Brackloon Wood - the past, present and future; soil development, climate change, land-use history and their impacts on succession, biodiversity and implications for native woodland management

Dr Declan Little
Project Manager, Woodlands of Ireland

woodlands OF IRELAND

Background

- Ancient woodland – Acidophillous Atlantic oakwood; 74 hectares of sessile oak, ash, elm hazel, birch, mountain ash, holly and willow
- Very high biodiversity value - Special Area of Conservation (SAC) and Natural Heritage Area (pNHA); some rare specialists!
- Flora and fauna studies and surveys during the 1990s
- Focus on land-use history, soil and woodland evolution
- Research and monitoring fed into management to restore and enhance biodiversity

Background

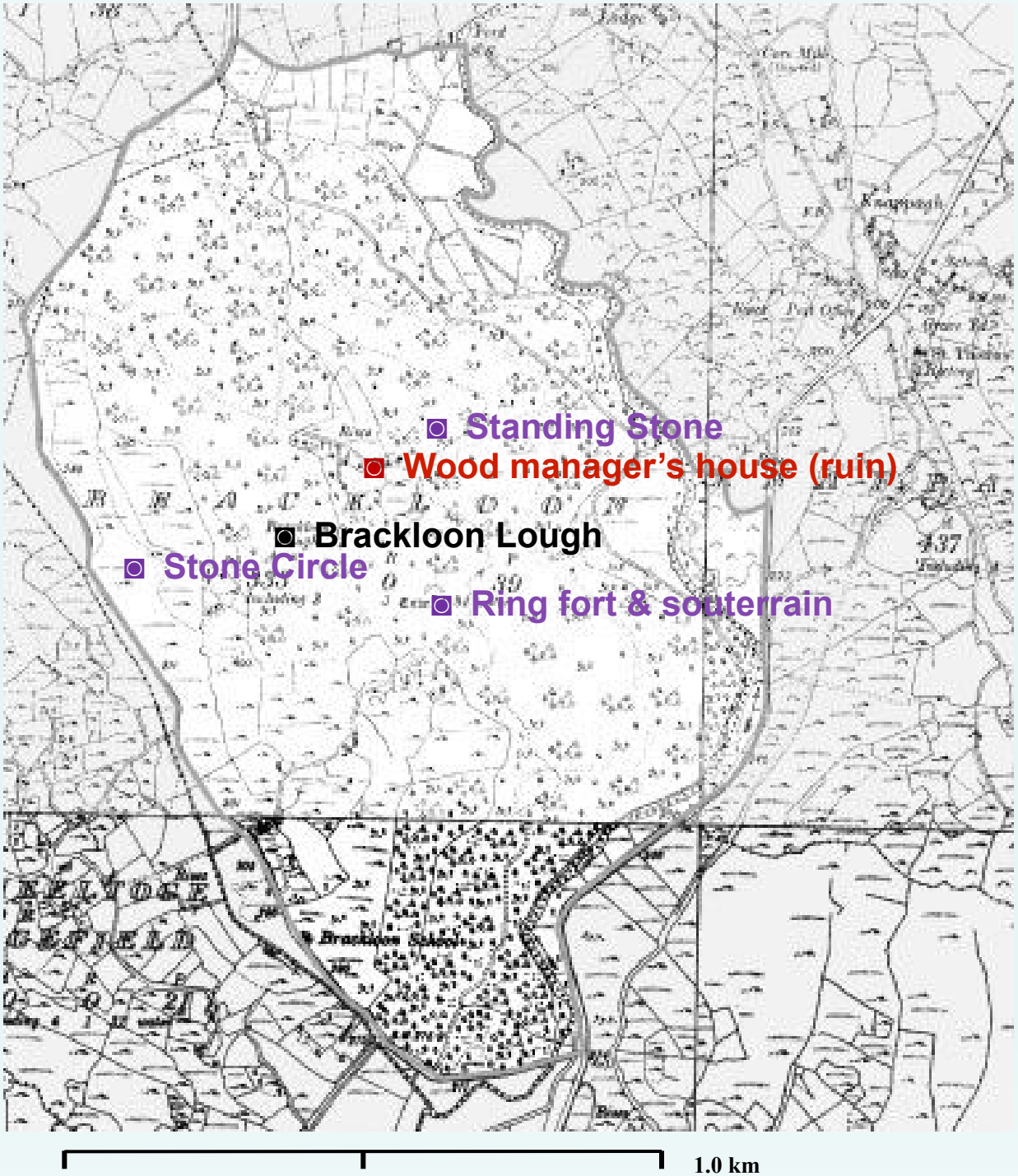
- **Management: the owners, Coillte Teo in co-operation with Sylviron Ltd., and Conservation Volunteers Ireland (CVI)**
  - **Since 1995; biodiversity and restoration**
  - **Pilot Native Woodland Scheme site; 1999**
- **Research and long-term monitoring: Forest Ecosystem Research Group, UCD; 1995-1998**
- **Monitoring: by Coillte since 1991 - EU FOREM project (effects of atmospheric pollution on forest ecosystems)**

