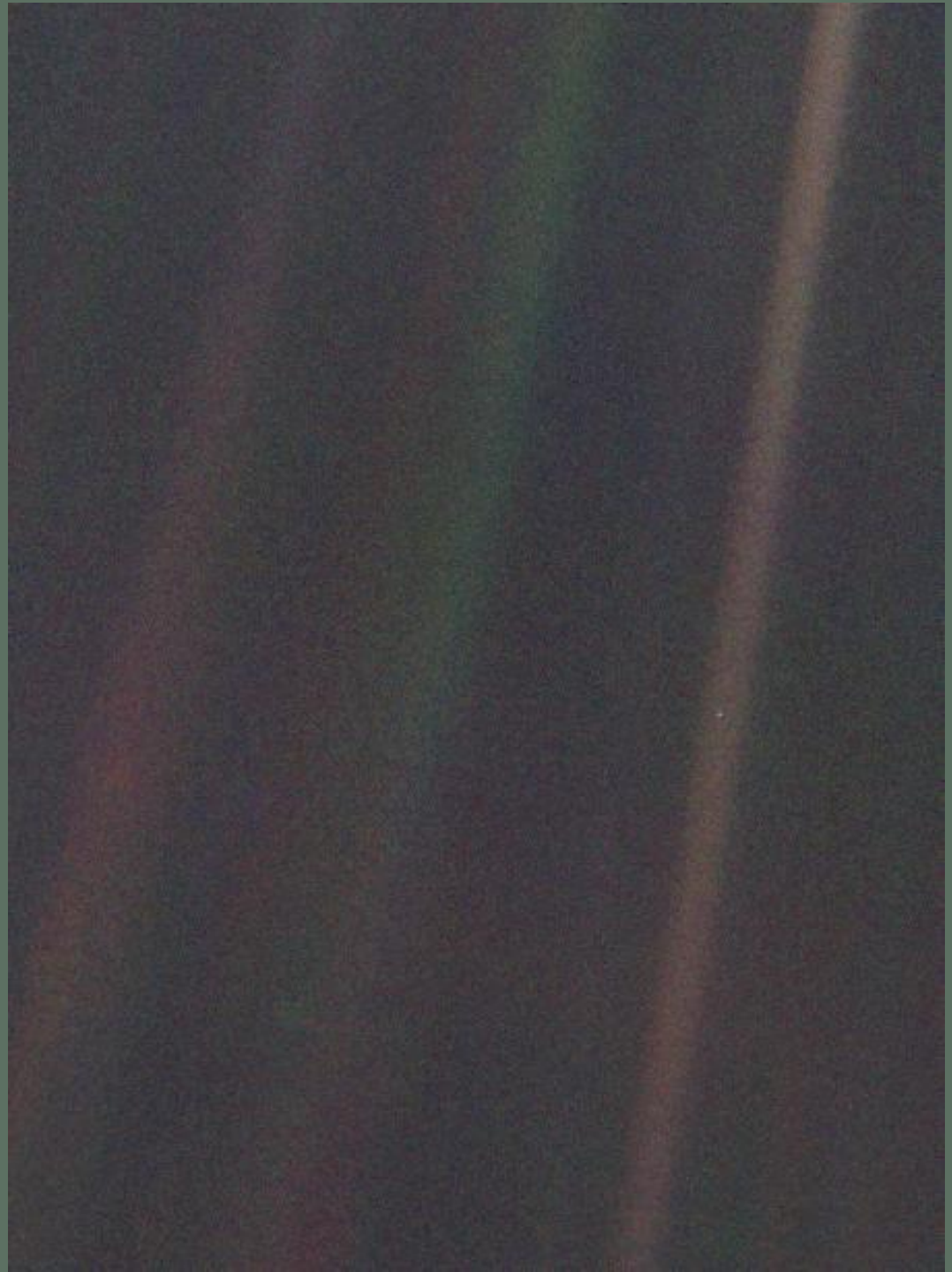
Loss of products
Loss of biodiversity
Climate change

Three Problems - One Solution

Dr John Kerr



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Loss of products

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Herbicides

EU on brink of historic decision on pervasive glyphosate weedkiller

Glyphosate is found in 60% of UK bread and environmentalists welcome a ban but industry warn of uproar among farmers if herbicide is phased out

