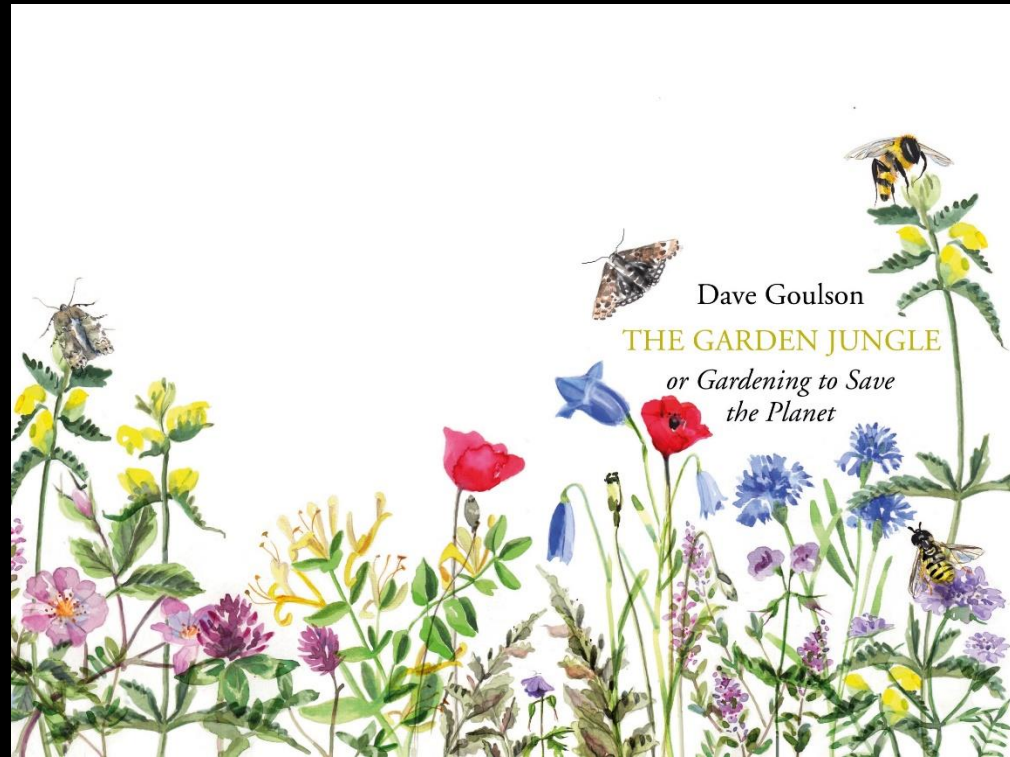
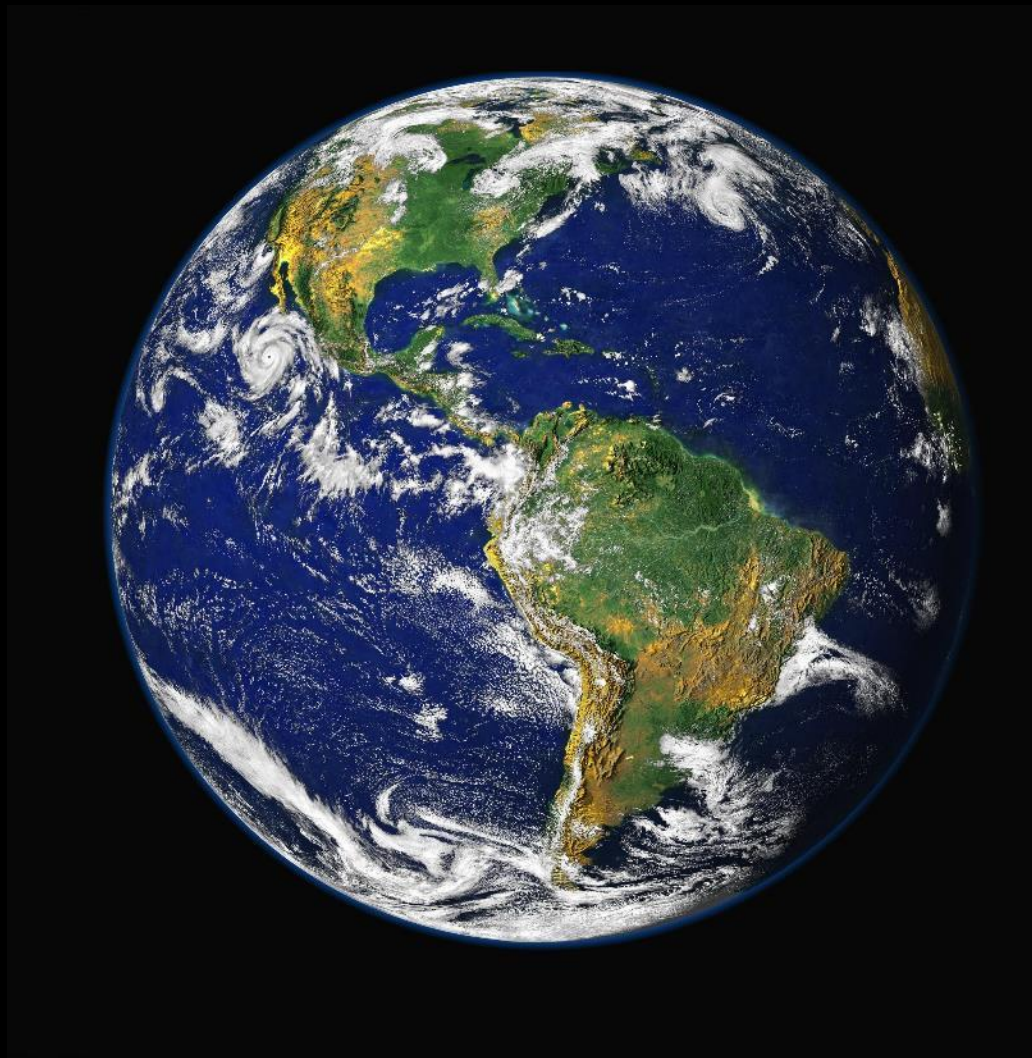


