



Habitat Management

Woodland Management

Woodlands: General

- Trees dominant
- 12% land coverage
- Individual canopies overlap
- Light critical – variety of plants species
- Decaying material
- Plantation
- Dominant tree species & spacing



Canopy



- Vary in density and structure
- Restriction to understorey
- Mature beech vs ash
- Woodlands – spacing the result of competition
- Plantation – proximity planting

Woodlands: Bark



- 80 species moss – oak woodlands
- 324 species of lichen
- 300+ km⁻² New Forest
- Microhabitats for invertebrates
- Filamentous algae

Woodlands: Soils

- Good cover – variety of unseen fauna
- Recycling – mycorrhizal
- 1700+ invertebrates in rotting wood habitats.
- Fungal hyphae



Types of woodland: Coniferous

- Predominantly conifers
- Typically evergreen
- Seed producing - inside cones



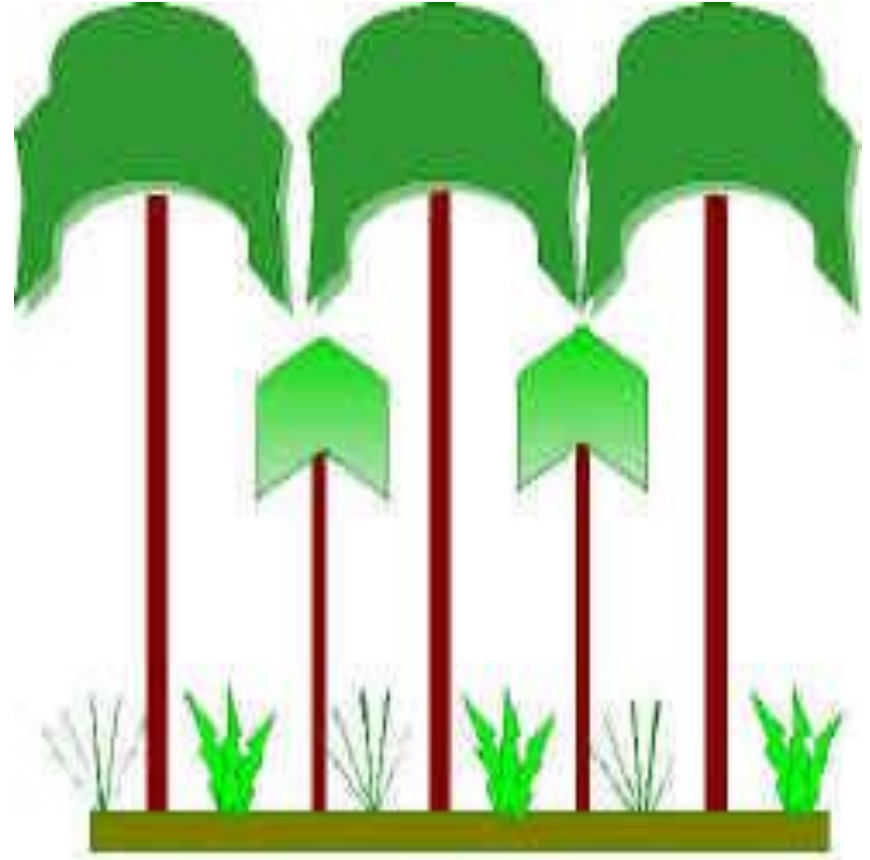
Broadleaf



- Variety
- Leaf shape – broad and flat
- Deciduous
- Holly
- Seeds – acorns and berries
- Climatic variability

Woodland structure (Anon, 2008)

- Variation in vertical structure
- Canopy - understorey – field layer – ground layer
- Blurred distinction
- Epiphytes



Woodland Structure

- **Understorey:** young trees of dominant variety, shrubs. Sprawling sideways growth; invasive non-natives
- **Field layer:** ferns, grasses, sedges
- **Ground layer:** mosses, ivy, lichens, fungi
- Vertical structure – influence where fauna found



Seasonal variation to structure

- Broadleaf – high light availability in dormancy
- Warmer autumn and spring periods – energy essential for flowering and seed production



Broadleaf vs coniferous understorey



- Bluebells and wood anemone
- Layers alter according to season
- Conifer – purpose planted
- Thinning – leads to better development

Sessile

Oak Woodland

- Two native species: **Sessile oak** *Quercus petraea* and **Pedunculate oak** *Quercus robur*
- Sessile – shallow, acid soils
- Pedunculate – heavy clays of ‘lowland’ Britain
- Often mixed woods - rarely single stands
- Diverse – 400+ invertebrates
- Ancient trees – 300+ lichens



Pedunculate

Beech wood

- Tall crowns and few lower branches
- Autumnal interest
- Dense shade – limited structure
- Saprophytic species – Birds-nest orchids
Neottia nidus-avis
- Beech leaves – slow to rot



Beech Woodland

- Not impoverished
- Not restricted by soil type – limestone soils
- 100+ species of invertebrates
- 200+ lichens
- Porcelain fungus
- Beech nuts – mast
- Grey squirrel



Ash Woodland

- Limestone areas
- Finely divided, compound leaves
- Loosely branched
- Varied understorey
- Less favoured by invertebrates (40 species)
- Rich in lichens (255)
- Climax species



Birch woodland



- Silver *Betula pendula* and Downy *Betula pubescens*
- Pioneering species
- Not long-lived
- Require high light levels
- Hardy
- Diverse – 300+ insects and mites
- Fly agaric *Amanita muscaria*

Alder/Willow Carr

- Wet or waterlogged soils
- Naturally part of succession from hydrosere
- Willows can support 450+ invertebrates
- Sedges; rushes
- Land drainage - BAPs



Coniferous Woodland

- Scots Pine *Pinus sylvestris*, Juniper *Juniperus Cupressaceae*, and Yew *Taxus baccata*
- Most planted as plantation – introduced species
- Forestry – economic yield 6 x that of broadleaf
- Softwood – pine furniture to paper



Douglas Fir *Pseudotsuga menziesii*



- Non-native
- Imported to improve yields
- Land too poor for agriculture
- Sitka spruce *Picea sitchensis*
- Conservation concerns – wide rides; streams and gullies cleared

Larch Woodland *Larix decidua*

- Deciduous
- Spreading, loose growth
- Light penetration
- Varied flora and fauna unlike most other conifer plantations
- Yacht building/timber cladding & rot resistant



Woodland Threats

- Legal Loopholes – 85% Ancient woodland has no legal protection
- Land management – agricultural practices, fragmentation & overgrazing
- Climate change – increased temperature, changes to precipitation & storms
- Diseases – fungal, viral & bacterial

Bacterial and Viral Infections

- Lack of light, water, CO₂ and nutrients can lead to reduced growth – stress
- Stressed trees more vulnerable to disease
- Oak decline – complex – bacteria, insect infestation & weathering

Acute – mature trees. Bacterial agents - symptoms such as stem bleeding

- Pedunculate & Sessile affected

Chronic – more prolonged (yrs)

- Early signs - foliage deterioration, twig death, sparse foliage over crown
- Typically Pedunculate



Brown and White Rot

- Brown rot – attacks cellulose
- Leaves a brittle, cracked brick effect – timber value lost
- White rot attacks all the wood – spongy mass
- Often only discovered when fruiting parts are visible
- Honey fungus
- Not all fungus problematic!



