Chapter 8: Components

Contents

8.0 Components

Components are the individual elements, or building blocks, of the forest that account for much of its nature and all of its recorded area. The component data collected should enable a person who has not visited the Square to get an idea of the representative character and composition of the Sections.

Components describe a particular element of an area. This area will generally take the form of a section, but may also be a smaller area such a component group. Treed area components are identified by species, storey (vertical structure) and component group (plan structure) within the section (described below). Components can also be used to describe a non-treed area, such as a house and garden etc.

Because components are not mapped, those which constitute a section are recorded as a proportion (%) of that section. By applying this % to the section area, the component area can be subsequently derived.

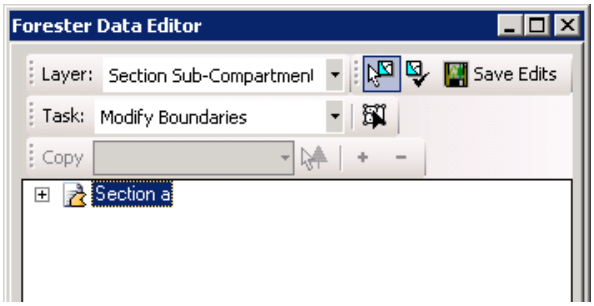
The minimum area for an individual component is ordinarily one percent (1%), of a section and can run up to 100% of a section. If there is more than one component then the % area allocation of the section must be shared between the components until they equal 100% per storey.

Individual components, whether treed or non-treed, will have component attributes attached to them.

8.1 Component Attributes

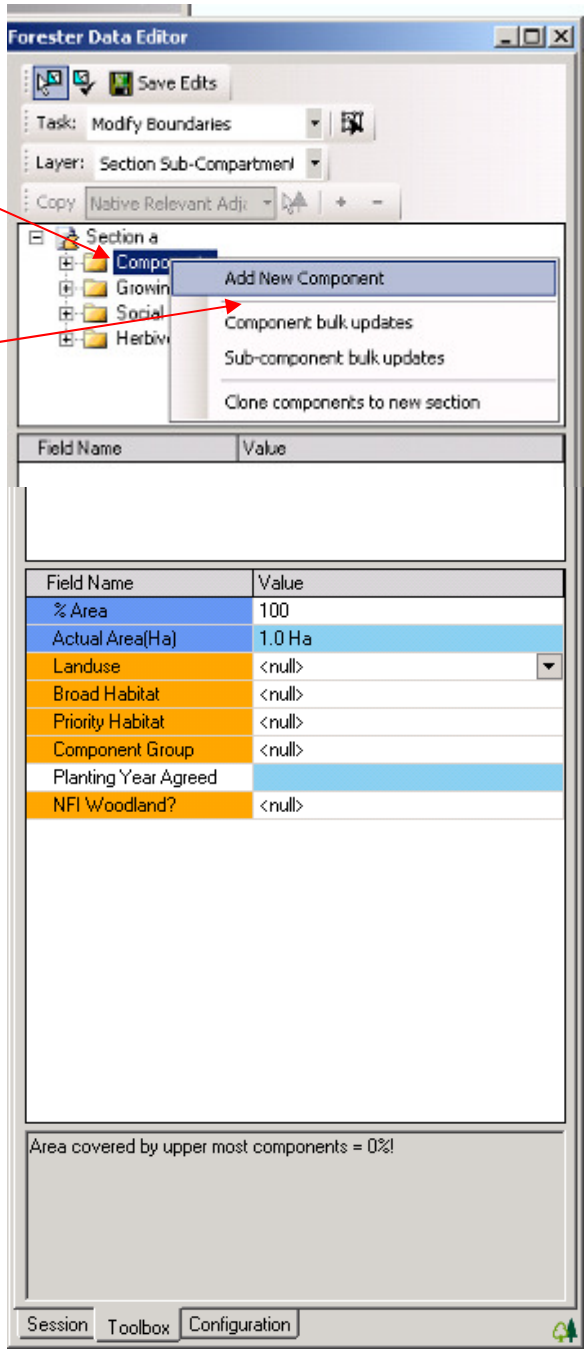
A range of attributes are recorded for each component. This is information specifically associated with the component such as species, planting year and storey.

Double click on the Section name (highlighted in the figure opposite) or single click on the ⊞ box next to the Section name. If the section is 'Inaccessible, NO visual assessments possible' no sub-folders will be shown.



In the Forester Data Editor window, right click on 'Components' to get the option to Add New Components.

Click on the Add New Components box to access the Component Data.

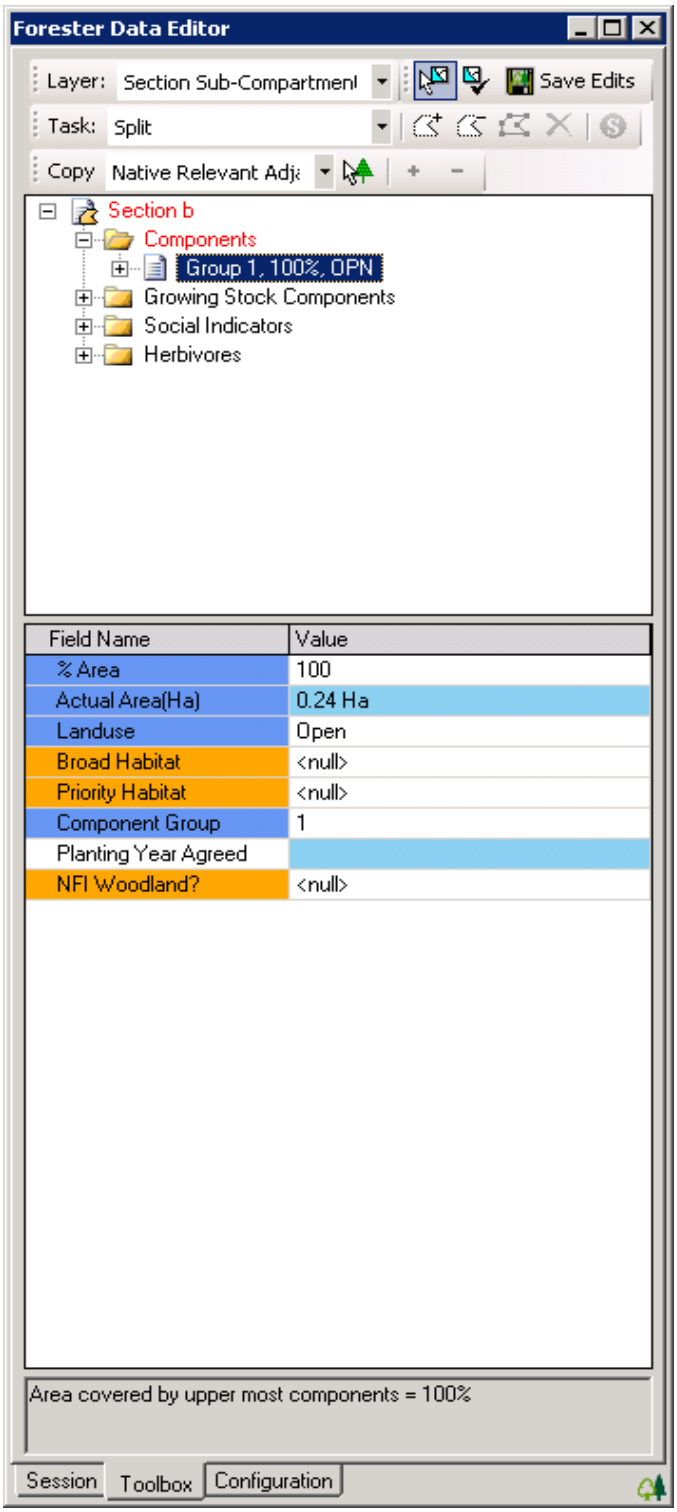


Note that the word Component is in red. This will turn black once all of the mandatory data fields have been correctly filled out.

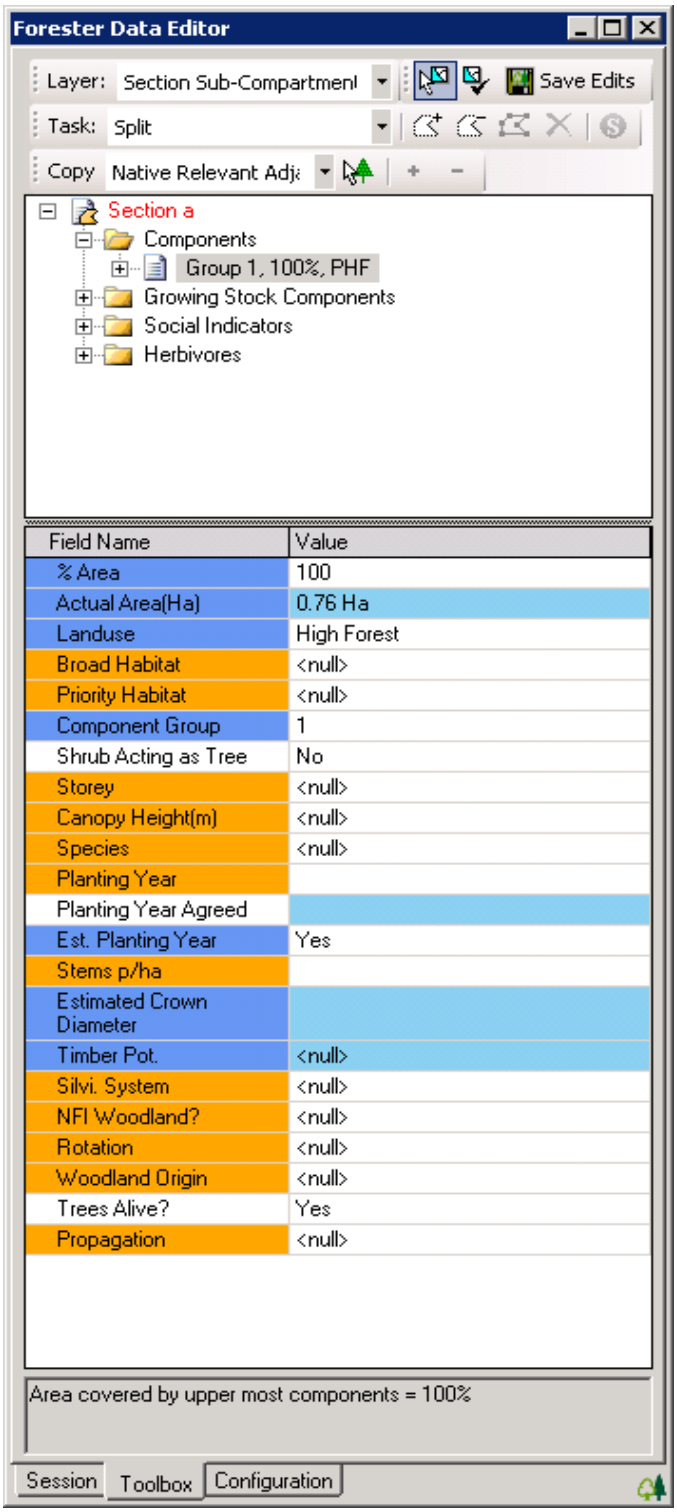
The number of Fields (Component Attributes) varies depending upon the Landuse option that are chosen.

There is more to survey and record for woodland areas than non-woodland areas. To help you remember what has to be recorded against which, the software brings up what has to be assessed according to the land use you choose. So for example if you choose the high forest landuse, the software will bring forth tree factors to be assessed and if you select a non-woodland landuse such as open water, it will not bring up tree attributes to be assessed.

Non-treed Area



NFI treed Area



8.2 Component Attribute Data Entry

Table 8 - 1: Component Attribute Level Data entry

Data Field	Options	Comments
%Area	Free text	Enter the % of the Section covered by this Component. See Chapter 8.4 for more details.
Actual Area	*None*	*Calculated by the software.*
Land Use	Various Land Use options available	Assessing and choosing the correct land use at the start of the survey is key to the whole assessment as the choice determines what has to be surveyed. The main choice is between high forest or woodland and non woodland land uses. – See **Chapter 8.6 Land Use** for the full Land Use listing.
Broad Habitat	All habitats are available –	Assess and choose the BROAD Habitat for the component. See **Chapter 8.7 Broad/Priority Habitat** for more details.
Priority Habitat	All priority habitats are available	Competent surveyors should ALWAYS identify and choose the Priority Habitat where one is present. If priority habitats are not applicable to this area (such as built up areas) record 'Not applicable' If the habitat cannot be identified choose 'Surveyed; Unknown Habitat'. If you assess the site due to snow cover record 'Not Surveyed'.
Component Group	• 1 • 2 • 3 • 4 • 5…… • 30	State which Component Group the Component belongs to. All Components belong to a Component Group. Component Groups can be comprised of just 1 Component. Component Group numbers start at 1 and must be consecutive e.g. if there are two Component Groups in a

		Section these need to be numbered 1 and 2, not 1 and 3 etc. (no gaps in the numbering). See Chapter 7 for more details.
Shrub Acting as tree	• Yes • No	This field is to account for those individual plants which are taxonomically categorised as shrubs, but have grown to the dimensions of a tree. Examples would be a Rhododendron that has achieved ≥ 5m in height, a relatively clean stem ≥ 4cm dbh and is forming part of the canopy with tree species. If you choose this option the species list will change to provide solely those species taxonomically categorised as shrubs, but which can of occasion have the morphology of trees.
Storey	• Upper • Middle • Lower • Complex • Young Trees	See Chapter 8.8
Canopy Height	• 0cm – 2m • 2m – 5m • 5m – 15m • 15m - 20m • 20m +	Estimate mean storey height of the component and record which band this falls within. For leaning or windblown trees enter the Canopy Height band the Component would have been in if VERTICAL. Dead Trees – enter Canopy Height of a whole tree (unsnapped) where possible.
Species	Various.	Tree species list unless 'shrub acting as tree' is chosen, then it becomes a shortened shrub list. See Chapter 8.9
Planting Year	Free text	Estimate the Planting year of the Component. See Chapter 8.10 for guidelines to estimating tree age. **Coppice** – estimate the planting year of the stool, not the stems.
Est. Planting Year	• No • Yes	Has the planting year been estimated or is it known (from the landowner for example)?
Stems p/ha	Free text	Estimate the stems per hectare of the Component based upon the Components' density of stems within its Component Group using the guide in Chapter 8.11. The minimum number of stems that can be entered is 1.

		Remember that for non-coppice multi-stems (fork <1.3m) *each* stem is counted. **Coppice** – estimate the number of stools per hectare not the stems. NB: this is NOT required for Seedling or Sapling components.
Estimated Crown Diameter	Free text.	This should be a quick visual assessment of the mean crown width of a component. This will include a broad range of widths, as would be expected with any normal distribution in a natural population and the estimate will be broad. Aim to get the mean within 1 m to 2 m of the actual value and use your plot crown width measurements at plot to self-calibrate your estimates. This field only appears if the Section is classed as 'Inaccessible, visual assessment possible'.
Timber Pot.	• Fuelwood potential only • Potential timber crop • Short roundwood crop	Estimate the potential of this component for one of the 3 choices. Note that for broadleaves to be considered to have Timber Potential the following rule must apply: If > 20 years old then stems per ha must be >= 100. If <20 years of age then stems per ha must be >= 500
Silvicultural System	• Even-aged, i.e. Clear cutting • Seed tree (Uniform shelterwood) • Strip Shelterwood • Group selection • Single tree selection • Coppice • Coppice with standards • Short Rotation Coppice • Pollarding • Group shelterwood • Other • Garden &	Assess the traditional silvicultural system that applies to the stand. See OGB 7 in the Additional documents folder on the Toughbook for guidance of some of these systems. A flowchart is located at the end of OGB 7 (page 56) for quick reference. Note that since silviculture systems often operate at a scale that is larger than the sample Square, that in some circumstances surveyors will need to look outside of the Square to ensure that the correct Silvicultural System is selected. A single silvicultural system is assessed for the Component Group.

	Ornamental • None Obvious	
NFI Woodland?	• NFI • Non NFI	Ascertain if the area in question falls within the definition of NFI woodland; i.e. is it part of a woodland ≥ 0.5 hectares in extent which has 20% or more canopy cover or the ability to achieve it with the trees on site? This includes restock sites, clearfell sites (classed as temporary unstocked) and new planting. Remember also that open areas within woodland (entirely surrounded by woodland) of up to 0.5 hectares in extent are classified as woodland. Also when assessing long thin woods remember that woods must on average be over 20 m in width, unless the area less than 20m in width is a small pinch point of less than 20m in length (which is permissible). When assessing if trees have hit the 20% threshold remember that trees must be within 20m of one another and that young trees and shrubs acting as trees are also included in totalling up to 20%. You can check your assessment against the NFI Woodland Map GIS layer. This may be different to what is on the ground, as not all types of woodland can be seen from the air at all times.
Rotation	• 1st rotation • 2nd rotation • More than 2 rotations • Not discernible	Estimate the number of rotations for each *Component* "A rotation is a period of time (in years), normally sequential (i.e. 1st, 2nd, 3rd etc.), where an even-aged stand is planted or naturally regenerated, matures and then is felled."
Historical Features	• Monument • Structures	Any form of monument, ancient or 'modern' e.g. standing stone or cenotaph respectively. Also any scheduled or unscheduled ancient monument. Any form of building, e.g. dwelling, farm, barn, industrial buildings etc. (stone, brick, wood etc.), in any state of repair, (roofed, non-roofed, evidence of a wall etc.), that

		is older than the Second World War (1939 – 1945).
Woodland Origin – this is the origin of the Component Group, not the individual components within the Group. Only one Woodland Origin category per Component Group should be recorded.	• Plantation	All planted components regardless of species planted or woodland management intentions i.e. whether primarily for commercial purposes or for conservation purposes
	• Semi-natural forest	Woodland composed of <u>mainly</u> locally-native trees and shrubs that derive from natural seed fall, suckering (sprouting from adventitious buds on the roots) or coppice, rather than from planting. A proportion of the crop may be of planted origin but the majority must originate from natural means.
	• Undisturbed by man	This generally means pristine woodland that has not been influenced either directly or indirectly by human intervention (e.g. has not been grazed by domestic animals). It is generally not thought to occur in the UK.
	• Recent natural expansion	This generally means expansion onto areas not previously wooded e.g. agricultural land. However, it could be applied either to Section/Component Group or individual components. It could also be applied to all areas with 100% site native species or any proportion of site nativeness species down to 0%.
	• Ancient forest	This is a term generally used in the UK to refer to woodland that has existed continuously since 1600 or before in England & Wales or 1750 in Scotland. Before these dates it is thought that extensive planting of new woodland was uncommon so any woodland was likely to be mostly natural in origin. This could be any Section/Component Group/Component for which the area is recognised as Ancient Woodland regardless of current status, or only those areas that appear to be semi-natural sites on previous Ancient Woodland thus taking account of field observations rather than purely the AW Layer. Most surveys split Ancient Woodland into 2 categories Ancient Semi-Natural Woodland (ASNW) and Planted Ancient Woodland Sites (PAWS). See Chapter 8.2.1 for more detail.
	• Not discernible	NOT DISCERNABLE.

Tree Alive?	• *Yes* • *No*	See Section 8.8.6
Propagation	• *Planted*	Introduced to the site as a transplant via human activity. Usually evident by the uniform location of the trees through planting in lines and trees being of the same species, or of a limited species range and of the same age. Often non-native. Evidence of cultivation or other establishment techniques such as tubing. Includes seed sowing.
	• *Regeneration*	A seedling or sapling arising from natural processes, such as a self-sown seed, distributed through natural processes, germinated and growth in situ. May be encouraged through fencing etc., seed dispersal may involve mammals or birds. Excludes seed sowing.
	• *Suckers*	a shoot rising from a subterranean stem or root
	• *Coppice Re-growth*	a shoot rising from a cut stem or stool
	• *Not surveyed*	
Outside Square Only?	• Yes • No	Very occasionally a circular plot will straddle a section boundary. If the stand continues outside of the square the entire plot is still valid and tree measurements must be taken across the entire plot. In some instances some of the trees outside of the square, but within the plot, will not be part of a component found within the square and for example may represent a new tree species. In these instances create a component for these trees (or tree) and mark it as 'outside square only' and set the component % area to 0%. This will enable FC data analysts to include the component data within the mensuration assessment, but exclude it for other assessments such as woodland condition.
Est. Top Height (m)	• Free text to 1 decimal place	Estimate the mean *total* height of the component. This field only appears if the Section is classed as 'Inaccessible, visual assessment possible', windblow and also for all Dead Stem Components.

Est. Mean DBH (cm)	• Free text (whole number)	Estimate the mean DBH of the component. This field only appears if the Section is classed as 'Inaccessible, visual assessment possible', windblow and also for all Dead Stem Components.

