


Plant Conservation in a Rapidly Changing World

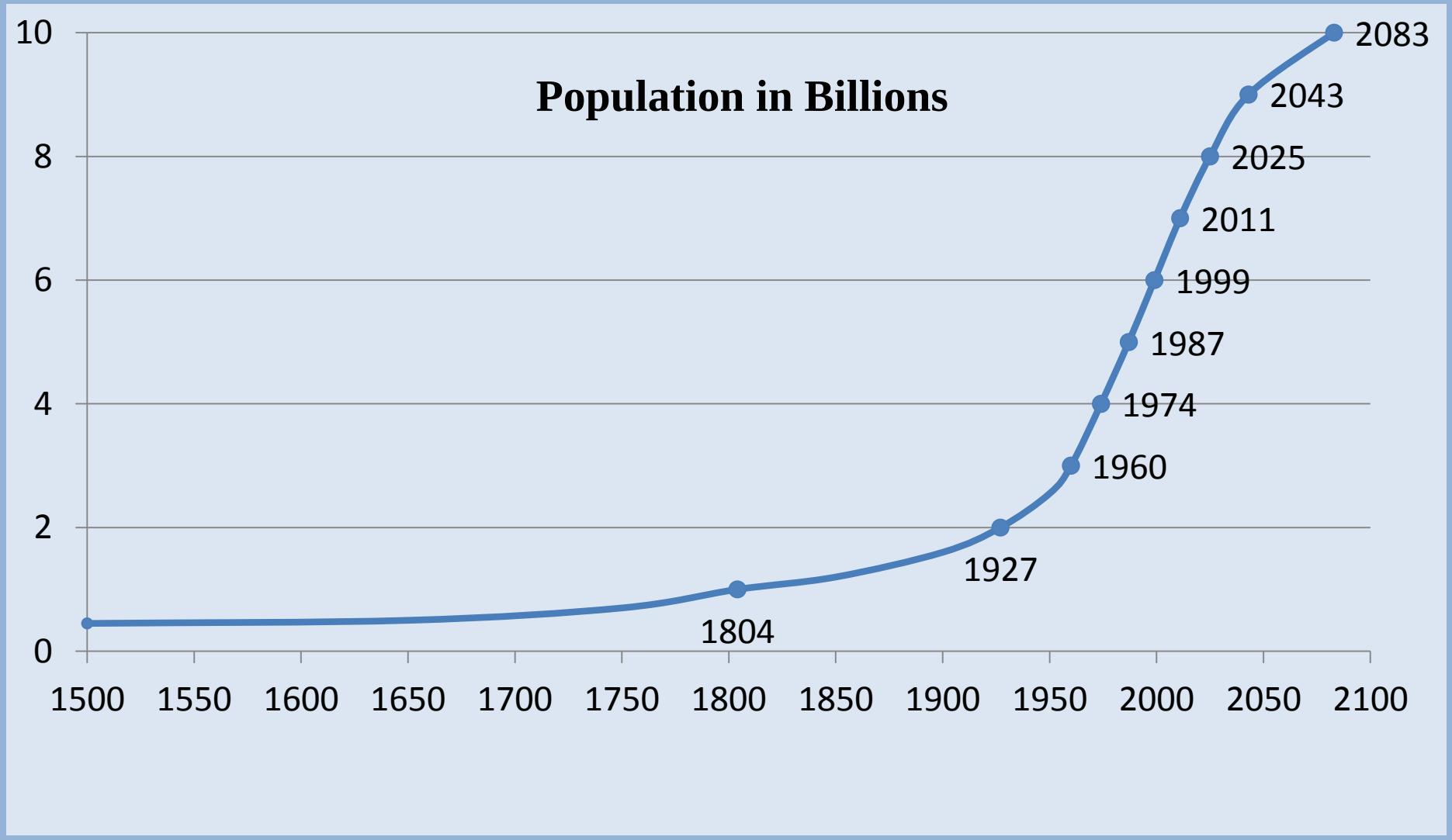
Arboretum Wespelaar
25 May 2014

Peter H. Raven
Missouri Botanical Garden





World Population Growth




75-K1
5471

Impact = P x A x T

Population

Affluence (Consumption)

Technology

Ranchettes in Colorado

One week of food for a Western family

One week of food for an African family

Shanghai air pollution

Accounting Framework for Ecological Services

Biocapacity:
How much bioproductive area is **available to us**?

Ecological Footprint:
How much bioproductive area do we **demand**?