→ Engagement/input from the local community

Location and Climate

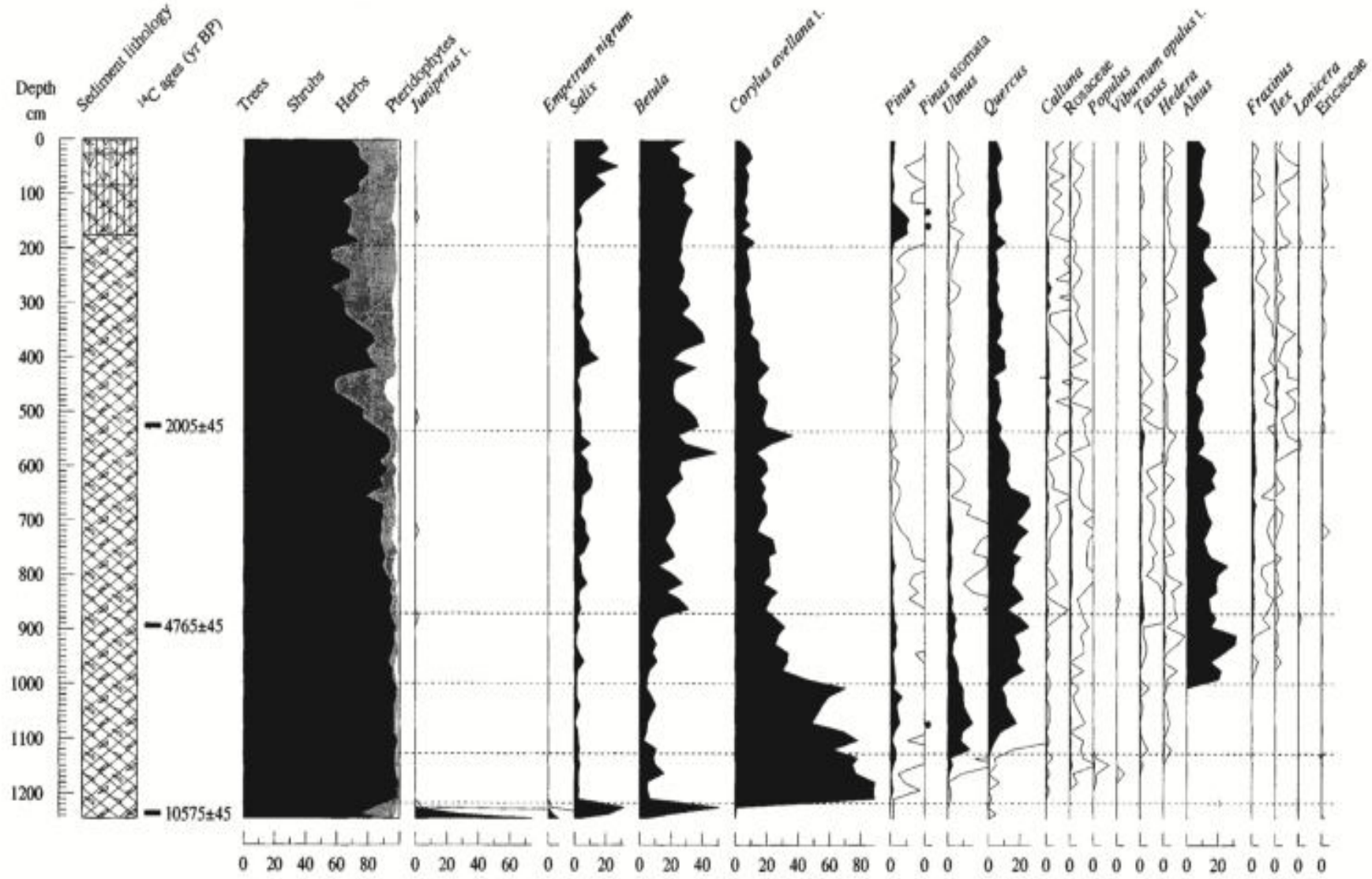
- **Located 7 km SW of Westport, Co. Mayo**
- **Subject to a cool, temperate Oceanic climate with ca. 1500mm precipitation per year**