8.2.1 Ancient Woodland Identification

Ancient woodland should be Sectioned separately from other woodland origins as per the instructions in Chapter 4.0.

When assessing whether an area is Ancient Woodland or not the Ancient Woodland Layer map can be used as an indicator of *potential* Ancient Woodland. However the Ancient Woodland Layer should not, by itself, be used to section out an area of Ancient Woodland, as it excluded woods less than 2 hectares and some areas were assessed and classified at a desk.

Of more importance are the various indicators including:

- Indicator plants
- Tree Species – see Table 8 - 6: Earliest planting dates for Conifers and Table 8 - 7: Earliest planting dates for Broadleaves
- Diversity and combination of tree and plant species
- Diversity in age classes
- Presence of veteran trees
- Age of trees
- Presence of wood banks (ancient woodland boundary markers – often with a stockade to keep out grazing animals)
- Stump sizes
- Evidence of old woodland industries (e.g. charcoal pits) or coppicing/pollarding
- Woodland location – steep sites tended to remain woodland for longer as they were harder to clear and unsuitable for grazing animals
- Woodland proximity to urban areas very far away or very close are often ancient woodland candidates, as these were either too far away from people to be exploited or communities kept woods close at hand for a ready supply of building materials and firewood, especially so in areas without stone or peat.
- Evidence of old tracks (sunk or incised, with veteran trees and hedging)
- Woodland names. As most place names in Britain were established well before 1600 any woodland areas which have woodland names or woodland as part of their name are more likely to be ancient. Especially if the names are in old languages; Gaelic, Welsh, Norse or Anglo-Saxon.

    - For example;
        - 'Thwaite', thveit (as in Arnthwaite) which comes from Old Norse meaning: 'a piece of land cleared from forest or reclaimed from wasteland'.
        - 'Keith' (as in Dalkeith, Keithley), Cold, Coat, Ced, Cet or Cot in English, are all remnants or borrow words from the old Welsh word for woodland. Coedd or Cot in modern Welsh. Cos in Cornish.
        - Coille, Killi, Kil, Kill, Kellie, Cellie - Gaelic for wood.
        - Ros, Rois- Gaelic for wood. –
        - Doire - Gaelic for small wood or grove
        - Lee, or leah, coming from the Old English for village in a clearing or wooded area
        - Holt and Hyrst - Old English for wood
        - Fyrhthe, ffridd, fyrhth woodland, scrub on banks (old Welsh / Welsh)
        - Grove, Grave, Graefe, Graf, Grafa, Old English for coppiced wood
        - Wood, wald. Weald - Old English for coppiced wood
- Similarly place names with tree species within them or woodland animals can denote ancient woodland roots.

If a surveyor feels that, based upon the indicators above, they interpret that the woodland is probably ancient woodland then it should be a Section or Component Group depending upon its total extent within the Square.

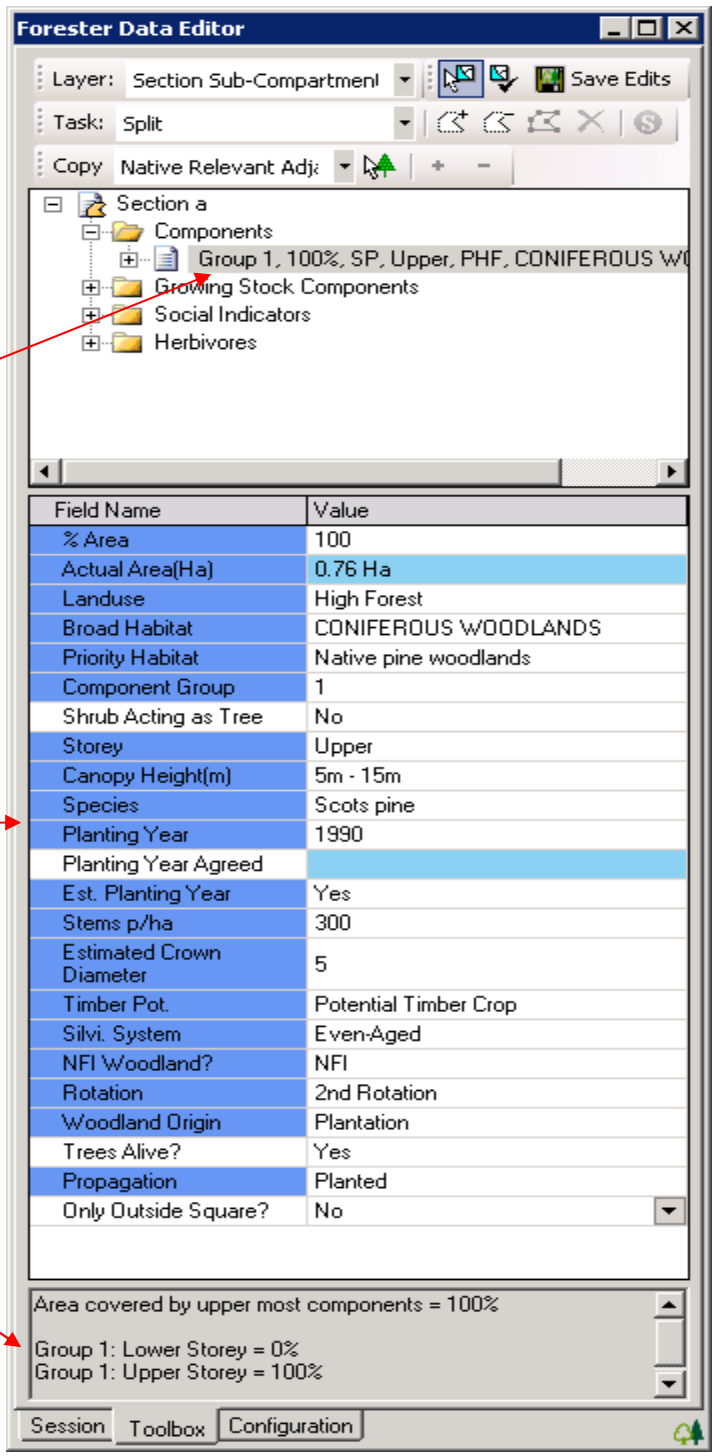
Example: Completed Trees Component data.

A summary of the data entered will appear in the main Component data line.

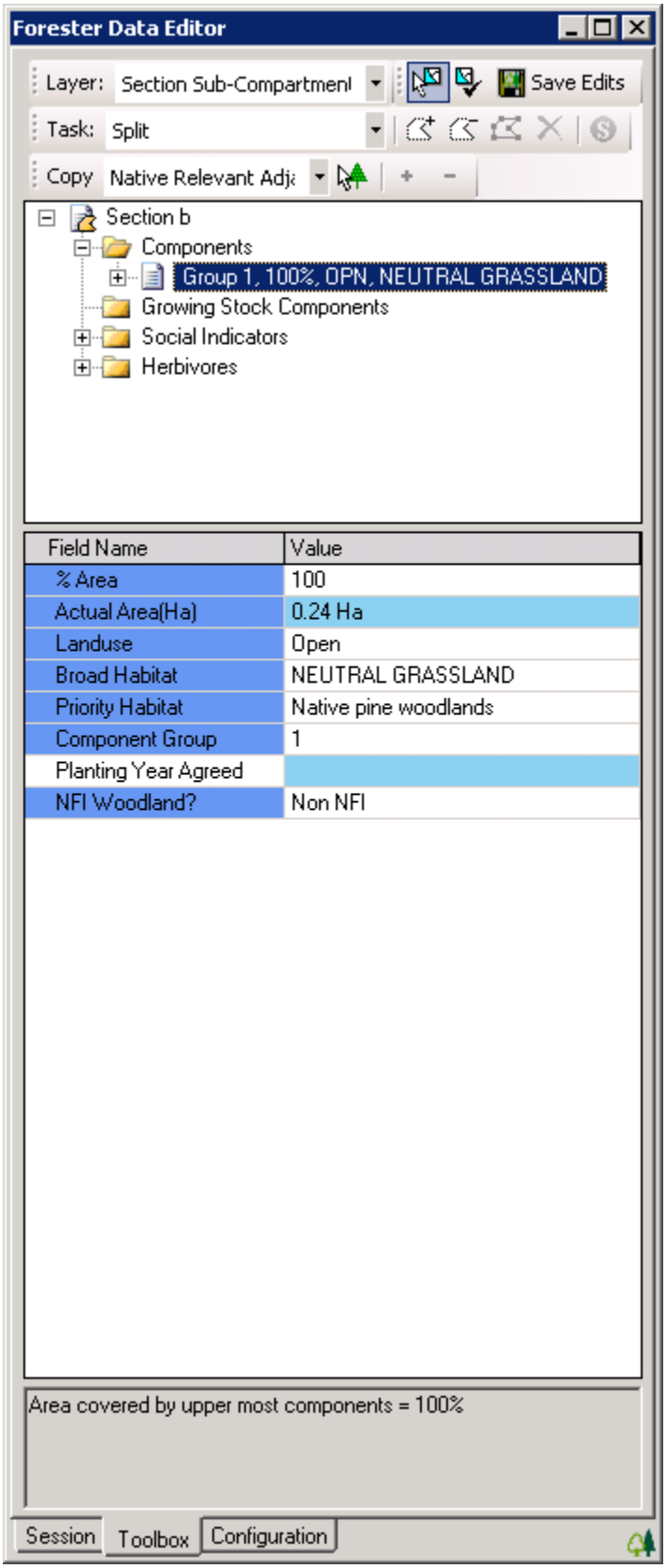
Orange Data Fields turn blue once attribute data has been entered.

Validation issues and checks are located in the grey area at the bottom of the Forester Data Editor window.

In this case it has correctly identified that the Uppermost storey = 100% of the Section.



Example: Completed Non-Treed Component data

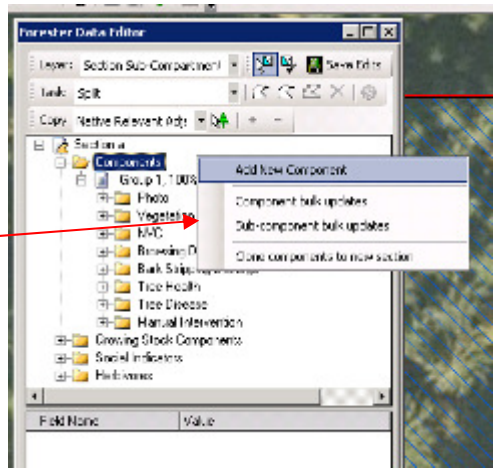


Fewer attribute data Fields are available for completion for a non-treed area.

8.3 Multiple Components

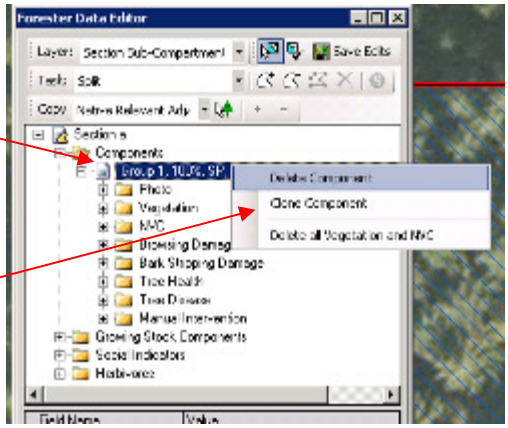
8.3.1 Add Component

If the Section has more than 1 Component, further Components can be added by right-clicking on Components and selecting Add New Components.



8.3.2 Delete Component

If too many Components have been created delete them by right-clicking on the Component to be deleted and selecting Delete Component.



8.3.3 Clone Component

In some instances a Component may be cloned instead of Added. Instead of having to enter the entire data set for a new Component again the Cloning function clones a selected Component, and all of its associated Component and Sub-Component attribute data, significantly speeding up the data collection BUT the newly cloned data **must** then be edited.

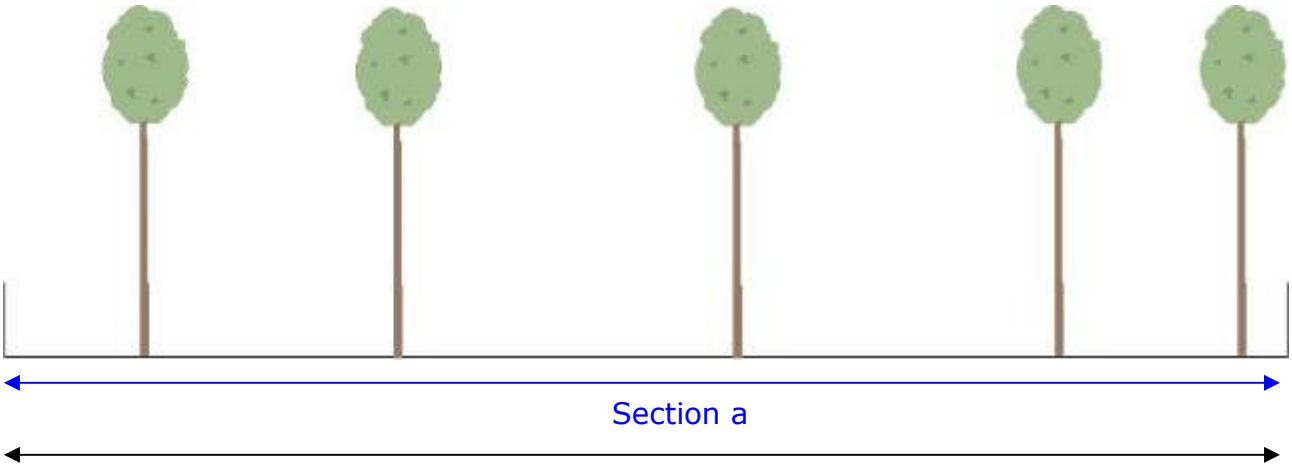
8.4 Component % Area

The *occupancy* of each component within each storey needs to be assessed and recorded in the **% Area** field of the software. Note that occupancy is *not* necessarily the same as canopy cover.

Across a Section all the uppermost components (treed and non-treed) must add up to 100% of the section area otherwise the full section area is not accounted for and the software *will not validate*.

As the number of storeys and Component Groups increases then the complexity of the storey assessments increases. The following examples will help to clarify the range of situations in the field.

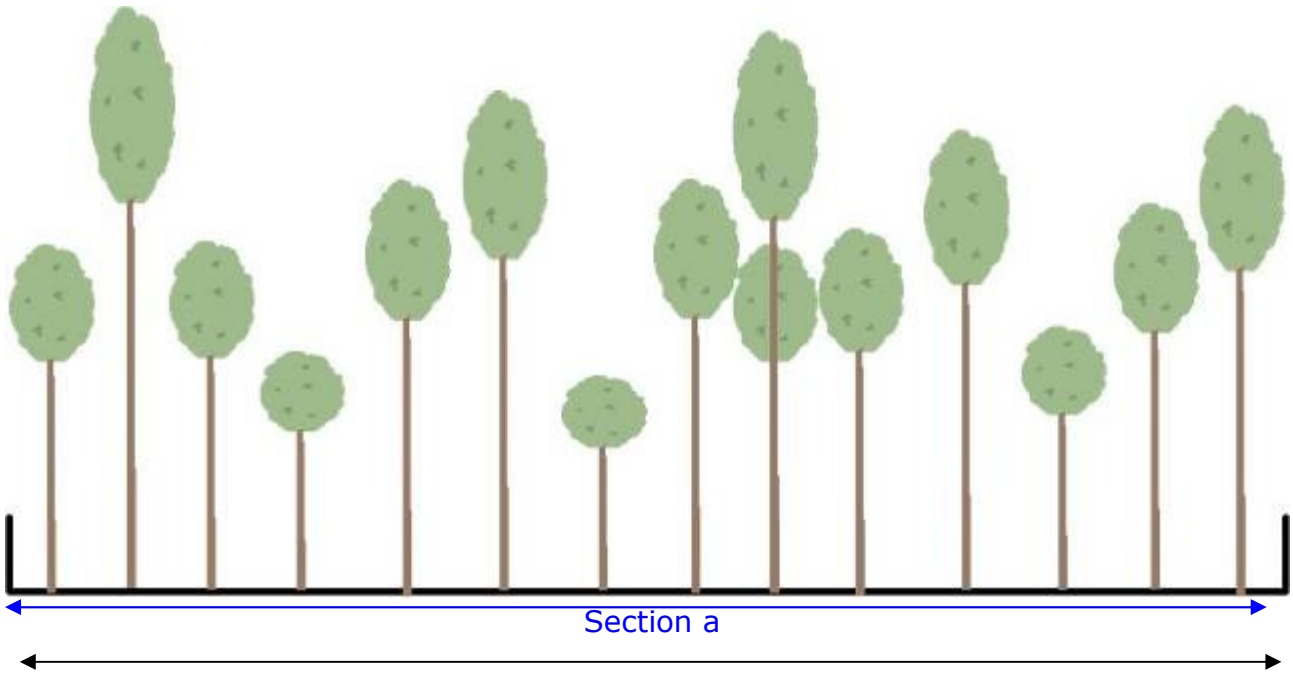
Example 8 - 1: One Component Group, One Storey (upper), One Component



The above section contains a single Component Group of a sparse Upper storey of Scots pine. The Scots pine is the only component present in the Upper storey and it dominates the site, so that this is determined to be a Scots Pine site or wood. Therefore the component *occupies* 100% of that storey. The canopy of the pine only covers 50% of the Section and that factor of low stocking will be represented in the stocking assessment and the crown measures and estimates at plot and component.

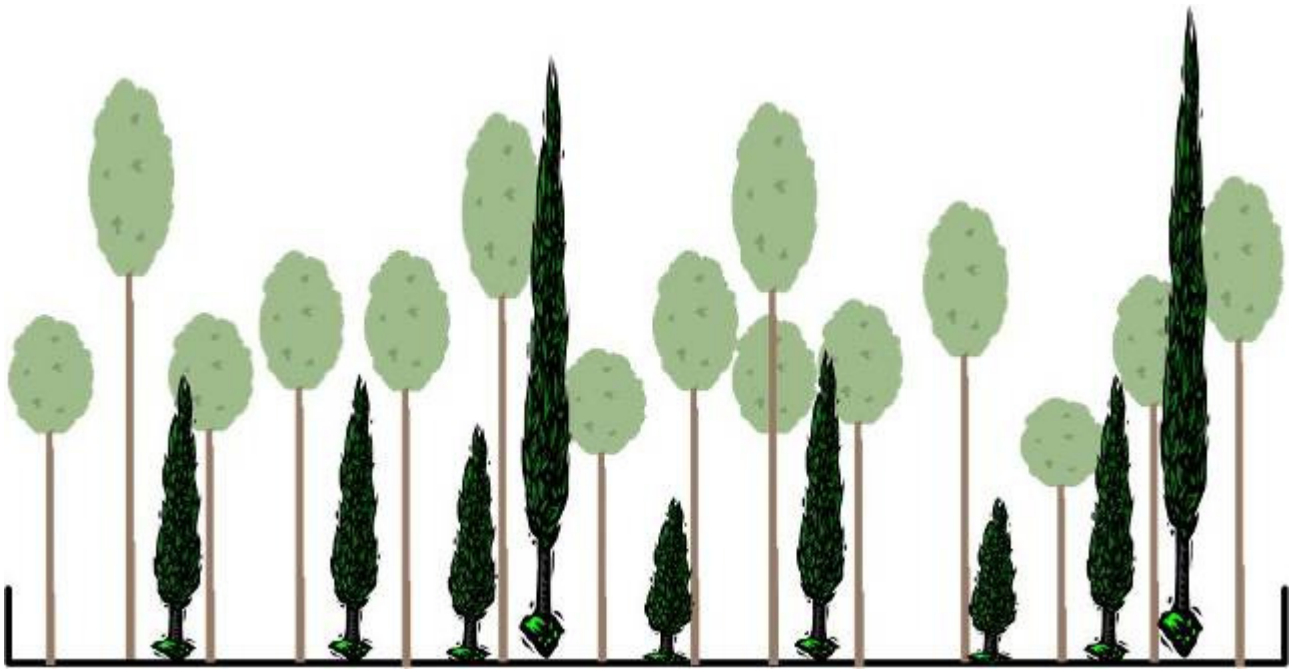
Section	Component Group (CG)	Storey	Component	%Area
a	1	Upper	Scots pine	100

Example 8 - 2: One Component Group, Complex Storey, One Component



Section	Component Group (CG)	Storey	Component	%Area
a	1	Complex	Scots pine	100

Example 8 - 3: One Component Group, Complex Storey, Multiple Components



Section a

CG1 (100% of Section)

Section	Component Group (CG)	Storey	Component	Canopy Height	%Area
a	1	Complex	Scots pine	5-15m (bulk of the trees are within this range)	50
		Complex	Western hemlock	15-20m	20
		Complex	Western hemlock	5-15m	30

In the above example there is no distinct height banding or 'gap' between stories. There is a distinct difference in the heights of the western hemlock, hence two components, but the Scot's pine blurs this banding across the Section resulting in a Complex Storey overall. There is no distinct banding within the pine and so only one Component is recorded with a weighted canopy height.