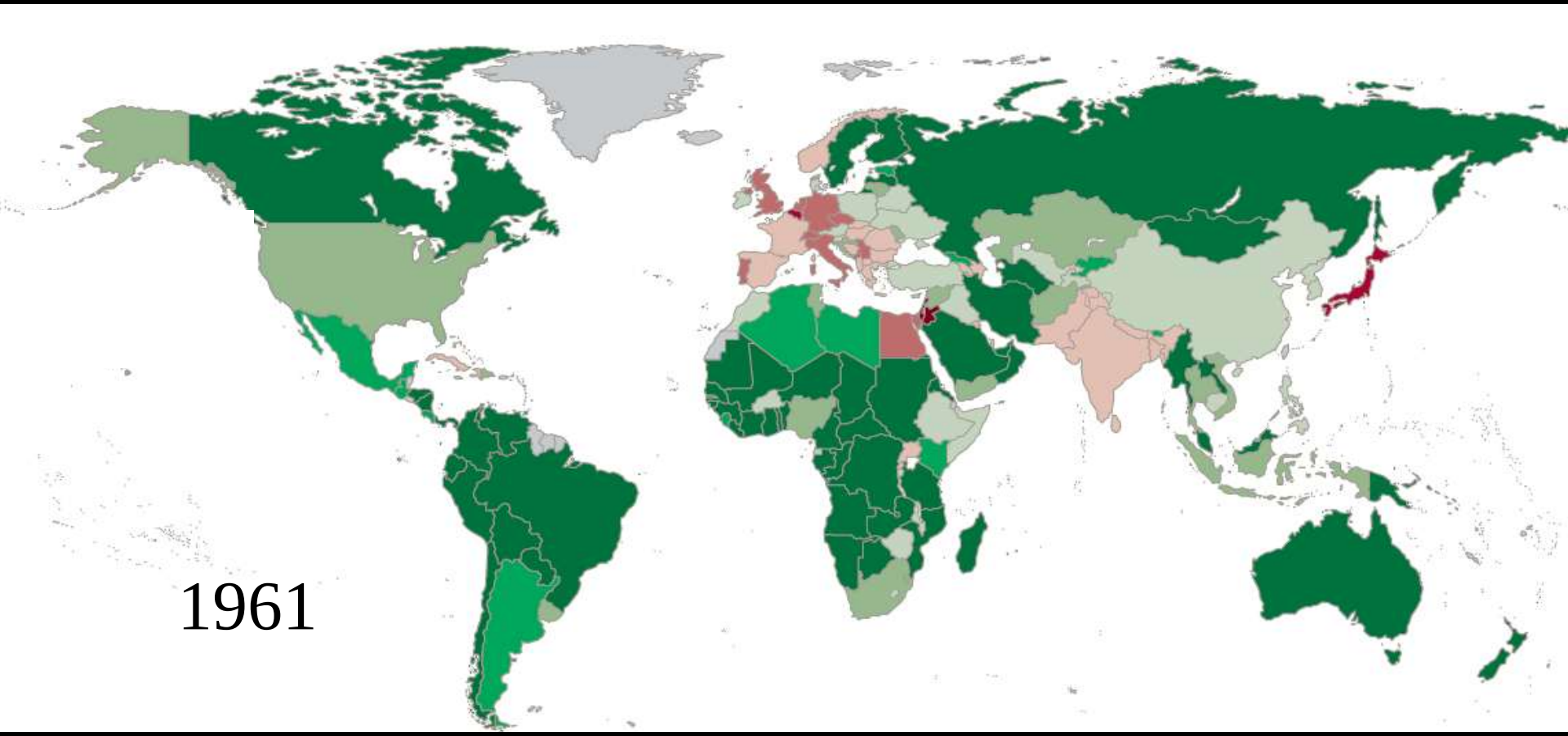
The Ecological Footprint

www.footprintnetwork.org

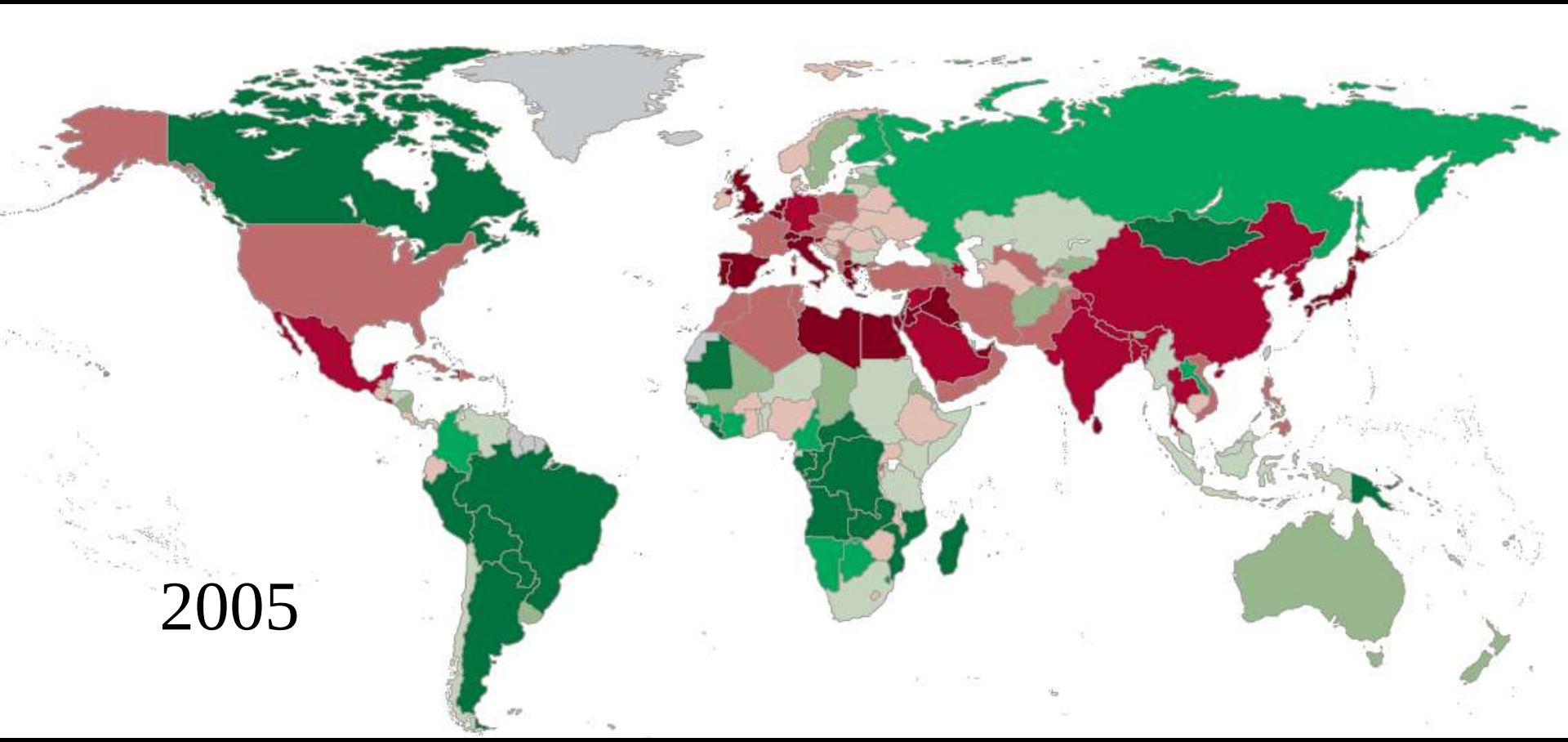
How Much of the World's Sustainable Productivity Are We Using Now?

- **70% of all biocapacity in 1970**
- **156% of all biocapacity in 2012**
- **We need 50% more productivity than exists**
- **Current human population is 7.1 billion. Total is estimated to grow to 9-9.5 billion by 2050.**

