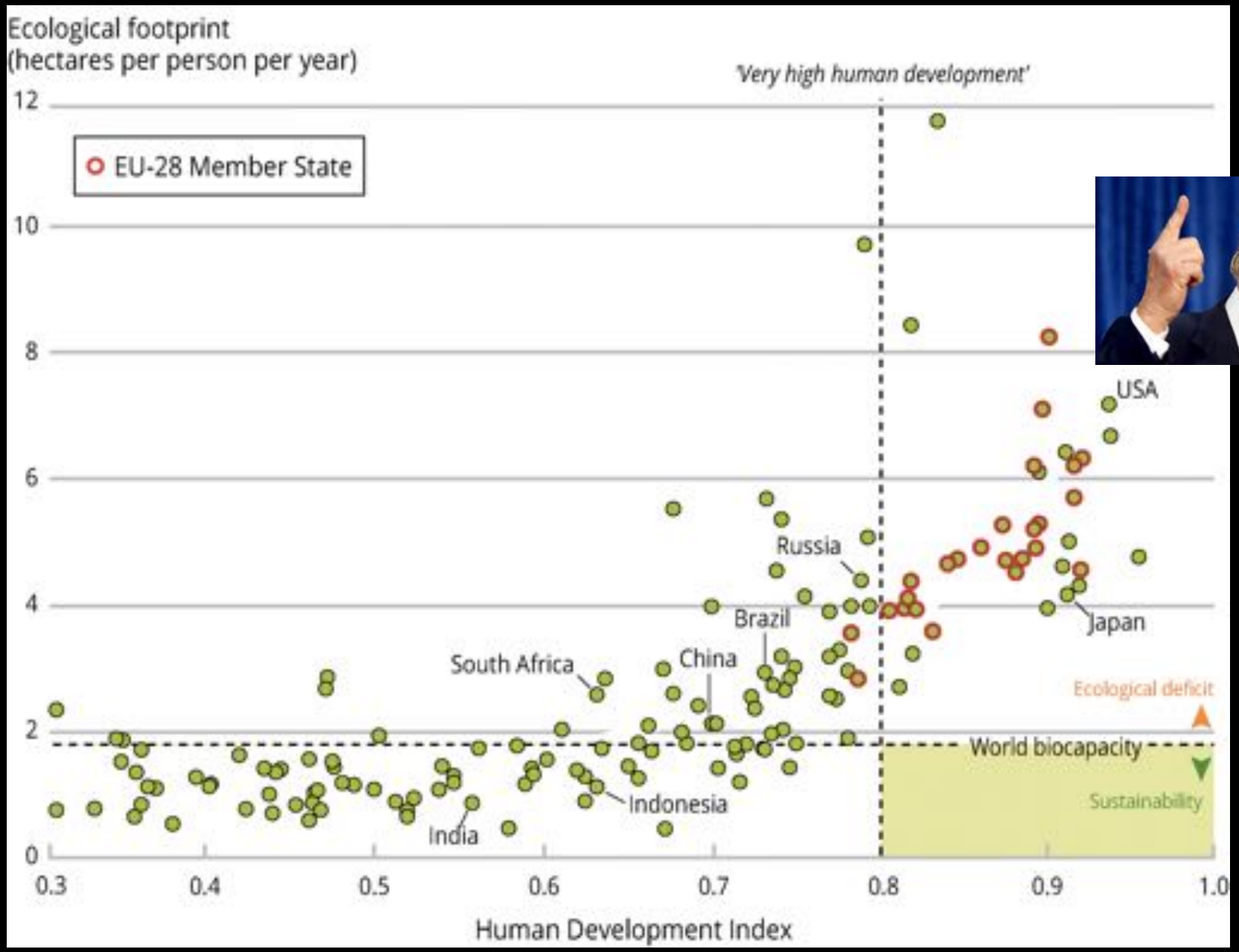
1. Definição e motivos
2. **A dinâmica da destruição**
3. Estados estáveis alternativos
4. Resumo
5. Sugestão de leitura

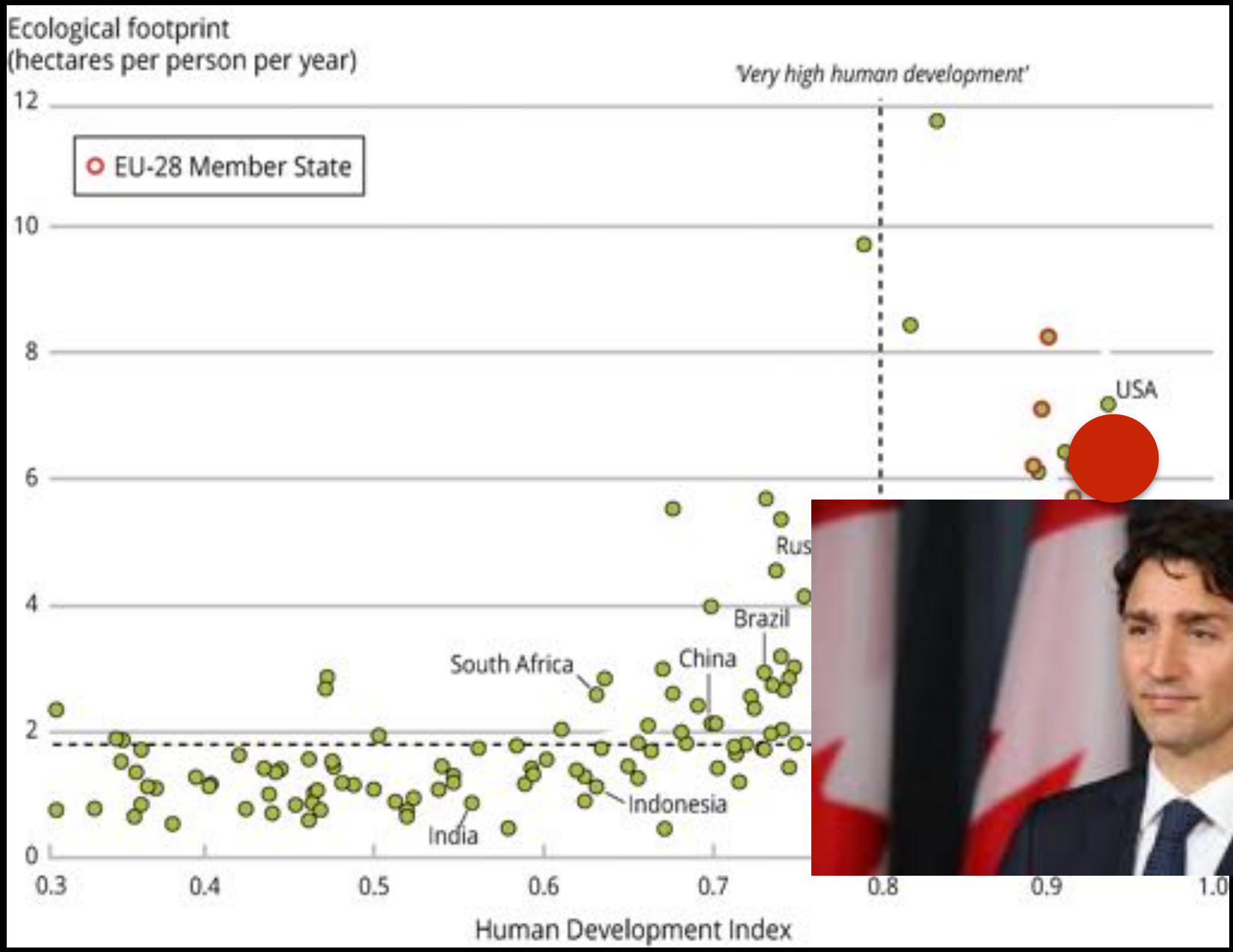
As ameaças à diversidade

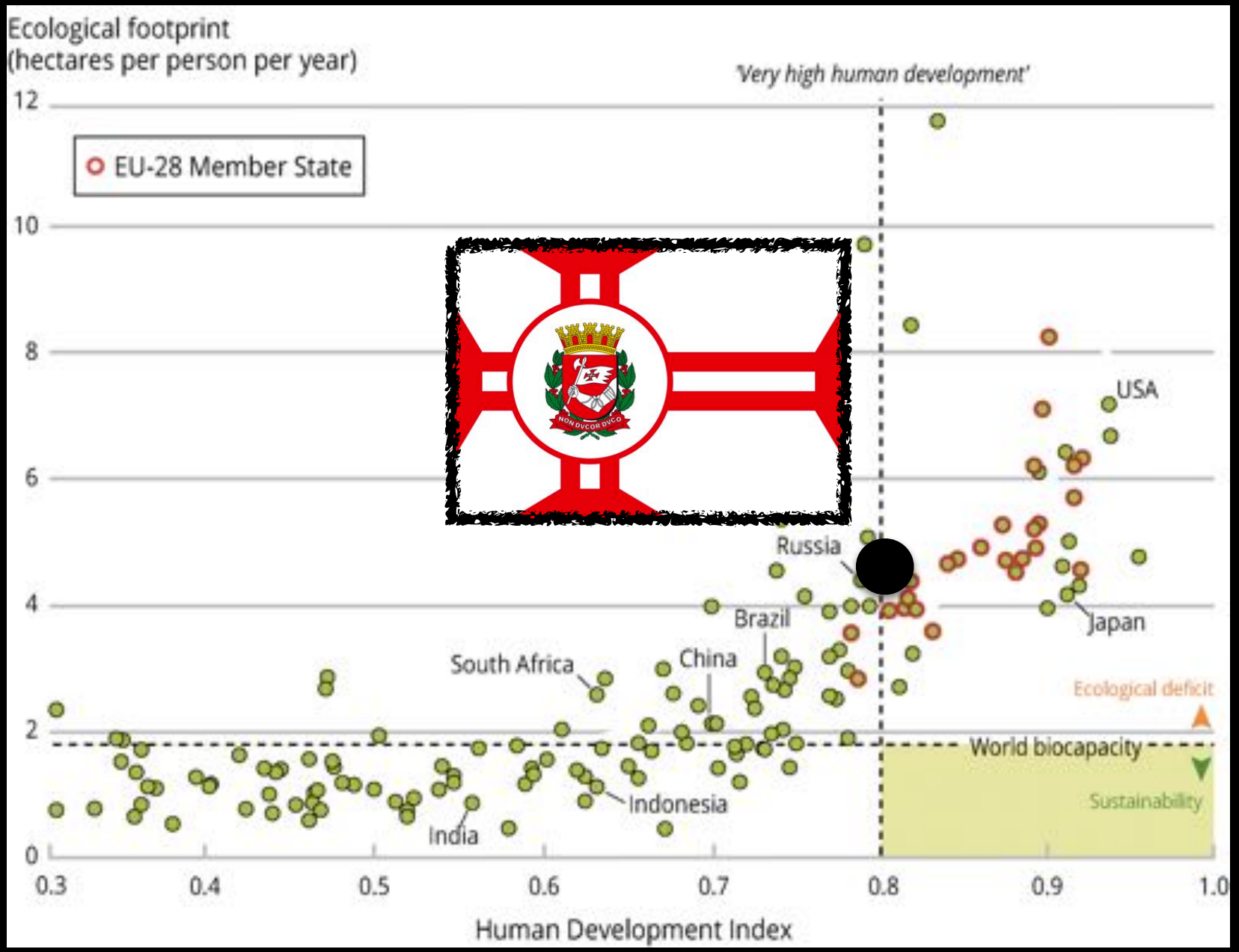
1. **Crescimento populacional humano**

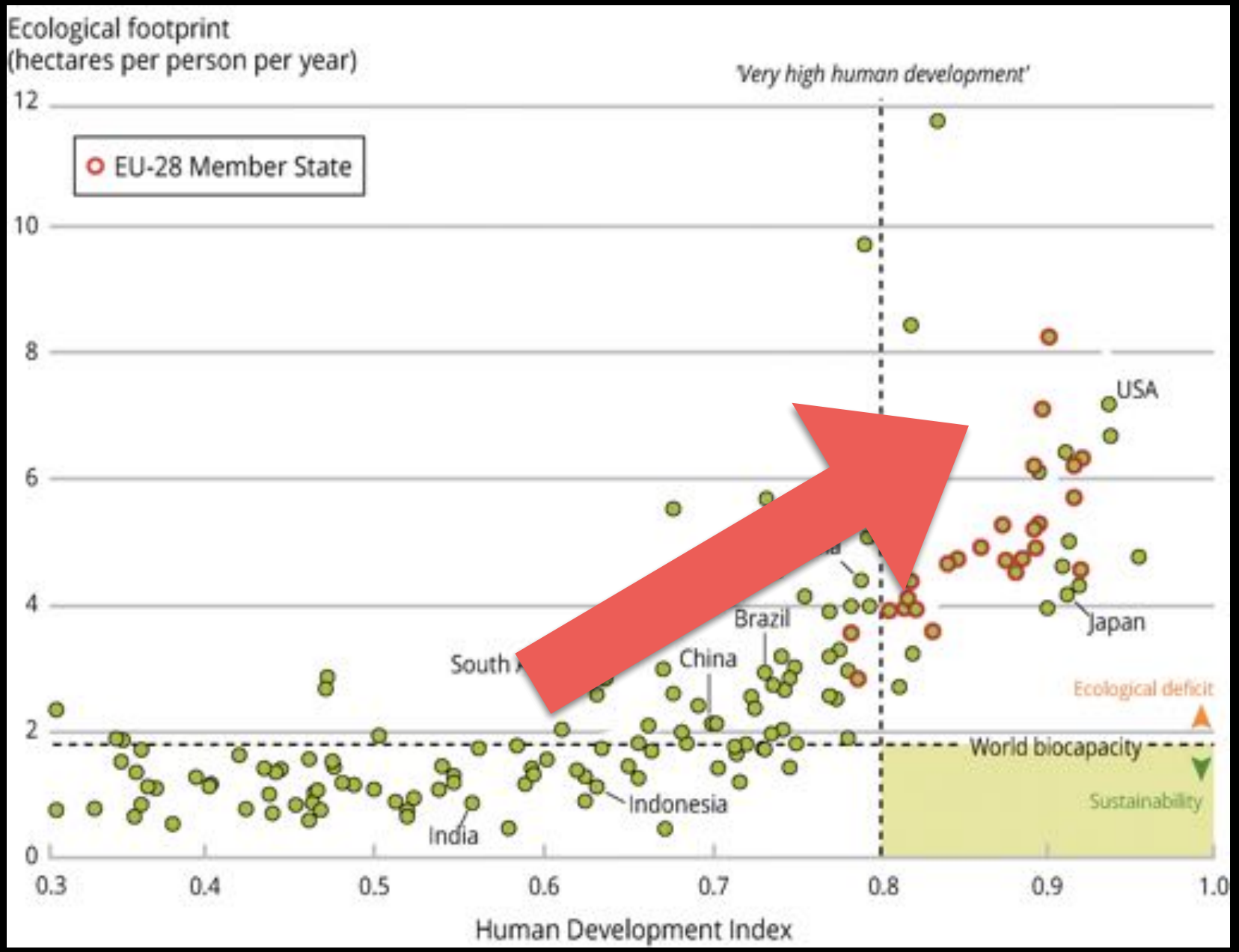

Population size (N)
500
450
400
350
300
250
200
150
100
50
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Time (months)

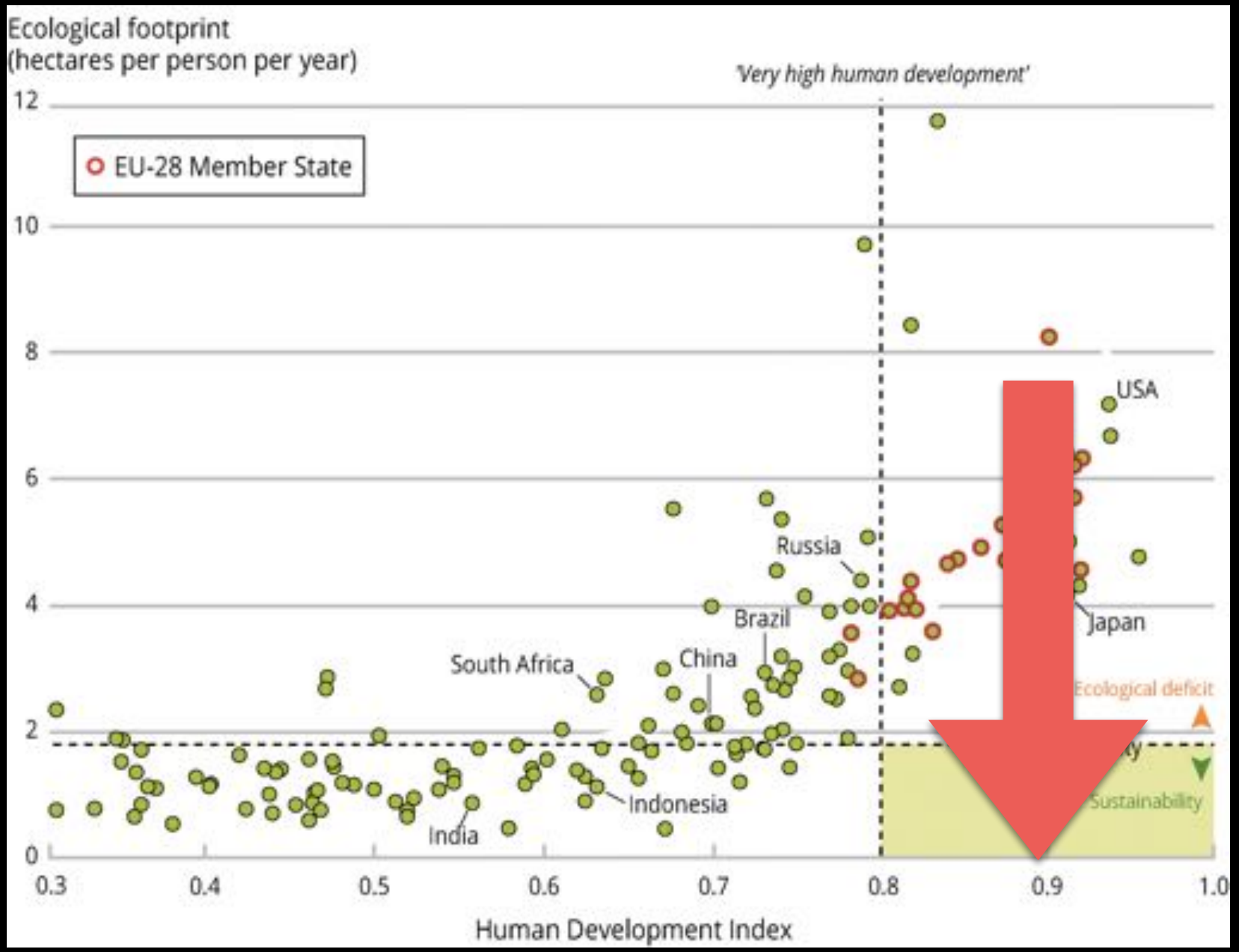

Ecological footprint
(hectares per person per year)
'Very high human development'
EU-28 Member State
12
10
8
6
4
2
0
USA
Russia
Brazil
Japan
China
South Africa
Indonesia
India
Ecological deficit
World biocapacity
Sustainability
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Human Development Index


Ecological footprint
(hectares per person per year)
'Very high human development'
EU-28 Member State
12
10
8
6
4
2
0
USA
Russia
Brazil
Japan
China
South Africa
India
Indonesia
Ecological deficit
World biocapacity
Sustainability
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Human Development Index


Ecological footprint
(hectares per person per year)
'Very high human development'
EU-28 Member State
12
10
8
6
4
2
0
USA
Rus
Brazil
China
South Africa
Indonesia
India
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Human Development Index

