

Forests, Carbon and Climate Change Mitigation

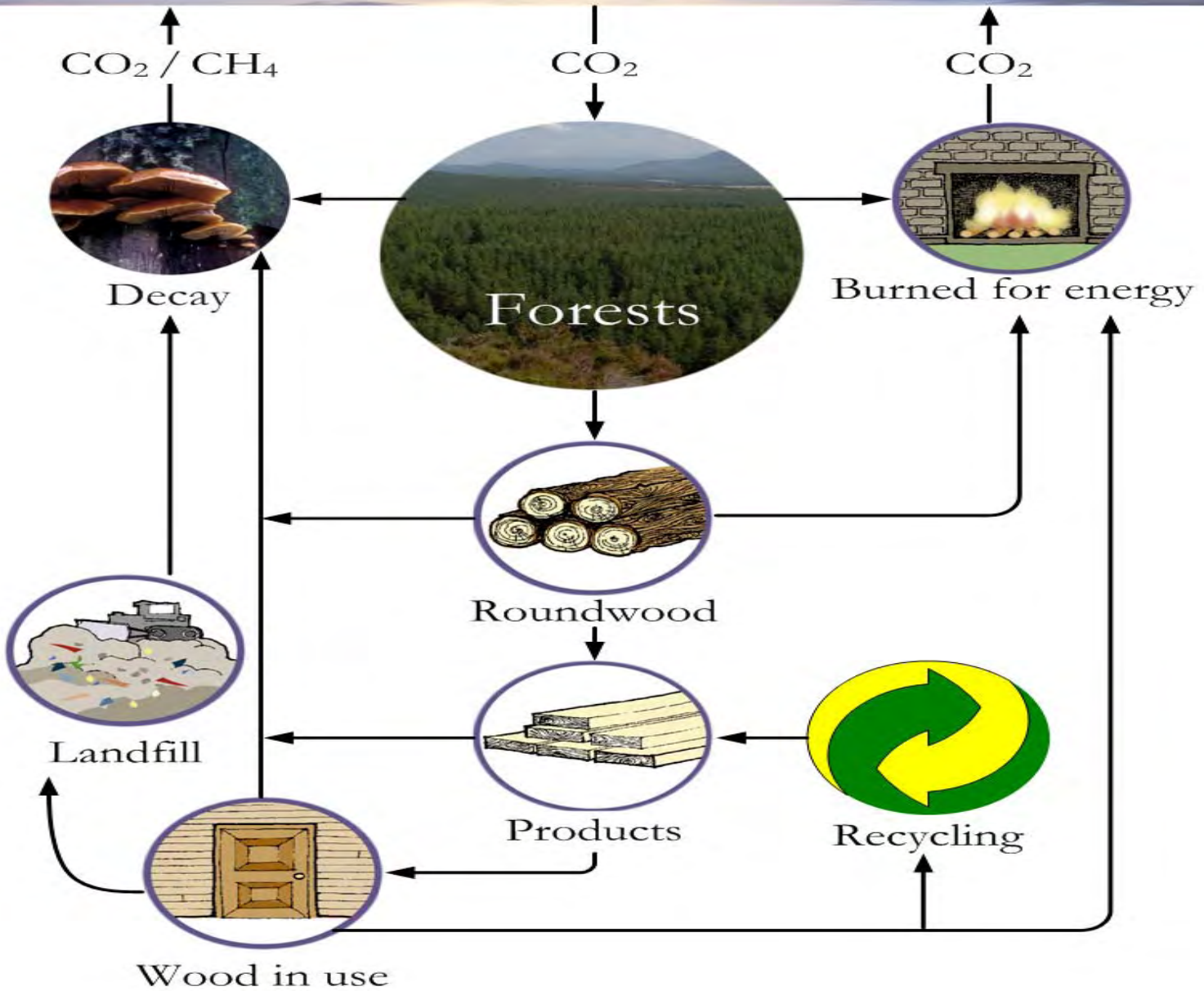


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What this presentation is about