→ **a *luxuriant carpet of mosses, liverworts and lichens especially on the boughs of trees***



Brackloon Wood, its environs and historical features (Ordnance Survey First Edition, 1842)

Vegetation: Pollen Analyses



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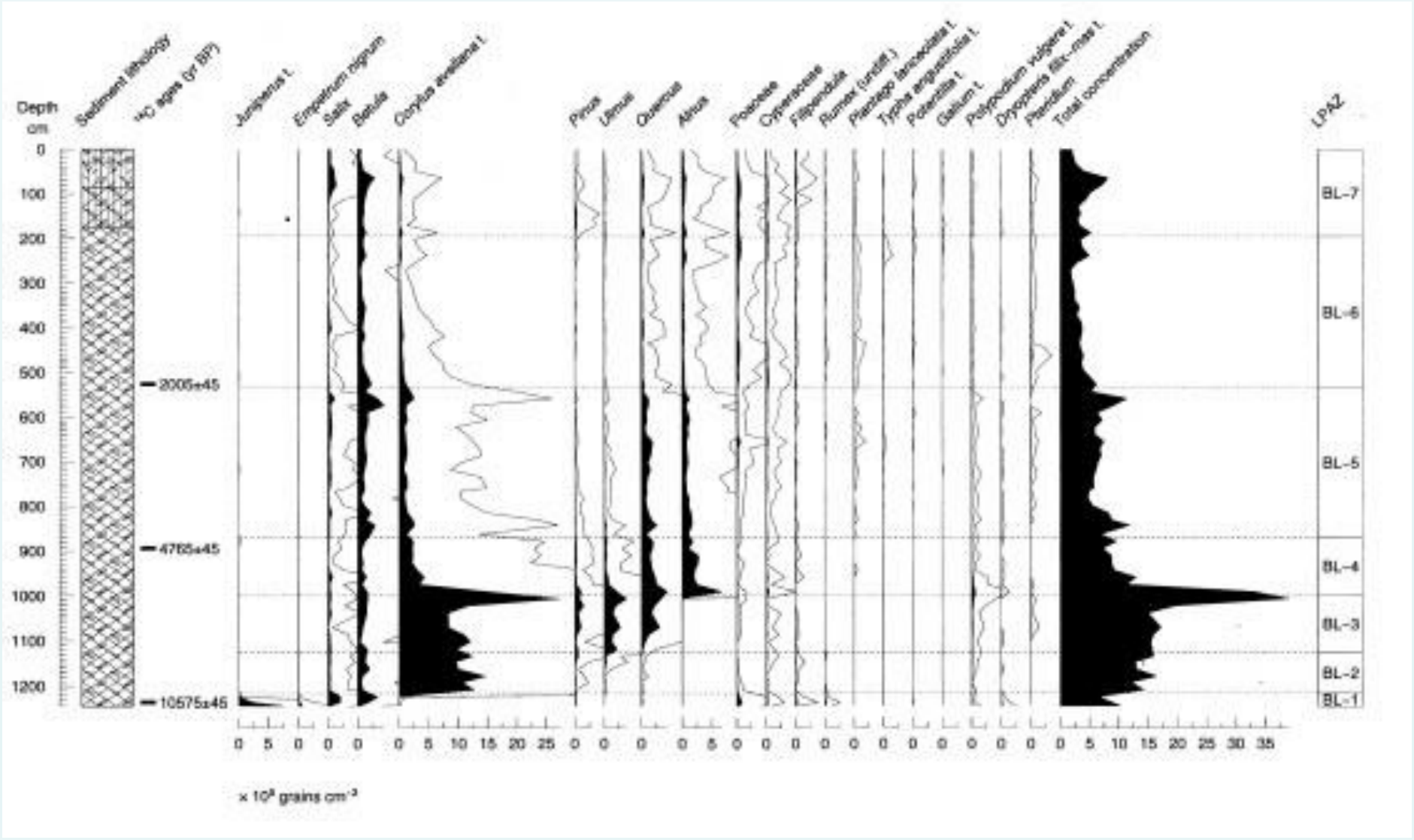
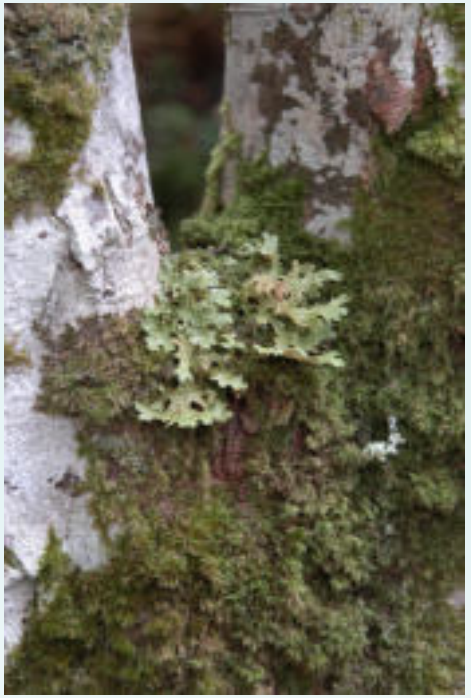


