

# National Forest Inventory Woodland Area Statistics: Scotland

26 May 2011

This publication contains initial provisional statistics for Scotland on:

- Woodland area at 31 March 2010; and
- Areas of new planting and observed woodland loss for 1995-96 to 2009-10.

The woodland area statistics in this release make use of the 2010 National Forest Inventory map and woodland grant maps for 1989-90 to 2007-08 and Forestry Commission administrative data.

The main findings are:

- The area of woodland in Scotland at 31 March 2010 is estimated to be 1,385 thousand hectares. This is 17.8% of the total land area in Scotland.
- The estimate of 1,385 thousand hectares of woodland in Scotland at 31 March 2010 is around 42 thousand hectares more than the previously published estimate for 2010.

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## Introduction

The Forestry Commission's National Forest Inventory (NFI) is to be a continuous inventory of Britain's woodlands conducted on a five year cycle. The elements of the inventory are a digital map of woodland in Britain constructed from aerial photography, complemented by other sources of information, and a programme of ground surveying of woodland using a representative sample drawn from the woodland and forested areas of Great Britain.

A completed version of the digital map is now available and is used to derive the statistics on woodland area reported here. The programme of ground surveying is currently in progress but the results from this are not yet available for use. In this report, total woodland area and information on woodland gain and woodland loss is derived for Scotland at the country level from the NFI map and certain other sources of information described in the body of the report and in the appendices. Later reports will utilise information from the ground survey programme and will provide profiles and breakdowns of the total woodland area on a regional basis and by type of woodland, including estimated areas of broadleaf and conifer woodland and their stocking levels.

The National Forest Inventory is the first continuous inventory of British forests and woodlands. It succeeds a series of single inventories produced by the Forestry Commission, the most recent of which was the National Inventory of Woodland and Trees (NIWT). This also involved the production of a digital woodland map from aerial photography and a programme of field surveys.

The previous estimate of total woodland area for Scotland for 2010, published in Forestry Statistics 2010, was partially based on annual updating of woodland area estimates derived from the NIWT map. The base year of the NIWT map for Scotland was 1995, and a programme of work has been underway to compare the spatial information in the NIWT and NFI maps and the woodland area statistics derived from them. The emerging conclusions from this exercise are provided in this report and are utilised in deriving the new estimate of total woodland area for Scotland, and information on woodland gain and woodland loss.

Estimates of total woodland area, woodland gain and woodland loss are conditional upon the definitions used in NIWT and NFI. The definitions used by NFI are described in full in the relevant sections of this report, and are expanded in Appendix 1 on Background and Definitions. These differ in some respects from the definitions used by NIWT and by other reports on woodland area, including the previous estimates of total woodland area published in Forestry Statistics 2010. NFI uses an observational approach to estimating woodland area, augmented by reported activity in respect of new planting, and specific tests and conventions in defining the existence and timing of woodland loss in line with international conventions. In the estimation and timing of woodland loss, NFI does not use information on intent or declared policy, which is a different approach to that used in some other contexts.

NFI-based estimates will form the basis of future reporting by the Forestry Commission on woodland areas within Great Britain. Using information from the ongoing ground survey, the NFI will also be used to inform softwood and hardwood timber production forecasts, reports on woodland structure, and other economic, ecological, environmental and social aspects of British woodlands.

## Area of Woodland at March 2010

**The total area of woodland in Scotland is estimated to be 1,385 thousand hectares. This is 17.8% of the total land area in Scotland.**

This estimate is based upon the NFI definition of woodland and on current assessments of woodland gain that are not captured in the aerial photography used to produce the NFI woodland map of Scotland. In the National Forest Inventory, woodland is defined as areas with a canopy cover of 20% or more (or the potential to achieve this), with a minimum area of 0.5 hectares and a minimum width of 20 metres. Areas of less than 0.5 hectares of open space within woodlands are included as part of the total woodland area, being considered as an integral part of the woodland ecosystem. Integral areas of greater than 0.5 hectares of open space are excluded. Assessments of woodland gain and woodland loss are described in the following sections on New Planting and on Woodland Loss, and further information is available in Appendix 1.

This new estimate compares with the Forestry Commission's previous estimate of woodland area in Scotland, for the same reference date of March 2010, of 1,343 thousand hectares (as published in Forestry Statistics 2010). Further information on the differences between these two estimates is provided in the Comparison of Woodland Area Figures section and Appendix 2.