Example 8 - 4: One Component Group, One Storey (upper), Three Components

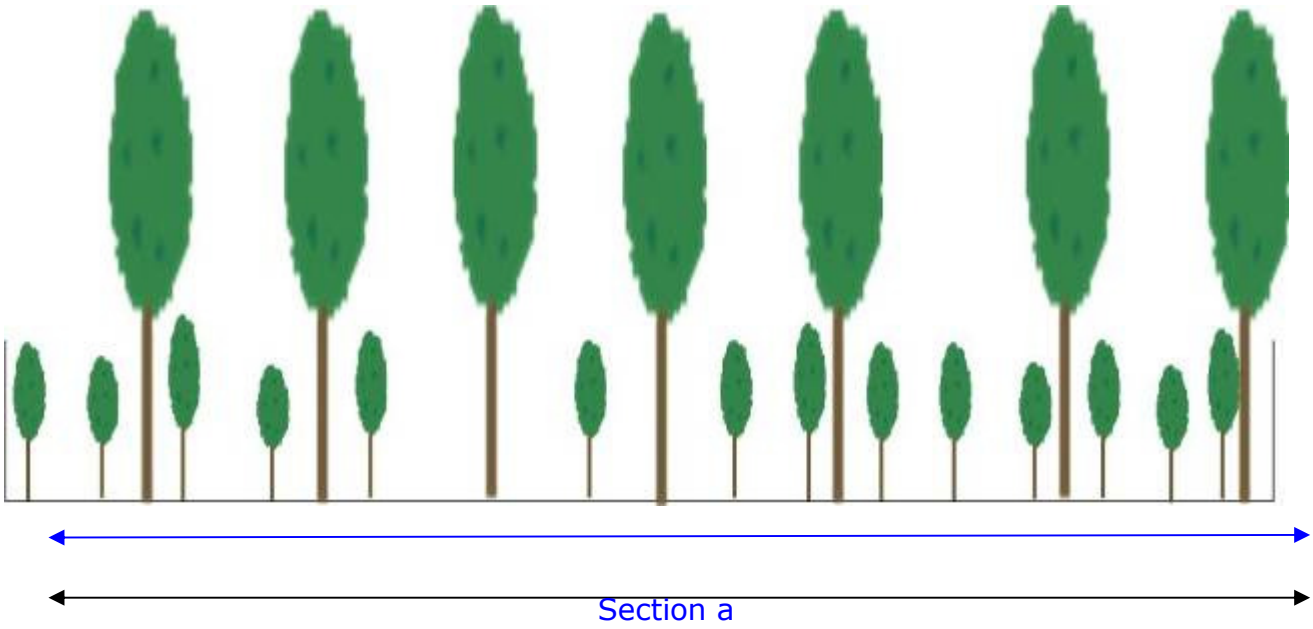
Section a

CG1 (100% of Section)

Section	Component Group (CG)	Storey	Component	%Area
a	1	Upper	Scots pine	40
		Upper	Sitka spruce	30
		Upper	Sitka spruce (windblown)	30

Note how the Section has been divided up between the constituent Components.

Example 8 - 5: One Component Group, Two Storeys (upper and lower), One Component per Storey

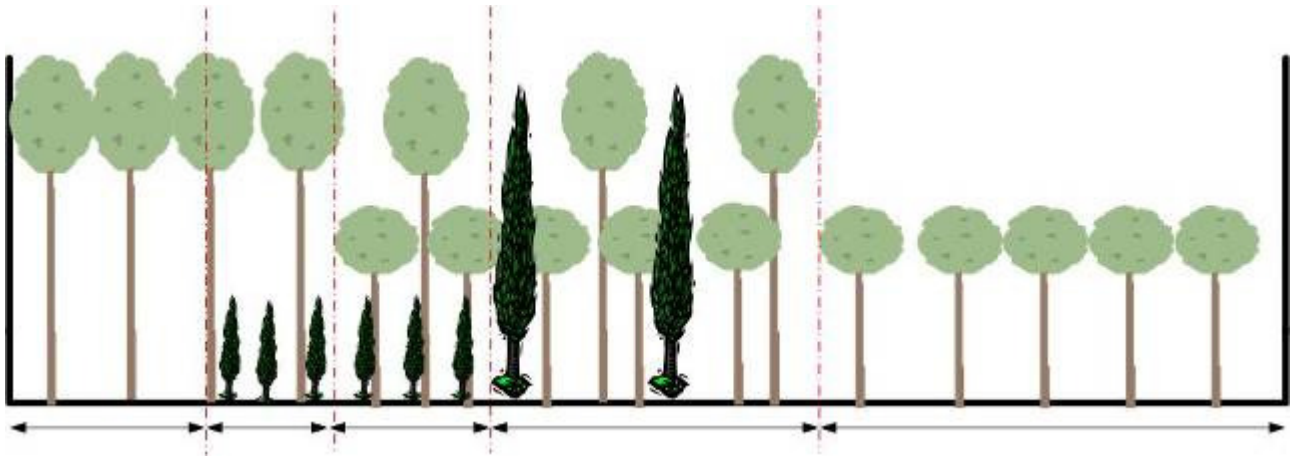


CG1 (100% of Section)

Section	Component Group (CG)	Storey	Component	%Area
a	1	Upper	Scots pine	100
		Lower	Scots pine	100

Each Storey occupies 100% of the Component Group in its own height band. This Component Group occupies 100% of the Section. The % Area field sums to 100% for each storey, which is allowed as the Storeys overlap each other. Any single storey must **not** occupy >100% of the Component Group and/or Section it is within.

Example 8 - 6: Five Component Groups, Three Storeys (upper, middle and lower), One or more Components per Storey



Section	Component Group (CG)	Storey	Component	%Area
a	1	Upper	Scots pine	15%
	2	Upper	Scots pine	10%
		Lower	Western hemlock	10%
	3	Upper	Scots pine	13%
		Middle	Scots pine	13%
		Lower	Western hemlock	13%
	4	Upper	Scots pine	12%
		Upper	Western hemlock	10%
		Middle	Scots pine	22%
	5	Middle	Scots pine	40%

Note that:

A Storey within a Component Group occupies the entire Component Group (unless there is open space present within that component group, then this area is netted off)

- The total % area covered by the uppermost Storey of each Component Group covers 100% of the Section. So for the above example the uppermost Components are:

- CG1 Scots pine Upper – 15%
- CG2 Scots pine Upper – 10%
- CG3 Scots pine Upper – 13%
- CG4 Scots pine Upper – 12% AND Western hemlock Upper – 10%
- CG5 Scots pine Middle – 40%

The sum of the uppermost components is therefore:

$$15\%+10\%+13\%+12\%+10\%+40\%=100\%$$

In order to arrive at the % area figures for each Component:

1. Decide what proportion of the Section each Component Group covers

    a. For the above example this would be: CG1:15%, CG2:10%, CG3:13%, CG4:22% & CG5:40%

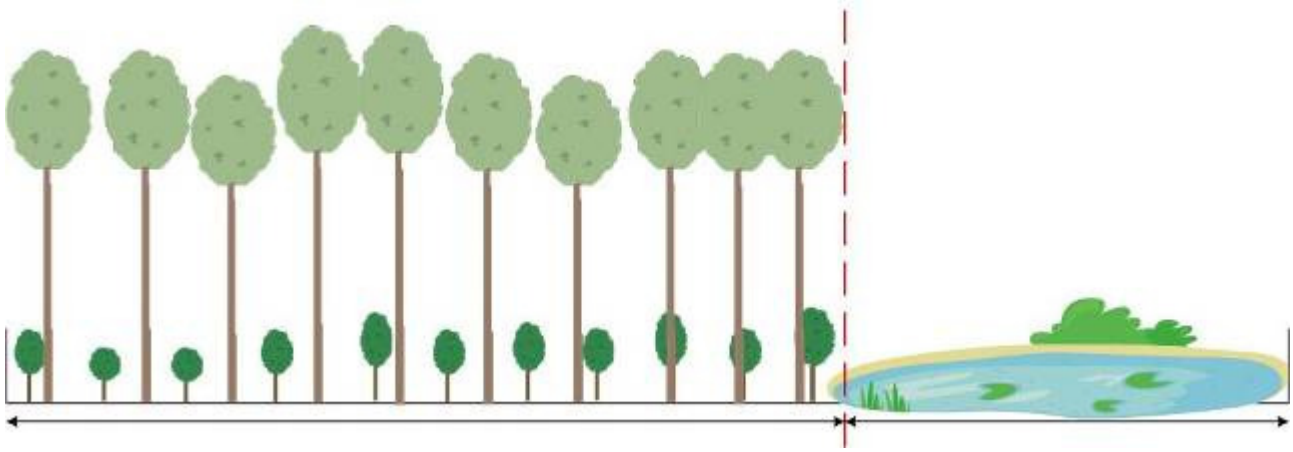
2. Within a Component Group – assign each Storey with the % that was assigned to the Component Group in (1) above regardless of actual canopy cover of the Storey within that Component Group.

    a. For example in CG4 above: each Storey is assigned 22%

3. For each Storey, split the % allocated to the Component Group in (2) above between its constituent Components.

    a. For example in CG4 above: the Upper Storey pine is assigned 12% and the western hemlock 10% reflecting their relative abundance in the Storey

Example 8 - 7: Mix of Treed and Open Component Groups



CG1
60%

CG2
40%

Section	Component Group (CG)	Storey	Component	%Area
a	1	Upper	Scots pine	60%
		Lower	Scots pine	60%
	2	Open Water (varies with IFT/IOA used)	Open Water	40%

The total occupancy of the uppermost Storeys (Scots pine Upper Storey and Open Water) = 100%.

If however an open space component is intimately mixed within woodland and this open space is permanent open space (and not the temporary open space between growing trees), then record the open space within the same component group. The sum of the uppermost canopy % area and the % area for the open space should add up to 100%

8.5 Zero (0%) Components

*Zero (0%) can be used but **only** where there is either a very low representation of a particular Component, such as a single tree or where the component is outwith the square but found within a circular plot. Here allocating 1% area would be too great, but the presence of the tree needs to be recoded.* For example if a component group has six components but the overall group is allocated 4% of the Section area, then four of the components (the most abundant) are allocated 1% each and the remaining two components allocated 0%. Alternatively, if one component in the above example is very

dominant and the other five components essentially take up no area then the dominant component could be allocated 4% and the rest 0% each.

8.6 Land Use

8.6.1 What Is Land Use?

Land Use is a means of classifying all land and open water within GB, with all land falling into one category or another.

Land is categorised according to its use or type and these types are often set in relation to land management choices or the physical nature of land, examples would be high forest, agriculture and open water respectively.

It is important to get Land Use correct as it is the basis for how we account for woodland area and any open space within woodland and it also determines what is to be recorded within the survey.

Land Use is assigned at a component level, because sites sometimes have intimate mixtures of different landuses, such as high forest and open. However, in the majority of cases the landuse will be common across a section or Component Group (and therefore to all Components within the Group).

As noted in some circumstances where different landuse are intimately mixed within the site a Component can have a different Land Use to the rest of the Components within a Component Group.

For example:

Windblow – If the windblow is intimately mixed i.e. scattered throughout the standing tree matrix the windblow has a Land Use of Windblow (Code: PWB) whereas the rest of the Components within the Component Group can have a Land Use of High Forest (Code: PHF).

Intruded Broadleaves – Components of self-sown broadleaves can be intimately mixed in a conifer crop. These broadleaves have a Land Use of Partially Intruded Broadleaves (PIB) whereas the conifer crop would be High Forest (PHF).

8.6.2 Land Use Codes

Table 8 - 2: Land Use codes and explanations

Land Use	Description
Agricultural land	Land in use for animal husbandry, biofuel (e.g. short rotation coppice), intensively managed commercial orchards or arable use.
Ancient and Ornamental	The use of this coding is restricted to specifically identified woodland within the New Forest. This needs to be confirmed with the FC District office in Lyndhurst.
Arboreta	Allocated to all Arboreta whether officially recognised or not. Include the surrounding or associated woodland managed with it. Areas with trees which primarily have an educational role may be included in this category.
Archaeological sites	This classification should take priority over all other land uses (including woodland) on or within the site in question. *If the Section is woodland then record as an IFT to get mensuration assessments and then note Monument etc. in Components.*
Burnt	Area of high forest destroyed by fire and where more than 80% of the trees have been killed.
Cabins / Holiday House	Land which is managed by Forest Holidays Joint Venture Company only. For FD run campsites see Other Recreation (FRO).
Campsite (also wild camping)?	Land which is managed or run for campsites, see Other Recreation (FRO).
Car Parks/Picnic Areas	Allocated at Section level if large enough, otherwise as a Component/Component Group with the surrounding crop. All woodland within car parks (i.e. islands) should be classified as Car Parks/Picnic Areas, but surrounding woodland, despite any influence on its management because of its proximity to the site should be classified normally (e.g. high forest).
Christmas Trees	This should only be used when it represents the main land use.
Commercial Orchard	Intensively managed for fruit production, composed of short lived dwarf or bush fruit trees, often on frames, less than 2m, no high canopy formed. Not of 'woodland character'.
Deer glades	Allocated to areas specifically used for deer management.
Failed	Treed areas planted within the previous 15 years which have less than 20% of the appropriate management table stocking. **For the NFI surveyors will need to be able to see dead, young trees indicating that the area has actually failed.** If these cannot be seen then the area is deemed open.

Land Use	Description
Felled	Felled areas, formerly high forest or windblow. Where an area is known to have been felled >10 years previously and has <20% canopy cover (or does not have the ability to achieve this through maturation of the current tree stock) then reallocate this area to another Land Use. **For the NFI if any area has trees on it 'Felled' should not be used. This category is only for unplanted/regenerated areas where felling has taken place.**
High Forest	Woodland which cannot otherwise be classified as arboreta, Ancient & Ornamental, Christmas trees, pockets of windblow, coppice, research area or seed stand. There should be a canopy cover of at least 20% (or in the case of younger crops, the ability to achieve this once matured).
Information Centre	Primarily applies to a building and its immediate surrounds such as lawns and car parks. May include areas with trees which primarily have an educational role but which are only a minor component of the site. Such sites can generally be recognised at the Section level.
Linear Feature and Open Space associated with Linear Feature	Do not use, use Permanent Open space associated with linear feature.
Mineral Working	Land with Mineral Working by Non-FC companies/organisations. This can be FC or non-FC land. Once abandoned or reclaimed, these areas may need to be reclassified as appropriate
Non-plantation research	Woodland/forest research sites, often designated with signage.
Nursery	Where land is managed as a nursery for plant production.
Open	Including: • wayleaves / rights of way; • unplanted hilltops and deer forests (usually large areas retained for management reasons which are likely to remain unplanted because of their altitude); • Areas of land within the forest block that have less than 20% canopy cover.
Open Water	Allocated to all land areas dominated by standing water for most of the year.
Other Built Facility	This should include the immediate surrounding area, down to 0.05ha (0.01ha if non-NFI in NFI) hectare. The code relates to non-residential buildings excluding Information Centres.
Other	Includes all other facilities provided specifically for public

Land Use	Description
Recreation	enjoyment. This includes campsites and cabin sites managed by Forest Districts and NOT the Forest Holidays Joint Venture Company.
Partially Intruded Broadleaf	Areas of low quality woody species (in terms of timber production) found in intimate combination with other plantation woodland. They are always allocated component status (i.e. never mapped) and are in most cases of natural origin but can result from past planting.
Permanent Open space associated with a linear feature	Land lost to permanent roads and tracks – sealed (tarmacadam or concrete) and metalled or water (river, canals).
Plantable land	Bare land immediately available for planting e.g. new land acquisitions. FC land only. Should be held as open on non-FC land.
Quarries	FC mineral working site, whether used or abandoned.
Research Plantation	The surround of any experiment should be included. In general the area should be given Section status. However, where the area is too small, the area should be classed as a component.
Residential	This should include the immediate surrounding area. It is permissible to allocate them section status down to 0.05ha (0.01ha if non-NFI in NFI) hectare.
Seed Stand	An area of high quality trees that are harvested for their seeds.
Seed Orchard	An intensively-managed plantation of specifically arranged trees for the mass production of genetically improved seeds to create plants, or seeds for the establishment of new forests.
Traditional Orchard	Fruit or nut trees planted at low densities, usually of varying age structure and over 2m in height to form a canopy. Presence of fallen and standing deadwood. Presence of shrubs and scrub in unmanaged sites and hay cutting in managed sites. Of 'woodland character'.
Unplantable or bare	Unstocked area associated with High Forest that is too small to treat as a Component Group is recorded as a component in the same Component Group as the high forest; (i.e. areas less than 0.01ha or several smaller areas the sum of which might add up to more than 0.01ha but which are scattered around the Section).
Unplanted streamsides	This category should reflect active management practices to maintain the unwooded state of water margins. Any planted or naturally occurring woodland too small to map as a Section should be separately recognised as a component or Component

Land Use	Description
	Group (allocated to high forest etc.).
Windblow - Dead	Areas of blown high forest which remain uncleared and are dead (e.g. no evidence of green cambium).
Windblow - Live	Areas of blown high forest which remain uncleared and are still alive (e.g. evidence of green cambium).
Worked Coppice	Areas actively managed under the coppice system. When in mixture with high forest crops (Coppice with standards), a component of each is recorded and use made of the 'storey' code to distinguish them.
Abandoned coppice	Stands of coppice that were worked in the past but have fallen into disuse and are not actively worked anymore. Generally this would mean that the coppice has not been cut for greater than 10 to 20 years.

Note:

Landuse of 'Open'. This can include grassy rides, open space next to streams, powerlines, gaslines etc roadside verges etc, which all qualify as Permanent Open space.

It can also include Unsealed\metalled roads which are 'turning back to nature' and which are not maintained for use by vehicles. Any area of land that could easily revert to woodland within 50 to 100 years

'Permanent Open Space Associated with a Linear Feature'. Includes Unsealed\metalled roads and tracks maintained for use by vehicles. Operational railway tracks, rivers and canals. Any area of land that is unlikely to woodland within 50 to 100 years.

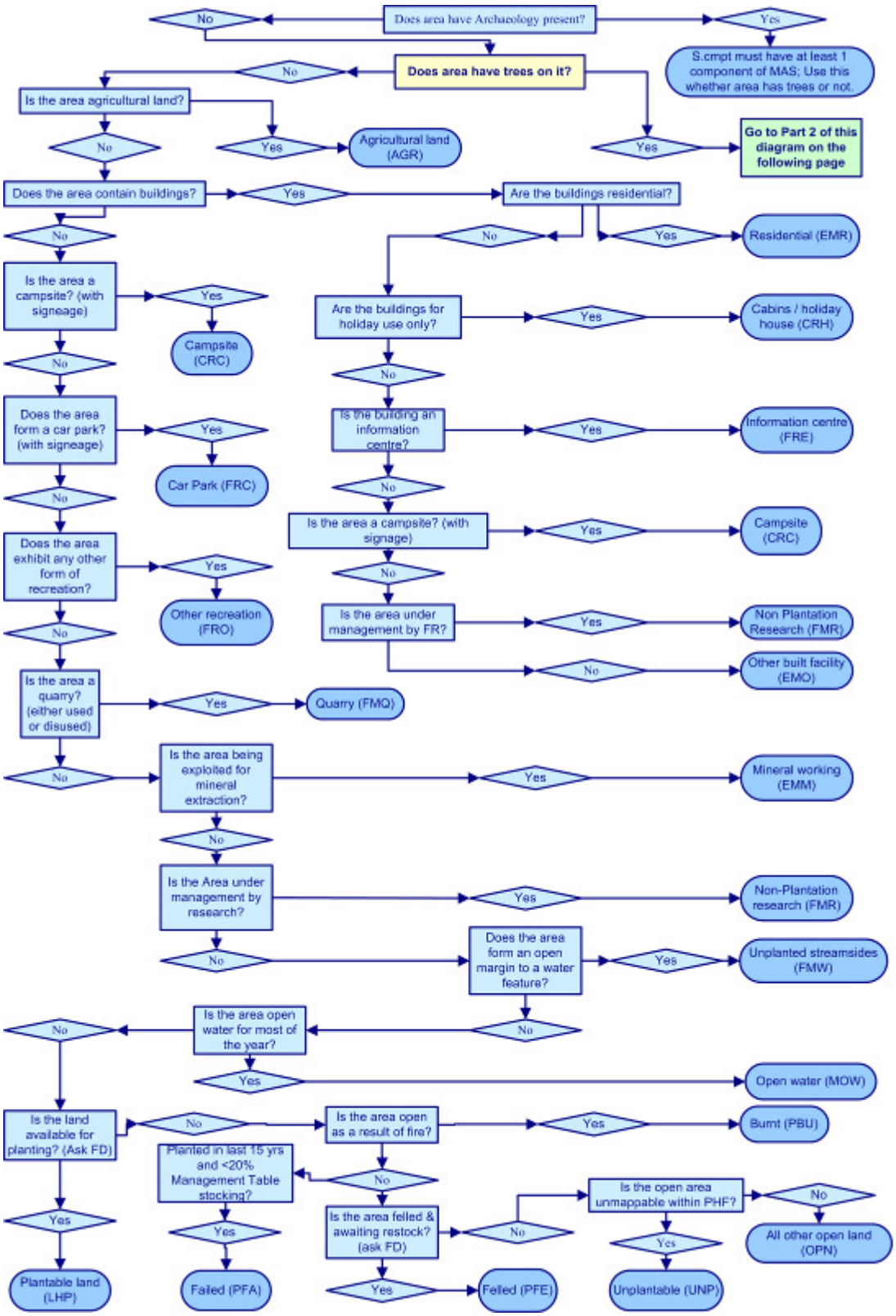
8.6.3 How does the surveyor decide what Land Use to enter?