Notifiable Diseases - fungi

1. Sudden Oak Death -

Phytophthora ramorum

- Native oaks not as susceptible as American oaks
- Rhododendron – host
- Since 2009 – Japanese Larch



2. Red Band Needle Blight -

Dothistroma septosporum

- Corsican Pine & Lodgepole Pine
- Defoliates – climatic change – wet, warm spring & summers

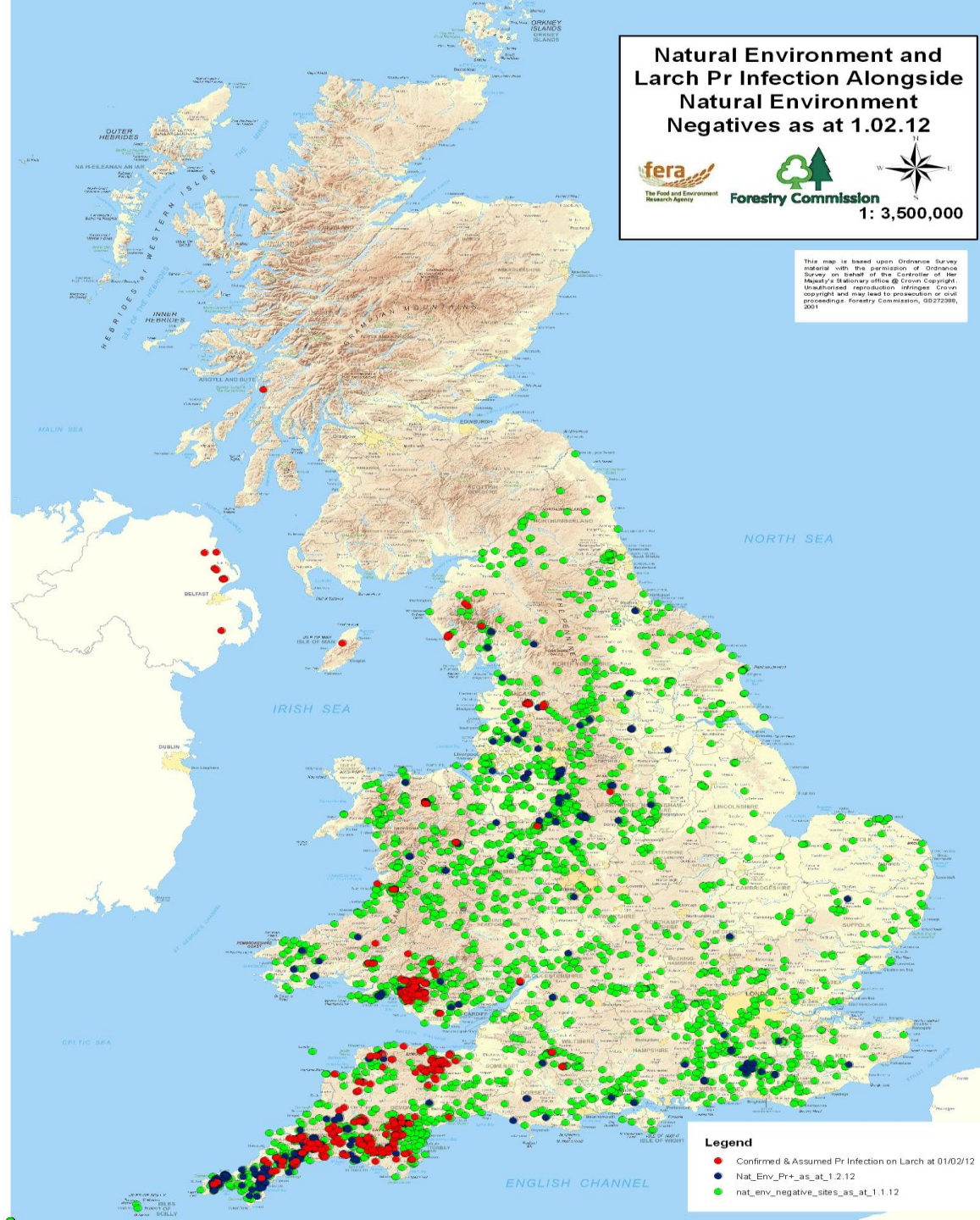


Natural Environment and Larch Pr Infection Alongside Natural Environment Negatives as at 1.02.12



1: 3,500,000

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Legend

- Confirmed & Assumed Pr Infection on Larch on 01/02/12
- Nat_Env_Pr+_as_at_1.2.12
- nat_env_negative_sites_as_at_1.1.12

Ash dieback – *Chalara fraxinea*

- UK's 3rd most abundant tree
- >400 years
- Supports specialist deadwood species – lesser stag beetle
- 14% nationally rare and scarce lichens
- Upland mixed woodlands – listed as a priority habitat under the Biodiversity Action Plan



Signs of ash dieback

Disease confirmed in UK (Oct 2012) 20 years after its arrival in eastern Europe

A real danger to UK's 80 million ash trees – could change landscape – Dutch Elm disease



- Spread via wind-blown spores
- Spread across Denmark in just 3 years
- Economic consequence
- 2% naturally resistant
- Now in 184 sites around Britain
- At least 25 tree diseases in UK currently (Gray, 2013)
- Globalisation of plant trade to blame