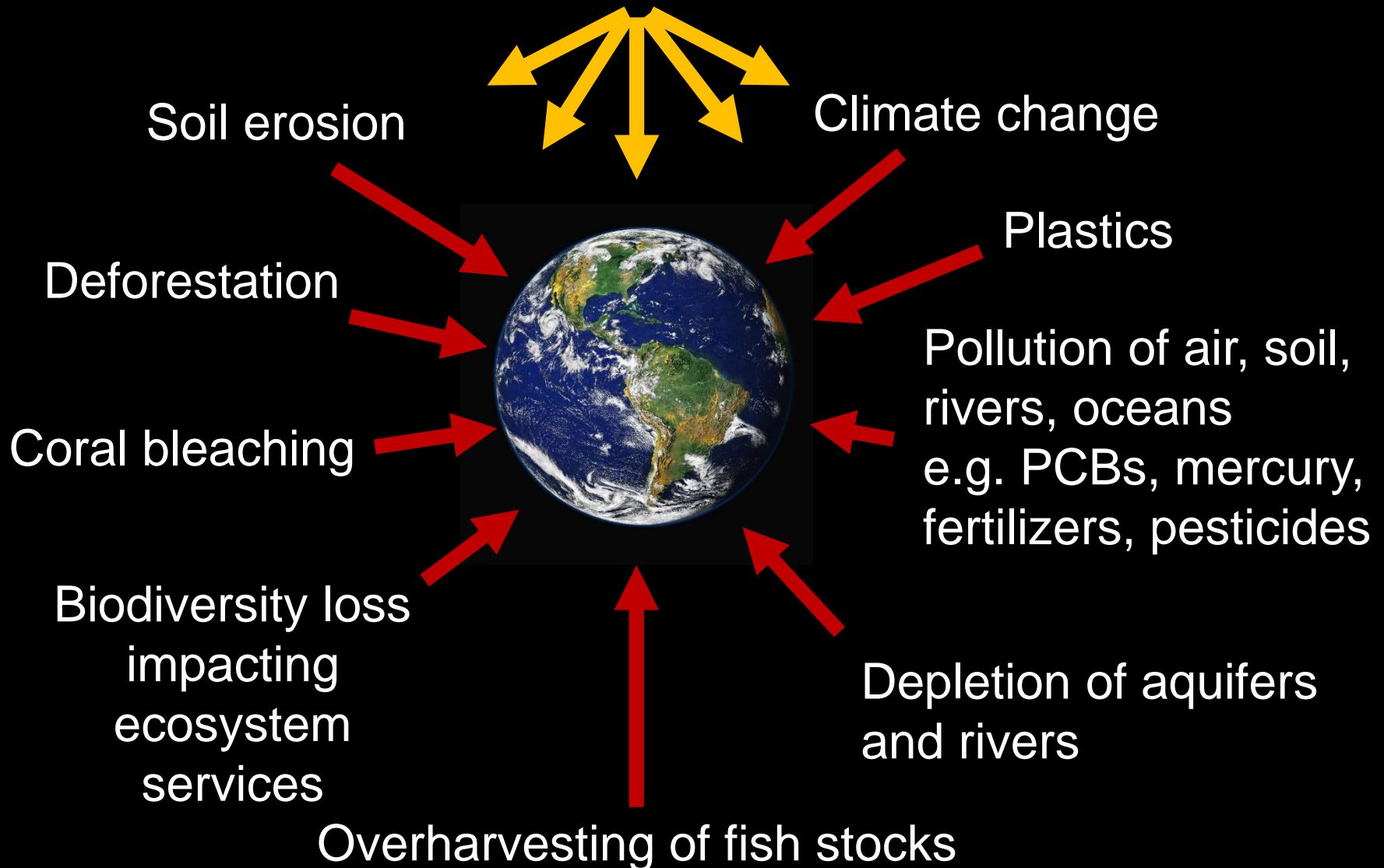
# *Gardening to save the planet*

Prof Dave Goulson  
University of Sussex  
[@DaveGoulson](#)