This new estimate of total woodland area in Scotland is based upon a new woodland map of Great Britain that has been produced by the Forestry Commission's National Forest Inventory. For Scotland, the map and estimated area have been derived from a base map constructed from interpretation of 2003-2007 aerial photography that has then been augmented and checked with information from other sources. These included:

- Recorded areas of new planting within woodland grant schemes (where this woodland is not yet visible from aerial photography, it is categorised as 'assumed woodland');
- Areas of Forestry Commission Scotland (FCS) new planting, as recorded in FCS' administrative systems;
- Some aerial photography for later time periods;
- Analysis of 2007 and 2009 remote sensing (satellite imagery data) that has been used by NFI for quality assurance of the estimated total woodland area; and
- Comparison of the new map with the previous woodland map of Great Britain from the National Inventory of Woodland and Trees (NIWT) and the NIWT Survey of Small Woodland and Trees. The NIWT woodland map for Scotland has a base year of 1995 but is based on aerial photography from around 1988, updated using administrative records.

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Table 1 shows how the NFI woodland area estimate for Scotland has been derived from the woodland area observed in the original NFI base map using these other sources of information.

**Table 1: NFI area 2010**

| thousands of hectares  |                |
|--|----------------|
|  | Woodland area  |
| <b>NFI area as initially mapped, using 2003 -2007 aerial photography</b>   | <b>1,285.5</b> |
| Plus assumed new woodland (documented in spatial records) planted from 1989-90 to 2007-08 which is not visible from aerial photography     | 93.6           |
| Plus assumed new woodland (documented in non-spatial records) planted from 2008-09 to 2009-10 which is not visible from aerial photography | +4.5           |
| Plus additions to the NFI map verified to date from comparison with the NIWT map   | +1.4           |
| Minus area deleted from the NFI map, verified to date from comparisons with the NIWT map   | -0.0           |
| <b>NFI area in 2010 as now estimated</b>   | <b>1385.0</b>  |

Sources: National Forest Inventory map, grant schemes, National Inventory of Woodland and Trees map, Forestry Commission Scotland administrative data.

Note:

Further description and information on the entries in this table can be found in later sections and in Appendix 1.

The area of woodland in Table 1 includes high forest and also areas of recently felled woodland and areas of young trees. In cases where woodland is identified as having been felled, it is presumed that such areas will be restocked with new trees. However, in some instances these areas may be converted to other land uses, such as for wind farm development or habitat restoration, and such conversions are not always immediately recorded by NFI as land use change. This is because it is generally not possible to immediately distinguish between clear felling for normal forest management purposes (which will be replanted or restocked) and clear felling as a precursor to permanent land use change. Further details are provided in the section on Woodland Loss.

## New Planting

New planting is the creation of new woodland by means of tree planting, natural regeneration or seeding on areas previously classified as non-woodland land uses. New planting has been undertaken by private owners, Forestry Commission Scotland and other organisations. Locating areas of recent new planting requires particular consideration in the estimation of total woodland area because seedlings, saplings and young trees less than 10 years old are difficult to identify from aerial photography, with the result that only a proportion of recent new planting (and none of the new planting conducted after the photography) will be detected in the photographic interpretation.

As a result, aerial photography interpretation has only identified a proportion of new woodland creation, and will under-record the amount of woodland created between 1995-

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96 and 2009-10. Once trees are 10 to 15 years old they are normally large enough to be identified by remote sensing methods and will usually be captured in the NFI base map. In recognition of this, both the NIWT and NFI maps have automatically added recorded areas of new planting not captured on the base map, as reported by Forestry Commission Scotland on their own land, and by grant-aided new planting schemes on other land. Until these woodland areas become visible from aerial photography, the NFI categorises these as 'assumed woodlands'. This approach assumes that the planting activity has taken place and that it has succeeded in establishing woodland with the potential to achieve minimum canopy cover. Consequently, there may be a proportion of this assumed woodland area in which no trees were actually planted or the planting scheme has failed, but this will ultimately be picked up through aerial photography.

Table 2 shows the area of new woodland reported to have been created in the last 21 years. Of the 190.4 thousand hectares of woodlands greater than 0.5 hectares that were reported to have been planted in Scotland between 1989-90 and 2009-10, 93.6 thousand hectares are not visible (based on 2003 to 2007/2009 aerial photography) but have been included in the woodland area estimate and mapped as 'Assumed Woodland'.