< 5,456

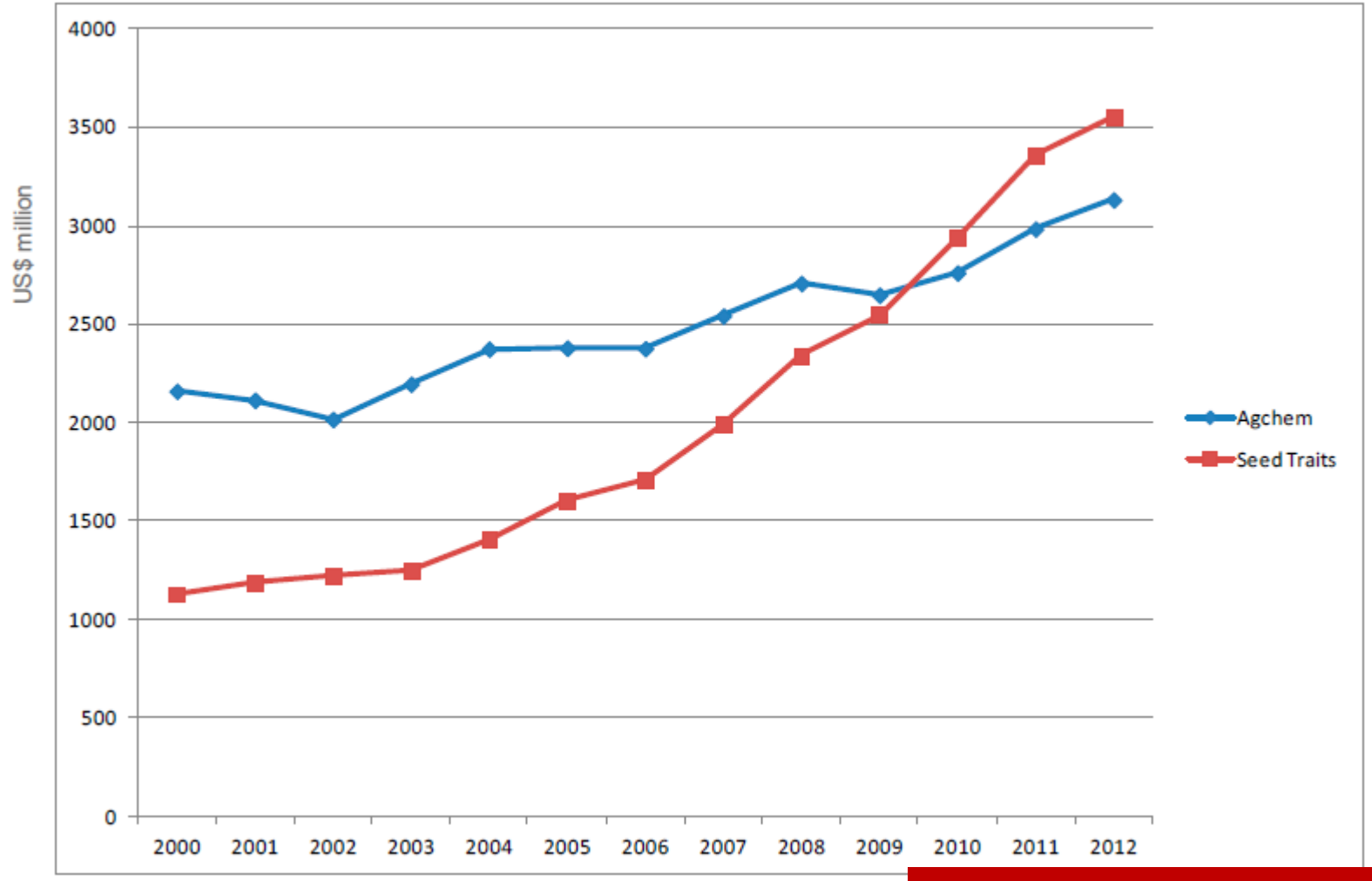
Arthur Neslen

Tuesday 24 October 2017 11.11 BST

Glyphosate is a weedkiller so pervasive that its residues were recently found in 45% of Europe's topsoil and in the urine of three quarters of Germans tested. Photograph: Philippe Huguen/AFP/Getty Images

Plant Protection Product Availability

Figure 3: *Swing of overall R&D expenditure towards seeds and traits*

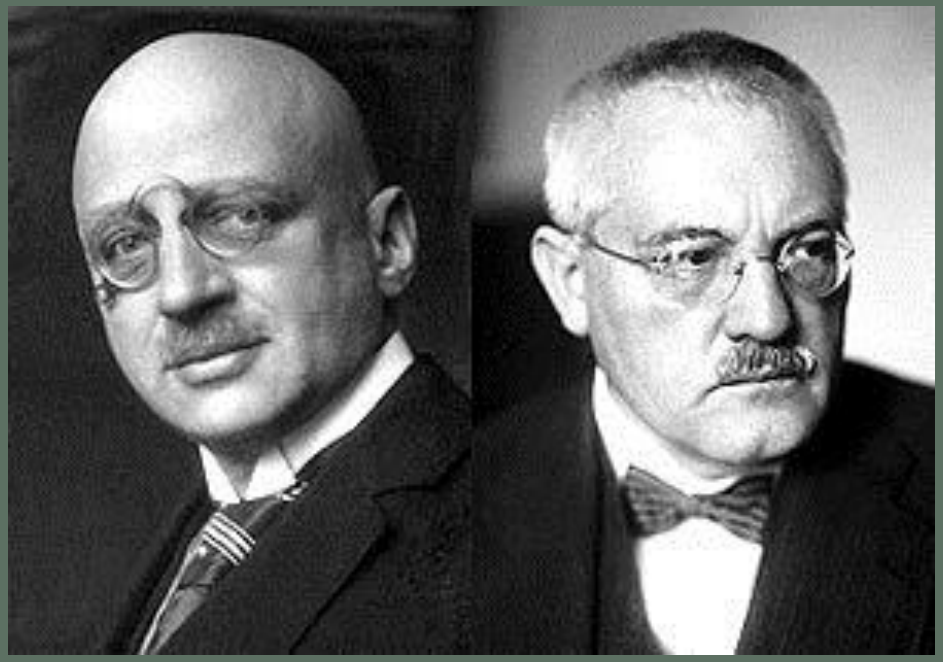


PhillipsMcDougall (for ECPA)