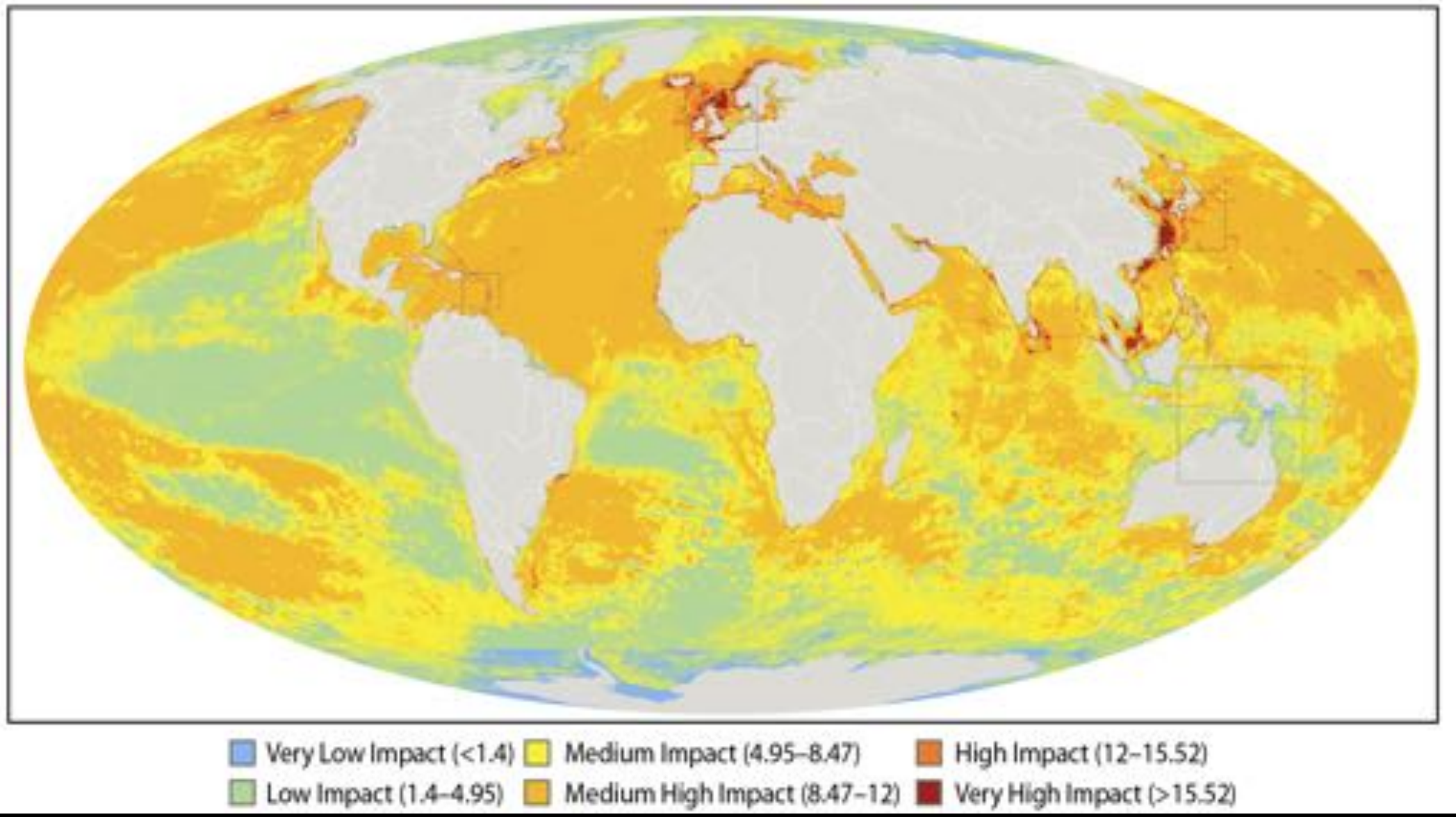

Ecological footprint
(hectares per person per year)
'Very high human development'
EU-28 Member State
12
10
8
6
4
2
0
USA
Russia
Brazil
Japan
China
South Africa
India
Indonesia
Ecological deficit
World biocapacity
Sustainability
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Human Development Index

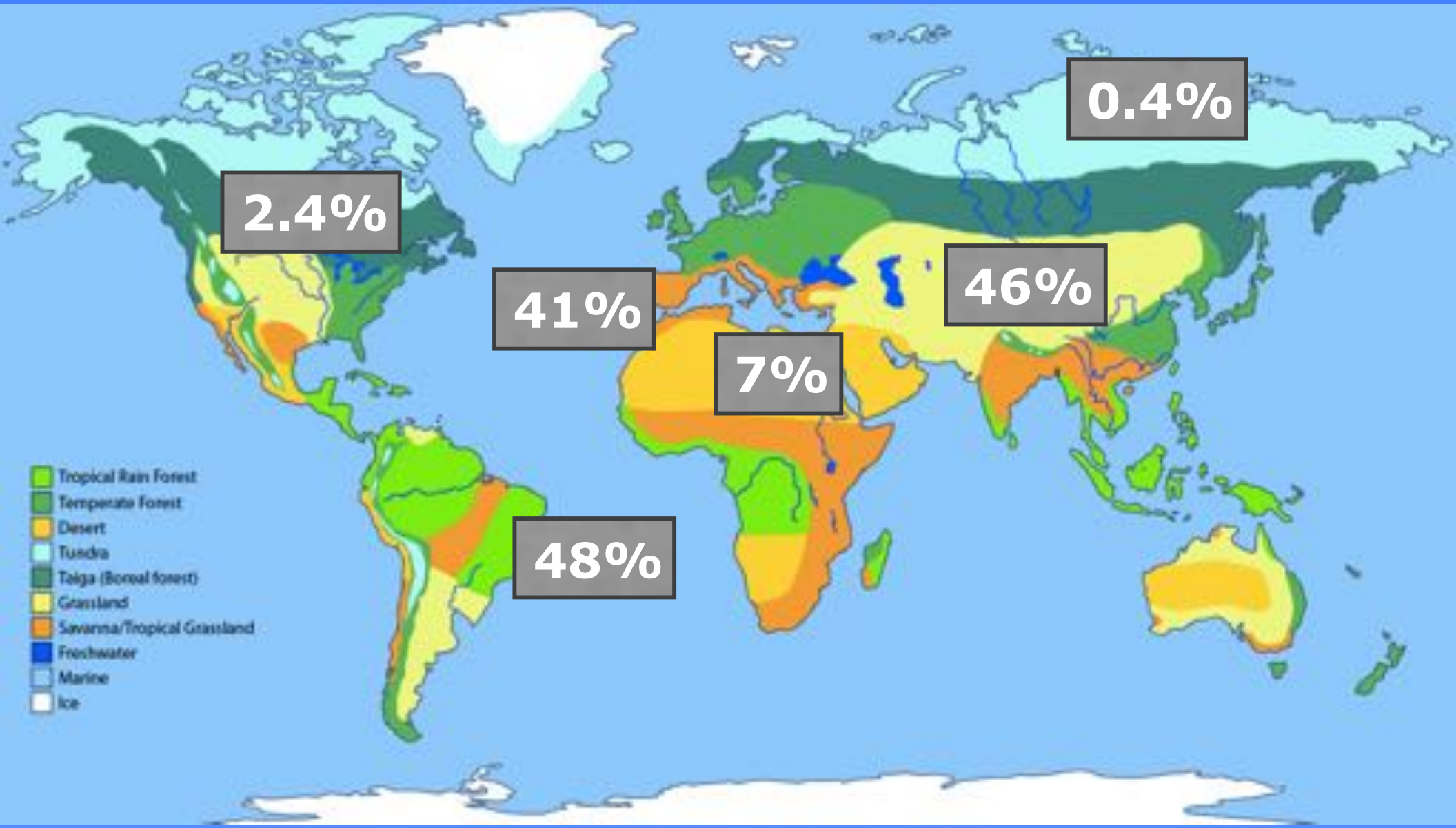

Ecological footprint
(hectares per person per year)
'Very high human development'
EU-28 Member State
12
10
8
6
4
2
0
USA
Japan
Brazil
China
South
India
Indonesia
Ecological deficit
World biocapacity
Sustainability
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Human Development Index

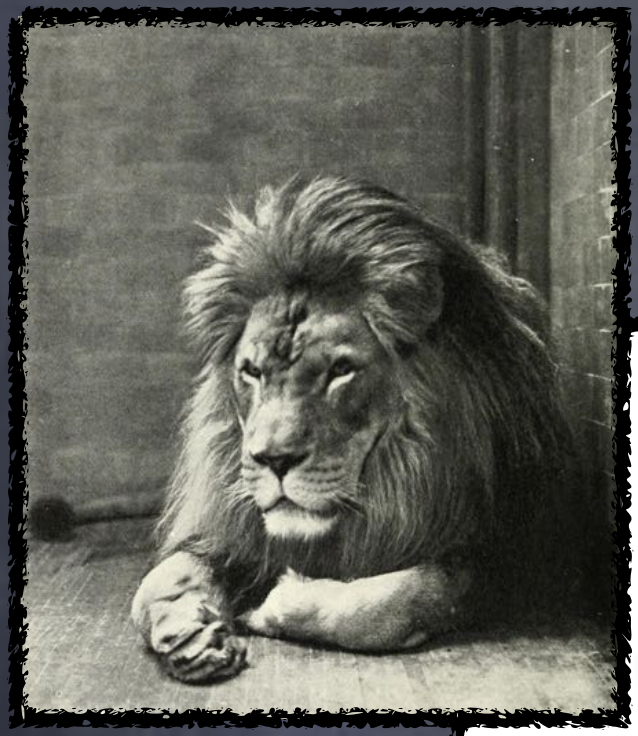

Ecological footprint
(hectares per person per year)
'Very high human development'
EU-28 Member State
12
10
8
6
4
2
0
USA
Russia
Brazil
Japan
China
South Africa
Indonesia
India
Ecological deficit
Sustainability
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Human Development Index

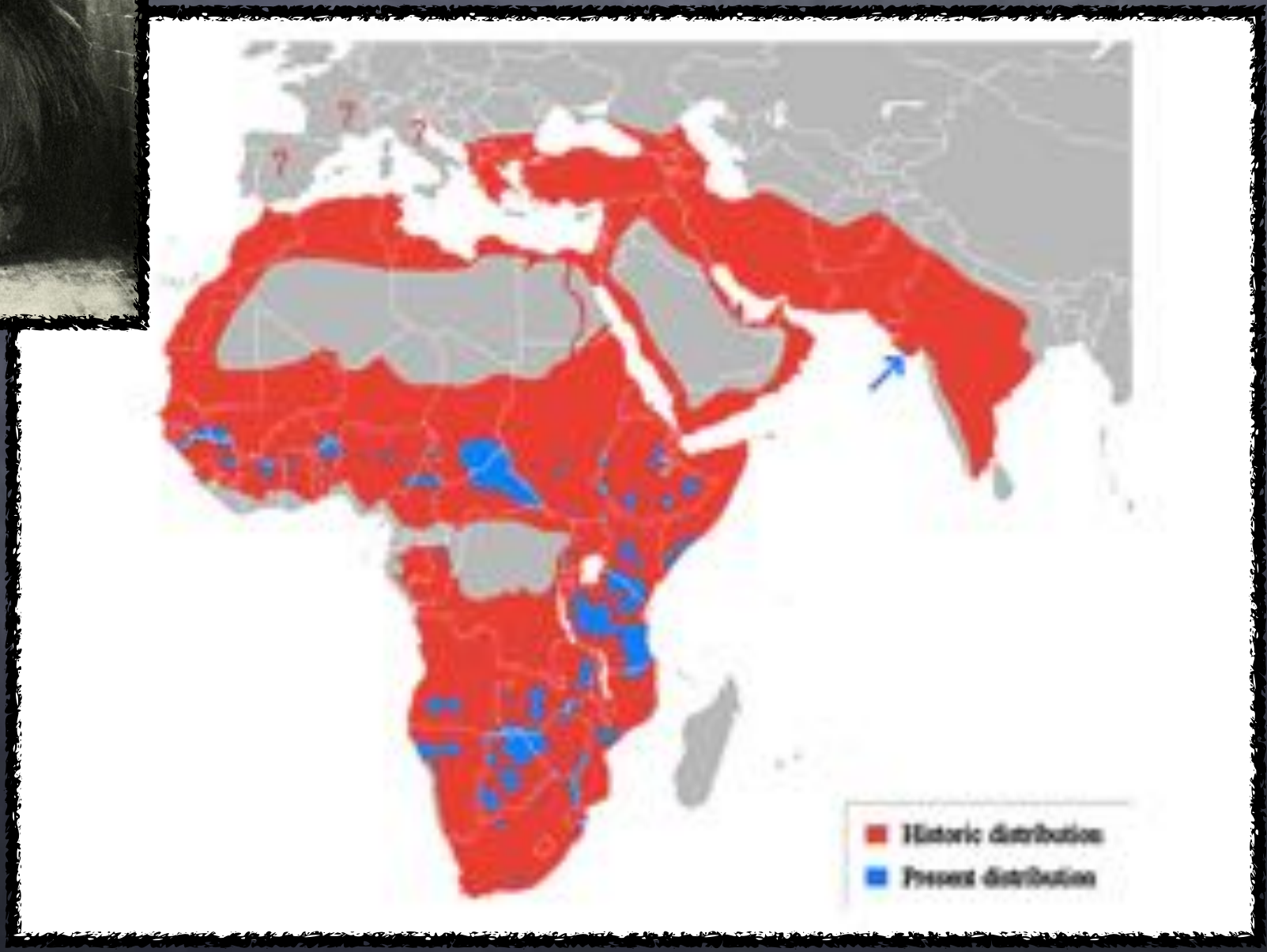
As ameaças à diversidade

1. Crescimento populacional humano
2. **Perda de habitat**


Very Low Impact (<1.4)
Low Impact (1.4–4.95)
Medium Impact (4.95–8.47)
Medium High Impact (8.47–12)
High Impact (12–15.52)
Very High Impact (>15.52)

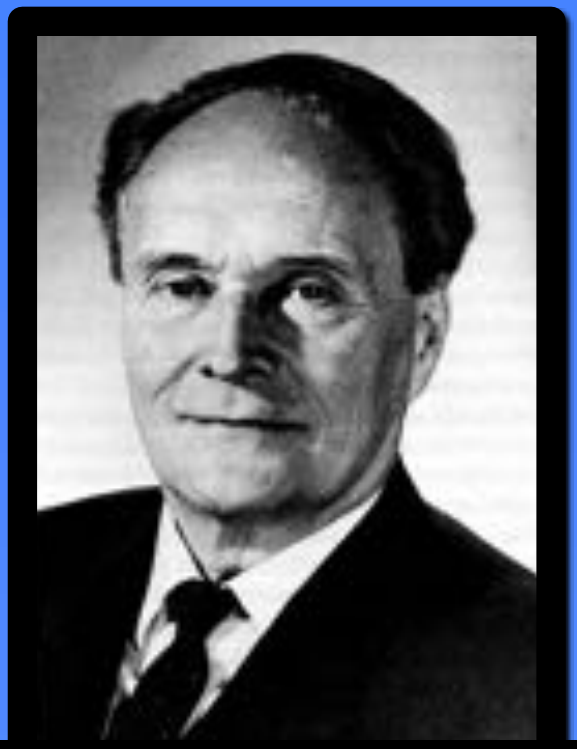

0.4%
2.4%
46%
41%
7%
48%
Tropical Rain Forest
Temperate Forest
Desert
Tundra
Taiga (Boreal forest)
Grassland
Savanna/Tropical Grassland
Freshwater
Marine
Ice