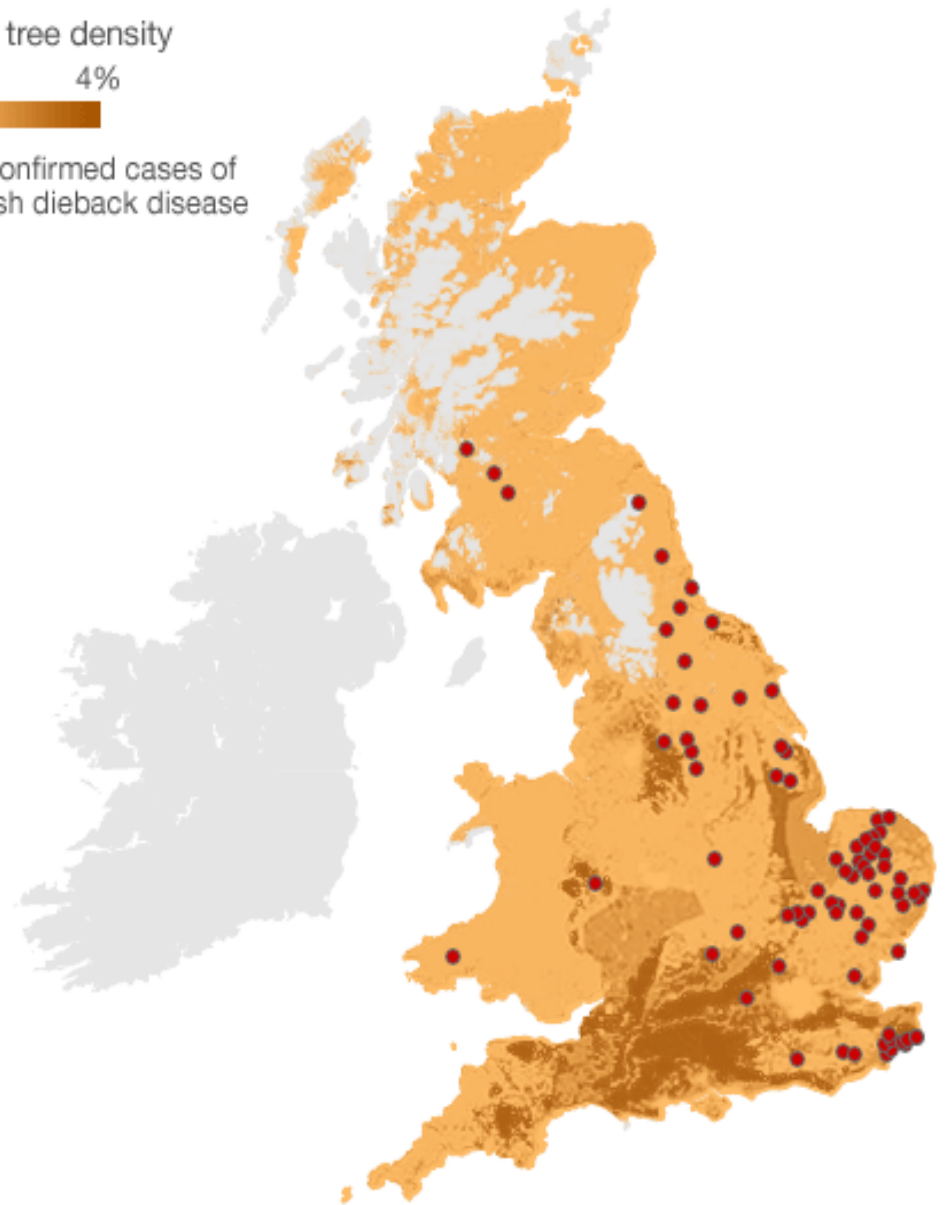
Ash dieback across Britain

Ash tree density

0% 4%



• Confirmed cases of ash dieback disease



Information correct at 1400 on 7 Nov 2012. No data for Northern Ireland. No nursery cases included.

Source: Countryside Survey, Forestry Commission



Chalara fraxinea

- Treated as a quarantine pest
- Ban on import & movement of ash trees
- Report suspected cases (Forestry Commission)
- Young/newly planted trees most vulnerable

Current season double needle necrosis (CSDNN)

- Imported from the Caucasus – seeds of Nordmann firs
- Fungus – *Sydowia polyspora*
- No fungicide treatment
- 150 growers across UK currently affected
- First spotted in UK 5 years ago



Nordmann Fir *Abies nordmanniana*
principally affected in UK



- Tan bands develop after shoots elongate
- Turn reddish brown before shedding
- Can be confused with needle rust, sunburn, herbicide burn or moisture stress

Oak Processionary Moth
Thaumetopoea processionea



Ancient Woodland



- Land which has been continuously wooded since AD1600 (England & Wales) or AD1750 (Scotland)
- Not necessarily the same tree cover
- Diverse
- Rare species
- Historical and archaeological significance
- Less than 2% of UK wooded area
- 20 ha in area

Ancient Woodland Indicator Species

- Historical maps & estate records
- Banks, ditches, topographical features
- Flora rather than fauna – vascular plants (AWVP)
- Where no air pollution – hundreds of lichens
- Caution – geographical variation; not always representative



Indicator species - characteristics

- Largely absent outside the wood
- Capable of growing in shade – adaptability
- Slow colonisers
- Reliable regional indicators



Woodland Management

- Faced with a piece of woodland, should it be managed or left to nature?
- Management :
 - Timber
 - Games species
 - Wildlife conservation
 - Recreational opportunities



Management for specifics

- Species-specific management often benefits others
- Simultaneous management – commercial products, conservation and recreation
- Conflicting needs



Planting

- Natural regeneration
 - succession
- Before planting – audit area
- Ecological vandalism
- Ecological complexity
- Provision tracks and rides
- Trees species to suit aim and objectives



Planting



- Broadleaf trees – slow growing but uses such as furniture
- Long-term investment
- Conservation value also
- Planting species suited to area reduces level of intervention and management needed
- Native before non-native species

Planting

- Spacing is species and purpose – dependent
- Timber production – plant close together
- Conservation – plant further apart
- Exposure and size of sapling
- Dormancy



Types of transplants

- Seedling :
 - Smallest.
 - Not previously moved from seedbed
- Transplants – transferred from seedling bed to secondary bed and grown on. '1+1'
- Undercutting – mechanically slicing through root. 1U1
- Whip – largest. 120-210cm
- Protection – guards, fencing, stakes



Coppicing

- Cutting down of trees and allowing stumps to regenerate
- Then harvesting re-growth
- Oak, hazel, lime, ash
- Re-growth can be rapid



Coppicing

- Labour intensive – expensive
- Wood products – relatively low market value
- Loss of traditional skills
- Less than 3% woodlands coppiced – sweet chestnut and hazel
- Old days – biodiversity a side-effect of coppicing



Pollarding



- Where grazing is prevalent, trees would be cut 2-5m above ground level
- Common in wood pasture
- Boundary markers
- Structural diversity
- Reduction active coppicing – decline British butterflies
- Hazel coppice - dormice