Biodiversity Loss and CO2 Emissions

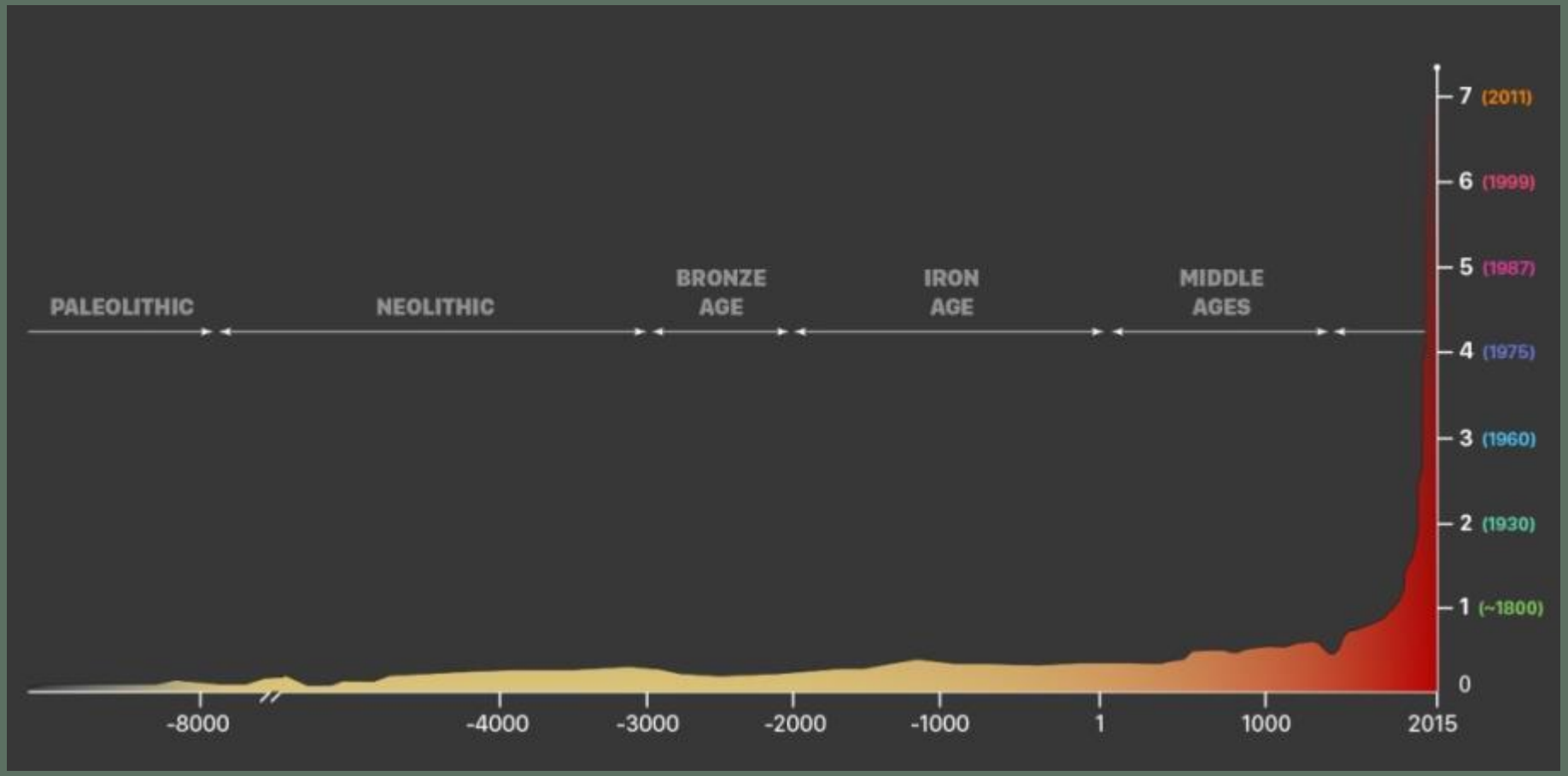
Breeding Bird Survey

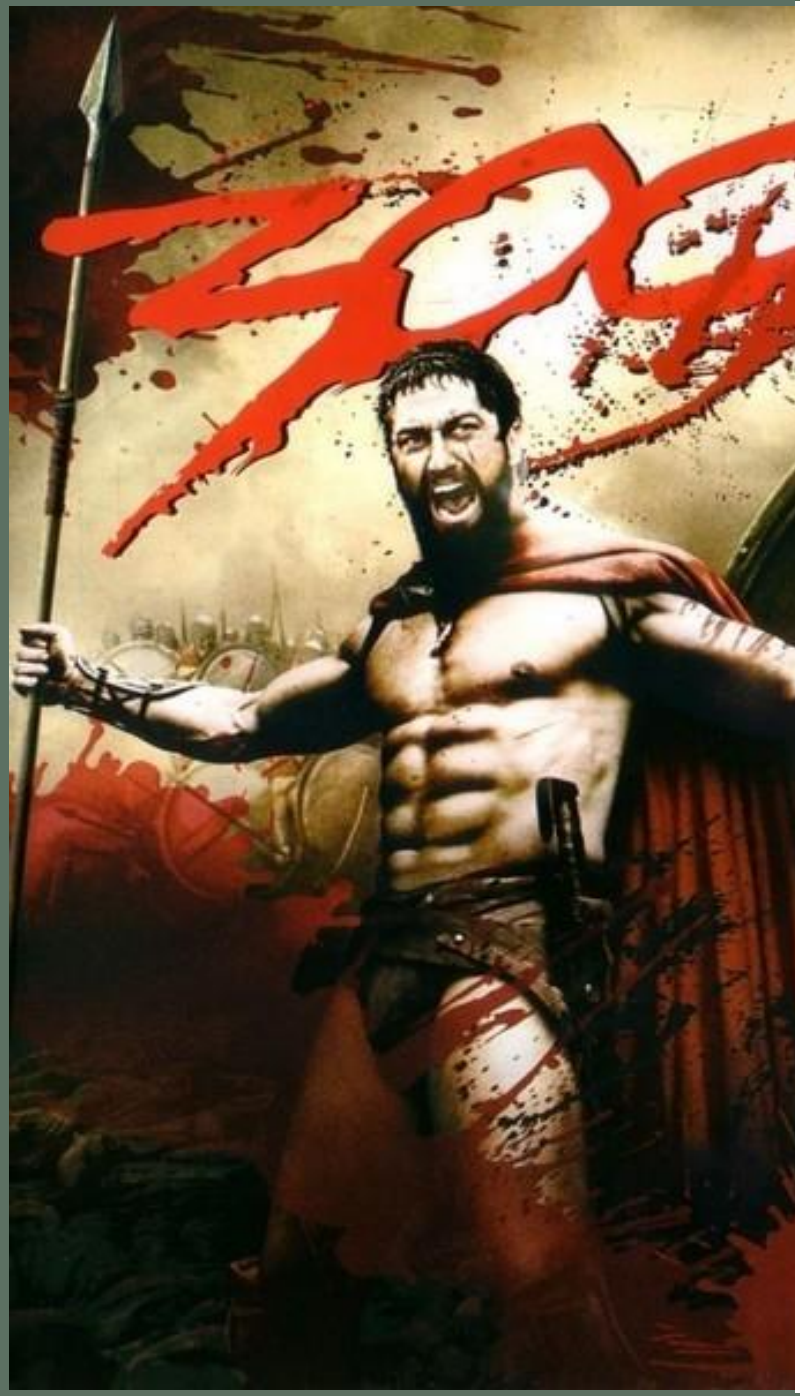
Nitrogen Fertiliser

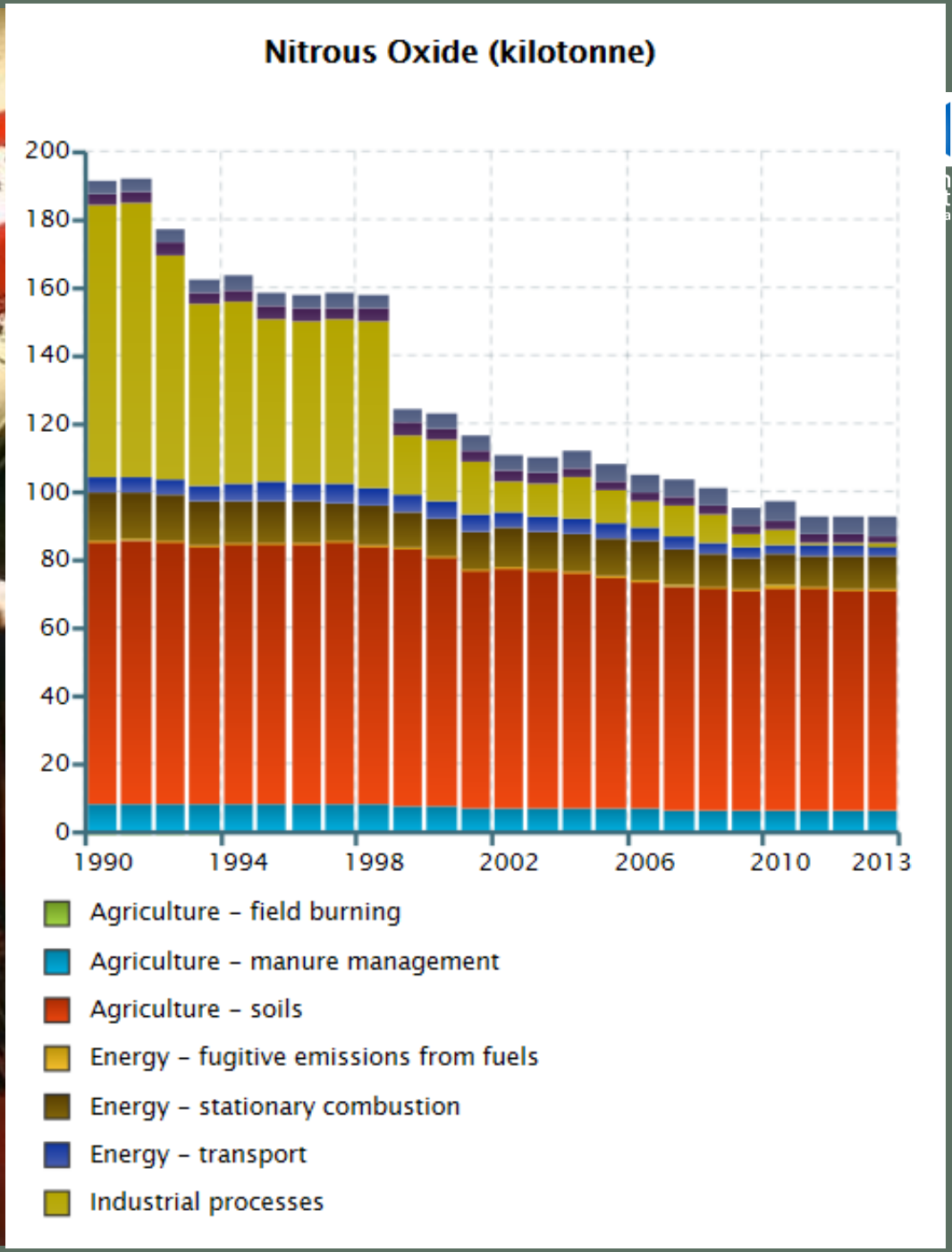


With average crop yields remaining at the 1900 level the crop harvest in the year 2000 would have needed **four times** more land and claimed nearly **half of all ice-free continents**, rather than under 15% that is required today.