Pollen Analyses - Results

- Neolithic evidence from ca. 5,600 BP
- Permanent settlement from ca. 2,900 BP
- Vegetation change started well before human impact and continued unabated
  - climate change and soil development
  - Dutch elm disease 5,000 BP
  - human impact a principal factor from 5,000 BP; progressive since 2,000 BP
- Elm, hazel and ash; abundant in the past and Scots pine, yew, aspen, juniper, elderberry and crowberry are now extinct

Vegetation

- **Vegetation and bryophyte surveys conclude that, though appreciable, biodiversity negatively impacted by human impact, past management and poor structural diversity, fragmentation, isolation and site limitations**
- **Recent introductions such as beech and rhododendron have serious implications for future management**



Archaeology

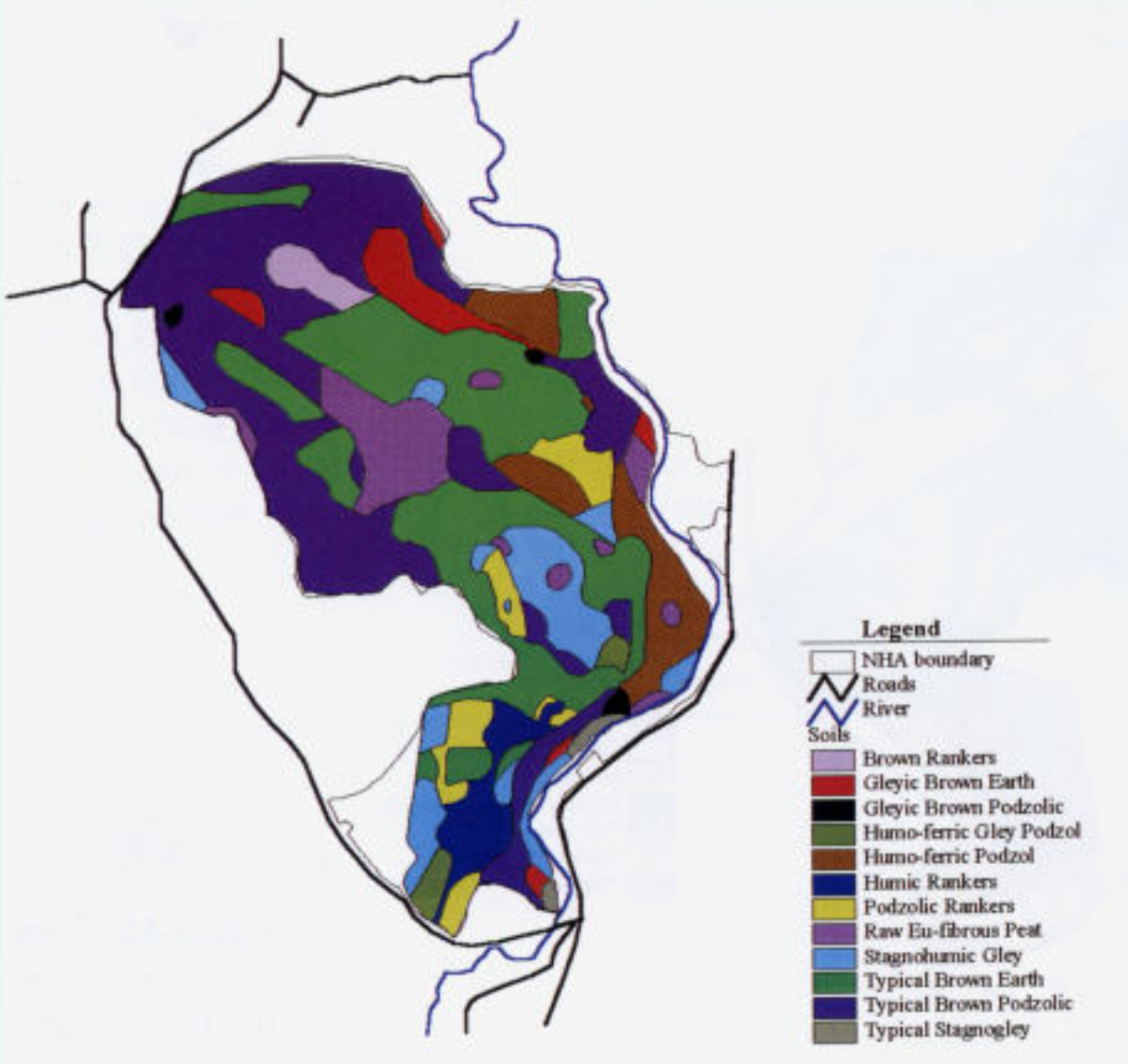
- A Neolithic megalithic tomb (5,000 BP) and 5 fulacht fiadh (3,000 BP) in Brackloon townland
- A stone circle and standing stone in the wood – at least pre-Christian (2,000 BP?)
- A late-Christian cashel/ringfort (1,000 BP) in the wood – pastoral farming!
- Charcoal hearths (400 BP) and charcoal in soils – local furnace during 17th century
- Croagh Patrick Archaeological Survey (2001); appreciable Bronze Age human settlement locally (3,000 BP)

