Chapter 8: Components

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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 a treed area. 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.

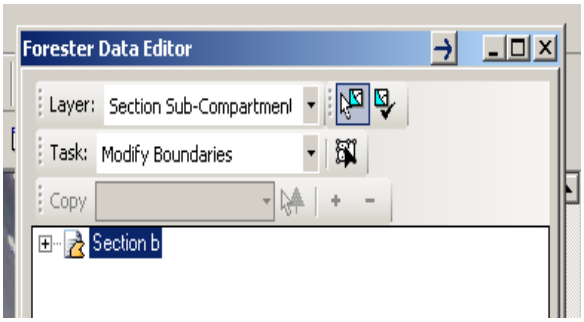
The minimum area for an individual component is ordinarily one percent (1%), of a section. However zero (0%) can be used but ***only*** *where there are more components than % allocated within a Component Group or where there are very few examples of a particular Component.* For example if a component 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.

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

8.1 Component Attributes

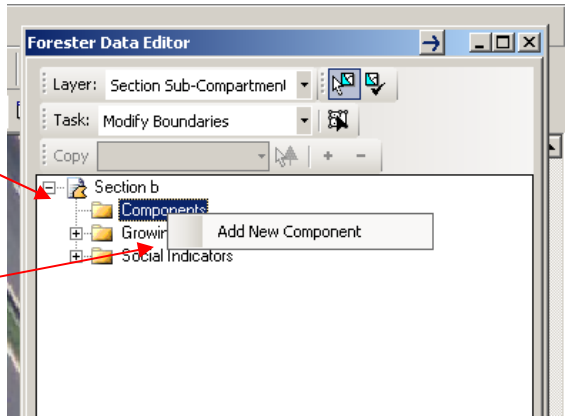
A range of attributes are recorded for each component. This is information specifically associated with the component such as species, planting year and storey.

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.



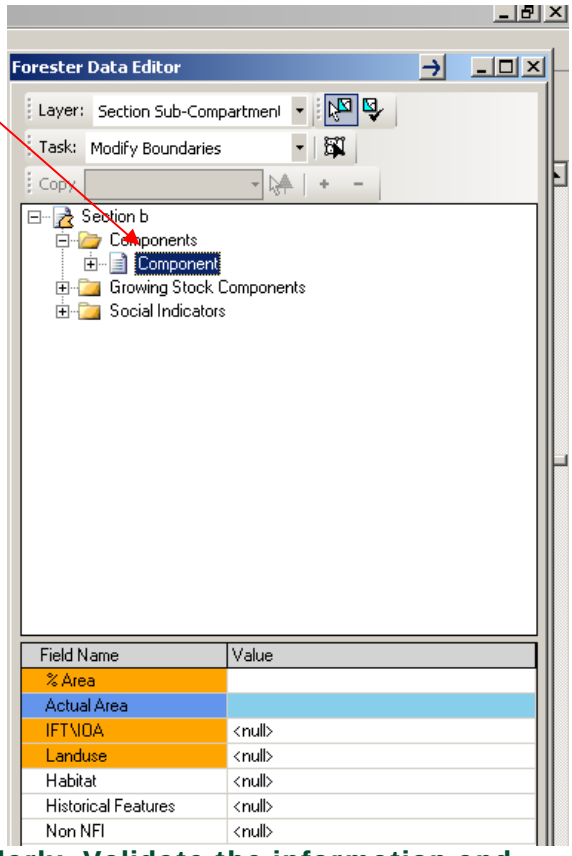
In the Forester Data Editor window, right click on 'Components' to get the option to Add New Components.

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



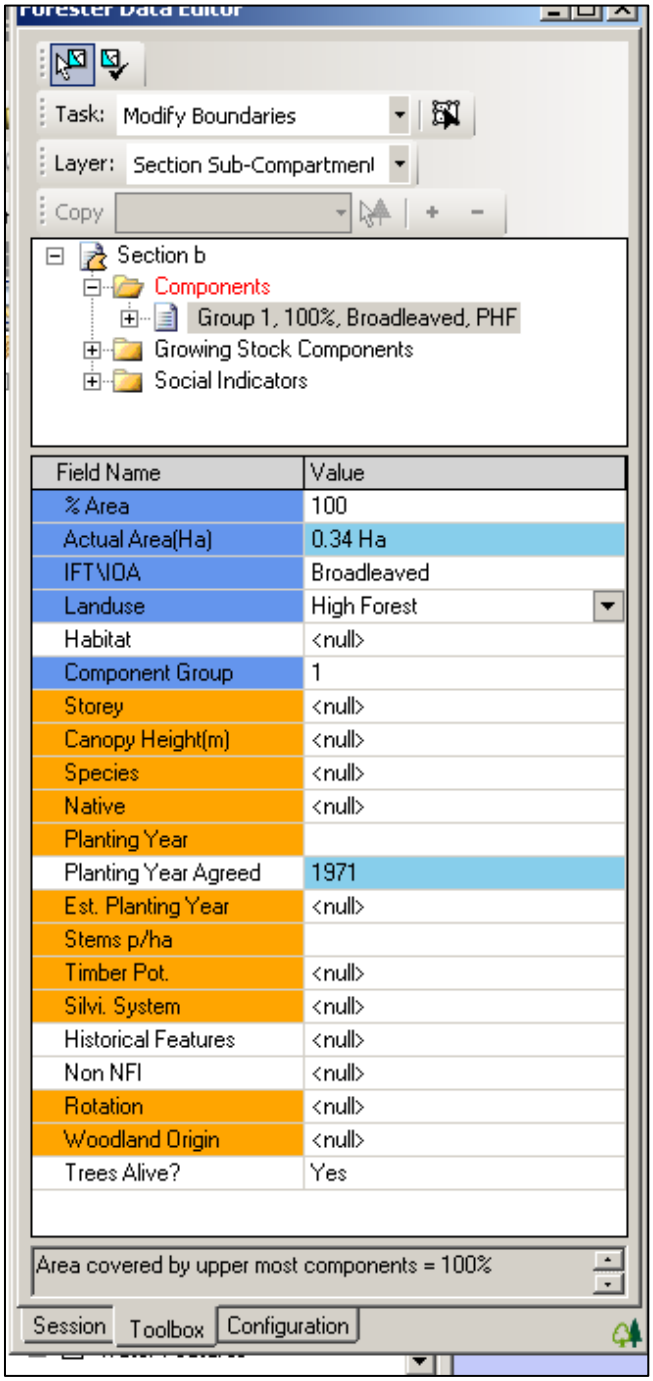
Note that the word Component is in red. This will turn black once all of the mandatory data fields have been correctly filled out.

The number of Fields (Component Attributes) varies depending upon the combination of IFT\IOA and Landuse options that are chosen.

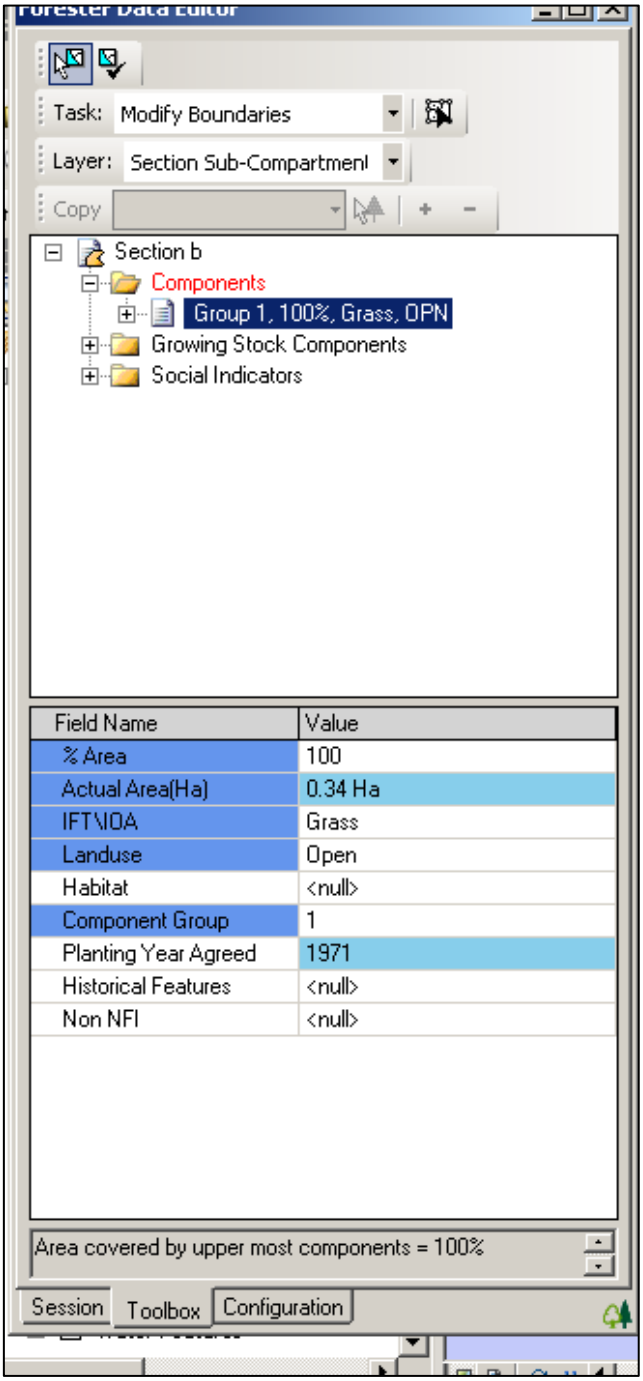


For non-treed areas there is less data to collect than for NFI treed areas:

NFI treed Area



Non-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.
IFT/IOA	• Conifer • Broadleaved • Mixed Predominately Conifer • Mixed Predominately Broadleaved • Coppice • Coppice with Standards • Shrub Land • Young Trees • Felled Woodland • Ground prepared for new planting • *Cloud or Shadow* • *Uncertain* • Windblow • Open Water • Grass • Agricultural land • Urban/Building • Forest Road, Track • River • Power line • Quarry • Bare • Windfarm	See Chapter 8.5 for IFT/IOA definitions. Choose the most appropriate IFT/IOA from the list opposite. The surveyor needs to assign the IFT/IOA based upon what is in the Component Group as though the surveyor was looking down from above. Note that depending upon IFT/IOA chosen the remainder of the Fields left to complete varies. Open Sections have less data to enter, treed sections have more data. 'Young Trees' is only permitted for Nurseries (Land Use = Nursery). Note that once the site has been visited 'Cloud or Shadow' and 'Uncertain' cannot be chosen as these are from aerial interpretation and are for NFI analyses only.

	• Other Vegetation	
Land Use	Various Land Use options available – See **Chapter 8.6 Land Use** for the full Land Use listing.	The available Land Use options depend upon the IFT/IOA selected.
Habitat	All habitats are available - See **Chapter 8.7 Broad/Priority Habitat** for more details.	Competent surveyors should ALWAYS choose the Priority Habitat where one is present; otherwise choose the BROAD Habitat (in upper case in the drop down menu). Do not use 'UNKNOWN' (for office use only). If the habitat cannot be identified use 'Surveyed; Unknown Habitat'. For snow cover use 'Not Surveyed'.
Component Group	• 1 • 2 • 3 • 4 • 5	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 7.0 for more details.
Storey	• Upper • Middle • Lower • Complex • Young Trees	See Chapter 8.8
Canopy Height	• 10cm – 2m • 2m – 5m • 5m – 15m • 15m - 20m • 20m +	Estimate mean 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.	See Chapter 8.9
Native	▪ Yes ▪ No	Is the Component *site* native? Use the Pine Zone and Beech Zone map layers to aid the decision. The tree

	▪ Not applicable	species list has all the GB native species in bold type. Site native woods: are defined as those on which the tree species present are suitable in the context of suitable soil types and drainage patterns, i.e. they can successfully colonise and complete their life cycle. Refer to Chapter 8.9 for more details.
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 2. 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.
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	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 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.

	• Short Rotation Coppice • Pollarding • Group shelterwood • Other • Garden & Ornamental • None Obvious	
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).
Non NFI	• <null> • Non NFI • NFI	Ground truth the validity of the NFI Map GIS layer and where this is significantly different to what is on the ground map to the latter. Ensure that the correct field has been selected before cloning the component.
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.
Rotation	• 1st rotation • 2nd rotation • More than 2 rotations • Not discernable	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."
Woodland Origin – this is the origin of	• Plantation	All planted components regardless of species planted or woodland management intentions i.e. whether primarily for commercial purposes or for conservation purposes

the Component Group, not the individual components within the Group. Only one Woodland Origin category per Component Group should be recorded.	• Semi-natural forest	Woodland composed of <u>mainly</u> locally-native trees and shrubs that derive from natural seedfall, 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*	Where a Component of trees has an element of dead trees within it the surveyor must assess what proportion of the component is dead by stem numbers based upon a proportion of the original planted stock. If the proportion of dead trees is ≥30% of the Component then the Component must be split into two separate components,

		one detailing the Live trees and the other detailing the Dead trees. As the components are potentially very similar it is important to make the Live/Dead distinction here. For all Dead Components two extra fields: Est. Top Height and Estimated Mean DBH will appear and need to be filled in. If the dead Component is deemed <30% and then dead trees are captured in a mensuration plot there is no requirement to make a component of dead trees at section level as no validation is undertaken by the software in this respect. If, by following the conventions for creation of storeys, the dead proportion of a crop forms a different storey to other components, it is not necessary to actually create a different storey for the dead trees. A crop storey should not be deemed 'Complex' on the basis of any height differential that the Dead trees present compared to other components within a component Group. 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

8.2.1 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.