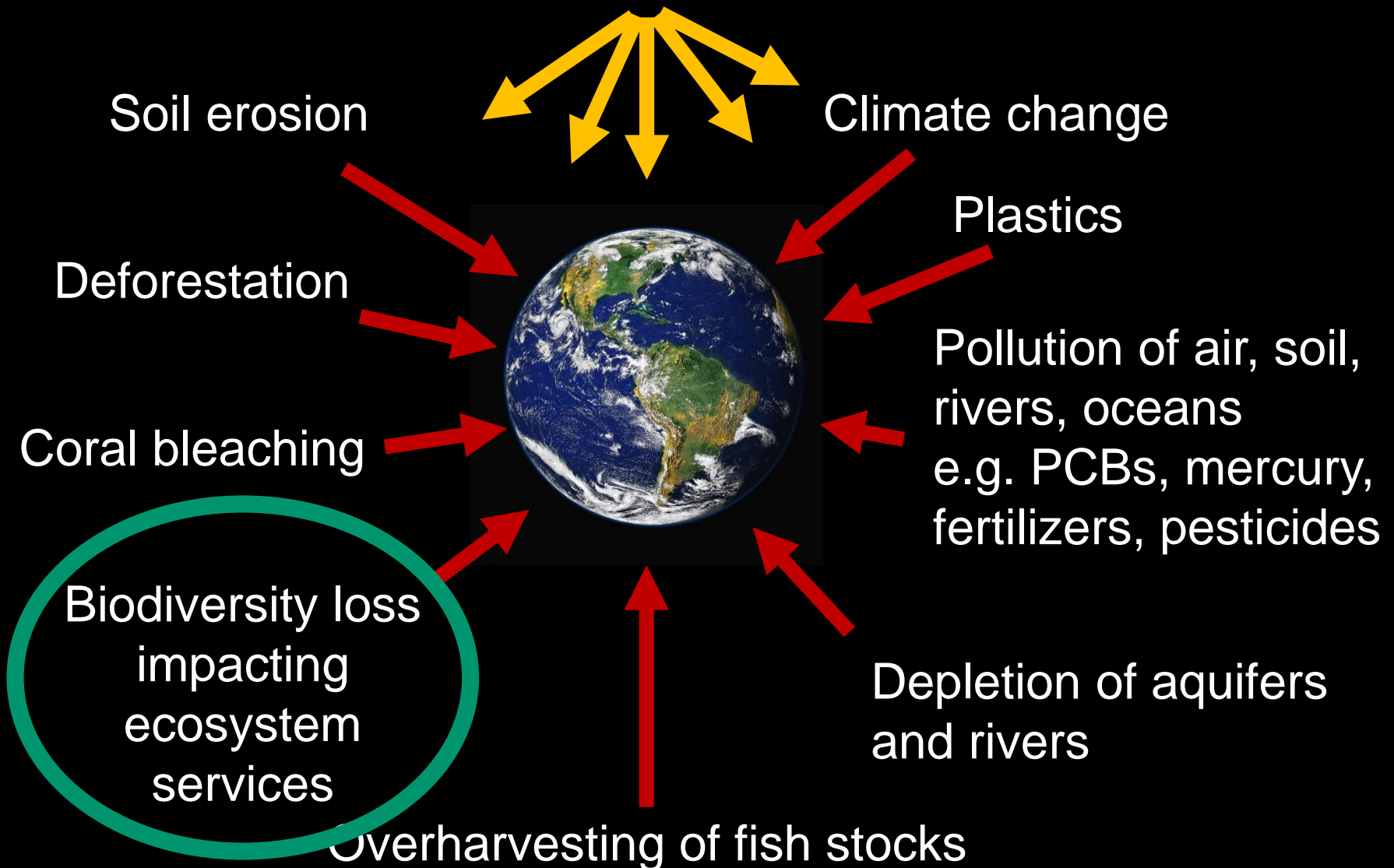


# Human population growth





# Human population growth





# Conservation often focuses on extinction & rarest species

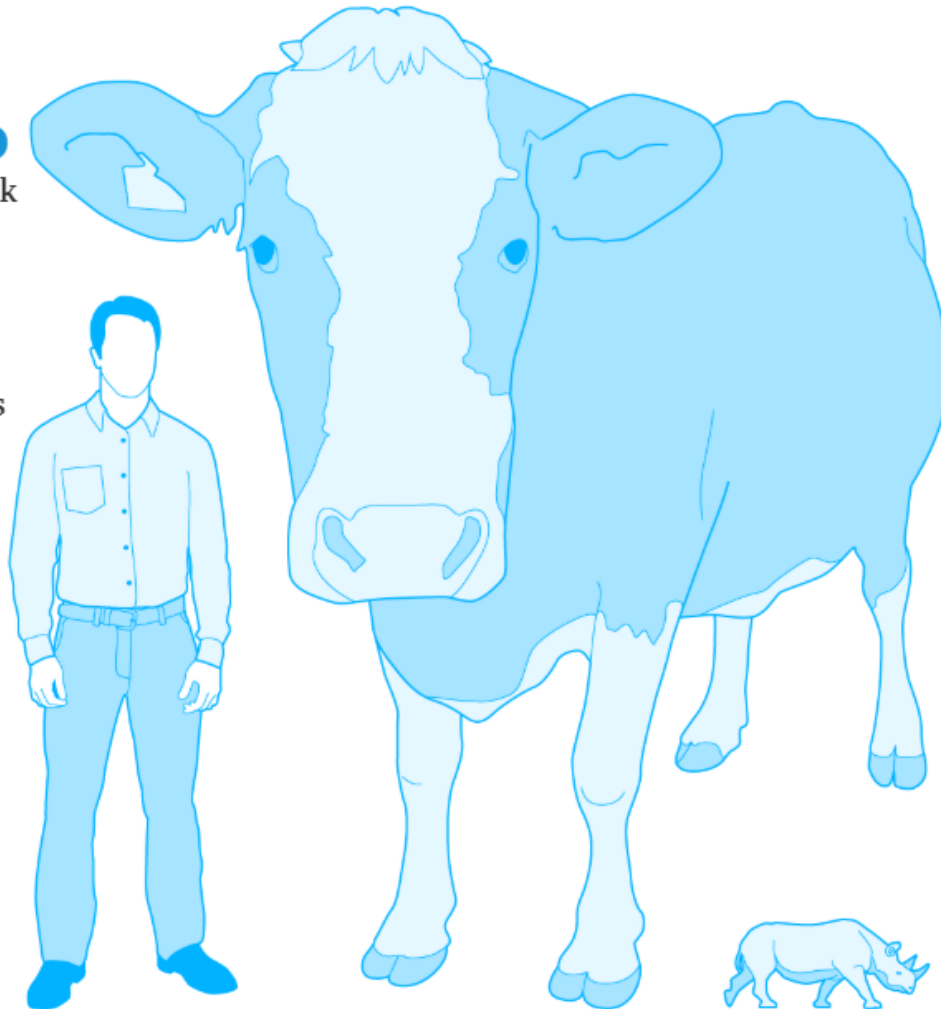


# We pay less attention to declines in bioabundance:

Of all the mammals on Earth, 96% are livestock and humans, only 4% are wild mammals

