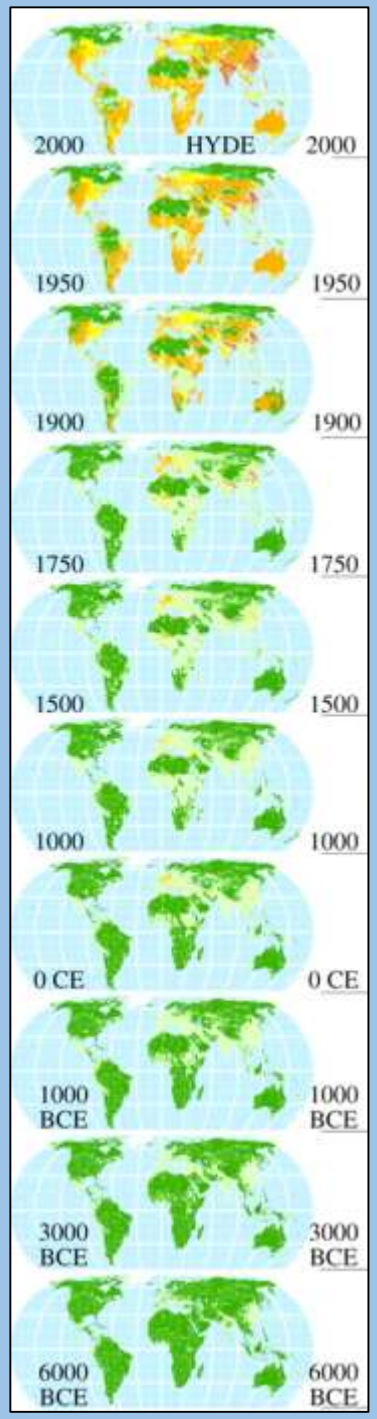
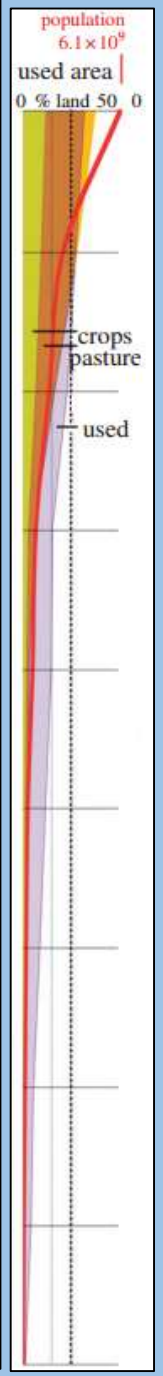
WILDLAND RESEARCH INSTITUTE


# Ecological Values of Wilderness

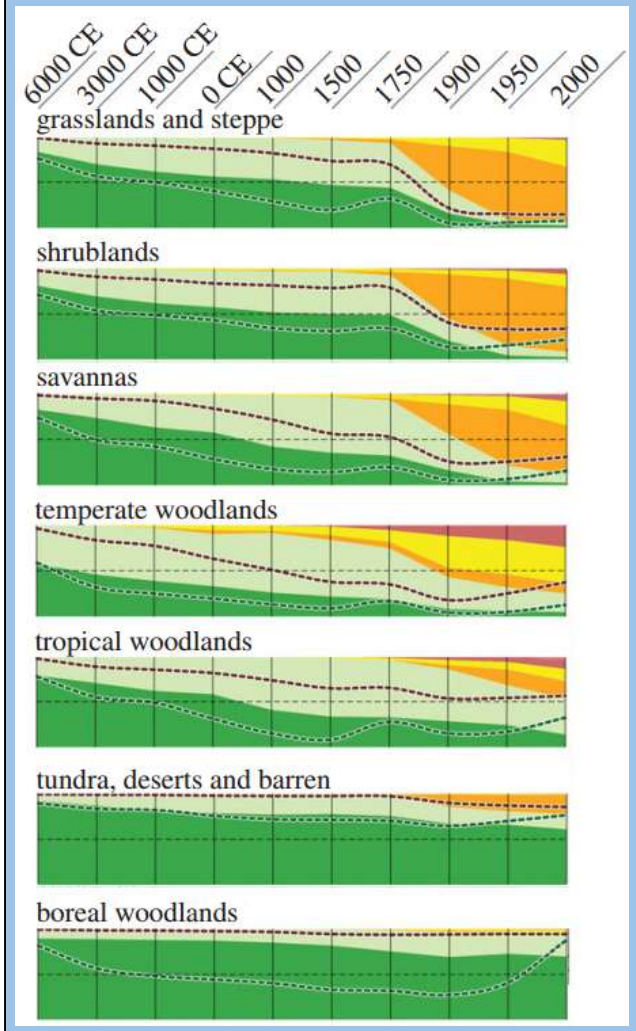
## How did we get here – where are we going?

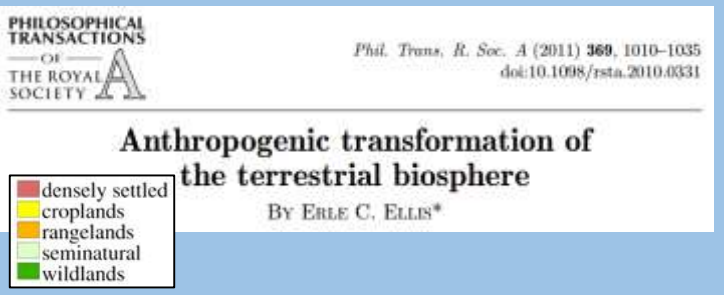
**Mark Fisher October 2013**
**Wildland Research Institute**




# Human population, exploitability and land transformation




**8,000 years ago:** Humans at very low population in a **wildland matrix**

**260 years ago:** Population begins to explode, expanding permanent land use

**Today:** Matrix is **transformed land**, massively increased human population, just islands of wildland

The more **easily** and more **valuable** biomes have shown the greatest land transformation

The sense of **LOSS** developed over the nineteenth century:

- In Europe, from scientists recognising **species loss**
- In America, in reaction to the consequences of **Manifest Destiny**

# Humans as the EXCEPTIONAL SPECIES

CSIRO PUBLISHING
www.publish.csiro.au/journals/wr *Wildlife Research*, 2003, **30**, 303–319

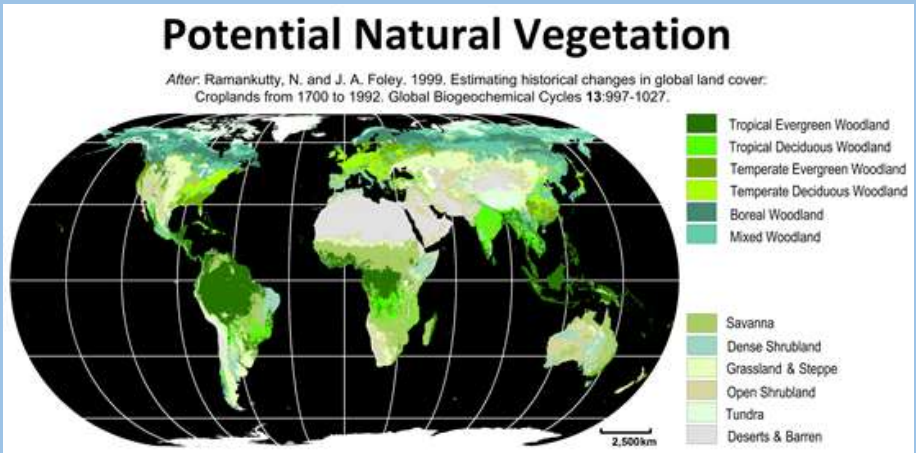
**How can we apply theories of habitat selection to wildlife conservation and management?**

*Douglas W. Morris*

Department of Biology and Faculty of Forestry and the Forest Environment, Lakehead University, Thunder Bay, Ontario P7B 5E1, Canada. Email: douglas.morris@lakeheadu.ca

"One fact is indisputable. The **negative impacts of humans** on the rest of biodiversity exceed those of any other species, and probably any other taxon, in the four-billion-year history of life on Earth. We **reduce the densities of some species**, and increase those of others. We **alter, manipulate, destroy**, and even move, habitat. We change the spatial context of habitat, habitat neighbours, the nature of edges, the relative abundance of habitats within the landscape, and the landscape itself. We **change the structure of ecological communities**, the geographical distributions of species, and the rules of regulation, succession, and assembly. And, we have a myriad of effects that we barely recognise, and about which we know even less, across all relevant scales in space and time"

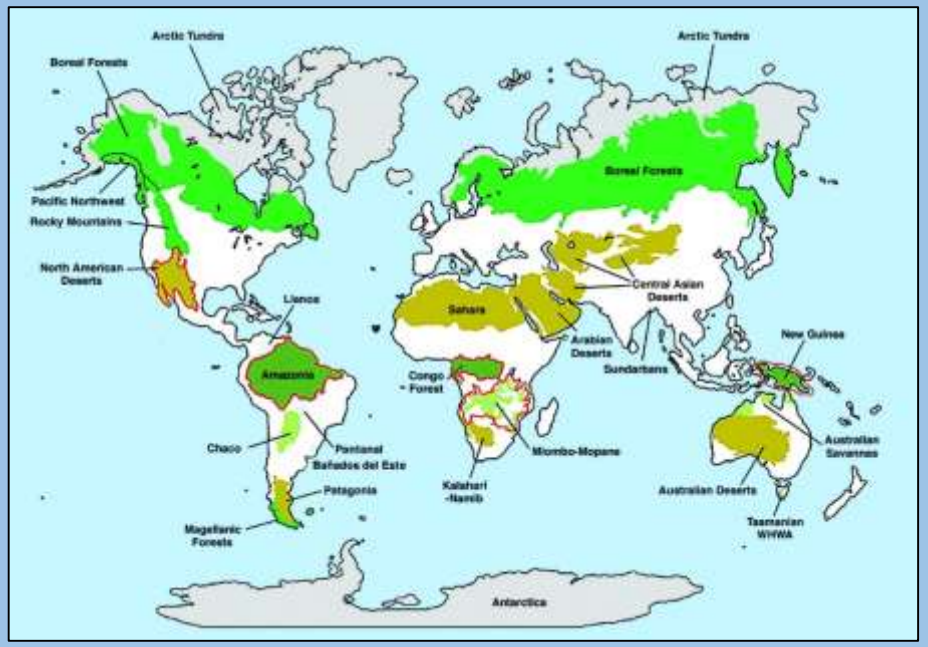
# Areas of lowest human impact - remaining wildness?

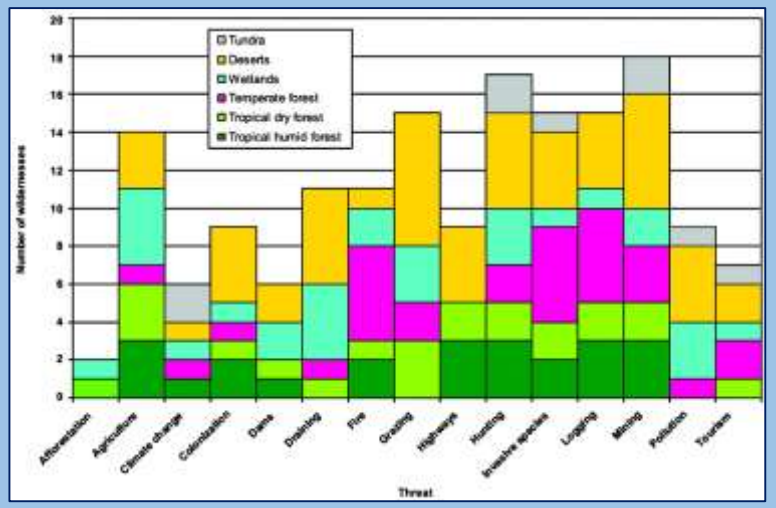




**24 areas identified - inhabited by only 3% of the worlds population**

biome areas of > 10,000 sq km with < 5 people per sq km, and at least 70% of its historical habitat extent (500 years ago)




**"agriculture, grazing, hunting, invasive species, logging, and mining are the most pervasive threats"**

**"they lie at one end of a continuum of human impact…..they hold the bulk of the planet's biomass and also the last remaining intact megafaunal assemblages…. The wilderness areas serve as valuable controls against which to measure the health of the planet"**