Of more importance are the various indicators including:

- Indicator plants (see the Additional Documents folder for more details)

- Presence of woodbanks
- Woodland areas having old names, especially if Gaelic, Welsh, Norse or Anglo-Saxon. For example 'thwaite' which comes from Old Norse meaning: 'a piece of land cleared from forest or reclaimed from wasteland'
- Age of trees
- Tree Species – see Table 8 - 21: Earliest planting dates for Conifers and Table 8 - 22: Earliest planting dates for Broadleaves
- Evidence of industry (e.g. charcoal pits) or coppicing/pollarding
- Woodland proximity to urban areas
- Stump sizes
- Evidence of old tracks

If a surveyor feels that, based upon the indicators above, the area is Ancient Woodlannd then it should be a Section or Component Group depending upon its total extent within the Square.

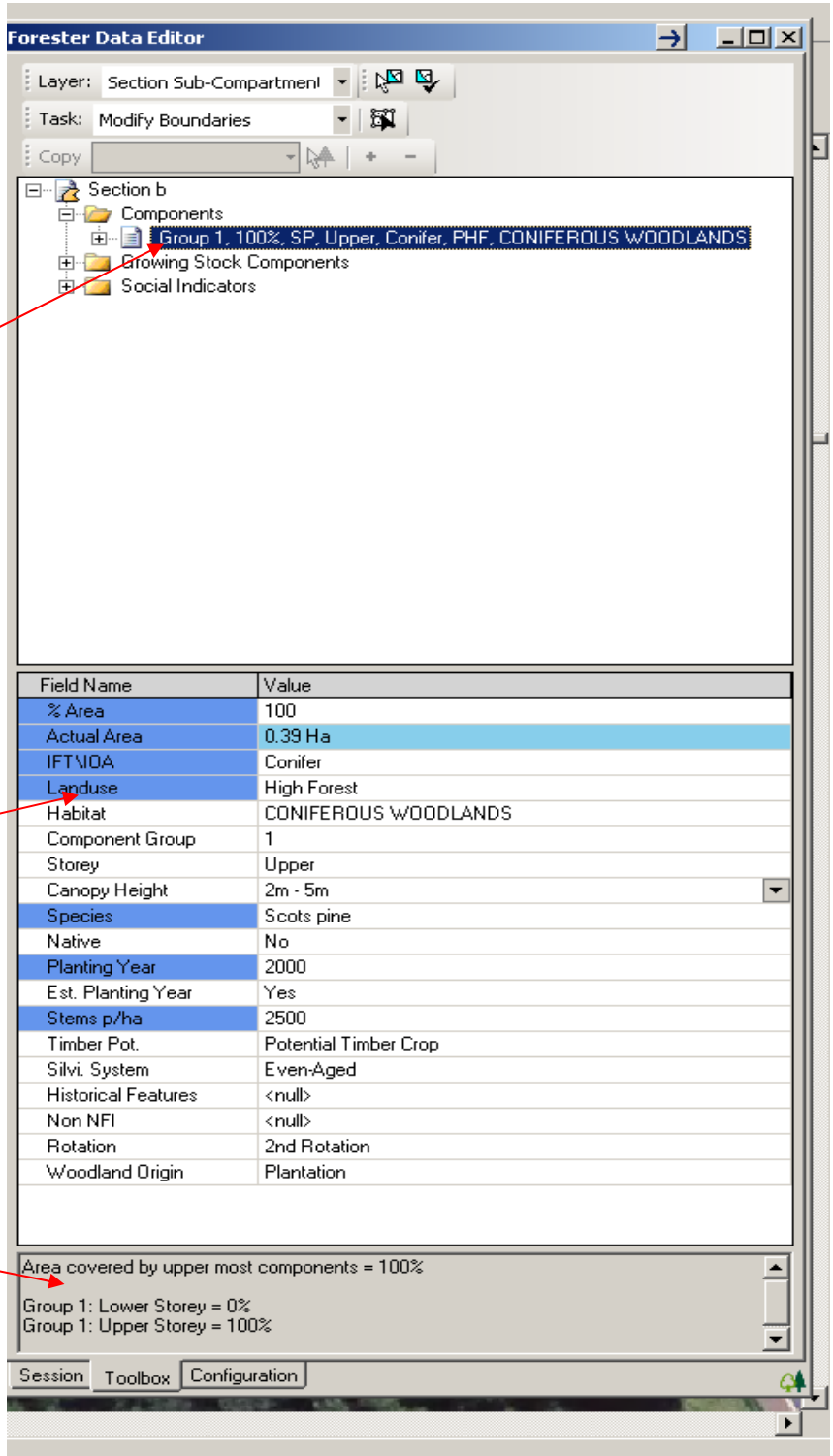
Example: Completed Trees Component data.

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

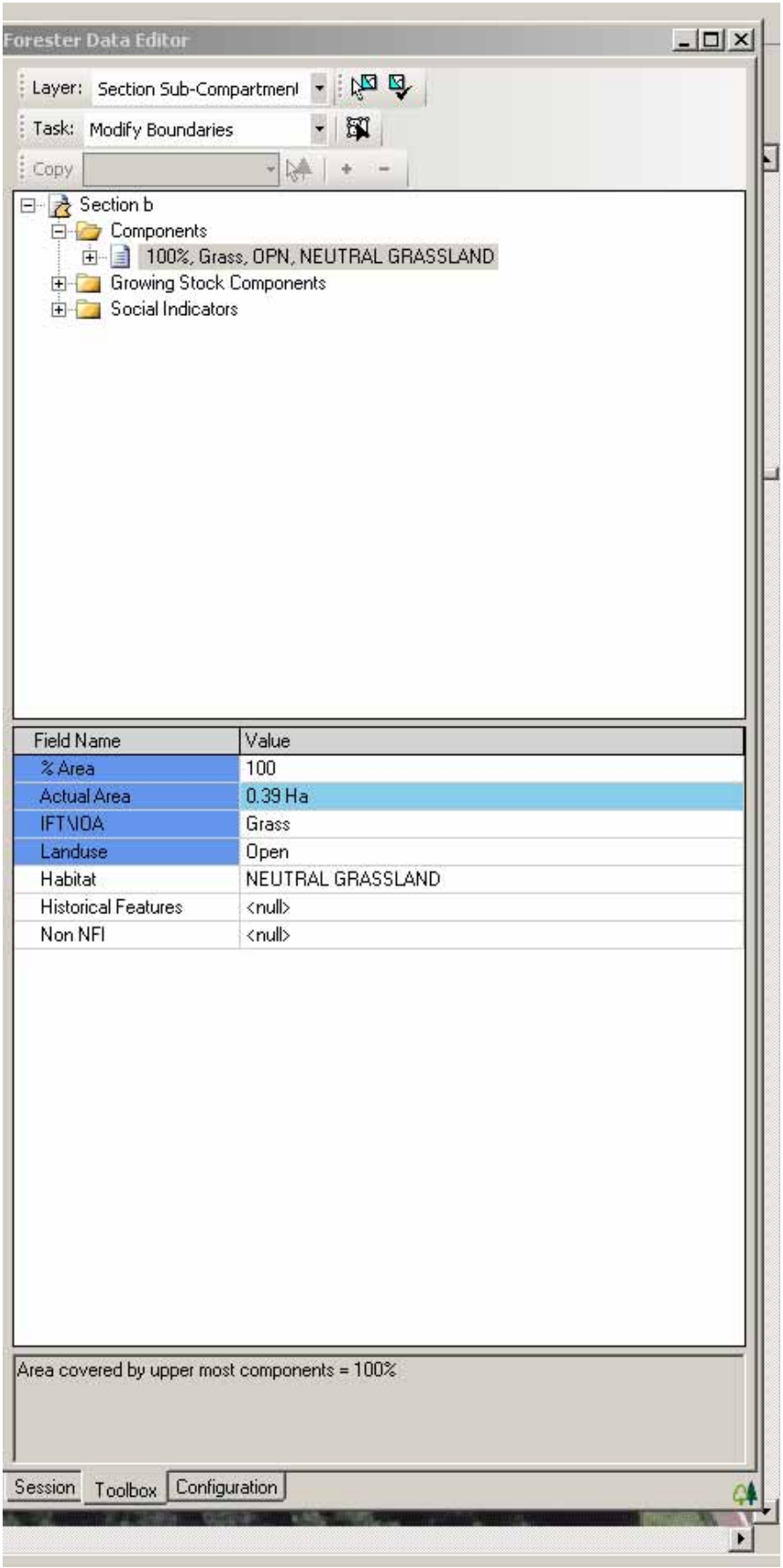
Orange Data Fields turn blue once attribute data has been entered.

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

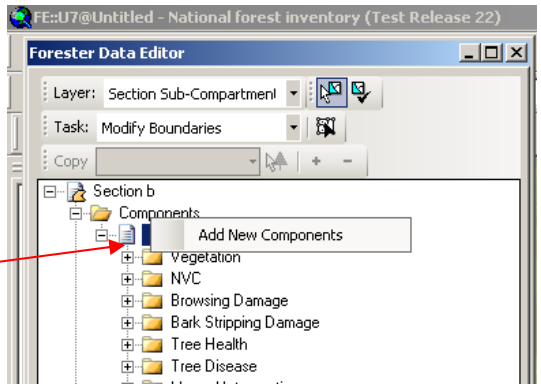


Fewer attribute data Fields are available for completion for a non-treed area.

8.3 Multiple Components

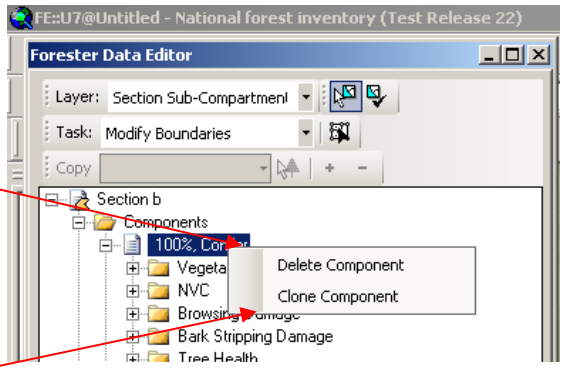
8.3.1 Add Component

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.