**60%**  
are livestock

**36%**  
are humans



**4%**  
are wild  
mammals

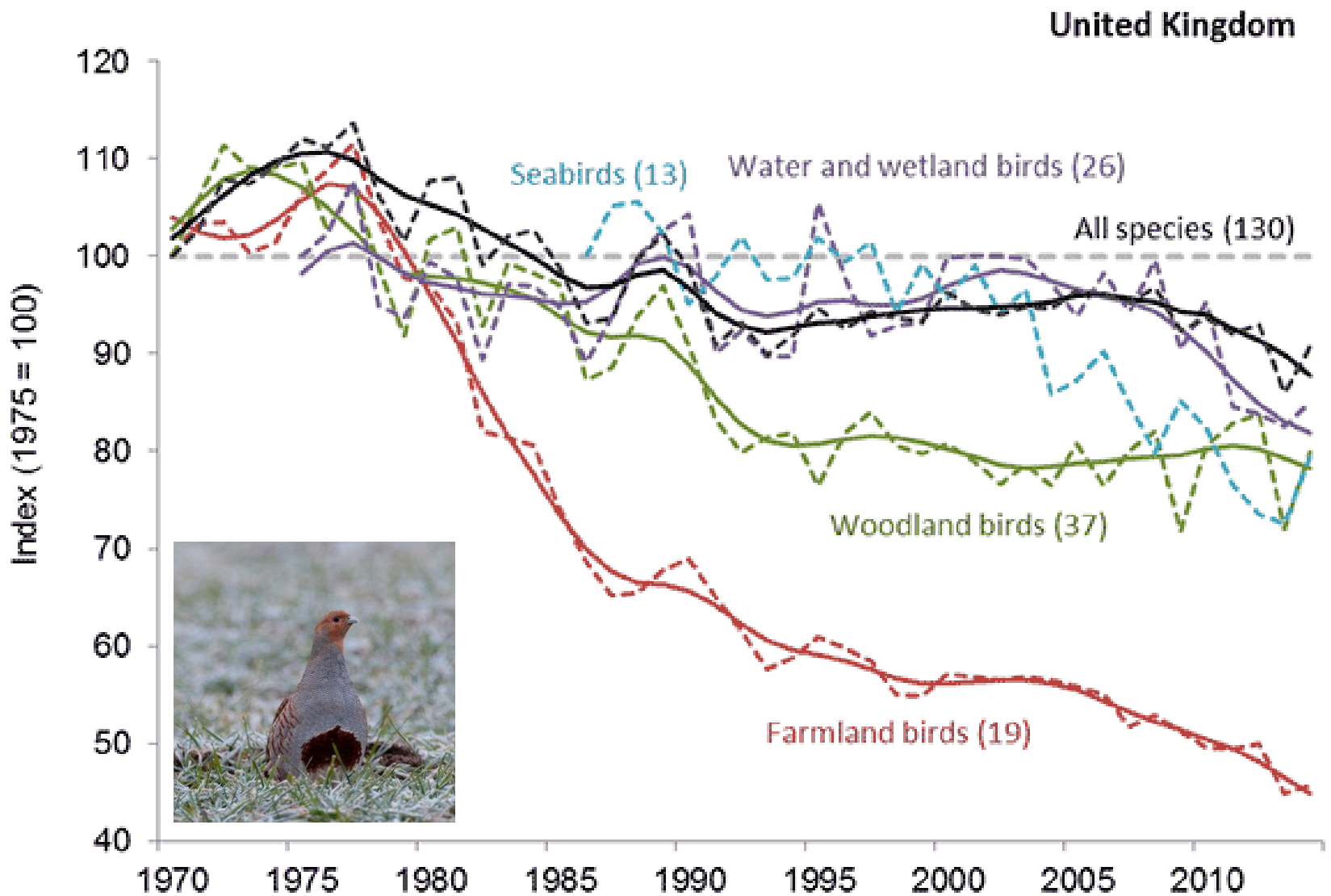


**70%**  
of birds are  
chickens and  
other poultry

**30%**  
are wild

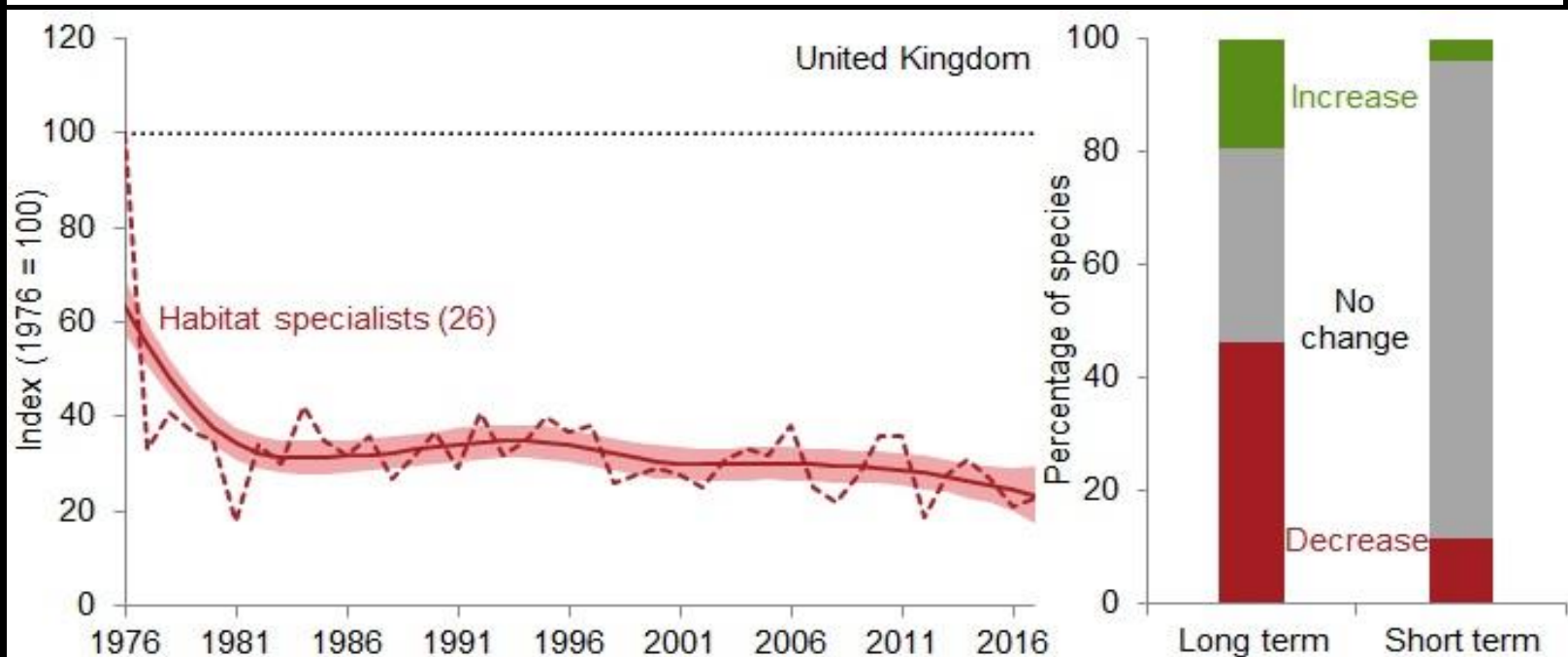
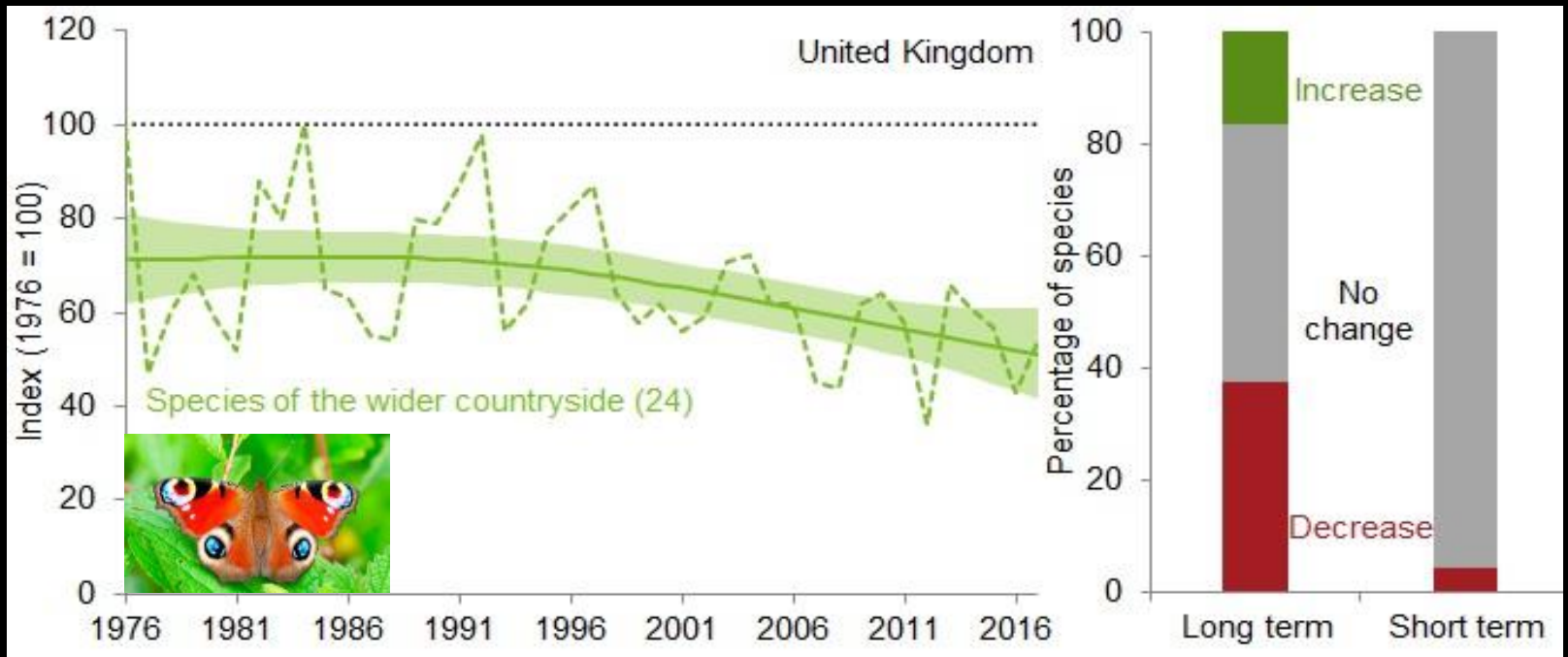
Guardian graphic.