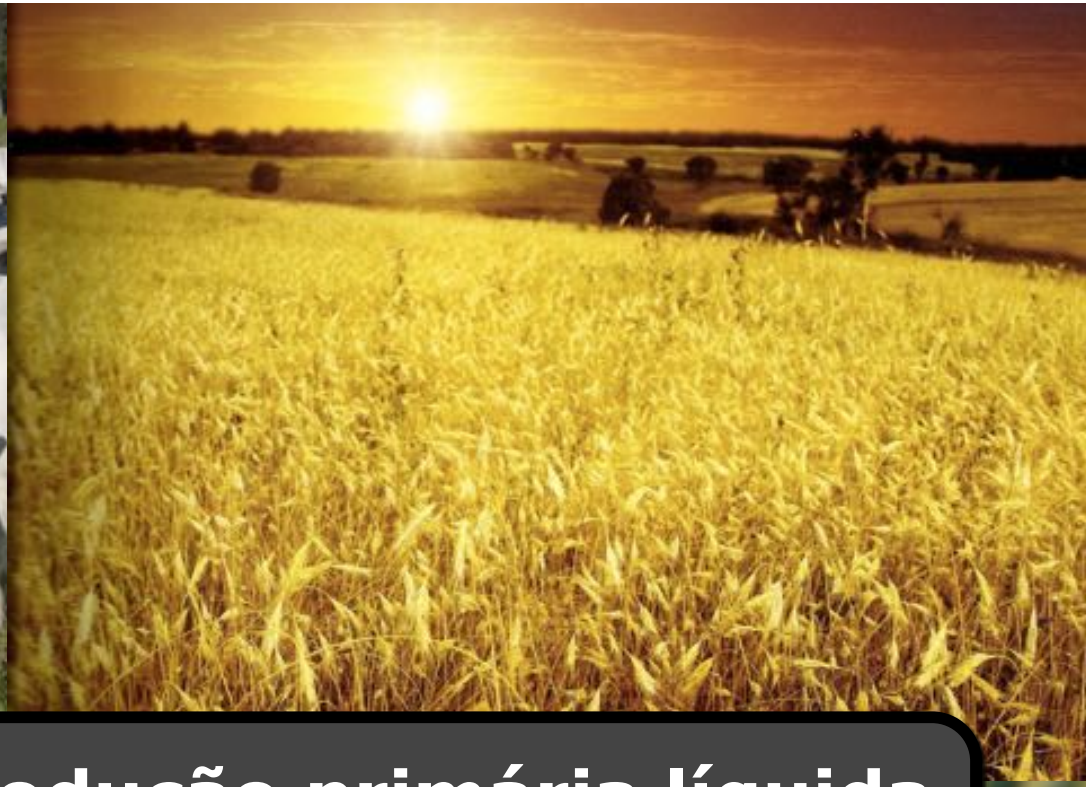

Historic distribution
Present distribution

O princípio da exclusão competitiva

Paramecium



Georgy Gause
1910 - 1986



20% - 40% da produção primária líquida

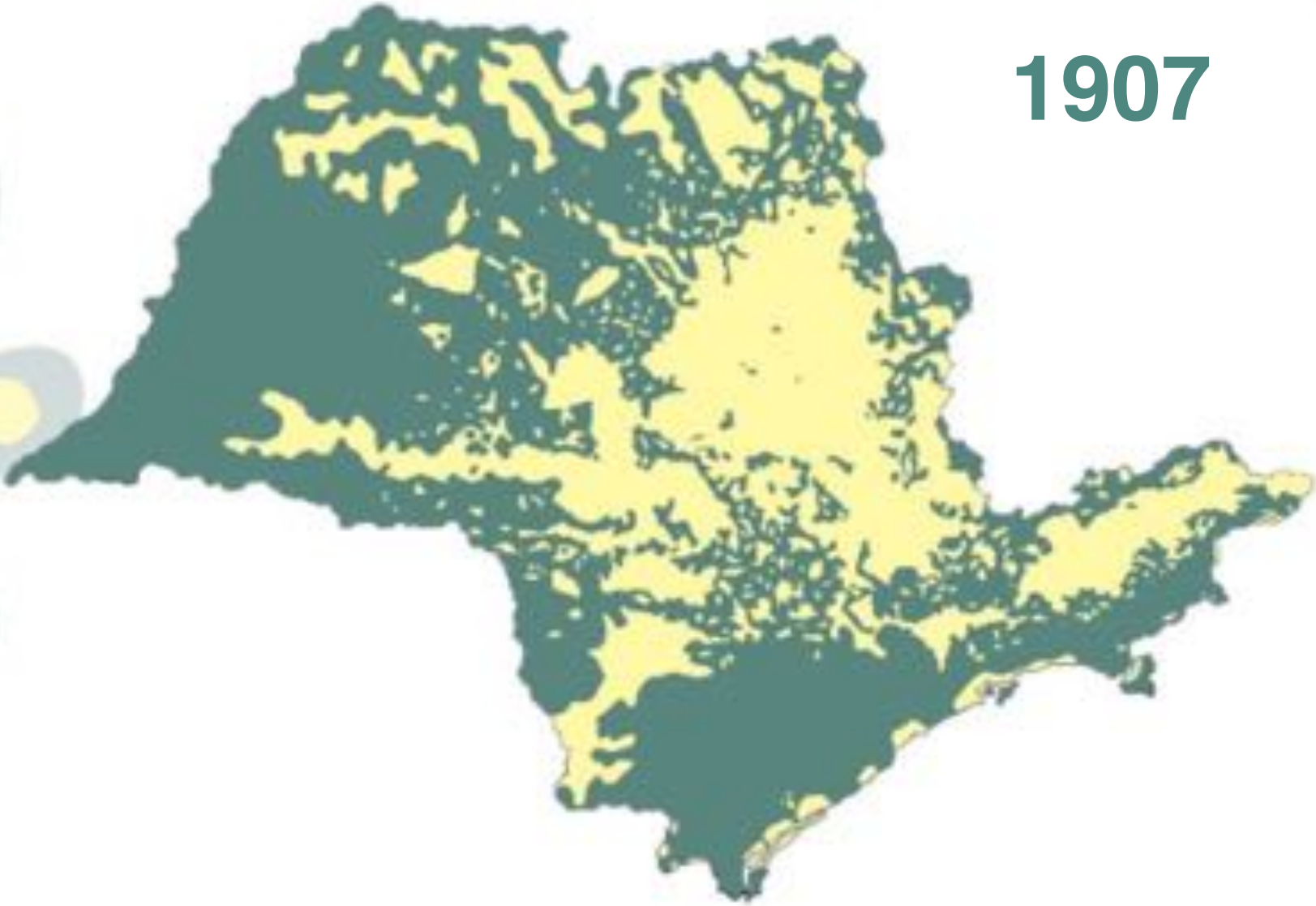
As ameaças à diversidade

1. Crescimento populacional humano
2. Perda de habitat
3. **Fragmentação de habitat**

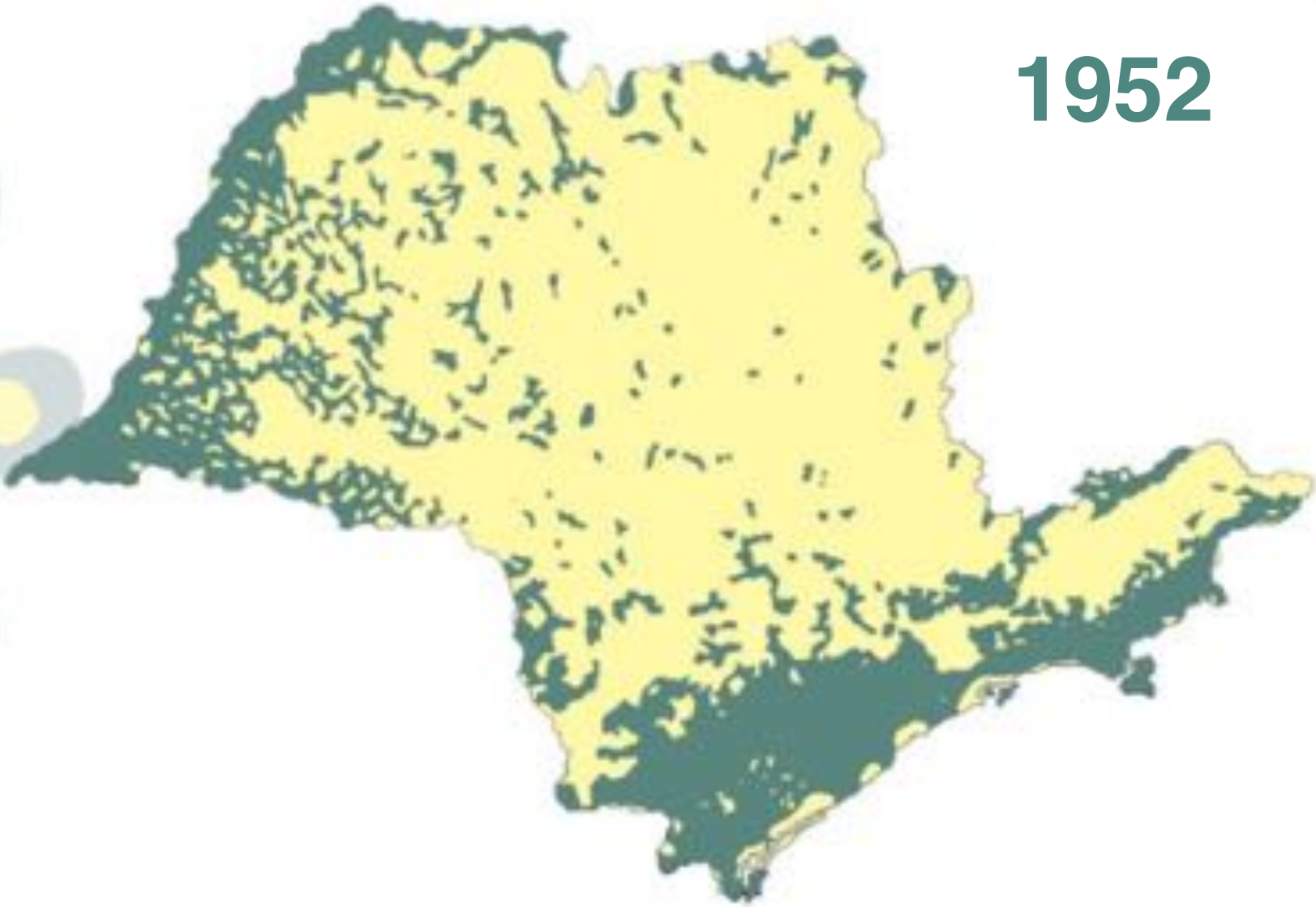
The Atlantic Forest

1500

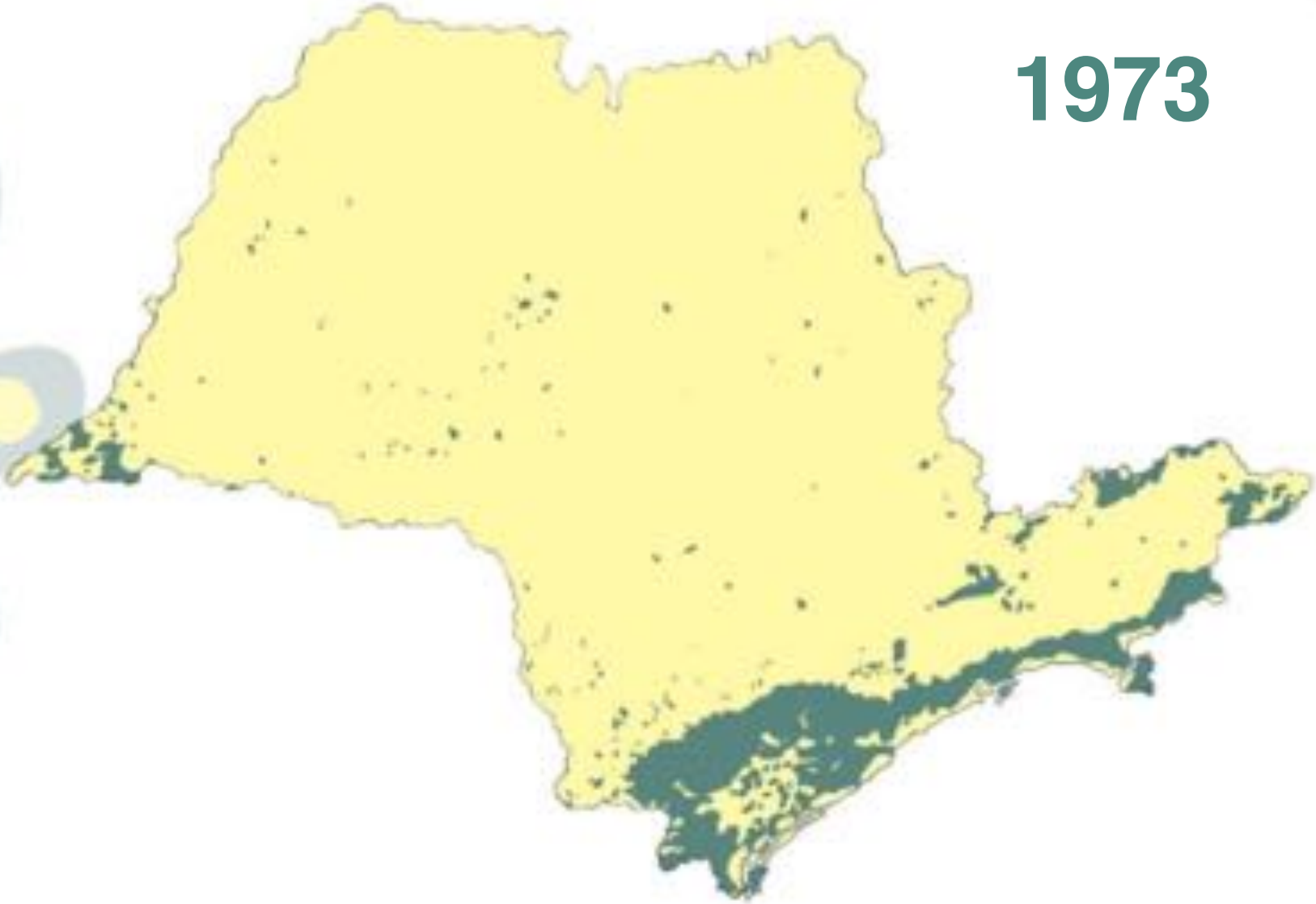
1845



1907

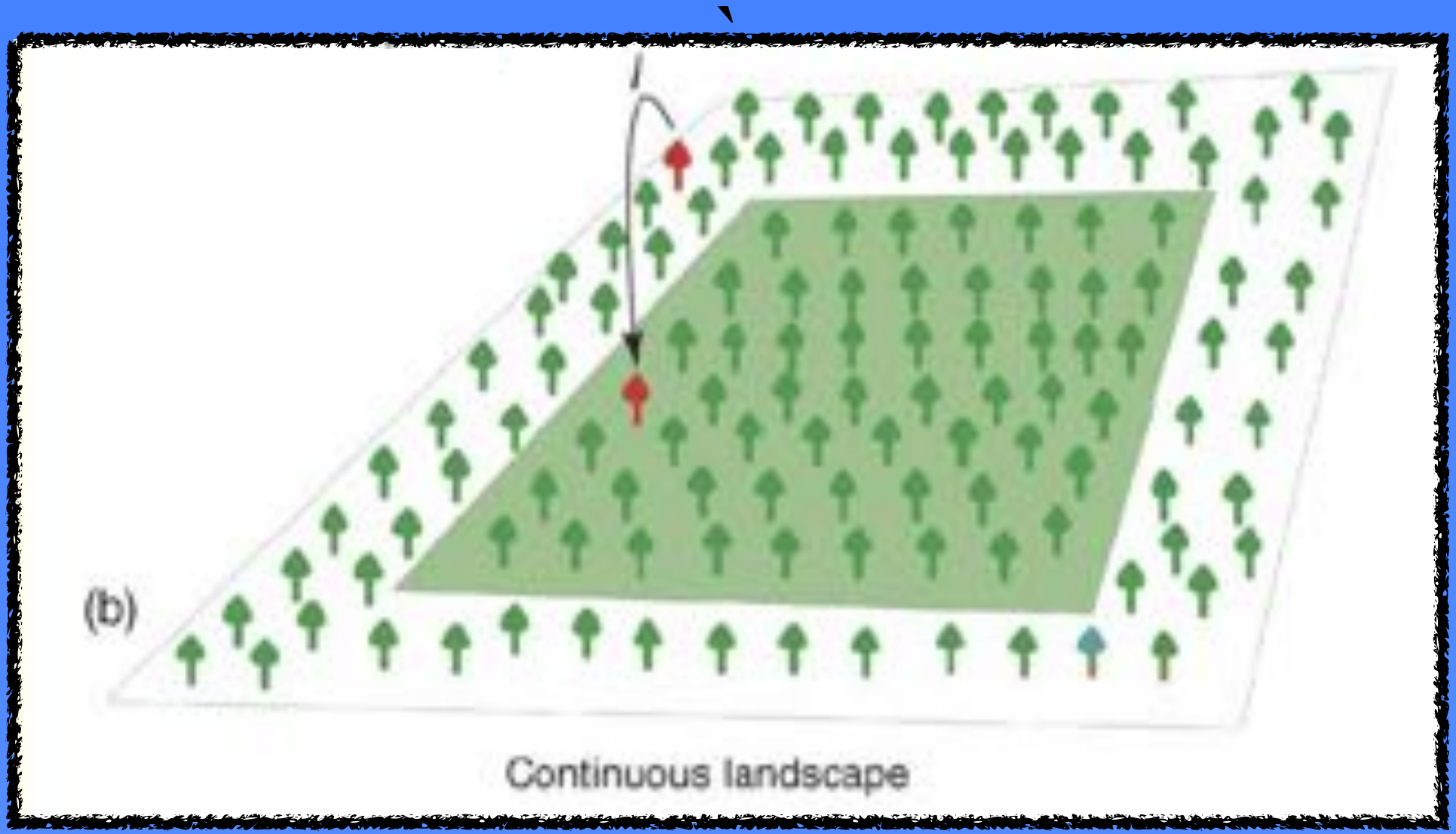


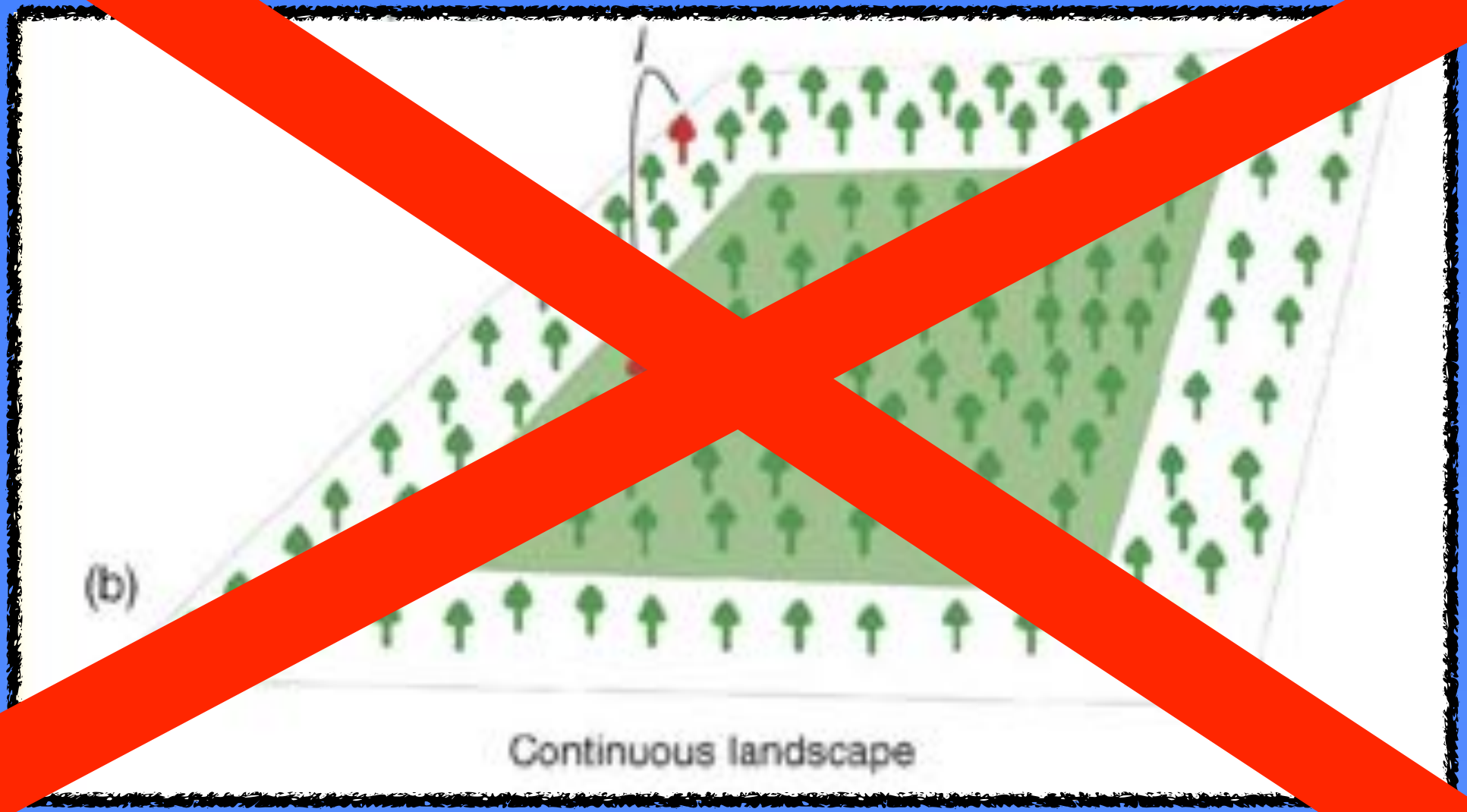
1952


1973

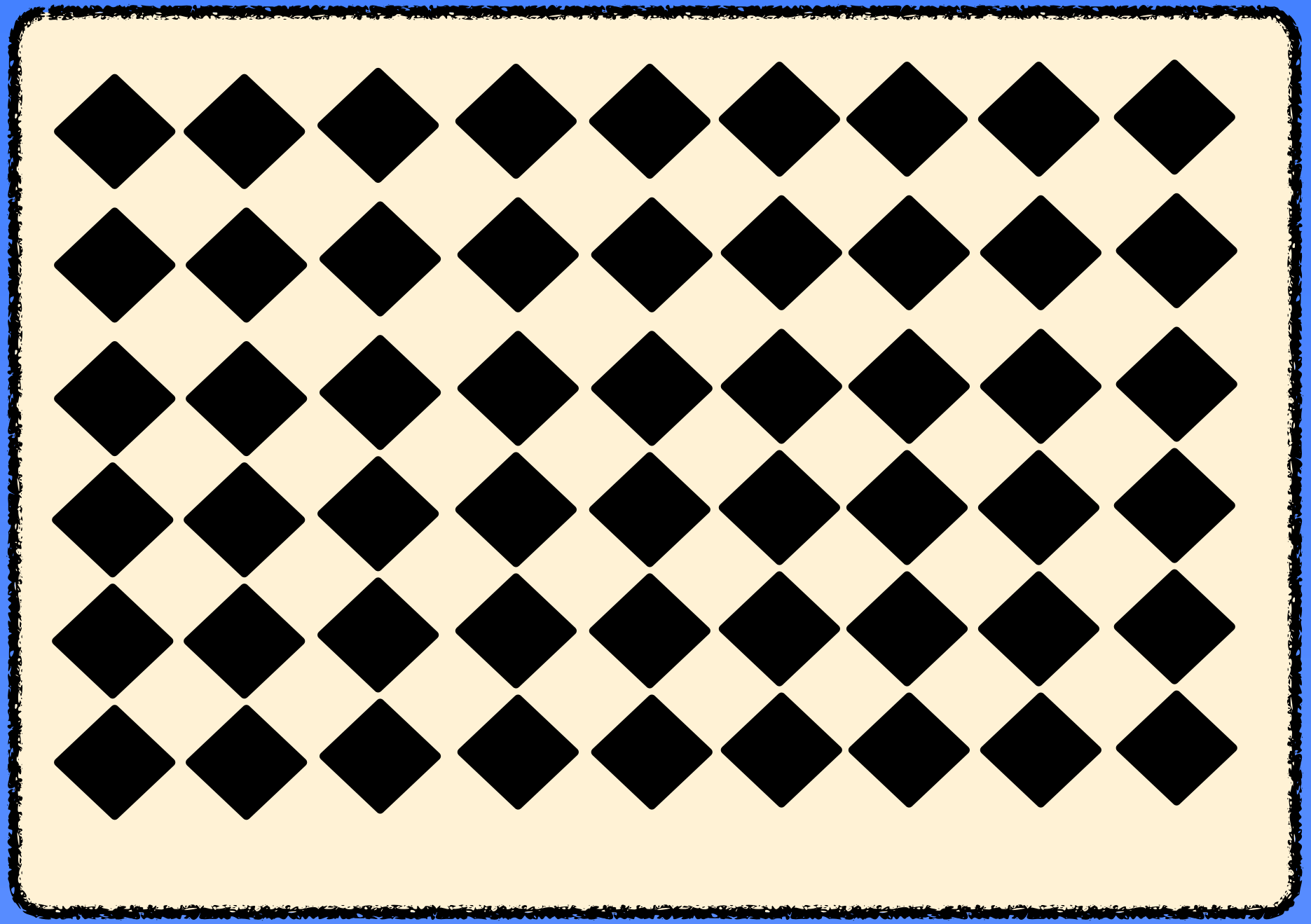

2000


São Paulo-Rio
Cia. Mogiana
Sorocabana
São Paulo Railway
Cia. Paulista
Noroeste do Brasil
Araraquara
São Paulo-Minas

