

# National Forest Inventory Woodland Area Statistics: England

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This publication contains initial provisional statistics for England on:

- Woodland area at 31 March 2010; and
- Areas of new planting and observed woodland loss for 1998-99 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 2009-10 and Forestry Commission administrative data.

The main findings:

- The area of woodland in England at 31 March 2010 is estimated to be 1,294 thousand hectares. This is 9.9 % of the total land area in England.
- This estimate of 1,294 thousand hectares of woodland in England at 31 March 2010 is around 164 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 forests and 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.

At the time of publication of this report a completed version of the digital map is available and has been used to derive the statistics on woodland area reported here. The programme of ground surveying is in progress but the results from this are not yet available. In this report, total woodland area and information on woodland gain and woodland loss is derived for England from the NFI map and 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 sub-national 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 forest map from aerial photography and a programme of field surveys.

The previous estimate of total woodland area for England 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 England was 1998, and a programme of work is 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 England, 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. NFI uses an observational approach to estimating woodland area, augmented by administrative records 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.

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 England is estimated to be 1,294 thousand hectares. This is 9.9 % of the total land area in England.**

This estimate is based on 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 England. In the National Forest Inventory, woodland is defined as areas with a canopy cover of 20% or more (or the potential to achieve this), 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 England, for the same reference date of March 2010, of 1,130 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 in Appendix 2

This new estimate of total woodland area in England is based upon a new woodland map of Great Britain that has been produced by the Forestry Commission's National Forest Inventory. For England, 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 include:

- Recorded areas of new planting within woodland grant schemes (where this woodland is not yet visible from aerial photography then it is categorised as 'assumed woodland');
- Areas of Forestry Commission new planting, as recorded in the Forestry Commission's 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 England has a base year of 1998, but is based on earlier aerial photography updated using administrative records.

# NFI Woodland Area Statistics: England

Table 1 shows how the NFI woodland area estimate for England has been derived from the woodland area observed in the original NFI base map, in combination with 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>1,255.8</b>
Plus assumed new woodland planted from 1989-90 to 2009-10 which is not visible from aerial photography	35.3
Plus additions to the NFI map verified to date from comparison with NIWT	3.0
Minus area deleted from the NFI map, verified to date from comparisons with NIWT	-0.3
<b>NFI area in 2010 as now estimated</b>	<b>1,293.8</b>

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

Note:

Further description and information on the entries in this table can be found in the Background and Definitions section.

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 urban 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) 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, the Forestry Commission and by other organisations and bodies. Locating areas of recent new planting requires particularly careful 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.

# NFI Woodland Area Statistics: England

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 1998-99 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 be captured in the NFI base map. In recognition of this under-recording of recent new planting, both the NIWT and NFI maps have automatically added recorded areas of new planting not captured on the base map, as reported by the Forestry Commission on their own land, and by grant-aided new planting schemes on other land. This approach assumes that the planting activity has taken place and 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. NFI has a category of 'assumed woodland' to cover such new woodland and these areas will be monitored to confirm that they have achieved minimum canopy cover (potential or actual) by their 10th year. If they have not, they will be removed from the woodland area.

Table 2 shows the area of new woodland reported to have been created in the last twenty one years. Of the 92.1 thousand hectares of woodlands of greater than 0.5 hectares that were reported to have been planted in England between 1989-90 and 2009-10, 35.3 thousand hectares are not visible (based on 2003 to 2007 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 1997-98	1998-99 to 2009-10	Total
Grant-aided new planting	40.6	44.6	85.2
Non grant-aided new planting	2.0	5.6	7.6
Forestry Commission new planting	0.6	2.3	2.8
<b>Total reported new planting</b>	<b>43.2</b>	<b>52.4</b>	<b>95.6</b>
Less areas of new planting of less than 0.5 hectares			<b>3.5</b>
<b>Total reported new planting (0.5 hectares or more)</b>			<b>92.1</b>

Source: Forestry Commission, grant schemes and Forestry Commission administrative data.

Notes:

1. Non-FC planting that is not grant-aided will only be included in the NFI map once it is visible in the aerial 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.

Areas of permanent woodland loss are being identified by comparing the aerial photography associated with the NIWT woodland map (mid 1990s) and the NFI woodland map (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 additional explanation are set out in Appendix 2.