Soil Survey and Analyses

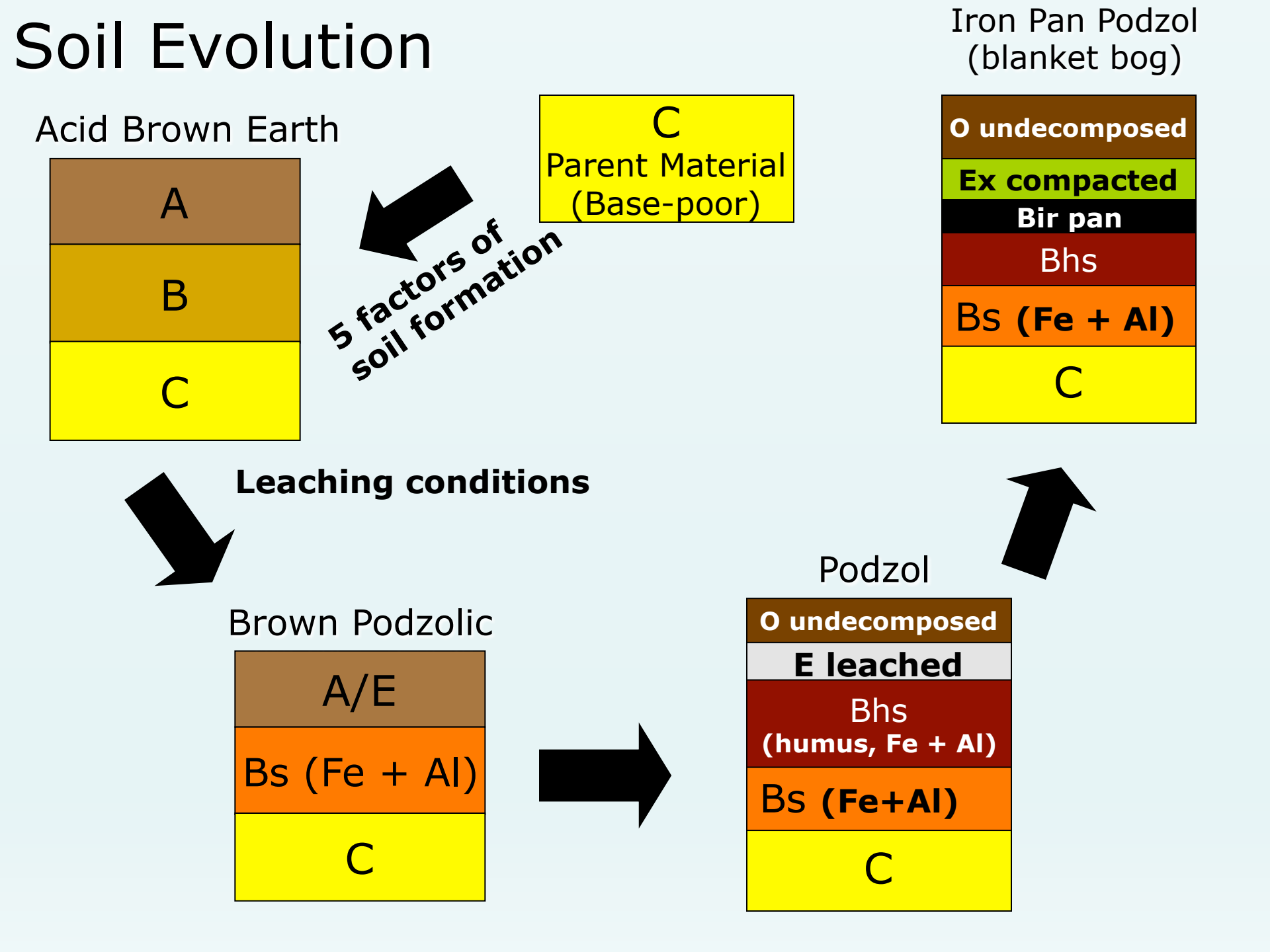
- Detailed soil formation studies undertaken
- Soil parent materials derived from metamorphic base-poor schists and gneiss
- Vegetation succession mirrors soil development and climate change
- Cooler, wetter climate from ca. 4,500 BP resulted in increased leaching of nutrients and podzolisation of soils
- Soil survey shows considerable variation in soil types
- Mineralogical analyses of soil parent material indicates all soils are derived from very similar substrates
- Soil fauna communities reflect changes in soil variation even over short distances