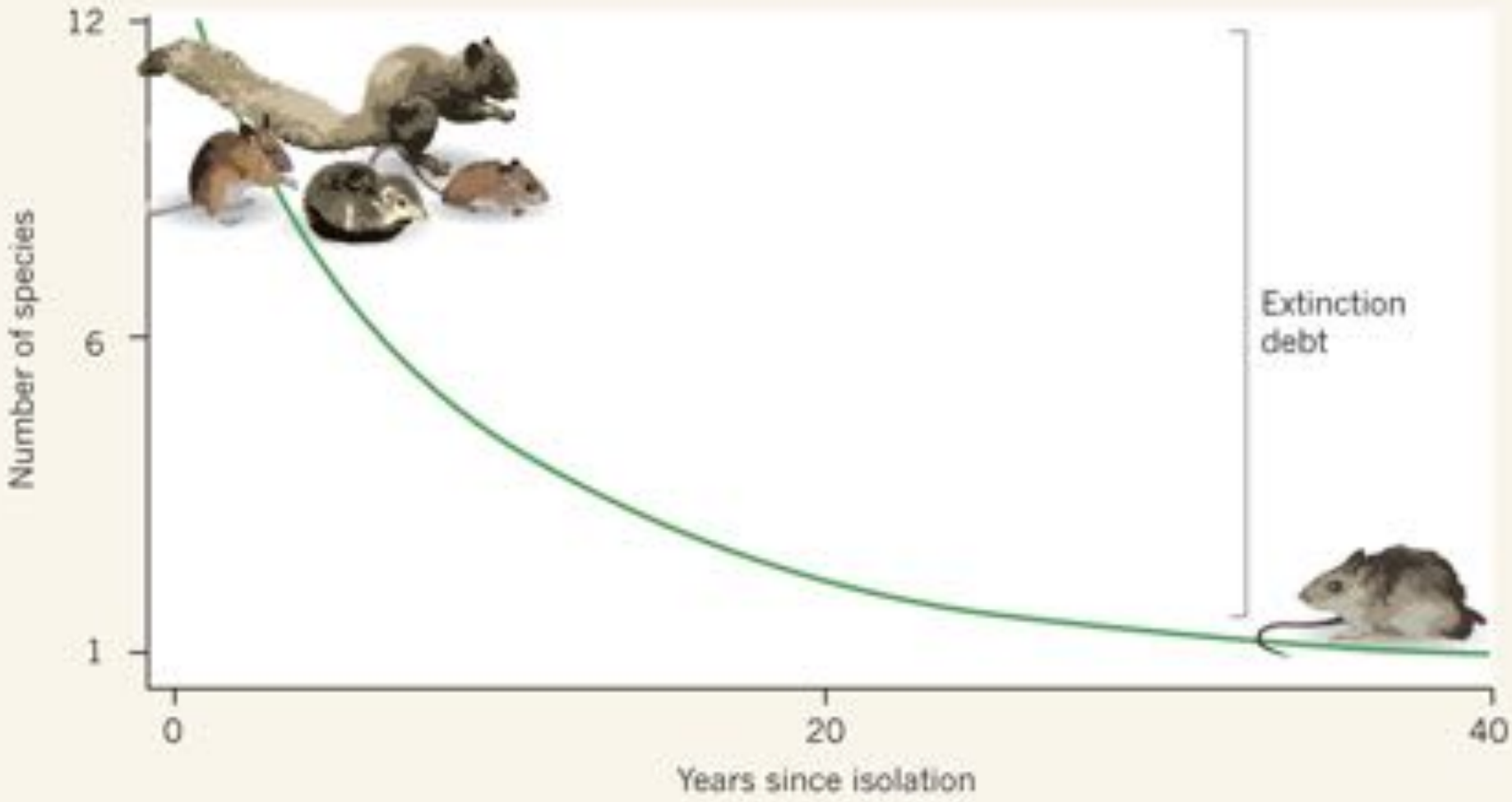

(b)
Continuous landscape


(b)
Continuous landscape


31
9
22
18
29
7
28
12
35
3
26
0
32
15
1
33
16
24
5



Débito de extinções



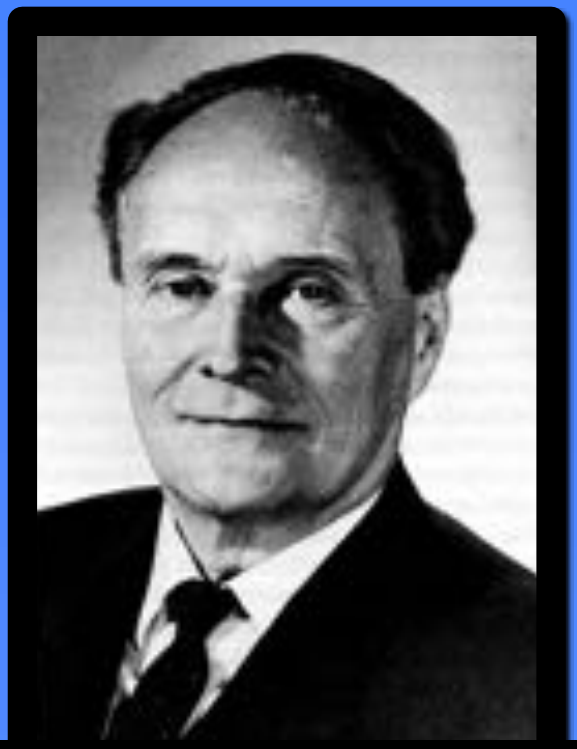
As ameaças à diversidade

1. Crescimento populacional humano
2. Perda de habitat
3. Fragmentação de habitat
4. **Espécies invasoras**

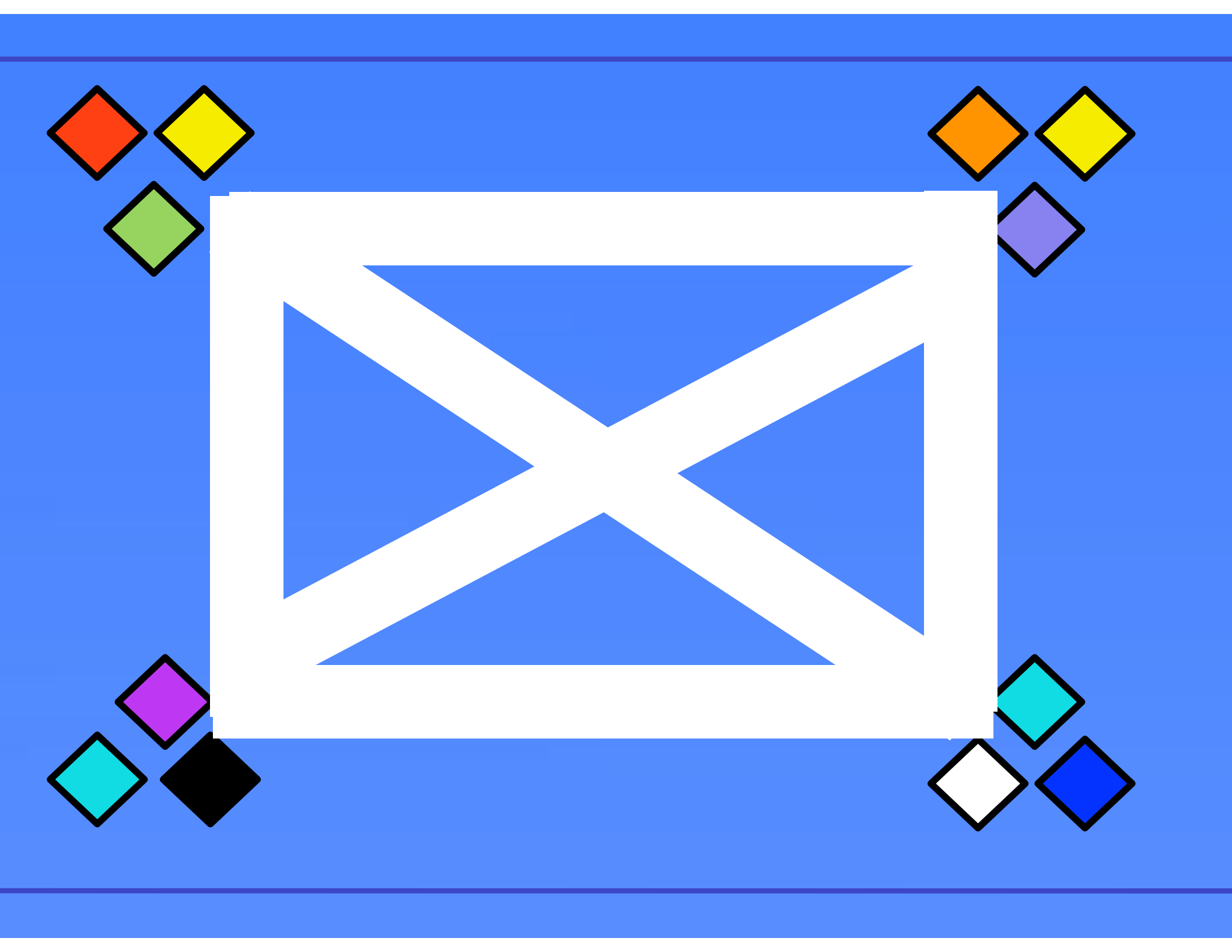

sPots and Greens

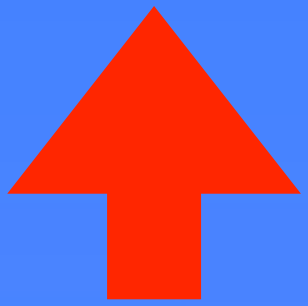
O princípio da exclusão competitiva

Paramecium



Georgy Gause
1910 - 1986

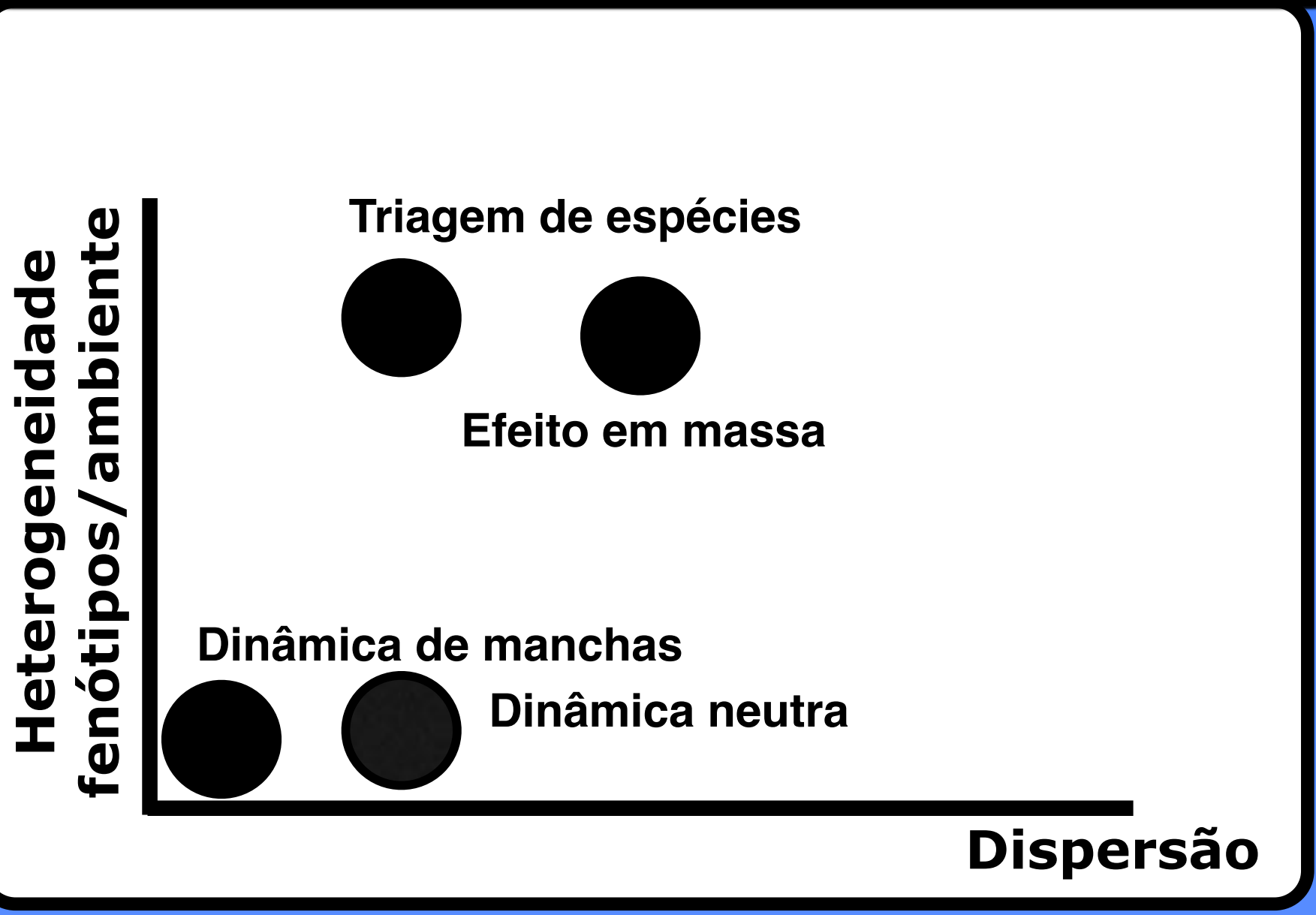




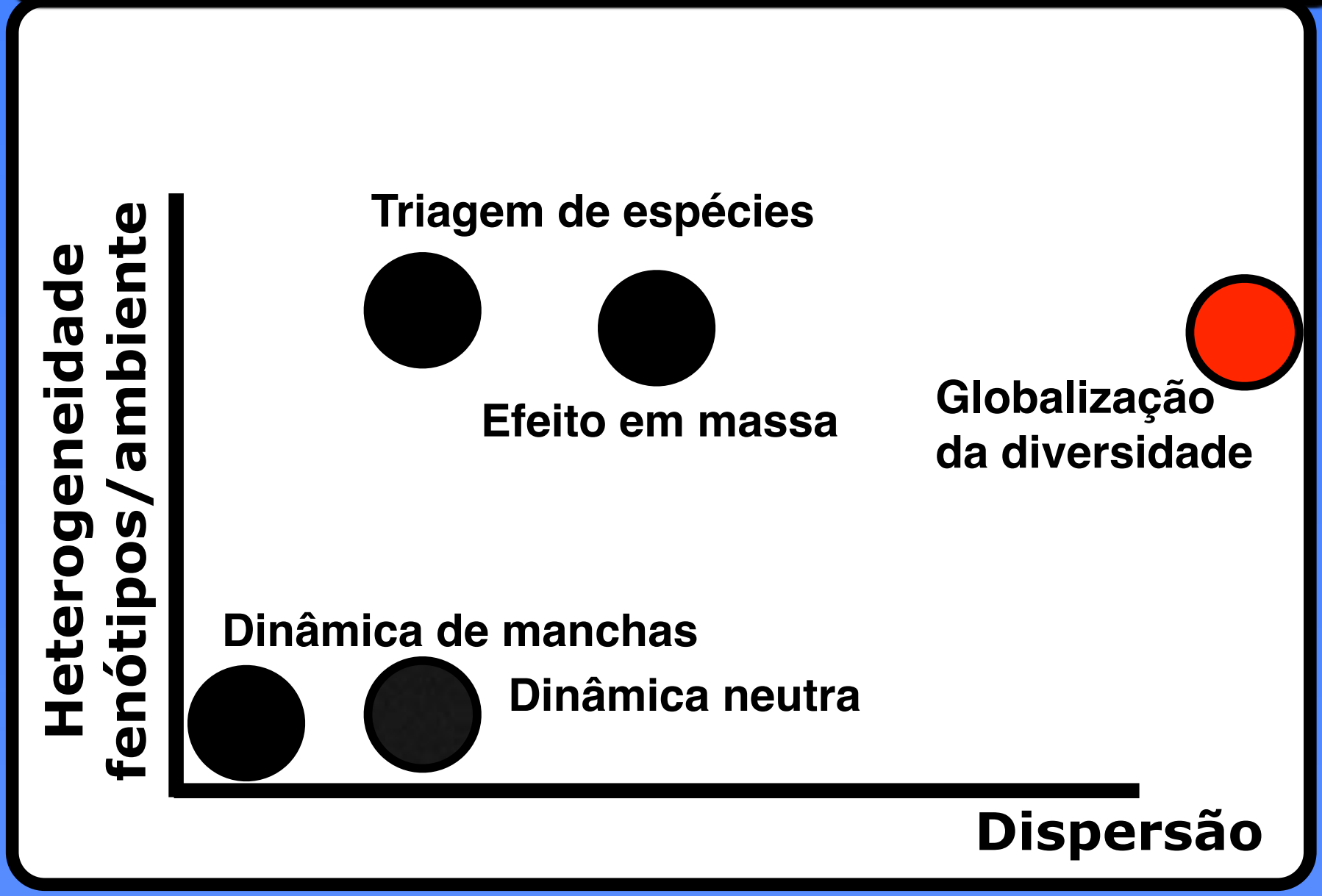
Diversidade local (alfa)

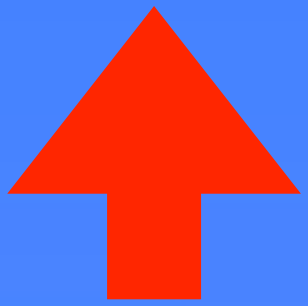
***Turn-over* (beta)**

Quatro formas de ver uma metacomunidade



Cinco formas de ver uma metacomunidade

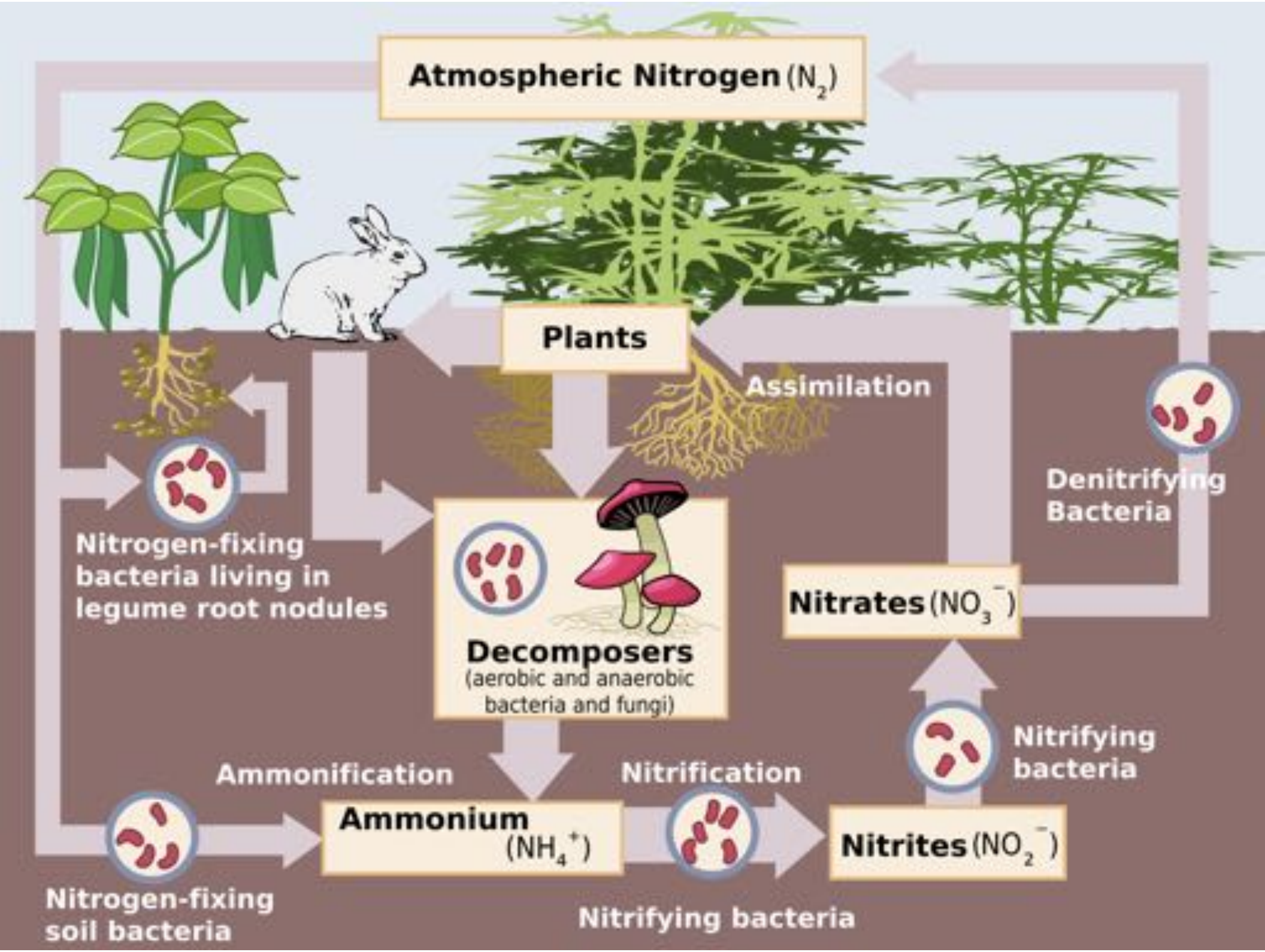




Diversidade local (alfa)