The following flowcharts illustrate how to decide upon appropriate land use codes for use.

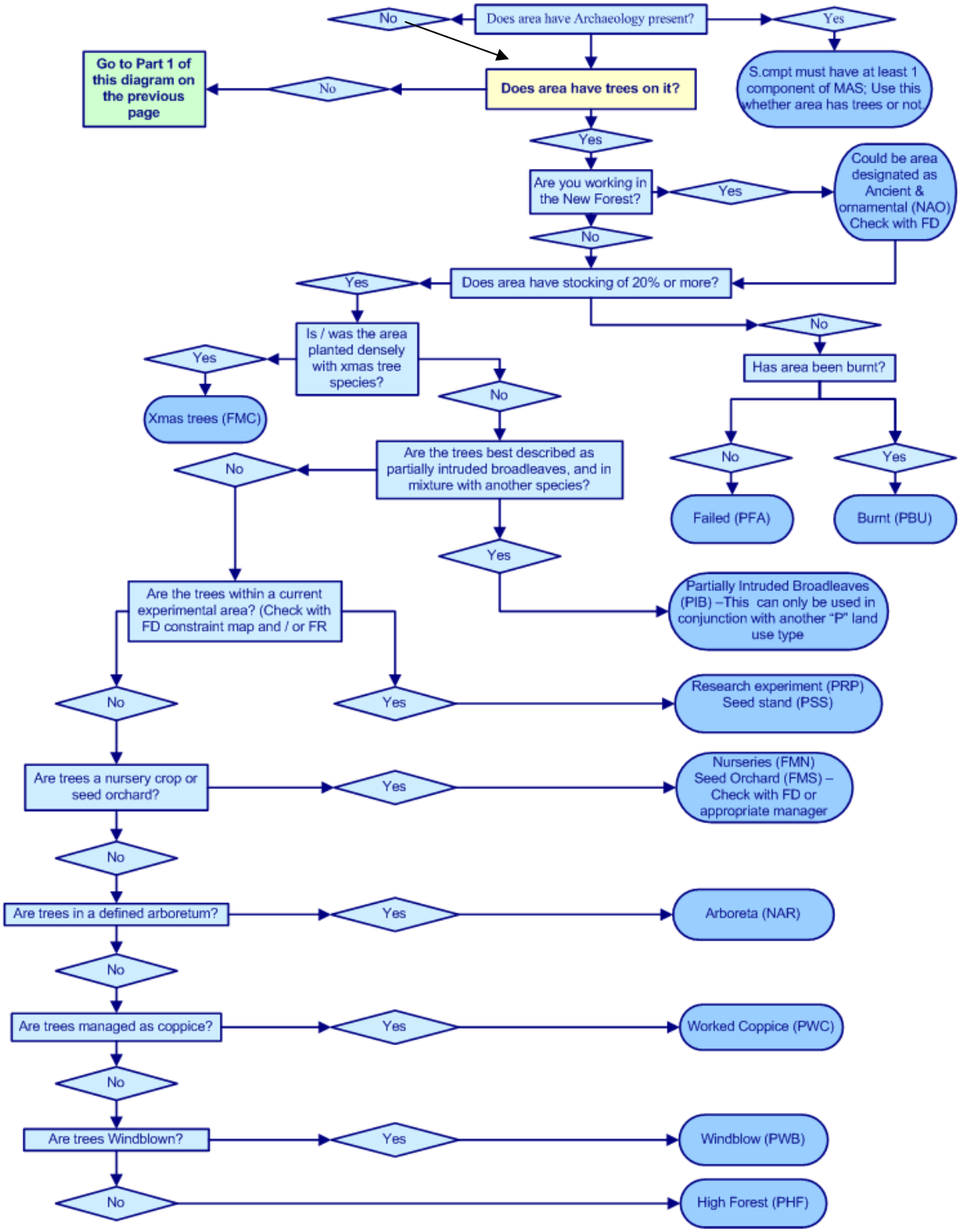
Note: *only cabin and campsites managed by Forest Holidays Joint Venture Company should be assigned 'Cabins/Holiday Houses' or 'Campsite'. Forest District run campsites should be 'Other Recreation'.*

When choosing Land Use surveyors need to remember the importance of the definition of NFI treed areas, especially the tree cover element. If an abandoned quarry has ≥20% tree cover it is an IFT (e.g. broadleaved) rather than an IOA (e.g. quarry) and the land

use is therefore a treed land use such as High Forest rather than an open land use such as Mineral Working.



Flowchart 8 - 1: Landuse – non-treed areas



Flowchart 8 - 2: Landuse – treed areas

8.7 Broad/Priority Habitat:

8.7.1 Treed Sections and Component Groups

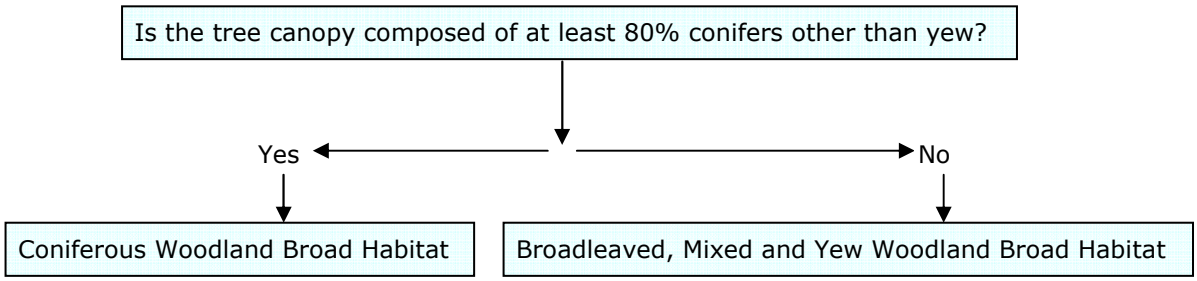
For NFI and Non-NFI treed Sections and Component Groups surveyors are required to record **UKBAP Habitat type** and **NVC community**.

8.7.1.1 UKBAP Habitat type

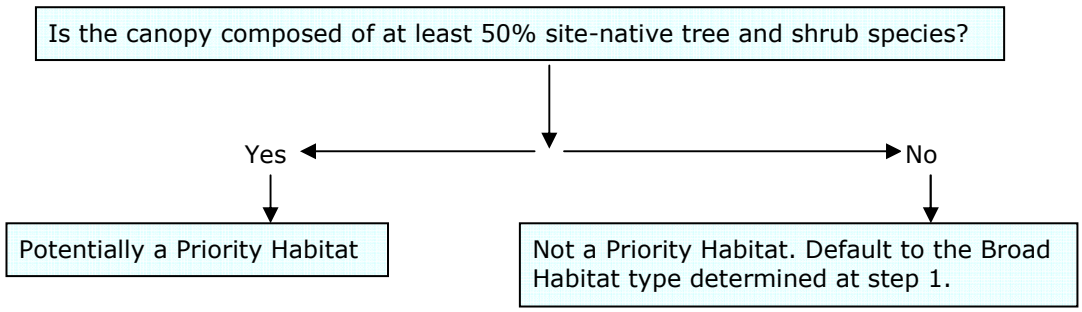
Record the Priority Habitat type where one is present and the Broad Habitat type where one is not (or where the surveyor really can't be sure if a Priority Habitat is present).

8.7.1.2 Recommended steps

1. Decide which of the 2 woodland Broad Habitat Types the Section or Component Group is.



2. Decide whether a Priority Habitat is present.



3. Decide which of the woodland Priority Habitats are present. Surveyors can do this by simply reading through the published Priority Habitat descriptions or assign a Priority Habitat type according to the NVC community identified in the field (see below).

8.7.1.3 Habitat surveying notes

- Ordinarily create a separate Component Group for each habitat type within the Section.
- Surveyors may need to Section on the basis of habitat alone e.g. a sizable area of uniform oak plantation straddling the transition from Lowland Mixed Deciduous Woodland to Upland Oak Woodland might be better split into 2 separate Sections.
- Clearfell - current NFI protocol:
  If the ground vegetation is readily identifiable as a Broad or Priority open Habitat then record as such. If not, then record as Broadleaved, Mixed and Yew Woodland Broad Habitat or Coniferous Woodland Broad Habitat, as appropriate.
- Roads, rides, tracks and railways- current NFI protocol:
  If in a rural setting, class as Boundary and Linear Feature Broad Habitat- unless at least 50% vegetated, and then classify according to the ground vegetation (e.g. Neutral Grassland, or Fen/Marsh/Swamp etc.).
  If in an urban setting, always class as Built-up Areas and Gardens Broad Habitat.

8.7.2 Non woodland or non-treed Sections and Component Groups

For NFI and Non-NFI non-treed Sections and Component Groups surveyors are required to record the **UKBAP Broad Habitat type only**.

Record the Priority Habitat type where one is present and is identifiable, if you cannot identify the priority habitat record surveyed, unknown habitat.

See 'UK Biodiversity Action Plan – Priority Habitat Descriptions (2008)' in the Habitats sub-folder of the Additional Documents folder for more detailed description of individual Habitats.

Table 8 - 3: Broad Habitat list

ARABLE/HORTICULTURE
BOGS
BOUNDARY & LINEAR FEATURES
BRACKEN
BROADLEAVED;MIXED/YEW WOODLANDS
BUILT UP AREAS & GARDENS
CALCAREOUS GRASSLAND
CONIFEROUS WOODLANDS
CONTINENTAL SHELF SLOPE
DWARF SHRUB HEATH
FEN; MARSH/SWAMP
IMPROVED GRASSLAND
INLAND ROCK
INSHORE SUBLITTORAL ROCK
INSHORE SUBLITTORAL SEDIMENT
LITTORAL ROCK
LITTORAL SEDIMENT
MONTANE HABITATS
NEUTRAL GRASSLAND
OCEANIC SEAS
OFFSHORE SHELF ROCK
OFFSHORE SHELF SEDIMENT
RIVERS & STREAMS
STANDING OPEN WATER/CANALS
SUPRALITTORAL ROCK
SUPRALITTORAL SEDIMENT

NFI woodland Broad habitats are shown in blue text.

Table 8 - 4: Priority Habitat List

Priority Habitats
Aquifer fed naturally fluctuating water
Arable Field margins
Blanket bog
Blue Mussel Beds on Sediment
Calaminarian grasslands
Carbonate Mounds
Coastal & floodplain grazing marsh
Coastal saltmarsh
Coastal sand dunes
Coastal vegetated shingle
Cold-water Coral Reefs
Deep Sea Sponge Communities
Estuarine Rocky Habitats
Eutrophic standing waters
File Shell Beds
Fragile Sponge and Anthozoan Communities on Subtidal Rocky Habitats
Hedgerows
Horse Mussel Beds
Inland Rock Outcrop and Scree Habitats
Intertidal Chalk
Intertidal Mudflats
Intertidal Underboulder Communities
Limestone pavements
Lowland Beech/Yew Woodlands
Lowland calcareous grassland
Lowland dry acid grassland
Lowland Fens
Lowland heathland
Lowland meadows
Lowland Mixed Deciduous Woodland
Lowland raised bog
Machair
Maerl beds
Maritime cliff/slopes

Priority Habitats *continued*
Mesotrophic lakes
Mountain Heaths & Willow Scrubs
Mud habitats in deep water
Native Pine Woodlands
Non-HAP Native Pine
Oligotrophic and Dystrophic Lakes
Open Mosaic Habitats on Previously Developed Land
Peat & Clay Exposures with Piddocks
Ponds
Purple moor grass/rush pastures
Reedbeds
Rivers
Sabellaria alveolata reefs
Sabellaria spinulosa reefs
Saline lagoons
Seagrass beds
Seamount Communities
Serpulid reefs
Sheltered muddy gravels
Sublittoral sands/gravels
Tide Swept Channels
Traditional Orchards
Upland Birchwoods
Upland calcareous grassland
Upland Flushes, Fens & Swamps
Upland hay meadows
Upland heathland
Upland Mixed Ashwoods
Upland Oakwoods
Wet Woodland
Woodpasture & Parkland

- Where a surveyor is unsure of the habitat the following may be used:
    - Surveyed; Unknown Habitat – where the surveyor cannot distinguish the Habitat.
    - Not Surveyed – for use when Open areas are covered in snow or water (flooding), or are burnt.

8.8 Storey assessments

Once a section has been defined an assessment across the entire section identifying the presence of distinct storeys (banding) must be made which will define and describe the vertical structure of the Section.

There are two main purposes for identifying storeys:

1. As a measure of Forest structure and diversity.
2. As a way of attaining a better representation of the distribution of heights of trees in a Section (e.g. for timber forecasting).

When the distribution of the heights of the trees within a Section is assessed, it is better to vertically stratify trees into bands of relatively equal heights, or storeys, to gain a more representative and efficient measure of this distribution. Thus ensuring that if a tree is selected to represent the height of the storey its height is such that it will not significantly distort the mean height of that storey. When deciding whether to separate out a storey it is important to bear this principle in mind.

NB: A single tree can be a storey by itself if:

- *This tree would unduly distort the mean height of a storey it was 'brought into' or chosen as a sample height tree,*
  Or
- *If it covers greater than 5% of the Section.*

8.8.1 How to assess Storeys

When it comes to separating out storeys correctly or not, there are four classes:

1. Definitely one storey
2. Definitely more than one storey
3. Complex storeys
4. Borderline cases, which could be fairly interpreted as any of the above.

8.8.1.1 Use of Mid-crown Height or Total Height

Mid-crown height is normally used to determine the storeys; however in some circumstances total height may be more applicable.

The **mid-crown** height is defined as the midway point between the **lower crown** height and the **total height** of the tree. The following diagrams illustrate examples of the positioning of the lower crown, total and mid-crown heights of conifer and broadleaf species.

This is a formal definition of the mid-crown height. In practice it represents the height which is 'half way up' the crown of a tree.

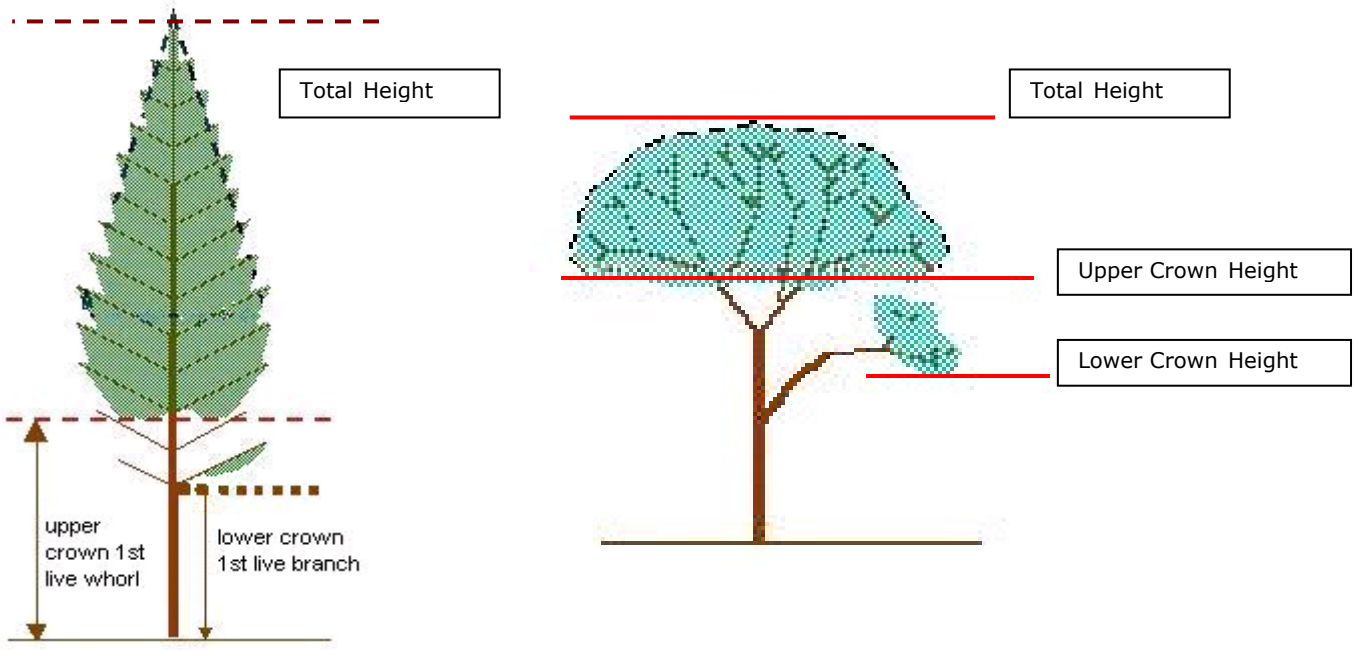


Figure 8 - 1: Height categories

Lower Crown height

Note that Lower Crown height is slightly different for conifers and broadleaves:

Conifers: The height of **the lowest live branch** (excluding epicormics and forks) **insertion** point that is connected to the crown, recorded to the nearest 0.1 m.

Broadleaves: The height of **the lowest level of foliage** that is connected to the crown (excluding epicormics and forks), recorded to the nearest 0.1 m.

As noted earlier mid-crown height is normally used to discern separation between stories. However in certain situations using the mean total height of the trees is more appropriate to classify separate storeys, e.g. where it is impractical or difficult to use mid crown heights.

An example where it would be difficult to use mid crown height is where crown depth varies greatly within trees of the same age and height.

This can occur where a stand has edge trees in the upper canopy, whose foliage reaches to the ground, whilst the main body of the stand has lost its lower foliage through light competition even though the trees are the same age and height.

Technically if mid crown was used to discern separate stories here, as the mid point of the edge trees crowns would be lower than that of the trees in that stand, there would be two separate stories. Clearly though if trees are the same total height and age, it is better to use total height to keep them within the same storey classification.

Likewise some shade tolerant trees such as cypresses can be planted alongside light demanders such as larch and even though the trees are the same total height and age the crown depths very significantly even though the both tree species are in rude health and are competing well and have the bulk of their crown in the upper canopy. Again here it is better to use total height to discern stories.

Crown mid-point works well when crowns are deeper on average and there is strong competition between trees, which will drive ongoing separation of the height bands. This can lead to situations where there is a clear sub dominant layer lower in the canopy (on average) then a clear dominant layer within the canopy. Yet the suppressed trees manage to keep a leader in the higher levels of the canopy. Thus both strata have a leader at the same height and the same total height, but the weighted centre of the crown mass is separate. Here it is best to use crown mid points to discern stories.

Situations where the total height may be more suitable to use than mid-crown height:

- Crops where edge trees have a crown that reaches the ground, but the main body of crop trees have a much shorter crown. In this situation, if the mid-crown height is used the edge trees can be put into a different storey to the main crop, even though the edge and main crop trees are the same height. Using total height and 'common sense' will keep them in the same storey and will not distort the mean height of the storey.