Ecological Creditors **Ecological Debtors**

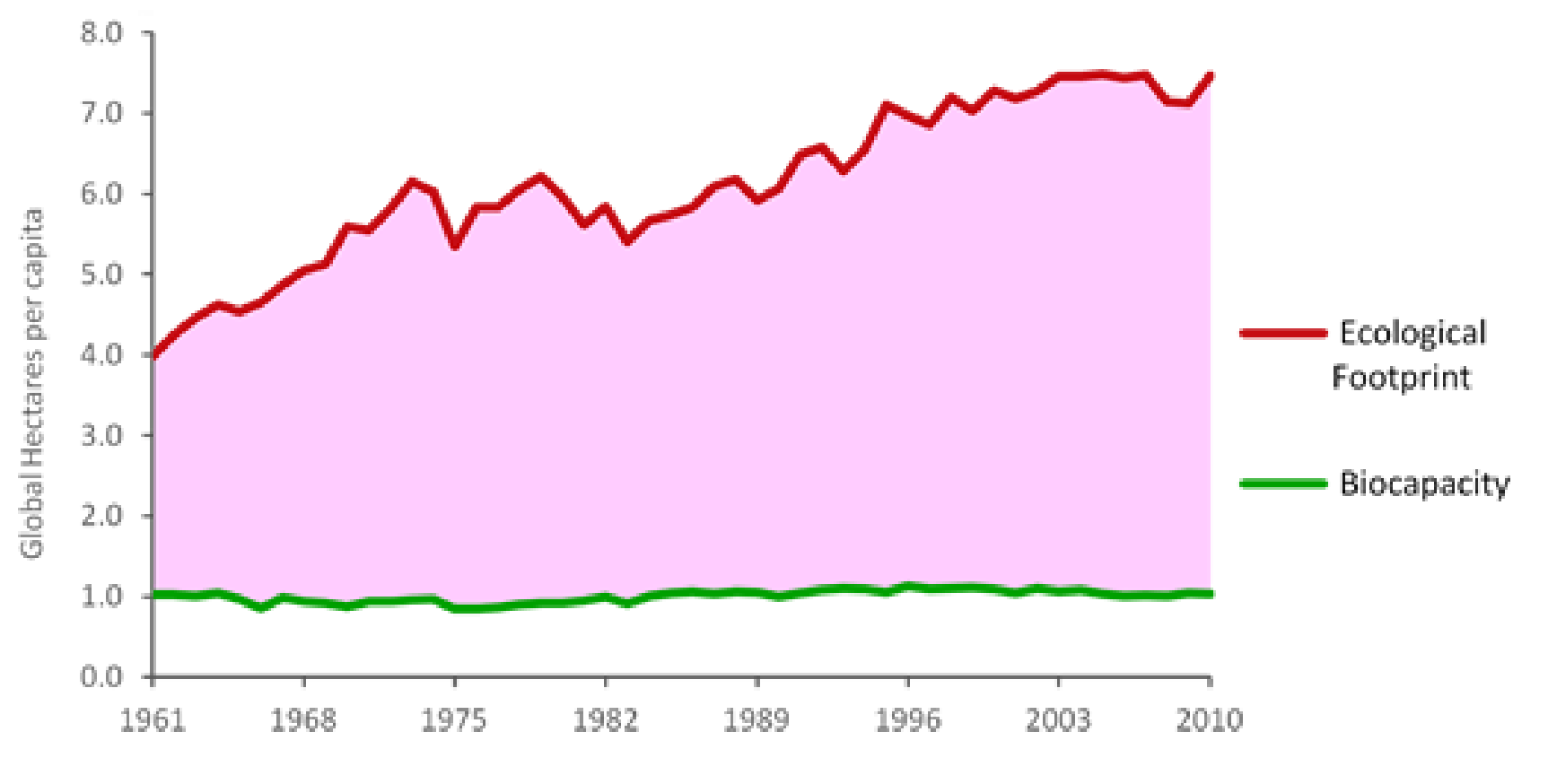


Ecological Creditors **Ecological Debtors**



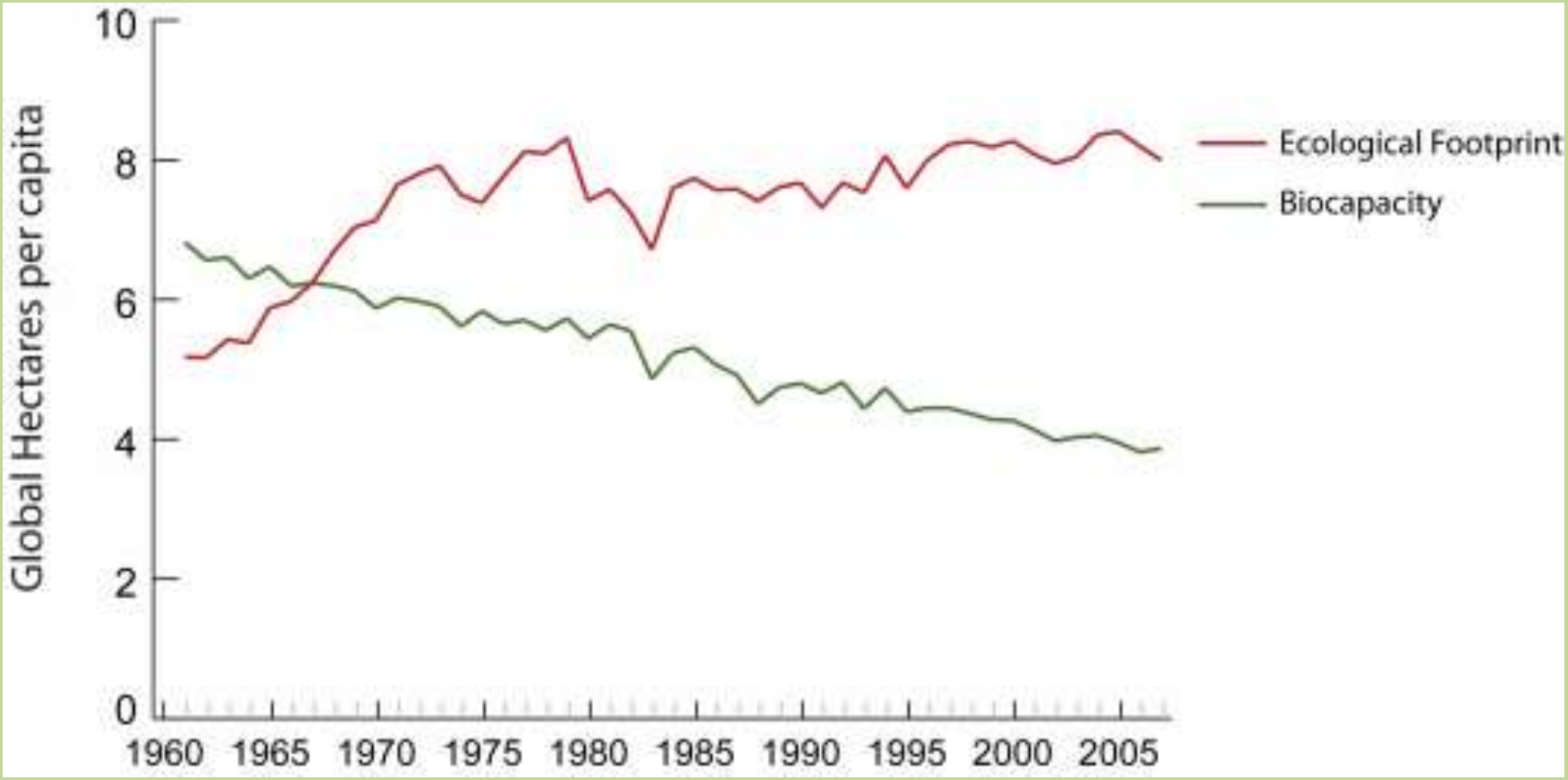
Belgium

Ecological Footprint and Biocapacity



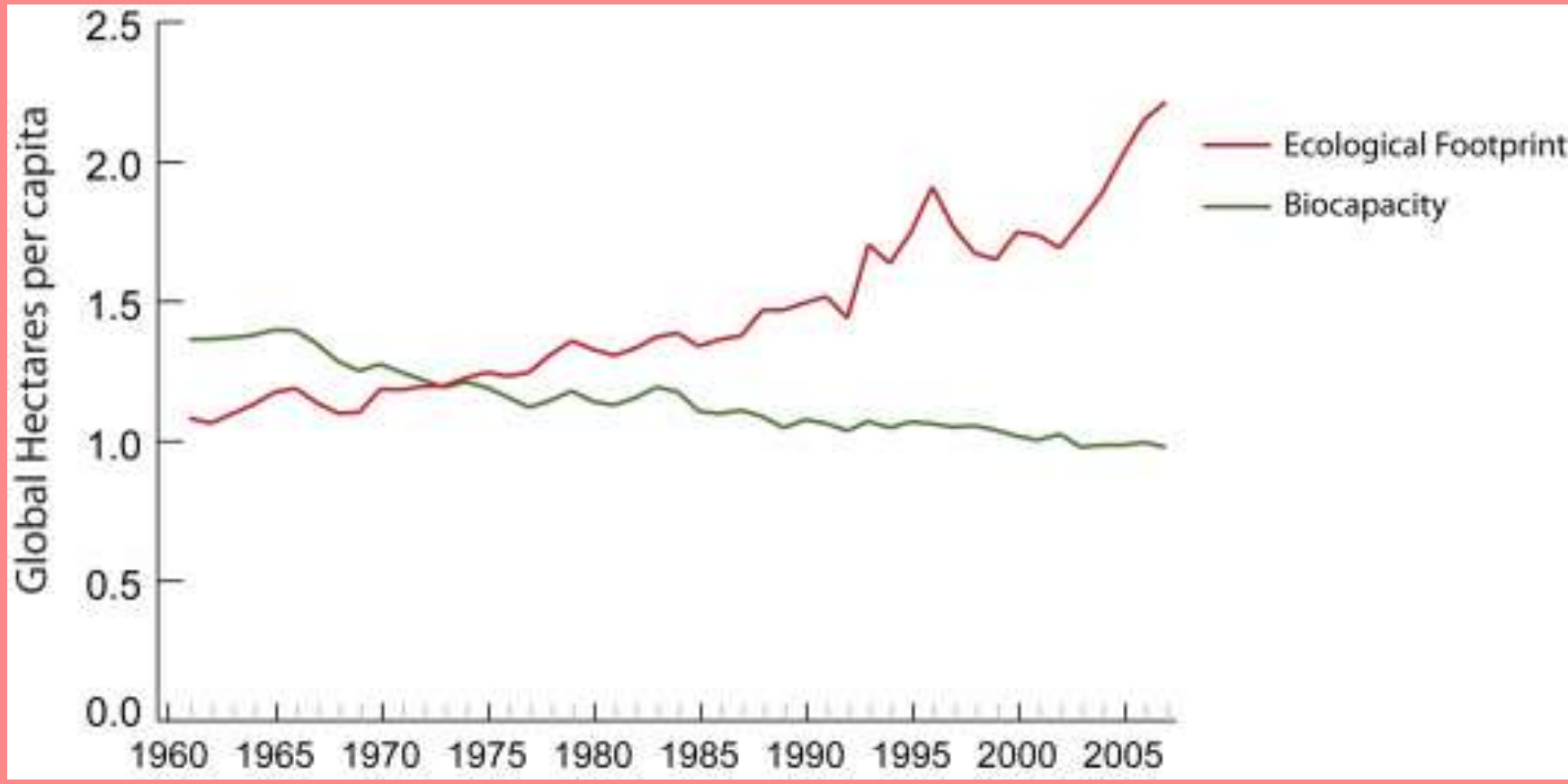
United States

Ecological Footprint and Biocapacity