→ fragmentation and isolation

Soil Map of Brackloon Wood



Soil Evolution



Soil Mineralogical Data

Table 1: Mineralogical analysis of four soil types at Brackloon Wood, Co. Mayo.

Soil Type	Horizon	Quartz	Albite	K-feldspar	Chlorite	Illite	Hematite	Kaolin	Geothite
Typical Brown Earth	C	51.4	14.2	4.0	9.8	0.7	0.7	-	-
Typical Brown Podzolic	B/C	48.9	18.4	3.0	4.7	0.8	0.8	-	-
Stagnohumic Gley	B/C	41.9	19.0	2.8	12.2	0.8	0.8	-	-
Humo-ferric Podzol	C	53.6	16.3	4.1	6.7	0.4	0.4	1.0	0.4

Soil fauna

- Earthworms surveyed in spring and autumn 1998 at 4 sites, i.e. brown earth, brown podzolic, podzol and gley
- Species: brown earth (11) > gley (7) > brown podzolic and podzol (3 each)
- Biomass: brown earth (260) > gley (80) > brown podzolic (30) > podzol (20)

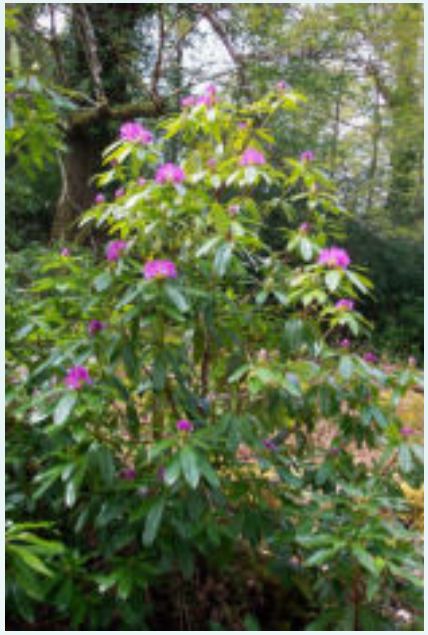
- Brown earths – epigeic and endogeic (litter/ surface dwellers and burrowers); gleys – epi-endogeic; brown podzolics and podzols – epigeic only

Pulling it all together!