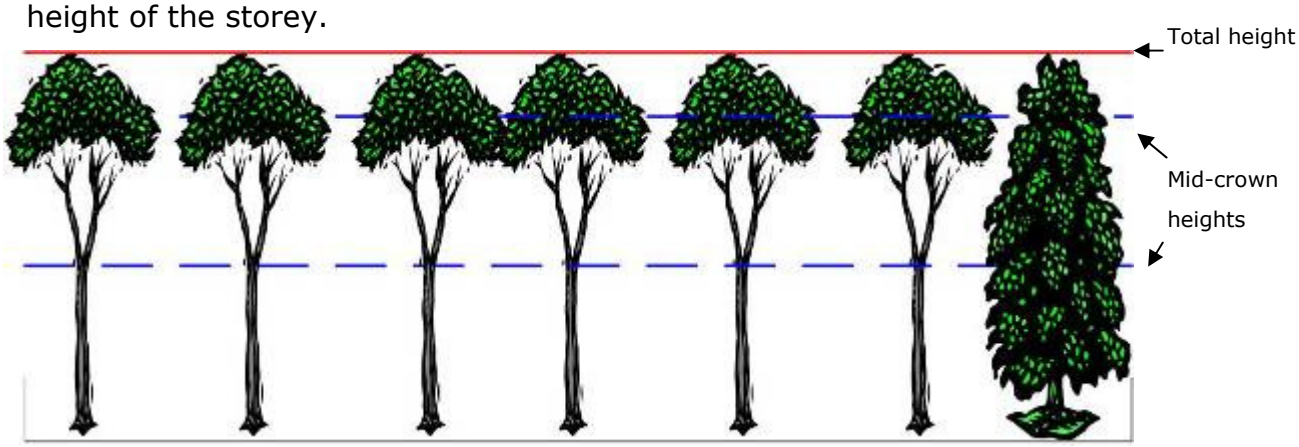


Figure 8 - 2: Use of total height 1

- Situations where trees of different species are the same total height but some species have much deeper crowns than others. E.g. in a mixed crop of Western hemlock and Scots pine where all the trees are the same total height, but the hemlock has canopy to the ground and the pine has a short canopy.

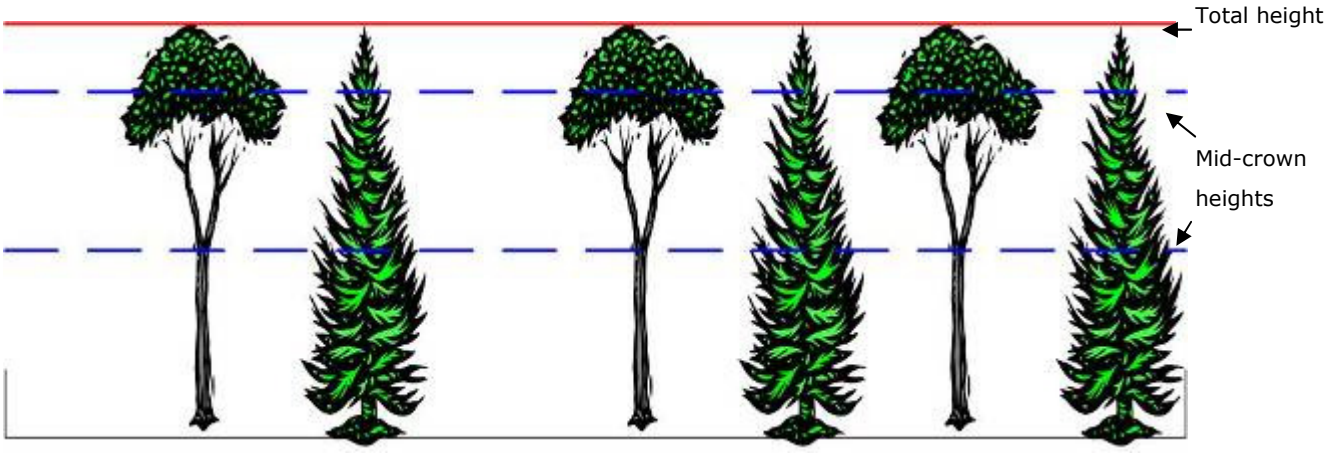


Figure 8 - 3: Use of total height 2

8.8.1.2 Banding to define storeys

Where there is a distinct difference between bands of tree mid-crown heights/total heights these bands are allocated to separate storeys.

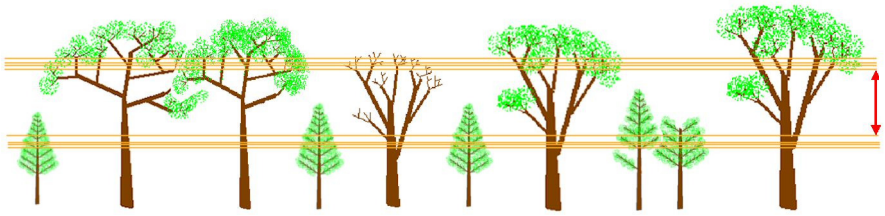


Figure 8 - 4: Two storeys Section

Where there is no distinct gap between mid-crown heights/total heights bands, the Section is considered to be single storey or Complex. If the banding is relatively shallow (<4m between upper and lower band) it is a single storey, where the banding is quite deep then the Section is more likely to be complex.

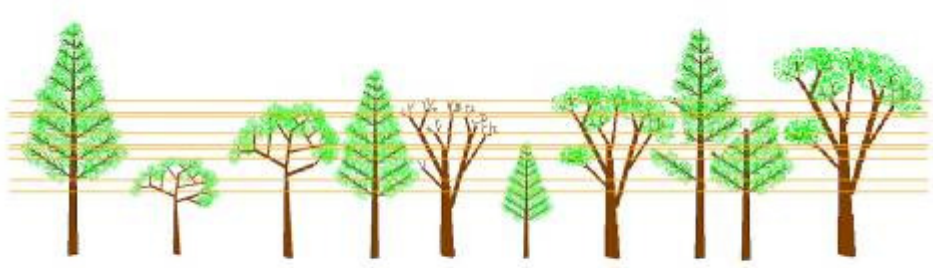


Figure 8 - 5: Complex or Single storey Section

8.8.1.3 Gap distance to distinguish individual Storeys

In first deciding whether an identifiable multi-storey structure exists within a section, consideration is given to the vertical distribution of the mid-crown/total heights of measureable (≥4cm DBH) trees within the section. The essential question to ask is whether these heights cluster into two or more groups on the vertical scale *across the Section*?

The convention to be used in answering this question is to visualize the heights of the trees within the section and to decide, in the first instance, whether an upper storey exists in the section. This is the case if there is a distinguishable cluster of heights in which the lowest member of that group is at least 4 metres/25% of storey band height (see Chapter 8.8.1.5), whether mid-crown or total, (see below) higher than most of the rest of the trees within the section. This is described as 'most' rather than 'all' because there are likely to be situations in which there is a well-defined highest group and one or more lower groups but also an occasional tree/s (<5% by %Area) whose height is spanning the vertical 'gap' between the highest group and the others. In this case, unless the trees are of a *significantly different height (e.g. would distort the mean height of the storey if chosen to represent the height of that storey)*, then they should be allocated to the storey they are closest to in terms of height. If these trees would distort the mean storey height of the storey they were pulled into then they must be treated as a storey in their own right, even if this new storey is composed of only a single tree (see: Chapter 8.8.1.6).

To distinguish storeys:

1. Look at the trees within the Section to get a 'feel' for whether there are different storey bands.

2. Decide whether the 4m gap rule or the 25% of storey height rule is most appropriate for each storey using the priority rules below:.

8.8.1.4 Gap Distance to use in order of priority

1. Storeys where maximum band height is **<10m**: use 25% of the upper band height to distinguish storeys.

2. Storeys where lowest band height is **>20m**: use 25% of the lower band height to distinguish storeys.

3. All other Storeys: use the 4m minimum gap distance.

Example 8 - 8: Storey Assessment:

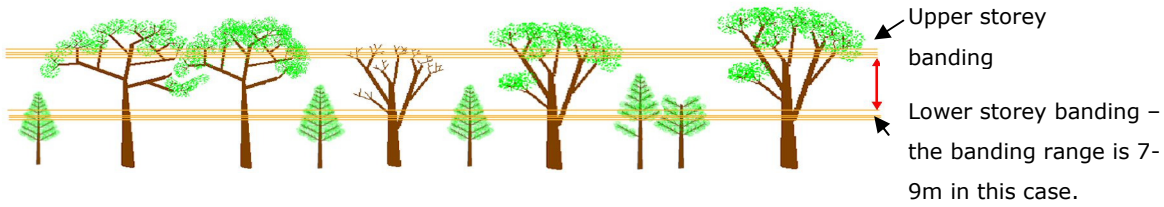


Figure 8 - 6: Storey Banding

In Figure 8 - 6 above the band range of the lower storey is 7-9m. The lowest member of the upper storey is at 12m. Is there one storey or two?

As the maximum height band is **<10m**, in order to define the maximum allowable gap for the differentiation between storeys we employ priority rule 1 (see 8.8.1.5 above)

Using the 25% rule (of the upper band height for the Lower Storey):

Band heights:

- Upper band height of lower storey (7-9m range) = 9m
- 25% of upper band height of lower storey = 9/4 = 2.25m (maximum allowable gap)
- Lowest band of upper storey = 12m.
- 12m – 9m = 3m, this is > the 2.25m allowable gap **therefore the Section is considered as a two storey Section**.

If the gap between the storeys had been <2.25m then the Section would be considered a single storey.

In another example, if the upper band height of the lower storey was 12m. Then priority rule three would have been used

Using the 4m rule:

- Lowest band of Upper storey (15m) - Upper band of Lower storey (12m) = 3m.
- 4m maximum gap allowed under this rule
- Actual gap (3m) is less than allowable gap (4m) **therefore the Section is considered as a single storey Section.**

8.8.1.5 Single trees as a Storey

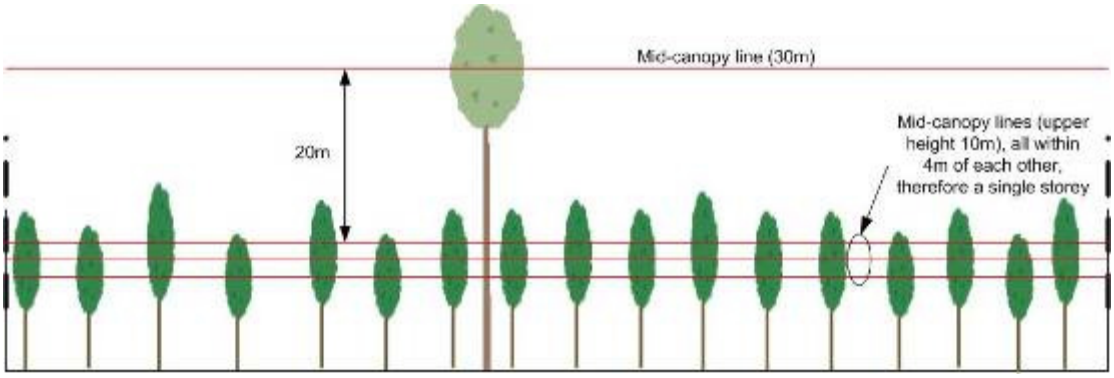


Figure 8 - 7: Multi-storey Section

In the above figure there is a distinct 4+m gap between the mid-crown heights. In this case the gap is 20m so the single tree *must* be a separate storey. If it was brought into the lower storey and it was chosen as a height sample tree then its height would significantly affect the mean height of the storey.

If the gap between the single tree and the lower storey was only 4.5m however (Figure 8 - 8) then there is a case for bringing this tree into the single storey below it.

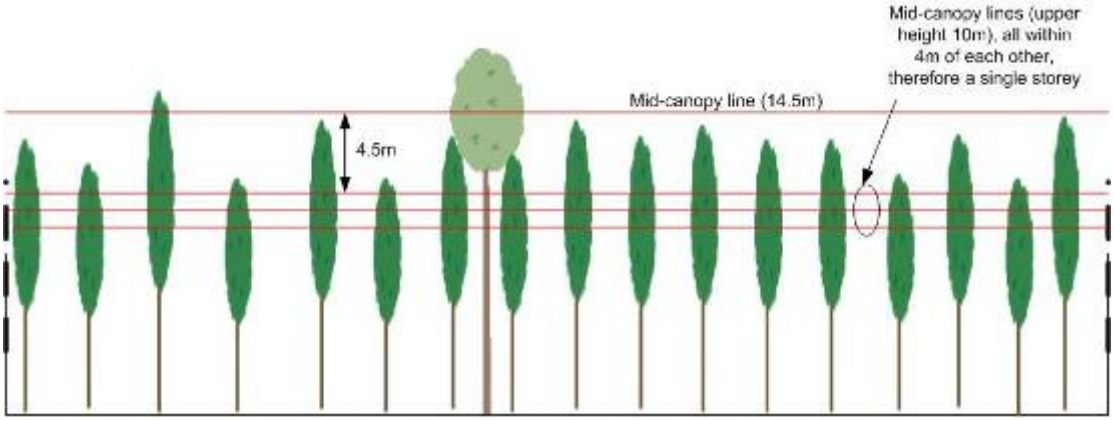


Figure 8 - 8: Single storey Section

Should this single tree be selected as a height tree within the lower storey its height will not significantly influence the mean height of the storey.

The allowable gap between storeys can therefore vary in certain circumstances. The other factor that needs to be considered when deciding if a tree, or trees, can be brought into a storey is the number or % occupancy of the tree/trees across the Section (%Area field in the Component level data).

Consider Figure 8 - 8 above. If the single tree only occupies 5% or less of the Section then it can be brought into the lower storey. If, however, it occupies more than 5% of the Section, or there are a number of trees at that height which occupy greater than 5% of the Section, then the tree/trees are allocated as a separate storey.

8.8.2 Storey Labels

A maximum of three measurable tree storeys are allowed within a Section. The following combinations of storeys are possible:

Label	Number of Storeys
Upper	**One**
Upper and Lower	**Two**
Upper, Middle and Lower	**Three**
Complex	**One**
Upper and Complex (Complex is acting as a lower storey in this case)	**Two**
Complex and Lower (Complex is acting as an upper storey in this case)	**Two**

8.8.3 Storey Definitions

- **Upper Storey** – The uppermost storey of measurable (≥4cm DBH) trees across the section
- **Middle Storey** – A storey of measurable trees with a measurable tree storey above it **and** below it
- **Lower Storey** – the lowest storey of measurable trees with 1 or 2 storeys above it
- **Complex** – a canopy structure with a wide range of heights where it is not possible to distinguish individual storeys within it, or where there are more than three distinct bands.

8.8.4 Seedling and Sapling - Young Tree Storeys

There are two storey classifications for **non-measurable** trees (<4cm DBH) regardless of age, seedlings and saplings. They do NOT count towards whether a Section is Complex or not or the total number of measurable tree storeys.

In some situations the Seedling or Sapling Tree Storey can be of the same height as a measurable tree storey (either separate or intimately mixed within a Section) and it is important not to confuse the two *types* of storey.

Record a separate component for each species of seedling (trees <50cm height) and each species of sapling (trees ≥50cm tall and <4cm DBH).

In the first cycle all non measureable trees were grouped into components of 'young trees'. In the second cycle these will be split into seedlings and saplings as per the definitions used in the young trees transects and plots. Where in the first cycle young trees were recorded, these components were automatically split into seedling and sapling components based upon their age (less than 4 years) and their canopy height. It will be for the second cycle surveyor to assess if these classifications still apply after 5 years of growth, if seedlings have been recruited to saplings and saplings to measureable trees in the lower, middle, upper or complex stories and if any new seedlings or saplings have established themselves in the intervening 5 years.

8.8.5 Leaning and Windblown trees

Enter the Storey the Component would have been in if VERTICAL.

8.8.6 Standing Dead Trees

1. Dead Tree Components are assessed at the Component Group level and are applicable to measureable trees only except for Component Groups where there are no measurable trees. In these cases the seedling and sapling dead components can be recorded.

2. A dead tree component must be created if there is visually estimated to be >=30% of dead stems (BA/volume – more difficult to do and would need to teach the concept) within a CG across all storeys combined.

3. Where there are 1 or 2 species of deadwood present then assign each species a Deadwood component.

4. Where there are 3 or more dead species in the stand, up to 3 dead components are recorded, in which:
    - One component is that corresponding to the predominant species (as per presently proposed)

- If there are dead conifers present, other than the predominant species, make an MC component with those
- If there are dead broadleaves present, other than the predominant species, make an MB component with those.

5. Assign a mean canopy height, mean DBH, mean total height and stems per hectare to the dead component (across all storeys for that component) – activated when Trees Alive? Field = No.

6. Do not assign a storey unless the dead tree Component is in a separate storey by itself. Do not assign Complex to the Section based on having a distinct dead tree storey.

7. If a dead tree is found within a plot a dead tree component is NOT required.

8. %area: assign as 0% for the dead components where the CG they are found in also contains live trees. If the CG only has dead components then assign these to total 100% of the CG (e.g. if CG 2 is 30% of the Section and only contains dead components then these dead components must total 30%).

NB: Dead tree heights are based upon their actual total heights at the time of the survey and tops are not 'added on'.

For Dead trees the Stem Decay sub-category under Tree Health must be completed, the other three sub-categories should be set to "Not Applicable."

8.8.7 Multiple storeys from the same root stock

Examples:

1) A Hazel coppice stool which has both measurable and non-measurable stems. Assuming the measurable stems form a single storey the data should reflect two components, one describing a storey of measurable stems (e.g. Upper) and one describing a storey of Young Trees.

2) A crop of Hornbeam where the root stock has a tall main stem alongside a much shorter stem – if the heights of the two types of stems are significantly different (as per the storeys rules above) the stems are assigned to different storeys.

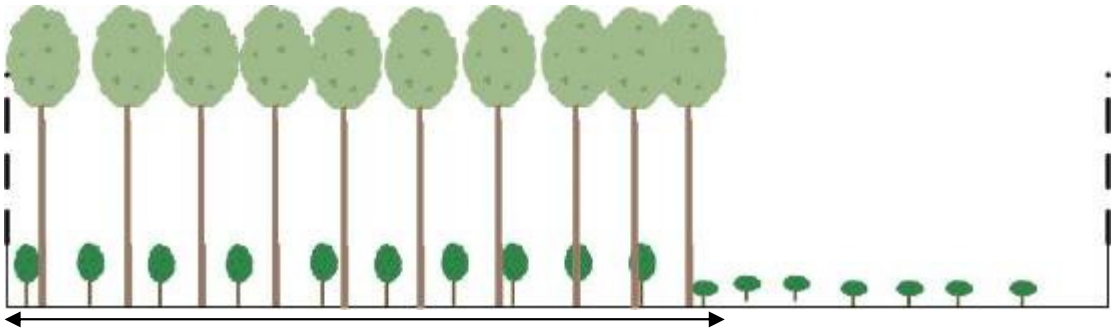
8.8.8 Defining and Recording Storeys within Sections with more than one Component Group

Rules:

1. When assessing the Storey to which a Component is to be assigned, a *Section* level assessment of the storey structure must first be undertaken.

2. If a Component is assigned as Upper storey then for any other Component within that Section (whether in the same or a different Component Group) to also be assigned as Upper storey they must have a storey height within tolerance.

Example 8 - 9: Two Component Groups and two storeys, 60% Upper and 100% Lower storey



CG1 (60% of Section area, Upper and Lower Storey)

CG2 (40% of Section area, Lower storey only)

Across the *Section*:

- Component Group 1 has two storeys, a tall storey of mature Scots pine and a shorter storey of younger western hemlock

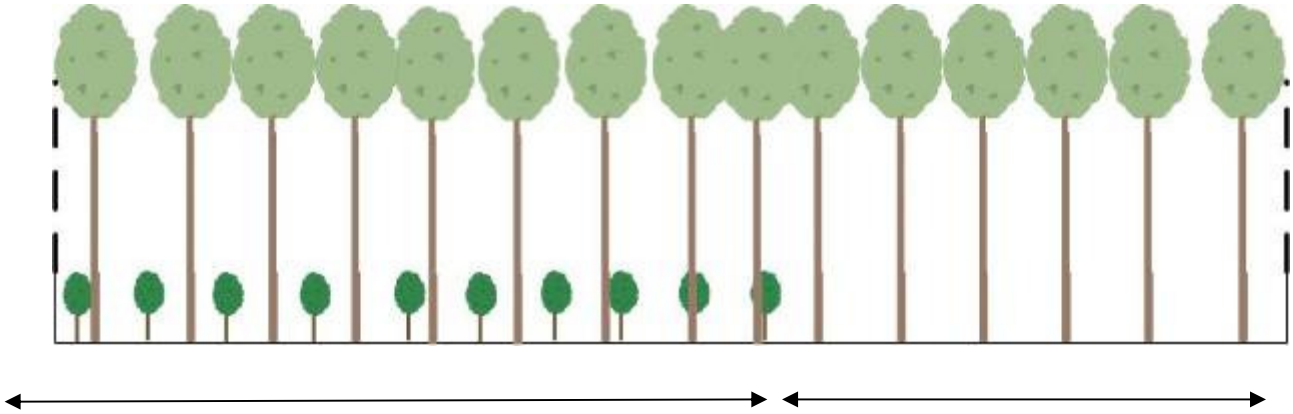
- Component Group 2 only has a single storey of young Scot's pine

- The western hemlock storey in CG1 has e.g. a mid-crown height within 4m of the Scots pine storey in CG2, therefore these Components are classed as being within the same storey for recording whether they are Upper, Middle or Lower storeys. Therefore CG2 only has a Lower storey in this example.