As ameaças à diversidade

1. Crescimento populacional humano
2. Perda de habitat
3. Fragmentação de habitat
4. Espécies invasoras
5. **Poluição**

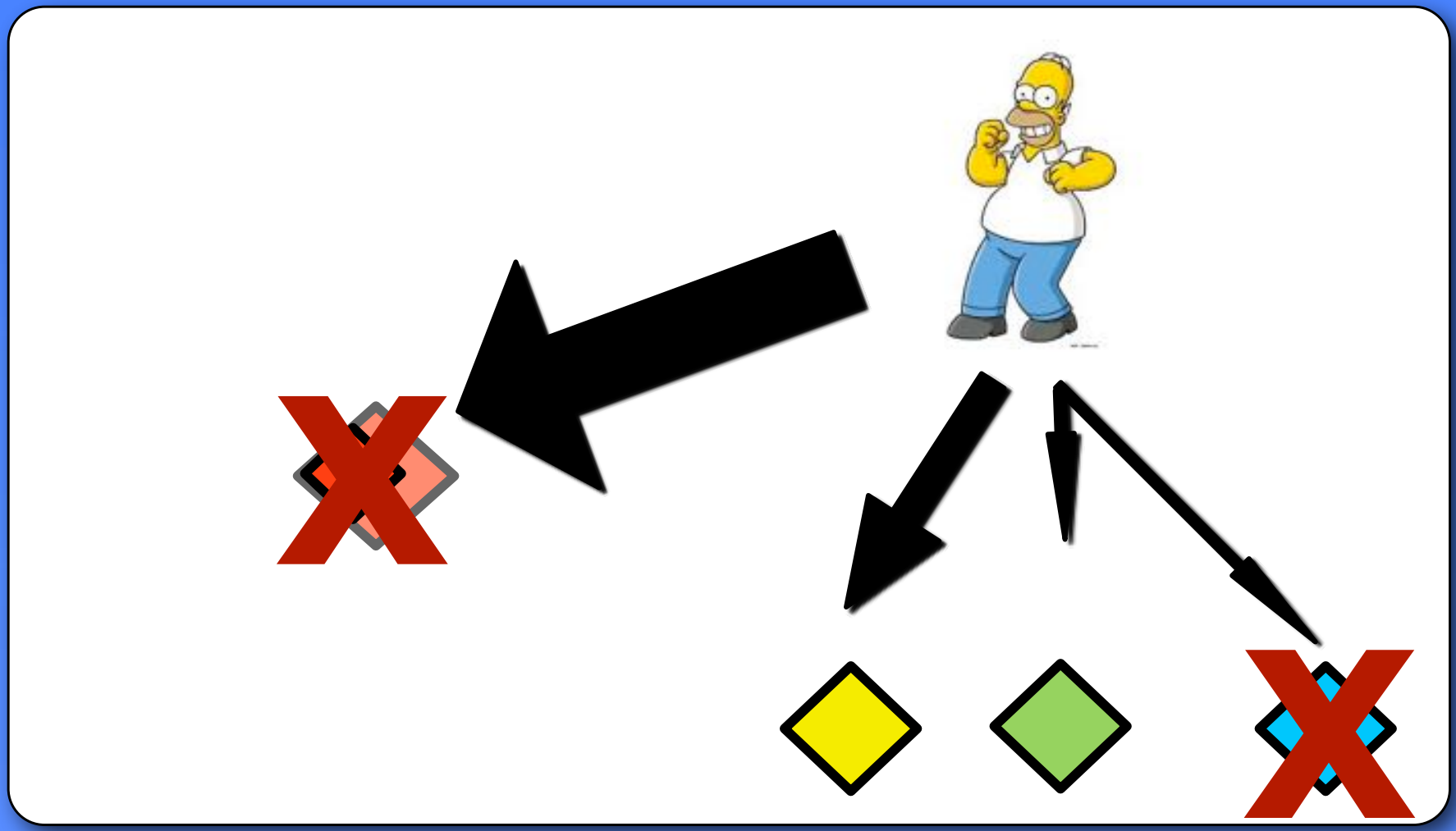

Atmospheric Nitrogen (N_2)
Plants
Assimilation
Denitrifying Bacteria
Nitrogen-fixing bacteria living in legume root nodules
Decomposers
(aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrogen-fixing soil bacteria
Nitrifying bacteria


MORE THAN JUST A DROP IN THE OCEAN
Already dead
Areas of concern
Dead zones are rapidly increasing as oceans warm
They are caused by excess nutrients and warming waters
The zones can suffocate fish, squid and other marine life
There are more than 400 ocean dead zones in the world's seas
Waters around Tasmania and near Perth were recently included on the list.

As ameaças à diversidade

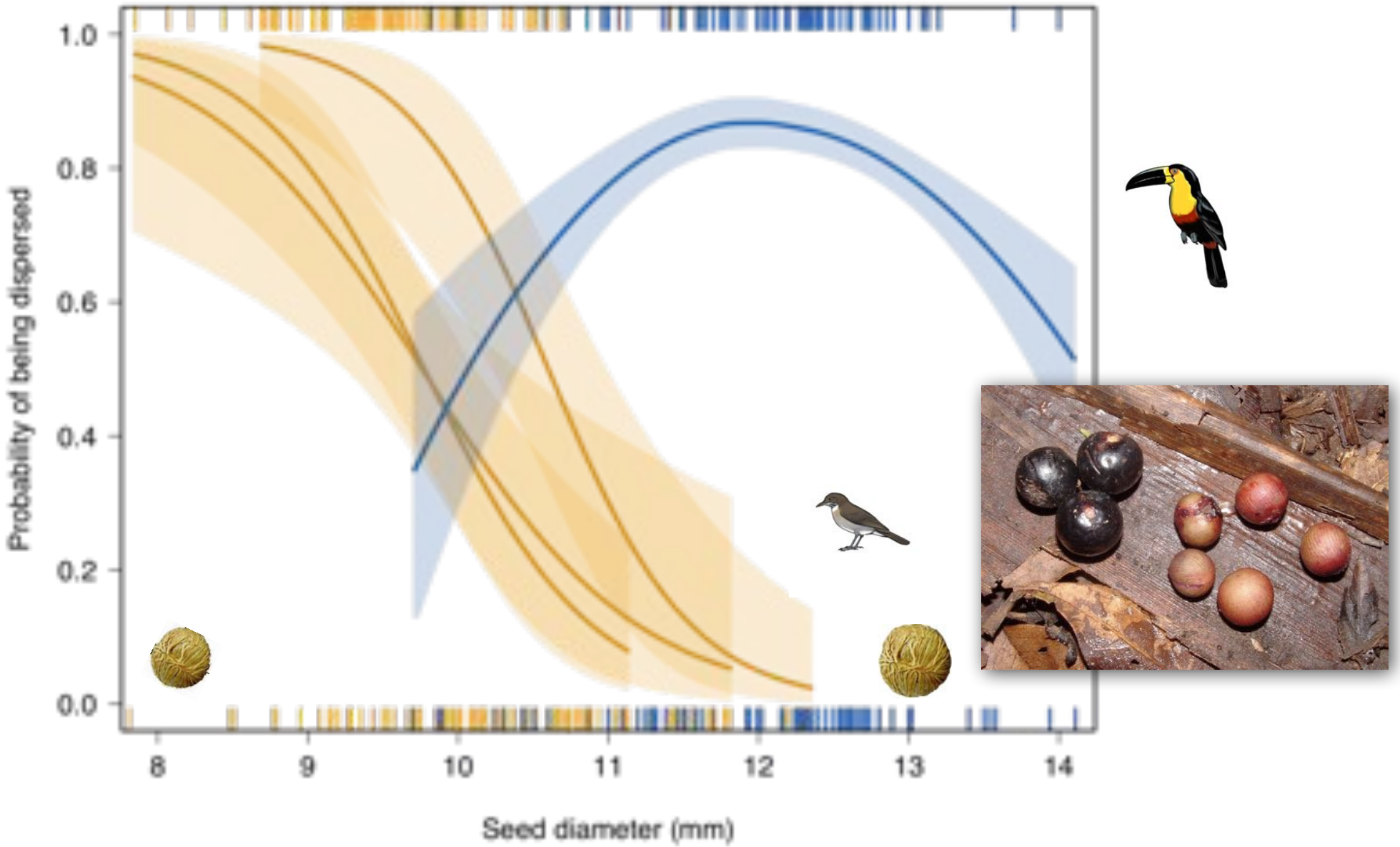
1. Crescimento populacional humano
2. Perda de habitat
3. Fragmentação de habitat
4. Espécies invasoras
5. Poluição
6. **Sobre-exploração**

Efeito top-down extremo



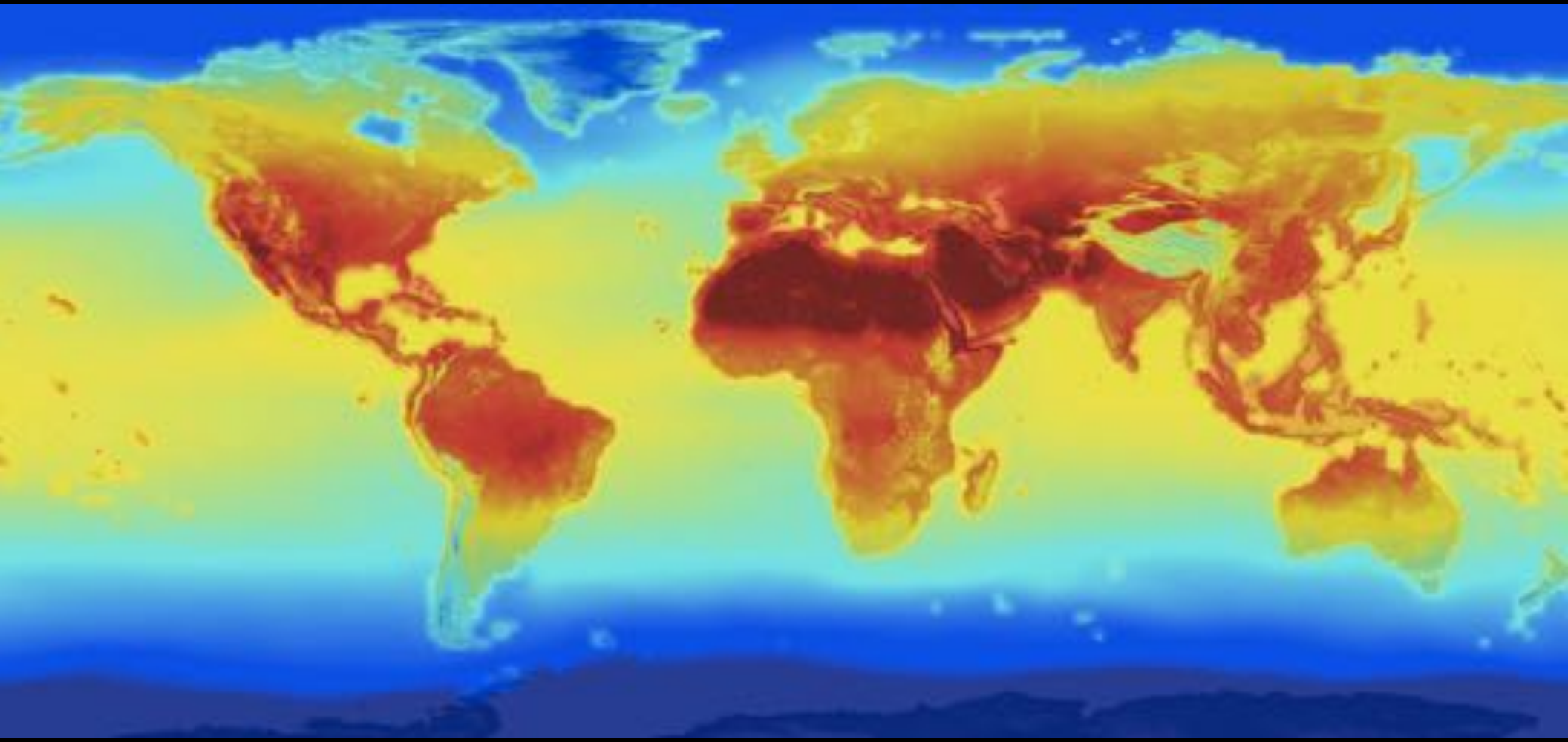
1. A ave mais abundante da Terra
2. 25-40% das aves norte-americanas
3. Um bando
    1. 3,5 bilhões de aves
    2. 1,5 x 500 km
    3. 14h passando

Phenotypic selection functions



As ameaças à diversidade

1. Crescimento populacional humano
2. Perda de habitat
3. Fragmentação de habitat
4. Espécies invasoras
5. Poluição
6. Sobre-exploração
7. **Mudança climática global**