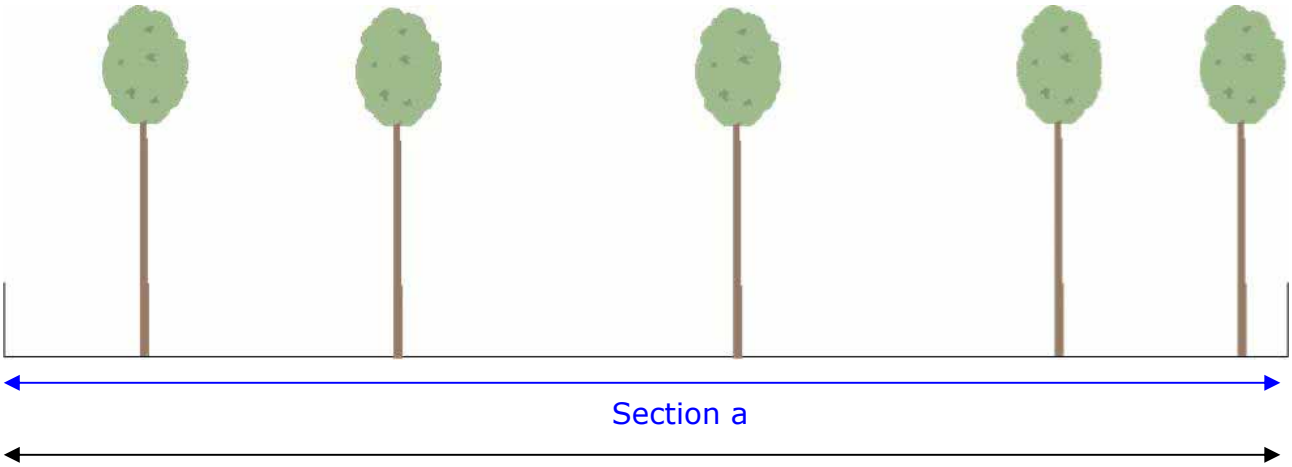
8.4 Component % Area

The *occupancy* of each component within each storey needs to be 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 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

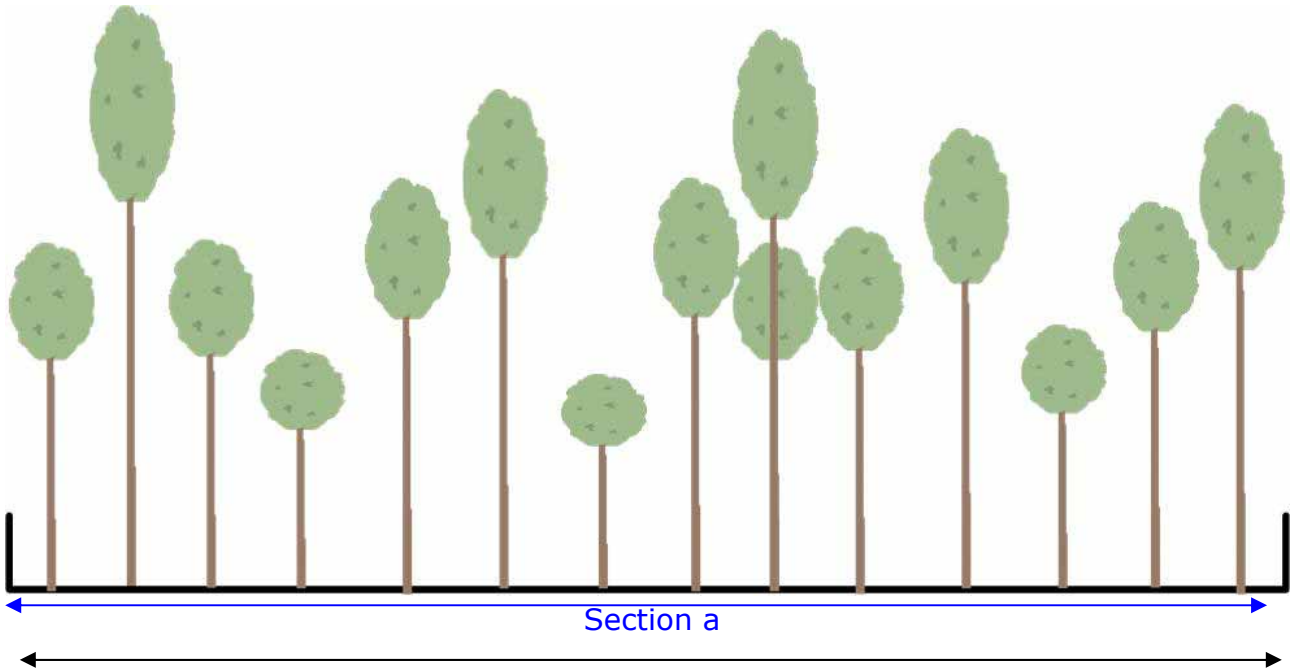


CG1 (100% of Section)

The above section contains a single Component Group of a sparse Upper storey of Scots pine. The canopy of the pine only covers 50% of the Section but, as the Scots pine is the only component present in the Upper storey it therefore *occupies* 100% of that storey.

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

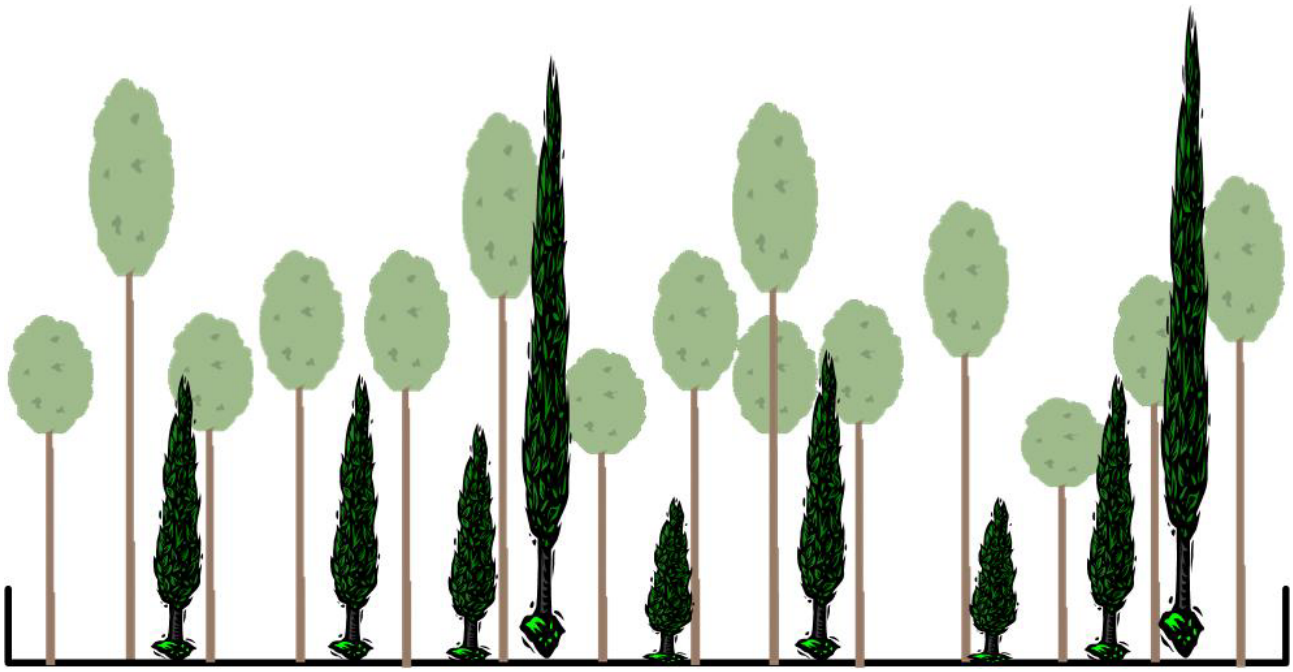
Example 8 - 2: One Component Group, Complex Storey, One Component



CG1 (100% of Section)

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

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



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 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

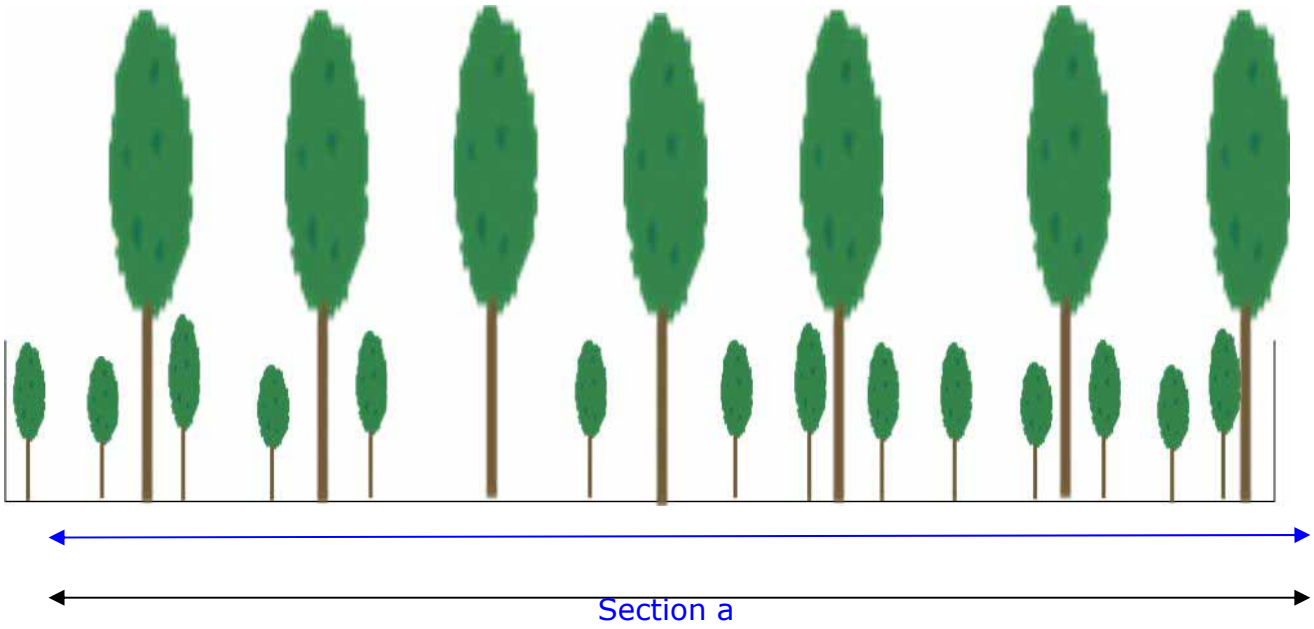
Section a

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

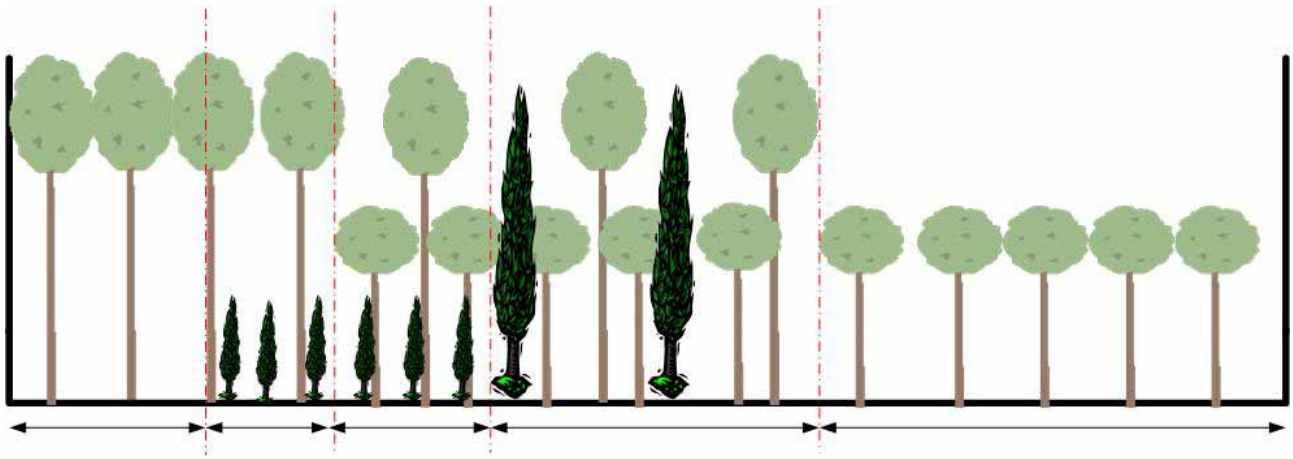


CG1 (100% of Section)

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, which in this case is 100% of the Section. The %Area field sums to >100%, 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
- 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%

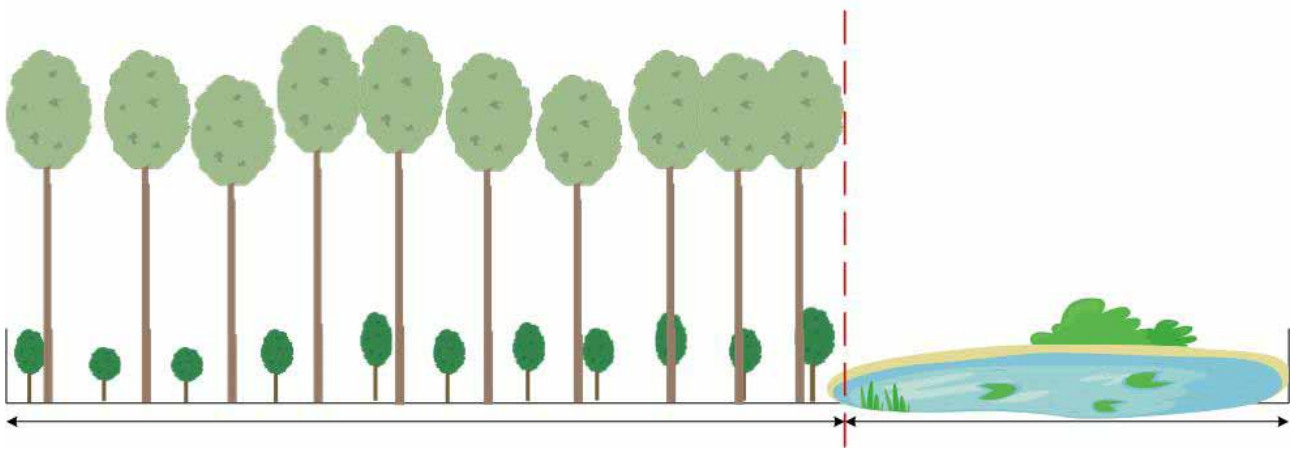
The sum of the uppermost components is therefore:

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



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%.