- An overview of the ways forests and forest management can contribute to climate change mitigation
- Recent forestry and carbon studies in North East England
- The potential contribution that forestry can make to GHG emission reduction in North East England

Atmosphere



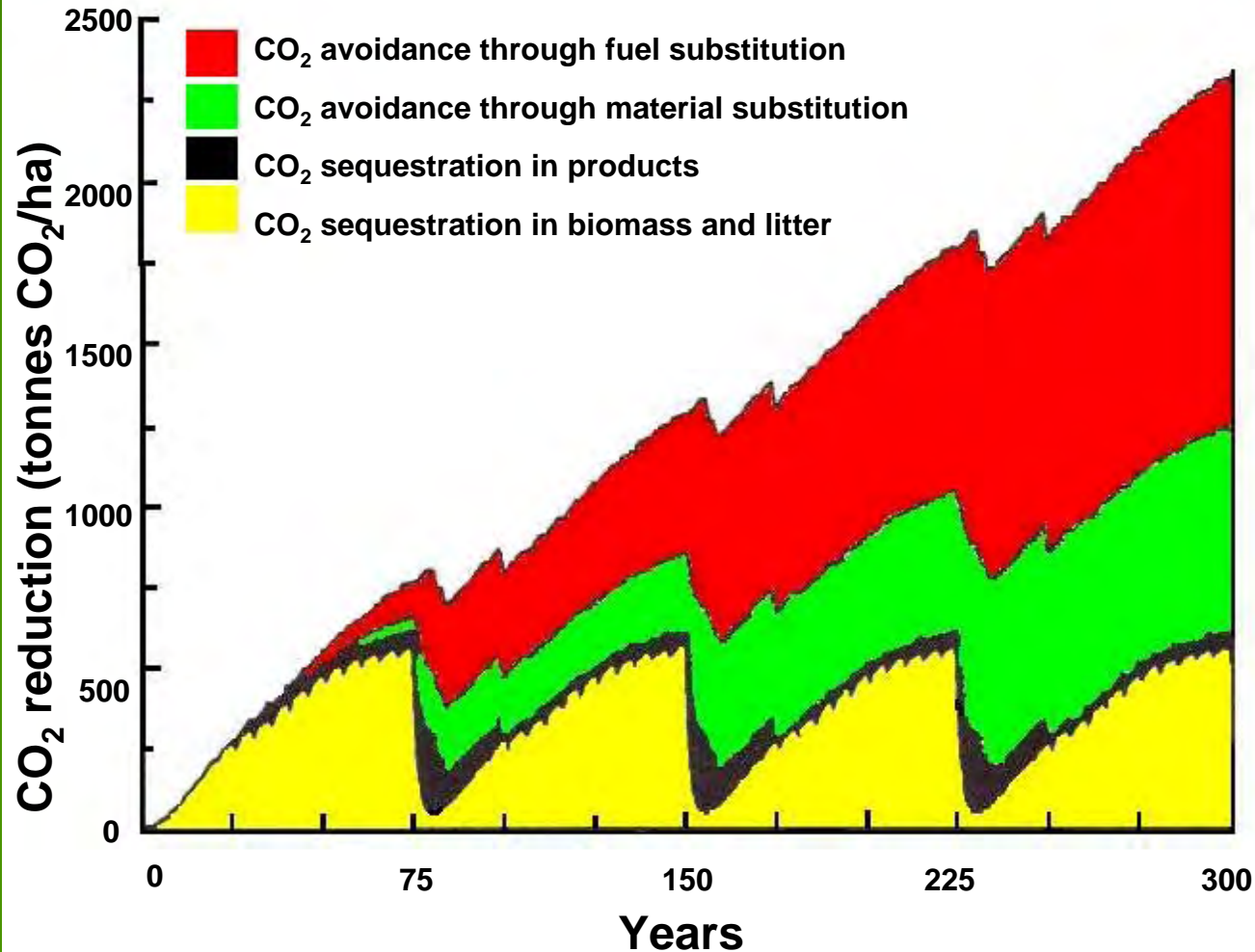
Forests: Carbon Stores and Gains

- Carbon stored in trees
 - Above ground
 - Below ground
- Carbon stored in the soil
- Carbon stored in wood products