Woodland gain can also occur as a result of natural colonisation of trees on disused or abandoned land. Since there are no available records on this, such areas will only be captured when trees become large enough to be identified in the aerial photography.

**Table 2: Areas of new planting, 1989-90 to 2009-10**

|   | thousand hectares     |                       |                       |
|---|-----------------------|-----------------------|-----------------------|
|   | 1989-90 to<br>1994-95 | 1995-96 to<br>2009-10 | 1989-90 to<br>2009-10 |
| Grant-aided new planting                                  | 63.4                  | 111.1                 | 174.5                 |
| Non grant aided new planting                              | 0.0                   | 0.2                   | 0.2                   |
| Forestry Commission new planting                          | 14.6                  | 3.2                   | 17.8                  |
| <b>Total reported new planting</b>                        | <b>78.0</b>           | <b>114.5</b>          | <b>192.5</b>          |
| Less new planting areas of less than 0.5 hectares         |                       |                       | 2.1                   |
| <b>Total reported new planting (0.5 hectares or more)</b> |                       |                       | <b>190.4</b>          |

Sources: Forestry Commission Scotland grant schemes and administrative systems.

Notes:

1. Non-FC planting that is not grant-aided will only be included in the NFI map once it is visible in the photography, as there is no spatial record. This may lead to under-representation in the NFI map of non grant-aided new woods younger than 10 years old, and results in a difference between the total woodland area in the NFI map compared to that estimated in this report.
2. Non grant aided new planting figures are annual estimates produced by Forestry Commission staff. There is no administrative or spatial data source for these figures.

## Woodland Loss

Woodland loss is defined in the NFI as an identifiable permanent removal of woodland cover to change the land use. Woodland cover is deemed to have been removed when any remaining trees on the site no longer have the potential to achieve a minimum coverage of 20% of the assessed area. When a definitive land use change is identified that has resulted in a permanent removal of tree cover to below the minimum canopy cover, such as the construction of buildings, quarries or car parks, an immediate identification of woodland loss is registered by NFI. However, removal of trees that are not immediately identifiable as a change of land use, such as the establishment of an open non-woodland habitat, are not identified as woodland loss until permanent loss of minimum tree cover is confirmed after a period of ten years.

Work is currently underway to identify areas of permanent woodland loss by comparing the aerial photography associated with the NIWT woodland map and the NFI woodland map over a variable period from 1988 through to 2003-2007. The study is limited to areas of difference in the two maps where NIWT identified woodland while NFI did not (referred to as 'NFI unmapped' – see later). Early results from this work together with further explanations of it are set out in Appendix 2.

It should be noted that Forestry Commission Scotland has broadly estimated that woodland removal due to wind farm development and habitat restoration in the period 2000 to 2010 is around 10 - 20 thousand hectares. Forestry Commission Scotland is commissioning work in 2011-12 to more accurately determine the area of permanent woodland loss due to wind farm development and habitat restoration which will provide additional information on woodland loss in Scotland.

For further information on woodland loss see appendices 1 & 2.

## Comparison of Woodland Area Figures

As part of the process to verify the NFI woodland area figure, work has been performed to reconcile:

- NIWT 1995 and NFI estimates of woodland area; and
- The NFI and Forestry Statistics 2010 estimates of woodland area.

### (1) Comparison between NIWT 1995 and NFI 2010 estimates of woodland area

The National Inventory of Woodland and Trees (NIWT) for 1995 estimated a total woodland area of 1,281 thousand hectares in Scotland (16.4% of land area) compared to the current NFI-based estimate of total woodland area in 2010 of 1,385 thousand hectares (17.8% of

land area). This represents a net difference between the two estimates of 104 thousand hectares. The causes of this net difference are important to understand and can be ascribed to five broad categories:

1. Methodological differences used in the mapping of woodland of greater than 2 hectares by NIWT compared to NFI.
2. Errors (due mainly to misinterpretation of photography) in the NIWT map.
3. Error in the estimate of area of smaller woodland (0.5-2.0 hectares) as assessed from the NIWT Survey of Small Woodland and Trees.
4. Errors in the NFI map.
5. Actual change in woodland area over the period between the base years of the two maps (1995 to 2010).

Analysis has been undertaken to identify and quantify the various individual sources of this difference, as far as can be determined.