Wood products and crafts

- Firewood
- Wood chip – by-product from sawmills:
 - Power stations
 - Paper industry
 - Flavour home-brewed beer
 - Mulch
 - Shock absorber for children's playgrounds
 - Herbal medicines – quinine, witch hazel, cinnamon



Woodland edges

- Transition zones
- Often higher biodiversity value – mingling of two habitat types
- Abrupt edges
- Woodland – scrub – open areas



Rotting wood

- Pursuit of tidiness when managing habitats
- Estimated 20% loss of fauna
- Standing wood – insects, fungi, bats & woodpeckers



Scrub management

- Path maintenance
- Promote diversity of plants
- Not in pursuit of tidiness
- Brambles and scrub:
 - Food source
 - Shelter
 - Breeding sites



Summary

- Most woodlands benefit from management
- Habitat altering
- Flexibility in management approach
- Financial and resource constraints
- Piecemeal changes



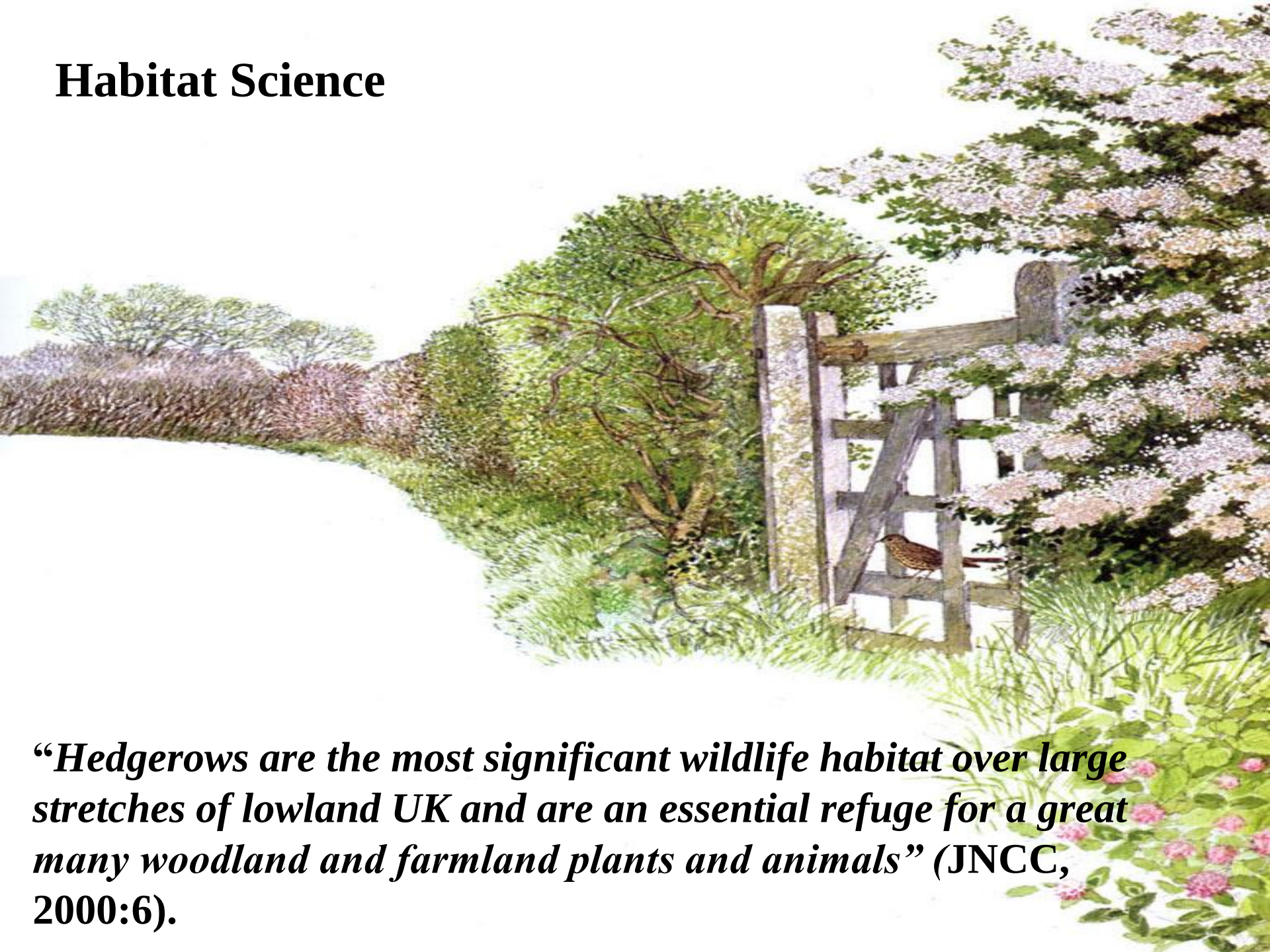
- Pictures from Offwell Woodland and Wildlife Trust (2004); Garate, 2010 and Jenkins, 2010/11





HABITAT SCIENCE: HEDGEROWS

Habitat Science



“Hedgerows are the most significant wildlife habitat over large stretches of lowland UK and are an essential refuge for a great many woodland and farmland plants and animals” (JNCC, 2000:6).

Hedgerows

- Complete ecosystem
- Size and structure varies
- Single species hedgerows
- Ancient hedgerows
- Species rich hedgerows





*“Modern technology owes
ecology an apology”*

(Eddison, 2001:8)