To date, all areas of difference of greater than 5 hectares between the NIWT map and the NFI map have been assessed. The area of confirmed woodland loss, to date, amounts to 275 hectares, but this area will increase significantly when smaller areas of difference are examined. Areas where the process of habitat restoration (conversion of woodland to non-woodland semi-natural habitat) has begun but is not yet complete are not included as confirmed woodland loss because it is not yet certain that the conversion from woodland will be achieved.

It should be noted that Forestry Commission administrative records indicate that between 1999 and 2010 unconditional felling licences for clearfell (where there is no obligation to replant trees) were granted for an area of 6,565 hectares and indicative management intentions for FC woodland was to convert 3,980 hectares from woodland to open habitat between 2000 and 2010. Other restructuring may increase this area.

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

## Comparison of Woodland Area Figures

As part of the process to confirm the NFI woodland area figure, analyses have been performed to reconcile:

- NIWT 1998 and NFI estimates of woodland area
- The NFI and Forestry Statistics 2010 estimates of woodland area

### (1) Comparison between NIWT 1998 and NFI 2010 estimates of woodland area

The National Inventory of Woodland and Trees (NIWT) for 1998 estimated a total woodland area of 1097 thousand hectares in England (8.4% of land area) compared to the current NFI-based estimate of total woodland area in 2010 of 1,294 thousand hectares (9.9% of land area). This represents a net difference between the two estimates of 197 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 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 (1998 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 study is being undertaken 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. The analysis is restricted to woodlands of 2 hectares or more to ensure a like-for-like comparison with NIWT which only mapped woodlands of more than 2 ha. This comparison located areas that NIWT identified as woodland but NFI did not (130 thousand hectares referred to as 'NFI unmapped') and areas that NFI identified as woodland that NIWT did not (216 thousand hectares referred to as 'NIWT unmapped'). Detailed analysis of areas of difference of 5 hectares or more for each of these classes, with reference to photography associated with the production of each map, has been undertaken to investigate the causes of these differences.

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 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 very substantial difference between the two estimates; the estimate derived from the NIWT small woods survey is 50.8 thousand hectares, while the estimate derived from the NFI map is 202.1 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 woodland 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 England as a result of a process of natural colonisation of trees, may also be contributing 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 has 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 under-estimated 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 FC woodland. The NFI estimate of 1,294 thousand hectares of woodland in England at 31 March 2010 is around 164 thousand hectares more than the estimate for 2010 that was included in Forestry Statistics 2010.

Analysis to date has identified the source of 130 thousand hectares of this difference, leaving 34 thousand hectares to be reconciled with further work. The main categories of differences identified to date were methodological (resulting in a net downward adjustment of the previous estimate of 16.5 thousand hectares) and corrections (providing upwards



adjustments of the previous estimate totalling 146.6 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 minimum width of 20 metres.

For the National Inventory of Woodland and Trees (NIWT), woodland is defined as areas with a canopy cover of 20% 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 England are based on data obtained from the 2010 National Forest Inventory map and takes 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. Further work will be undertaken to identify and confirm any such areas and these will be removed from the total woodland area.

Within the 3 thousand hectares of additional woodland area added to the NFI map as a result of comparisons with the NIWT map to date (as shown in Table 1), 1,768 hectares appeared as high density woodland in the NIWT photography, but as low density woodland (less than 20% canopy cover) in the NFI photography. These areas have been added to the NFI map on the assumption that seed from the remaining trees will help to regenerate a new crop with the potential to achieve a minimum of 20% canopy cover.

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) and English Woodland Grant Scheme (EWGS). 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 1997-98 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 (130 thousand hectares referred to as 'NFI unmapped') and areas that NFI identified as woodland but NIWT did not (216 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 129.8 thousand hectares of 'NFI unmapped' areas, all area polygons of over 5 hectares have been assessed, totalling 15.2 thousand hectares. The remaining 114.6 thousand hectares of 'NFI unmapped' areas (differences of less than 5 hectares) have not yet been analysed. From the 15.2 thousand hectares that have been studied, 3.0 thousand hectares were assessed as valid woodland (mostly comprised of transition or low density woodlands at the time of the NFI photography) and have been added to the total NFI area. A further 1.7 thousand hectares were located in grant-aided areas which are included in the NFI map as 'assumed woodland', and 275 hectares have been identified as woodland loss as set out in Table 3 below.