- Carbon gain from material substitution
- Carbon gain from woodfuel
- Carbon gain from land-use change

Cumulative carbon storage and emission reductions

From Nabuurs (1996) - Norway spruce 75 year rotations



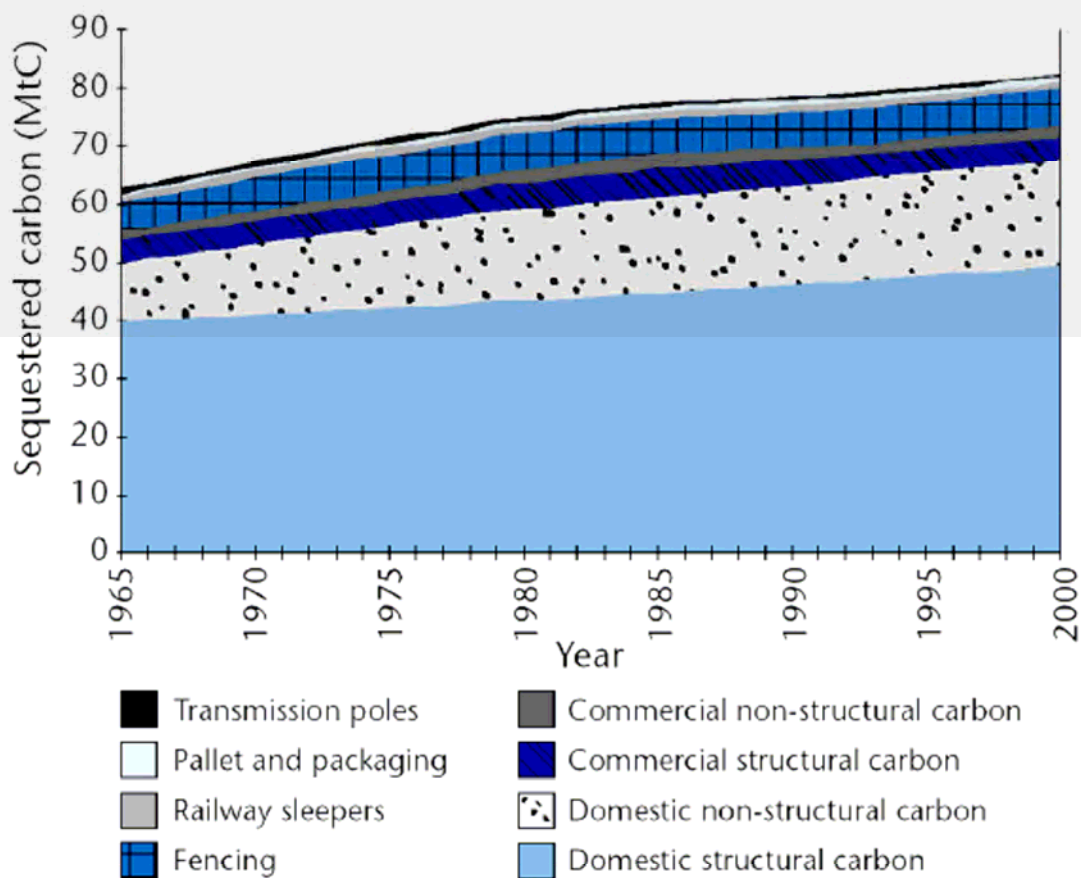
UK Forestry and Carbon: Some Numbers

- C store in forest trees 150 million tonnes
- C store in forest soils 244 million tonnes
- C store in wood products 80 million tonnes

- Current C sequestration in forests
 - 4.0 million tonnes per annum
- Current C removals in harvested wood products
 - 2.0 million tonnes per annum

- Current UK GHG emissions – 151 million tonnes carbon equivalent per annum (554 million tonnes CO₂ equivalent)
 - From agriculture – 10.5 million tonnes carbon per annum

UK carbon stocks in wood products - a forgotten contribution?