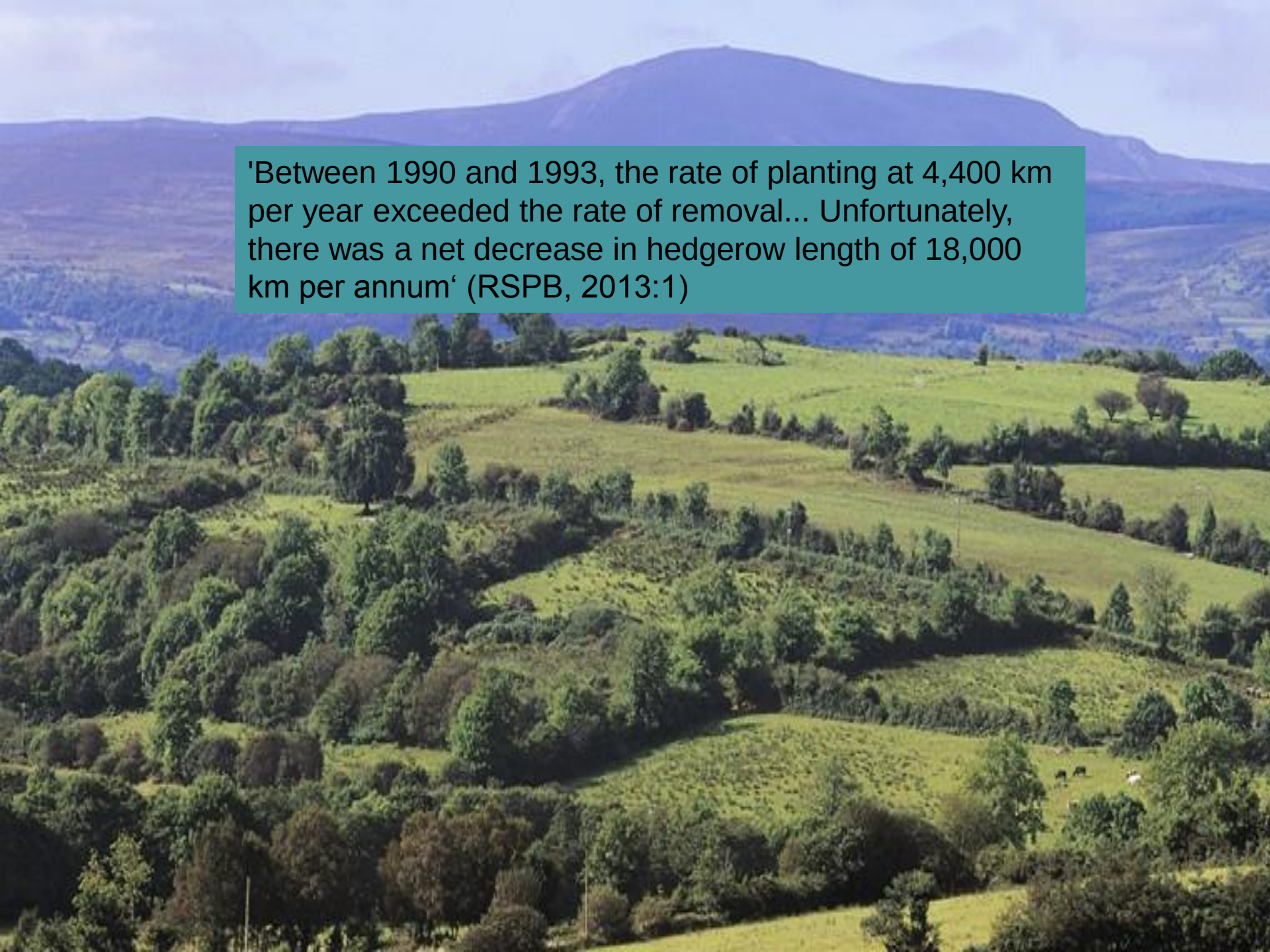
Hedgerows and Birds

- 80% woodland birds
- 50% mammals
- 30% butterflies

- Ditches & Banks – frogs, newts, reptiles



- 
- A photograph of a hawthorn bush with red berries in a hedgerow. The bush is in the foreground, with many red berries visible. The background shows a grassy field and more trees under a cloudy sky.
- Where woodland is limited – hedgerows are vital
 - 30% birds nest in hedges
 - Dead wood – source insects



'Between 1990 and 1993, the rate of planting at 4,400 km per year exceeded the rate of removal... Unfortunately, there was a net decrease in hedgerow length of 18,000 km per annum' (RSPB, 2013:1)

Tithe Maps

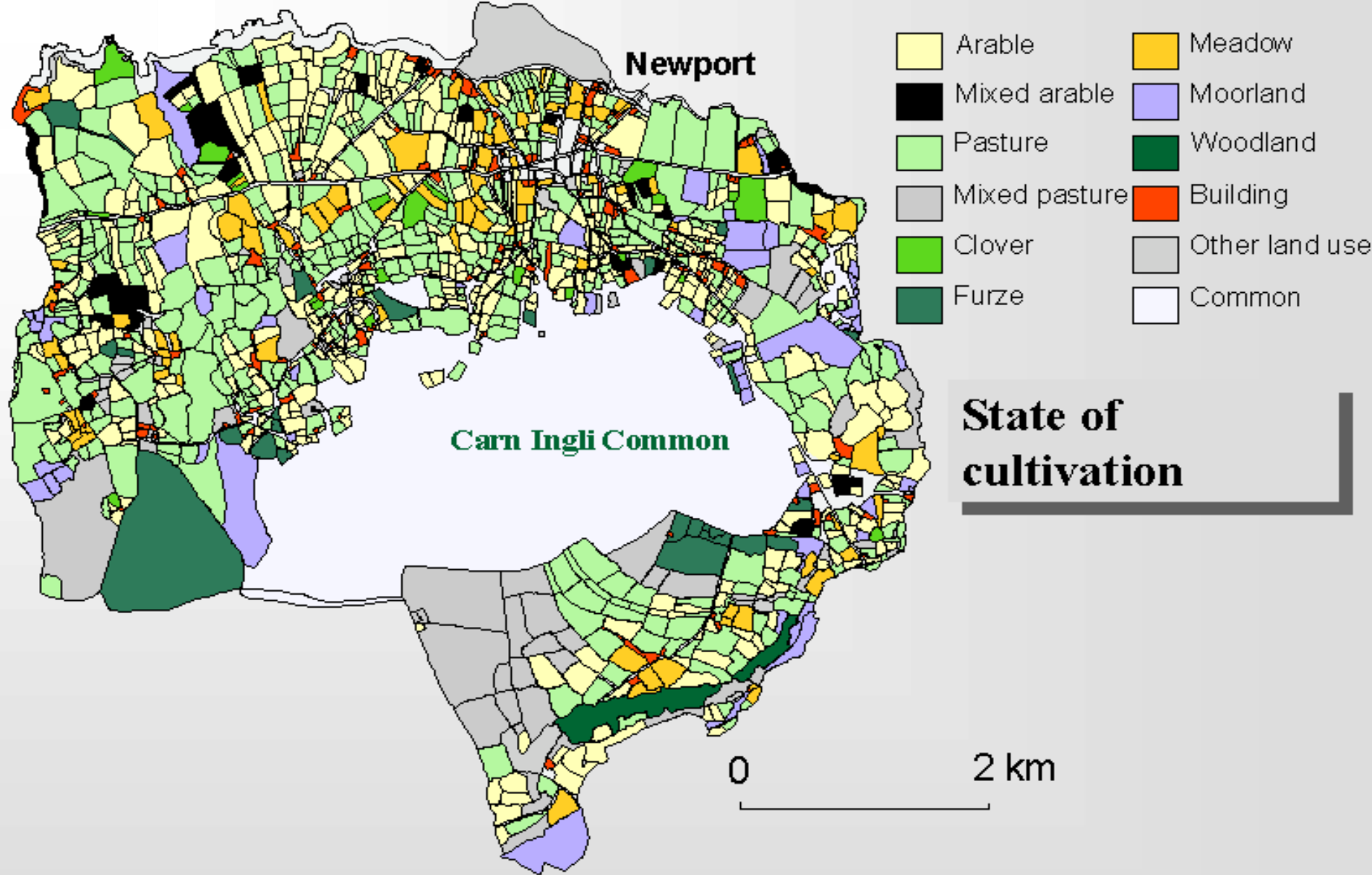
- Bronze Age & Roman times
- Increase in planting 19th century – tree nurseries
- History of field patterns
- Changes of land-use