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

<b>Land use change</b>	hectares Total identified woodland loss
Residential buildings	116
Quarries	48
Golf courses	46
Open Water	20
Recreational buildings	20
Industrial buildings	12
Car parks	4
Wind farms	0
Agriculture	0
Other	8
<b>All Woodland loss</b>	<b>275</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.
2. Scaling up these areas to the total area of differences in the 'NFI unmapped' category would give an estimated total observable woodland loss for the relevant period of 2.3 thousand hectares. However, this would assume that smaller areas of difference have the same causal profile as the larger areas of difference so far examined. This assumption is very unlikely to be accurate and this statistic should therefore be regarded as unreliable as a realistic estimate. Further work will be undertaken to quantify the full amount of observable woodland loss in 2011/2012.
3. FC England has been operating an active policy of heathland restoration. These areas are not included in the current woodland loss statistics quoted in this table due to the ten year rule which the NFI applies to such areas before confirming them as woodland loss. See background section on woodland loss for further details.

Areas of confirmed permanent woodland loss reported in Table 3 are based solely on comparative photographic interpretation. This approach differs in scope from estimates of woodland loss reported by other sources, if based on reported intent of woodland conversion, and therefore immediately include areas of woodlands felled for the purpose of habitat change to non-woodland. For this reason, the area of woodland loss in Table 3 should not be used as an indicator of gross deforestation.

Forestry Commission administrative records indicate that between 1999 and 2010 unconditional felling licences for clearfell (where there is no obligation to replant trees) were granted for an area of 6,565 hectares and indicative management intentions for FC woodland was to convert 3,980 hectares from woodland to open habitat between 2000 and 2010. Other restructuring may increase this area. NFI will, in the future, confirm whether woodland loss has occurred in these instances.

There will also be other causes of potential woodland loss that are unreported to date. These will be reflected in the NFI figures after a period of ten years with no woodland cover, or if evidence of permanent change is evident in the imagery before that time.

Of the remainder, 5.5 thousand hectares were identified as areas where NIWT was incorrect and woodland had never existed, and 4.6 thousand hectares resulted from methodological differences between NIWT and NFI.

## NIWT unmapped

Of the 216.4 thousand hectares of 'NIWT unmapped' areas, around 10% of area polygons of over 5 hectares have been assessed, totalling 3.1 thousand hectares. The remaining 213.3 thousand hectares of 'NIWT unmapped' areas have not yet been analysed. From the 3.1 thousand hectares that have been studied to date, around 1.1 thousand hectares were assessed as existing woodland that should have been included in NIWT, 0.3 thousand hectares were assessed as non-woodland areas and have been removed from the NFI map, and around 1.5 thousand hectares were identified as new planting that occurred since NIWT. These estimates will be refined further in 2011/12.

## (2) Comparison between NIWT 1998 and NFI 2010 estimates of woodland area

The analysis undertaken to date has 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 1212 thousand hectares for 1998 (table 4).

After accounting for woodland gain and loss between 1998 and 2010 (shown in Tables 2 and 3), there is a remaining discrepancy of 33.3 thousand hectares to reconcile within woodlands of over 2 hectares. This is the difference between the 1998 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. Based on the analysis of these areas to date, it is likely that the remainder will be largely composed of woodlands missed by NIWT in 1998.

# NFI Woodland Area Statistics: England

Table 4: Reconciliation of NIWT (1998-based) and NFI (2010-based) total woodland areas

	thousands of hectares
<b>NIWT 1998 estimated area (as reported)</b>	<b>1096.9</b>
<b>Methodology adjustments</b>	<b>-31.9</b>
Of which:	
Subtract areas of small woods (0.1 to 0.5 hectares)	-24.2
Subtract small areas of open space (0.5-1.0 hectares)	-3.0
Adjustments due to other methodology differences	-4.6
<b>NIWT 1998 under NFI conventions (uncorrected)</b>	<b>1065.0</b>
<b>Identified errors in NIWT map and small woodland survey</b>	<b>146.9</b>
Of which:	
Confirmed non-woodland in 1998	-5.5
Confirmed woodland in 1998 missed by NIWT	1.1
Under-estimate of woodland area of 0.5-2.0 hectares in NIWT small woods survey	151.3
<b>NIWT 1998 woodland area (under NFI definitions and corrections)</b>	<b>1211.9</b>
<b>Identified changes in woodland area 1998-2010</b>	<b>48.6</b>
Of which:	
New planting 1998-99 to 2009-10	52.4
Adjusted by planted areas of less than 0.5 hectares	-3.5
Confirmed woodland loss	-0.3
<b>Corrected NIWT 1998 woodland area updated to 2010</b>	<b>1260.5</b>
<b>NFI estimated woodland area 2010</b>	<b>1293.8</b>
<b>Unreconciled difference</b>	<b>33.3</b>