Source: Broadmeadow and Matthews (2003); FCIN48 ([http://www.forestresearch.gov.uk/pdf/fcin048.pdf/\\$FILE/fcin048.pdf](http://www.forestresearch.gov.uk/pdf/fcin048.pdf/$FILE/fcin048.pdf))

Recent Forestry carbon Research in North East England

- Carbon account for Kielder Forest
- Carbon in existing woodlands in Northumberland National Park
- Carbon gains through woodland creation in Northumberland National Park

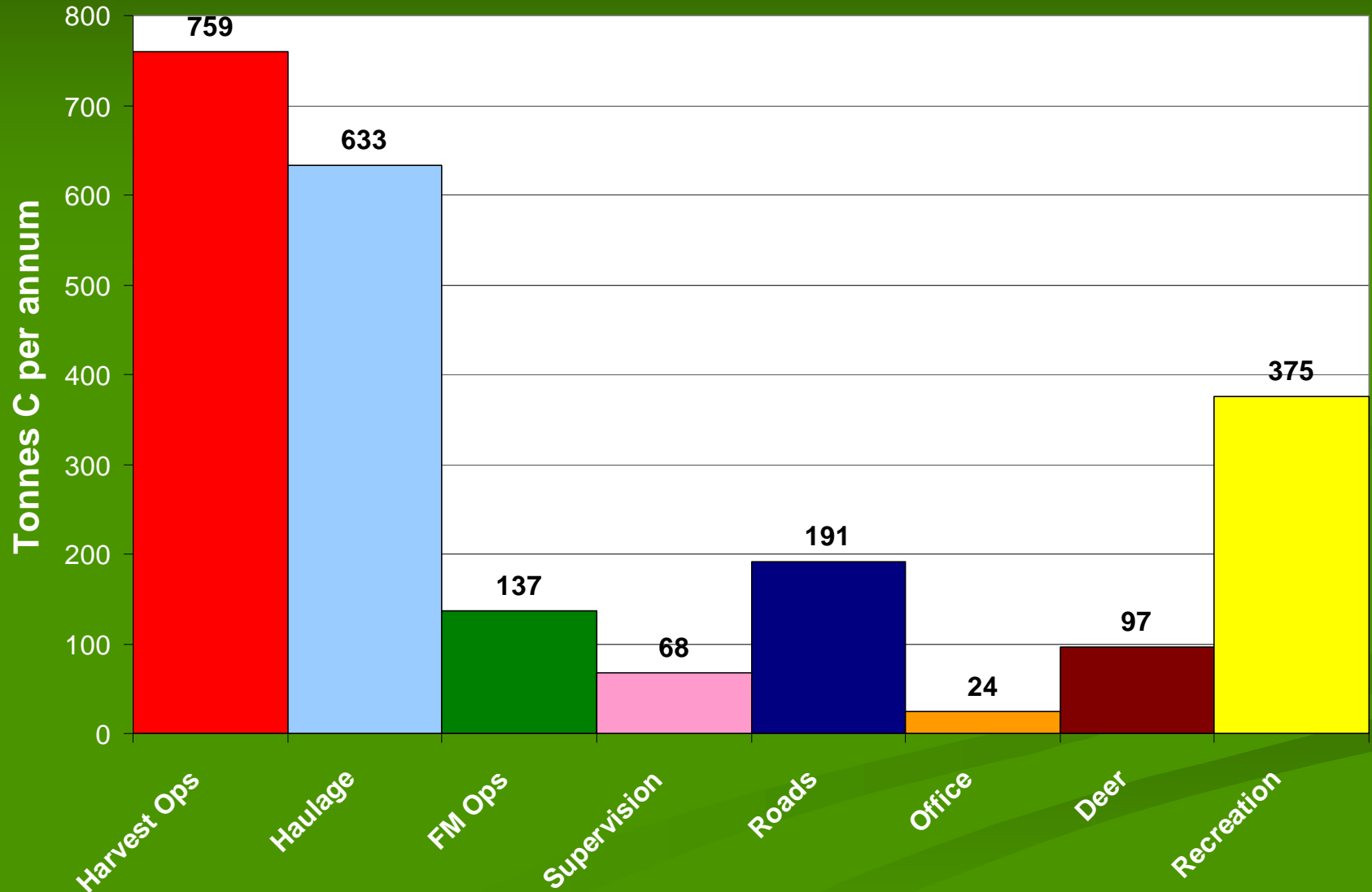
Carbon in Kielder Forest

Source	Tonnes carbon
Above ground standing tree biomass	1,696,300
Forest soils	5,714,000 to 7,583,000
Annual sequestration in standing trees	81,720
Annual removals in harvested products	79,000