Important Hedgerows

- Marks a pre-1850 parish
- Township boundary
- Includes at least 7 woody species in 30m
- Associated with:
 - Archaeological site
 - Ditch
 - Bank or wall





Tithe Map of Newport, 1845

(Pearson & Collier, 2001)

Hedgerow Management

- Livestock enclosure
- Define boundaries
- Rare in Europe
- Agricultural mechanisation – demise

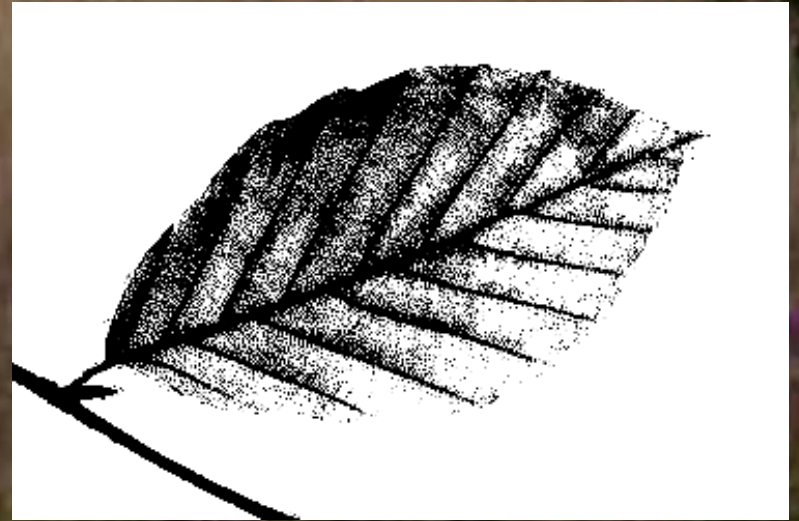


Biodiversity Action Plan Species



Hedgerow Management

- 1997 legal protection-
Hedgerow
Regulations
- Under review
- Management of
existing hedges



Hedgerow Regs (1997)

- Complicated and often criticised
- Excludes any hedgerow within or borders a domestic garden
- Those covered by the Regs include:
 - Common land
 - Village Greens
 - SSSIs
 - LNRs
 - Land used for agriculture
 - Land used for forestry
 - Land used for keeping/breeding horses, ponies or donkeys
- But not hedgerows (including any in the above list) which are 'within or marking the boundary of the curtilage of a dwelling-house'
- Must be 20m in length or connected to another hedge at both ends



Hedgerow Regulations 1997

- **Illegal to remove without permission**
- **Prohibition orders within 6 wks**
- **Local planning authority**
- **Unlimited fine & replacement**

“The Swansea millionaire, his chopper and an historic hedgerow”
(South Wales Evening Post, 07/01/15)

- 3 hedgerow sections removed from his field in Caswell
- On tithe map since 1847 – ancient hedge
- Fined and issued with a hedgerow replacement notice



When to trim?

- 
- Outside nesting season!
 - Late winter preferable
 - Retain ground cover
 - Best practice guidelines:
 - not permitted between 1 March 31 July (England and Scotland)
 - Not permitted between 1 March 31 August in Wales and Northern Ireland.

Advice and grant aid

- Advice
 - Farmers - Farming and Wildlife Advisory Group
 - Wildlife Groups
- Grants:
 - England - The Countryside Stewardship Scheme (CSS) offers voluntary 10-year agreements for managing and restoring farmland habitats including hedgerows
 - English Nature
 - Wales – Glastir & CCW (NRW)



‘Saving Gower’ – Heritage Lottery Fund

- £1,315,200 – for various community and environmental projects in Gower
 - Restoration and conservation projects
 - Re-establishing customs/boundaries
 - Training
 - Record ancient hedgerows – identification first

Saving Gower' – Heritage Lottery Fund – meeting at Rhossili 25/02/15

Agenda

1. Hedgerows:

- Look at the desk based archaeological survey
- Way forward for the ecological survey
- Volunteer involvement
- Future activities.



2. Hay meadow project:

- Programme of activities
- Bailing machinery application
- Base line survey of sites
- Best practice - North Pennines project
- Code of conduct of participants



Biodiversity

- Estimated 0.5 million km in England and Wales – 42% ($\approx 154,000$ km) are ancient or species rich
- Since 1984 – 25% loss in Wales
- Banning straw and stubble burning (1992)
- Neglect and removal



(Carmarthenshire Council, 2007)

Loss of Hedgerows

- Neglect – no laying
- Loss of hedgerow trees
- Use of herbicides, fertilisers and pesticides
- Increased stocking rate
- Careless encouragement



(Museum of Wales, 2004)

BENEFITS

- Habitat in itself
- Wildlife corridor
- Aesthetics
- Wind break



(English Heritage, 2003)

Managing Hedgerows for wildlife

- **Variation**
- **Management – trimming/cutting**
- **Seasonality**
- **Hedge junctions**
- **Gap up**
- **Agri-environmental schemes : 1st Mar – 31st July**
- **Fence livestock**
- **Grass buffer strips – Agri-environmental grants**
- **Avoid fertiliser drift**
- **Avoid close cultivating**