## Comparison of woodland areas of greater than 2 hectares

A partial study has been performed to compare the NFI map with the NIWT map to analyse the differences in these maps for woodland of more than two hectares in size. Since the NIWT map recorded woodlands of 2 hectares and above only, woodlands of less than two hectares were removed from the NFI map for the purposes of this study, so that the comparison is like-for-like. In this study, a direct comparison of where NIWT and NFI found woodland was made. This comparison located areas that NIWT identified as woodland but NFI did not (169 thousand hectares referred to as 'NFI unmapped') and areas that NFI identified as woodland that NIWT did not (156 thousand hectares referred to as 'NIWT unmapped').

Work to date has concluded that most of the differences are a result of the limitations in previous technology that led to NIWT under-reporting woodland area. Anomalies identified in this study as having been due to errors found in the NFI map have been rectified in the current map. The extent of these anomalies are shown in Table 1 above.

Further information on this work can be found in Appendix 2.

## Comparison of woodland areas of 0.5-2 hectares

A comparison of estimates of woodland area for woodlands between 0.5 and 2 hectares in size has also been made. For NIWT, this estimate was derived from the reported results from the NIWT Survey of Small Woodland and Trees. For NFI, the estimate is obtained from the NFI map by summation of woodland areas falling into this size band.

The results show a notable difference between the two estimates; the estimate derived from the NIWT small woodlands survey is 19.1 thousand hectares, while the estimate derived from the NFI map is 59.5 thousand hectares. Preliminary investigations have been made on the cause of this difference, which has revealed a difference in scope as one

contributory factor (the NIWT small woodlands survey did not cover urban areas). Factors associated with the differences in definition of woodland by NIWT and NFI, and the possibility of an actual increase in small woodlands in Scotland as a result of a process of natural colonisation of trees, may also be making some contributions to this difference.

However, it is not conceivable that such factors could explain the full magnitude of the difference in the estimates. Since the examination of areas of woodland of over 2 hectares on the NFI map described above have revealed no major errors in the mapping process, the estimate of the 0.5 to 2 hectare category of woodland from the NFI map has been accepted as broadly accurate. It is therefore concluded that the NIWT survey underestimated the area of woodland in this size category.

## (2) Comparison between 2010 estimates

The previously published estimate of woodland area at 2010 was based on annual updating of areas from the NIWT map with annual grant-aided new planting data (for non-FC woodland) and data from administrative sources (the Forestry Commission sub-compartment database (SCDB)) for FCS woodland. The NFI estimate of 1,385 thousand hectares of woodland in Scotland at 31 March 2010 is around 42 thousand hectares more than the estimate for 2010 that was included in Forestry Statistics 2010.

Analysis to date has identified causes that result in an upward adjustment to the previous estimate of 64 thousand hectares, leaving an outstanding reverse difference of 22 thousand hectares to be reconciled with further work. The main categories of differences identified to date were methodological (resulting in a net upward adjustment of the previous estimate of 30.6 thousand hectares) and corrections (providing further upwards adjustments of the previous estimate totalling 33.7 thousand hectares, with the dominant factor within this being the inclusion of the under-estimate of small woodlands area in the NIWT small woodlands survey within the previous estimate).

Further information on the comparison between these two estimates is given in Appendix 2.

## Appendix 1: Background and Definitions

### Area of woodland:

For the National Forest Inventory (NFI), woodland is defined as areas with a canopy cover of 20% or more (or the potential to achieve this), with a minimum area of 0.5 hectares and width of 20 metres.

For the National Inventory of Woodland and Trees (NIWT), woodland is defined as areas with a canopy cover of 50% or more (or the potential to achieve this) and over 50 metres in width. The NIWT woodland map aimed to include all areas satisfying this definition and with a minimum area of 2.0 hectares or over. Woodland area from 0.1 hectares to 2.0 hectares was derived from the NIWT Survey of Small Woodland and Trees.

The National Forest Inventory woodland area statistics include areas of less than 0.5 hectares of open space within woodlands as part of the total woodland area, being considered as an integral part of the woodland ecosystem. Areas greater than 0.5 hectares of open space are excluded from the figures.

For the National Inventory of Woodland and Trees, woodland area statistics include areas of open space within woodlands of less than 1.0 hectares as part of the total woodland area. Areas greater than 1.0 hectares of open space are excluded from the figures.