Global Population

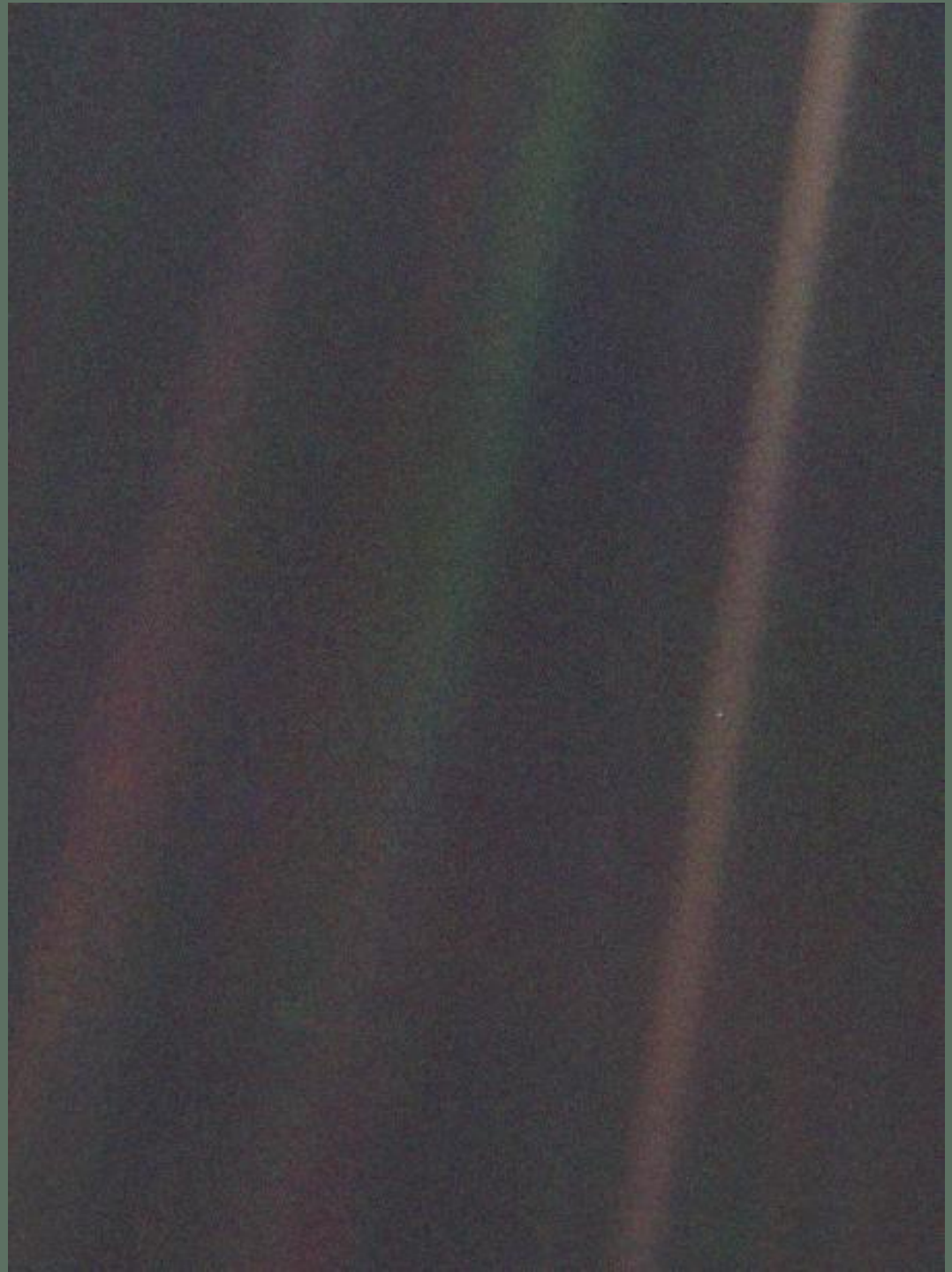





Nitrous Oxide (kilotonne)
200
180
160
140
120
100
80
60
40
20
0
1990
1994
1998
2002
2006
2010
2013
Agriculture – field burning
Agriculture – manure management
Agriculture – soils
Energy – fugitive emissions from fuels
Energy – stationary combustion
Energy – transport
Industrial processes

Schools of Thought

Critical Limits versus Competing Objectives



NASA/JPL

"Anyone who believes in indefinite growth on a physically finite planet is either mad, or an economist."

— David Attenborough

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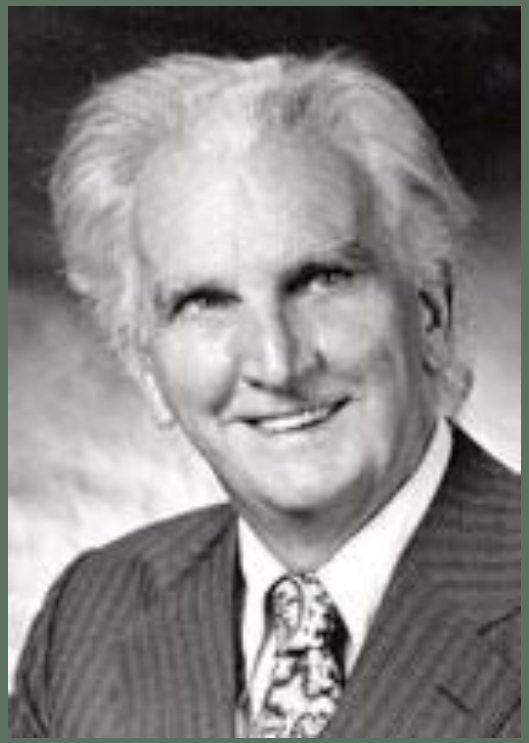
David Attenborough's speech to the RSA



"Anyone who believes in indefinite growth in anything physical, on a physically finite planet,' he said,' is either mad – or an economist."