# The eradication of large carnivores

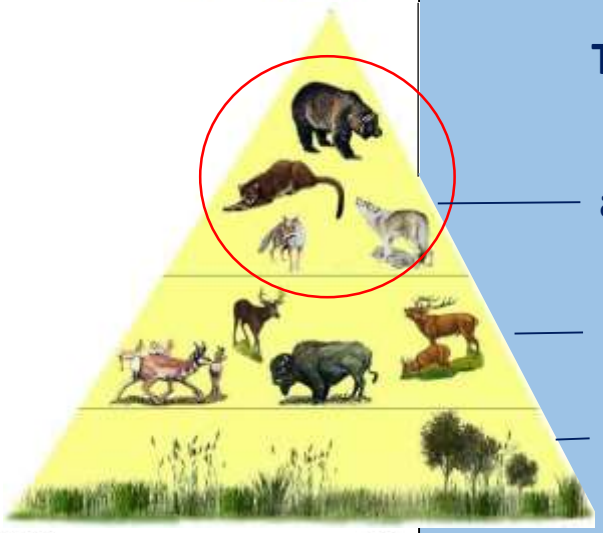
REVIEW

## Trophic Downgrading of Planet Earth

James A. Estes,[1*] John Terborgh,[2] Justin S. Brashares,[3] Mary E. Power,[4] Joel Berger,[5] William J. Bond,[6] Stephen R. Carpenter,[7] Timothy E. Essington,[8] Robert D. Holt,[9] Jeremy B. C. Jackson,[10] Robert J. Marquis,[11] Lauri Oksanen,[12] Tarja Oksanen,[13] Robert T. Paine,[14] Ellen K. Pikitch,[15] William J. Ripple,[16] Stuart A. Sandin,[10] Marten Scheffer,[17] Thomas W. Schoener,[18] Jonathan B. Shurin,[19] Anthony R. E. Sinclair,[20] Michael E. Soulé,[21] Risto Virtanen,[22] David A. Wardle[23]

Until recently, large apex consumers were ubiquitous across the globe and had been for millions of years. The loss of these animals may be humankind's most pervasive influence on nature. Although such losses are widely viewed as an ethical and aesthetic problem, recent research reveals extensive cascading effects of their disappearance in marine, terrestrial, and freshwater ecosystems worldwide. This empirical work supports long-standing theory about the role of top-down forcing in ecosystems but also highlights the unanticipated impacts of trophic cascades on processes as diverse as the dynamics of disease, wildfire, carbon sequestration, invasive species, and biogeochemical cycles. These findings emphasize the urgent need for interdisciplinary research to forecast the effects of trophic downgrading on process, function, and resilience in global ecosystems.





**TROPHIC LEVELS**

- apex consumers
- herbivores
- primary producers

**"Until recently, large apex consumers were ubiquitous across the globe and had been for millions of years. The loss of these animals may be humankind's most pervasive influence on nature"**

"What escapes the eye ... is a much more insidious kind of extinction: the extinction of ecological interactions"

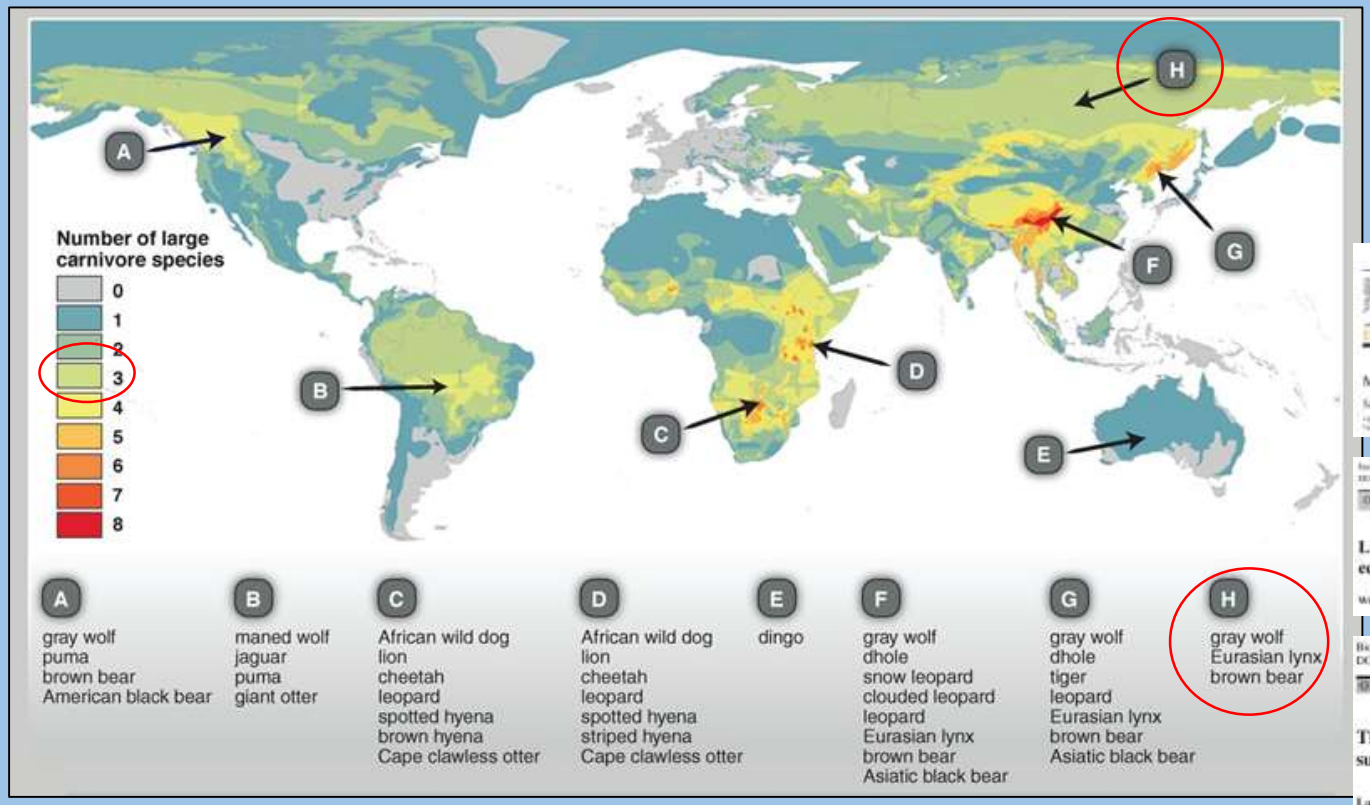
Daniel H. Janzen (*1*)

**What is the consequence of this loss of top predators?**

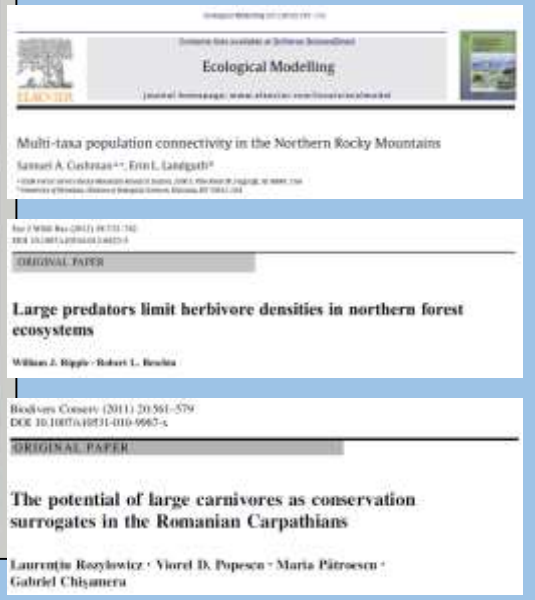
# Contemporary overlap of large carnivore ranges

Extensive **range contraction** in Europe, SE North America, and W and central Africa

Three-species guild of **wolf, lynx, & bear** stretches across Russia into Scandinavia, edges of E Europe, the Baltic states, the Balkan states, and the Carpathian and Dinaric countries




Evidence of **synergy** between predators, and **co-location** with **high diversity**



**Question**

**WHAT IS THE CONSEQUENCE OF PREDATOR REMOVAL?**

# The Green World Hypothesis

Vol. XCIV, No. 879 The American Naturalist November–December, 1960

## COMMUNITY STRUCTURE, POPULATION CONTROL, AND COMPETITION

NELSON G. HAIRSTON, FREDERICK E. SMITH, AND LAWRENCE B. SLOBODKIN

Department of Zoology, The University of Michigan, Ann Arbor, Michigan

herbivores would normally expand to the point of depletion of the vegetation, as they do in the absence of their normal predators and parasites.

- photosynthesis turns the world **green**
- uncontrolled **herbivore pressure** turns the world **brown**

**Predators** control the effect of herbivores

# Ecological Meltdown in Predator-Free Forest Fragments

John Terborgh,[1*] Lawrence Lopez,[2] Percy Nuñez V.,[3] Madhu Rao,[4,5] Ghazala Shahabuddin,[6] Gabriela Orihuela,[7] Mailen Riveros,[8] Rafael Ascanio,[9] Greg H. Adler,[11] Thomas D. Lambert,[10] Luis Balbas[12]

SCIENCE VOL 294 30 NOVEMBER 2001

Intact vegetation in unaltered area

Almost no plants left where herbivores overpopulated

**Lago Guri, Venezuela, flooded by hydro-electric dam, creating predator free islands**

- **predators present (photo top right)**
- **jaguar, cougar, and harpy eagles absent (bottom right)**

*Journal of Ecology* 2006
94, 253–263

## Vegetation dynamics of predator-free land-bridge islands

JOHN TERBORGH, KENNETH FEELEY*, MILES SILMAN†, PERCY NUÑEZ‡ and BRADLEY BALUKJIAN*

**Summary**

1 We tested the 'green world' hypothesis of Hairston, Smith and Slobodkin by monitoring vegetation change on recently created predator-free land-bridge islands in a huge hydroelectric impoundment, Lago Guri, in the State of Bolivar, Venezuela.

2 Our results affirm the green world hypothesis and expose the operation of a strong top-down trophic cascade that negatively impacted nearly every plant species present, implying that community stability is maintained through the action of predators.

Journal of Applied Ecology

British Ecological Society

*Journal of Applied Ecology* 2009, **46**, 73–81 doi: 10.1111/j.1365-2664.2008.01601.x

# Indirect effects of invasive species removal devastate World Heritage Island

Dana M. Bergstrom[1*], Arko Lucieer[2], Kate Kiefer[1], Jane Wasley[1], Lee Belbin[3], Tore K. Pedersen[1,2] and Steven L. Chown[4]

**"management intervention to eradicate a mesopredator has inadvertently and rapidly precipitated landscape-wide change on sub-Antarctic Macquarie Island"**


Fig. 4. Vegetation at a *Polystichum* fernbrake site in 2001 (a) and 2007 (b) in Green Gorge and herbfield around Finch Creek in 2001 (c) and 2007 (d). The large shield ferns (a) were completely grazed by rabbits leaving dead remnant bases which were colonized by small unpalatable species (b). The large megaherbs and tussock grasses (c) have been grazed and replaced with other species including *Poa annua* (d).

**Feral cats eradicated from Macquarie Island by 2000 – rabbit population increased rapidly**

With the luxury of the wisdom of hindsight, we can suggest that the current situation arose as a consequence of inadequate recognition of top–down control of rabbits by a population of only 160 adult cats.