Orchards and nurseries are not included in woodland area estimates in NFI.

Further information on the methodology used in the National Forest Inventory and in the National Inventory of Woodland and Trees is available at [www.forestry.gov.uk/inventory](http://www.forestry.gov.uk/inventory).

In the previously published estimates of woodland area at March 2010 (Forestry Statistics 2010), the area of Forestry Commission (FC) woodland was derived from the FC's administrative systems, rather than NIWT data. They were based on land use codes in the Forestry Commission's sub-compartment database, identifying either whole mapped woodland sub-compartments or the percentage of each sub-compartment that is recorded as woodland. This resulted in the exclusion of all minor open space within woodlands and the immediate exclusion of areas cleared with the intention of conversion to other land uses (e.g. natural habitat restoration and wind farm areas).

The NFI sample square fieldwork programme will measure and report upon any changes in basal area, woodland stocking, species composition etc. that arise through habitat restoration work. This will give more information on change in woodland composition over time.

NFI woodland area figures for Scotland are based on data obtained from the 2010 National Forest Inventory map and take account of reported new planting. At present no downward adjustments have been made for land that has been grant aided to establish woodland, but

which may have failed to achieve woodland cover. Any potential instances of such failed grant schemes are therefore presently included in the NFI woodland map as assumed woodland.

Woodland as a % of land area was derived from the NFI 2010 estimate of woodland area in conjunction with the Office for National Statistics 2010 Standard Area Measurements (SAM) figures for land area, utilising the 'Land only measurements in hectares', which exclude inland water.

## New planting:

'New planting' can occur as a result of planting, seeding or the natural colonisation of new woodland trees. Planting and sowing will always be the outcome of human intervention, but natural colonisation can result from solely natural processes, or a combination of both natural and human processes. The figures included in Forestry Statistics 2010 and in this report are for all these types of woodland creation.

Information about Forestry Commission planting, seeding and colonisation comes from FC administrative systems.

Information about non-Forestry Commission planting, seeding and colonisation comes principally from grant schemes: the Woodland Grant Scheme (WGS), Scottish Forestry Grant Scheme (SFGS) and Rural Development Contracts (RDC). For planting and seeding schemes the date of the first payment sets the year within which the planting is reported. Assumptions about planting, seeding and colonisation are checked at a later date against aerial photography when the trees are large enough to observe.

For natural colonisation/ regeneration, the areas included are recorded at the point at which the second instalment of grant aid has been paid during the year. This is because the second instalment is approved when woodland reaches a certain stage and density of growth, so this information corresponds approximately to the amount of new woodland created.

For non grant-aided planting, seeding and colonisation, areas are only included when the trees have become older and are visible in aerial photography, introducing a lag between establishment and identification. This process therefore only identifies non grant-aided new woodland areas which are composed of older natural colonisation at some time after their initial establishment. This is a result of there being no spatial records to base assumptions upon.

The National Forest Inventory aerial photography interpretation has picked up a proportion of new woodland creation, but this initially under-records the amount of woodland created between 1995-96 and 2009-10, as the technology often fails to detect stands of trees younger than 5 to 10 years. Once trees are 10 to 15 years old they are normally large enough to be identified by remote sensing methods and will be included in the overall woodland area figures. Because of this factor, NFI, NIWT and annual estimates of

woodland area have assumed that grant-aided new planting achieved canopy cover. NFI now has a category of 'assumed woodland' to cover such new woods. These woods will be monitored using remote sensing to confirm if they have achieved a canopy cover by their 10th year. If they have not, they will be removed from the woodland area.

## Woodland loss:

If an area of woodland is clear felled, it is presumed that tree cover will be replaced. A period of 10 years is allowed for trees to be re-established before such an area is mapped as non woodland, unless an obvious and permanent land use change is detected. Areas of clearfell that have occurred over the last 10 years that show no definitive photographic evidence of land use change to non-woodland are included in the NFI woodland area and classified as transition woodlands. This is to allow for the usual period of time it takes for woodland to re-establish and for the difficulties associated with detecting young trees from aerial photography and satellite imagery. Where woodland is clear felled and converted to non-woodland land uses that are immediately identifiable by remote imagery, such as quarries or golf courses, these areas will be reported as woodland loss upon first detection.