China

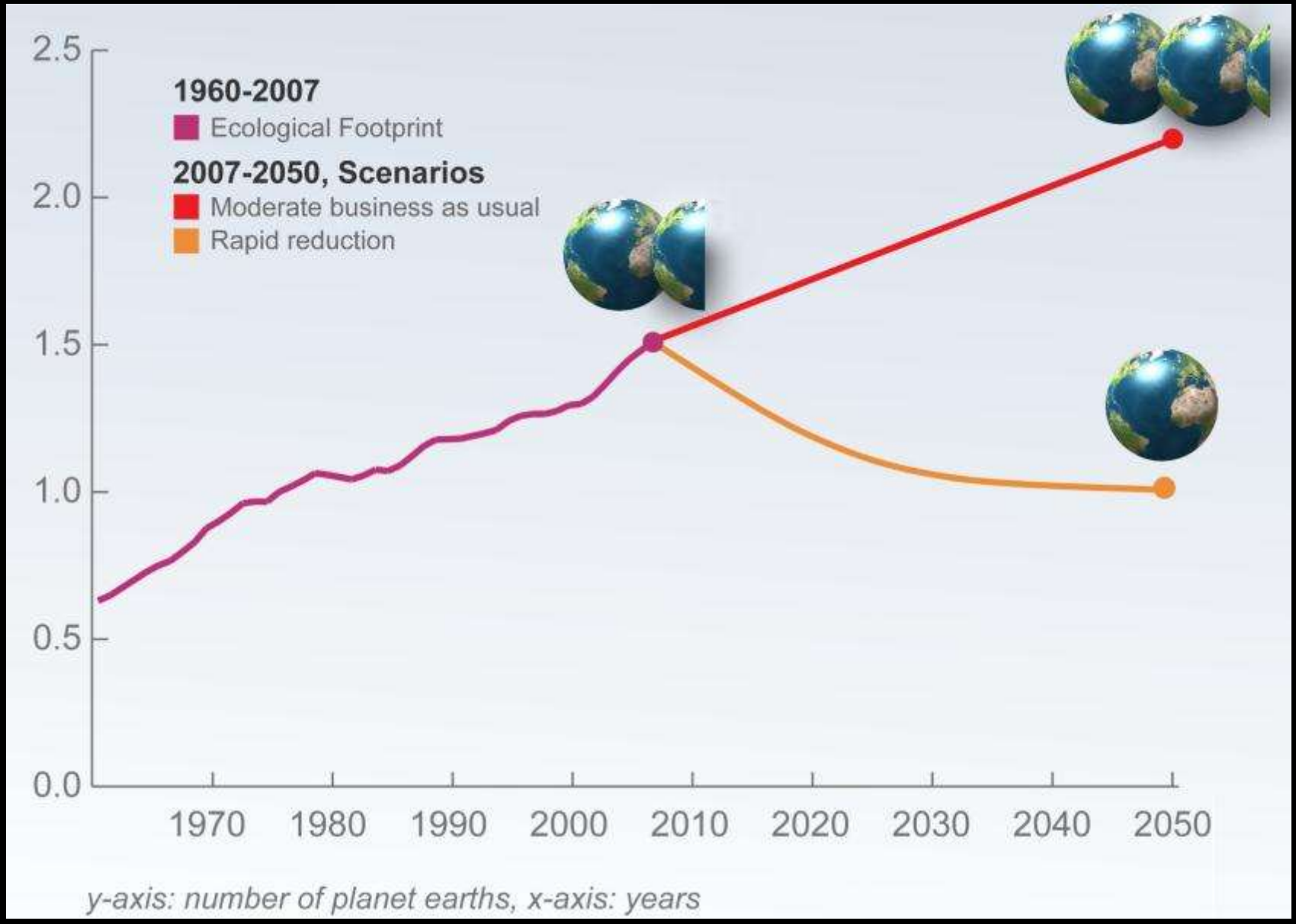
Ecological Footprint and Biocapacity



August 20, 2013

Can all nations achieve the standards of prosperity present now in industrialized countries using available technologies? We in western Europe and the U.S. take what we have now as standard -- perhaps not enough.

