Woodlands and Carbon in the Lake District National Park

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Outline

- Woodland resource in the LDNP
- Carbon storage in LDNP woodlands
- Carbon sequestration in LDNP woodlands
- Carbon Gains – wood products and substitution
- Woodland creation and carbon
- So what: the wider context
Woodland Resource in the LDNP

- Woodlands – NIWT 1999 – 28,412 hectares
  - 40% conifer
  - 42% broadleaf
  - 8% mixed
  - 0.3% coppice
  - 2.3% felled/windblow
  - 7.6% open space
  - 33% managed by FE

Source: FC National Inventory of Woodlands and Trees 2002
Carbon Storage in LDNP High Forest

Conifers: 5.2 million tonnes of CO2
(410 tonnes per hectare)

Broadleaves: 7.4 million tonnes of CO2
(569 tonnes per hectare)

Total: 12.6 million tonnes of CO2
Chart 1: Carbon stored in tree biomass shown by species group

- Spruce
- Larch
- Other cons
- Ash/syc/bi
- Oak
- Other bdls
Chart 2: Carbon stored in tree biomass shown by planting year class

- 000 tonnes CO2
- Broadleaves
- Conifers

Year classes:
- 91-99
- 81-90
- 71-80
- 61-70
- 51-60
- 41-50
- 31-40
- 21-30
- Pre 1921
Carbon Sequestration in LDNP High Forest

Conifers: 103,740 tonnes CO2 per annum
(8.2 tonnes/ha/annum)

Broadleaves: 55,860 tonnes CO2 per annum
(4.3 tonnes/ha/annum)

Total: 159,600 tonnes CO2 per annum
Net Carbon Sequestration in LDNP Woodlands

- Conifers: 46,480 tonnes CO2 per annum
  (3.7 tonnes CO2/ha/annum)

- Broadleaves: 51,020 tonnes CO2 per annum
  (3.9 tonnes CO2/ha/annum)

Total: 97,500 tonnes CO2 per annum
Carbon Stores, Emissions and Gains

- **Carbon Stores:**
  1. Above ground biomass
  2. Below ground biomass
  3. Wood products
  4. Change in soil carbon store

- **Carbon Emissions**
  1. Forest management and harvesting
  2. Timber transport
  3. Product manufacture

- **Carbon Gains/Losses**
  1. Direct substitution – woodfuel
  2. Material substitution
  3. Net carbon balance from land use change
# Summary Carbon Account for LDNP woodlands

<table>
<thead>
<tr>
<th>Item</th>
<th>Conifers (tCO2)</th>
<th>Broadleaves (tCO2)</th>
<th>Total (tCO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual sequestration in tree biomass</td>
<td>103,460</td>
<td>56,140</td>
<td>159,600</td>
</tr>
<tr>
<td>Removed in harvesting</td>
<td>57,260</td>
<td>4,840</td>
<td>62,100</td>
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<tr>
<td>Net annual sequestration</td>
<td>46,200</td>
<td>51,300</td>
<td>97,500</td>
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<tr>
<td>Added to wood product C store</td>
<td>34,190</td>
<td>1,400</td>
<td>35,590</td>
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<td>Material substitution C gain</td>
<td>20,900</td>
<td>600</td>
<td>21,500</td>
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<tr>
<td>Woodfuel C gain</td>
<td>9,350</td>
<td>2,210</td>
<td>11,560</td>
</tr>
<tr>
<td>Operational emissions</td>
<td>1,360</td>
<td>50</td>
<td>1,410</td>
</tr>
<tr>
<td>Total net C gain</td>
<td>109,280</td>
<td>55,460</td>
<td>164,740</td>
</tr>
<tr>
<td>Net C gain per ha</td>
<td>8.7</td>
<td>4.2</td>
<td>6.4</td>
</tr>
</tbody>
</table>
Carbon Chart for LDNP Native Woodland Model: 100 Years

- Woodfuel Carbon Gain
- Material Sub. Carbon Gain
- Wood Products Carbon Store
- Tree Biomass Carbon Store

Years 0-100
Tonnes CO2/ha

#REF!
Carbon Chart for LDNP Conifer Model: 100 Years

- Woodfuel Carbon Gain
- Material Sub. Carbon Gain
- Wood Products Carbon Store
- #REF!
- Tree Biomass Carbon Store

Y-axis: Tonnes CO2/ha
X-axis: Years 0-100
So What?

- Lake District currently responsible for GHG emissions of 2.3 million tonnes CO2 per annum

- Target to reduce this by 1% (i.e. 23,000 tonnes) per annum

- A 1% improvement in the carbon performance of existing LDNP woodlands would contribute 7% towards the target

- A mixed woodland planting programme of 350 hectares per annum would contribute 10% towards the target