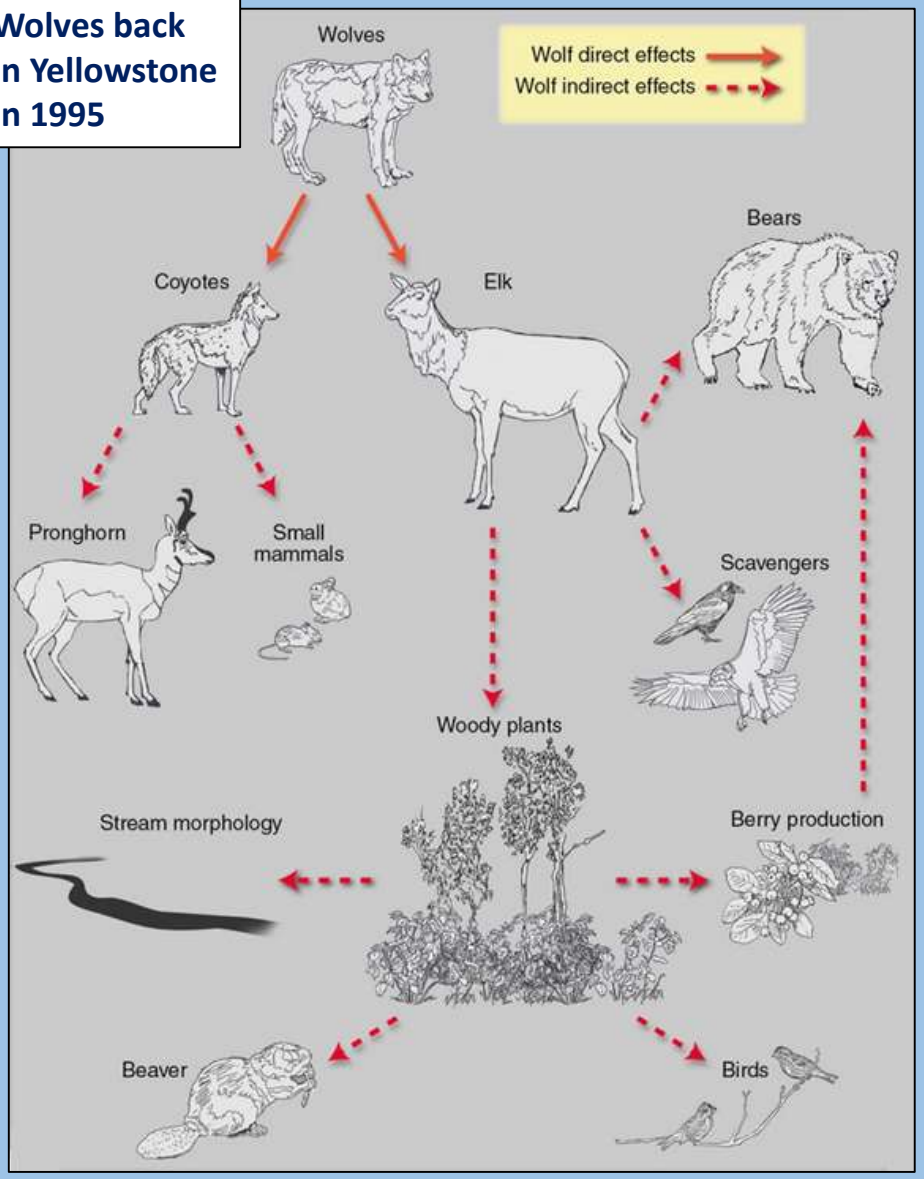
# Inadvertent change precipitated by management intervention

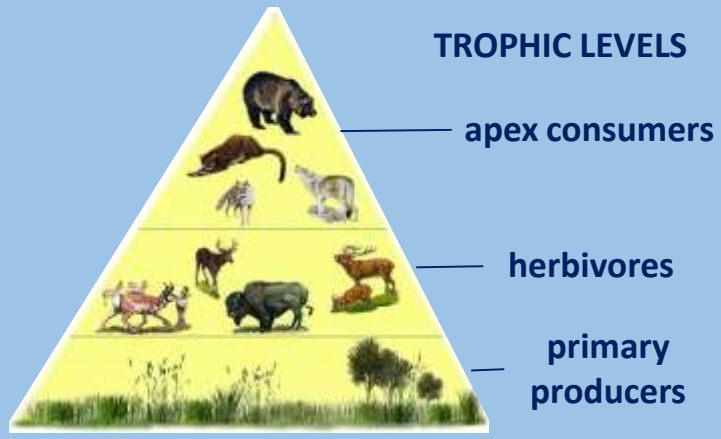
- Neither mammal should have been on the island
- Myxoma virus was incapable of longterm rabbit control
- Eradication of feral cats brought unintended results
- Rabbit eradication now using poisoned baits

Original native vegetation: Macquarie Island cabbage (Kerguelen cabbage, *Stilbocarpa polaris*) and lush tussock (*Poa foliosa)*

# What is a TROPHIC CASCADE?

**Wolves back in Yellowstone in 1995**

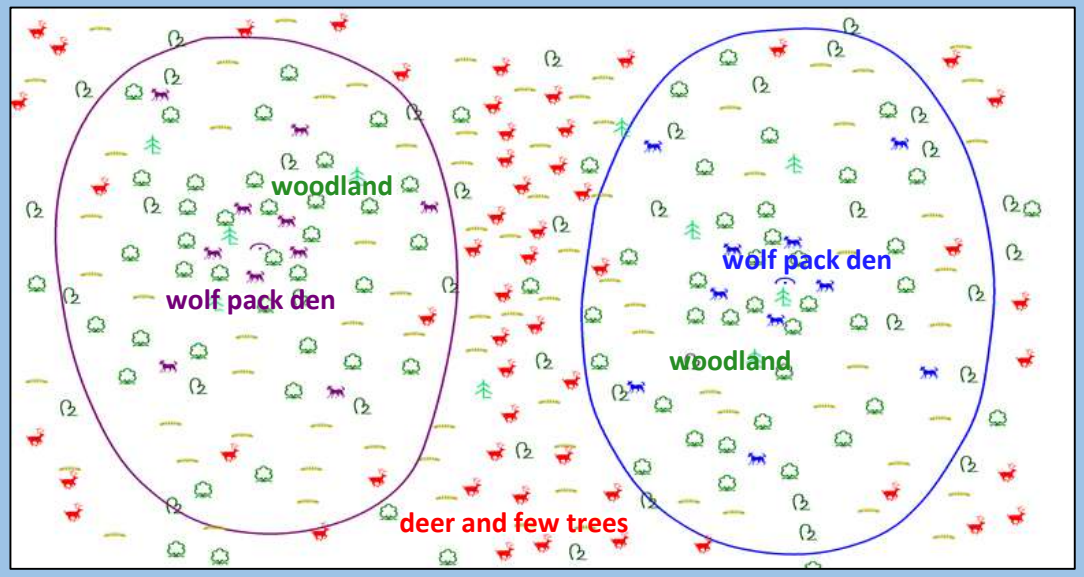



A trophic cascade occurs when the animals at the top of the food chain - the **top predators** - modify the numbers not just of their prey, but also of species with which they have **no direct connection**. Their impacts **cascade down the food chain**, in some cases radically changing the ecosystem.

# Wolves make woodland in a landscape of fear

An argument for reinstatement of wolf to the Scottish Highlands has been that ecologically unsustainable native red deer numbers would be reduced through wolf predation – a **'density mediated' trophic cascade**




However, deer avoid places or browse less where there is a high risk of wolf predation, which allows previously inhibited tree regeneration – a **'behaviourally-mediated' trophic cascade**


Biological Conservation 142 (2009) 2314–2321

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Restoring landscapes of fear with wolves in the Scottish Highlands

Adrian D. Manning [a,*], Iain J. Gordon [b], William J. Ripple [c]

[a] The Fenner School of Environment and Society, The Australian National University, Canberra, ACT 0200, Australia
[b] CSIRO Sustainable Ecosystems, Davies Laboratory, PMB PO, Aitkenvale, Qld 4814, Australia
[c] Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR 97331, USA

Changes in deer behaviour could thus be as important as lethal effects so that **fewer wolves** may be needed in Scotland than indicated by predator—prey modelling

## Question

## WHAT WOULD HAPPEN IF HUMAN IMPACT WAS WITHDRAWN?

# Chernobyl 28 years on

# Wildlife comeback (unplanned)


## vegetation restoring

# Wildlife comeback - unplanned freeing of natural processes

# Research 2002 to 2011 in the Ukrainian area of the Chernobyl Exclusion Zone

*Vestnik zoologii*, **46**(3): e-21–e-28, 2012
DOI 10.2478/v10058-012-0020-2

UDC 599. 742: 502. 472 (477. 41)

## LARGE CARNIVORES OF THE CHERNOBYL NUCLEAR POWER PLANT EXCLUSION ZONE

**M. Shkvyria[1], D. Vishnevskiy[2]**

[1] *I. I. Schmalhausen Institute of Zoology of NAS of Ukraine, B. Chmielnicky str., 15, Kyiv, 01601 Ukraine*
[2] *SSSIE "Chornobyl radioecological centre" Shkilna str., 6, Chornobyl, Kyiv region, 07270 Ukraine*

Received 12 July 2011
Accepted 28 March 2012

**Large Carnivores of the Chernobyl Nuclear Power Plant Exclusion Zone. Shkvyrya M., Vishnevskiy D.** — During nine years observations on large carnivores of Exclusion Zone have been carried out. Species composition and the number of large predators in the Exclusion Zone correspond to the regional conditions. The presence of bears and permanent stay of the lynx in the Exclusion Zone was confirmed. Six wolf packs were counted. The use of an anthropogenically transformed areas, the shift of the daily regime of activity and characteristics of the diet are the most specific features of this animal group.

Key words: wolf, lynx, bear, exclusion zone.

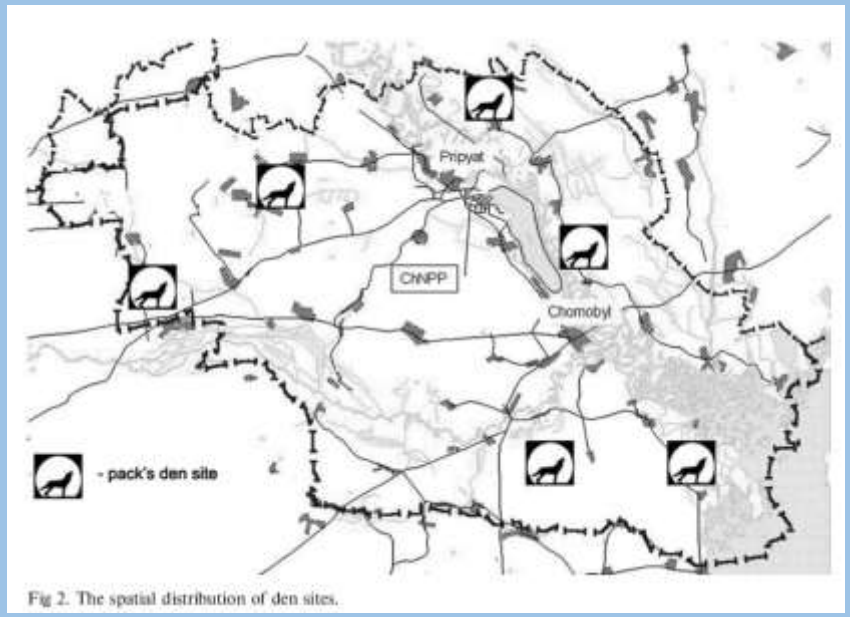


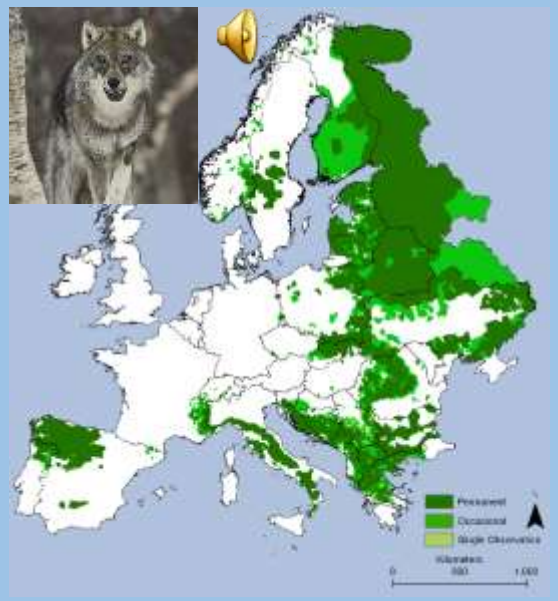

Fig 2. The spatial distribution of den sites.