Potential storage in wood products	1,532,000
Annual gain from material substitution	101,800
Annual emissions from forest operations	2288

Annual carbon emissions: Kielder

Source	Tonnes carbon per annum	% of total	% of total excl. Deer and Recreation
Harvesting Operations	759	33	42
Timber Haulage	633	28	35
FM Operations	137	6	8
Operators/Supervision	68	3	4
Roads	191	8	10
Office Energy	24	1	1
Deer (C equivalent)	97	4	-
Recreation	375	17	-
TOTAL	2288	100	100
Total per m ³ (kg)	4.9		3.9
Total per hectare (kg)	57.3		45.4

Annual carbon emissions: Kielder



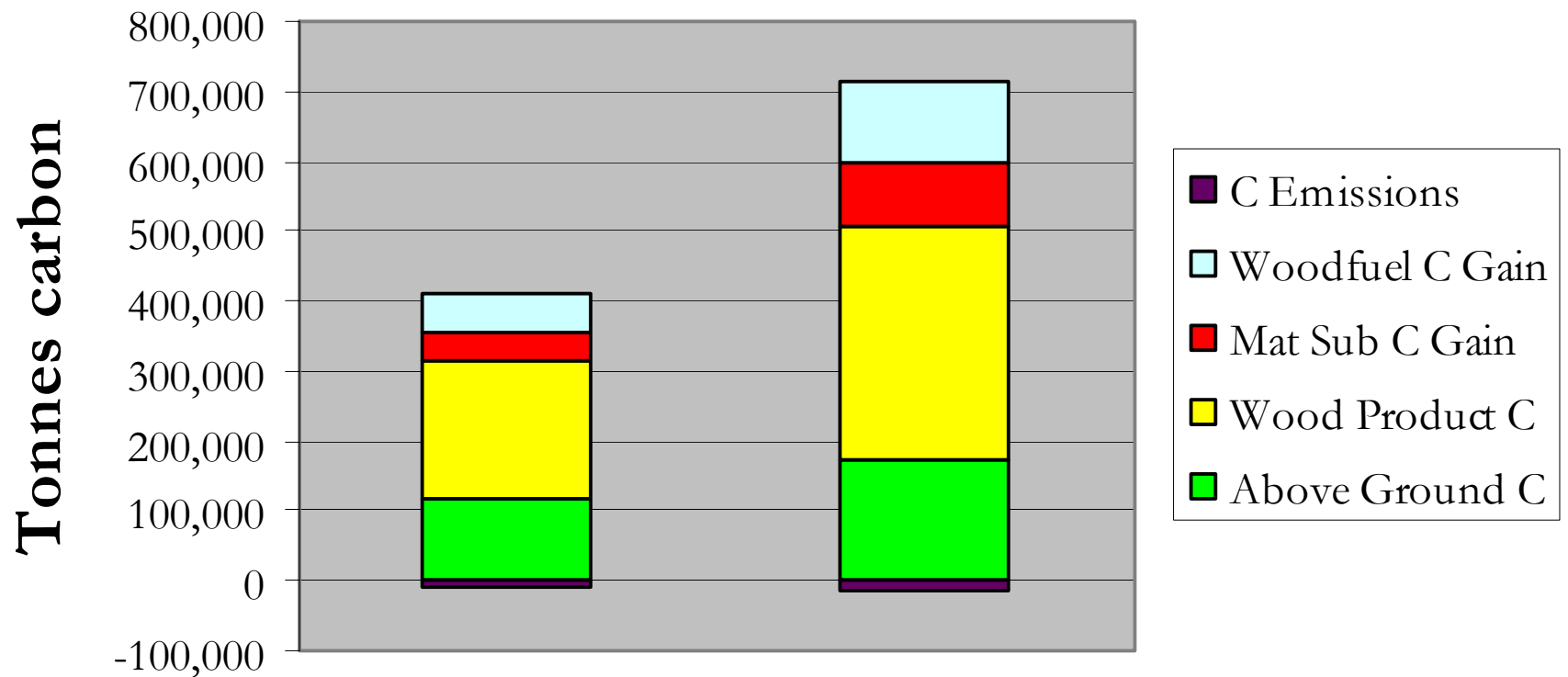
Carbon in existing woodlands in Northumberland National Park