3. The Upper storey is the storey with the highest storey height within the *Section* regardless of the actual area of the Section covered.

See further examples below:

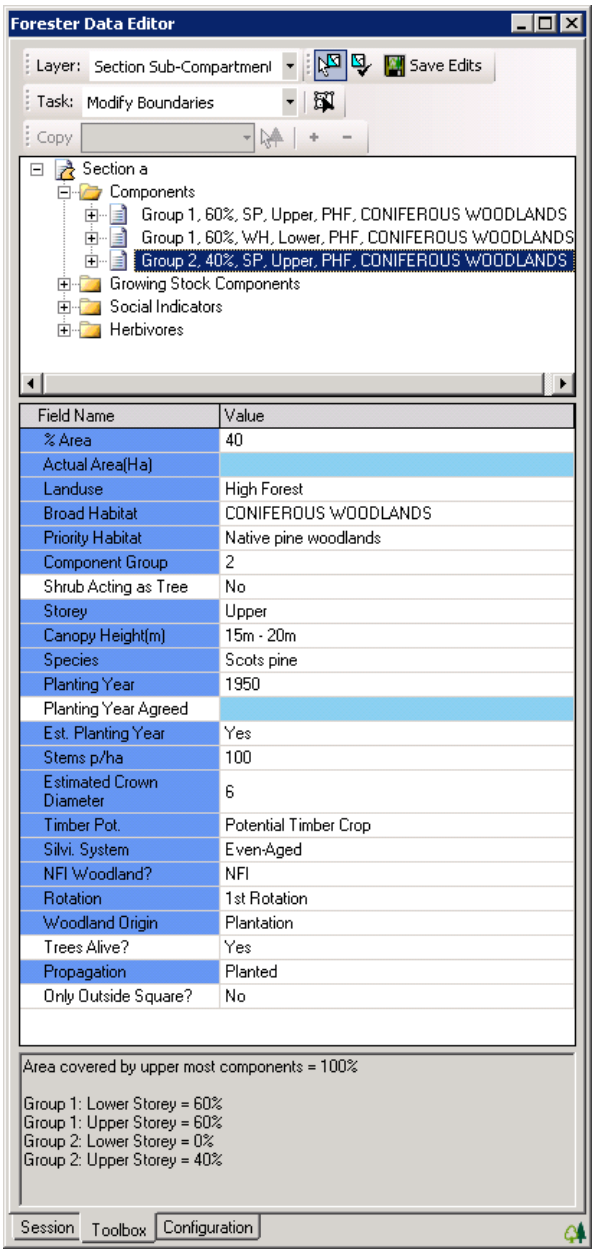
Example 8 - 10: Two Component Groups and two Storeys, 100% Upper and 60% Lower storey



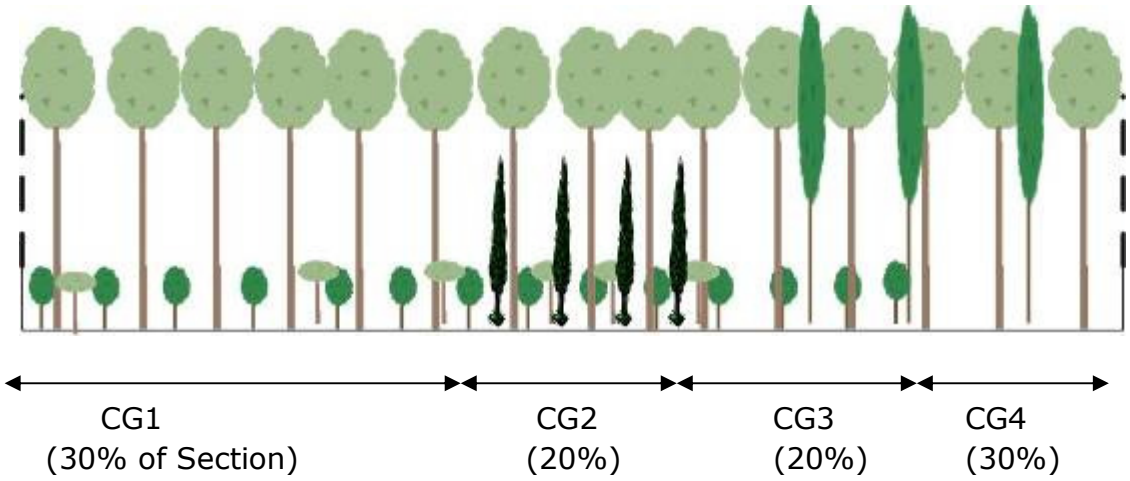
CG1 (60% of Section area) CG2 (40% of Section area)

Section	Component	Component Group	Species	% of section Area	Storey	Stems/ha
A	1	1	Scots pine	60	Upper	100
	2	1	Western hemlock	60	Lower	2500
	1	2	Scots pine	40	Upper	100

- Each Component Group has 100% coverage for each storey recorded within it
- 100% of the Section is accounted for



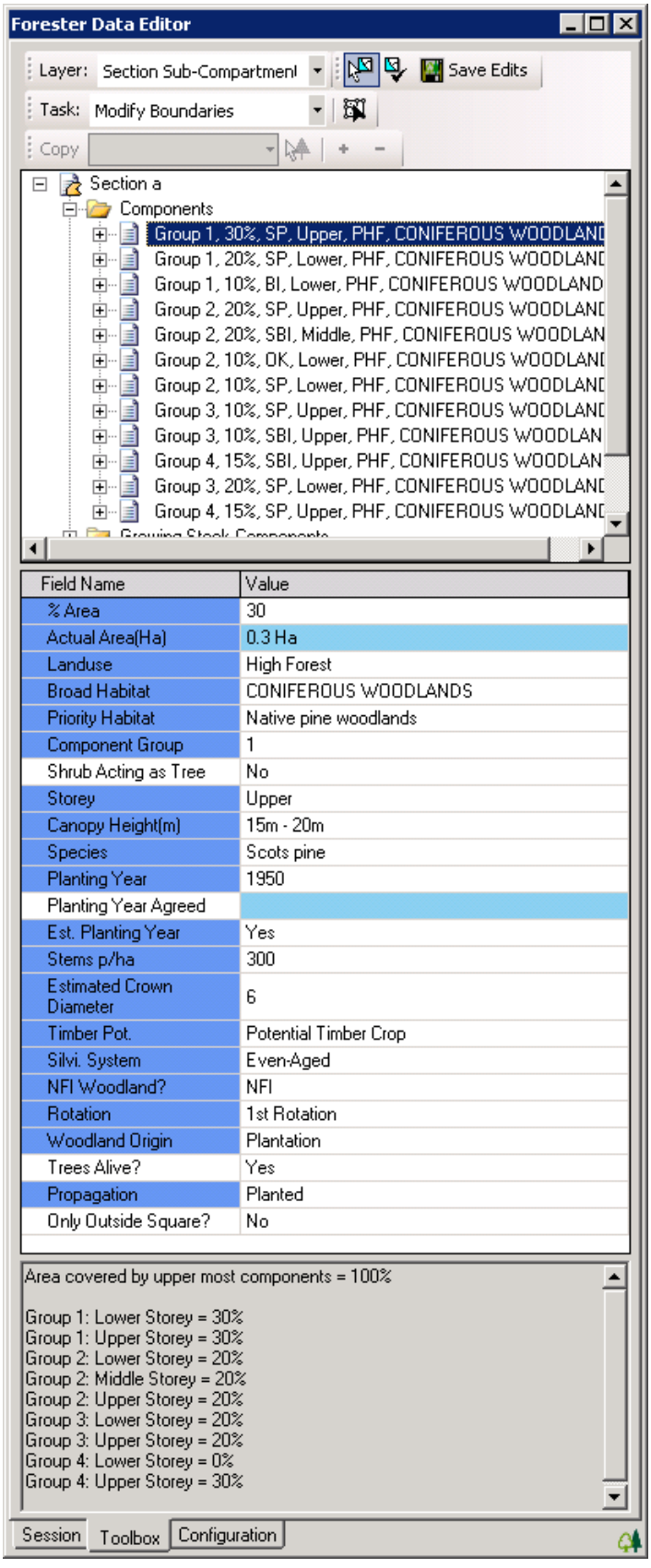
Example 8 - 11: Four Component Groups and 3 Storeys



Records						
Section	**Component**	**Component Group**	**Species**	**% Area**	**Storey**	**Stems/ha**
A	1	1	Scots pine	30	Upper	300
	2	1	Scots pine	20	Lower	800
	3	1	Birch	10	Lower	500
	1	2	Scots pine	20	Upper	300
	2	2	Silver birch	20	Middle	300
	3	2	Scots pine	10	Lower	800
	4	2	Oak	10	Lower	800
	1	3	Scots pine	10	Upper	150
	2	3	Silver birch	10	Upper	150
	3	3	Scots pine	20	Lower	800
	1	4	Silver birch	15	Upper	150
	2	4	Scots pine	15	Upper	150

When the above are entered into the NFI Surveyor software the data should look something like this.

- The software validates
- The data is correct as each storey covers 100% of their associated Component Group
- 100% of the Section area is accounted for



8.8.9 Storey assessments on slopes and undulating ground

Trees which look similar in height but are in fact of different heights and may therefore be in different storeys. In this case the trees are in a Complex storey (no distinct height differences)

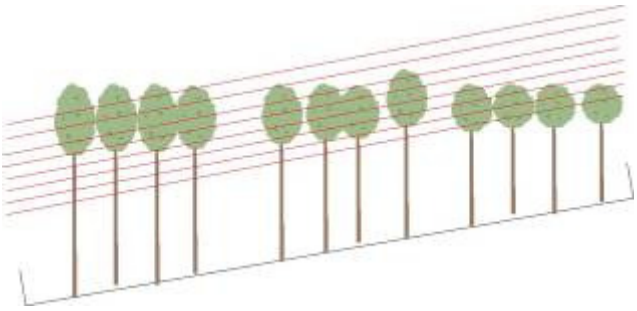


Figure 8 - 9: Storey assessment on a slope 1

Trees which look different in height but are in fact very similar. This is a single storey – Upper in this case.

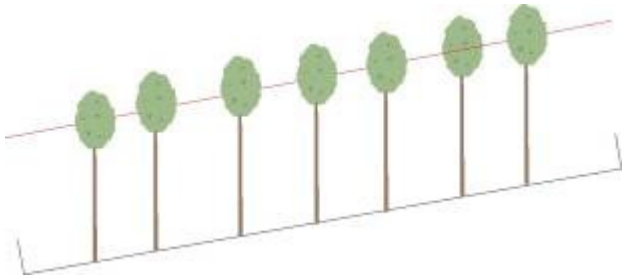


Figure 8 - 10: Storey assessment on slope 2

The undulating ground makes storey assessment more difficult. Trees A and B look similar in height but due to their positions in a gully or ridge, the trees are actually different heights and are in different storeys. A is an Upper storey tree whereas B is in the Lower storey.

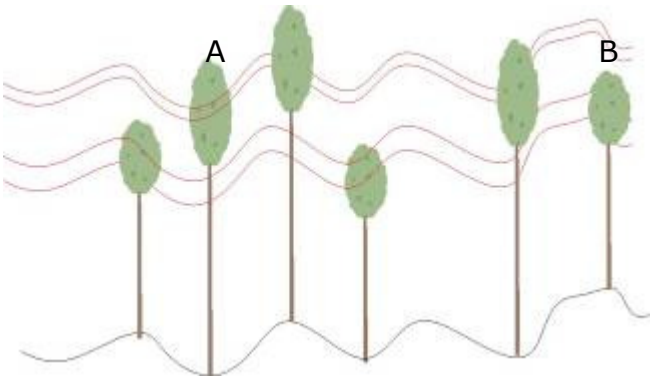


Figure 8 - 11: Storey assessment on undulating ground 1

The trees look like they are different heights but are in fact all the same giving a single storey component – in this case Upper storey.

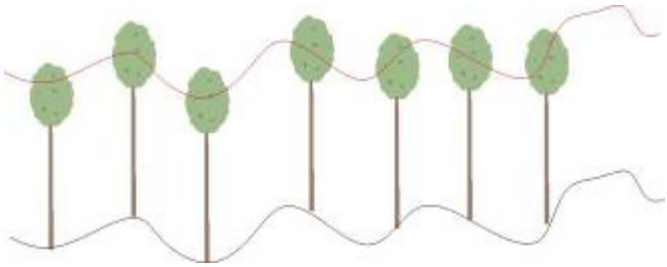


Figure 8 - 12: Storey assessment on undulating ground 2

8.9 NFI Tree Species list

In the list below **species native (in the NFI context) to the UK are in bold text** (Holly species is in **blue** bold to denote that whilst some holly species are native – primarily *Ilex aquifolium,* others are not). Sycamore, in agreement with SB+NH, NRW and NE is, for NFI purposes, deemed native (it has naturalised in GB).

Whilst it is important to get all tree species identification correct, those tree species in **red** are those that all survey staff are expected to know and identify correctly. These species are important for the Production Forecast and/or are commonly found throughout Britain.

The tree species within the software are listed (mostly) in alphabetical order in the following sequence:

Table 8 - 5: Tree species list

Common Name	Latin Name	Notes
Alder	*Alnus spp*	
Armand's pine	*Pinus armandii*	
Ash	***Fraxinus excelsior***	
Aspen	***Populus tremula***	
Atlas cedar	*Cedrus atlantica*	
Austrian pine	*Pinus nigra var nigra*	
Beech	***Fagus sylvatica***	Regarded as native for NFI purposes throughout all of GB
Bhutan pine	*Pinus wallichiana*	
Big leaf maple	*Acer macrophyllum*	
Birch (downy/silver)	***Betula pubescens/pendula***	
Bird cherry	***Prunus padus***	
Bishop pine	*Pinus muricata*	
Black poplar	***Populus nigra***	
Black walnut	*Juglans nigra*	
Blackthorn	***Prunus spinosa***	
Bornmullers fir	*Abies bornmuelleriana*	
Box	***Buxus spp***	
Calabrian pine	*Pinus brutia*	
Cedar of Lebanon	*Cedrus libani*	
Cider gum	*Eucalyptus gunnii*	
Coast redwood	*Sequoia sempervirens*	
Common alder	***Alnus gultinosa***	

Common lime	***Tilia europaea***	
Common walnut	*Juglans regia*	
Corsican pine	*Pinus nigra var maritima*	
Crab apple	***Malus sylvestris***	
Crack willow	***Salix fragilis***	
Douglas fir	*Pseudotsuga menziesii*	
Downy birch	***Betula pubescens***	
Downy oak	*Quercus pubescens*	
Elder	**Sambucus nigra**	
Elm	*Ulmus spp*	
English elm	***Ulmus procera***	
European larch	*Larix decidua*	
European silver fir	*Abies alba*	
Field maple	***Acer campestre***	
Goat willow	***Salix caprea***	
Grand Fir	*Abies grandis*	
Grecian fir	*Abies cephalonica*	
Green alder	*Alnus viridis*	
Grey alder	*Alnus incana*	
Grey poplar	*Populus canescens*	
Grey willow	***Salix cinerea***	
Hawthorn species	*Crataegus spp*	
Hazel	***Corylus avellana***	
Holly species	***Ilex spp***	
Holm oak	*Quercus ilex*	
Hornbeam	***Carpinus betulus***	
Horse chestnut	*Aesculus hippocastanum*	
Hungarian oak	*Quercus frainetto*	
Hybrid larch	*Larix x eurolepis*	
Hybrid poplar	*Populus serotina/trichocarpa*	
Italian alder	*Alnus cordata*	
Japanese cedar	*Cryptomeria japonica*	
Japanese larch	*Larix kaempferi*	
Juniper	**Juniperus communis**	
Korean pine	*Pinus koreana*	
Large-leaved lime	***Tilia platyphyllos***	
Lawsons cypress	*Chamaecyparis lawsoniana*	
Lenga	*Nothofagus pumilio*	
Leyland cypress	*Cupressocyparis leylandii*	
Lime	*Tilia spp*	
Loblolly pine	*Pinus taeda*	

Lodgepole pine	*Pinus contorta*	
London plane	*Platanus x acerifolia*	
Macedonian pine	*Pinus peuce*	
Maritime pine	*Pinus pinaster*	
Mexican white pine	*Pinus ayacahuite*	
Mixed broadleaves	For use in Dead Tree Components and in situations where there are a lot (40+) different species of broadleaf in the Section – e.g. in an arboretum	
Mixed conifers	For use in Dead Tree Components and in situations where there are a lot (40+) different species of conifer in the Section – e.g. in an arboretum	
Monterey pine	*Pinus radiata*	
Mountain pine	*Pinus uncinata*	
Narrow-leafed ash	*Fraxinus angustifolia*	
Noble fir	*Abies procera*	
Nordmann fir	*Abies nordmanniana*	
Norway maple	*Acer platanoides*	
Norway spruce	*Picea abies*	
Oak (robur/petraea)	***Quercus spp***	
Oriental beech	*Fagus orientalis*	
Oriental spruce	*Picea orientalis*	
Paper-bark birch	*Betula papyrifera*	
Pedunculate/common oak	***Quercus robur***	
Plane spp	*Platanus spp*	
Ponderosa pine	*Pinus ponderosa*	
Pyrenean oak	*Quercus pyrenaica*	
Raoul/rauli	*Nothofagus nervosa*	
Red alder	*Alnus rubra*	
Red ash	*Fraxinus pennsylvanica*	
Red oak	*Quercus borealis*	
Red (pacific silver) fir	*Abies amabilis*	
Roble	*Nothofagus obliqua*	
Rowan	***Sorbus aucuparia***	
Scots pine	***Pinus sylvestris***	Regarded as native in Lots: **85 to 108 only**
Serbian spruce	*Picea omorika*	

Sessile oak	***Quercus petraea***	
Shagbark hickory	*Carya ovata*	
Shining gum	*Eucalyptus nitens*	
Silver birch	***Betula pendula***	
Silver maple	*Acer saccharinum*	
Sitka spruce	*Picea sitchensis*	
Slash pine	*Pinus ellottii*	
Small-leaved lime	***Tilia cordata***	
Smooth-leaved elm	***Ulmus carpinifolia***	
Sweet chestnut	*Castanea sativa*	
Sycamore	***Acer pseudoplatanus***	Regarded as native within the NFI
Tulip tree	*Liriodendron tulipifera*	
Turkey oak	*Quercus cerris*	
Wellingtonia	*Sequoiadendron giganteum*	
Western hemlock	*Tsuga heterophylla*	
Western red cedar	*Thuja plicata*	
Western white pine	*Pinus monticola*	
Weymouth pine	*Pinus strobus*	
White ash	*Fraxinus americana*	
White oak	*Quercus alba*	
White poplar	*Populus alba*	
White willow	***Salix alba***	
Whitebeam	***Sorbus aria***	
Wild cherry/gean	***Prunus avium***	
Wild service tree	***Sorbus torminalis***	
Wych elm	***Ulmus glabra***	
Yew	***Taxus baccata***	
Yunnan pine	*Pinus yunnanensis*	
other birches	*Betula spp*	
other broadleaves		
other Cedar	*Cedrus spp*	
other cherry spp	*Prunus spp*	
other conifers		
other Eucalyptus	*Eucalyptus spp*	
other firs (Abies)	*Abies spp*	
other larches	*Larix spp*	
other Nothofagus	*Nothofagus spp*	
other oak spp	*Quercus spp*	
other pines	*Pinus spp*	
other poplar spp	*Populus spp*	

other spruces	*Picea spp*	
other walnut	*Juglans spp*	
other willows	*Salix spp*	

If you cannot identify a tree species as it is very rare, record as 'other conifer' or 'other broadleaved' accordingly and take a photograph of it. Notify your contract manager. Or if you can identify the genus but not the individual species record 'other cedar' etc, take a photograph and notify your contract manager. If you can identify the tree species but it is not on the above list, again photograph the tree and notify your contract manager.

8.10 Planting Year Estimation

8.10.1 Methods of Ageing Trees

The NFI software requests the Planting Year of the Component, Survey staff can either estimate this directly or can assess the age of the tree and subtract this from the current survey year.