Kenneth Boulding, an Economist and President Kennedy's environmental advisor forty five years ago

Political Context

“The last thing we want is to leave environmental debts for our children to clear up” “No generation has a freehold on this earth. All we have is a life tenancy – with a full repairing lease.” Tory conference 1988

“In Scotland we are determined to play a leading role in developing the thinking about the concept [of natural capital] and its application.”

To World Forum on Natural Capital Edinburgh 2015

Natural Capital and Ecosystem Services

Natural Capital has been defined as the world's *stocks* of natural assets which include geology, soil, air, water and all living things. It is from these *stocks* that we derive the *flow* of ecosystem services that sustain people.

Natural Capital:

Agricultural Land (*stock)*

Ecosystem service:

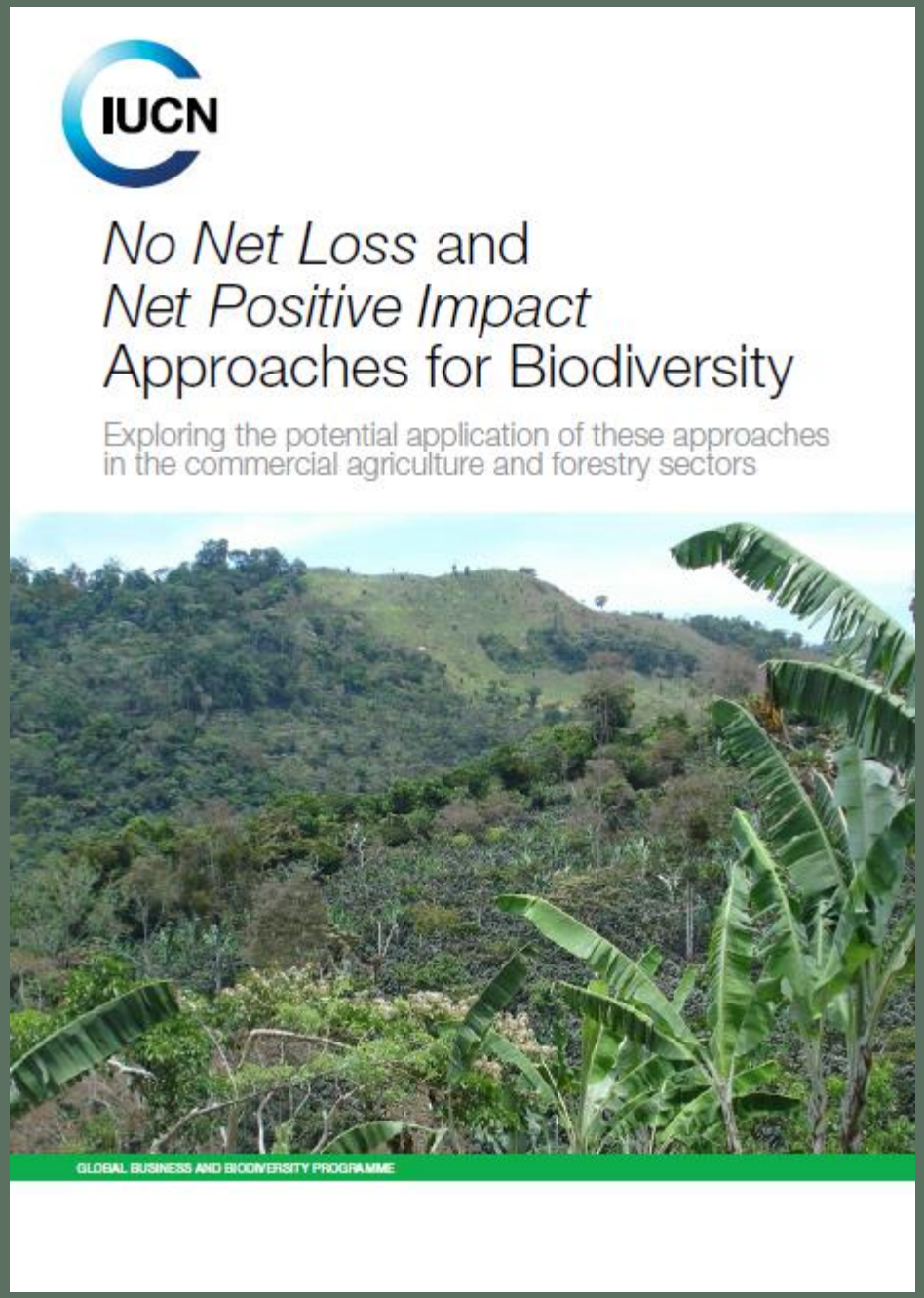
food (*flow*)

A Solution ?

Since these **flows of services** have value the emerging system of natural capital accounting could, if harnessed properly, deliver that **value as income** to those who can demonstrably protect and improve the flow of these services.