Source	Tonnes carbon
■ Currently stored in above ground biomass	749,069
■ Annual sequestration (above ground)	44,094
■ Annual addition to wood product store	27,855
■ Annual material substitution gain	4,181
■ Annual woodfuel gain	3,286
■ Annual emissions	717

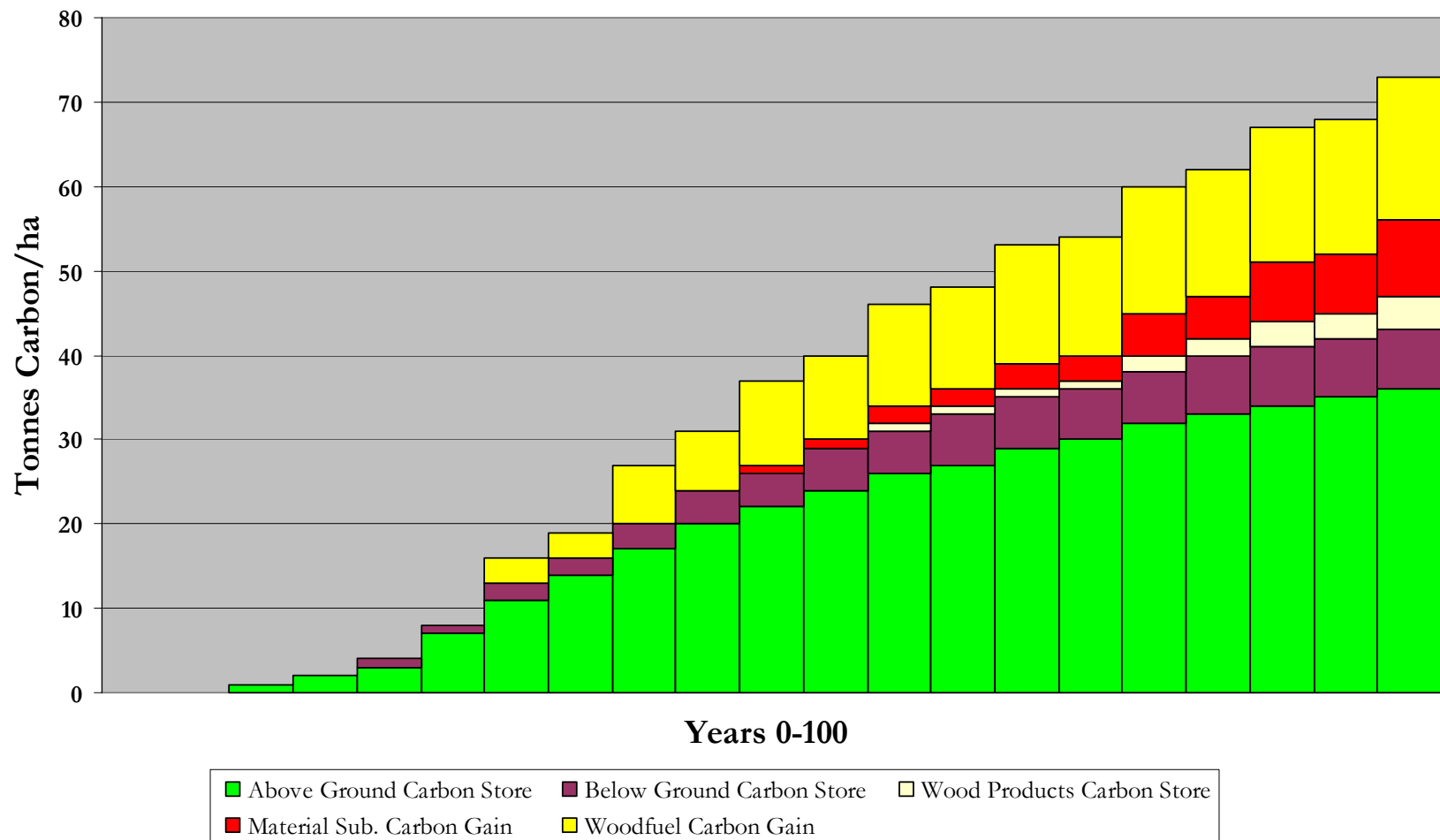
Carbon Gains in NNP Woodlands over 10 and 20 years

Source of Carbon Gain	Gain by 2018 (tonnes carbon)	Gain by 2028 (tonnes carbon)
Increase in carbon stored in above ground biomass	119,208	171,913
Addition to carbon stored in wood products	193,312	335,446
Material substitution carbon gain	41,810	88,898
Woodfuel carbon gain	57,068	118,888
Woodland Management carbon emissions	-7,185	-13,793
Totals	404,213	701,352
Total per hectare	20.5	35.5
Total per hectare per annum	2.05	1.78