Overshoot Scenarios



Why is There a Problem?

- Human population growth has reached record levels
- Our individual levels of consumption are huge and climbing rapidly
- Technologies developed during the Industrial Revolution, when our total population was about 750 million people, have proven highly destructive in a world with ten times as many of us

Children gathering firewood

BIODIVERSITY

- The living species of plants, animals, fungi, and microorganisms with which we share this planet are essential for our lives.
- We hope to build global sustainability on the basis of their properties.
- Yet we are driving them to extinction at an unprecedented rate.
- How can this process be reversed?

Dong Ba Market, Hue, Vietnam

Herbal Medicines in Mexico

Why Every Species Matters

Aspirin first came from willow bark

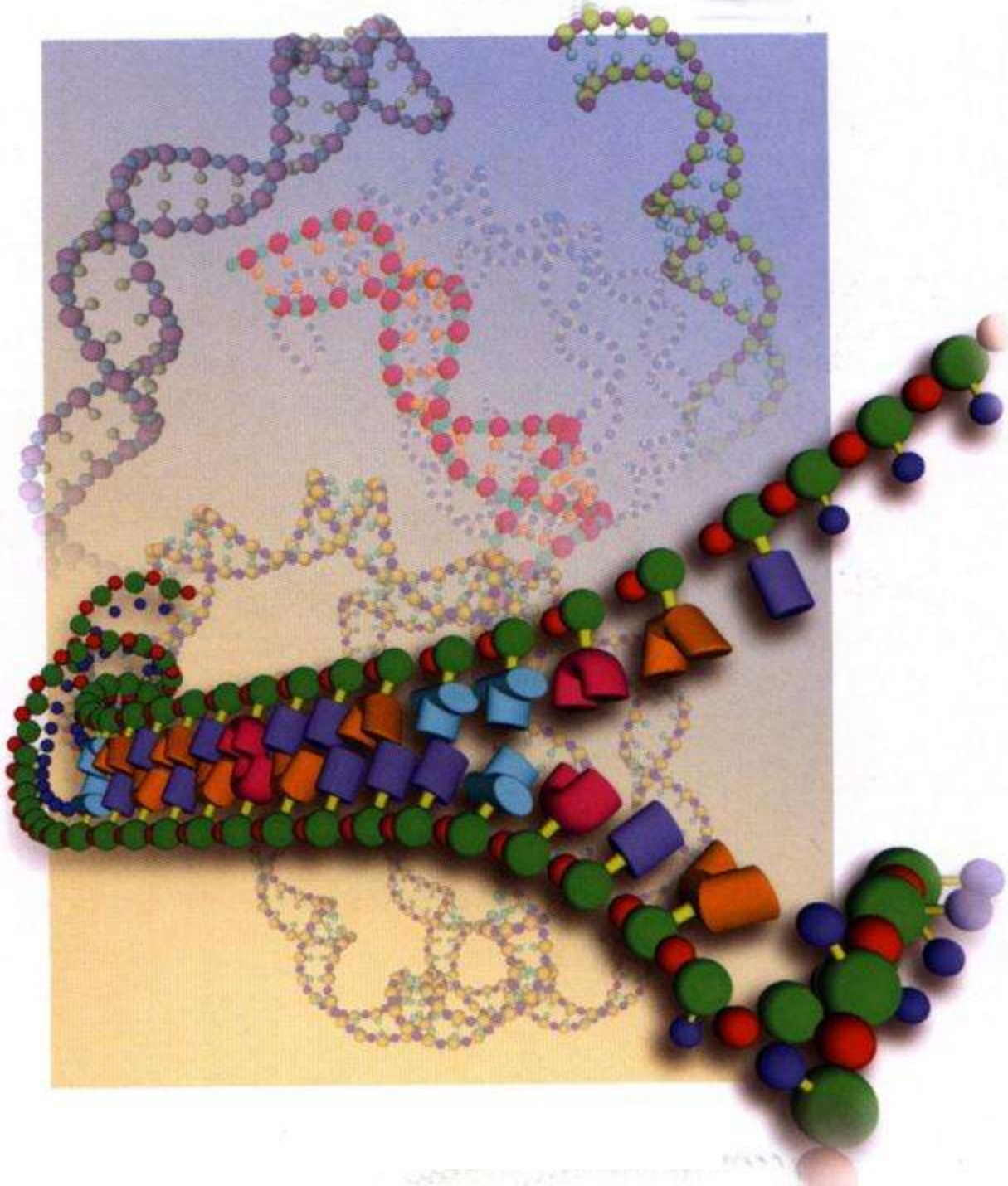
Prof. Dr. Otto Wilhelm Thomé "Flora von Deutschland, Österreich und der Schweiz" 1885, Gera, Germany

Why Every Species Matters

Warfarin, the toxic rat poison and effective blood thinner was first isolated from moldy sweet clover

Photo by John Frisch.

Venom of the green mamba looks promising as a new treatment to prevent kidney failure following a heart attack.