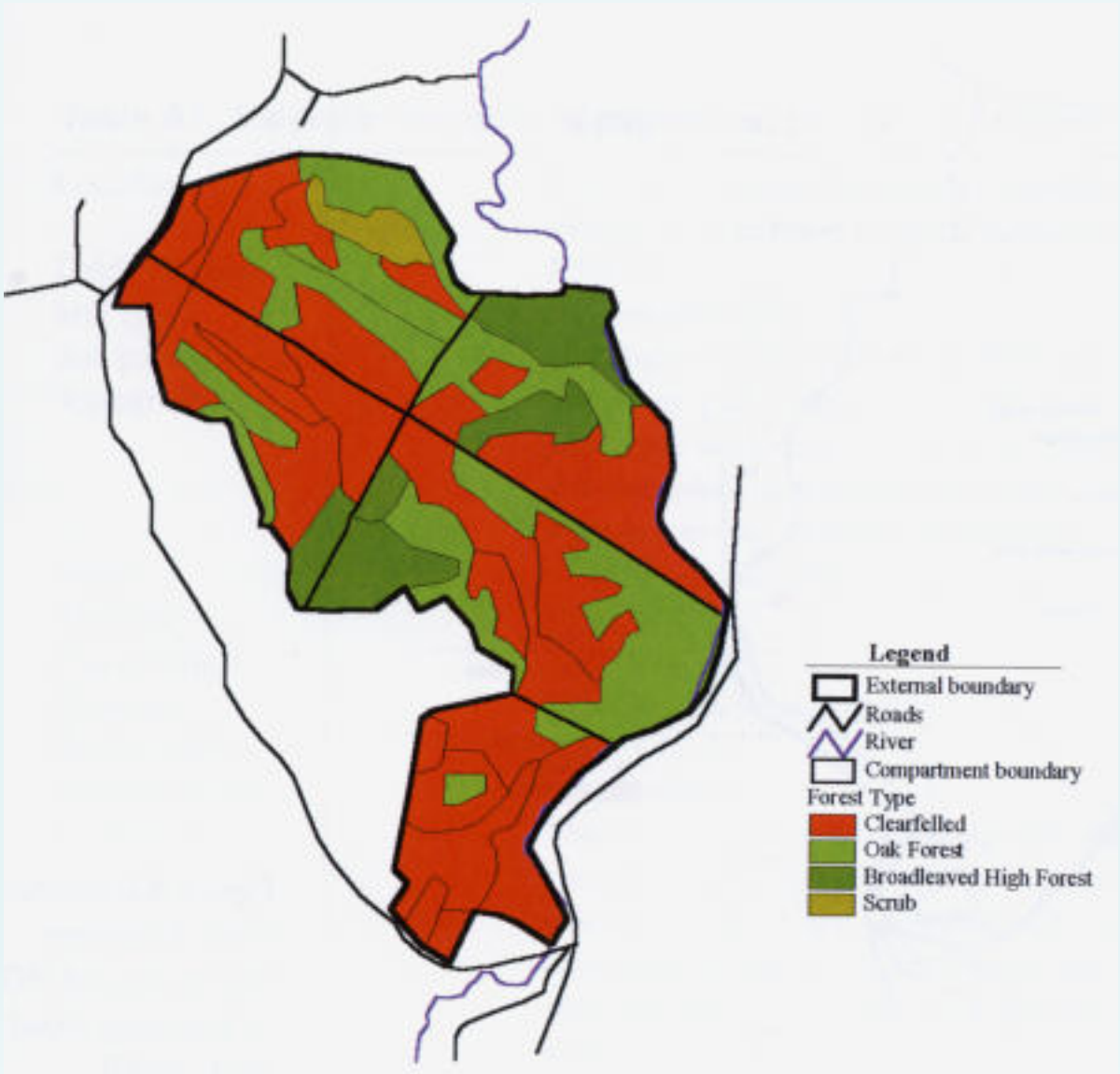
- **Pollen analyses, radiocarbon dating, prehistoric archaeology, historical records, soil, fauna and flora studies indicate continuous change and disruption of woodland dynamics**
- **Climate change and disease impacts**
- **Human impact considerable over millennia, particularly repeated clearing/felling**
- **Resulted in depleted biodiversity, fragmentation and soil impoverishment**
- ***Serious implications for future management!***