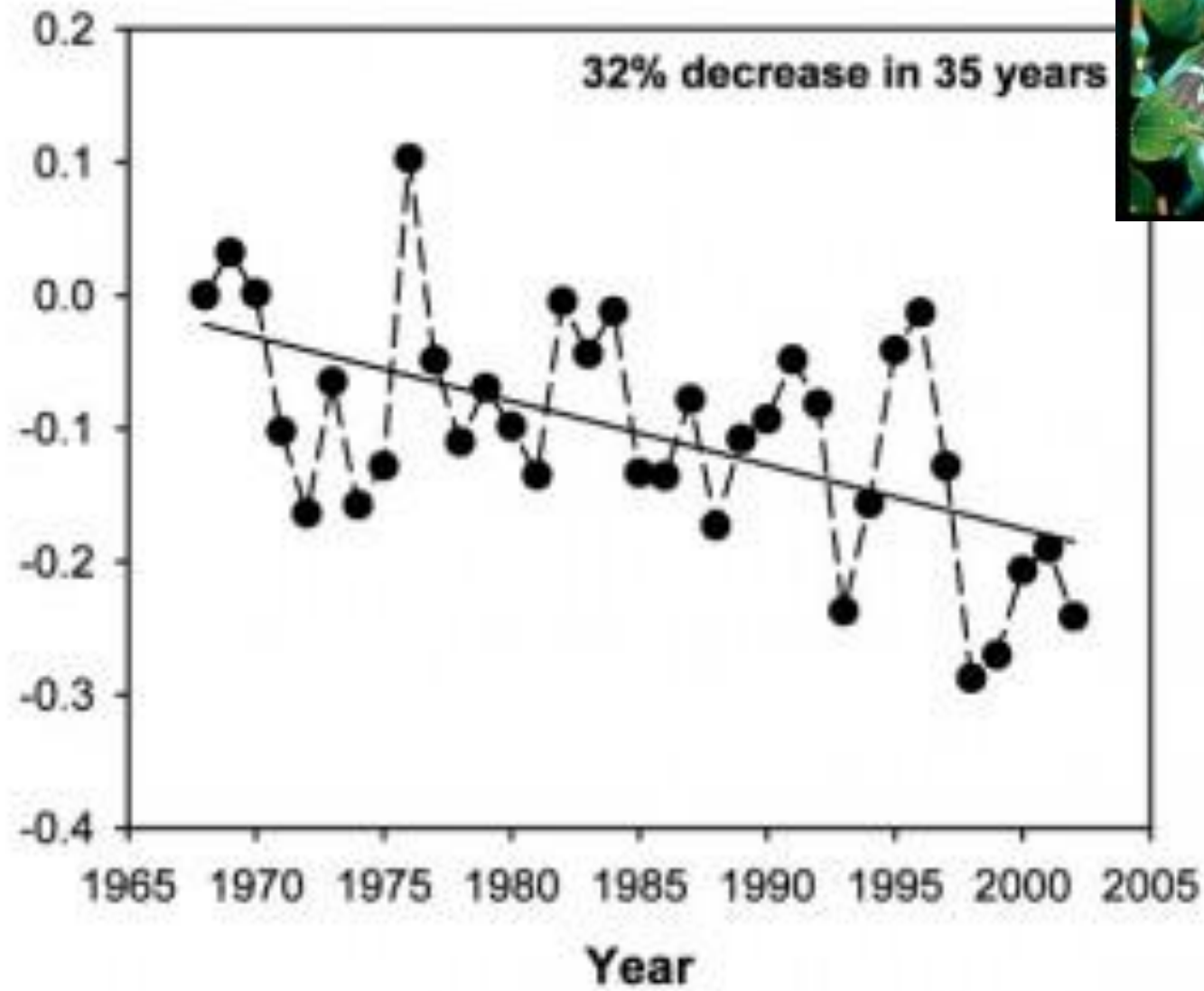




WWF/ZSL: 58% fall in global number of wild vertebrates, 1970-2016

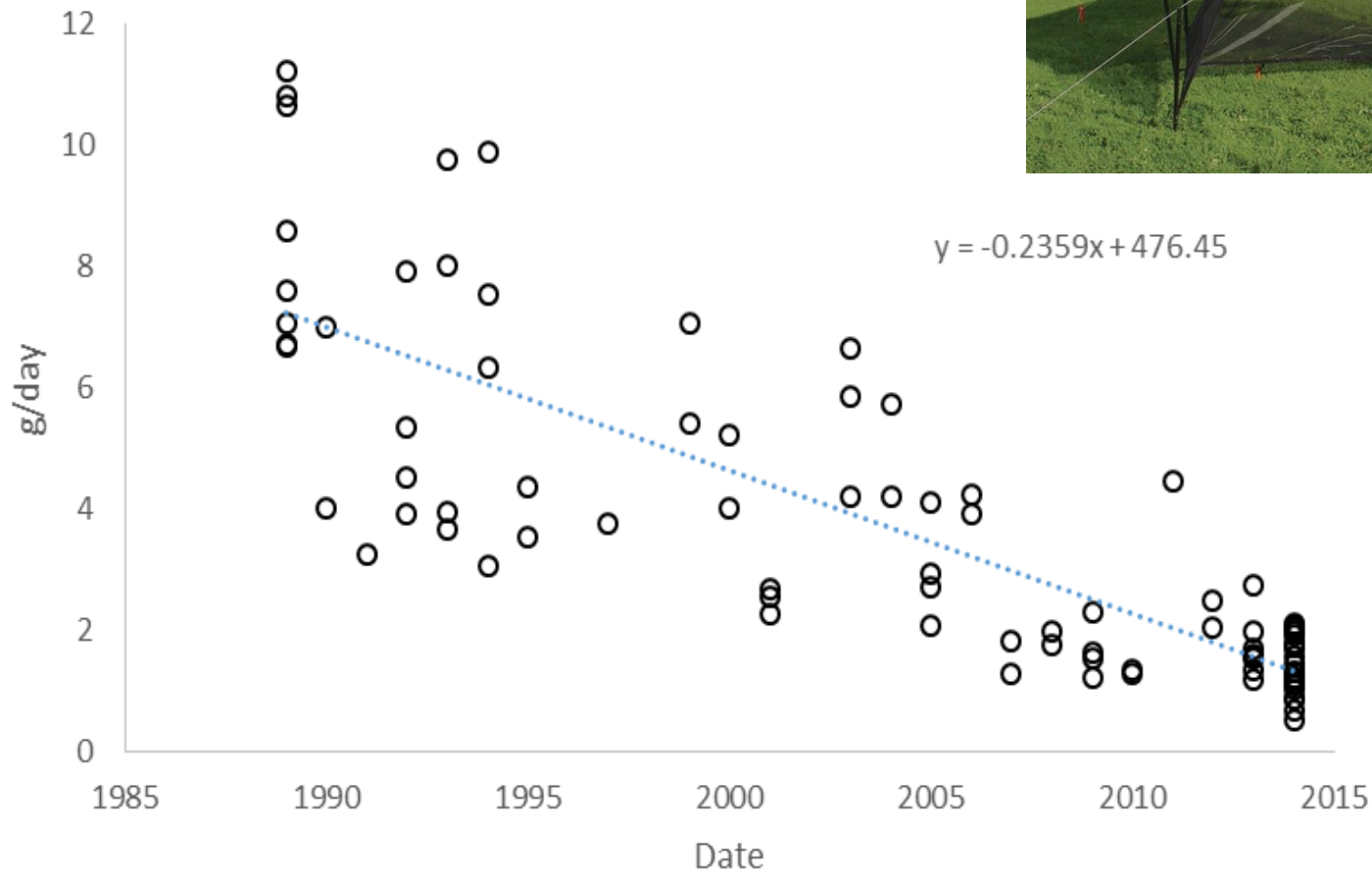
# What about insects?







Catch per day (grams of insects) in Malaise traps deployed at 63 sites in Germany between 1989 and 2014.



Hallmann, CA, ... Goulson, D & de Kroon, H. 2017. More than 75 percent decline over 27 years in total flying insect biomass in protected areas. PlosONE 12: e0185809.