**Wolves**
- **from 30 to 40 in 6 packs with den locations**
- **smaller home range inside Exclusion Zone due to higher density of prey species from increasing naturalness of landscape vegetation**

**Lynx & Bear**
- **presence confirmed**

**Bison (*Bison bonasus*) introduced 1996 in to Poleski State Radiation and Ecological Reserve (Belarus area of exclusion zone)**

# System directing mammalian species and their contemporary distribution in Europe





# Wildlife comeback from the East
## Wolf sub-populations and the expansion into NW Europe

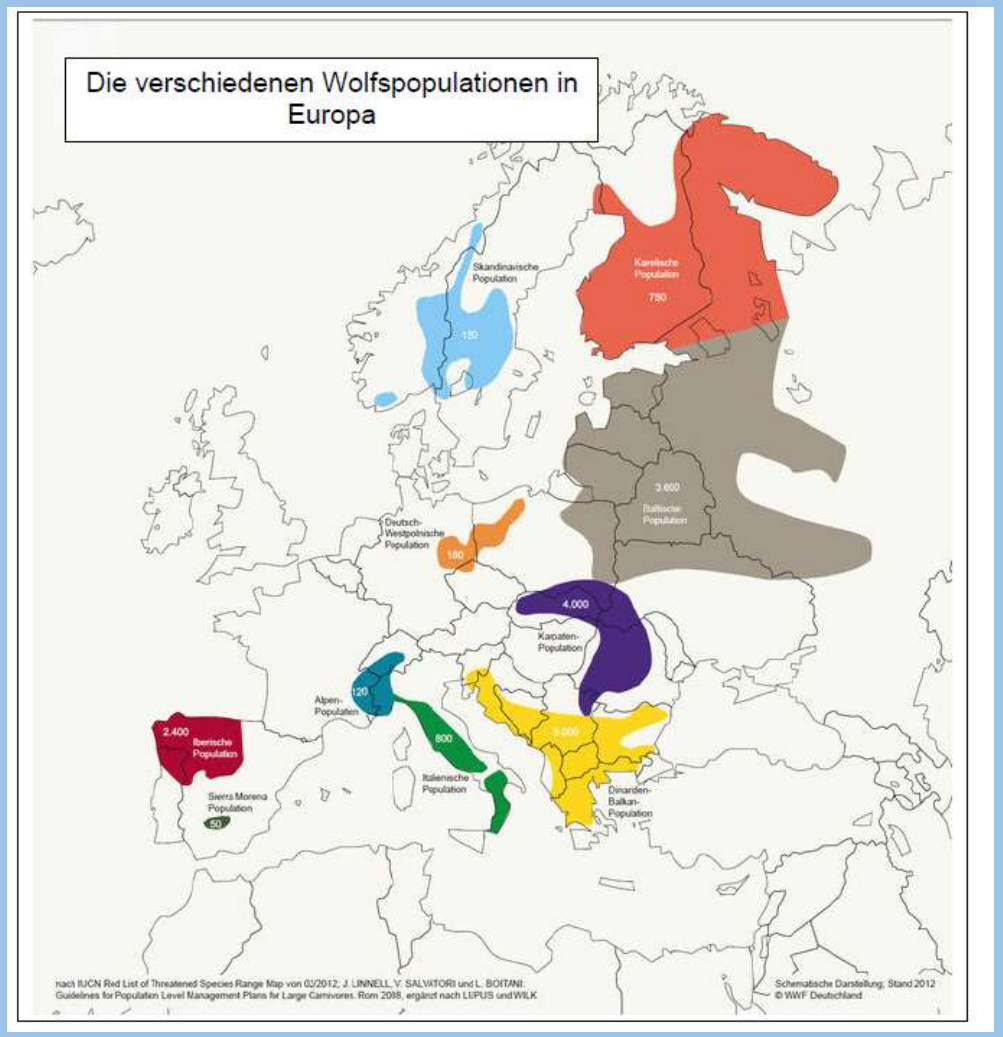
-wolf population grown to about 20,000

-10 subpopulations rarely mix

- German- W Poland group probably from Baltic group, not Carpathian

-wolves in Denmark came from Germany

-Netherlands and Belgium NEXT!




WWF Deutschland 2012

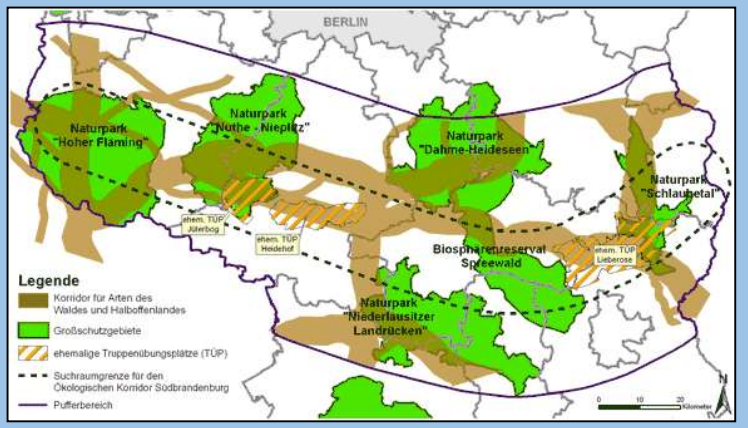
# Future (secondary) wilderness in Germany

Stiftung Naturlandschaften Brandenburg
Die Wildnisstiftung

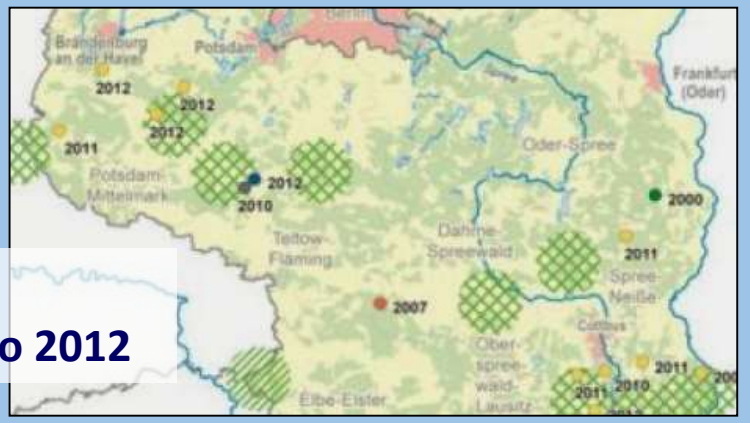
## Wildlife comeback planned at large scale

- three ex-military training areas in Brandenburg protected through non-intervention since 2000
- secondary wilderness seen as core areas in an ecological corridor that stretches to border with Poland
- adds 12.7km$^2$ to Germany's target of 2% wilderness by 2020
-Jüterborg and Lieberose designated under EU Habitats directive for protection of wolf


Ökologischer Korridor Südbrandenburg



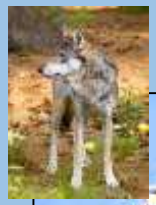

Wolf management plan, Brandenburg 2013-2017



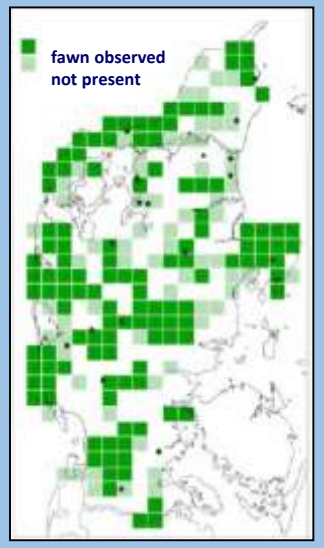

Wolf packs in Brandenburg to 2012

Wolves caught in a camera trap in Lieberose 2010 – at least 3 wolf cubs born since then

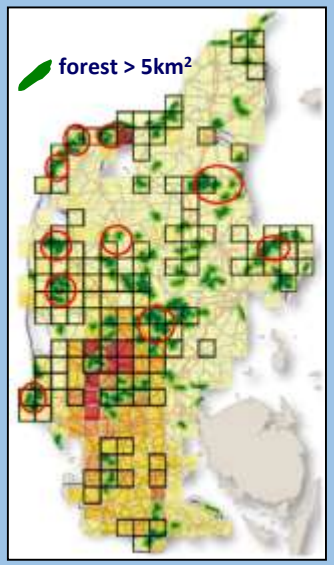
# Denmark accepts the return of the wolf




**Wolf sightings, Danish Nature Agency, Ministry of Environment 2007-2013**




**Red deer fawn 1995-2003**




potential breeding areas for wolf

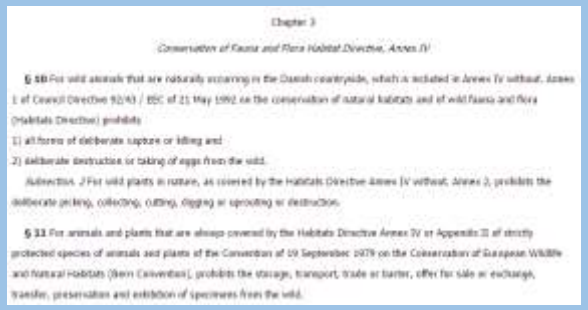
## Wolves in Denmark - what can we expect? Feb 2013

AARHUS UNIVERSITY

- report identifies areas of prey and suitable habitat for wolf
- 10 sites identified as **potential breeding areas**

## Executive Order No. 330 of March 2013

- gives **strict protection** to wolves under **Habitats Directive**



Chapter 3

*Conservation of Fauna and Flora Habitat Directive, Annex IV*

§ 10 For wild animals that are naturally occurring in the Danish countryside, which is included in Annex IV without Annex I of Council Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) prohibits

1) all forms of deliberate capture or killing and

2) deliberate destruction or taking of eggs from the wild.

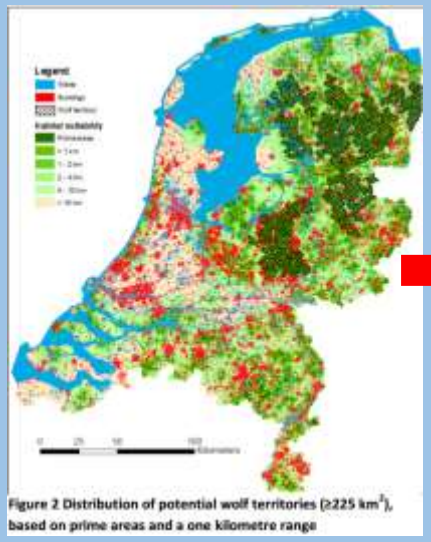
Subsection. 2 For wild plants in nature, as covered by the Habitats Directive Annex IV without Annex 2, prohibits the deliberate picking, collecting, cutting, digging or uprooting or destruction.

§ 11 For animals and plants that are always covered by the Habitats Directive Annex IV or Appendix II of strictly protected species of animals and plants of the Convention of 19 September 1979 on the Conservation of European Wildlife and Natural Habitats (Bern Convention), prohibits the storage, transport, trade or barter, offer for sale or exchange, transfer, preservation and exhibition of specimens from the wild.

## National plan for wolves in Denmark, June 2014

- details rates of compensation under s.39 Nature Protection Act 2013 for losses of livestock

# The Netherlands prepares for the return of the wolf




Potential wolf territories 2012

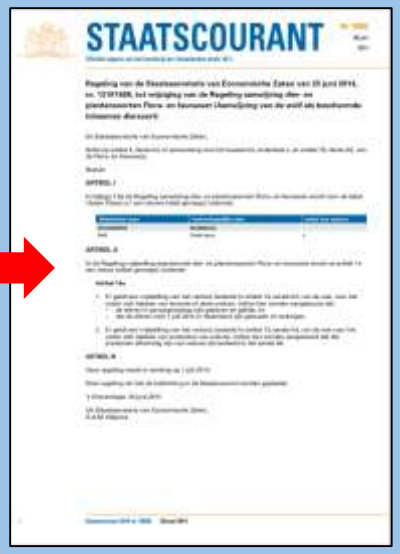

Opinion surveys 2012


Commissioned report 2012


Workshop reports 2013


Law report 2013


Proposal for National Plan 2013




Regulation of the Minister of Economic Affairs of June 25, 2014, no. 13107468

Process of **civic engagement** led to the designation of the wolf as a **protected native species** in advance of a permanent presence

Main argument given for welcoming the wolf was that **nature itself would determine whether or not the animal comes back**

**Question**

**WHAT DO YOU THINK WOULD BE THE LEGAL SITUATION IF A BREEDING PAIR OF WOLVES SWAM ACROSS THE ENGLISH CHANNEL/NORTH SEA?**

# The meaning of words

There is a need to define terms if we are to understand what wildness is in Britain. They are important in:

- understanding the natural associations between species
- understanding ecological function and natural processes

- determining what species are missing that are essential to natural processes

- making the case for the reinstatement of those missing species

Nature conservation legislation in Britain is VERY POOR at defining words

# What defines a NATIVE species and its NATURAL RANGE?

Sea level rise reduced the land area that linked Britain and Ireland to the rest of Europe, becoming submerged by 7,500 BP:

- **Native species** are those that returned after the ice melted and **before the land bridge disappeared**

- Britain and Ireland have a **smaller number** of native species in their flora because of the loss of the land connection: France 3,500; Britain 1,172; Ireland 815

- Wildlife and Countryside Act 1981 s14.1 defines a **non-native species**:

**"is of a kind which is not ordinarily resident in and is not a regular visitor to Great Britain in a wild state"**

**A native species is not necessarily native (indigenous) to the whole of Great Britain, but to its natural or native range:**

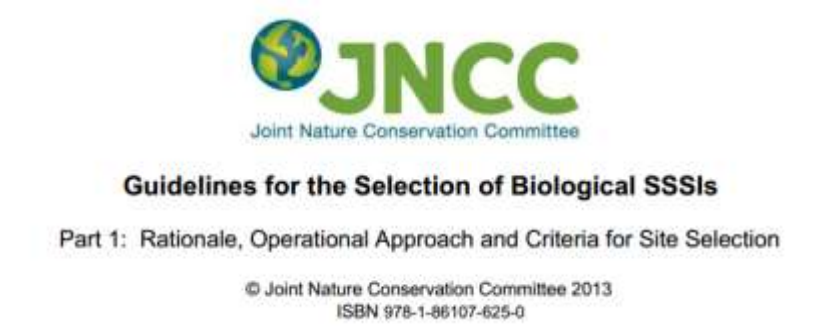
- The EU Habitats directive 1992 and GB regulations refer to **natural range** without defining it. We can take it as an area where a species is not a vagrant but stays put