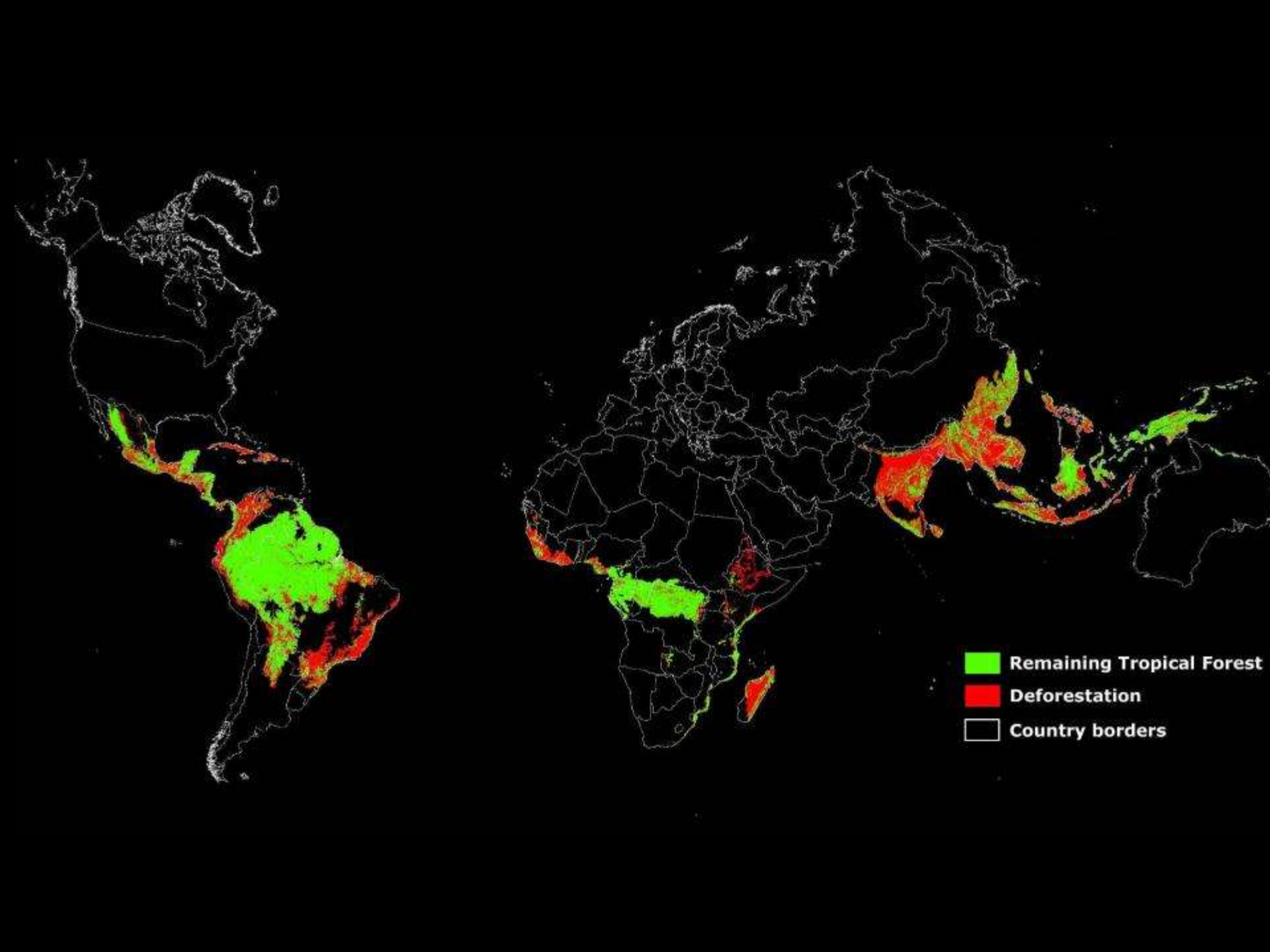


Species of Eukaryotes

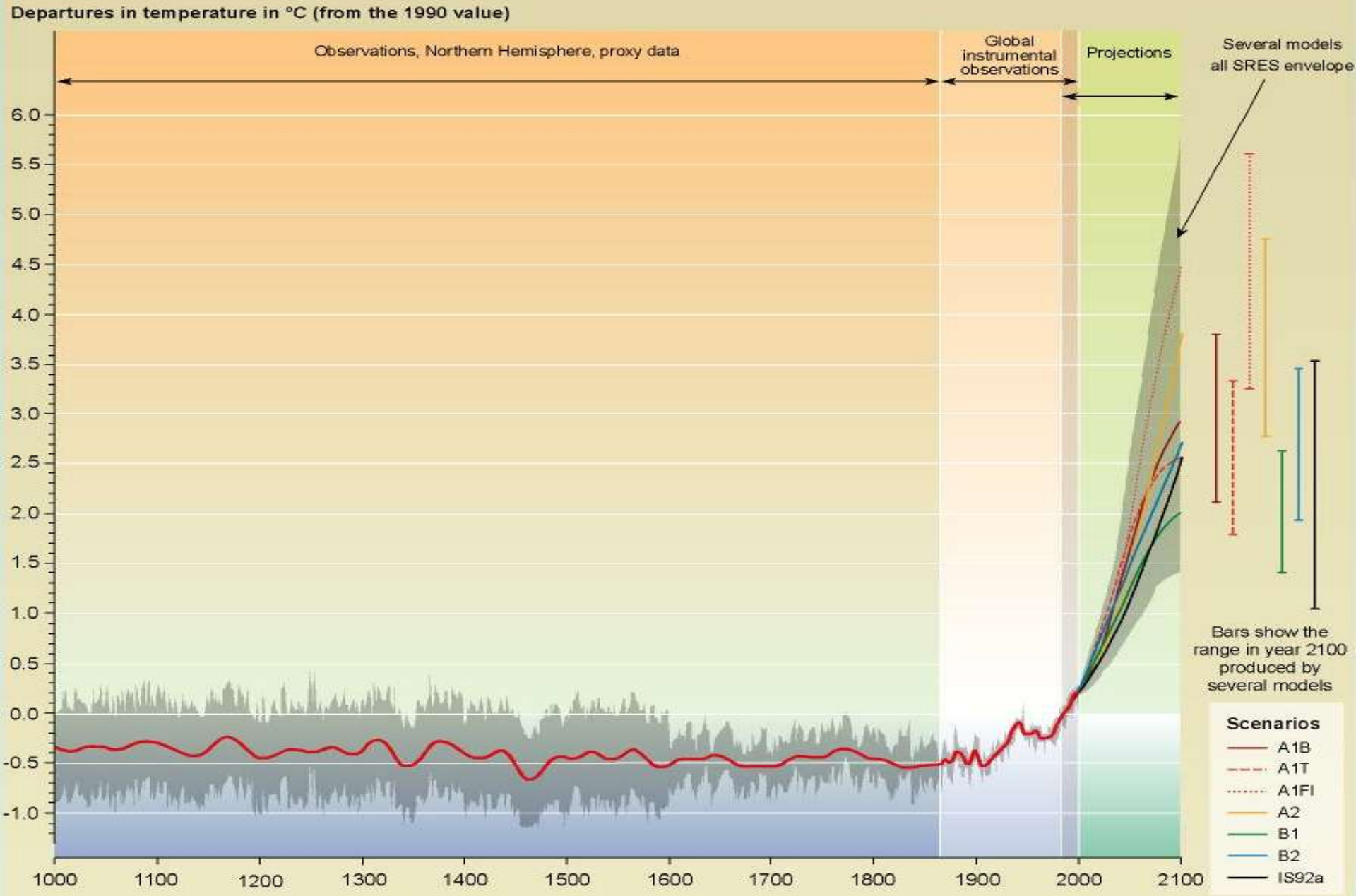
- **Entire World:**
  - **>12 million species estimated**
  - **Only 1.9 million have been identified**
  - **No reliable way to estimate total numbers**
  - **We know next to nothing about most of them, even if they have been named**