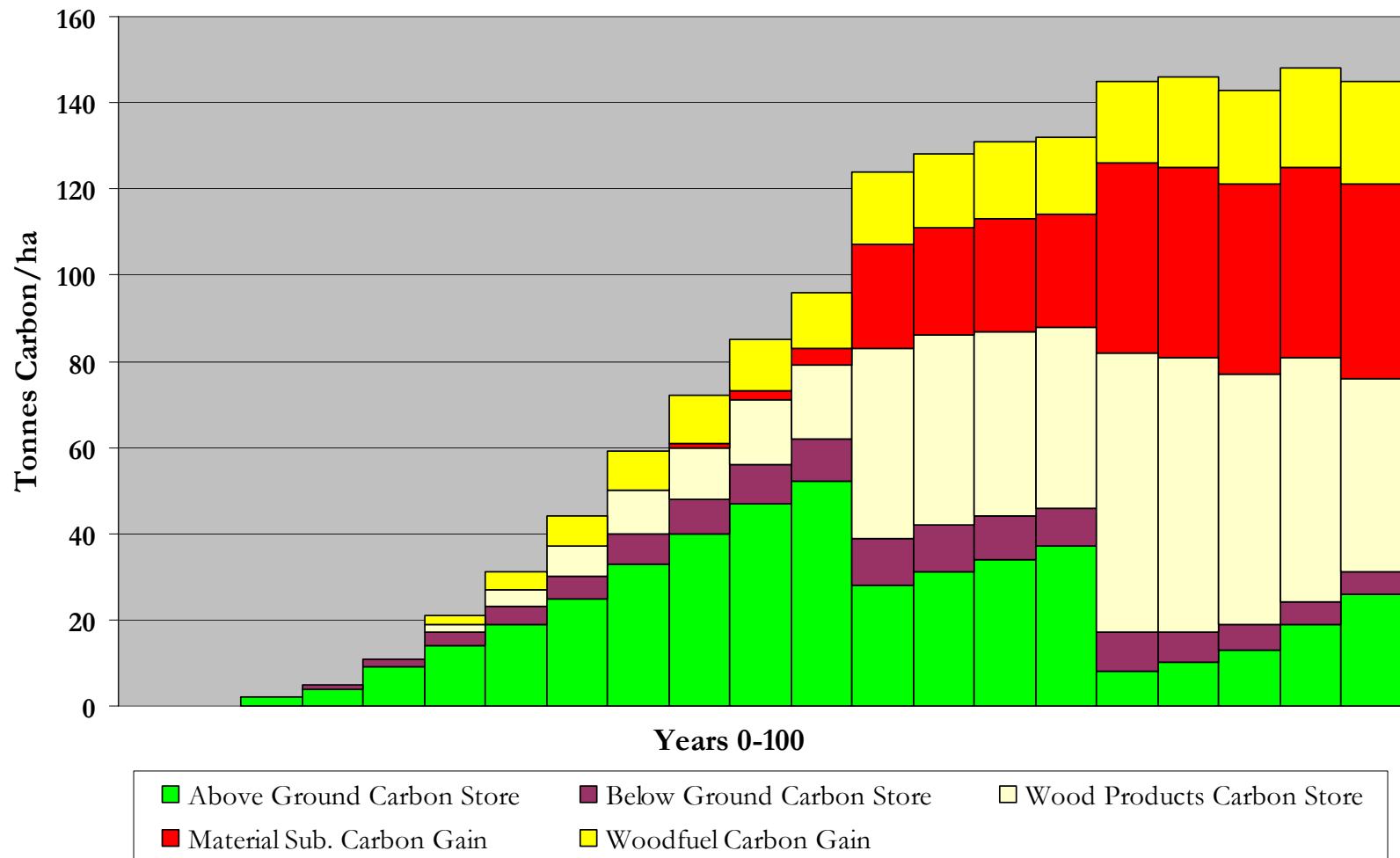
Net Carbon Gain in Northumberland National Park Woodlands by 2018 and 2028



Carbon Gains for NNP Native Woodland Model: 100 Years



Carbon Gains for NNP Conifer Model: 100 Years



Potential Contribution of Forestry to GHG emissions reduction in NEE

- Existing woodlands
- New Woodlands

Potential Contribution: Existing Woodlands

- Carbon Gain over 20 years - 20,000 hectares
 - = 700,000 tonnes
 - = 35,000 tonnes per annum
- Over 100,000 hectares (NE England)
 - = 175,000 tonnes per annum

Potential Contribution: New Woodlands

- NNP Conifer Model – Carbon Gain (100 years)
= 1.4 tonnes C per hectare per annum
- Higher yielding forests
 - 2.4 tonnes C per annum
- Include soil C gains
 - 2.7 tonnes C per annum
- Include land use change
 - 3.3 tonnes C per annum

Potential Contribution of Forestry in NE England

- Current emissions from agriculture
 - 373,000 tonnes C per annum
- Deduct existing woodlands (175,000 pa)
 - 198,000 tonnes C per annum
- To become carbon neutral (land use) would require an additional 60,000 hectares of forest

Conclusions

- More of:
land use policy thinking
- Less of:
wasting carbon
- Differently:
living!
rediscovering wood