**An area where the physical or biological factors essential to the life and reproduction of a species are present**

- **Native range** is the **historical** natural range. s14P WACA (only applies in Scotland):

**"the locality to which the animal or plant of that type is indigenous, and does not refer to any locality to which that type of animal or plant has been imported (whether intentionally or otherwise) by any person"**

# What is NATURALNESS – as defined in nature conservation



JNCC

Joint Nature Conservation Committee

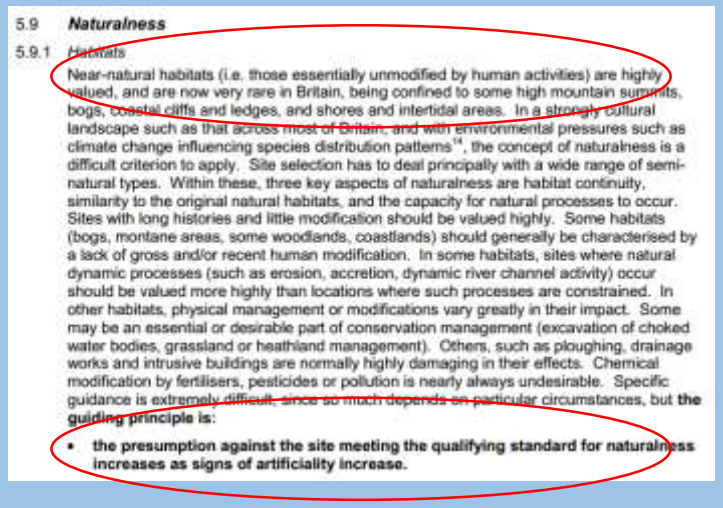
**Guidelines for the Selection of Biological SSSIs**

Part 1: Rationale, Operational Approach and Criteria for Site Selection



ISBN 978-1-86107-625-0

The criteria used for site evaluation and selection in the designation of statutory protected areas (Sites of Special Scientific Interest (SSSI)):
Typicalness, Fragility, Size, Diversity, **Naturalness**, Rarity, Ecological coherence, Potential value, Recorded History



5.9 ***Naturalness***

5.9.1 *Habitats*

Near-natural habitats (i.e. those essentially unmodified by human activities) are highly valued, and are now very rare in Britain, being confined to some high mountain summits, bogs, coastal cliffs and ledges, and shores and intertidal areas. In a strongly cultural landscape such as that across most of Britain, and with environmental pressures such as climate change influencing species distribution patterns[14], the concept of naturalness is a difficult criterion to apply. Site selection has to deal principally with a wide range of semi-natural types. Within these, three key aspects of naturalness are habitat continuity, similarity to the original natural habitats, and the capacity for natural processes to occur. Sites with long histories and little modification should be valued highly. Some habitats (bogs, montane areas, some woodlands, coastlands) should generally be characterised by a lack of gross and/or recent human modification. In some habitats, sites where natural dynamic processes (such as erosion, accretion, dynamic river channel activity) occur should be valued more highly than locations where such processes are constrained. In other habitats, physical management or modifications vary greatly in their impact. Some may be an essential or desirable part of conservation management (excavation of choked water bodies, grassland or heathland management). Others, such as ploughing, drainage works and intrusive buildings are normally highly damaging in their effects. Chemical modification by fertilisers, pesticides or pollution is nearly always undesirable. Specific guidance is extremely difficult, since so much depends on particular circumstances, but **the guiding principle is:**

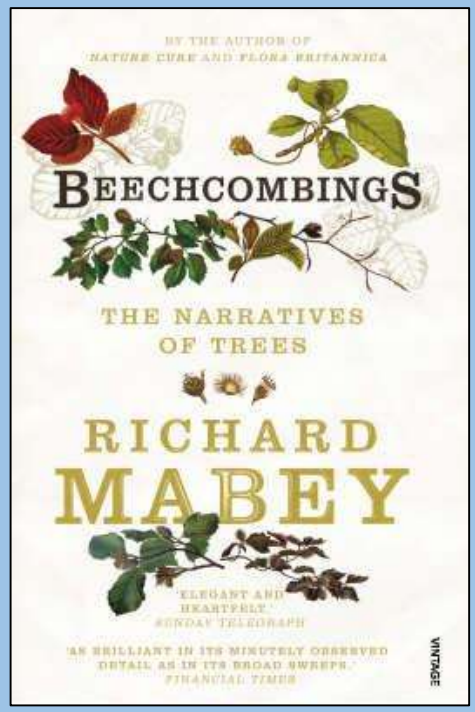
- **the presumption against the site meeting the qualifying standard for naturalness increases as signs of artificiality increase.**

"**Near-natural** habitats (i.e. those **essentially unmodified by human activities**) are highly valued, and are now very rare in Britain, being confined to some **high mountain summits**, **bogs**, **coastal cliffs** and **ledges**, and **shores** and **intertidal areas**"

**"the guiding principle is:**

- **the presumption against the site meeting the qualifying standard for naturalness increases as signs of artificiality increase"**

# WILD?
# NATURAL?
# NATIVE?




"More and more I'm inclined to view **'naturalness'** not as a state, a place in freeze frame, but as a **PROCESS**"

"Naturalness is whatever occurs ***BETWEEN*** human interventions"

"**WILD, UNMANAGED**, trees show us possibilities beyond our cultural tunnel-vision"

# Bradfield Woods NNR


Ancient wood managed for “nature” by coppicing in rotation under “standard” trees
- wood divided into compartments (coupes) by “rides”
- regrowth protected from dear browsing by enclosing compartments with “dead” hedges made from brash
- **paths around compartments and NOT through wood**

Native – yes

Natural – NO *(only between coppicing?)*

Wild – NO

# The Warren Wood, Studland

Native - yes
Natural - NO
Wild – NO

Will the Moshatel survive?

Moschatel is an **Ancient Woodland Indicator** wildflower of undisturbed woodland

# Arne SSSI, Dorset

Native – mostly

Natural – NO (removal of trees)

Wild – DEFINITELY NO

is this **monoculture** really worth the **destruction**?

# Undercliff woodland

- below Emmetts Hill, Chapman's Pool

Native - yes

Natural - yes

Wild – DEFINITELY YES

# Axmouth to Lyme Regis Undercliffs NNR

Looking up to the cliff

Looking out to sea

Land slip in 1839 created a large undercliff, ungrazed since the 1900s

- **species-rich** woodland from natural regeneration
- areas of high canopy and scrub along 7 miles, depending on slope

Wayfaring Tree

Native – yes (mostly)

Natural - yes

Wild – DEFINITELY YES

**Is this a secondary wilderness in Britain?**

# Ling Gill NNR, N Yorks

- **ancient** ash woodland in a steep-sided gill
- **inaccessibility** is the reason for its survival
- **Ancient Woodland Indicator** plants, freshwater crayfish

Native - yes

Natural - yes

Wild – DEFINITELY YES


# Colt Park Wood, Ingleborough NNR, N. Yorks

- **ancient** ash wood on the deeply fissured limestone pavement

- **luxurious growth** of lichens, moss and ferns

Native - yes

Natural - yes

Wild – DEFINITELY YES


High scar to the east keeps sheep out

Wood rough

Deer toe print

Wider grikes are avenues for roe deer !

# Glen Affric NNR, Scottish Highland

- **native pinewood**, one of the largest in Scotland

Bog woodland

River Affric

Coire Loch

Native - yes

Natural - yes

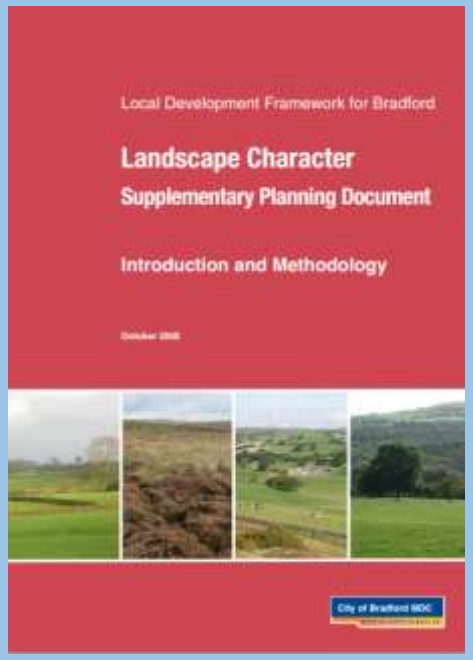
Wild – DEFINITELY YES

## What do the wilder landscape examples have in common?

- Little evidence of **human intervention**, possibly in the past, certainly in the present, and hopefully **into the future**
- Outside the margins of productive/extracted land
- A **richness of diverse vegetation** suited to the edaphic and climatic conditions
- Capacity to support a wide range of the animal kingdom
- An **intrinsic beauty** ("biophilia" – Edward Wilson, 1984)
- A large measure of **SELF-DETERMINATION**

They are SELF-WILLED LAND

# Why is it that woodland often provides the wildest experience?




Landscape Character Assessment is a matter of **"perception"** having replaced **Natural Area Profiles** as the means to understand our predominantly cultural landscapes. However……

**"Woodland is perceived as a very 'natural' landscape ……the landcover that results when man ceases to work the land"**

City of Bradford Metropolitan District Council — Local Development Framework For Bradford

**9.0 THE LANDSCAPE TYPES OF BRADFORD**

**Other Information**

9.6.4 Woodland is perceived as a very 'natural' landscape because it is the landcover that would have existed before man arrived here, and the landcover that results when man ceases to work the land. It can provide a very concentrated experience of the natural world in that it can be valuable habitat for a wide variety of wild plants, birds, animals and the enclosure of the trees hides views of other land more influenced by man.

**"It can provide a very concentrated experience of the natural world in that it can be valuable habitat for a wide variety of wild plants, birds, animals and the enclosure of the trees hides views of other land more influenced by man"**

**Question**

**WHAT DO YOU THINK WOULD BE THE NATURAL VEGETATION OF BRITAIN IN THE ABSENCE OF HUMAN IMPACT?**

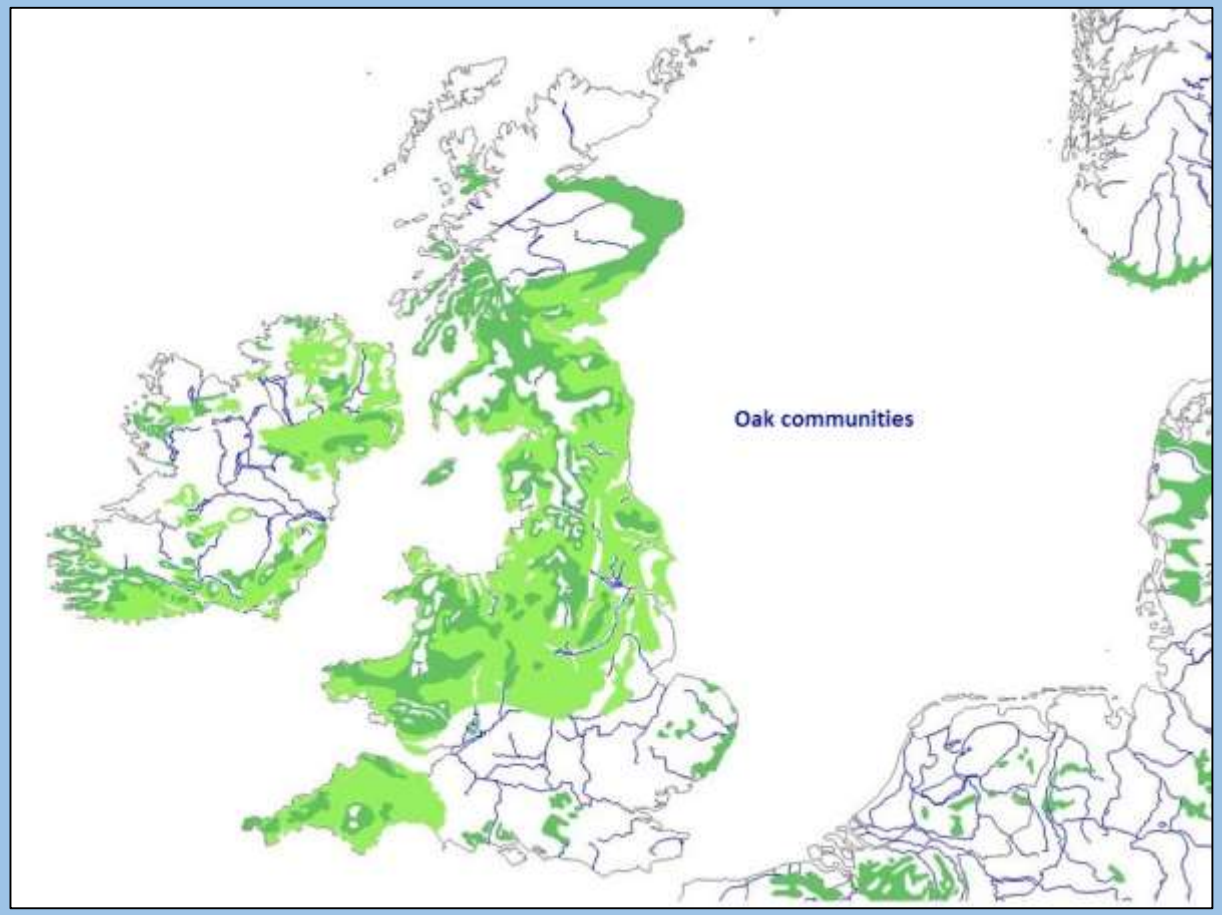
# Natural vegetation mapping of Europe

Plants form distinct communities driven by the environment of their location (phytosociology)
- a series of plant communities were identified across Europe during the twentieth century based on surviving **remnants of natural and near-natural ecosystems** and their correlation with site-specific conditions
- a digital mapping system was released in 2004 that matches these plant communities with the **current climatic and edaphic conditions** of Europe