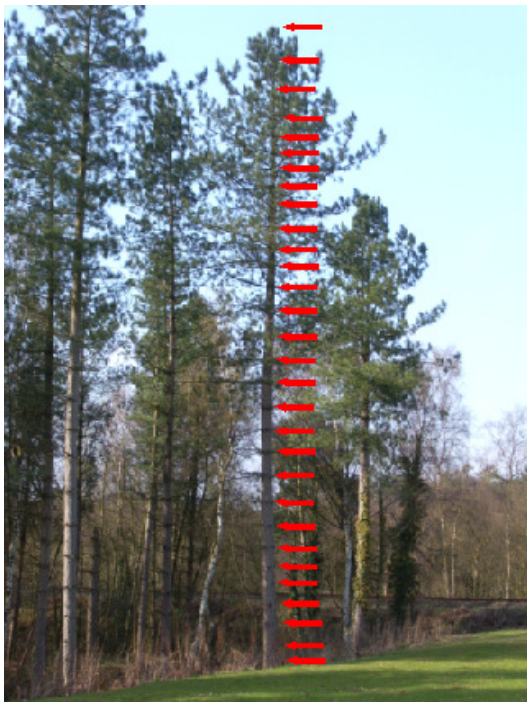
There are several methods of ageing trees:

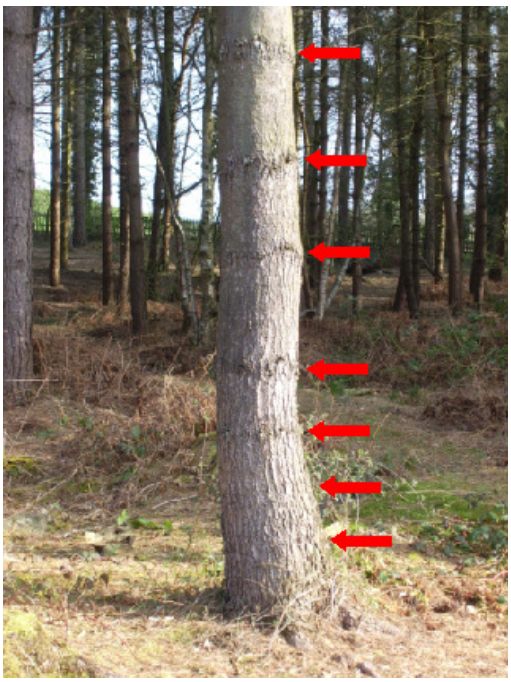
8.10.1.1 Estate/Owner Information

Reliable information from 3rd parties e.g. owners or estate information with good records.

8.10.1.2 Whorl Counting (Conifers)

A whorl is the circular pattern of branching up the stem, with each whorl indicating one years' growth. Counting the whorls or marks of old whorls, on trees is a reliable method up to the point when it is no longer possible to get a good view of the whole tree. Care needs to be taken to count all whorls and not miss those close together due to the tree being held "in check", for example due to poor site conditions such as waterlogging, or due to frequent and persistent browsing, root compaction etc.





- Branch scars become fainter with age as they are gradually grown-over
- Ridges and change in bark texture around the stem can indicate position of whorl.

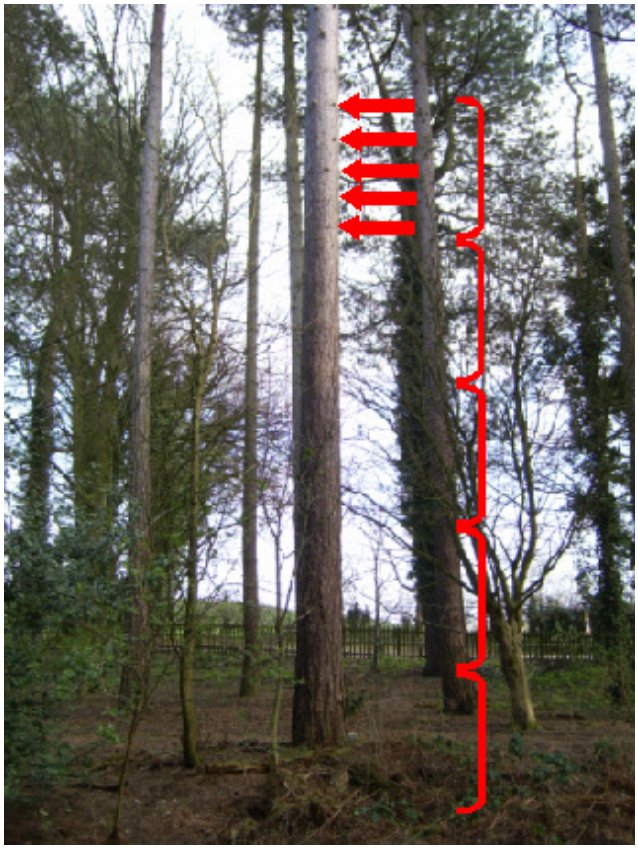
8.10.1.3 Flattened and stag tops

Older trees, and those that have grown out of shelter, can display flattened and stag-headed tops where branch whorls are no longer obvious, so making age estimation difficult.

- Follow the line of the main stem. Kinks and prominent side branches can indicate annual growth limits in the same way as whorls
- Bracketing does not work well as growth rate slows considerably – annual length put on by the growing tip is often less than half that estimated by bracketing

8.10.1.4 Bracketing (Mature conifers)

- All external evidence of whorls can be lost on the lower stems
- The method of bracketing should be used to estimate number of whorls in the stem



8.10.1.5 Young Conifers

- Whorl counting should be used to estimate seedling age
- Current years seedlings and 1-year olds have no growth whorls

- Sitka spruce – 4 years

8.10.1.6 Branching Patterns

Where a lower main branch can be clearly seen (excluding epicormic or partial/damaged branches) it is possible to count the number of pairs of opposite shoots, normally associated with a change in colour and texture of needles along the central spine. Add the number of pairs of shoots to the number of whorls on the main stem below the point of insertion of the branch to give an estimated age of the tree.

Counting Opposite Shoot Pairs on Branches (note pair of branches and change in needles along the central spine of the branch)

8.10.1.7 Annual Growth Scar Counting (Broadleaves)

Counting the number of scars on the whole tree (if visible) or the lowest main branch would be equivalent to counting whorls on conifers. If the lowest main branch is counted then the main stem below the branch also needs to be aged and the two counts

added together.

An emergent, less than 1 year old, beech seedling

8.10.2 Date of Earliest Planting

For a number of exotic trees the earliest known planting dates are shown below. This information can be used to define the maximum planting year. However, this information is for guidance and is not a guarantee of planting dates.

8.10.2.1 Earliest Planting Dates for Conifers

There are only 3 native species of conifer in the UK, the Scot's pine (*Pinus sylvestris*) (within the pine zone), yew (*Taxus baccata)* and juniper (*Juniperus communis)*. Thus all other species of conifer have been introduced into the UK. The earliest dates of introduction of many species are fairly well catalogued and known.

Table 8 - 6: Earliest planting dates for Conifers

Species	Approximate introduction date
Austrian Pine	1835
Coast redwood	1846
Corsican pine	1759
Douglas fir	1826
European Larch	1732
Grand Fir	1831

Hybrid larch	1897
Japanese Cedar	1846
Japanese Larch	1861
Lodgepole Pine	1853
Maritime Pine	1596 (restricted in plantations to the New Forest & Wareham with some semi-naturalised pockets in west Surrey and Northamptonshire).
Noble Fir	1831
Norway Spruce	1750
Sitka Spruce	1831
Wellingtonia	1853
Western Hemlock	1851
Western Red Cedar	1853

8.10.2.2 Earliest Planting Dates for Broadleaves

Table 8 - 7: Earliest planting dates for Broadleaves

Species	**Approximate introduction date**
Common Walnut	1656
Downy Oak	c1600
Holm oak	1780
Horse chestnut	c1500
Lime, non-native	1820
Norway maple	c1685
Shining gum	1902

8.10.2.3 Stump ring counting

Counting the rings of stumps on site will give an approximation of the age of the stump. This may be extrapolated to give the approximate age of standing trees in many circumstances.

8.11 Stems per Hectare

The number of Stems per Hectare of each Component, within its Component Group (CG), needs to be estimated.

- Maidens/Standards: measurable stems (≥4cm DBH) are counted (including natural multi-stemmed trees)
- Coppiced trees (at **any** time in its lifetime – ensure that coppice is entered under Manual Intervention, either as greater, or less than 3 years) the *stool* is counted
- Seedlings (Trees <50cm in height) and saplings (Trees >50cm in height and <4cms DBH) in a Young Tree Storey
- Live Components only count live stems/stools
- Dead Components only count dead stems/stools

8.11.1 Coppice stools

Count the stools only (using the methods below) but ensure that:

a) Stools are assessed and not stems

b) Where there is more than one storey, the number of stools for each storey is assessed. For example where a coppice crop has stools that have stems in more than one storey these stools are counted for each storey.

- E.g. 500 stools per hectare each of which has one or more stems in the Upper and Lower storey: record 500 stools per hectare for *each* storey.

8.11.2 Maidens/Standards

There are two methods for doing this:

1. Use the mean tree spacing of the Component within the Component Group and look up the estimated stems per hectare from the table below.

2. Count/Estimate the number of stems for each Component and divide by the Component Groups area.

For example:

Section a = 0.2ha

CG1: 20% of the Section (0.04ha)

Upper storey: SP - 100% occupancy by stems within this storey, %Area = 20%

CG2: 80% of the Section (0.16ha)

Upper storey: SP - 50% occupancy by stems within this storey, %Area = 40%
Upper storey: DF - 50% occupancy by stems within this storey, %Area = 40%
Lower storey: Birch (a single tree) - 100% occupancy by stems in this storey, %Area = 80%

Method 1: using mean spacing within the CG storey

1) From the mean spacing of the Upper storey trees CG1: **3.0m** -> 1,111 sph and multiply by the proportion of stems (100% in this case) so sph = 1,111 x 100% = 1,111 for the Upper storey SP

2) From the mean spacing of the Upper storey trees CG2: **2.5m** -> 1,600 sph and multiply by the proportion of stems (50% each in this case) so sph = 1,600 x 50% so sph = 800 for both the Upper storey SP and DF

3) From the mean spacing of the Lower storey trees CG2: a single tree only across the CG so use no. trees/CG area = 1/0.16 = 6 sph (as deriving mean spacing for a single tree is not possible).

Method 2: Count/Estimate the number of stems for each Component and divide by CG area

So for the above example:

CG1: (0.04ha) -
Upper storey: SP - 100% occupancy within this storey, %Area = 20%: **45 trees counted** within the 0.04ha CG -> 45/0.04 = 1100 sph

CG2: (0.16ha)
1) Upper storey: SP - 50% occupancy by stems within this storey, %Area = 40%: **260 trees estimated** within the 0.16ha CG -> 260/0.16 = 1625 sph

2) Upper storey: DF - 50% occupancy by stems within this storey, %Area = 40%: **260 trees estimated** within the 0.16ha CG -> 260/0.16 = 1625 sph

3) Lower storey: Birch - 100% occupancy by stems in this storey, %Area = 80%: **1 tree counted** within the 0.16ha CG -> 1/0.16 = 6 sph

Note that a Component cannot have a Stems p/ha of 1 – the software will not allow this.

Table 8 - 8: Approximate stems per hectare for a given metric mean spacing between trees.

Spacing/m	Stems/ha	Spacing/m	Stems/ha	Spacing/m	Stems/ha
1.0	**10000**	4.0	**625**	7.0	**204**
1.1	**8264**	4.1	**495**	7.1	**198**
1.2	**6944**	4.2	**567**	7.5	**178**
1.3	**5917**	4.3	**541**	8.0	**156**
1.4	**5102**	4.4	**517**	8.5	**138**
1.5	**4444**	4.5	**494**	9.0	**123**
1.6	**3906**	4.6	**473**	9.5	**111**
1.7	**3460**	4.7	**453**	10.0	**100**
1.8	**3086**	4.8	**434**	10.5	**91**
1.9	**2770**	4.9	**416**	11.0	**83**
2.0	**2500**	5.0	**400**	11.5	**76**
2.1	**2268**	5.1	**384**	12.0	**69**
2.2	**2066**	5.2	**370**	12.5	**64**
2.3	**1890**	5.3	**356**	13.0	**59**
2.4	**1736**	5.4	**343**	13.5	**55**
2.5	**1600**	5.5	**331**	14.0	**51**
2.6	**1479**	5.6	**319**	14.5	**48**
2.7	**1372**	5.7	**308**	15.0	**44**
2.8	**1276**	5.8	**297**	15.5	**42**
2.9	**1189**	5.9	**287**	16.0	**39**
3.0	**1111**	6.0	**278**	16.5	**37**
3.1	**1041**	6.1	**269**	17.0	**35**
3.2	**977**	6.2	**260**	17.5	**33**
3.3	**918**	6.3	**252**	18.0	**31**
3.4	**865**	6.4	**244**	18.5	**29**
3.5	**816**	6.5	**237**	19.0	**28**
3.6	**772**	6.6	**230**	19.5	**26**
3.7	**730**	6.7	**223**	20.0	**25**
3.8	**693**	6.8	**216**	20.5	**24**
3.9	**657**	6.9	**210**	21.0	**23**

8.12 Variations for Re-measure Squares.

8.12.1 Summary

The following sections take you through what is required of a re-assessment of components when undertaking a Re-measure square. It will set out what to look for in terms of the current state of the woodland, where the approach is the same as that of a new square, but it then goes onto something new: how you identify change between the previous survey 5 years ago and your survey.

Identifying real change and understanding differences and tolerances between your assessment and the previous surveys and knowing how and when to apply these are key to undertaking a second cycle Re-measure survey.

When assessing a square that has been previously assessed your key aim is to supply evidence of change.

You will be looking to identify change factors such as:

- Clearfelling
- Thinning
- Planting
- Regeneration
- Tree Growth
- Mortality
- Human activity
- Herbivory and pests & diseases

The NFI is interested in identifying real change on the ground through change in the data and has to be able to isolate real change from other 'spoiling' factors that may look like real change in the data collected but which do not reflect real change on the ground. Such spoiling factors are 'noise' which mask real change and take the form of previous survey errors and subjective differences in interpretation between you and the last surveyor when surveying the same parameter.

Examples of real change are easy to understand, a clearfell, a new road etc. Subtler change such as one storey evolving into two through natural competition is harder, but necessary to identify.

Examples of 'black and white' survey errors are easy to understand, if the previous surveyor did not record a road and you find a well-established road, that is a black and

white error on their behalf. You will record the road in the survey square and so we can discern this road from a newly built road, we require you to identify the creation of the road data as survey error.

Surveyor subjectivity is harder to deal with, but you do need to take account of it in your assessment. This is necessary as whilst some measurements are highly objective in nature such as the length of a road within the sample square, some are not, such as 'good health'. The missing road is an inarguable fact, and is wrong. The same applies for tree diameters and tree heights, both very objective, inarguable measures. Such measures are highly objective and are either wrong or right.

Some assessments though, such as some circumstances in sectioning, storey allocation and % allocation of species within the storey cannot be so easily categorised into right or wrong as they contain a subjective element. Sectioning a field from a woodland is pretty black and white, but sectioning two interwoven priority habitats is not as clear cut. Thus comparing assessments concerning these factors between surveys is not such a black and white matter and will sit more on a continuum of definitely right through to acceptably right to definitely wrong. We need to be aware of this when re-assessing squares.

In assessing if the previous surveyor was right or wrong and when deciding if you need to correct that data or if it is acceptable and desirable to live with their assessment you have to decide where we are on that continuum.

If your assessment aligns with the previous one then there is no issue, if they are close enough **within acceptable bounds** then we will run with them. It is only when they are unacceptably different do we need to roll up our sleeves and take account of the differences. This will take the form of correcting the differences and in extreme and rare circumstances wiping the previous survey and starting again.

8.12.2 Change within Acceptable Bounds.

The main benefits of having acceptable bounds and sensible tolerances around such measures are:

- It reduces your workload and keeps down the cost of the survey.
- It maintains continuity in stratification, sampling and measurements

As discussed the factor of 'acceptable bounds' or tolerances arises as some measures within the survey have a subjective element in their assessment. If we reduce the

amount of difference between the two surveys due to such subjectivity in survey there are multiple benefits.

Examples of this would be sectioning within mixtures, or within fragmented habitats or within continuums of species change. How to interpret this is covered in Chapter 4 on sectioning.

Another would be storey allocation, where two 'good' surveyors may disagree or spend a long time debating over whether a stand is 2 or 3 storeys. Where there are no definitive 'right' answers we need to isolate this factor from the change picture. Section 8.5 in this chapter identifies the difficulties in establishing the number of storeys at some sites.

Fundamental differences in section and storey stratification can lead to more or less sample plots and samples trees. This can lead to significant differences in the assessment of the square, purely through the random nature of sampling. This would not impact on regional level comparisons and assessments between the two cycles but would start to impinge on our ability to assess change within the stand.

So there is little to gain from having two surveys of the same square with different basic stratification (e.g. 3 sections versus 4), but much to gain through keeping the same stratification (3 versus 3), as any differences in these situations are more likely due to real change as opposed to stratification / sampling differences, unless there is real change.

Only when the basic stratification in the original survey is so poor that it does not represent the stand in any way should it be corrected or abandoned. This should be a rare incidence, whilst the smaller subjective differences will be frequent.

Surveyors need to be given guidance as to what is within 'acceptable bounds' through subjectivity in assessment and what is not and is thus either error or real change.

Specific advice on tolerances for each element of the survey are provided in situ with each section of the survey manual. However as much of the 'meat' of change will be recorded within the components, we cover this in more depth here.

8.12.3 Assessing Real change, no change, subjectivity difference (acceptable bounds) and errors.

8.12.3.1 Assessing the section components in depth

By this stage you should already have a feel of the nature of the section, its landuse and if appropriate; its number of storeys, components, component groups and species. Now that you are assessing this section 'in depth' look at the section visualisation tool (see file: 2nd_Cycle_software_tools V2.doc in the Additional Documents folder) and the components and gain a detailed view of what the previous surveyor found and recorded.

Walk the section and look out for:

1. The features previously identified.
2. Are they still evident?
3. How have they changed?
4. Are they missing?
5. Are there any new features?

At this stage it is best to reconfirm that you are still broadly content with the definition of this section, its storey structure and basic composition.

If you feel that the stand is pretty much as described and has simply 'grown on' for 5 years, a few changes to the component attributes may be all that it requires to bring the section up to date, such as the revision of the storey height bands, estimated crown diameters and stocking.

Some stands may have evolved more significantly and you may have to identify and record factors such as:

1. A thinning event:
    a. Its impact on stocking.
    b. Its impact on component / species %'s.
    c. The presence of new rides or racks.
    d. A change in silvicultural practice.
    e. The presence of tree damage such as bark skimming.
    f. Notice its impact on the amount and type of deadwood.
2. Any other new management practice.
3. The loss of a seedling layer.
4. The change of a seedling layer to a sapling layer.
5. A new tree species colonising the stand.

The point is to identify what has changed since the last survey and to assess, measure and record that change.

For example: approximately 10% of conifer sites will have been clear felled since the last survey. Approximately 10% of these clearfell sites will have been section boundaries, the removal of components (such as high forest) and the creation of new components (such as clearfell and seedlings) within the section will need to recorded (real change).

This will reduce the amount of work required to assess the stand overall, as it will reduce the amount of mensuration work, but time will need to be put into assessing the extent and nature of any new clearfell and restocking.

Occasionally you may find a site where you disagree with the previous surveyors basic sectioning and stratification of the site. In these instances we give guidance on what to accept and what to reject, see the sections below on 'tolerances' in sectioning and storey allocation.

Once you have confirmed or updated the basic section structure of the square and have confirmed or amended the stands characteristics in its associated component data fields you will need to start thinking about locating the plots.

As previously noted the key to understanding and recording real change in components is that once you have observed differences between your assessment and the previous one you need to discern between errors, differences due to subjectivity and real actual change.

At the component level the elements with the greatest degree of subjectivity and thus the hardest to judge are generally story allocation and % area allocation. The next section looks at how these should be treated through worked examples:

8.12.3.2 Storey Allocation.

Example 1:

Surveyor 1: 3 storeys recorded - upper, middle and lower.

You find a stand composed of discernible, measureable (components of 4cm DBH or greater) storeys; a complex storey.

This one storey difference may have been a legitimate subjective difference that two good surveyors would make on the same day. So even if you feel the previous surveyor should have plumped for 4 stories and an assessment of complex, as to you four storeys are clearly discernible and would have been 5 years ago, it is best to keep with their storey allocation as this will maintain continuity with the storey stratification at the plot level. **Record no change**.

However if you can see that say the upper storey has split out into two distinct storeys over the last 5 years, then that is **real change and should be recorded as such** and the storeys reassigned.