The principal exception to the presumption of tree cover being replaced after felling is that of habitat restoration, where owners remove tree cover to establish non-woodland habitats and land uses. The NFI rule is that until such new non-forest land uses are well established, they are not declared as woodland loss. The same principle is used as when assessing the failure of new woodland establishment; a ten year period is allowed before a land use change to woodland is deleted. This procedure provides greater assurance that only areas of definite and permanent change are included in woodland loss statistics.

## Appendix 2:

### Comparison of maps and woodland area estimates

#### (1) Comparison of NIWT and NFI maps

The National Forestry Inventory team is undertaking a study, comparing the NFI map with the NIWT map to identify the principal causes of the difference between the two maps. A direct comparison of where NIWT found woodland and where NFI found woodland has been made. This located areas that NIWT identified as woodland but NFI did not (169 thousand hectares referred to as 'NFI unmapped') and areas that NFI identified as woodland but NIWT did not (156 thousand hectares referred to as 'NIWT unmapped'). Detailed analysis of each of these classes is being undertaken by examination of historic aerial photography, verifying which of the maps is correct, or if differences are real changes over time.

#### NFI unmapped

Of the 169 thousand hectares of 'NFI unmapped' areas, 71% of area polygons of over 20 hectares have been assessed, totalling 21 thousand hectares. The remaining 148 thousand hectares of 'NFI unmapped' areas (including all differences of under 20 hectares) have not yet been analysed. From the 21 thousand hectares that have been studied, around 1.4 thousand hectares are assessed as valid woodland, 4.6 thousand hectares are comprised of new planting schemes and have been added to the total NFI area, and 89 hectares have been identified as woodland loss as set out in table 3 below.

**Table 3: Areas of permanent woodland loss observed in partial examination of mapping differences between NFI and NIWT of greater than 20 hectares**

| Land use change          | hectares                       |
|--------------------------|--------------------------------|
|                          | Total identified woodland loss |
| Residential buildings    | 43                             |
| Quarries                 | 12                             |
| Car parks                | 1                              |
| Other                    | 33                             |
| <b>All Woodland loss</b> | <b>89</b>                      |

Source: National Forest Inventory map, National Inventory of Woodland and Trees map.

Notes:

1. The areas of woodland loss reported in Table 3 only cover instances where a clear change in land use is evident.

Most of the remaining 15 thousand hectares were identified as areas where either NIWT was incorrect and woodland had never existed (8 thousand hectares) or arose as a result of methodological differences between NIWT and NFI (7 thousand hectares).

## NIWT unmapped

Of the 156 thousand hectares of 'NIWT unmapped' areas, 44% of area polygons of over 20 hectares have been assessed, totalling 2.8 thousand hectares. The remaining 153 thousand hectares of 'NIWT unmapped' areas have not yet been analysed. From the 2.8 thousand hectares that have been studied, around 1.4 thousand hectares are assessed as existing woodland that should have been included in NIWT. This estimate will be refined further in 2011/12.

## (2) Comparison between NIWT 1995 and NFI 2010 estimates of woodland area

The analysis undertaken to date generated a number of revisions that could be applied to NIWT data to give revised area estimates under NFI definitions, processes and technologies. Adjustments for methodology changes and corrections give a revised estimate of 1,293 thousand hectares for 1995 (table 4).

After accounting for woodland gain and loss between 1995 and 2010 (shown in Tables 2 and 3), there is a discrepancy of 20.4 thousand hectares to reconcile. This is the difference between the 1995 estimate from NIWT (updated to 2010, including a correction for under-estimation of the area of small woodlands from the NIWT small woods survey) and the 2010 estimate from NFI, which is lower than the adjusted NIWT-based estimate.

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Table 4: Reconciliation of NIWT (1995-based) and NFI (2010-based) total woodland areas