The assumption is that these natural plant communities are developed **without the effects of direct human intervention and utilisation**, nor any interaction with wild animals

There are 35 phytosociological plant communities represented in the UK
- 19 **woodland communities** are characterised by the dominant tree present, but also the species of the shrub and ground layer (similar to National Vegetation Classification)
- the **non-woodland types** include lowland and upland bogs, coastal and mountain heath, coastal sand dune and salt marsh, and sub-alpine dwarf shrub communities

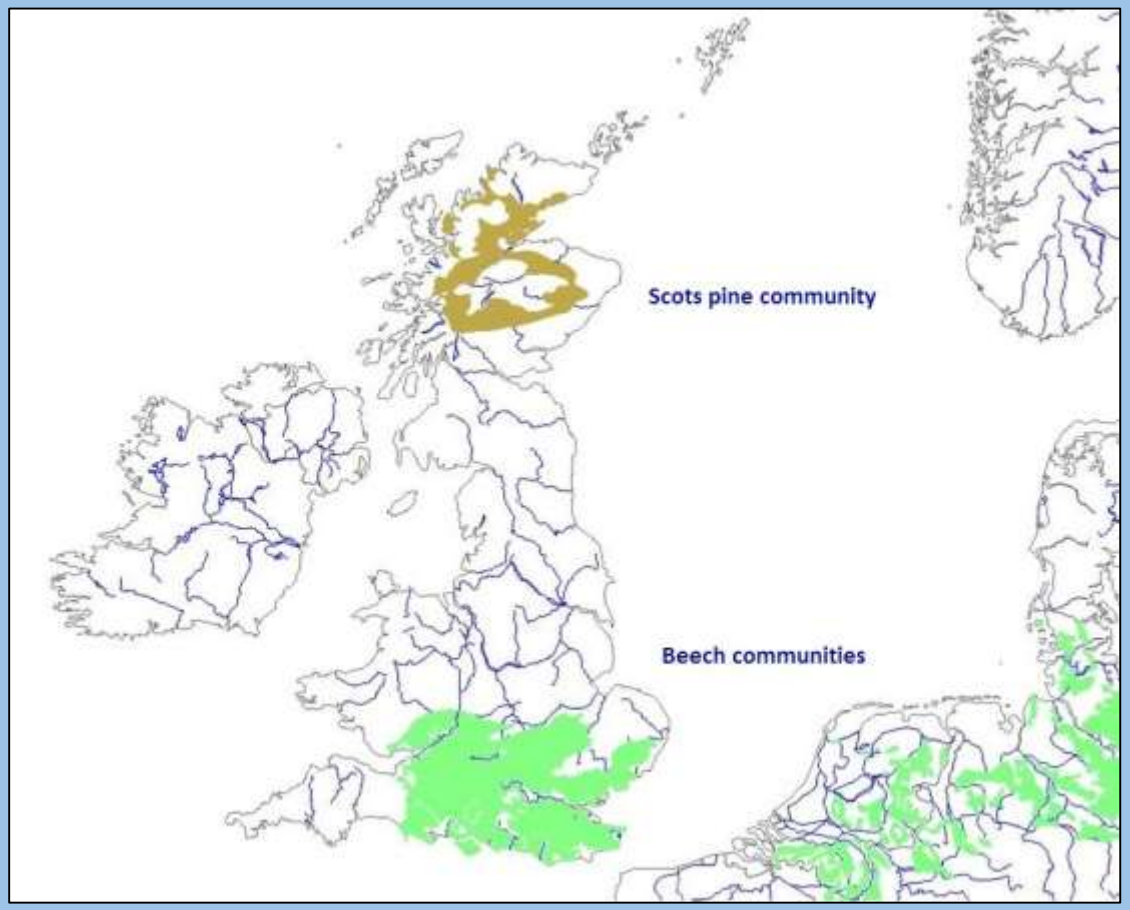
# Oak communities could cover much of the UK




**Five different communities with oak as the predominant tree, and which cover 66.6%**

- varying amounts of ash in one (W9 with W10)
- others are oak with varying amounts of birch (W11, W16, W17)

# Beech and Scots pine communities have restricted distribution

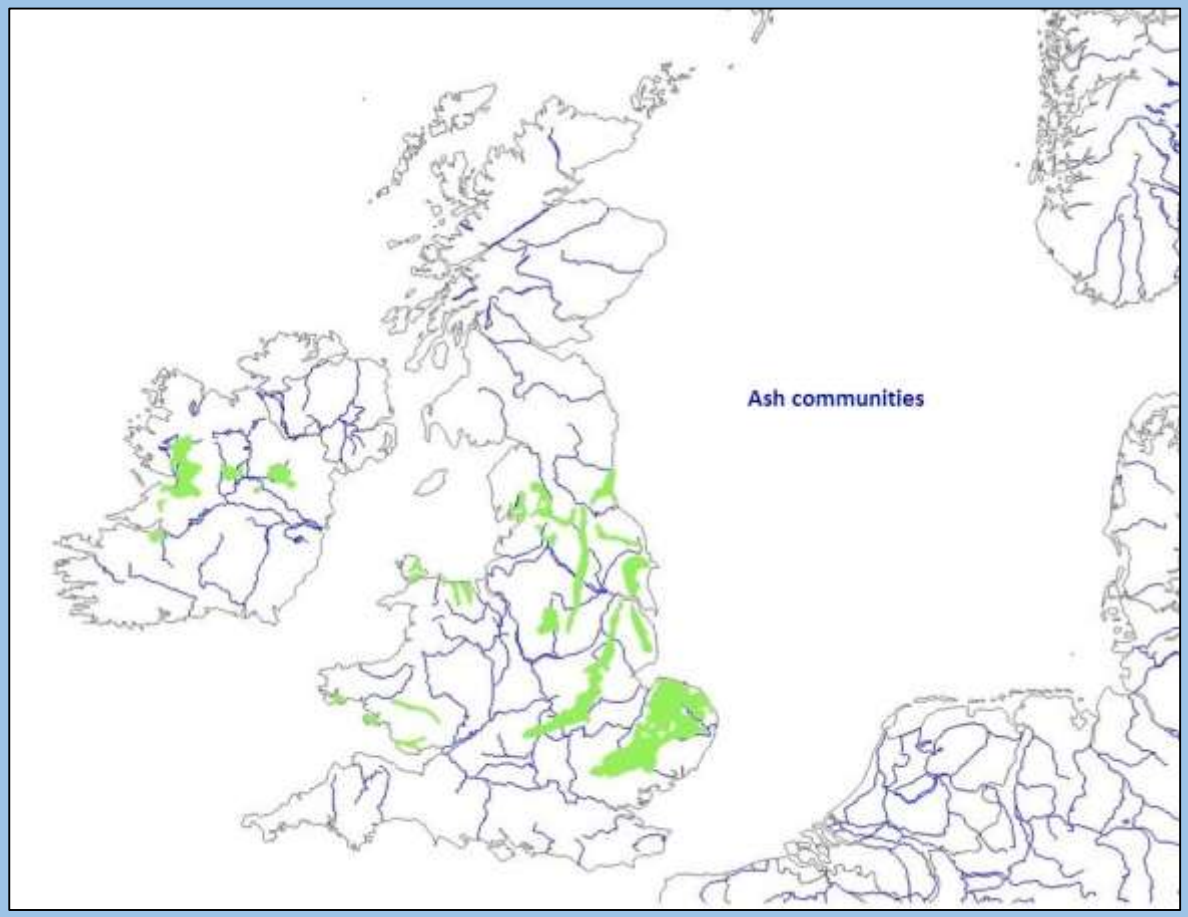



**Natural beech distribution** is constrained by climate:

- late returner after ice melt, confined to the south, not reaching much into the West Country or Wales
- three beech woodland communities (15.4%) (W12, W14, W15) but the larger of these is interspersed with oak woodland that has some ash woodland (W10) because of Jurassic and Cretaceous limestone

**Scots pine community (5.5%) meets the rigors of the Scottish Highlands**

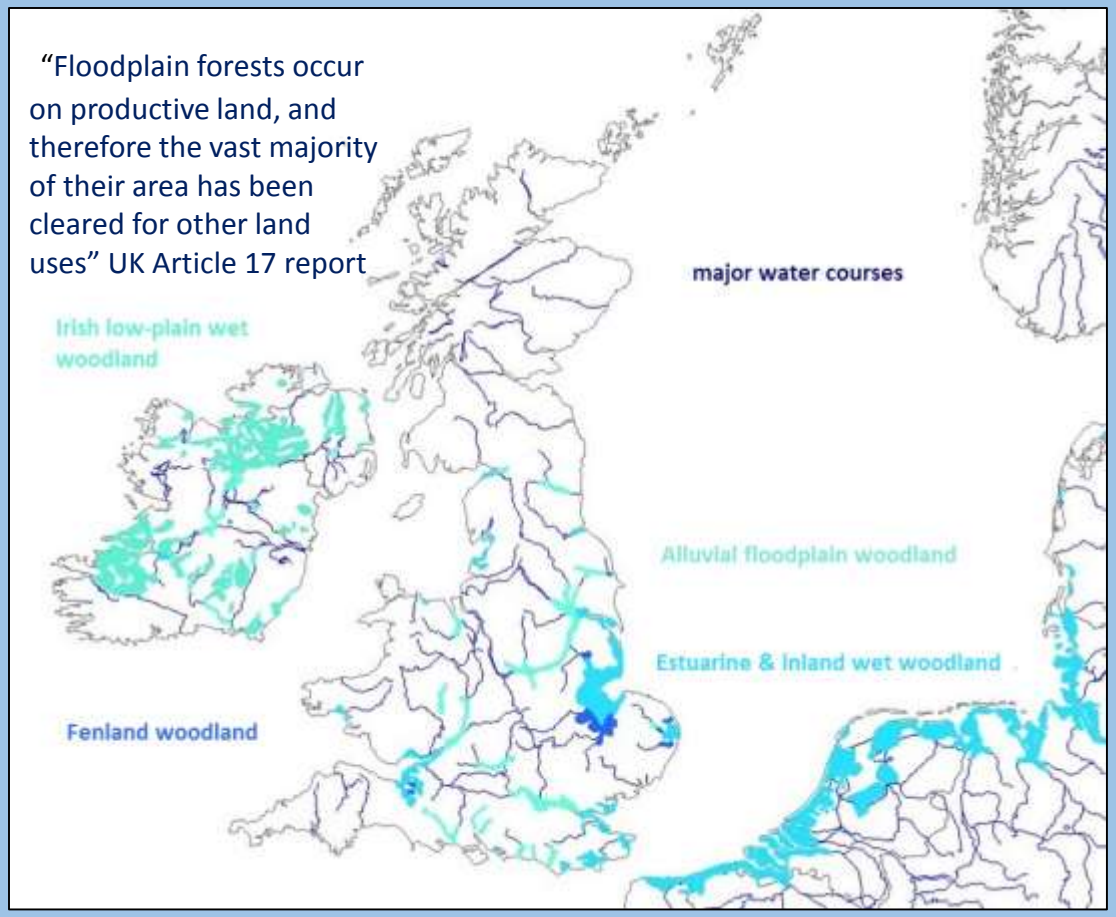
# Ash communities bounded by limestone geology




**Two ash communities (W8) could cover about 6.2%, following distribution of limestone:**

- **Carboniferous** of the White Peak in Derbyshire, and the Yorkshire Dales running over to the Lake District
- northern section of **Jurassic** limestone running up to the E coast of Yorkshire
- **Permian** limestone ribbon running NS to the E of Leeds and upto the mouth of the Tyne River
- **Cretaceous** towards the E coast of Yorkshire and Lincolnshire, and running from London to the N Norfolk coast.