8.12.3.3 Storey Rules

Observe and record real change in the storey structure since the last survey.

If there has been no change in measureable trees storey structure (Upper, Middle, Lower and Complex) since the last survey and your interpretation is different to the previous surveyors, accept one storeys worth of difference, (excluding seedlings and saplings), but correct if more than one storeys difference (e.g. they recorded 1 storey and you see 3 storeys).

Example 2:

The previous surveyor found:

Upper and Lower stories

But you found differentiation in the upper canopy, so there were 3 distinct layers and thus an Upper, Middle and Lower categorisation. Here there is only one storey difference in interpretation, so accept that and use the original surveyor's stratification.

If however you found only 5 discernible stories, spanning Upper, Middle and Lower and there is no evidence of the 'additional stories' ever existing, correct the storey structure to complex.

8.12.3.4 % Area Allocation.

As % area allocation is a visual assessment, there are bound to be minor differences in % area allocation between two surveyors, especially in complex stands with several components.

However there should not be notable or significant differences between the two unless real change has occurred.

Some forms of real change will be easier to observe, such as the introduction of recent windblow to a stand, the removal of one species from a mixture during thinning, or the establishment of a new species through seedling regeneration.

What will be harder to observe will be subtle shifts in canopy allocation between two competing species within the same storey.

Example 3:

In a mixture; the previous surveyor observed;

Scots pine 50%, 50% Norway spruce, in the Upper Canopy.

Your assessment is

Scots pine 55%, 45% Norway spruce, in the Upper Canopy

There is no evidence of thinning, mortality or crown suppression. So is this real change or previous surveyor error, or just subjective differences in a visual assessment?

In this case it is hard to tell, so we supply rules:

8.12.4 % Area Allocation Rules

1. If a % area allocation is out by ≤**10%** of the value (e.g. if the value is 20% then 10% of that value is 2%, if the value is 80% then 10% of the value is 8%) between the two surveys, accept as is unless there is evidence of real change (mortality, removals etc.).

2. If a % area allocation is out by >10% of the value between the two surveys, and there **is evidence of real change** (mortality, removals etc.), change the values.

3. If a % area allocation is out by > 10% of the value between the two surveys, and there **is no evidence of real change** (mortality, removals etc.), change the values and record that you found survey errors.

The exception to these rules are:

If a component was missing from a previous assessment, whether that is less or greater than 10% of the section area, create a component and a % area allocation and adjust the other components accordingly.

Example 3 continued:

With these rules in hand to complete Example 3:

The previous assessment

Scots Pine 50%, 50% Norway Spruce, in the Upper Canopy.

Your assessment is

Scots Pine 55%, 45% Norway Spruce, in the Upper Canopy

There is no evidence of real change on the ground such as thinning or mortality. Your assessment of the % allocation of Scots Pine is around 10% greater than the previous surveyors (50 * 10% = 55), and the assessment of Norway Spruce 10% less (50*-10% = 45) **accept the previous assessment**.

Example 4:

The previous surveyors' assessment was:

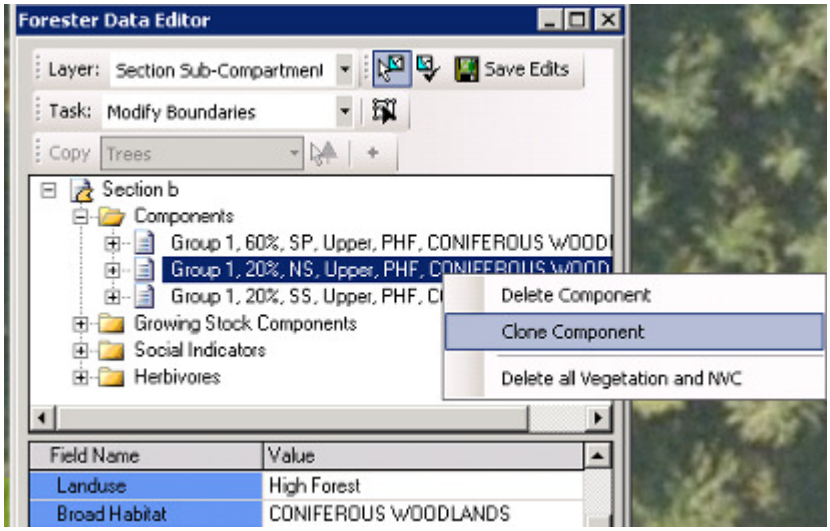
Scots pine 60%, 20% Norway spruce, 20% Sitka Spruce in the Upper Canopy.

Your assessment is:

Scots Pine 60%, Norway Spruce 5 %, Sitka Spruce 20 %, live windblow 15% (Norway), in the Upper Canopy

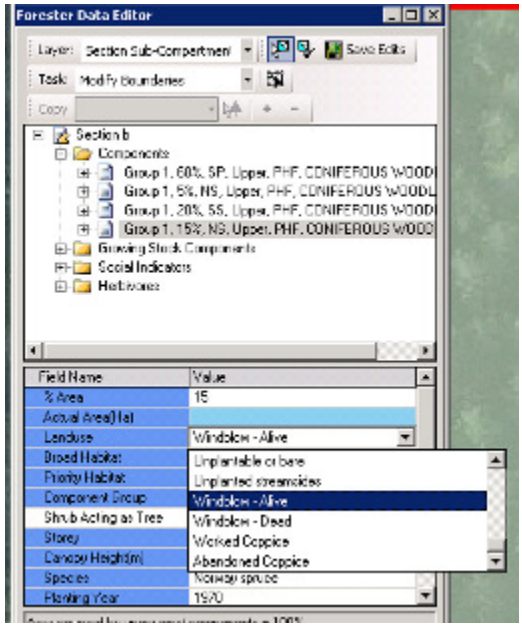
You have observed that much of the Norway is windblown, that it is still alive and your assessment is that this occurred within the last three years. **This is real change and should be recorded.**

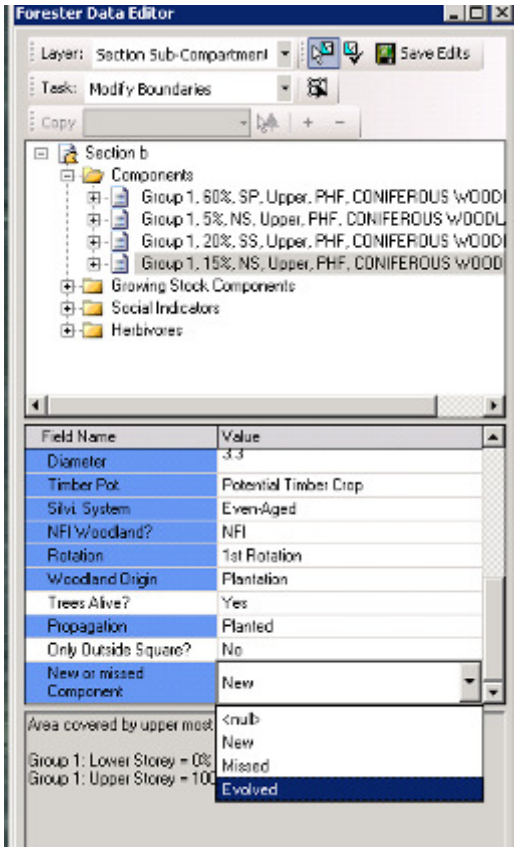
Go to the Norway component, clone it and set the new clone to 'windblow – live' in the landuse field. Also under the New or Missed Component field, record that this component has 'Evolved' from an existing component. Adjust the % area allocation to 15%.
Go back to the original Norway component and adjust its area allocation to 5%.



Clone the NS

Change the Area %'s and the cloned NS Landuse to 'Windblow – Alive'





Set the cloned area to Evolved

Example 5:

The previous surveyors' assessment:

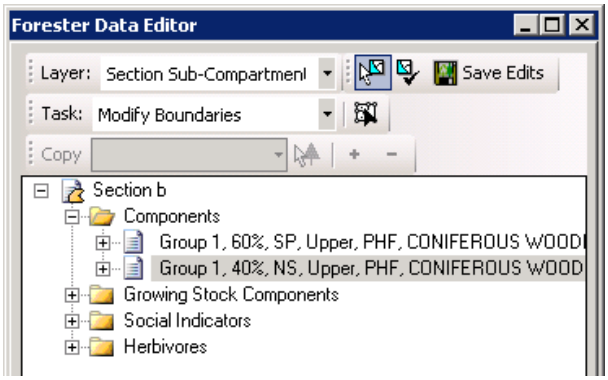
Scots Pine 60%, 40 % Norway Spruce in the Upper Canopy.

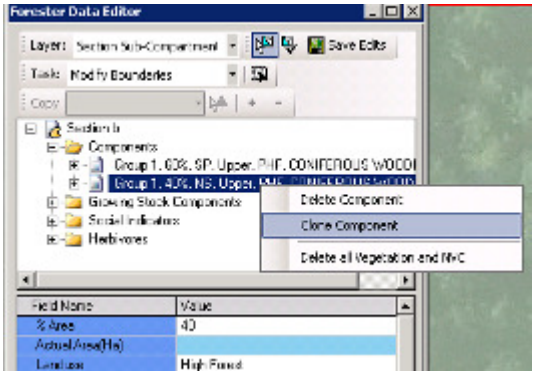
Your assessment:

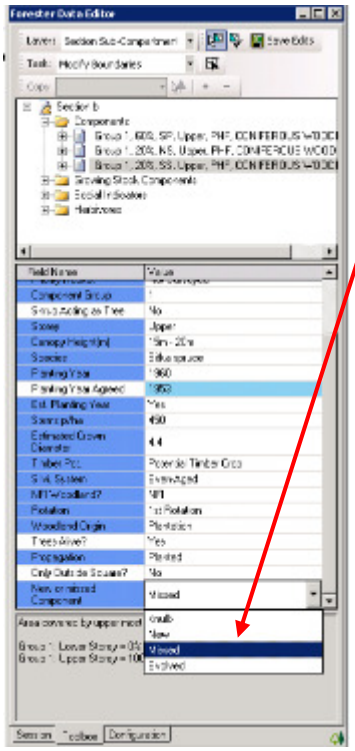
Scots Pine 60%, Norway Spruce 20 %, Sitka Spruce 20 %, in the Upper Canopy

It would appear that the previous survey did not discern between the Sitka and Norway Spruces. Here you need to correct the data:

Add a new component for the Sitka Spruce and in the 'New or Missed Field' record 'Missed'.

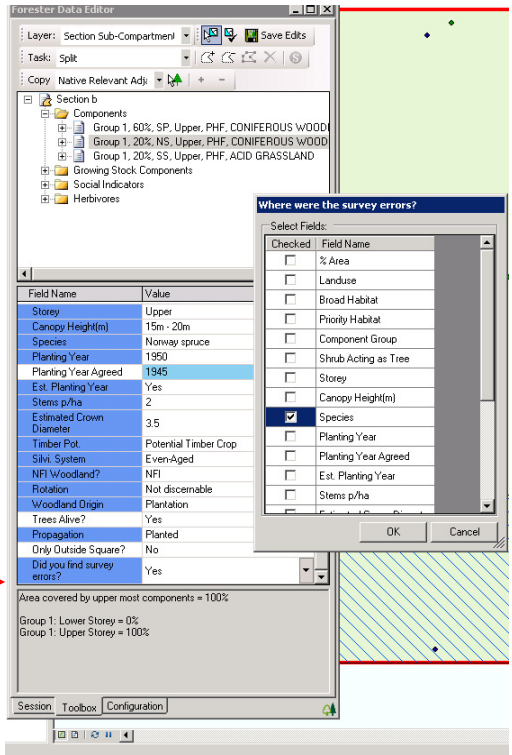






Add that it is a 'Missed' component.

Correct the Norway's component for its % area allocations and record that you found survey errors.



Example 6:

The previous surveyors' assessment:

Scots Pine 50%, 50% Norway Spruce, in the Upper Canopy.

Your assessment:

Scots Pine 50%, 50% Norway Spruce, in the Upper Canopy.
100% Scots pine seedlings

Your assessment for the upper canopy is exactly the same as that of the previous surveyors, but you have found seedlings on the ground. None of these seedlings look older than 3 years, so you conclude that this is real change.

You need to record the introduction of the seedlings and to do so you need to use tools specific to Re-measure squares. To do this you need to use additional tools in the field surveyor software that are only available for Re-measure squares.

8.12.5 New Tools for updating components:

If you right click on the section and choose to 'Add New Component' as usual the software will add another component. A new field is added to the bottom of the component record:

8.12.5.1 New or Missed Component

You have to choose one of three options:

- New - a new component since the last survey has been introduced to the section, examples being seedlings and saplings, clear felling etc.
- Missed - a component that should have been recorded in the previous survey but was not
- Evolved - This generally involves the growth or 'evolution' of trees into another new component. An example would be a single upper storey in the first cycle assessment evolving into two stories; upper and lower, through natural competition.

8.12.5.2 Additional Component Rule:

Evolved: If a component was physically present at the previous survey, but part of it has changed through natural, biotic factors such as growth, natural mortality, grazing or pests & diseases such that a new additional component is necessary, then classify that as **'evolved'**.

New: If a component was physically present at the previous survey, but part of it has changed through 'external' abiotic, factors such as wind, fire and human intervention such that a new additional component is necessary, then classify that as **'new'**.

8.12.5.3 How to treat other assessments within the component assessment.

For most of the other factors assessed at the component level there are not the same levels of subjectivity in assessment as there are for storey and % component allocation.

The following table should give you a broad sense of this:

Highly objective Measures	Measures with a degree of subjectivity
Distance to road	Planting year
Plot data	Section boundary differences
Number of trees in plot	Setting a strata as component group or a section
Tree height	Storey allocation
Diameter	Component % allocations
Crown measures	Canopy height
Live dead	Stocking
Transects	Visual height assessment
Presence of tree species	Visual BDH assessment
NFI / Non NFI	Estimated crown diameter
Shrub acting as tree	Silviculture systems
Presence of pests and diseases	Historic management
Herbivory	Ease of harvesting
	Propagation
	Woodland origin
	Landuse
	Priority habitat
	Broad habitat

For the highly objective measures in the left hand column, there is only one answer and there is no subjectivity in assessment. For those in the right hand column there is a degree of subjectivity, with those at the top of the list having a greater degree and those at the bottom less.

We have set specific rules or guidance for 'acceptable bounds' or tolerances in the previous chapter and chapters for those more subjective areas in the right hand column which need specific treatment such as sections, component groups, storeys and % area allocations.

For the remainder of the measures in the right hand column we can give more generic rules.

8.12.6 Generic Rules

The further you go down the list the less subjectivity there is in assessment and the less we would expect to see tolerances playing a part in accepting or defining differences. Differences will more likely be due to real change or surveyor error.

- Non-numeric assessments - A good general rule of thumb is to accept and record what you observe in the non-numeric assessments.

- Numeric assessments - A good general 'rule of thumb' is that if the previous surveyor was no more than 10% different in their assessment from you, in the remaining areas of the survey, accept that.

This rule applies easily to planting year (apply the % to the trees 'age' not the planting year), stocking, canopy height, visual height assessments, visual DBH assessments, and estimated crown diameters. These are all visual assessments and contain some element of measurement error or subjectivity and in light of this it is sensible to apply tolerances.

For the non-numeric assessments:

Most assessments here are primarily objective in nature and with such tolerances or acceptable bounds are small. Also the choices are more digital in nature and are more black and white. For example a landuse of agriculture is quite different to one of high forest as compared to a stocking assessment which is assessed on a continuum. This leads us to say if you find a difference in your assessment and the previous one, it must either be real change or surveyor error.

In these assessments therefore we expect you to record what you assess on the day.

Exceptions would be where two categories are very close by definition. An example might be under timber potential where the previous survey selected a potential timber crop and you see a fuel wood crop.

In such instances again record your own assessment on the day as the difference may be subjective difference or it could be error or it may be down to changes in market conditions. Only when you have clear evidence of error should you record it so. On the whole though if you observe differences here they should be recorded and only classified as surveyor error if you are definite that is the case.

8.12.7 To record your decisions within the software:

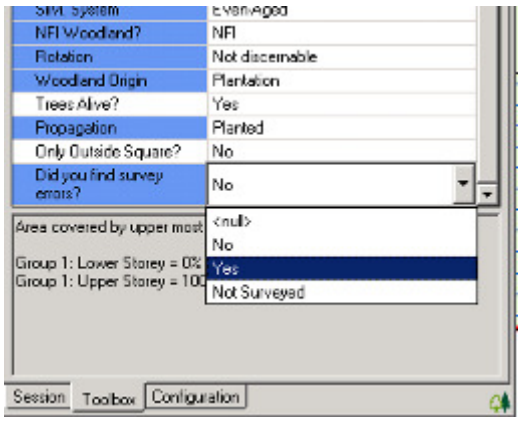
8.12.7.1 Adjusting a field within a component

Where a component existed in the first cycle and remains in the second, but has changed in some way in its description, so that one of the previous values held at component level needs to change then simply change it. However if that change is needed because the previous surveyor made an error, make your change then update the following field:

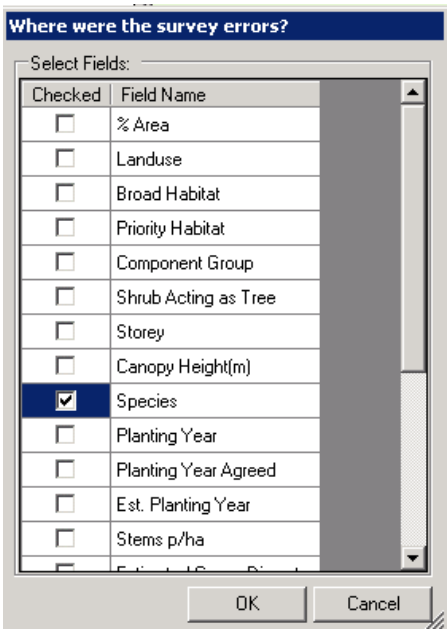
Did you find Survey errors?

- Yes
- No

This field is set to No by default

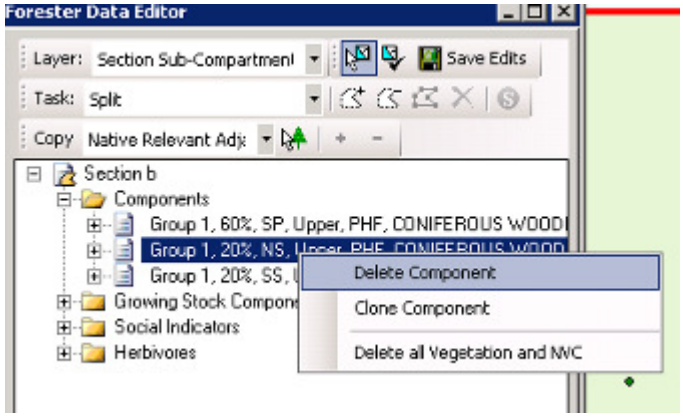


A dialogue box will then open up asking you to identify or 'check' which values you had to correct due to previous surveyor errors.



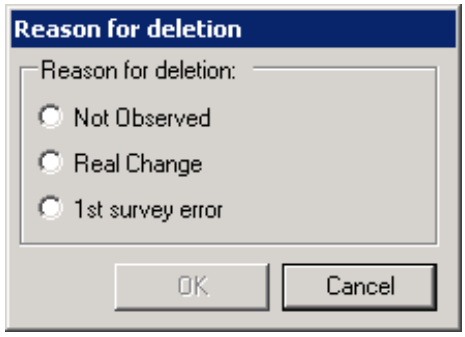
Delete Component

If, in your assessment, you cannot find a component that was previously recorded you need to delete this. After completing the deletion the software will generate a dialogue box which will ask you the question:



Reason for Deletion

- Not observed
- Real Change
- 1st Surveyor errors



Where:

Not observed.

If after a day or more surveying you cannot find a component that the previous surveyor recorded, but you have reason to believe that you may have missed seeing it but it may still be evident, just that you have not seen it - record not observed. An example would be broadleaf seedlings, which are hard to see, especially if they were previously recorded as a low % area allocation and at a very low density in the winter. It could be that with such a small thing to spot you have missed them. If you had surveyed in the spring or summer when the leaves were out you may have spotted them. Similarly if a components area allocation was at 0% and was, for example, a small tree in a lower storey then that again could have been missed. For such small and unobtrusive components we expect no more than an additional 20 minutes of searching before you record 'not observed'.

Real change.

The component has been removed. For example in a thinning or felling.

1st Survey Error.

Where a component is not evident and there is no chance that it has not been observed this time. For example, a component of very large old broadleaves at a high stocking density and a high % area allocation. If there is no evidence of removal, stumps, etc., and you believe a mistake was made previously, record '1st surveyor error'.