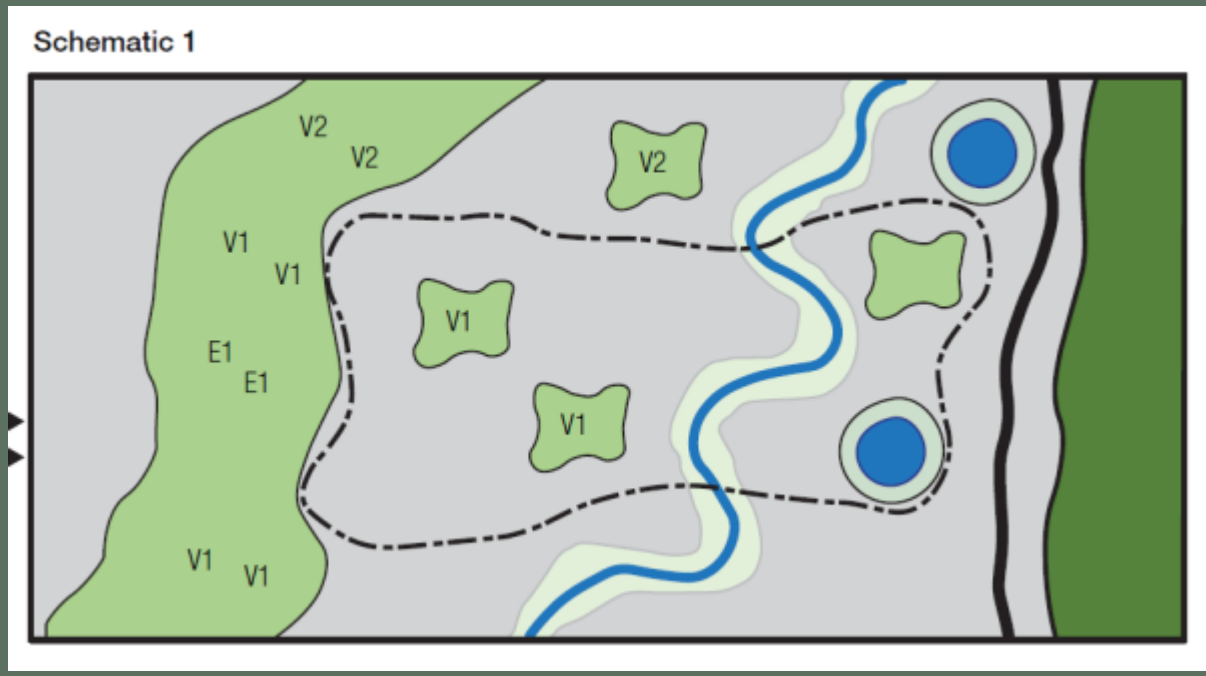
Businesses able to maintain and enhance their **stock of natural capital** will be best placed in the future to reap the **rewards of their investment**.

The IUCN Model



STAGE 1: Identify priority biodiversity values in the region and define NPI goals

STAGE 2: Map locations, compile trends, and establish a baseline or reference frame of the selected biodiversity features



Legend

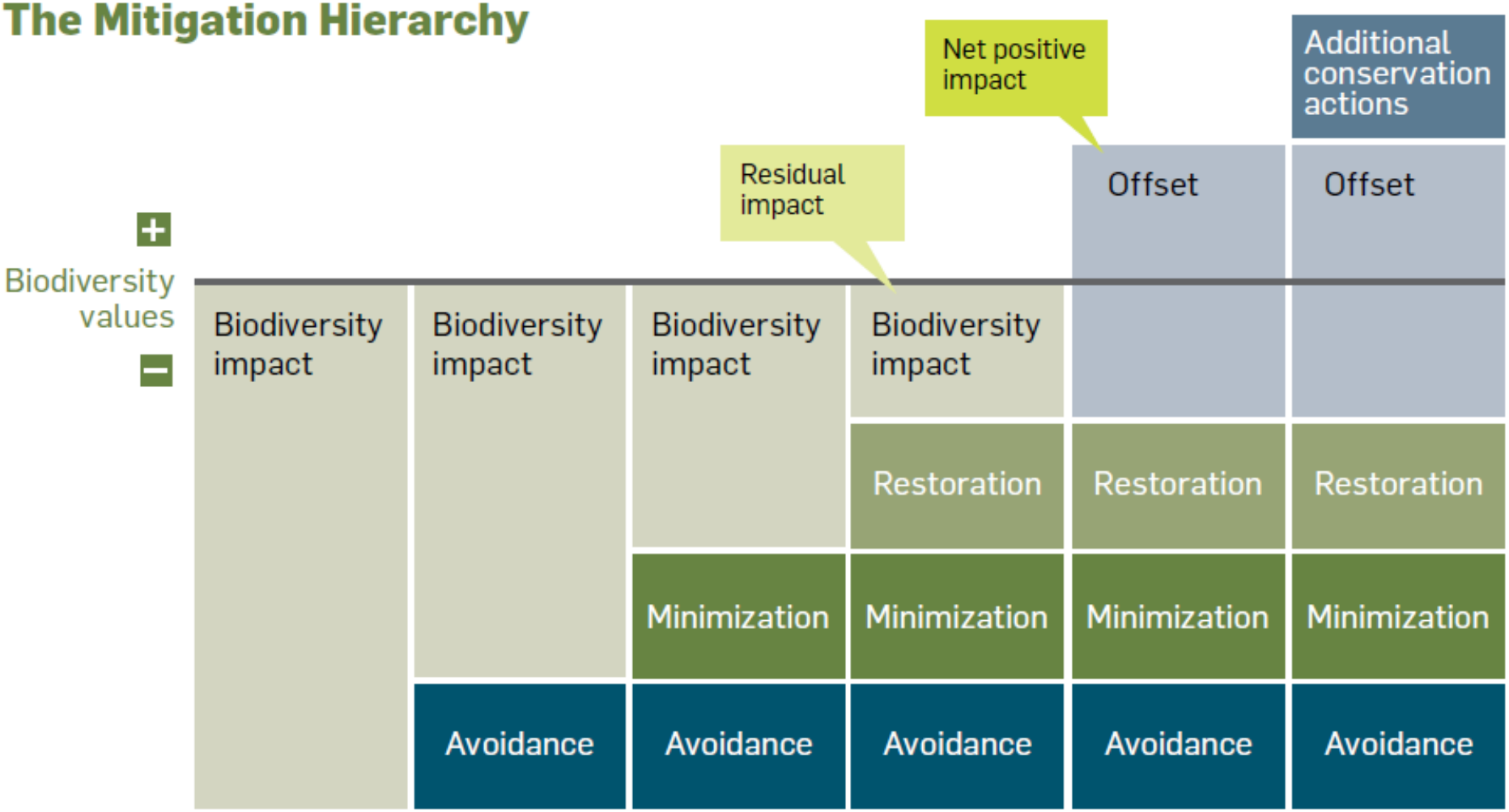
- Water bodies (stream, river, lake, wetland)
- Riparian areas (natural habitat around water bodies)
- HCV or rare habitat or natural habitat areas
- Legally protected area
- E/V Record of presence of Endangered (E) or Vulnerable (V) species
- Offset area
- Area under agricultural and forest management
- Area under proposed or ongoing management interventions
- Buffer areas with reduced disturbance activities
- Project boundary
- Road
- Native species retention or restoration
- Wildlife corridor