Improve Hedge Biodiversity

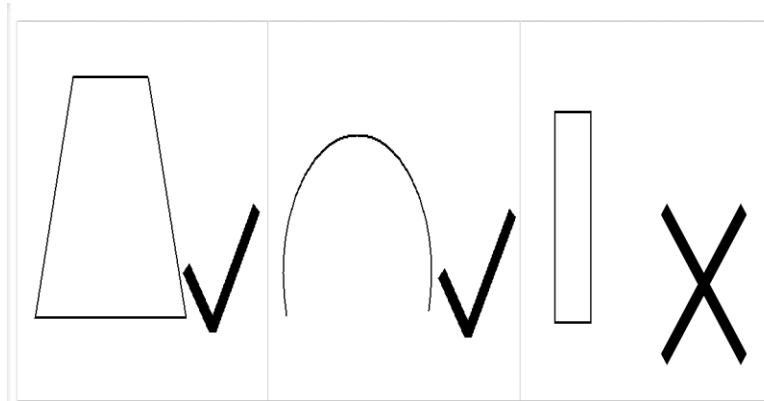
- Thicker
- Trees
- Large variety
- Wide separation
- Understorey
- Artificial habitats



(JNCC, 2000)

Species Variation

- Structure attracts different species
- Thick down to the base – blackbirds, robins and wrens
- Tall trees – owls and sparrowhawks
- Grassy areas and brambles – small mammals – barn owls



(JNCC, 2000)



•Grass Buffer

•Effects of flailing



Maintenance

- 
- Flail trimming - used with care
 - Cost-effective
 - Alternate years (The Farming and Wildlife Advisory Group)
 - Roadside hedges
 - Young hedges

Long-term Management

- **Hedge Laying**
 - Traditional
 - Neat, stock-proof barriers
 - Method dependent on stock and climate
 - Pleachers
 - Angled
 - 15-20 years





Stanley Anderson





The Flying Hedge Style



A low hedge on a bank – typically used in Pembrokeshire, Gower, and Carmarthenshire



Midland Bullock – for farms with large livestock



Welsh Border – double brush hedge with stakes @ 35° slant. Dead wood prevents regrowth being grazed



Derbyshire – stakes and pleachers

Long-term Management

- Coppicing
 - Cut to ground level
 - Coppice too high - gappy
 - Regrowth from base
 - Angled
 - Willow, hazel, alder and hawthorn



Carmarthenshire

- One of the most complex networks in Wales
- Wildlife rich
- LBAP – Hedgerow Action Plan
- Planted on a bank
- Wych elm *Ulnus glabra* – white hairstreak butterfly *Satyrrium alba*



(Follett, 2005)

Elm *Ulnus procera* and Laburnham *Labernum anagyroides*



(Fenwick, 2004)



(Fenwick, 2004; Mitchell, 2004)

Carmarthenshire Hedgerow trees and shrubs

(Baker, 2004; Fenwick, 2004; Stables, 2004)



Penllergaer Hedgerows



- Narrow-leaved Ash
Fraxinus angustifolia
- *Species-rich hedges*
- *Poorly recorded non-native*
- *Very long terminal leaves*
- *Native ash shown for comparison*

Gower Hedgerows

- Max Hooper – species diversity of a hedge related to its age and the manner in which it was created (Pollard *et al.*, 1974)
- While older hedges tend to be more species rich, the converse is not necessarily true!



(Fenwick, 2004)

Hedge Management in Gower

- Planting and repairs
- Hazel *Corylus avellana*
- Gorse *Ulex europaeus*
- Holly *Ilex aquifolium*
- Assart vs enclosure



(Crellin, 2004; Fenwick, 2004)

Gower - Gorse

- Overton Mere – gorse clearance
- Wildlife benefits but invasive
- Threatening delicate flora such as the rare Goldilocks aster *Aster linosyris*
- Future grazing to maintain maritime heath and limestone grassland
- Funded by CCWs Ecosystem Resilience & Diversity Fund





Overton Mere

- Calcareous plant
- Gorse protects aster from grazing livestock
- Gorse <20cm high
- Population currently stable but vulnerable
- Grazing/burning/



Assart Hedges in Gower



(Davidson ,2003; Fenwick, 2004; Calow, 2007)

Gower Hedgerows

- Recent hedgerows
 - Elder *Sambucus nigra* and Dog-rose *Rosa canina*
- Species richness in lane hedges – origins in woodland
- Diversity affected by vehicles



(Fenwick, 2004)

Gower Hedgerows

- Slow colonisers
such as Dogwood
Cornus sanguinea
- More prevalent
along lanes
- Roadside hedges –
anomalous results
when Hooper's
Rule is applied?



(Mitchell, 2001)

Gower banks and ditches

- More diversity if accompanied by ditch

 Age?

(Jones, 2006)



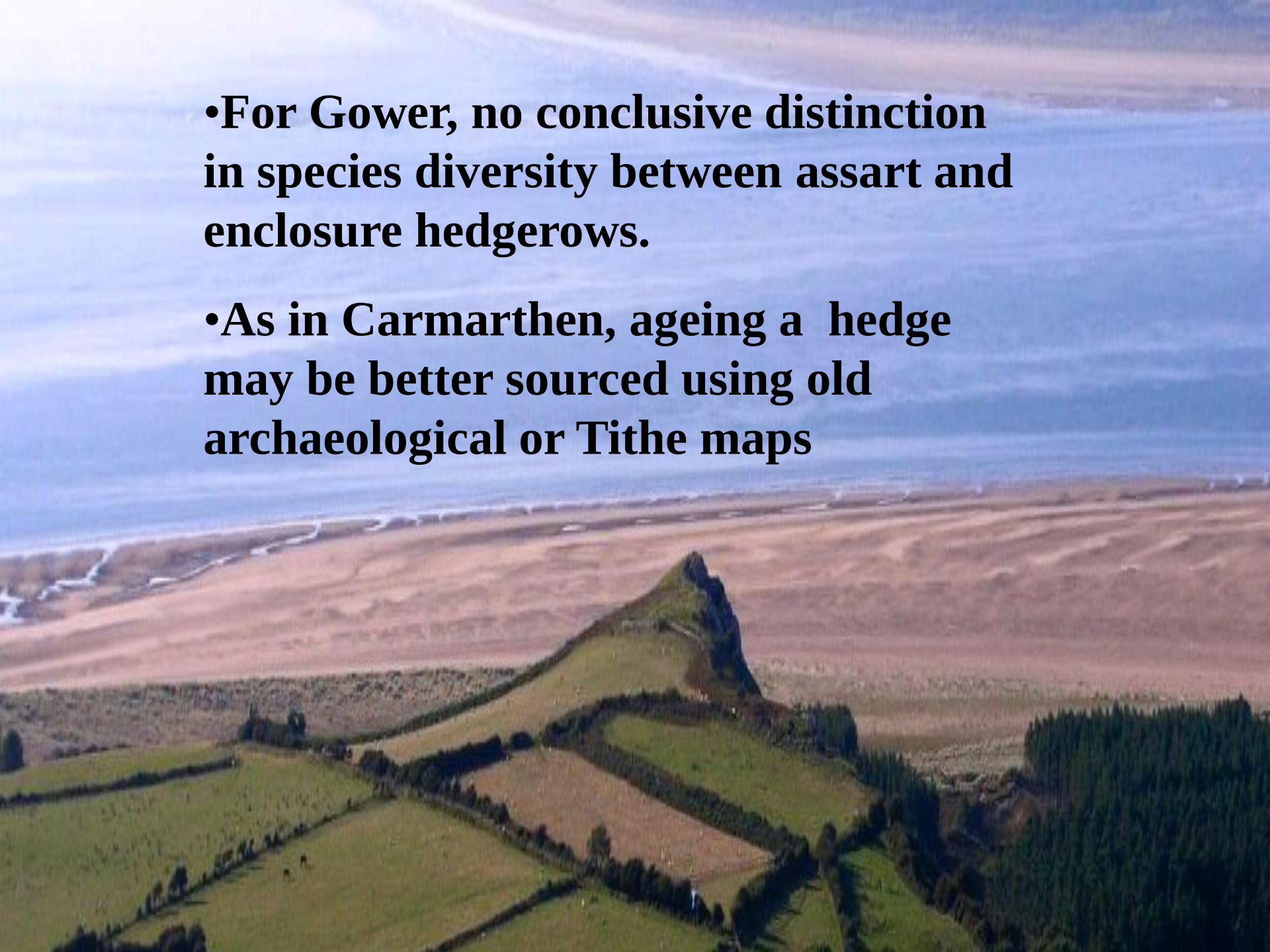
“Under favourable conditions, the analysis of species diversity can provide supporting data for historical models but it does not offer a ‘fast-track’ solution to chronological problems of landscape change”