# Large area wet woodland – a vital, missing component of our landscapes




## alluvial floodplain woodland community (2.2%) that is MISSING from our major rivers

- **NO comparable NVC!**
- oak, ash, alder, wych elm and willow
- Tyne towards Newcastle
- Upper Derwent and the Rye below Pickering
- Lower Derwent, Ouse, Aire, Trent, Dove and Soar between York to Leicester
- Dee near Chester
- Lugg through Herefordshire
- Severn from Stourport to the Bristol Channel
- Thames from Reading to Grays
- Stour and Avon, Test, Itchen, Arun, Adur, Uck and Ouse in SE England.-

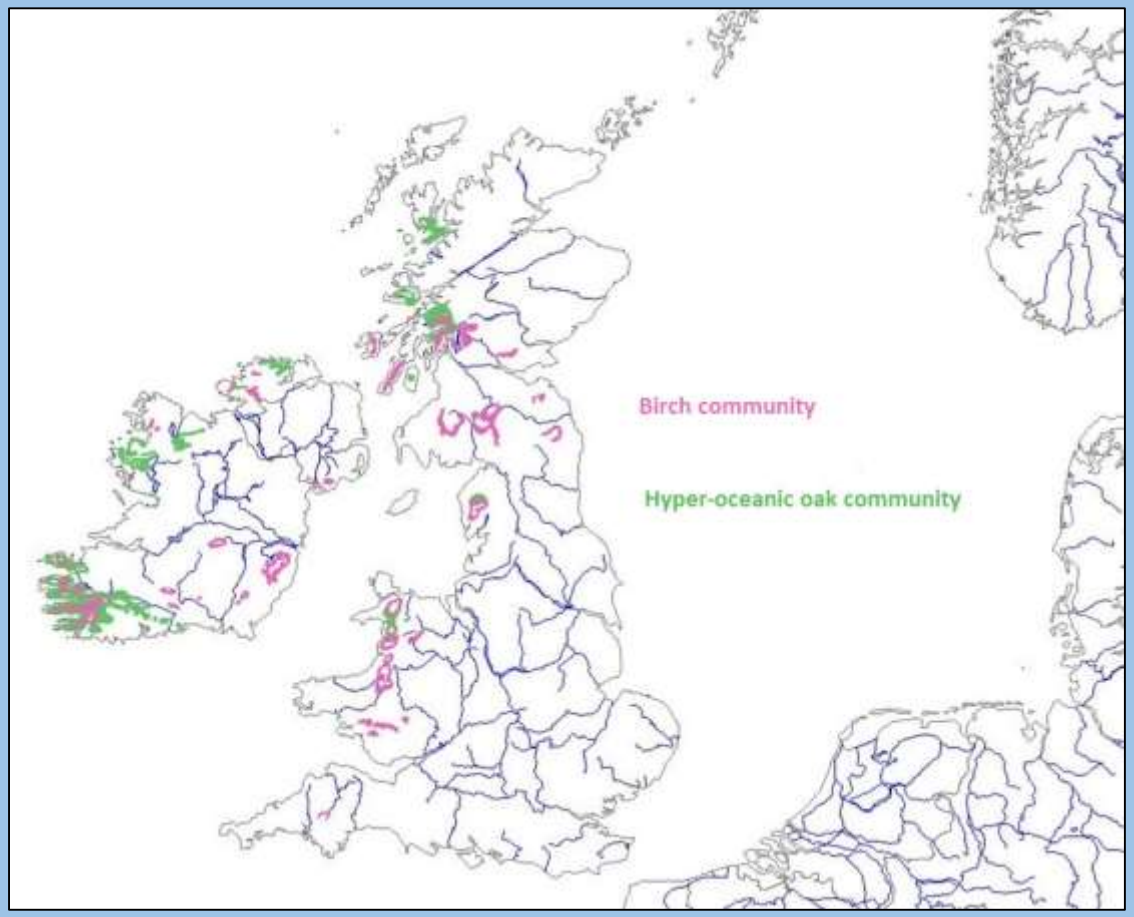
## estuarine and low lying inland wet woodland community (2.6%) also MISSING:

- mixes of ash, oak, wych elm and some alder
- Humber estuary; around the Wash; Thames estuary; Somerset levels; Norfolk Broads; and in the SE the Pevensey Levels; a Rother Levels with Romney and Walland Marshes; and low lying land stretching diagonally across NE Kent

## fen woodland community (0.5%) also MISSING

- willow-alder-birch
- low lying land in the Somerset Levels; northern area of the Lincolnshire Fens; around the Norfolk Broads; fens between Whittlesey and Lakenheath (Great Fen, Wicken Fen)

# Woodland at the montane and coastal fringe




The **birch community** has mostly been lost – it would have been on higher mountain slopes between **oak forests** and **mountain heaths**, where the slopes are too steep for blanket bog

One of the oak communities that could develop in northwest Wales, the Lake District and west Scotland, is representative of the extant **Atlantic oakwoods**, and which share a common **hyper-oceanic influence** with oak woods in western Ireland, of a **luxuriant growth of ferns and mosses**

# Irish woodland interiors – the common factor

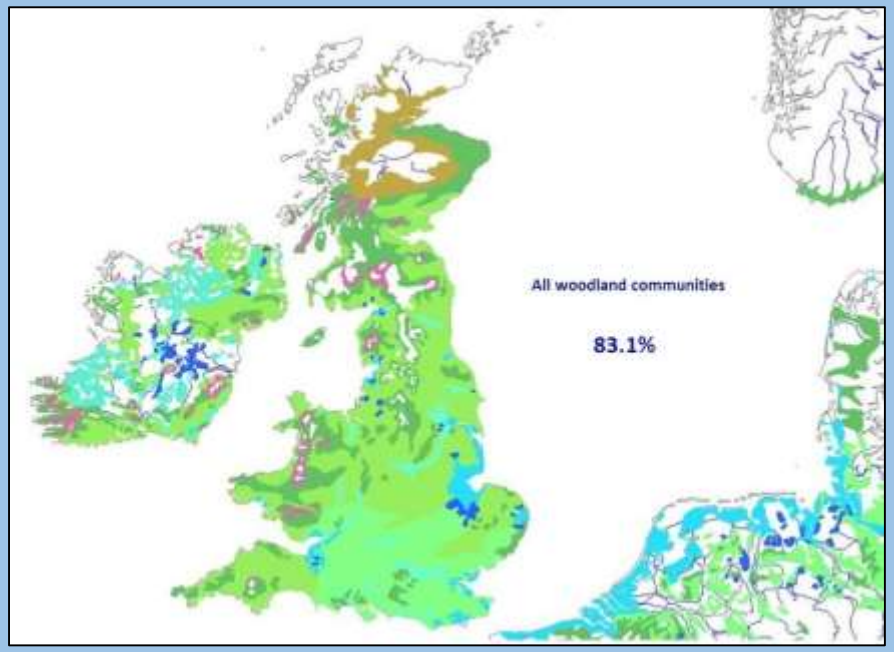
Ireland has 33 publicly owned woodland NNR

## HYPER-OCEANIC INFLUENCE

- mild winters, cool summers, and rain can fall throughout the year

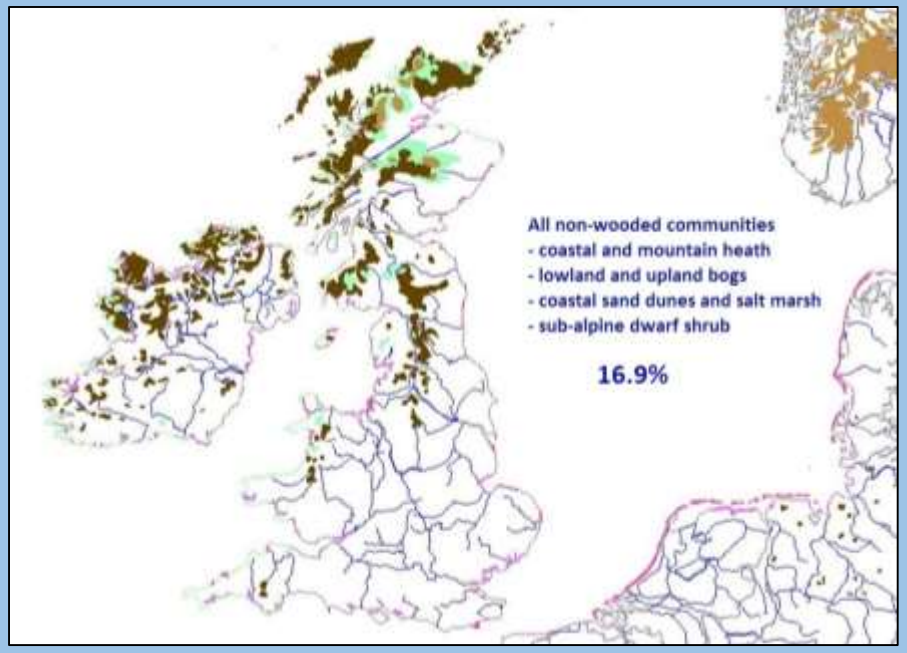
take away the trees and you get bog!

Crawford, R. (2005) Trees by the sea: advantages and disadvantages of oceanic climates. Proc. Royal Irish Acad. 105B: 129-139




## Lessons from vegetational mapping

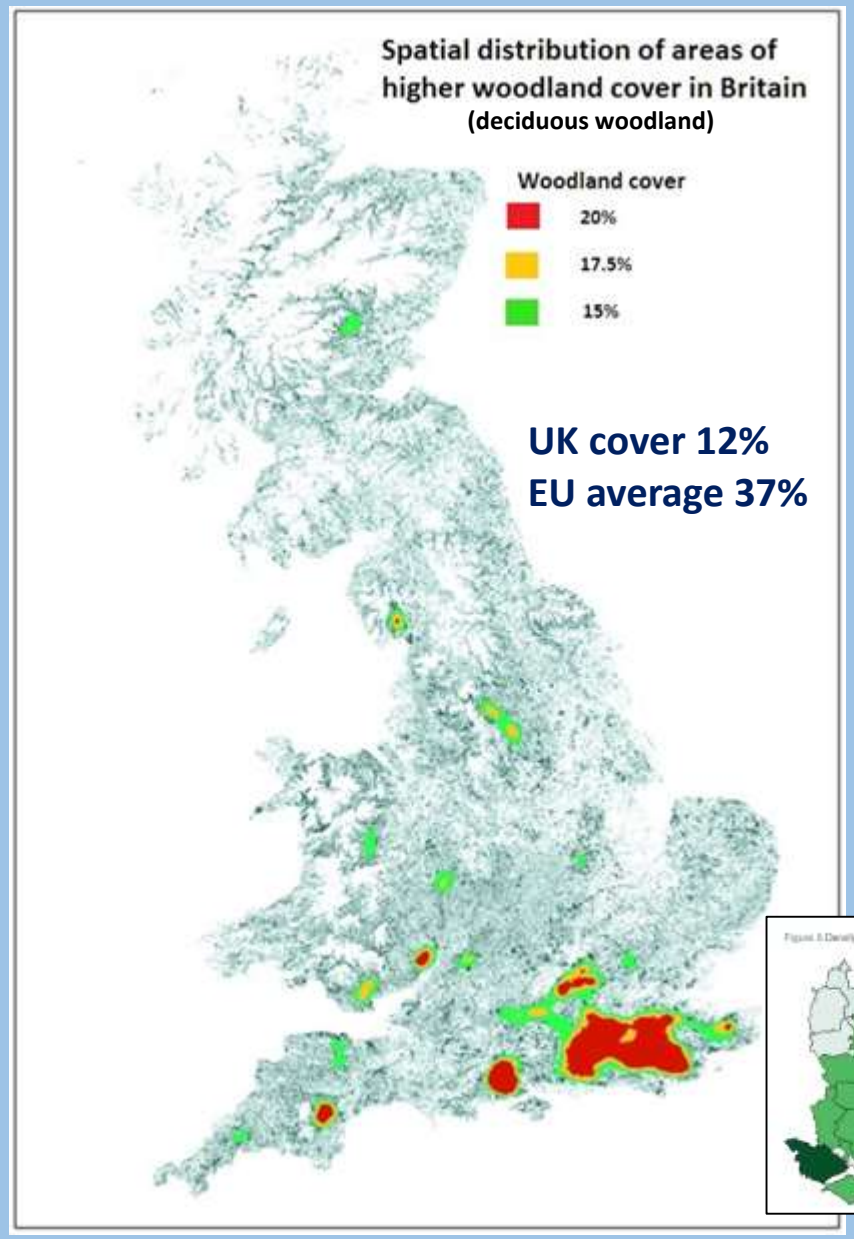
- open landscapes more likely at **altitude** and on **coastal fringe**
- inland lowland heathland is an **artefact** of human cultural use
- bog formation makes the uplands resistant to **reinstatement of woodland** to the treeline