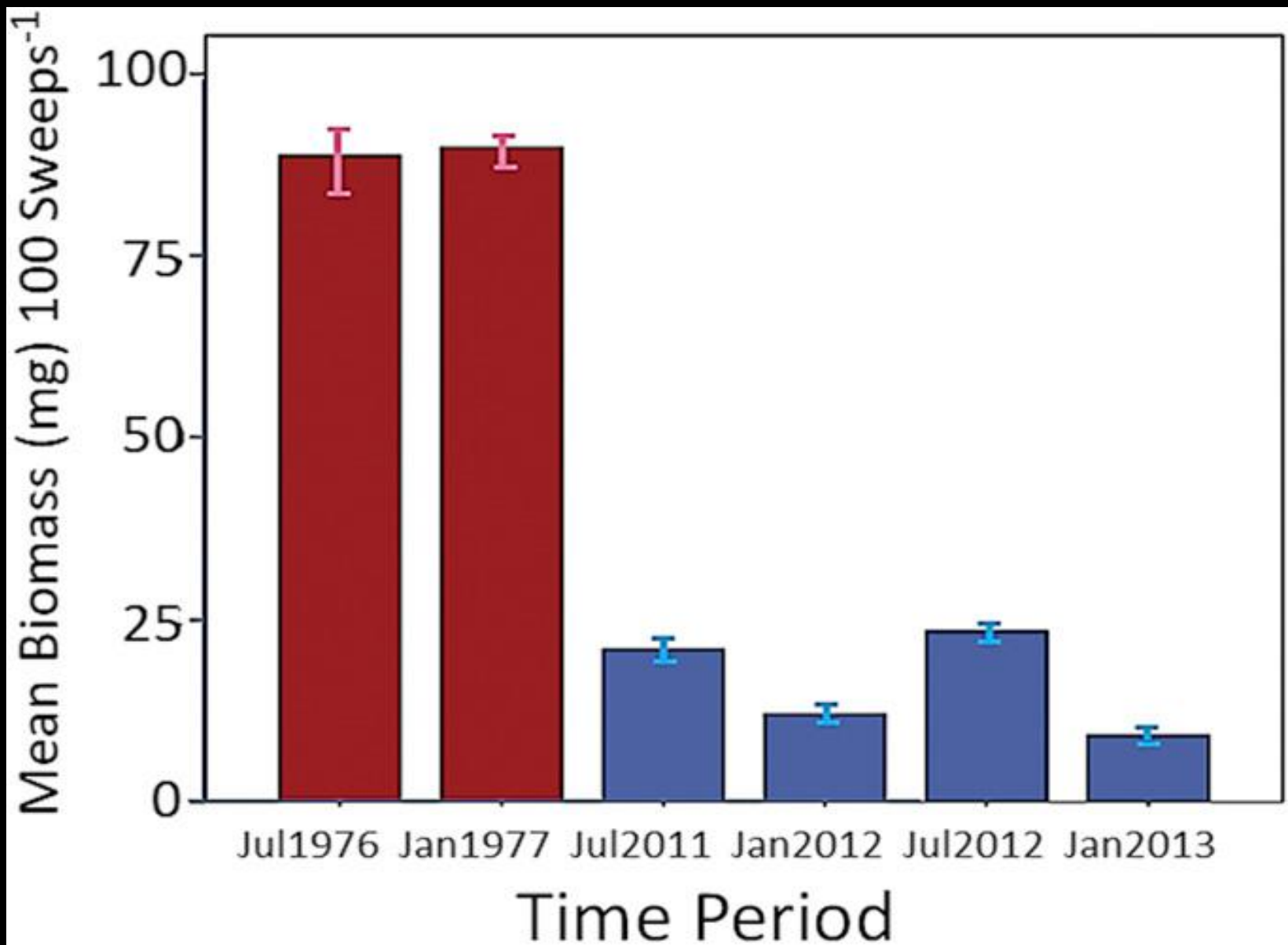


Fig. 2. Mean dry-weight arthropod biomass per 100 sweeps taken in the same sample area in the Luquillo rainforest during July 1976, January 1977, July 2011, and January 2013. One SE around the mean biomass is shown for each bar. Total sweeps taken in each period was 800, except for July 1976, when 700 sweeps were taken. Data for 1976 and 1977 are from Lister (22). From Lister and Garcia 2018 PNAS

## Why does loss of insects matter?

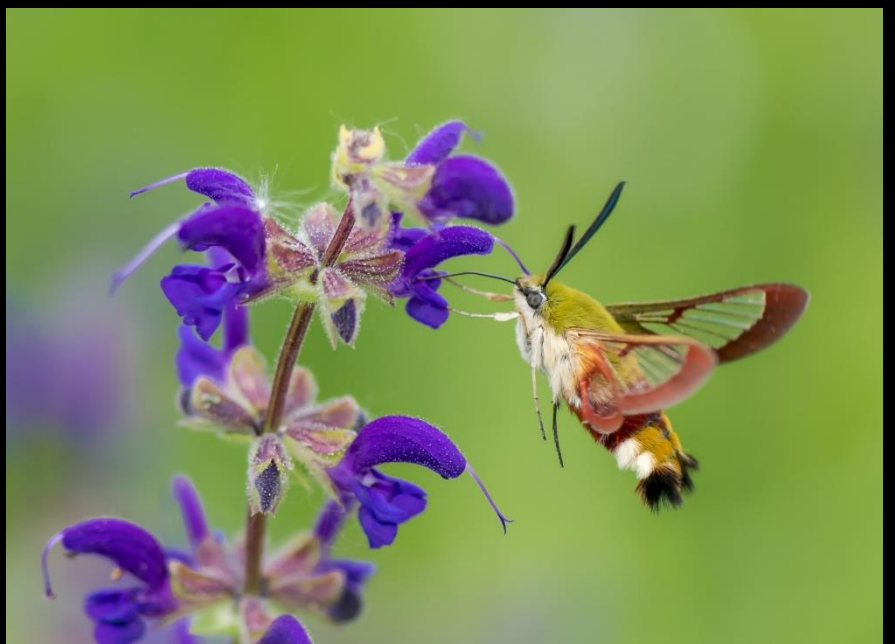
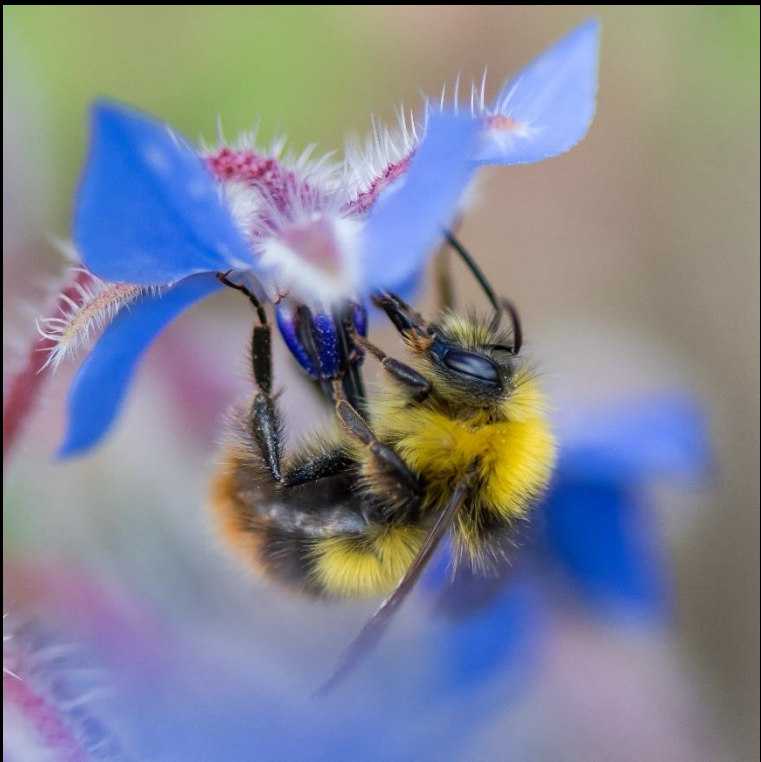
*“If all mankind were to disappear, the world would regenerate back to the rich state of equilibrium that existed ten thousand years ago. If insects were to vanish, the environment would collapse into chaos.”*