|  | thousand hectares |               |
|--|-------------------|---------------|
| <b>NIWT 1995 estimated area (as reported)</b>                                  |                   | <b>1281.5</b> |
| <b>Methodology adjustments</b>   | <b>-22.1</b>      |               |
| Of which:  |                   |               |
| Subtract areas of small woods (0.1 to 0.5 hectares)                            | -9.6              |               |
| Subtract small areas of open space (0.5-1.0 hectares)                          | -5.5              |               |
| Adjustments due to other methodology differences                               | -7.1              |               |
| <b>NIWT 1995 under NFI conventions (uncorrected)</b>                           |                   | <b>1259.3</b> |
| <b>Identified errors in NIWT map and small woodland survey</b>                 | <b>33.8</b>       |               |
| Of which:  |                   |               |
| Confirmed non-woodland in 1995   | -7.9              |               |
| Confirmed woodland in 1995 missed by NIWT                                      | 1.4               |               |
| Under-estimate of woodland area of 0.5-2.0 hectares in NIWT small woods survey | 40.3              |               |
| <b>NIWT 1995 woodland area (under NFI definitions and corrections)</b>         |                   | <b>1293.1</b> |
| <b>Identified changes in woodland area 1995-2010</b>                           | <b>112.3</b>      |               |
| Of which:  |                   |               |
| New planting gross total 1996-2010   | 114.5             |               |
| Adjusted by planted areas of less than 0.5 hectares                            | -2.1              |               |
| Confirmed woodland loss  | -0.1              |               |
| <b>Corrected NIWT 1995 woodland area updated to 2010</b>                       |                   | <b>1405.4</b> |
| <b>NFI estimated woodland area 2010</b>  |                   | <b>1385.0</b> |
| <b>Unreconciled difference</b>   |                   | <b>-20.4</b>  |

Sources: National Inventory of Woodland and Trees, National Forest Inventory map.

Notes:

1. Reconciliation to date is based on a partial comparison of areas of difference between the NIWT and NFI maps of greater than 20 hectares.
2. The correction for the under-estimation of woodland area of 0.5 to 2.0 hectares from the NIWT small woods survey is the full difference between this estimate and that derived from the NFI map. It therefore inherently assumes no change in the underlying area of this category of woodland between the base years for NIWT and NFI (1995 and 2010).
3. Further work on the differences between NFI and NIWT will be undertaken to reduce the unreconciled difference.

## (3) Comparison between 2010 estimates

The above comparison of woodland areas identified by NIWT and NFI accounts for some of the difference of 42 thousand hectares between the previous Forestry Commission estimate of woodland area at March 2010 of 1,343 thousand hectares and that of the current estimate of 1,385 thousand hectares, based on the NFI map.

The previously published estimate of woodland area at 2010 was based on annual updating of areas from the NIWT map with annual grant-aided new planting data and estimates of new planting without grant aid (for non-FC woodland) and data from administrative sources (the Forestry Commission sub-compartment database (SCDB)) for FC woodland. A

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summary of the various adjustments and updating applied to the NIWT 1995 woodland area estimate to obtain the previous FC estimate of total woodland, as published in 'Forestry Statistics 2010' is given in Table 5.

**Table 5: Derivation of previous Forestry Commission estimate of total woodland area in 2010 from the NIWT 1995 estimate**

|  | thousand hectares |
|--|-------------------|
| <b>NIWT 1995 estimated area</b>  | <b>1281.5</b>     |
| <b>Adjustments and updating of FC woodland area</b>                      | <b>-51.6</b>      |
| Of which:  |                   |
| Discrepancy between NIWT FC area and SCDB area for 1995                  | -21.8             |
| FC new woodland 1996-2010  | 3.2               |
| Adjustments due to land use changes and to integral open areas 1996-2010 | -33.0             |
| <b>Changes to non-FC woodland 1995-2010</b>                              | <b>111.3</b>      |
| Of which:  |                   |
| Grant schemes 1996-2010  | 111.1             |
| Non-FC non-grant scheme new planting 1996-2010                           | 0.2               |
| Assumed non-FC woodland loss 1996-2010                                   | 0.0               |
| <b>Net changes and adjustments for all woodland</b>                      | <b>59.7</b>       |
| <b>Reported total woodland area in Forestry Statistics 2010</b>          | <b>1343.0</b>     |

Notes:

1. Transfers of ownership between FC and non-FC woodland via the FC acquisitions and disposals programme between 1995-96 and 2009-10 are not shown in this table since they have no effect on total woodland area.
2. The adjustments due to land use changes and to integral open areas between 1995 and 2010 include updating of the sub-compartment database for land use transitions before 1995, corrections for integral open space of less than 1 ha and for declared land use change including open habitat restoration.