## Uses of the vegetational mapping

- determine areas of **high naturalness** by finding locations that deviate least from **natural potential**
- show the degree of representation of **natural ecosystems** in our protected areas
- **opportunity mapping** for networks, core area expansion, and **restoration** of missing natural habitats

# Are there any large areas that function ecologically as woodland?



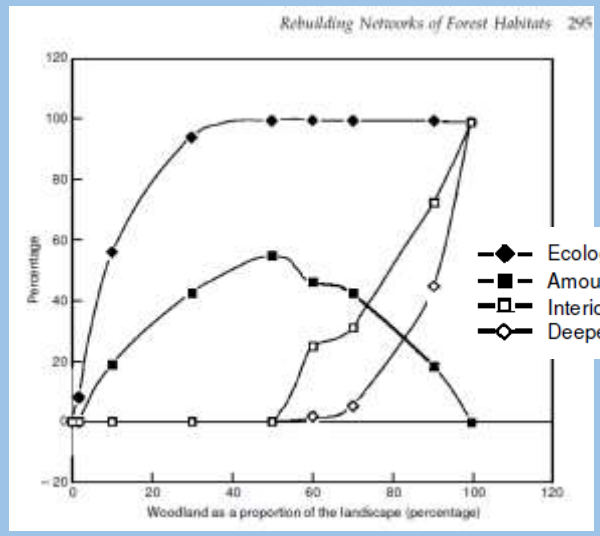

*Landscape Research*, Vol. 25, No. 3, 291–303, 2000

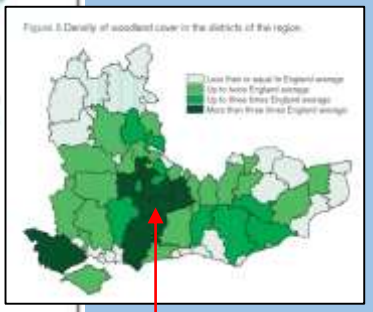
**Rebuilding Networks of Forest Habitats in Lowland England**

G. F. PETERKEN

ABSTRACT *Forest habitats in England have remained fragmented for centuries, and this has isolated populations of woodland species. Now, however, there may be opportunities to increase woodlands and restore the connections between habitats and populations. An ecological basis is provided for reconstructing a forest habitat network.*

KEY WORDS: England, forest, habitat network, landscape



Waverley Borough Council area is 30% wooded

At 30% cover and above, woodland becomes **ecologically functional:**
- likelihood of corner or edge **contact** with other woodland
- overcomes **fragmentation** and **isolation**

**Question**

**WHAT ELSE ARE WE MISSING FROM OUR LANDSCAPES?**

# Ecological incompleteness and our missing top predators

## There is no shortage of herbivores

| | Mesolithic | Now |
|---|---|---|
| Elk | 64,617 | 2 |
| Aurochs | 83,896 | 0 |
| Wild Boar | 954,378 | 500 |
| Mountain hare | 421,320 | 350,000 |
| Red deer | 1,253,613 | 350,000 |
| Roe deer | 832,793 | 800,000 |
| Beaver | 80,949 | 100 |
| Cattle | 0 | 9,675,000 |
| Sheep | 0 | 21,951,000 |
| Horse | 0 | 750,000 |
| Pig | 0 | 4,326,000 |
| Rabbit | 0 | 40,000,000 |
| Brown hare | 0 | 800,000 |
| Other deer | 0 | 395,000 |
| Bison | 0 | 0 |
| | 3,691,566 | **79,397,602** |

Maroo, S. & Yalden, D.W. (2000) The Mesolithic mammal fauna of Great Britain. Mammal Review 30: 243-248

## There is a shortage of carnivores!

| | Mesolithic | Now |
|---|---|---|
| Wolf | 7,000 | 0 |
| Lynx | 6,603 | 0 |
| Bear | 13,207 | 0 |
| Wildcat | 66,033 | 40 |
| Otter | 22,281 | 7,350 |
| Pine Marten | 147,474 | 3,650 |

## Megafauna did not survive post-glacial habitat change – humans only helped to push them over the edge of extinction


MacDonald, G.M. et al.(2012) Pattern of extinction of the woolly mammoth in Beringia. Nature Communications. 3: 893

Ripple, W.J., Van Valkenburgh, B., (2010) Linking top-down forces to the Pleistocene megafaunal extinctions. BioScience 60: 516–526.

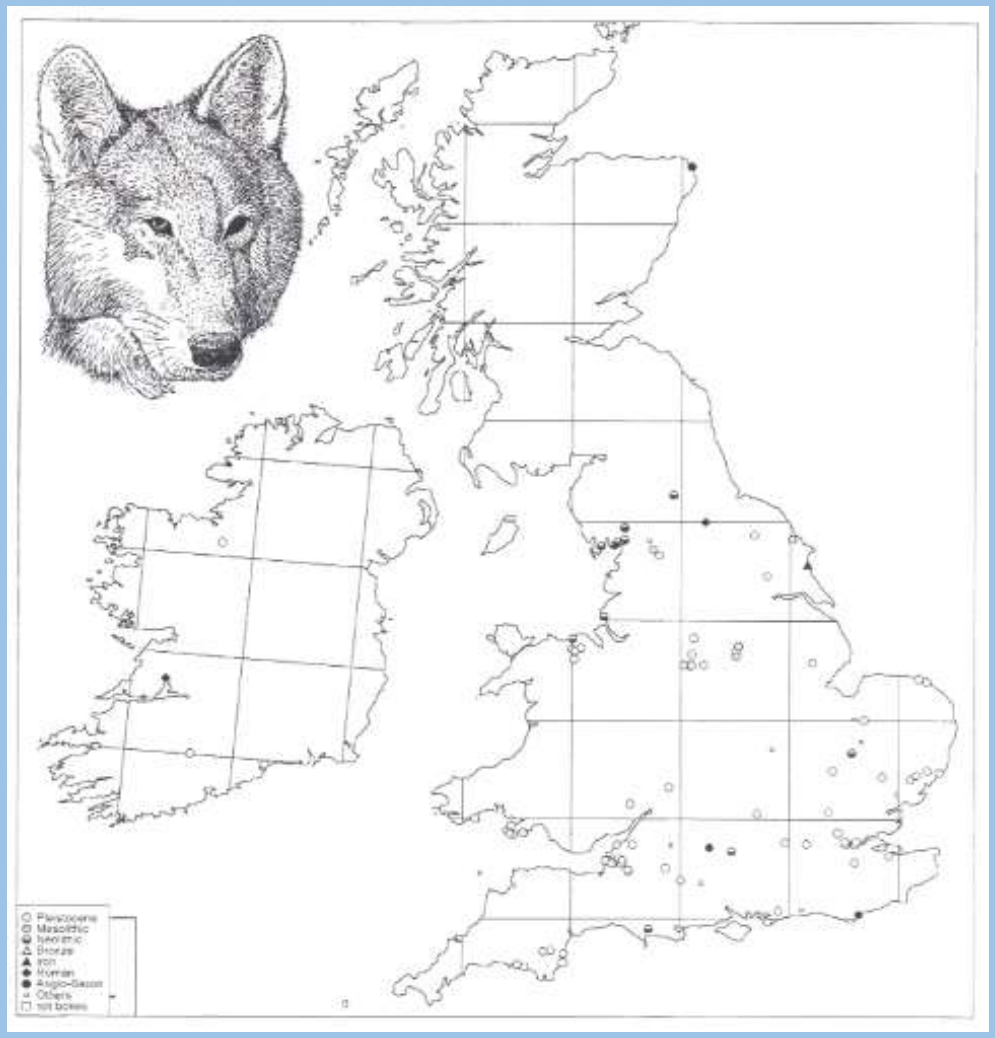
Allen et al (2010) Last glacial vegetation of northern Eurasia, Quaternary Science Reviews 29: 2604-2618

Nogués-Bravo D. et al (2008) Climate Change, Humans, and the Extinction of the Woolly Mammoth. PLoS Biol 6: e79

Stuart et al (2004) Pleistocene to Holocene extinction dynamics in giant deer and woolly mammoth. Nature 431: 684-689


## And a shortage of beaver!

# Wolf, bear and lynx fossil bone finds




Kitchener A.C. & Bonsall C (1997) AMS radiocarbon dates for some extinct Scottish mammals Quaternary Newsletter 83: 1-11
Hetherington, D.A. et al (2006) New evidence for the occurrence of Eurasian lynx (Lynx lynx) in medieval Britain. Journal of Quaternary Science 21, 3–8

*Article 22*

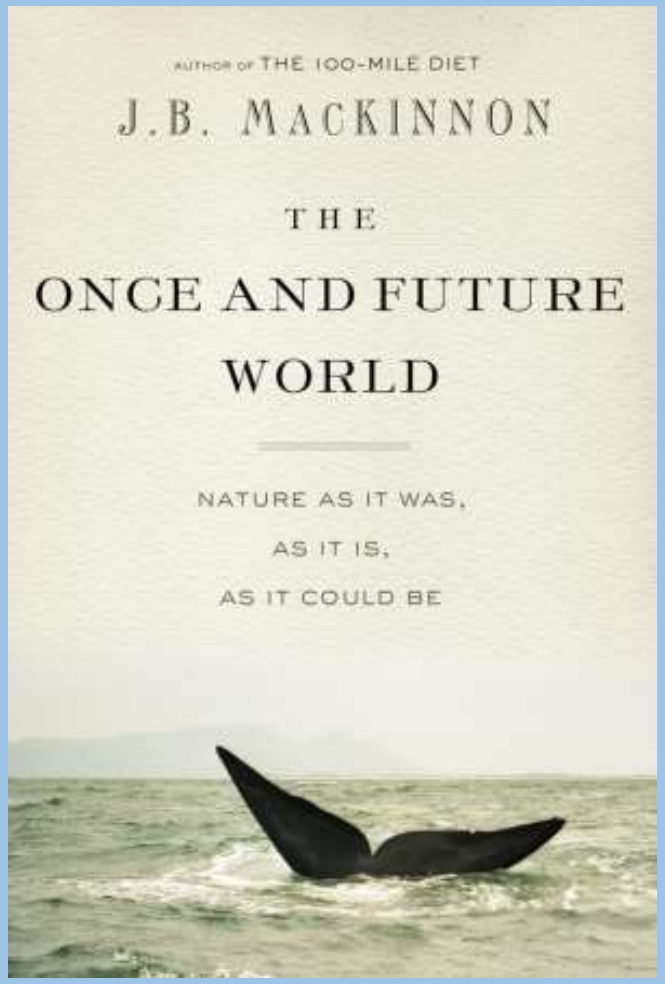
In implementing the provisions of this Directive, Member States shall:

(a) study the desirability of re-introducing species in Annex IV that are native to their territory where this might contribute to their conservation, provided that an investigation, also taking into account experience in other Member States or elsewhere, has established that such re-introduction contributes effectively to re-establishing these species at a favourable conservation status and that it takes place only after proper consultation of the public concerned;

EU Habitats Directive

**"study the desirability of re-introducing species in Annex IV that are native to their territory"**

# The challenge of LOST ISLAND




**Islands first settled:**
< 500 years ago - Chagos Islands, Ascension Island, Diego Garcia, Falkland Islands, and Macquarie Island
< 1,000 years ago - New Zealand, Easter Island, Hawaii and Iceland
< 2,000 years ago - Madagascar

Final chapter is devoted to **imagining a large undiscovered island.** MacKinnon paints an irresistible picture of Lost Island:

- teeming fisheries of the ocean; reefs that are explosions of colour, seals and sea lions bobbing among them; the blow holes of whales; hungry sharks making the sea hiss and boil from the frenzy of shoals of fish
- the land, shaped by its plants and animals, has wildlife trails that bore through the stands of ancient forest and traverse the grasslands; there are herds of wild bison, mammoths and sabre-toothed cats, giant camels, giant lizards, giant parrots, and giant tortoises

**What would you do if you discovered Lost Island?**

- **would you tell anyone else about it?!**
- **what would you do differently if it was settled?**