8.5 Interpreted Forest Types and Interpreted Open Areas

The NFI GB Woodland Map has been divided into Interpreted Forest Types (IFT) and Interpreted Open Areas (IOA). These are listed in Table 8 - 2 - 2 and 8 – 3 below. For each Component Group within a Section the surveyor must select the appropriate IFT or IOA then record this against all the Components in the Group.

Table 8 - 2: IFT codes to be used and brief descriptions

IFT	Description
Conifer	The canopy open to the sky is comprised of at least 80% conifer species.
Broadleaved	The canopy open to the sky is comprised of at least 80% broadleaf species.
Mixed Predominantly Conifer	The canopy open to the sky is comprised of between 50% and 80% conifer species.
Mixed Predominantly Broadleaved	The canopy open to the sky is comprised of between 50% and 80% broadleaf species.
Coppice	An area of woodland in which the trees and shrubs are periodically cut back to ground level to provide firewood or timber. The multi-stemmed re-growth from the coppice stools produces an even-aged single-storey crop. This is almost always broadleaf species but can occasionally be conifer, for example coast redwood. Restricted to actively managed coppice that is still in rotation (this may be as long as 30 years).
Coppice with Standards	Chiefly, historically managed woodland, consisting of two distinct elements: a lower even-aged storey treated as coppice, and an upper storey of standard trees that are allowed to reach full height. The distribution of the standards may be clustered or scattered.
Shrub Land	For office use only
Young Trees	For office use only
Felled Woodland	Areas of woodland where the trees have been felled. Any remnant trees must comprise less than 20% tree canopy cover. This category should not be confused with recently cut coppice. Felled Woodland is considered temporarily unstocked. If after 10 years the site has not been replanted or, has insufficient regeneration the site will be re-classified as an IOA.

Ground Prepared for New Planting	Ground which shows evidence of management in preparation for re-afforestation as well as afforestation, e.g. ploughing, mounding, scarifying etc.
Cloud or Shadow	For office use only
Uncertain	For office use only
Windblow	Areas of trees uprooted by the wind as opposed to those that have been snapped by wind or snow. There two categories in the landuse options: 'Windblow -alive', 'Windblow – dead'.

Table 8 - 3: IOA codes to be used and brief descriptions

IOA	Description
Open water	This includes natural systems such as lakes, meres and pools, as well as man-made water bodies such as reservoirs, canals, ponds and gravel pits. Ditches with open water for at least the majority of the year are also included.
Grass	A predominantly grassy area. If there is evidence of agricultural management then assign to 'Agricultural land' IOA.
Agricultural land	May contain a cereal crop or pasture. Also includes bio-fuel and nursery crops.
Urban/Building	Buildings within woodland areas; may include gardens surrounding the building. Also includes tarmacadam and concrete roads whether in an urban or rural setting.
Forest road, track	Non-tarmacadam, often single track. Includes private driveways.
River	Includes streams.
Powerline	All above and below ground utilities to be included.
Quarry	Active and disused. Evidence of excavation of substrate.
Bare	Bare ground/rock.
Windfarm	Groups of turbines.
Other vegetation	Anything not covered by the above, e.g. gorse, rhododendron, bracken, heather and reedbeds etc.

Burnt area: assign to the IFT/IOA the area would have been prior to burning.

8.6 Land Use

8.6.1 What Is Land Use?

Land Use is a means of classifying land according to management and crop type, and is linked to IFT and IOA. It is important to get Land Use correct as it is used for analyses such as Production Forecasting of timber stocks for Great Britain.

In the majority of cases the Land Use is assigned to a Component Group (and therefore to all Components within the Group). However, in some exceptional circumstances 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 - 4: 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	This classification should take priority over all other land uses

Land Use	Description
sites	(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.
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.
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

Land Use	Description
	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 Recreation	Includes all other facilities provided specifically for public 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.
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.

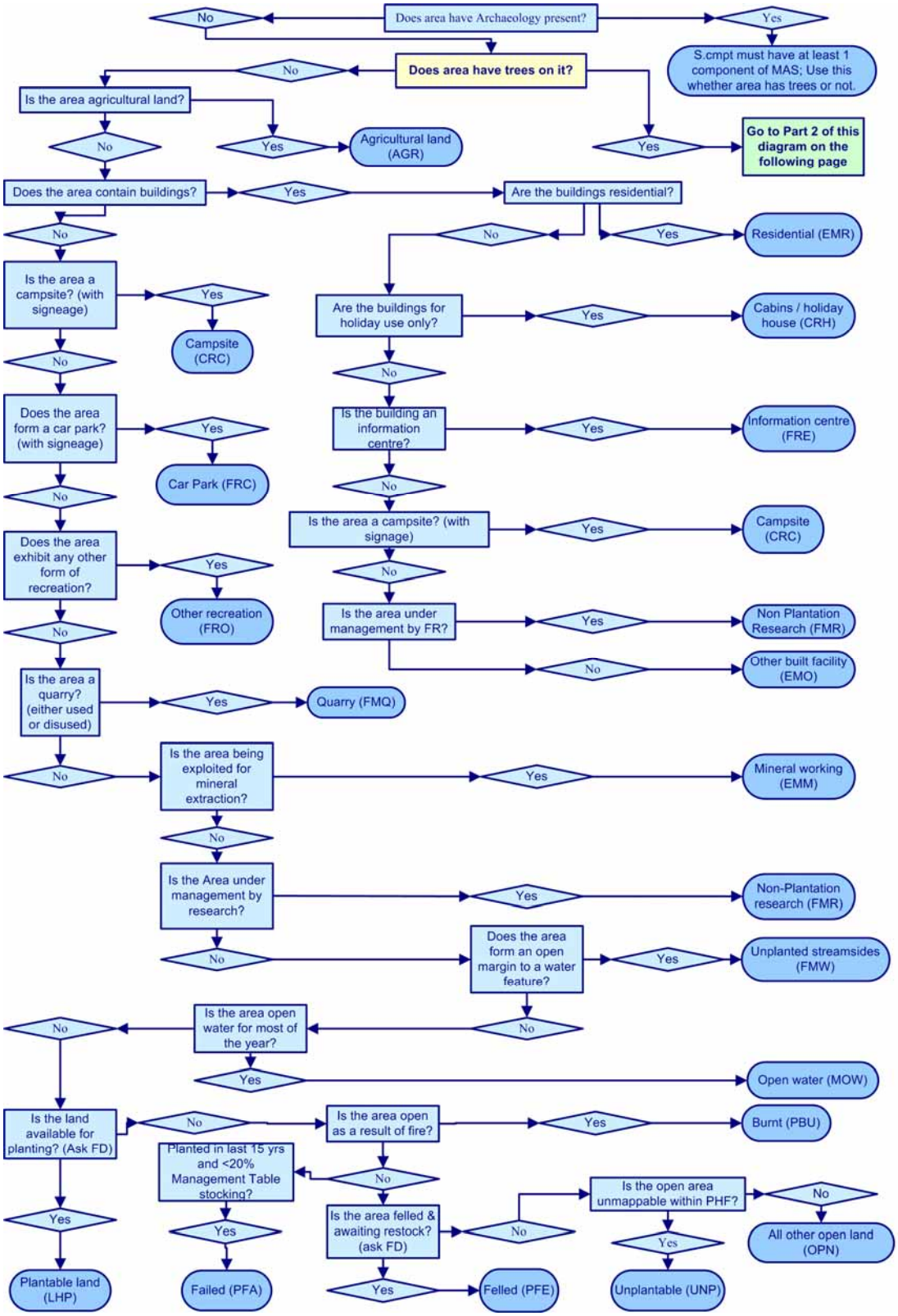
Land Use	Description
Research Plantation	The surround of any experiment should be included. In general the area should be given Section status. However, where the area is too small, the area should be classed as a component.
Residential	This should include the immediate surrounding area. It is permissible 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.
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 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.

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

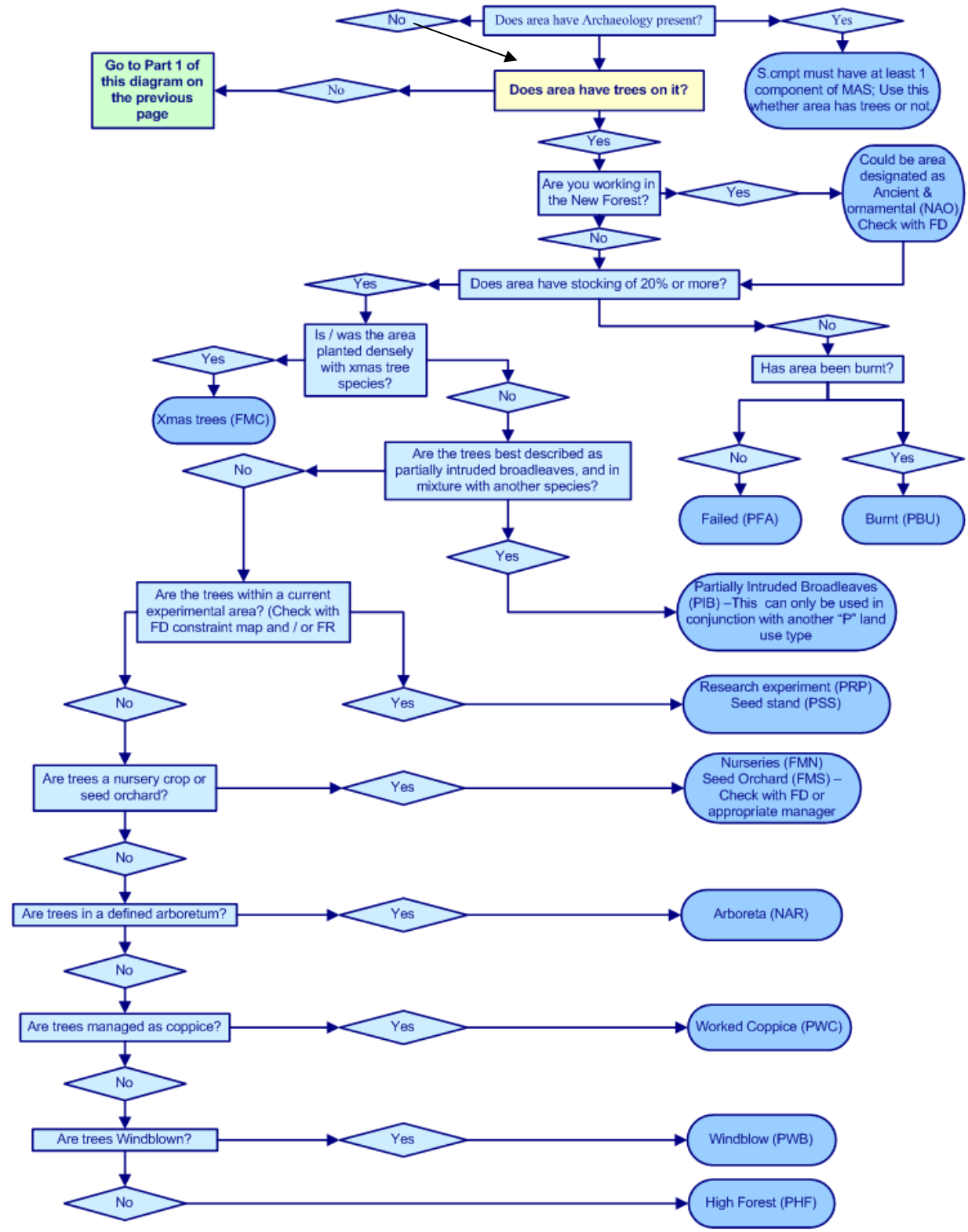
The following flowcharts illustrate how to decide upon appropriate land use codes for use.