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

Note:

1. Reconciliation to date is based upon a comparison of areas of differences between the NIWT and NFI maps of greater than 5 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 assumes no change in the underlying area of this category of woodland between the base years for NIWT and NFI (1998 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 164 thousand hectares between the previous Forestry Commission estimate of woodland area at March 2010 of 1,130 thousand hectares and that of the current estimate of 1,294 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 summary of the various adjustments and updating applied to the NIWT 1998 woodland



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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 1998 estimate**

	thousands of hectares
<b>NIWT 1998 estimated area</b>	<b>1096.9</b>
<b>Adjustments and updating of FC woodland area</b>	<b>-16.6</b>
Of which:	
Discrepancy between NIWT FC area and SCDB area for 1998	-3.9
FC new woodland 1998-2010	2.3
Adjustments due to land use changes and to integral open areas 1998-2010	-15.0
<b>Changes to non-FC woodland 1998-2010</b>	<b>50.2</b>
Of which:	
Grant schemes 1998-2010	44.6
Non-FC non-grant scheme new planting 1998-2010	5.6
Assumed non-FC woodland loss 1998-2010	0.0
<b>Net changes and adjustments for all woodland</b>	<b>33.6</b>
<b>Reported total woodland area in Forestry Statistics 2010</b>	<b>1130.0</b>

Notes:

1. Transfers of ownership between FC and non-FC woodland via the FC acquisitions and disposals programme between 1998 and 2010 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 1998 and 2010 include updating of the sub-compartment database for land use transitions before 1998, corrections for integral open space of less than 1 ha and for declared land use change including open habitat restoration.

The main adjustments made to the NIWT 1998 total woodland area to obtain the previously estimated woodland area for 2010 are a decrease of 15.0 thousand hectares resulting from adjustments made within the FC sub-compartment database, and an increase of 44.6 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 15.0 thousand hectares to FC woodland between 1998 and 2010 will not be accounted for because woodland areas converted to other use (such as for habitat restoration) 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 164 thousand hectares between the current and previous estimates of total woodland area for 2010, via an analysis of each estimate in relation to NIWT 1998 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 FC new woodland between 1998 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

	thousands of hectares
<b>Previous estimate of total woodland area in 2010</b>	<b>1130.0</b>
<b>Methodology adjustments</b>	<b>-16.5</b>
Of which:	
Discrepancy between NIWT FC area and SCDB area for 1998	3.9
FC treatment of internal open space and felling for habitat change 1998-2010	15.0
Area of NIWT small woods (0.1 to 0.5 hectares)	-24.2
Small areas of open space (0.5-1.0 hectares)	-3.0
Adjustments due to other methodology differences	-4.6
Adjustment for new planted areas of less than 0.5 hectares	-3.5
<b>Corrections</b>	<b>146.6</b>
Of which:	
NIWT 1998 non-woodland	-5.5
NIWT 1998 missed woodland	1.1
Under-estimate of woodland area of 0.5-2.0 hectares in NIWT small woods survey	151.3
Confirmed woodland loss	-0.3
<b>Total adjustments and corrections</b>	<b>130.1</b>
<b>Previous estimate after identified adjustments and corrections</b>	<b>1260.1</b>
<b>Yet to be reconciled</b>	<b>33.7</b>
<b>Reported NFI 2010</b>	<b>1293.8</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 1998 woodland area are currently estimated to account for 130 thousand hectares of the difference between the two estimates of woodland area in 2010. Remaining differences totalling 34 thousand hectares are attributed to, as yet, un-reconciled differences between the NIWT 1998 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.