Targets and Baseline

Priority Project 10: Improving ecological connection

Project Priority 11: Sustainable land management

The Mitigation Hierarchy



STAGE 3: Overlay production plans on biodiversity map and apply mitigation hierarchy.

Avoid

Minimise

Restore

Offset

Offset (compensate)

Legend

- Water bodies (stream, river, lake, wetland)
- Riparian areas (natural habitat around water bodies)
- HCV or rare habitat or natural habitat areas
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What does that mean in practice?

Virus Control in Finland (high grade region)

Problem of PVY increase in Finland.

Insecticides were found to be **not effective** in controlling PVY transmission.

Control could be **achieved** by discouraging aphids from feeding on young plants using a **straw much**. In conjunction with **healthy seed**.

Growers in Finland are gaining control of PVY using this method (Kirchner et al., 2014).

Tuber moth control in Victoria Australia

Victoria Australia potato growers were suffering major problems due to potato tuber moth.

Entomologist Paul Horne demonstrated an abundance of naturally occurring biological control agents for PTM

Beneficial insects very susceptible to insecticides used to control virus vectors

By eliminating use of insecticides, with a switch to use of virus tested seed, Victorian seed potato growers now control PTM and maintain control of virus

Sprays reduced from 7 per year to zero over ten years

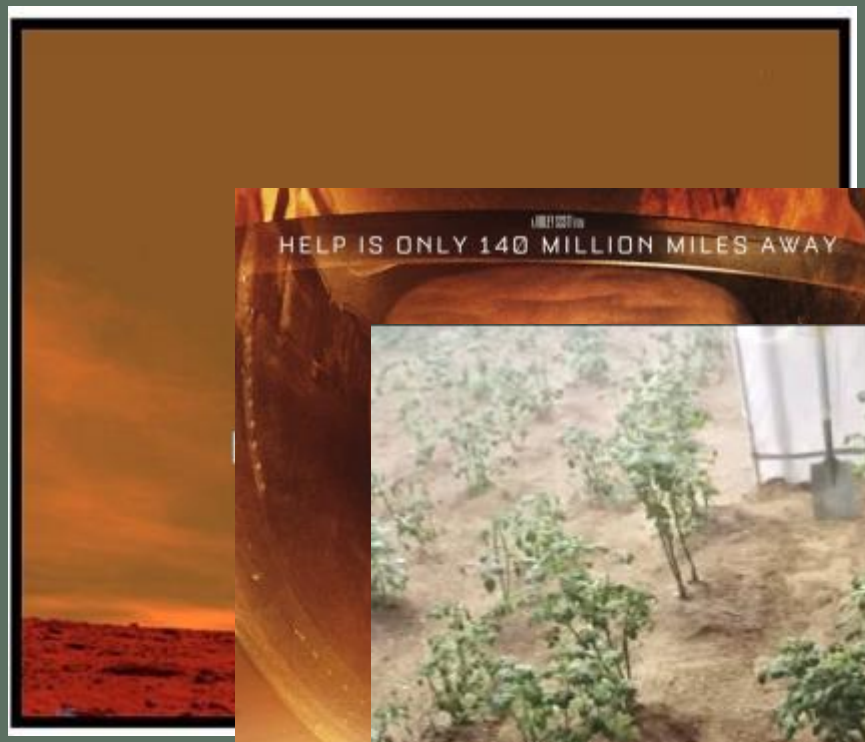
Rush Control Scotland

An infestation of soft rush is **bad for both** farmers and biodiversity outcomes.

Ayrshire, Caithness and Strathspey are all examples of **successful partnership working** between farmers and conservation bodies.

Control measures include topping, **weed wiping** and **reseeding**.

All these measures improve both grazing and habitat value **attracting financial support**.



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