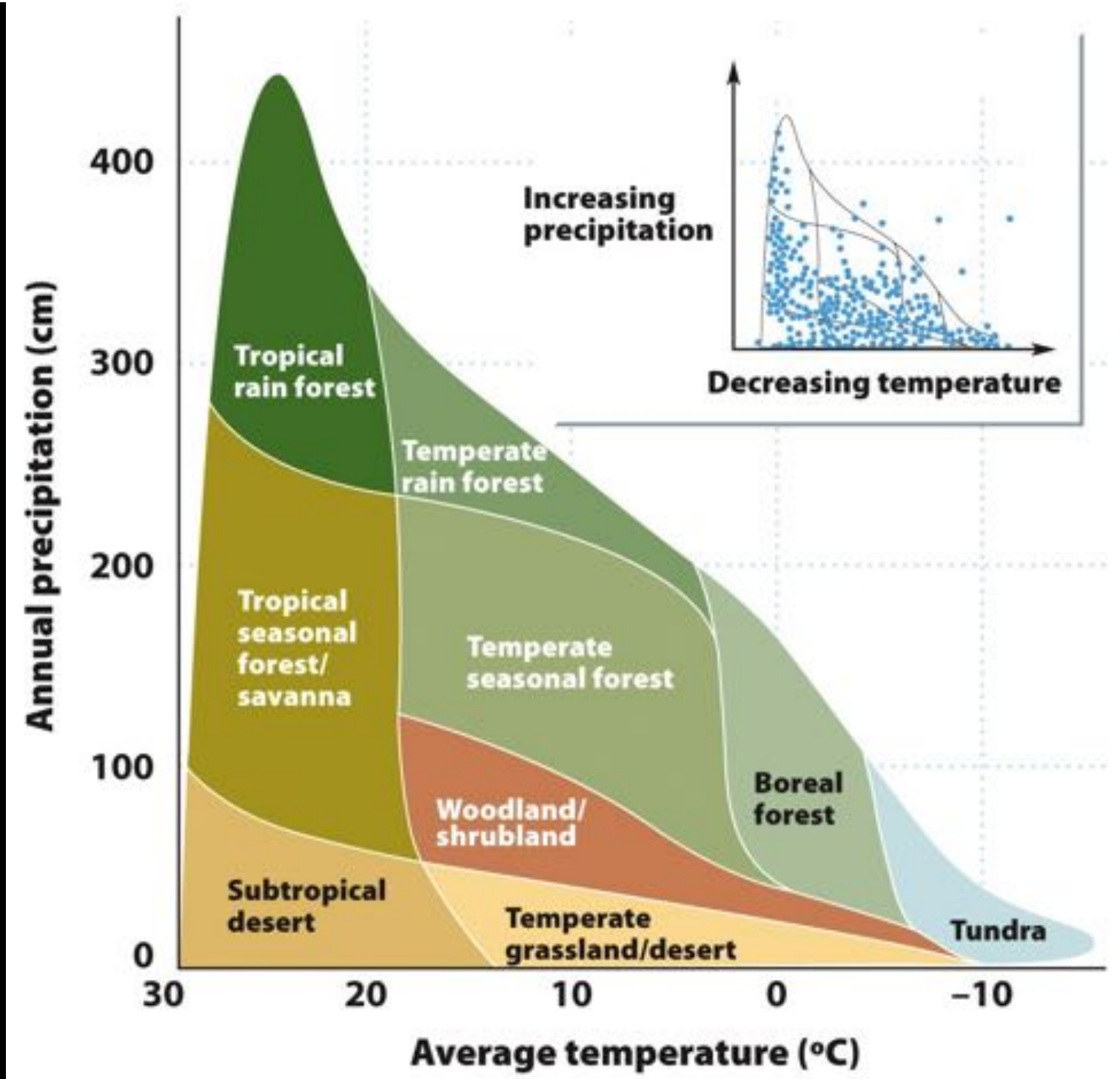


Figure 5.5
The Economy of Nature, Sixth Edition

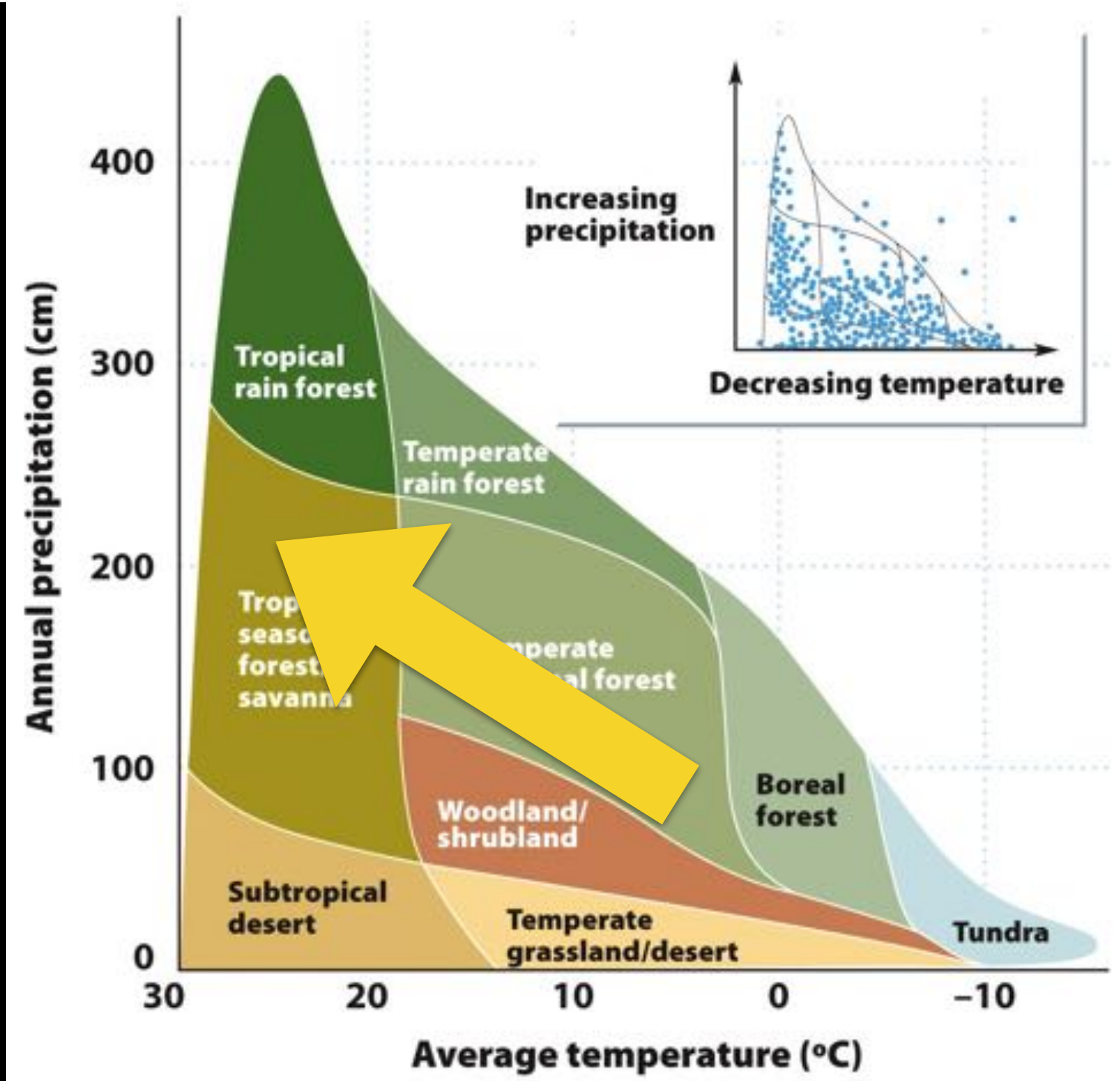
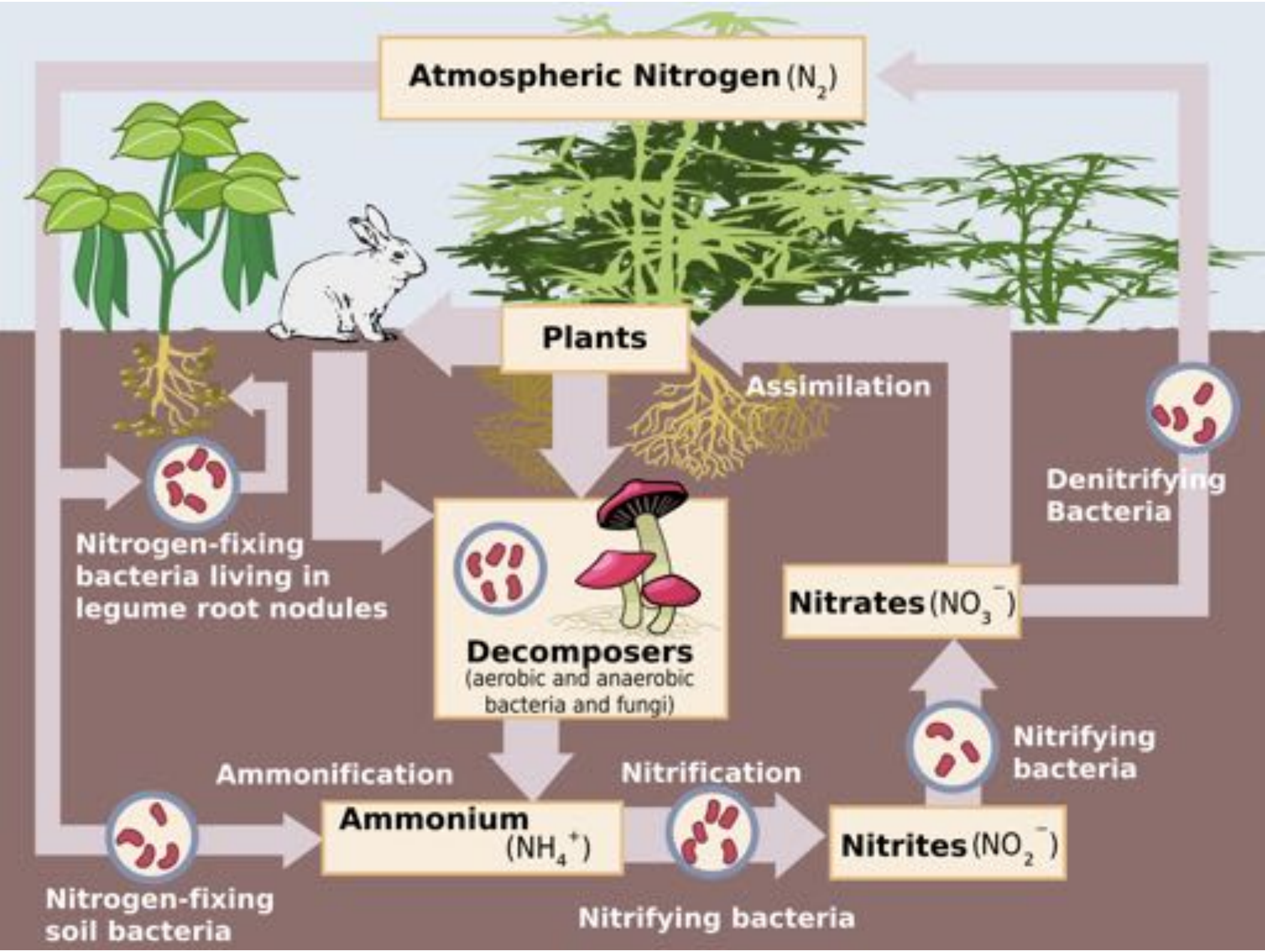


Figure 5.5
The Economy of Nature, Sixth Edition


Atmospheric Nitrogen (N_2)
Plants
Assimilation
Denitrifying Bacteria
Nitrogen-fixing bacteria living in legume root nodules
Decomposers
(aerobic and anaerobic bacteria and fungi)
Nitrates (NO_3^-)
Nitrifying bacteria
Ammonification
Nitrification
Ammonium (NH_4^+)
Nitrites (NO_2^-)
Nitrogen-fixing soil bacteria
Nitrifying bacteria

Conservação de comunidades ecológicas

1. Definição e motivos
2. A dinâmica da destruição
3. **Estados estáveis alternativos**
4. Resumo
5. Sugestão de leitura

As ameaças à diversidade

1. Crescimento populacional humano
2. Perda de habitat
3. Fragmentação de habitat
4. Espécies invasoras
5. **Poluição**
6. Sobre-exploração
7. Mudança climática global

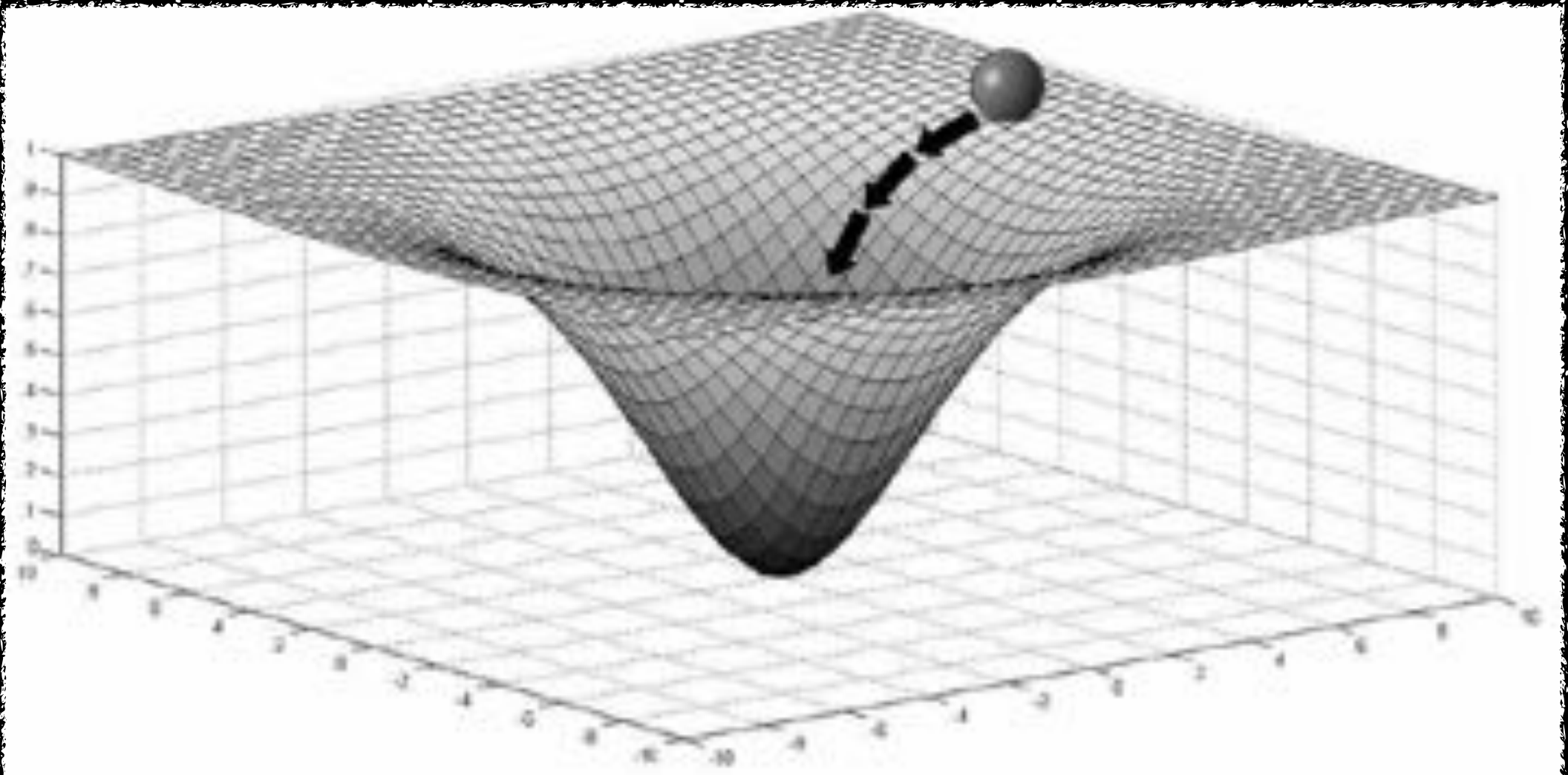
Estabilidade

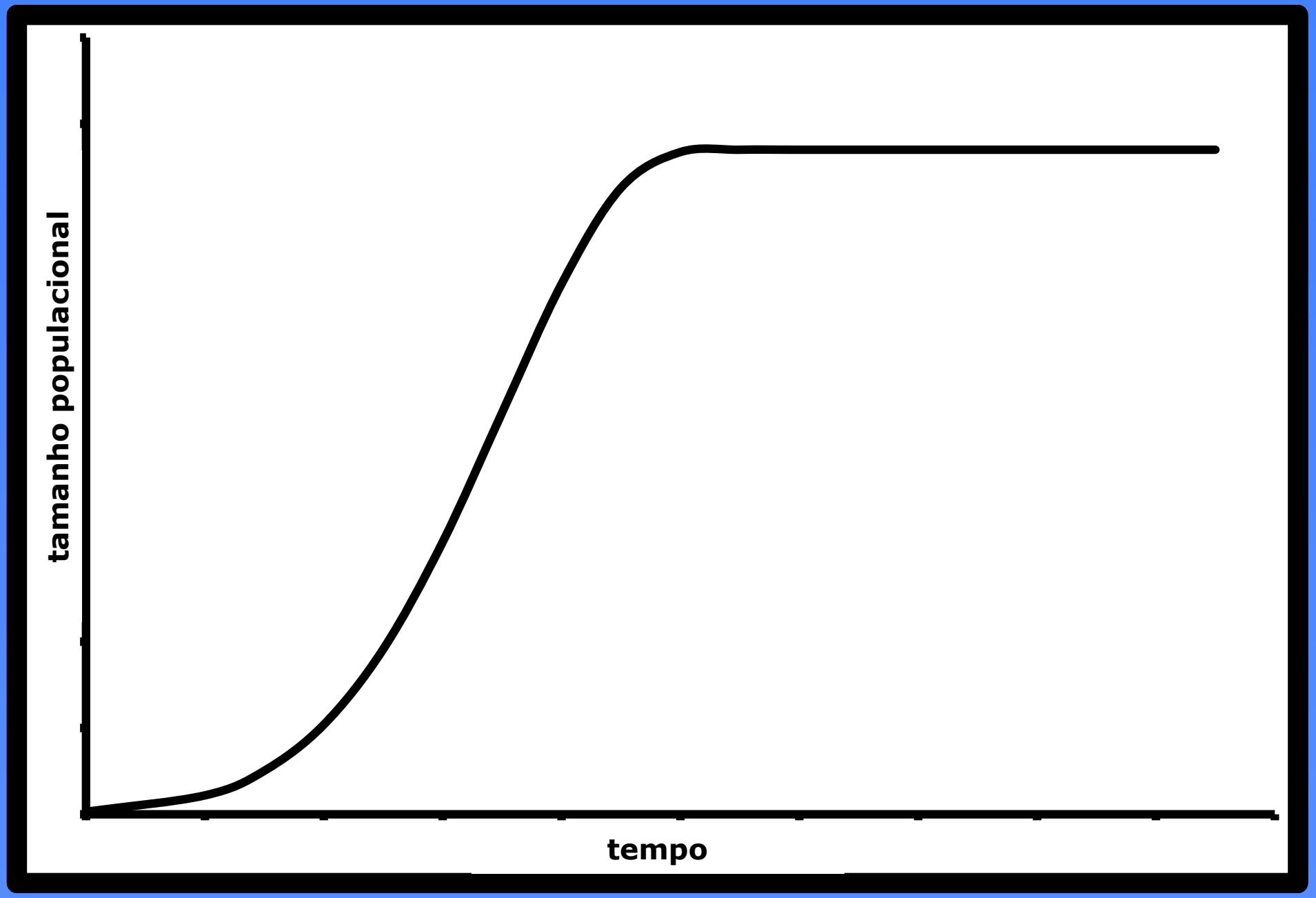
1. Estabilidade no tempo

2. Dois componentes:

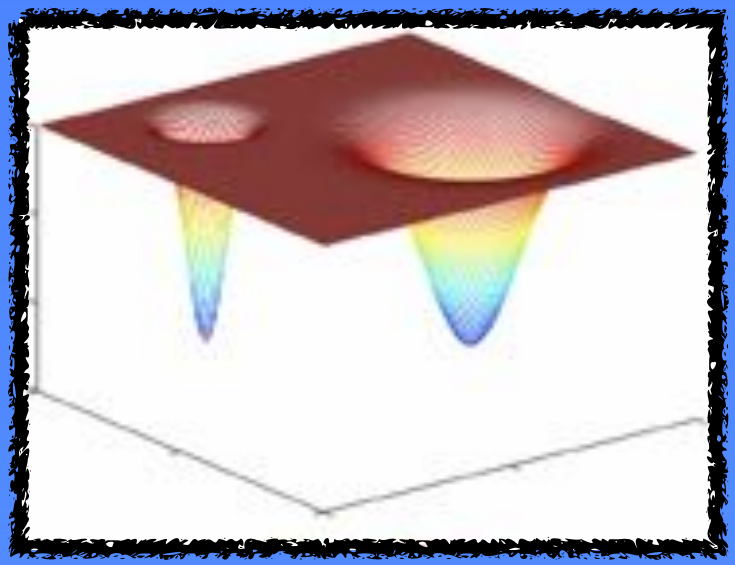
Resiliência: quão rápido a comunidade retorna ao equilíbrio
Resistência: quão difícil é para a comunidade sair do equilíbrio