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



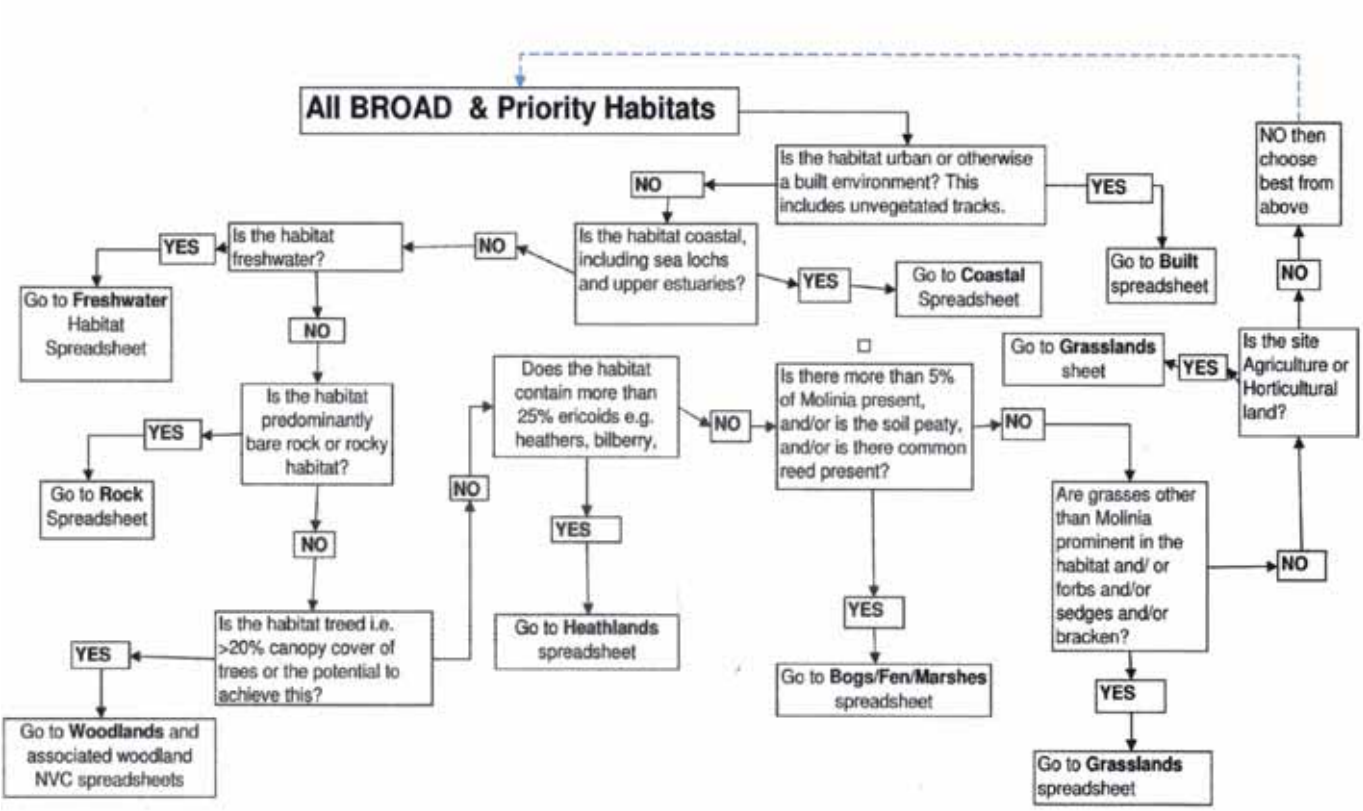
Flowchart 8 - 1: Landuse – non-treed areas



Flowchart 8 - 2: Landuse – treed areas

8.7 Broad/Priority Habitat:

All BROAD and Priority Habitats are available regardless of the combination of IFT/IOA and Landuse. Ideally, surveyors should be familiar with all likely Habitats for their Bid Area/s. A spreadsheet with flow charts for groups of habitats (e.g. woodlands) and the appropriate Habitat depending on certain criteria are shown in the HAPS Flowchart below.



Flowchart 8 - 3: Habitat flowchart

8.7.1 Treed Sections and Component Groups

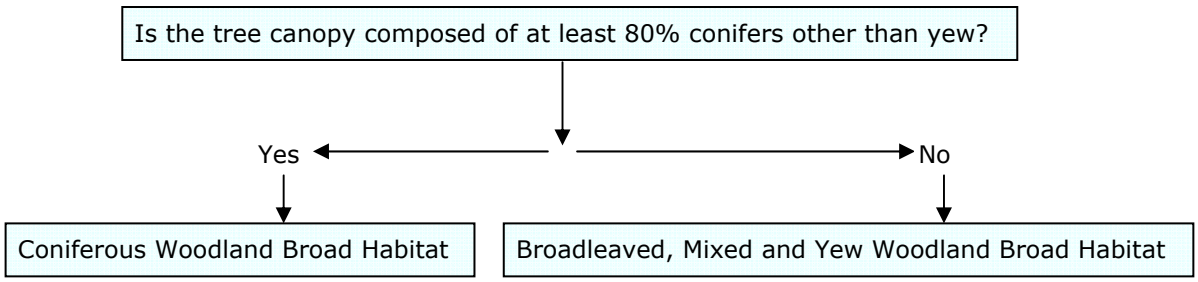
For NFI and Non-NFI treed Sections and Component Groups surveyors are required to record **UKBAP Habitat type** and **NVC community**. Surveyors should aim for no more than 15 minutes per Section.

8.7.1.1 UKBAP Habitat type

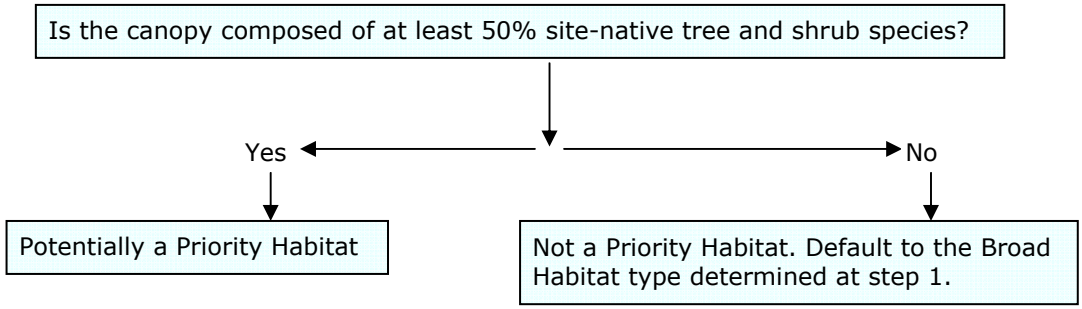
Record the Priority Habitat type where one is present and the Broad Habitat type where one is not (or where the surveyor really can't be sure if a Priority Habitat is present).

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).

Habitat surveying issues

- Ordinarily create a separate Component Group for each habitat type within the Section. Rarely, 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.
- Do not assign the "UNKNOWN" habitat category- this is to be removed from the software. Record "Surveyed; Unknown Habitat" or "Not Surveyed", as appropriate.

8.7.2 Non-treed Sections and Component Groups

For NFI and Non-NFI non-treed Sections and Component Groups surveyors are required to record the **UKBAP Habitat type only**. Aim for 15 minutes per Section.

8.7.2.1 UKBAP Habitat type

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

Habitat surveying issues

- Do not assign the "UNKNOWN" habitat category- this is to be removed from the software. Record "Surveyed; Unknown Habitat" or "Not Surveyed", as appropriate.

See 8.7.3: NFI BROAD and Priority Habitats for more detail. See 'UK Biodiversity Action Plan – Priority Habitat Descriptions (2008)' for more detailed description of individual Habitats.

Table 8 - 5: 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
URBAN

NB: URBAN was redefined by the UK BAP steering group and has been absorbed into BUILT UP AREAS & GARDENS. As such URBAN should no longer be used.

Table 8 - 6: 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:
- UNKNOWN – DO NOT USE. USE Surveyed; Unknown Habitat
- 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.

8.7.3: NFI BROAD and Priority Habitats

8.7.3.1 UK Biodiversity Action Plan (UKBAP)

This was published in 1994 and is the Government's response to the Convention on Biological Diversity (CBD) which the UK signed up to in 1992 in Rio de Janeiro. The CBD called for development and enforcement of national strategies and associated action plans to identify, conserve and protect existing biological diversity, and to enhance it wherever possible.

The UKBAP describes the biological resources of the UK and provides detailed plans for conservation of these resources. Habitats are classified into 2 groups: Broad Habitats and Priority Habitats.

8.7.3.2 UKBAP Broad Habitats

Broad Habitats are described in broad terms e.g. all woodland is classed as either "Coniferous Woodland" or "Broadleaved; Mixed/Yew Woodland".

The current list of UKBAP Broad Habitats contains 27 habitats which together cover the whole of the land surface of the UK and the surrounding sea to the edge of the continental shelf.

<u>Broad Habitat Descriptions</u>

- Full definitions for each of the 17 terrestrial and freshwater Broad Habitat Types are given in "JNCC Report 307: Guidance on the interpretation of the Biodiversity Broad Habitat Classification (terrestrial and freshwater types)", compiled by D.L. Jackson (2000).

- Brief descriptions are also given in "Summary Descriptions of Woodland NVC Communities (and their Relationships with UK BAP Priority Habitats) and UK BAP Broad Habitats", compiled by Ben Averis (2010).

- See also NFI Field Manual document "UKBAP- NFI Broad and Priority Habitat Summaries", compiled by Julie Gardiner.

8.7.4 UKBAP Priority Habitats

Priority Habitats are habitats that have been highlighted as priorities for conservation action under the UKBAP. The current list of UKBAP Priority Habitats published in 2007 contains 65 habitats.

8.7.4.1 Priority Habitat Descriptions

- Full descriptions for each of the 65 UKBAP Priority Habitats are given in "UK Biodiversity Action Plan Priority Habitat Descriptions", compiled by the Biodiversity Recording and Information Group (BRIG) in 2008 (updated July 2010).

- See also NFI Field Manual document "UKBAP- NFI Broad and Priority Habitat Summaries", compiled by Julie Gardiner.

8.7.4.2 Habitat Action Plans

A UKBAP Habitat Action Plan (HAP) has been published for each Priority Habitat. This describes the status of the habitat (i.e. how widespread and abundant it is, current threats etc.) and sets out targeted action to conserve the habitat.

- Take a look at the Local Biodiversity Action Plan (LBAP) for your region. This will contain a HAP for each of the Priority Habitats in the region, often with distribution maps and reference to specific sites.

8.7.4.3 Woodland Priority Habitat qualifying criteria

To qualify as a Priority Habitat, a stand must have:

- **At least 20% canopy cover, or the potential to achieve this in the case of newly planted stands**.

- **A canopy composed of at least 50% site-native tree and shrub species.** Site-native trees are those which are native to the locality and capable of growing naturally on the site i.e. they can successfully colonise and complete their life cycle.

<u>Priority Habitats include:</u>

- Ancient semi-natural woods i.e. semi-natural stands (composed of locally native trees and shrubs which derive from natural regeneration or coppicing rather than planting) on ancient woodland sites (AWS).

- Other semi-natural woods i.e. definition as above but on more recent woodland sites.
- Planted woods on ancient woodland sites (PAWS) where >50% of the canopy is composed of site-native species.
- Other planted woods where >50% of the canopy is composed of site-native species, and the agreed aim is to manage towards a more semi-natural structure and composition.
- New native woodlands created to mimic the natural composition of the woodlands on the site.

8.7.4.4 Lowland Beech and Yew Woodland Priority Habitat

Beech native zone

The accepted native range of beech is south of a line from the Wash, across to South Wales and down to Dorset. See the "Beech Zone" GIS shapefile supplied in the Support Files folder for your Bid Area.

Classification issues

- Planted beech woodlands within the Beech Zone may be included in the Lowland Beech and Yew Woodland Priority Habitat.
- Long-established planted beech woodlands outwith the Beech Zone may be included within the Lowland Beech and Yew Woodland Priority Habitat where they have acquired a high conservation value.
- Other planted beech woodlands outwith the Beech Zone should be classed as the Broadleaved, Mixed and Yew Woodland Broad Habitat.
- It can be difficult distinguishing between beech woodland and any other woodland type with a high proportion of beech. There's no fixed minimum %, but beech should always be the most abundant tree and should usually be strongly dominant.
- Regenerating patches that lack beech should be classed as Lowland Beech and Yew Woodland Priority Habitat if they occur as a mosaic with mature beech woodland and show signs of a former beech crop.
- Yew stands within the native range of beech are included in the Lowland Beech and Yew Woodland Priority Habitat.
- Yew stands on Carboniferous and Magnesian limestones in northern Britain, growing in association with Upland Mixed Ash Woodland, are included in the Upland Mixed Ash Woodland Priority Habitat.

8.7.4.5 Native Pine Woodlands Priority Habitat

UKBAP definition

The UKBAP defines Native Pine Woodlands as "relict indigenous forests dominated by self-sown Scots pine which occur throughout the central and north-eastern Grampians and the northern and western Highlands of Scotland". These Native Pine Woodlands (believed to have originated from post-glacial woodland remnants) are listed in the Forestry Commission's Caledonian Pinewood Inventory. They are also referred to as Caledonian Pinewoods.

Scots pine native zone

The accepted native range of Scots pine is shown by the "Pine Zone" GIS shapefile supplied in the Support Files folder for your Bid Area.

Classification issues

- Scots pine woodlands with similar physiognomy and composition to Caledonian Pinewoods but of uncertain genetic origin should be classed as Native Pine Woodlands Priority Habitat if they fall within the Pine Zone.
- Planted Scots pine woodlands within the Pine Zone may be included in the Native Pine Woodlands Priority Habitat.
- All Scots pine woodlands outwith the Pine Zone should be classed as the Coniferous Woodland Broad Habitat.