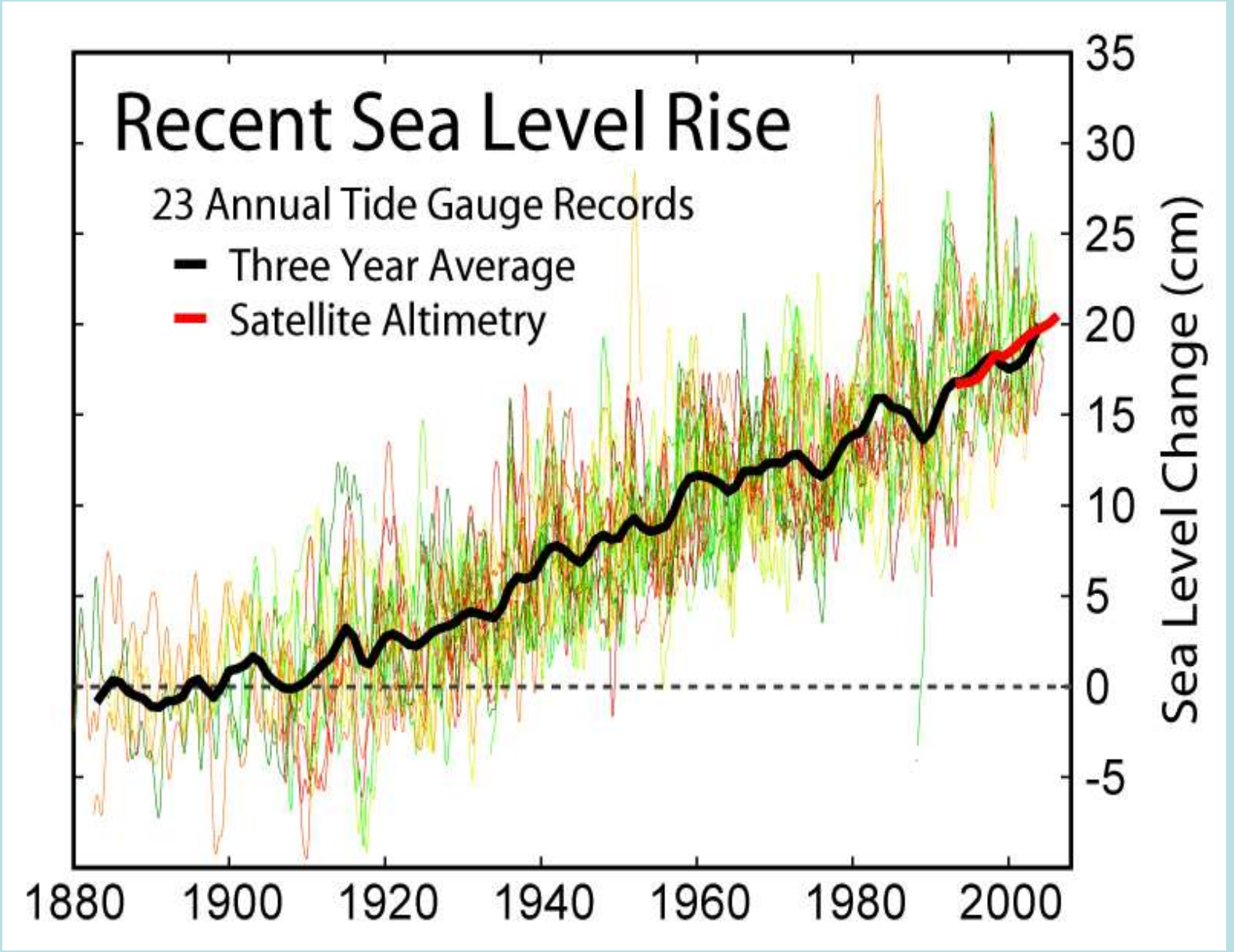
<u>Conclusion</u>: **We know very little about the organisms on Earth**

- Extinction pressures include:
  - habitat loss
  - global warming
  - alien invasive species
  - overharvesting in nature
- This century could see the extinction of more than half of all of the terrestrial species that now exist.
- Particularly in the tropics, the existence of most lost species will never be known to us


Remaining Tropical Forest
Deforestation
Country borders

Variations of the Earth's surface temperature: year 1000 to year 2100




Recent Sea Level Rise
23 Annual Tide Gauge Records
Three Year Average
Satellite Altimetry
35
30
25
20
15
10
5
0
-5
Sea Level Change (cm)
1880
1900
1920
1940
1960
1980
2000

Sudden Oak Death

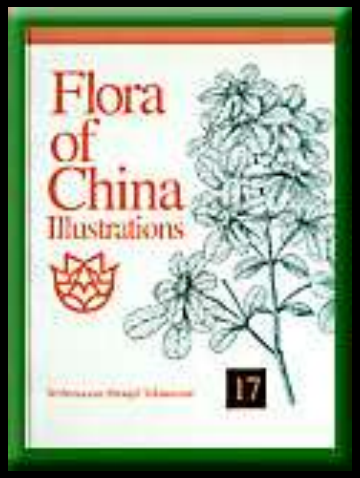
Anopheles stephensi

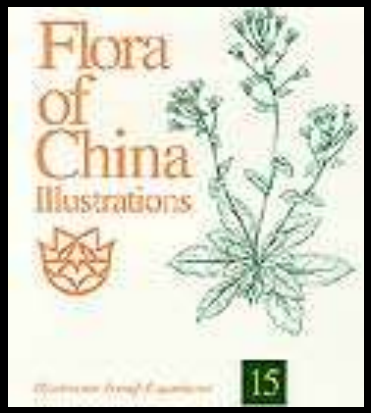
Ginseng - *Panax quinquefolius*

Extinction Rates
(Assuming >12 million species of eukaryotes)

- Historically about a dozen per year
- From 1500 to 1950 about 1000 per year
- Currently several 1000's per year
- Later this century: 10,000's per year