Atrator

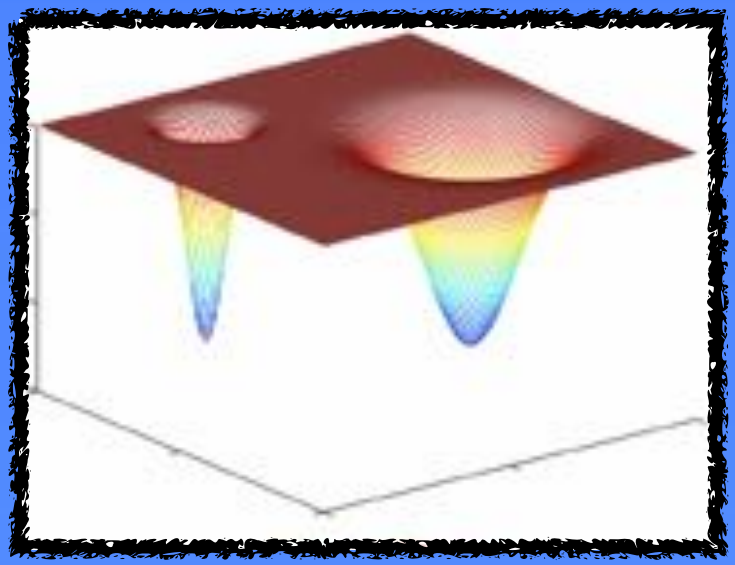


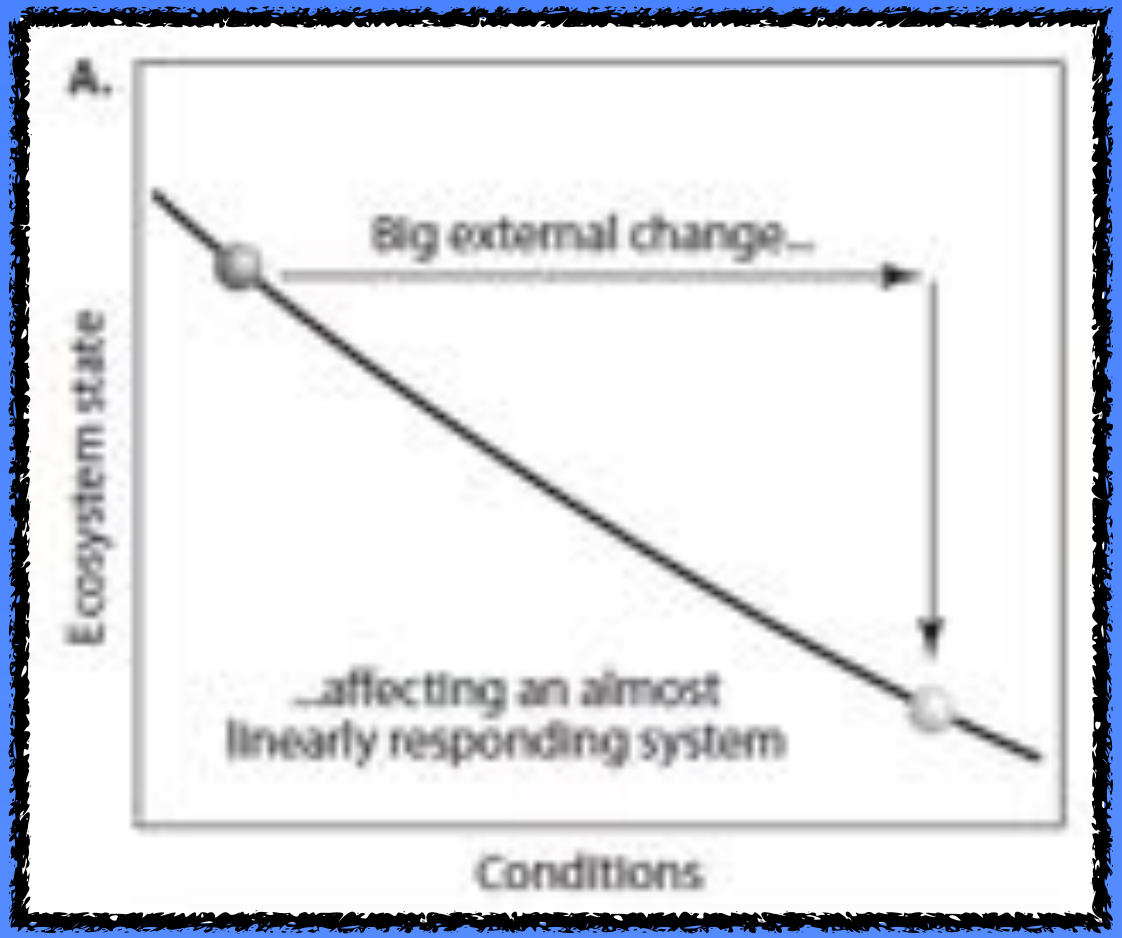

tamanho populacional
tempo

Múltiplos atratores

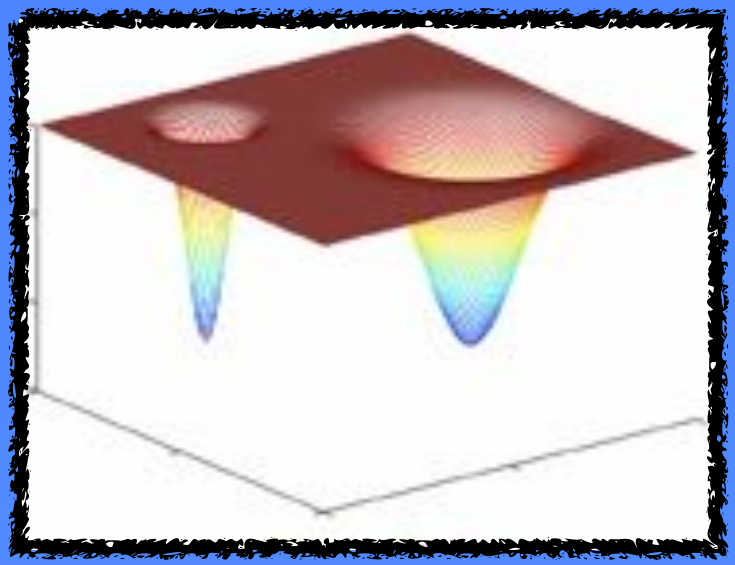


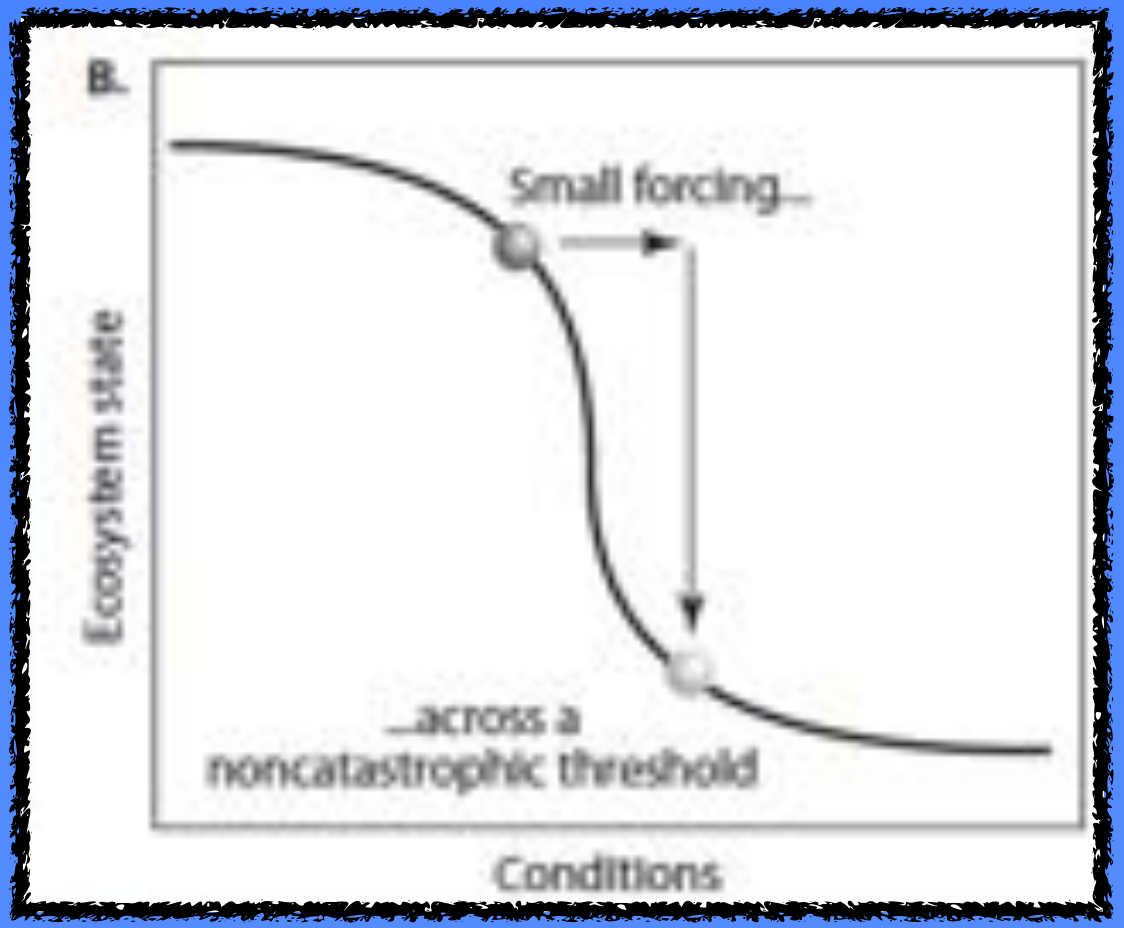
Múltiplos atratores



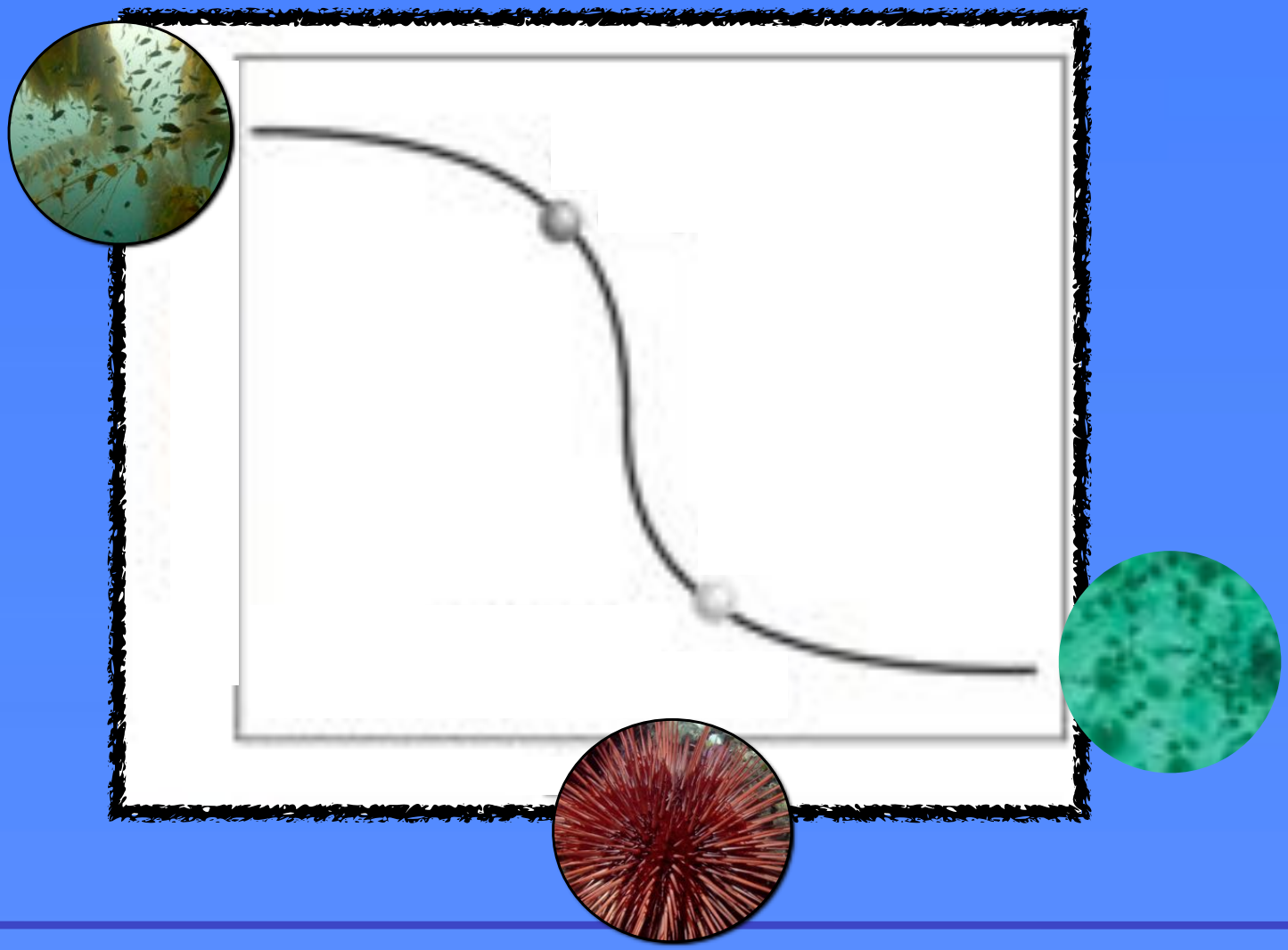


Não-linear



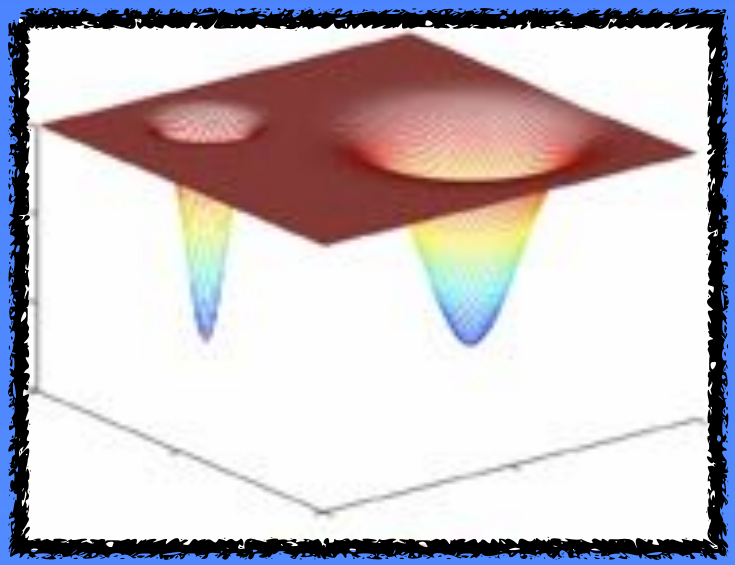

B.
Small forcing...
Ecosystem state
...across a
noncatastrophic threshold
Conditions

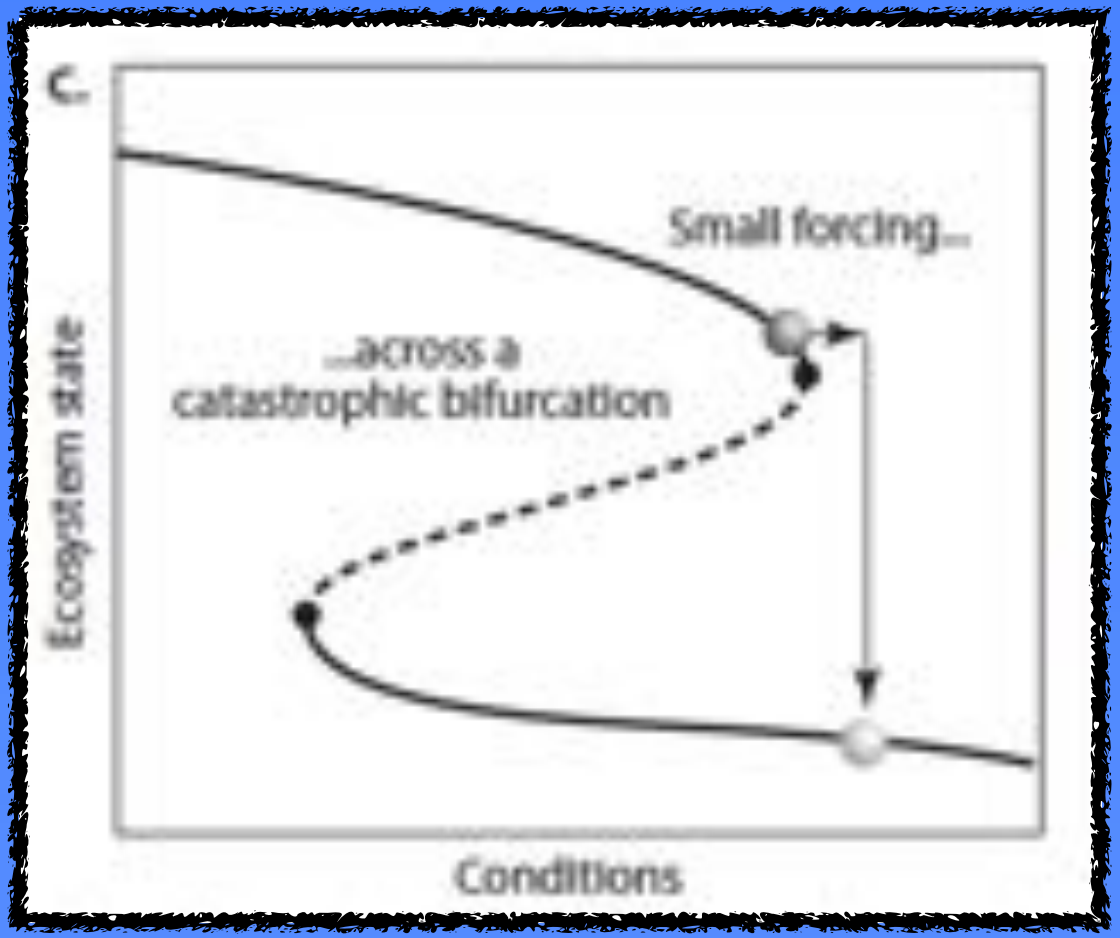
Dois pontos de equilíbrio (estados) distintos