8.7.4.6 Distinguishing between upland and lowland habitat types

In theory, the lowland zone extends to the limit of enclosed, agricultural land, which is traditionally taken as 250-400m a.s.l. In practice, the distinction between lowland and upland is more to do with the severity of climate i.e. an upland environment can exist at low altitude, and vice versa. So when assigning a Priority Habitat, remember that the upland woodland types have no lower altitudinal limit.

There are 3 GIS shapefiles in the Support Files folder for each Bid Area:

- uplandorlowland
- uplandoakorash
- lowland_mixed_deciduous

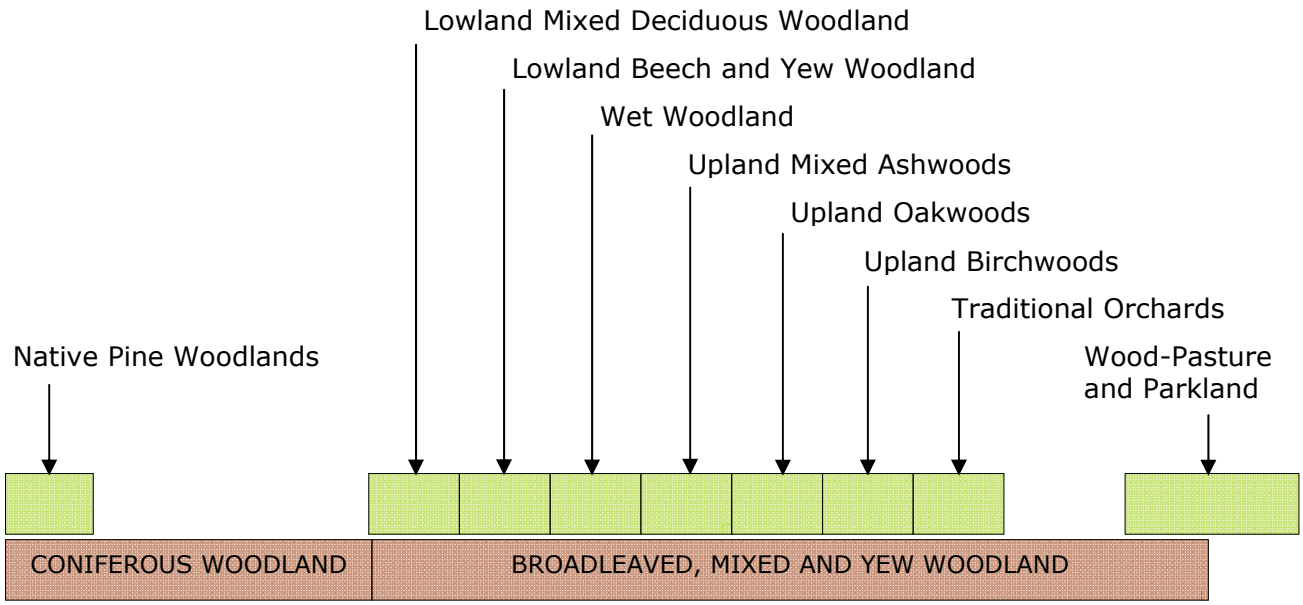
Do not be overly led by these! Please determine the habitat type independently, on a site-by-site basis.

8.7.5 Relationship between Broad and Priority Habitats

It's important to understand that the Priority Habitat classification **sits within** the Broad Habitat classification i.e. a wood classed as "Broadleaved, Mixed and Yew Woodland" Broad Habitat type may also be an example of "Lowland Mixed Deciduous Woodland" Priority Habitat type, and can be reported on at either level.

Most of the Broad Habitats contain one or more Priority Habitats. Sometimes the Priority Habitats account for the whole of the Broad Habitat, and sometimes only part e.g. all Calcareous Grassland falls into 1 of 2 Priority Habitat types, but only some examples of Acid Grassland are a Priority Habitat. See below:

8.7.5.1 Woodlands:



Note: Wood-Pasture and Parkland Priority Habitat includes some non-woodland habitats and also overlaps with various other Priority Habitats.