Management Operations: 1999 - 2002

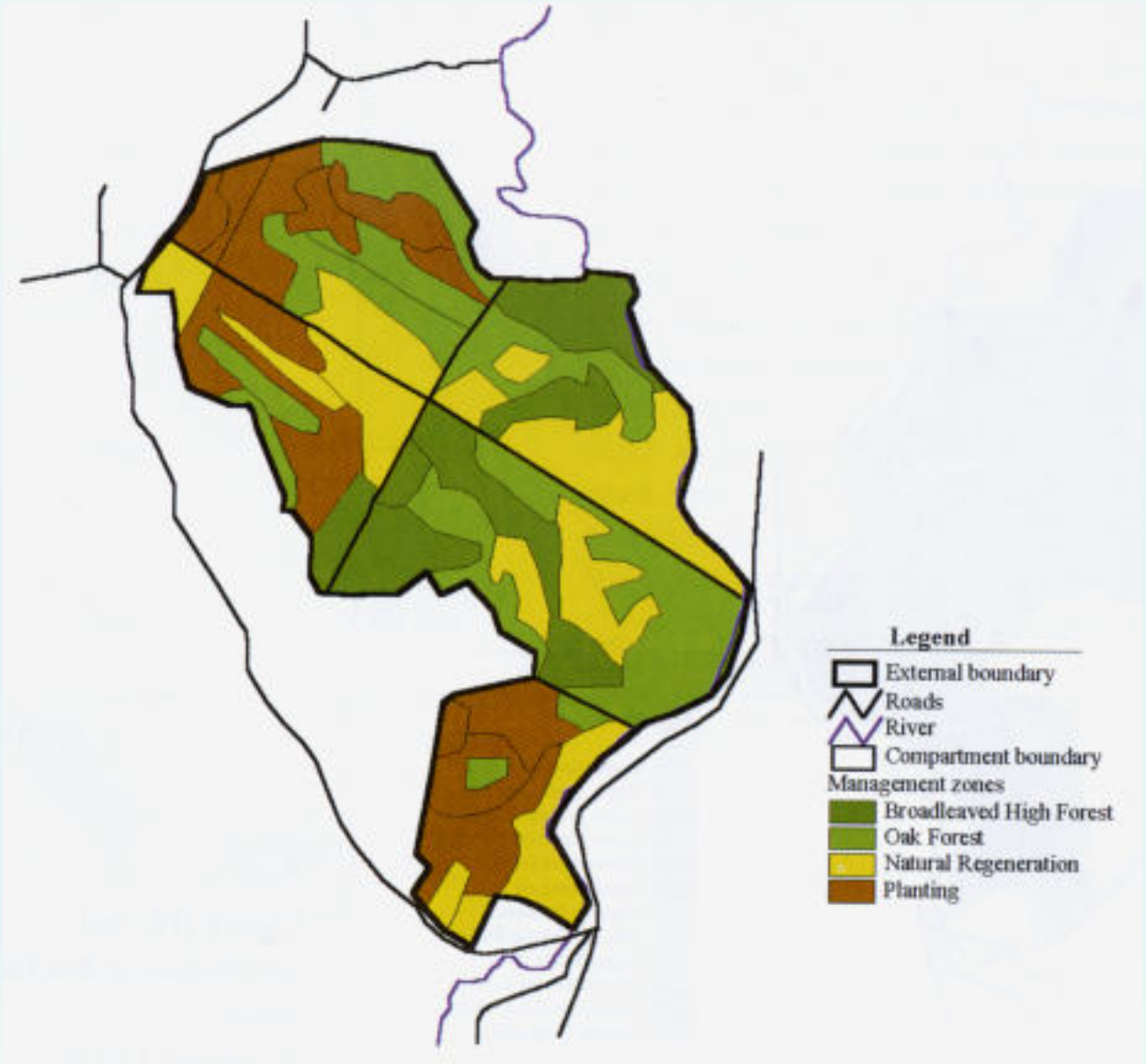
- Removal of exotic and naturalised species (rhododendron, underplanted conifers and beech)
- Reduction of grazing pressure – fencing
- Defragmentation – enrichment planting and natural regeneration
- Age and species diversification - planted Scots pine, oak, ash, cherry, hazel, alder and hawthorn; natural regeneration of birch, holly and willow
- Limited wood production – birch



Woodland Structure, 1996



Woodland Structure today



Key issues

- What type of woodland should we promote, how and at what scale?
- Where soils are severely degraded areas should woodland be promoted at all?
- Should the current even-aged oak canopy be re-structured?
- Is wood production appropriate?
- What about the wider landscape locally?
- Climate change and diseases – future considerations

Conclusions

- Research and land-use history informs management
- Set out management objectives clearly and lay the foundations for future viability
- Excessive management in a short period may be detrimental
- Management outcomes should be assessed at intervals
- Don’t be afraid to change management objectives
- As history and culture of considerable interest locally, involve the local community!