End result:
more than half of all species may be lost by 2100


Flora
of
China
Illustrations
17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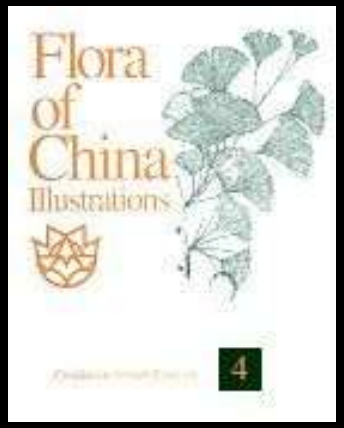
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Illustrations
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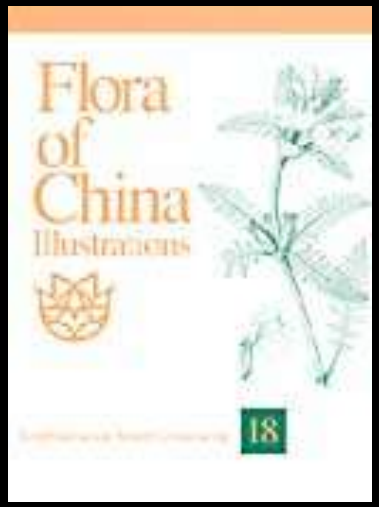
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Illustrations
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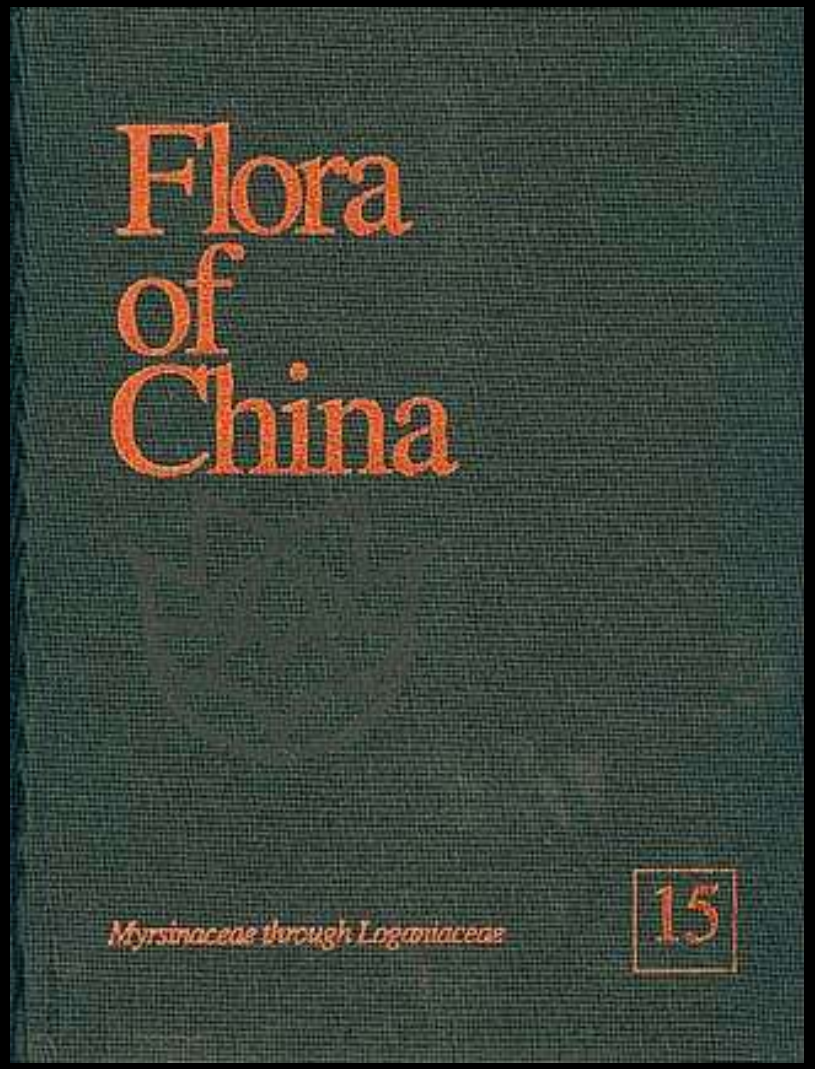
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of
China
Myrsinaceae through Loganiaceae
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Volunteers in remnant prairie, St. Louis

The Bigger Picture

- Limit, then reverse, global warming
- Alternative energy sources
- Social justice
- Empower people everywhere
- Population stability
- New technologies

Principles of The Rio Declaration

Eradicating poverty and reducing disparities in living standards in different parts of the world are essential to achieve sustainable development and meet the needs of the majority of people.

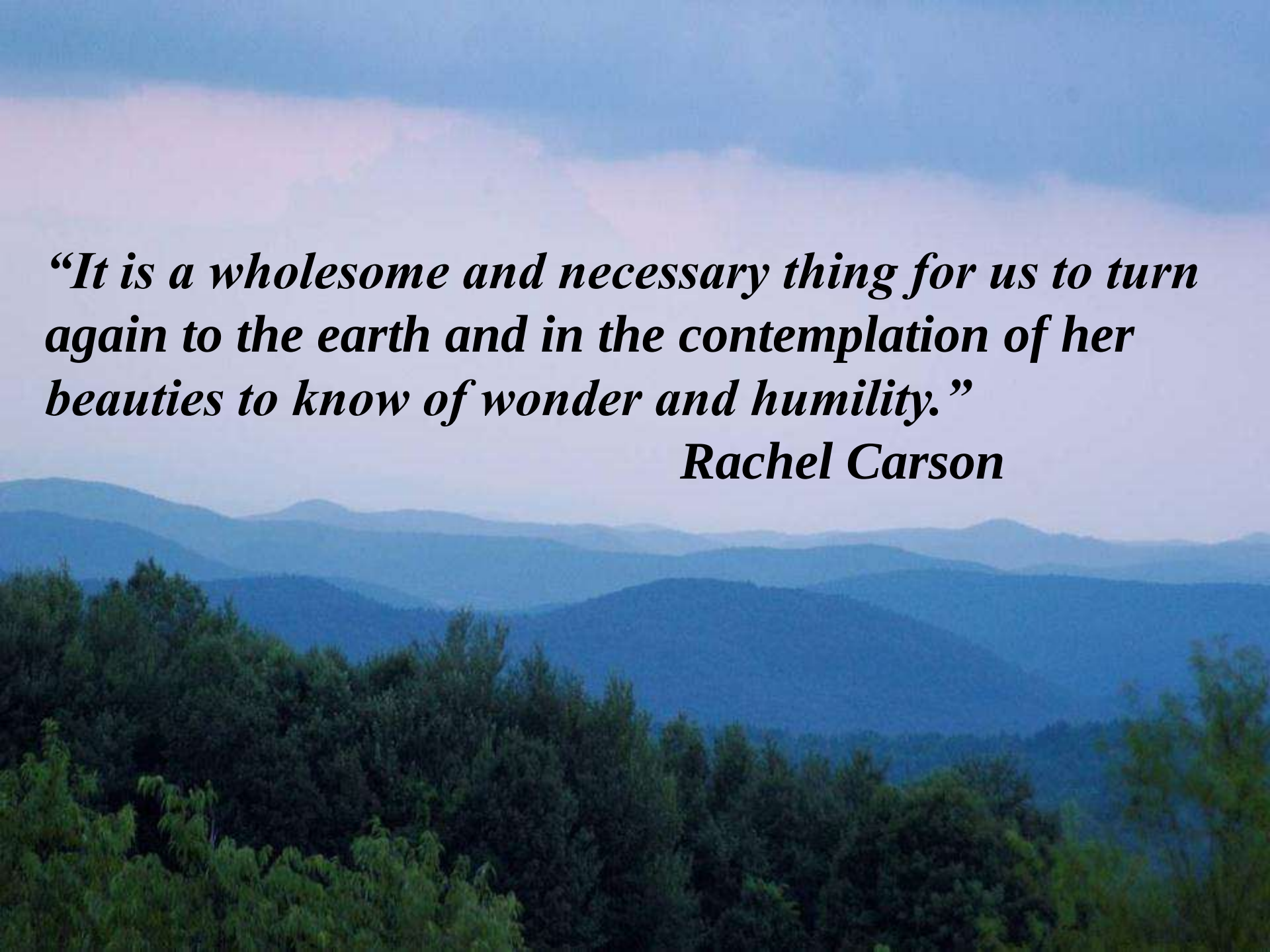
Tibetan girl gathering firewood

Some actions for individuals:

- Promote international understanding
- Learn
- Act
- Vote
- Teach

We start teaching every child about nature… early and often.

If they learn to appreciate the beauty and majesty of nature, they will protect it in the future and…
perhaps…
find their own life’s passion!


“It is a wholesome and necessary thing for us to turn again to the earth and in the contemplation of her beauties to know of wonder and humility.”
Rachel Carson