Figure 8 - 1: Woodland Broad and Priority Habitats

8.7.5.2 Grasslands

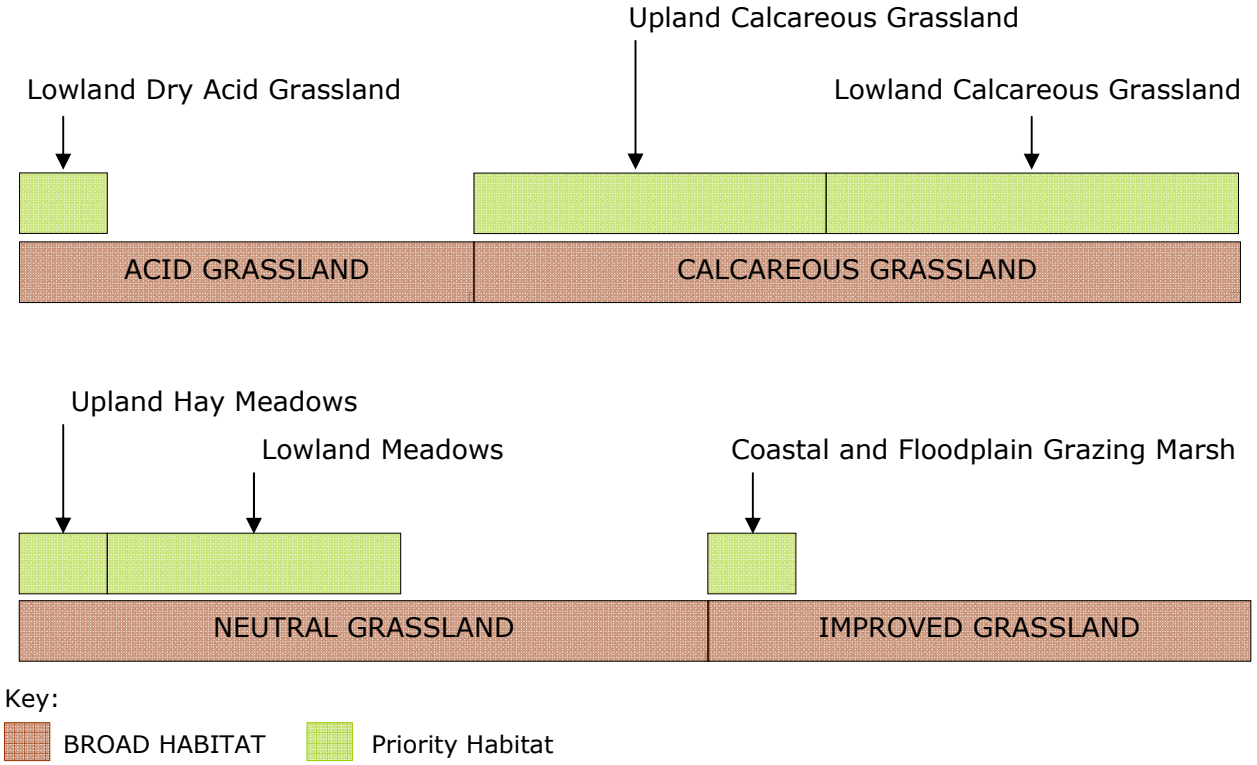


Figure 8 - 2: Grassland Broad and Priority Habitats

8.7.5.3 Arable and horticultural:

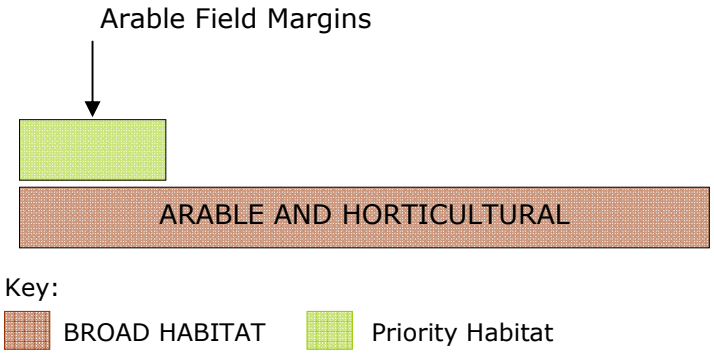


Figure 8 - 3: Arable and horticultural Broad and Priority Habitats

8.7.5.4 Bogs, fens and marshlands:

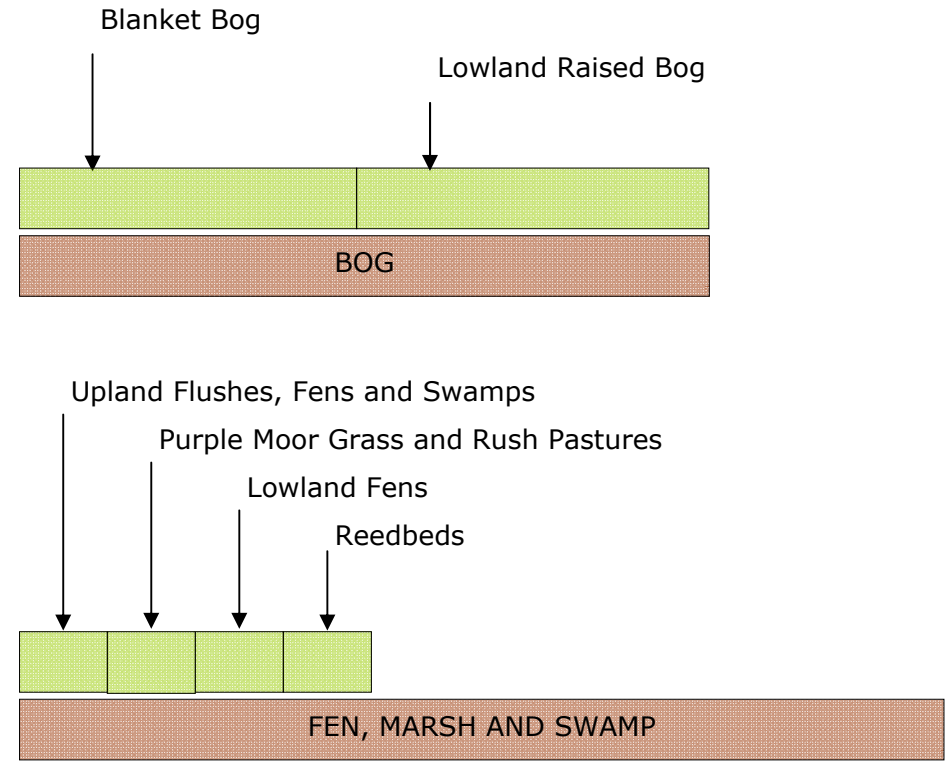


Figure 8 - 4: Bogs, fens and marshland Broad and Priority Habitats

8.7.5.5 Boundary and linear features:

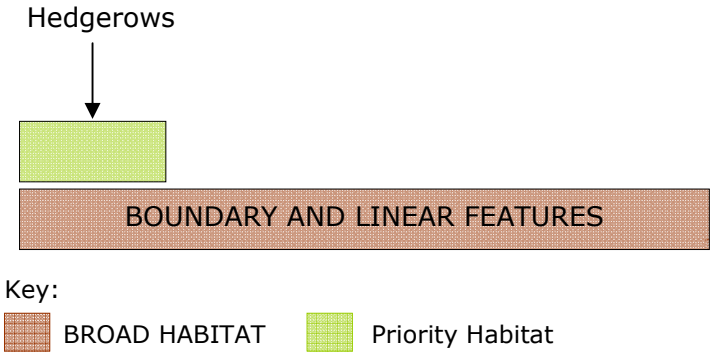


Figure 8 - 5: Boundary and linear features Broad and Priority Habitats

8.7.5.6 Heath and montane:

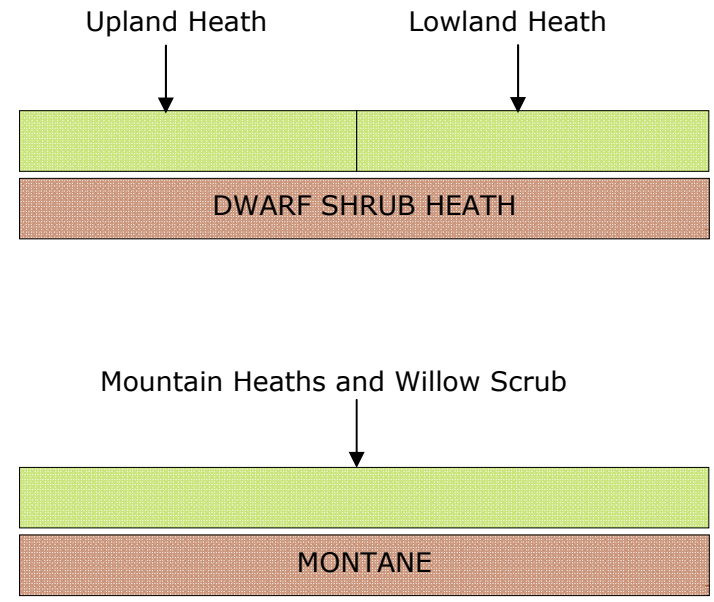


Figure 8 - 6: Heath and montane Broad and Priority Habitats

8.7.5.7 Rock:

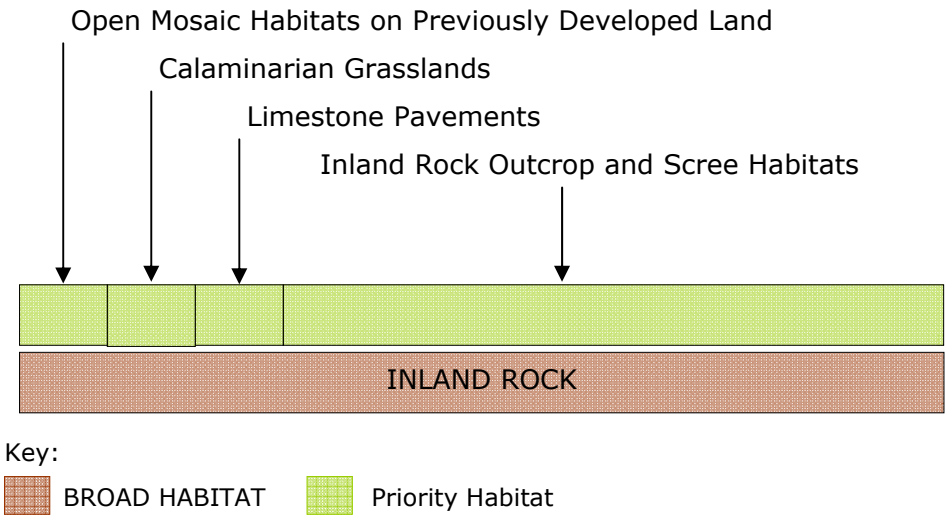


Figure 8 - 7: Rock Broad and Priority Habitats

8.7.5.8 Freshwater:

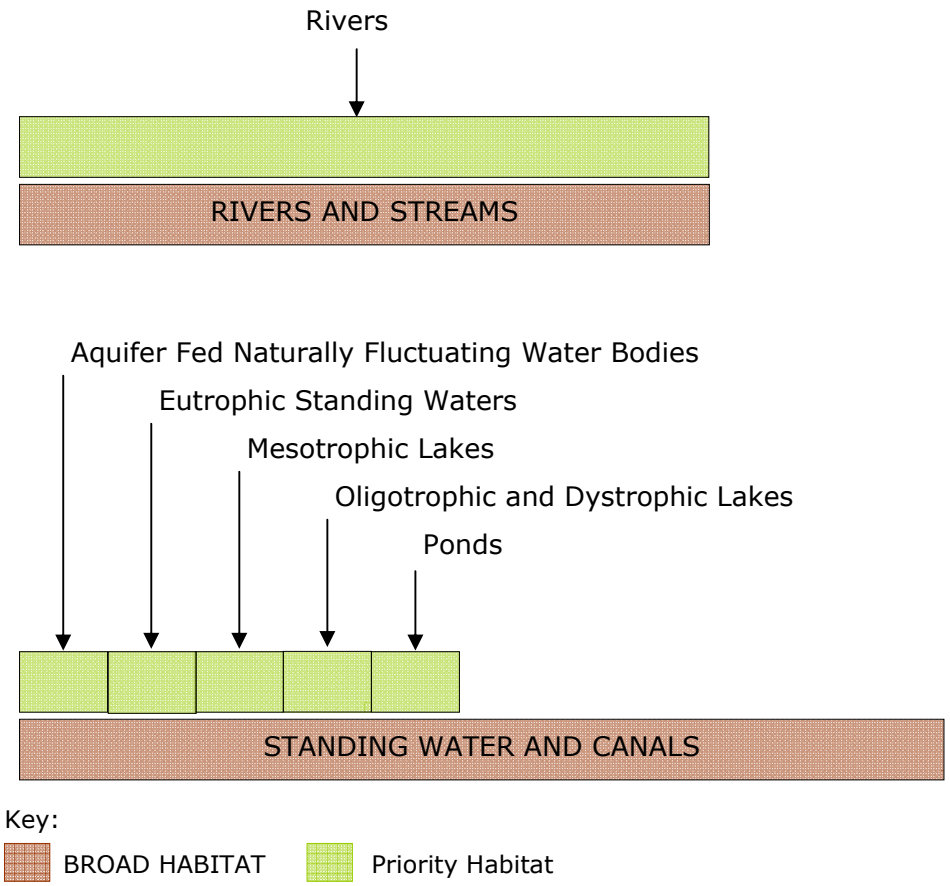


Figure 8 - 8: Freshwater Broad and Priority Habitats

Table 8 - 7: Placement of BROAD & Priority Habitats in Categories

Category of Habitat	BROAD and Priority Habitats
Built **(Table 8-8)** This includes all built environments both urban and rural - industrial and domestic including woodland tracks that are not vegetated to any significant extent.	BOUNDARY & LINEAR FEATURE
	BUILT UP AREAS & GARDENS
	IMPROVED GRASSLAND
	Open Mosaic Habitats on Previously Developed Land
	URBAN
Coastal (including upper estuary, islands & sea lochs)	
Sublittoral - Permanently submerged. For obvious reasons the NFI does not cover these areas. Unless you have been notified of a particular habitat default to OCEANIC SEAS **(Table 8-9)**	Carbonate Mounds
	Cold-water Coral Reefs
	CONTINENTAL SHELF SLOPE
	Deep Sea Sponge Communities
	File Shell Beds
	Fragile Sponge & Anthozoan Communities
	INSHORE SUBLITTORAL ROCK
	INSHORE SUBLITTORAL SEDIMENT
	Mud Habitat in Deep Water
	OCEANIC SEAS
	OFFSHORE ROCK SHELF
	OFFSHORE SHELF SEDIMENT
	Peat & Clay Exposures with Piddocks
	Sabellaria spinulosa Reefs
	Seamount Communities
	Serpulid Reefs
	Sublittoral Sands/Gravels
Littoral - Intertidal areas between low and high tide line **(Table 8-10)**	Blue Mussel Beds on Sediment
	Horse Mussel Beds
	Intertidal Chalk
	Intertidal Mudflats
	Intertidal Underboulder Communities
	LITTORAL ROCK
	LITTORAL SEDIMENT
	Maerl Beds
	Sabellaria alveolata Reefs
	Seagrass Beds
Estuarine Habitats - upper estuary only	Estuarine Rocky Habitats

(Table 8-11)	Sheltered Muddy Gravels
	Tide Swept Channels
Supralittoral / Inland areas - areas above the high tide mark that are subject to salt spray and splash (Table 8-12)	Coastal Sand Dunes
	Coastal Vegetated Shingle
	Coastal Saltmarsh
	Coastal and Floodplain Grazing Marshes
	Machair
	Maritime Cliff/Slopes
	Saline Lagoons
	SUPRALITTORAL ROCK
	SUPRALITTORAL SEDIMENT
Freshwater Habitats (Table 8.13)	Aquifer Fed Naturally Fluctuating Bodies
	Eutrophic Standing Waters
	Oligotrophic & Dystrophic Lakes
	Mesotrophic Lakes
	Ponds
	Rivers
	RIVERS & STREAMS
	STANDING OPEN WATER & CANALS
Non-Coastal Rock Habitats (Table 8.14)	Limestone Pavements
	INLAND ROCK
	Inland Rock Outcrop & Scree Habitats
Woodlands (Table 8.15)	BROADLEAVED; MIXED/YEW WOODLANDS
	CONIFEROUS WOODLANDS
	Lowland Beech/Yew Woodlands
	Lowland Mixed Deciduous Woodland
	Mountain Heaths & Willow Scrubs
	Native Pine Woodlands
	Non-HAP Native Pine
	Upland Birchwoods
	Upland Mixed Ashwoods
	Upland Oakwoods
	Wet Woodland
	Hedgerows
	Traditional Orchards
	Woodpasture & Parkland

Heathlands & Ericaceous Wetlands Heaths and mire can be difficult to separate so there will be some cross over in these habitats - see flowcharts for more details **(Table 8.16)**	DWARF SHRUB HEATH
	Lowland Fen (see Bogs; Fens/Marshes)
	Lowland Heath
	Lowland Raised Bog (see Bogs; Fens/Marshes)
	MONTANE HABITAT
	Upland Heath
Bogs; Fens/Marshes (not coastal) **(Table 8.17)**	Blanket Bog
	BOGS
	FEN; MARSH/SWAMP
	Lowland Fen
	Lowland Raised Bog
	Purple Moorgrass/ Rush Pasture
	Reedbeds
	Upland Flushes, Fens & Swamps
Grasslands - This category includes agricultural and horticultural land **(Table 8.18)**	ACID GRASSLAND
	Arable Field Margins
	ARABLE/HORTICULTURE
	BRACKEN
	Calaminarian Grasslands
	CALCAREOUS GRASSLAND
	IMPROVED GRASSLAND
	Lowland Calcareous Grassland
	Lowland Dry Acid Grassland
	Lowland Meadows
	NEUTRAL GRASSLAND
	Upland Calcareous Grassland
	Upland Hay Meadows

Table 8 - 8: Built Habitats

BOUNDARY & LINEAR FEATURES	Boundary and linear features that do not qualify either as Hedgerows, Cereal Field Margins, Rivers & Streams or Standing Open Water.
BUILT UP AREAS & GARDENS	This type includes urban and rural settlements, farm buildings, caravan parks and other man made built structures such as industrial estates, retail parks, waste and derelict ground, urban parkland and transport

	infrastructure. It also includes domestic gardens and allotments. It does not include amenity grassland, which should be included in IMPROVED GRASSLAND
Open Mosaic Habitats on Previously Developed Land	The habitat is best defined in terms of structure and growth forms, rather than through specific vegetation communities. It comprises mosaics of bare ground with, typically, very early pioneer communities on skeletal substrates, more established open grasslands - usually dominated by fine-leaved grasses with many herbs, areas of bare ground, scrub and patches of other habitats such as heathland, swamp, ephemeral pools and inundation grasslands.
URBAN	Urban areas that will not qualify as one of the priority habitats.

Table 8 - 9: Coastal Habitats – Sublittoral

Carbonate Mounds	Carbonate mounds are very steep-sided mounds of variety of shapes, which may be up to 350m high and 2 km wide at their base (Weering et al, 2003). They occur offshore in water depths of 500-1100m with examples present in the Porcupine Seabight and Rockall Trough (Kenyon et al, 2003). Carbonate mounds may have a sediment veneer, typically composed of carbonate sands, muds and silts. The cold-water reef-building corals Lophelia pertusa and Madrepora oculata which form colonies up to 30cm high, as well as echiuran worms are characteristic fauna of carbonate mounds.
Cold-water Coral Reefs	The extent of *L. pertusa* reefs vary and occur within a depth range of 200->2000 m. Why are you here, consult with your conscience
CONTINENTAL SHELF SLOPE	Self Explanatory
Deep Sea Sponge Communities	Deep sea sponge aggregations are principally composed of sponges from two classes: Hexactinellida and Demospongia. Glass sponges (Hexactinellidae) tend to be the dominant group of sponges in the deep sea although demospongids such as *Cladorhiza* and *Asbestopluma* are also present. The massive sponges that dominate some areas include *Geodia barretti*, *G. macandrewi*, and *Isops phlegraei*. They occur between water depths of 250-1300m (Bett & Rice, 1992), where the water temperature ranges from 4-10°C and there is moderate current velocity (0.5 knots). Deep-sea sponge