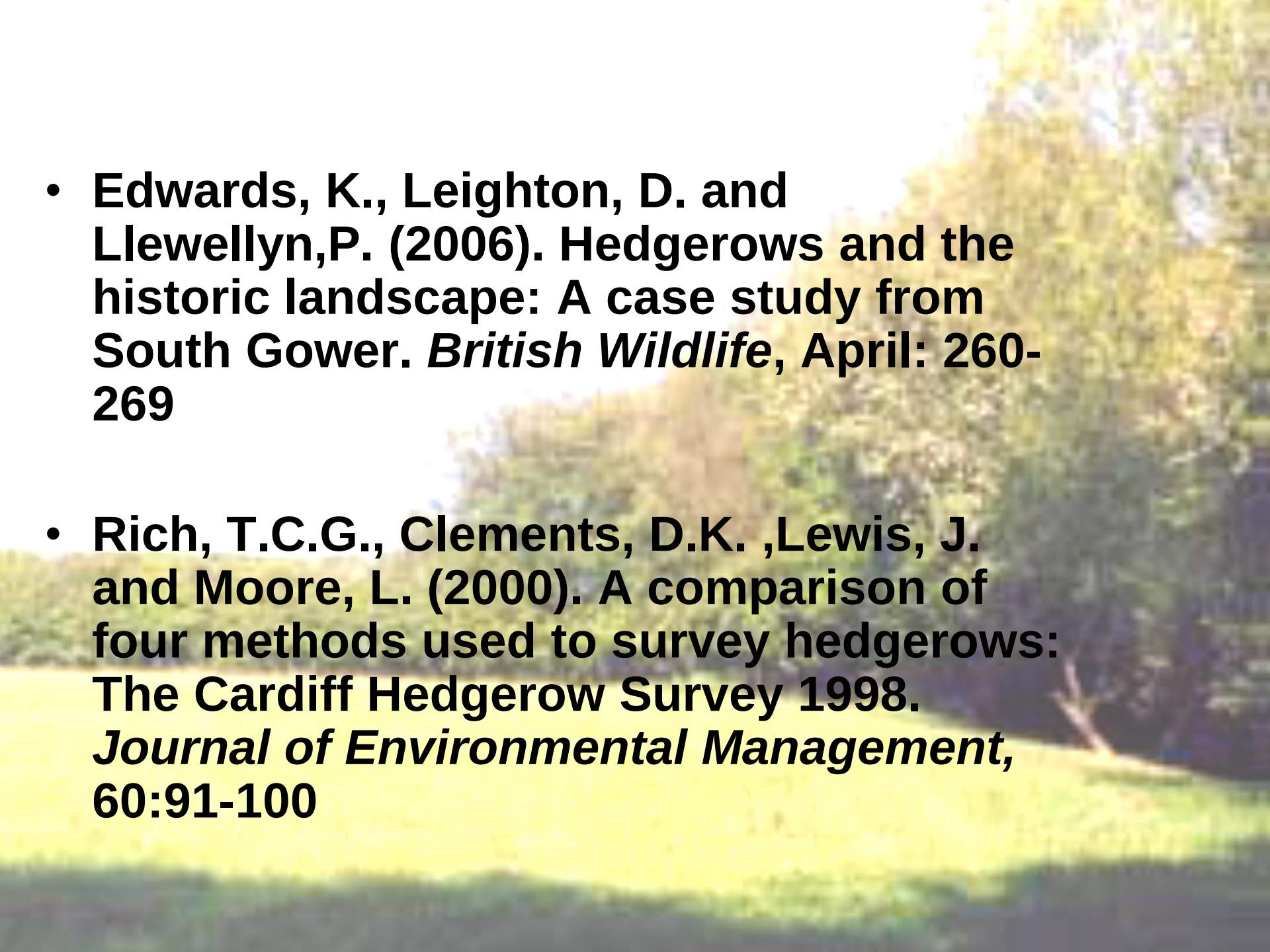
(Edwards et al., 2006:269)



•For Gower, no conclusive distinction in species diversity between assart and enclosure hedgerows.

•As in Carmarthen, ageing a hedge may be better sourced using old archaeological or Tithe maps



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- **Edwards, K., Leighton, D. and Llewellyn, P. (2006). Hedgerows and the historic landscape: A case study from South Gower. *British Wildlife*, April: 260-269**
 - **Rich, T.C.G., Clements, D.K., Lewis, J. and Moore, L. (2000). A comparison of four methods used to survey hedgerows: The Cardiff Hedgerow Survey 1998. *Journal of Environmental Management*, 60:91-100**

- Self Study Question:
- Using the material provided, evidence how conservation management techniques can have a positive impact on species diversity.