E O Wilson

## What have insects ever done for us?

- Pollination
- Recycling of dung & leaves
- Corpse disposal
- Seed dispersal
- Soil health
- Pest controllers
- Food for innumerable birds, bats, lizards, amphibians etc.,

















Your produce choices  
*without* bees

# Causes of declining bioabundance?

Loss of habitat

Pesticides

Climate change







Loss of habitat





37 0141

Bougainville, Picardy

Street View - Mar 2011

Hide imagery



Iram Drove

Wellingham, England

Street View - Sep 2008

Hide Imagery





Tjongeradiel  
Nieuwehorre, Friesland  
Street View - Jul 2009



Hide imagery





40 Oosthoekstraat  
Tiel, Flanders  
Street View - Aug 2009

521

Skane County

Street View - Jul 2011



Hide imagery





4988 Co Rd F62

Jones City, Iowa

Street View - Oct 2012







Pesticides



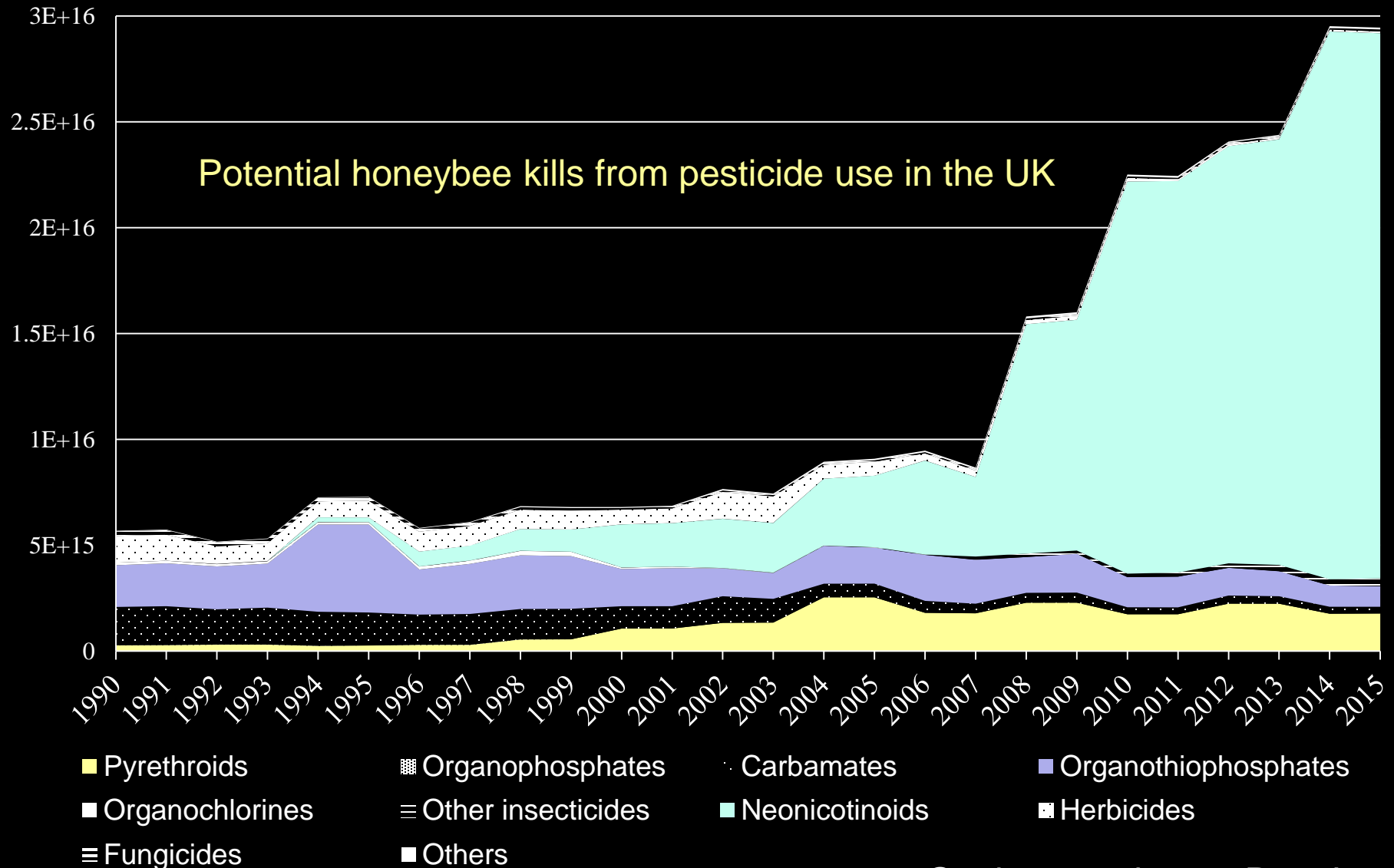
# Pesticides

## Agrochemical applications on an oilseed rape field in Sussex

25/08/2012	Insecticide and fungicide	Cruiser	280 g/l thiamethoxam, 8 g/l fludioxonil and 32.3 g/l metalaxyl-M	Seed dressing
	Herbicide	Shadow	Quinmerac, Dimethenamid-p, Metazachlor	Spray
28/08/2012	Herbicide	Dictate	480g/litre bentazone as sodium salt in the form of soluble concentrate	Spray
	Fungicide	Fiddle	Clomazone	Spray
08/09/2012	Molluscicide	Tds Major	Metaldehyde	Slug pelleter
12/09/2012	Herbicide	Shadow	Quinmerac, Dimethenamid-p, Metazachlor	Spray
10/10/2012	Herbicide	Crawler	Carbetamide	Spray
05/11/2012	Fungicide	Genie 25	Flusilazole	Spray
	Insecticide	Gandalf	Beta-cyfluthrin	Spray
16/02/2013	Fertiliser	Double Top	Ammonium Sulphate and Ammonium Nitrate	Fertiliser spreader
	Herbicide	Crawler	Carbetamide	Spray
	Herbicide	Pilot Ultra	Quizalofop-P-ethyl	Spray
10/04/2013	Fertiliser	Nitram	Ammonium nitrate	Fertiliser spreader
22/04/2013	Fertiliser	Nitram	Ammonium nitrate	Fertiliser spreader
	Fungicide	Filan	Boscalid	Spray
17/05/2013	Fungicide	Flanker	Picoxystrobin	Spray
	Insecticide	Alert	Alpha-cypermethrin	Spray
	Fungicide	Propulse	Fluopyram, Prothioconazole	Spray
05/06/2013		Hallmark		
	Insecticide	Zeon	100 g/l lambda-cyhalothrin and 1,2-benzisothiazolin-3-one	Spray
	Insecticide	Gandalf	Beta-cyfluthrin	Spray
	Insecticide	Mavrik	Tau-fluvalinate	Spray