The largest adjustments made to the NIWT 1995 total woodland area to obtain the previously estimated woodland area for 2010 are a decrease of 33 thousand hectares which resulted from the exclusion of all integral open space from FC estate woodland area estimates, plus adjustments made within the FC sub-compartment database for actual land use changes and the ongoing re-classification of areas previously miss-classified as high forest to reflect already existing integral open space within FC woodland. The other large adjustment was an increase of 111 thousand hectares in non-FC woodland to account for an assumed increase in woodland in this sector as a result of new planting under woodland grant schemes. Note that, under the methodology used in the current NFI-based estimate of woodland area, some of the decrease of 33 thousand hectares to FC woodland between 1995 and 2010 will not be accounted for because woodland areas converted to some other uses (such as habitat change) are not registered as a change of land use until 10 years after felling.

Table 4 and Table 5 provide a 'road map' towards an explanation of the difference of 42 thousand hectares between the current and previous estimates of total woodland area for

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2010, via an analysis of each estimate in relation to NIWT 1995 estimated woodland area. After eliminating factors that appear in both tables and are therefore neutral with respect to the comparison of the previous and current estimates (grant schemes and non-grant scheme new non-FC woodland, and new FC woodland between 1995 and 2010), Table 6 shows the various sources of difference in the two estimates and their magnitude. (There may be some interaction between the various items listed in this table, but such interactions are considered to be negligible.)

**Table 6: Relationship between previous and current FC estimates of total woodland area for 2010**

|  | thousand hectares |               |
|--|-------------------|---------------|
| <b>Previous estimate of total woodland area in 2010</b>                        |                   | <b>1343.0</b> |
| <b>Methodology adjustments</b>   | <b>30.6</b>       |               |
| Of which:  |                   |               |
| Discrepancy between NIWT FC area and SCDB area for 1995                        | 21.8              |               |
| FC treatment of internal open space and felling for habitat change 1996-2010   | 33.0              |               |
| Area of NIWT small woods (0.1 to 0.5 hectares)                                 | -9.6              |               |
| Small areas of open space (0.5-1.0 hectares)                                   | -5.5              |               |
| Adjustments due to other methodology differences                               | -7.1              |               |
| Adjustment for new planted areas of less than 0.5 hectares                     | -2.1              |               |
| <b>Corrections</b>   | <b>33.7</b>       |               |
| Of which:  |                   |               |
| NIWT 1995 non-woodland   | -7.9              |               |
| NIWT 1995 missed woodland  | 1.4               |               |
| Under-estimate of woodland area of 0.5-2.0 hectares in NIWT small woods survey | 40.3              |               |
| Confirmed woodland loss  | -0.1              |               |
| <b>Total adjustments and corrections</b>                                       | <b>64.2</b>       |               |
| <b>Previous estimate after identified adjustments and corrections</b>          |                   | <b>1407.2</b> |
| <b>Yet to be reconciled</b>  | <b>-22.3</b>      |               |
| <b>Reported NFI 2010</b>   |                   | <b>1385.0</b> |

Note:

Further work on the differences between NFI and NIWT will be undertaken to reduce the unreconciled difference.

Methodology adjustments and corrections so far identified to the NIWT 1995 woodland area over-account for the difference between the two estimates of woodland area in 2010, such that the NFI-based estimate is 22.3 thousand hectares lower than the adjusted and corrected NIWT-based estimate. This discrepancy is attributed to as yet un-reconciled differences between the NIWT 1995 woodland map and the new NFI 2010 woodland map. Further work on the examination of areas of difference between these two maps is ongoing, and will result in future adjustments to both NIWT and NFI confirmed woodland areas.

## Further information:

Previous statistics on woodland area and planting are available at [www.forestry.gov.uk/statistics](http://www.forestry.gov.uk/statistics), including Forestry Statistics 2010 (September 2010) and Forestry Facts & Figures 2010 (September 2010). Forestry Statistics 2010 also contains additional information about the sources and methodology used.

For further information on the NFI, including contact details, please visit [www.forestry.gov.uk/inventory](http://www.forestry.gov.uk/inventory). Copies of this report together with accompanying A4 map and underlying GIS data are available from the above web page under the 'NFI outputs released' link.

Figures for woodland area in 2010 and earlier years are provisional and will be subject to revision as further results become available from the National Forest Inventory.

## Official Statistics:

This is an Official Statistics publication. For more information about Official Statistics and the UK Statistics Authority visit [www.statisticsauthority.gov.uk/](http://www.statisticsauthority.gov.uk/).

Figures in tables have been independently rounded, so may not add to the totals shown.