Kriegisch et al. 2016

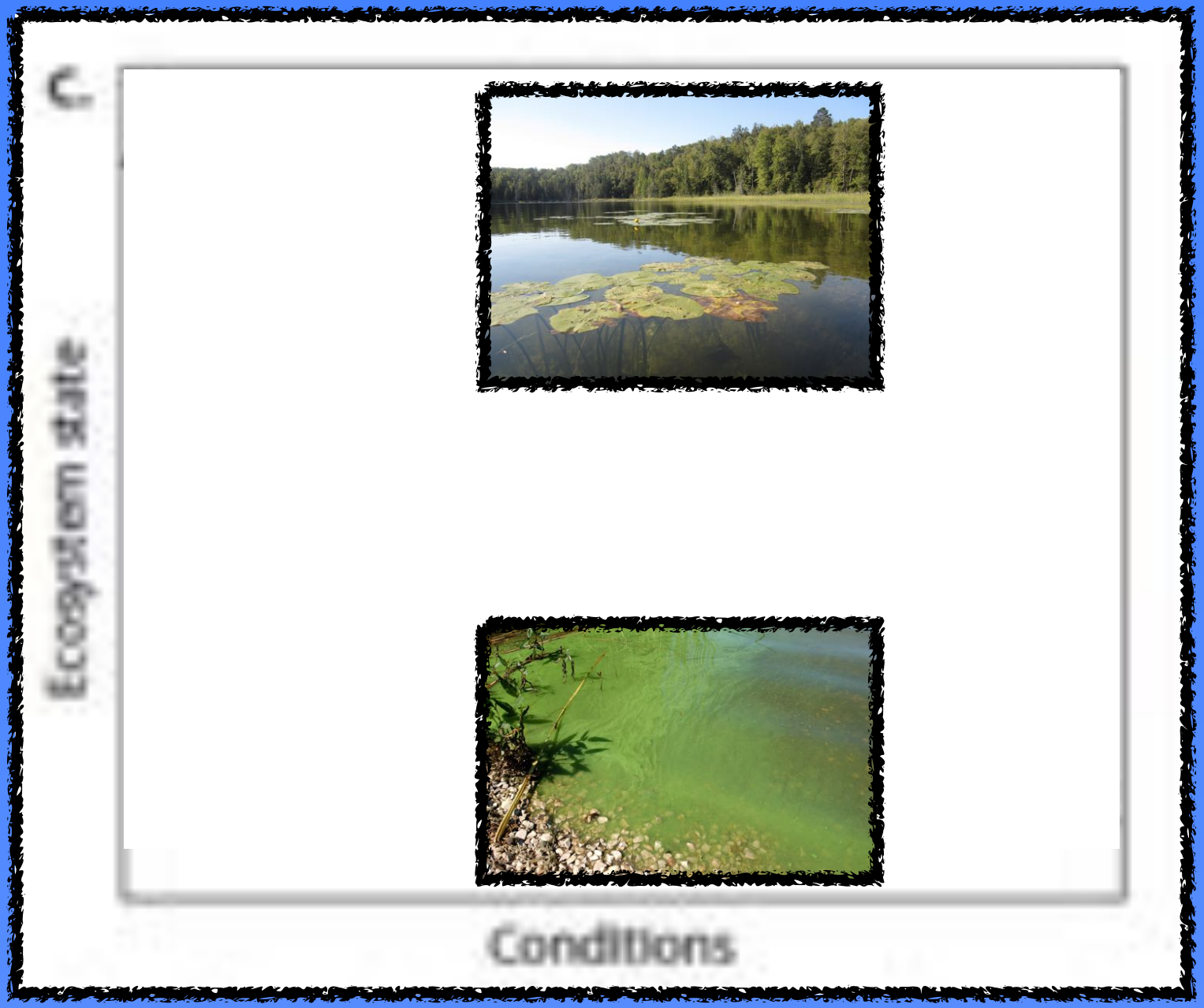
Estados estáveis alternativos

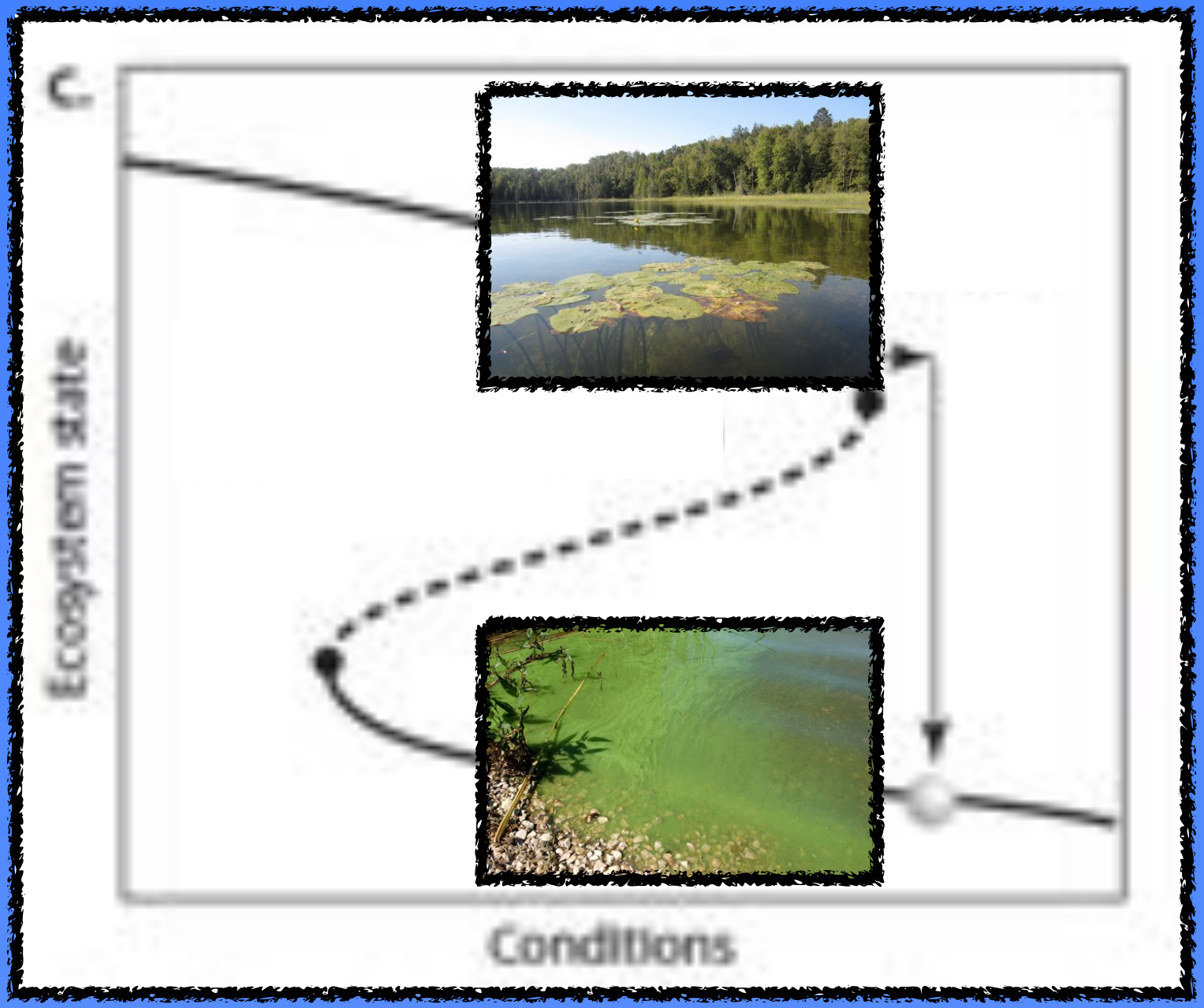


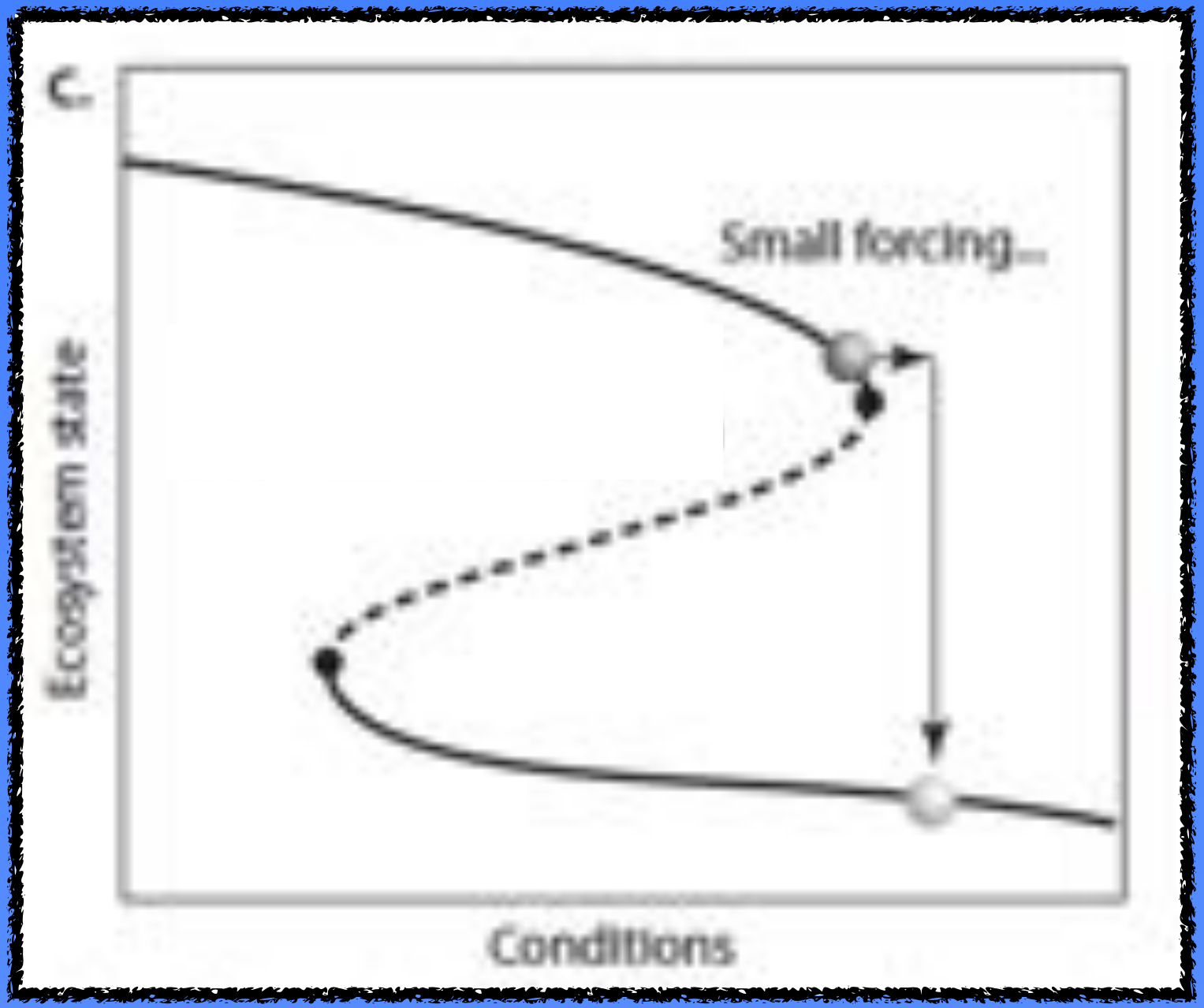


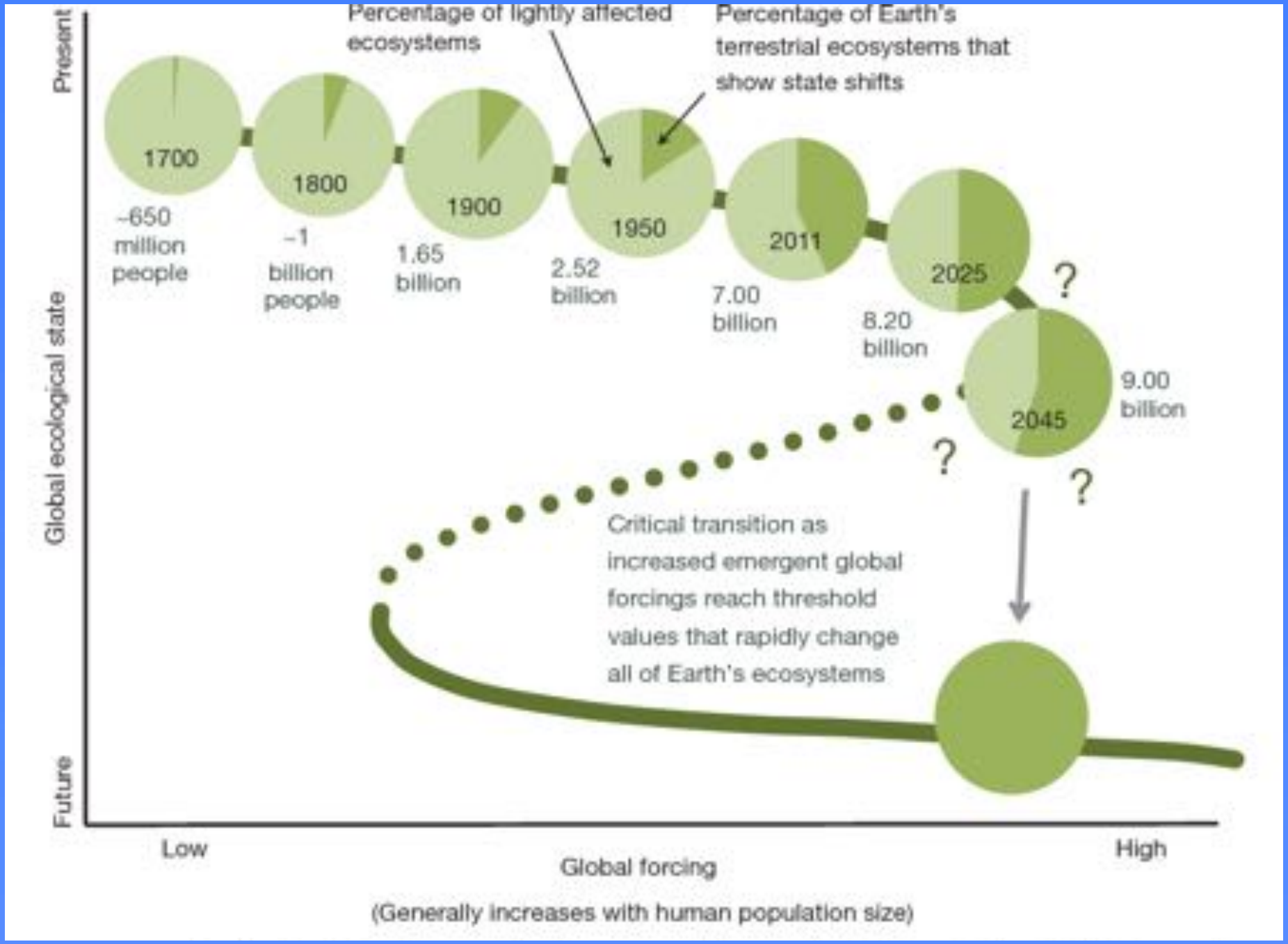
Estados estáveis alternativos

A system is said to have alternative stable states if under the same external conditions (e.g., nutrient loading, harvest pressure, or temperature) it can settle to different stable states (Scheffer, 2009).


C
Ecosystem state
Conditions


Ecosystem state
Conditions


c.
Small forcing...
Ecosystem state
Conditions


Present
Global ecological state
Future
Percentage of lightly affected ecosystems
Percentage of Earth's terrestrial ecosystems that show state shifts
1700
~650 million people
1800
~1 billion people
1900
1.65 billion
1950
2.52 billion
2011
7.00 billion
2025
8.20 billion
2045
9.00 billion
?
?
?
Critical transition as increased emergent global forcings reach threshold values that rapidly change all of Earth's ecosystems
Low
High
Global forcing
(Generally increases with human population size)

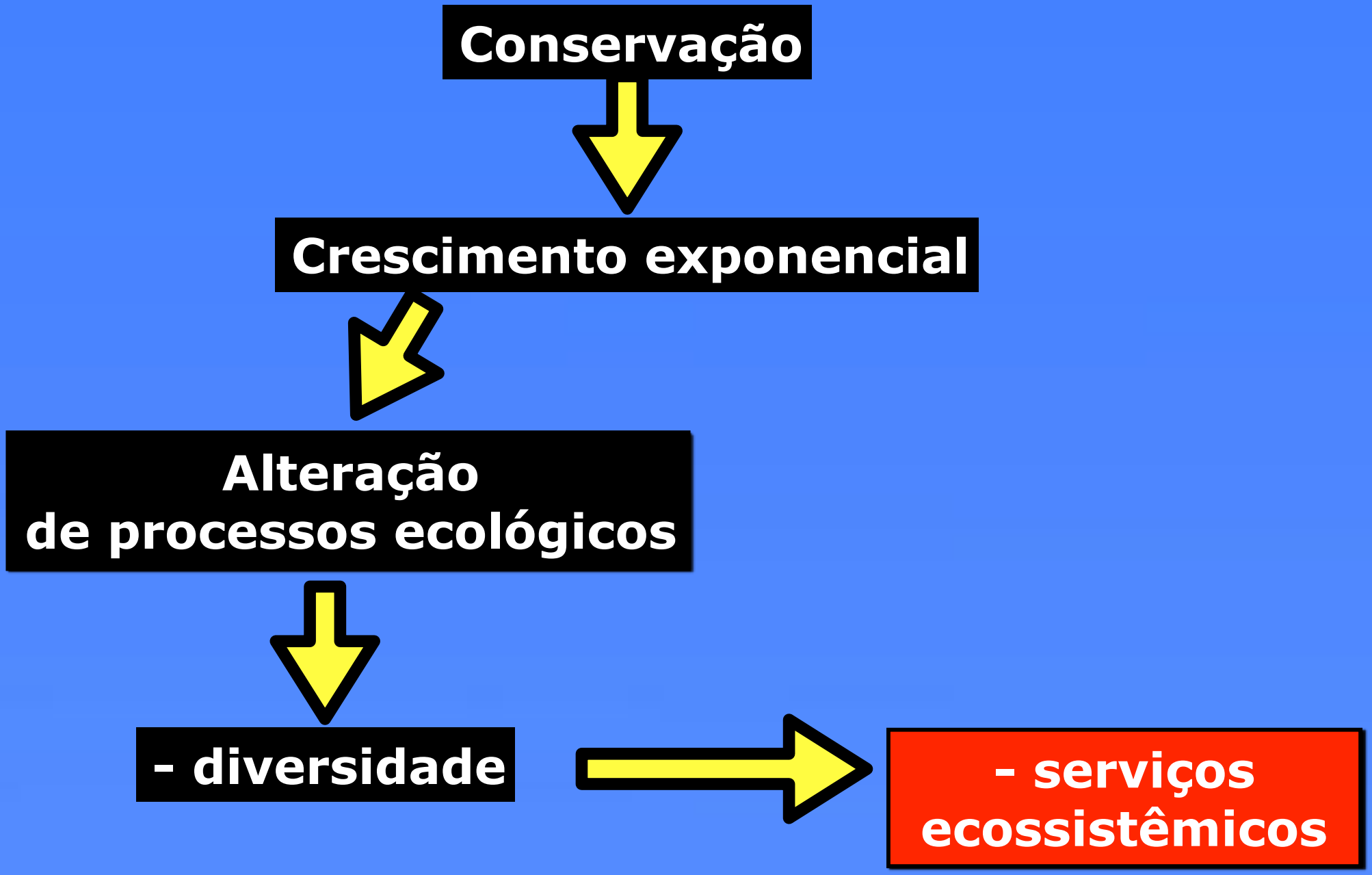
Conservação de comunidades ecológicas

1. Definição e motivos
2. A dinâmica da destruição
3. Estados estáveis alternativos
4. **Resumo**
5. Sugestão de leitura


Conservação
Crescimento exponencial


Conservação
Crescimento exponencial
Alteração
de processos ecológicos

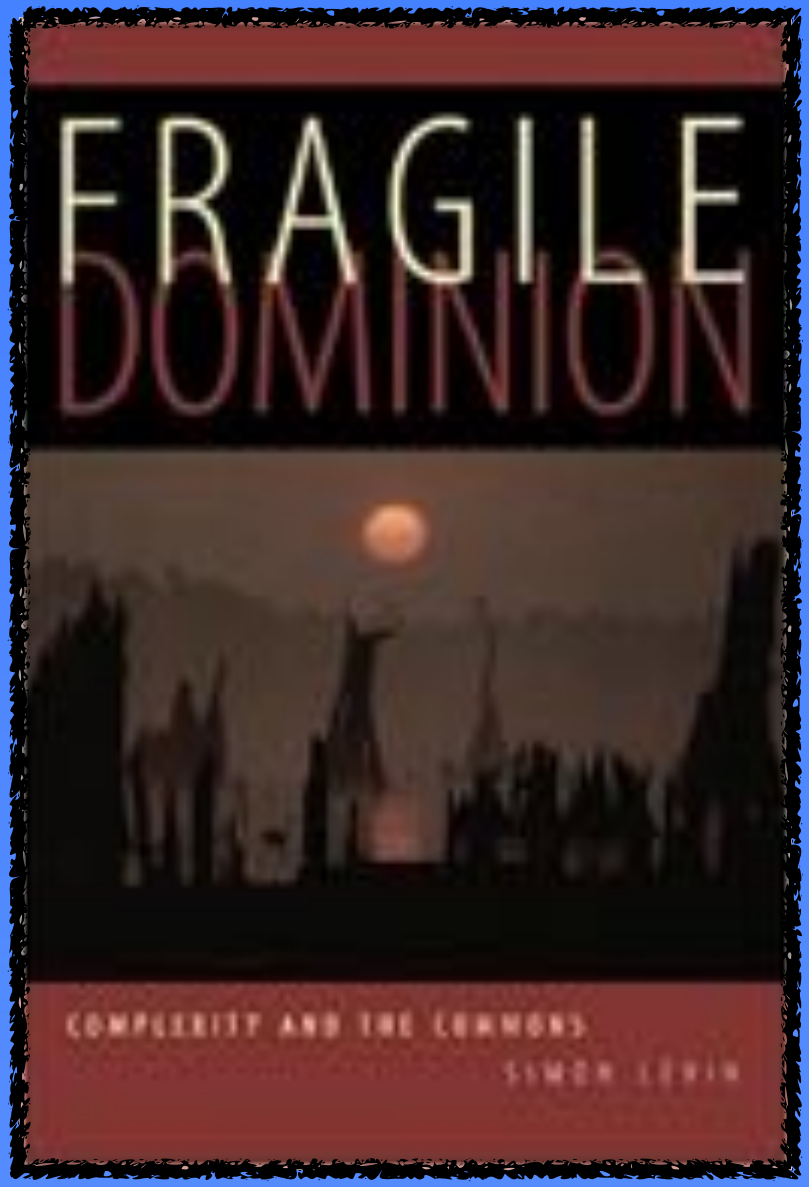

Conservação
Crescimento exponencial
Alteração
de processos ecológicos
- diversidade

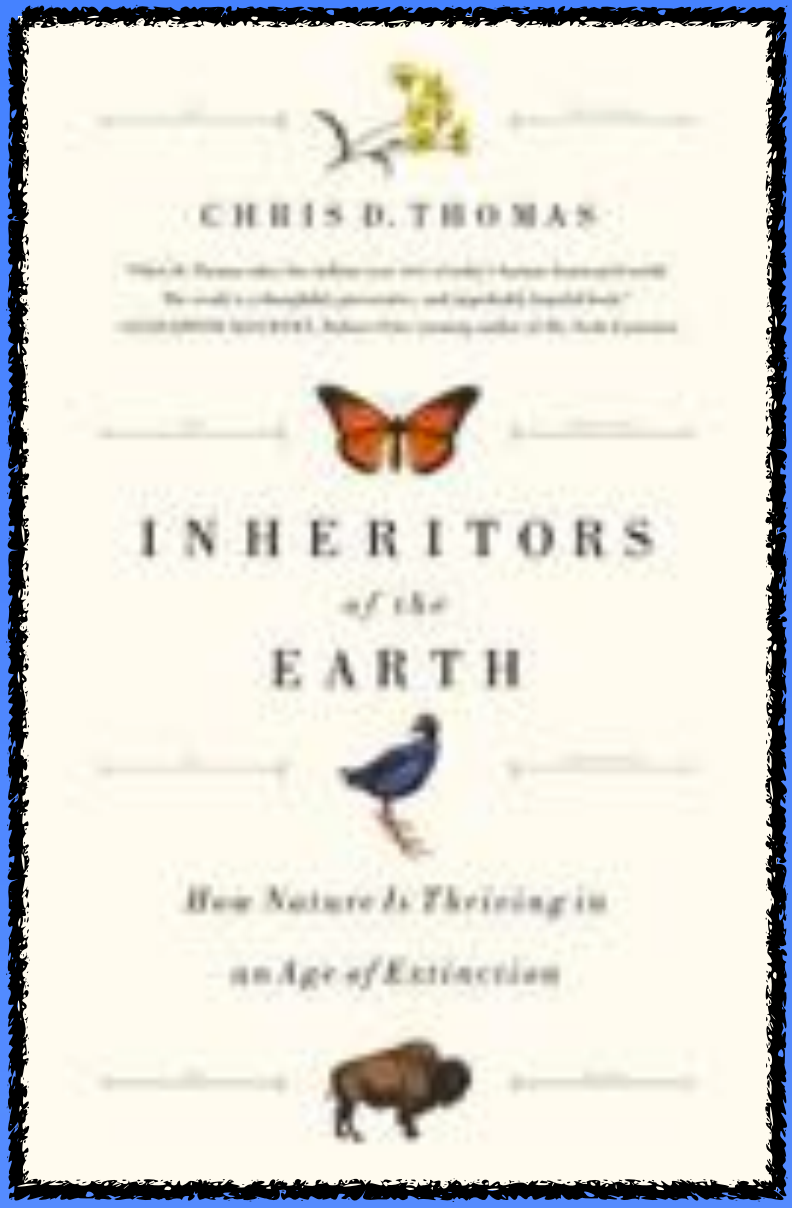

Conservação
Crescimento exponencial
Alteração
de processos ecológicos
- diversidade
- serviços
ecossistêmicos


Conservação
Crescimento exponencial
Alteração
de processos ecológicos
- diversidade
- serviços
ecossistêmicos
Estados alternativos

Conservação de comunidades ecológicas

1. Definição e motivos
2. A dinâmica da destruição
3. Estados estáveis alternativos
4. Resumo
5. **Sugestão de leitura**


FRAGILE
DOMINION
COMPLEXITY AND THE COMMONS
SIMON LEVIN


CHRIS D. THOMAS
INHERITORS
of the
EARTH
How Nature Is Thriving in
an Age of Extinction