= 22 different chemicals

# Aren't new pesticides safer for the environment than older ones?





# POISON

KEEP OUT OF REACH OF CHILDREN  
READ SAFETY DIRECTIONS  
FOR ANIMAL TREATMENT ONLY



## advocate<sup>®</sup>

for Dogs 10-25kg

100g/L IMIDACLOPRID, 25g/L MOXIDECTIN

## Fleas, heartworm & worms

Once a month topical flea and worm treatment

- Stops fleas feeding in 3-5 minutes
- Prevents heartworm and controls intestinal worms and larvae







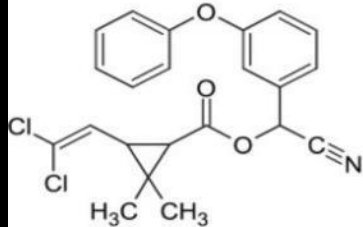
# Limited / monotonous floral resources

*Lack of alternative forage may increase exposure to pesticides*

*Poor diet compromises immunity*

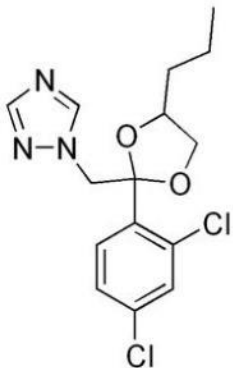
*Immune response energetically costly*

## Pyrethroids



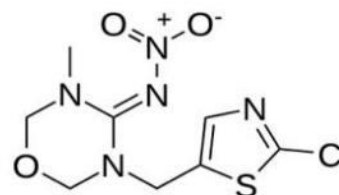
*Fungicides increase toxicity*

## EBI Fungicides



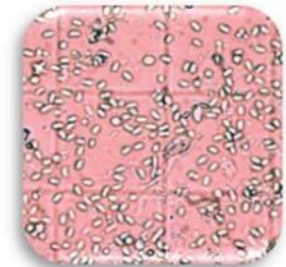
*Fungicides act synergistically to increase toxicity*

## Neonicotinoids



*Pesticide exposure affects disease tolerance and susceptibility*

## Parasites + Pathogens



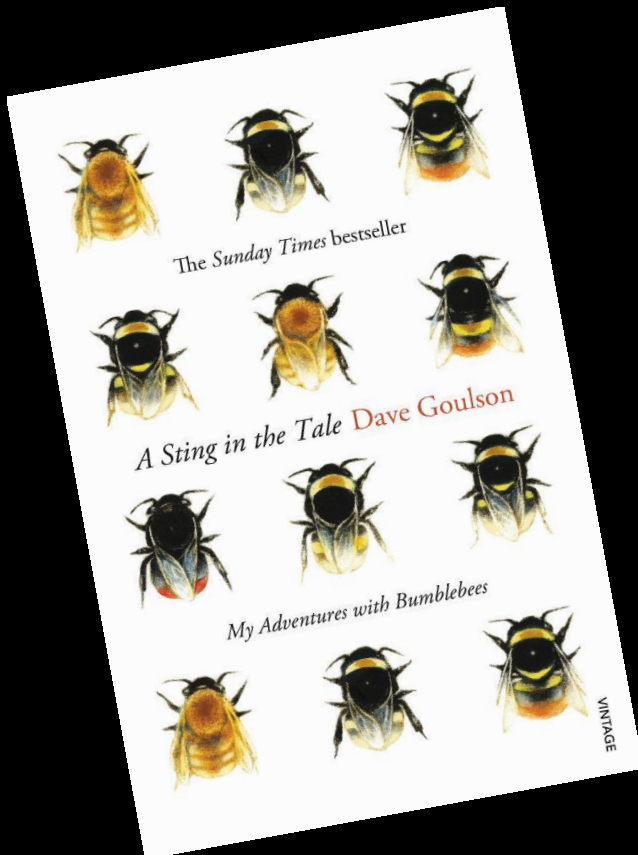


What can we do?



# What can we do?

- Raise awareness:
  - how do we engage with the 95%?



@DaveGoulson

# What can we do?

- Ensure children learn about nature and ecology at school
- GCSE in “Nature & Environment”?





What can we do?

Promote wildlife-  
friendly gardening

Turn our cities, towns  
and villages into a  
network of insect  
reserves





Mow less!





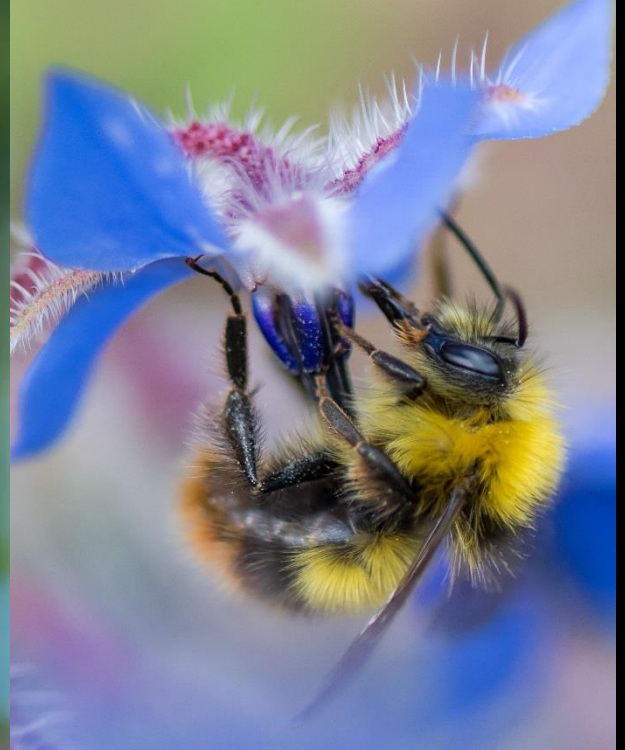
Choose the right flowers.....

























50x more bumblebees, 13x as many hoverflies, Blackmore & Goulson 2014











What about farming?  
Is this approach to farming the only way  
to feed the world?





Organic?







3lb  
£12

SIRLOIN STEAK £7.49  
£16.51

FINEST ENGLISH  
T-BONE STEAKS £5.99  
£13.18

FRESH EXTRA LEAN  
DICED BEEF £3.69  
2lb FOR £6.50

FINEST SCOTCH  
FILLET STEAK £10.99  
£24.22

RIBEYE STEAKS £7.99  
£17.41

2lb  
FOR ONLY  
£6.50

FINEST EXTRA LEAN  
STEAK MINCE £2.79  
2lb FOR £5

FRESH ENGLISH  
DOUBLE LAMB  
CHOPS £4.99  
3lb FOR £10

FRESH ENGLISH  
LAMB CHUMP  
CHOPS £5.99  
2lb FOR £9.99

2lb  
FOR ONLY  
£9.99

3lb  
FOR ONLY  
£24.99

FRESH ENGLISH  
STEWING STEAK £2.49  
£4.50

1378/439  
14.79

1456/799  
11.59

1316/799  
10.50

1456/799  
11.87







UK: 27% of adults obese; 63% overweight; 20% of 10-11 yr olds obese; costs economy £27 billion



# Alternative modes of food production:

Encourage/ support/  
promote allotmenting  
& home veg growing:

Dig for victory!





Alternative modes of  
food production:

Encourage/ support/  
promote allotmenting  
& home veg growing:

Dig for victory!



Can farming learn  
from this?









Stephen Briggs



















*“Save a bee today;  
save the world tomorrow”*