	aggregations may be found on soft substrata or hard substrata, such as boulders and cobbles which may lie on sediment.
File Shell Beds	File shell beds are characterized by dense populations of Limaria hians where nests coalesce into a carpet over the sedimentary substratum. These nests can be built of shell, stones debris and maerl (when present) interlaced by several hundred byssus threads, and lined by mucus, mud and their faeces. Limaria hians beds in tide-swept sublittoral muddy mixed sediment (SS.SMX.IMX.Lim) have been recorded from 4-98 m on mixed muddy gravel or sand, coarse sands and muddy maerl in areas with weak to strong tidal streams and across the spectrum of wave exposure. The biotope occurs at high densities in the Creag Gobhainn area of Loch Fyne (Hall-Spencer & Moore, 2000), is widespread in areas of accelerated tidal streams within Loch Sunart (Howson, 1996; Bates et al. 2004; Mercer et al. 2007) and a number of other sealochs on the west coast of Scotland (Loch Carron, Loch Creran, Loch Alsh, Lochs Broom and lower Loch Linnhe).
Fragile Sponge & Anthozoan Communities	These communities are found on bedrock which is locally sheltered but close to tide-swept or wave exposed areas. They are dominated by large, slow growing species such as branching sponges and sea fans. The branching sponges include species such as Axinella dissimilis, Axinella damicornis, Axinella infundibuliformis, Homaxinella subdola and to a lesser extent Raspailia and Stelligera species. In Wales, this community is primarily found where there is steeply sloping bedrock with local shelter. Sites include north and west Anglesey, the Lleyn peninsula, and in Pembrokeshire from Strumble Head in the north to Stackpole in the south, excluding St Brides Bay. Elsewhere, this community is present around England's south-west peninsula from west Dorset to Lundy, and also off the south-east coast of Ireland.
INSHORE SUBLITTORAL ROCK	For the purpose of the broad habitat classification the inshore area is defined as within six nautical miles of the shoreline. The seabed of inshore areas is dominated by soft sediment. Where sublittoral rock habitats occur they tend to be immediately adjacent to the shore, fringing islands, headlands, open coast and rocky inlets such as rias and sea lochs. Further offshore, rocky sublittoral habitats may be present as submerged reefs, pinnacles and ledges, and are

	often surrounded by areas of soft sediment.
INSHORE SUBLITTORAL SEDIMENT	This habitat includes intertidal and subtidal beds of the blue mussel Mytilus edulis on a variety of sediment types and in a range of conditions from open coasts to estuaries, marine inlets and deeper offshore habitats. Intertidal mussel beds occur on a variety of sediment substrata such as sand, cobbles and pebbles, muddy sand and mud.
Mud Habitats in Deep Water	These occur between 20-30m of sea in many of the UK's marine environments, including marine inlets such as sea lochs.
OCEANIC SEAS	Default to this for Sublittoral Habitats
OFFSHORE SHELF ROCK	Should not be used unless notified
OFFSHORE SHELF SEDIMENT	Should not be used unless notified
Peat & Clay Exposures with Piddocks	This habitat includes littoral and sublittoral examples of peat and clay exposures, both of which are soft enough to allow them to be bored by a variety of piddocks, particularly Pholas dactylus, Barnea candida and Barnea parva. These unique and fragile habitats are irreplaceable, arising from former lake bed sediments and ancient forested peatland (or 'submerged forests'). Depending on erosion at the site, both clay and peat can occur together or independently of each other. This habitat encompasses examples of peat and clay exposures with either existing or historical piddock activity (i.e. dead shells in piddock holes). This BAP habitat also encompasses occurrences of peat and clay exposures with no evidence of either past or present piddock activity, but which have the potential for this community to develop on the basis of environmental conditions and presence of similar beds locally. This BAP habitat does not include examples of harder sedimentary rock (e.g. limestone) with the piddock Hiatella arctica. It also does not include piddocks in sandstone, chalk and soft mudstone.
Sabellaria spinulosa Reefs	*Sabellaria spinulosa* reefs comprise of dense subtidal aggregations of this small, tube-building polychaete worm. Given its few key requirements, and its tolerance of poor water quality, *S. spinulosa* is naturally common around the British Isles. It is found in the subtidal and lower intertidal/sublittoral fringe with a wide distribution throughout the north-east Atlantic, especially in areas of turbid seawater with a high sediment load. There are extensive examples of

	this form of colony on the west Wales coast, particularly off the Lleyn Peninsula and Sarnau candidate Special Area of Conservation (cSAC) and the Berwickshire and North Northumberland Coast cSAC.
Seamount Communities	Seamounts are defined as undersea mountains, with a crest that rises more than 1,000 metres above the surrounding sea floor (Menard, 1964 in Rogers, 1994). Seamounts can be a variety of shapes, but are generally conical with a circular, elliptical or more elongate base. Seamounts are volcanic in origin, and are often associated with seafloor 'hot-spots' (thinner areas of the earth's crust where magma can escape).
Serpulid Reefs	*Serpula vermicularis* is a marine worm, which makes a hard, calcareous tube 4-5 mm in diameter and up to 150 mm long. In most places the worms are solitary with the base of the tube attached to stones or shells, and the feeding end growing up into the water. The worms can also aggregate into clumps or 'reefs' up to 1 m across. The species has a worldwide distribution (except for polar seas) in sheltered sites, but the reef form has been reported from very few locations. In the UK, reefs have only been found in Loch Creran, and the Linne Mhuirich arm of Loch Sween, both sea lochs on the west mainland coast of Scotland.
Sublittoral Sands/ Gravels	Subtidal sands and gravel sediments are the most common habitats found below the level of the lowest low tide around the coast of the United Kingdom. The sands and gravels found to the west of the UK (English Channel and Irish Sea) are largely shell derived, whereas those from the North Sea are largely formed from rock material.

Table 8 - 10: Coastal Habitats – Littoral – intertidal

Blue Mussel Beds on Sediment	This habitat contains dense aggregations of Blue Mussels (*Mytilus edulis*), on sand or on sheltered muddy shores.
Horse Mussel Beds	Horse mussels (*Modiolus modiolus*) form beds and reefs which stabilise otherwise mobile seabeds. They are found from the lower shore to a depth of ~280m.
Intertidal Chalk	The erosion of chalk exposures on the coast has resulted in the formation of vertical cliffs and gently sloping intertidal platforms with a range of micro-habitats of biological importance. Supralittoral and littoral fringe chalk cliffs and sea caves support various algal communities unique to this soft rock type. Such coastal exposures of chalk are rare in Europe, with those occurring on the south & east coasts of England accounting for 57% (ICES, 2003).
Intertidal Mudflats	Mudflats are sedimentary intertidal habitats created by deposition in low energy coastal environments, particularly estuaries and other sheltered areas. Their sediment consists mostly of silts and clays with a high organic content. Towards the mouths of estuaries where salinity and wave energy are higher the proportion of sand increases. Mudflats are intimately linked by physical processes to, and may be dependent on, other coastal habitats such as soft cliffs and saltmarshes. They commonly appear in the natural sequence of habitats between subtidal channels and vegetated saltmarshes. In large estuaries they may be several kilometres wide and commonly form the largest part of the intertidal area of estuaries. However, in many places they have been much reduced by land claim.
Intertidal Underboulder Communities	Habitat found underneath boulders anywhere from mid-shore to extreme low water, also in rock pools and lagoons
LITTORAL ROCK	Rock found in the Littoral Zone that doesn't fit into any Priority Habitats – default to this if unsure of other Littoral rocky habitat
LITTORAL SEDIMENT	Sediment found in the Littoral Zone that doesn't fit into any Priority Habitats– default to this if unsure of other Littoral sediment habitat

Maerl Beds	Maerl is a collective term for several species of calcified red seaweed. It grows as unattached nodules on the seabed, and can form extensive beds in favourable conditions. Maerl is slow-growing, but over long periods its dead calcareous skeleton can accumulate into deep deposits overlain by a thin layer of pink, living maerl. Maerl beds typically develop where there is some tidal flow, such as in the narrows and rapids of sea lochs, or the straits and sounds between islands. Live maerl has been found at depths of 40 m, but beds are typically much shallower, <20m and extending up to the low tide level. Maerl beds are found off the S and W coasts of Britain, north to Shetland, but are particularly well developed around the Scottish islands and in sea loch narrows, around Orkney, and in the S in the Fal Estuary.
Sabellaria alveolata Reefs	The honeycomb worm Sabellaria alveolata, a polychaete, which constructs tubes in tightly packed masses with a distinctive honeycomb-like appearance, forms these reefs. These reefs can be up to 30 or even 50 cm thick and take the form of hummocks, sheets or more massive formations. Reefs are mainly found on the bottom third of the shore, but may reach mean high water of neap tides and extend into the shallow subtidal in places. They do not seem to penetrate far into low salinity areas. In Britain, S. alveolata reefs are found only on shores with strong to moderate wave action in the south and west, between Lyme Bay on the south coast of England and the Scottish coast of the Solway Firth.
Seagrass Beds	Seagrass beds develop in intertidal and shallow subtidal areas on sands and muds. They may be found in marine inlets and bays but also in other areas, such as lagoons and channels, which are sheltered from significant wave action. Three species of *Zostera* occur in the UK, and all are considered to be scarce (present in 16-100 ten km squares). Dwarf eelgrass *Zostera noltii* is found highest on the shore, often adjacent to lower saltmarsh communities, narrow-leaved eelgrass *Zostera angustifolia* on the mid to lower shore and eelgrass *Zostera marina* predominantly in the sublittoral.

Table 8 - 11: Coastal Habitats –Upper Estuary

Estuarine Rocky Habitats	This habitat encompasses rocky habitats in estuaries, extending from supralittoral lichens down to the subtidal circa littoral. Estuarine rocky habitats incorporate substrata types such as bedrock and stable boulders. Rocky habitat is a comparatively uncommon feature in estuaries in the UK. Although generally forming small areas in comparison with the extent of sediment substrates in estuaries, estuarine rocky habitats contribute much to the overall biodiversity within estuaries.
Sheltered Muddy Gravels	Sheltered muddy gravel habitats occur principally in estuaries, rias and sea lochs, in areas protected from wave action and strong tidal streams. In fully marine conditions on the lower shore this habitat can be extremely species-rich because the complex nature of the substratum supports a high diversity of both infauna and epifauna. However, good quality examples of this habitat are very scarce. Polychaetes and bivalve molluscs are normally dominant and the most varied, but representatives of most marine phyla can be present.
Tide Swept Channels	These occur where a constricted coastline acts as a funnel. Found at the entrance to sea lochs, lagoons, and between islands.

Table 8 - 12: Coastal Habitats – Supralittoral/ Inland areas

Coastal Sand Dunes	Coastal sand dunes develop where there is an adequate supply of sand (sediment within the size range 0.2 to 2.0 mm) in the intertidal zone and where onshore winds are prevalent. The critical factor is the presence of a sufficiently large beach plain whose surface dries out between high tides. The dry sand is then blown landwards and deposited above high water mark, where it is trapped by specialised dune-building grasses, which grow up through successive layers of deposited sand. Embryonic and mobile dunes occur mainly on the seaward side of a dune system where sand deposition is occurring and occasionally further inland in blow-outs. They support very few plant species, the most characteristic being marram grass Ammophila arenaria. Semi-fixed dunes occur where the rate of sand accretion has slowed but the surface is still

	predominantly bare sand; marram is still common but there is an increasing number of other species. Fixed dune grassland forms largely closed swards where accretion is no longer significant, the surface is stabilised and some soil development has taken place. Calcareous fixed dunes support a particularly wide range of plant species. On dunes that have become acidified by leaching, acid dune grassland or dune heaths develop. Dune heaths are usually dominated by heather Calluna vulgaris. Acidic dunes, which are heavily grazed by rabbits may support lichen communities. Dune slack vegetation occurs in wet depressions between dune ridges; it is often characterised by creeping willow Salix repens sap. argentea and a number of mosses.
Coastal Vegetated Shingle	Shingle is defined as sediment with particle sizes in the range 2-200 mm. Shingle beaches are widely distributed round the coast of the UK, where they develop in high energy environments. In England and Wales it is estimated that 30% of the coastline is fringed by shingle. The vegetation communities of shingle features depend on the amount of finer materials mixed in with the shingle, and on the hydrological regime. Classic pioneer species on the seaward edge include sea kale Crambe maritima, sea pea, Lathyrus japonicus, Babington's orache, Atriplex glabriuscula, sea beet, Beta vulgaris, and sea campion Silene uniflora; which can withstand exposure to salt spray and some degree of burial or erosion. Further from the shore, where conditions are more stable, mixed communities develop, leading to mature grassland, lowland heath, moss and lichen communities, or even scrub.
Coastal Saltmarsh	Coastal saltmarshes in the UK (also known as 'merse' in Scotland) comprise the upper, vegetated portions of intertidal mudflats, lying approximately between mean high water neap tides and mean high water spring tides. For the purposes of this action plan, however, the lower limit of saltmarsh is defined as the lower limit of pioneer saltmarsh vegetation (but excluding seagrass Zostera beds) and the upper limit as one metre above the level of highest astronomical tides to take in transitional zones. Saltmarshes are usually restricted to comparatively sheltered locations in five main physiographic situations: in estuaries, in saline lagoons, behind barrier islands, at the heads of sea lochs, and on beach plains. The development of saltmarsh

	vegetation is dependent on the presence of intertidal mudflats.
Coastal & Floodplain Grazing Marshes	Grazing marsh is defined as periodically inundated pasture, or meadow with ditches that maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed and some are cut for hay or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds; although they may abut with fen and reed swamp communities.
Machair NVC: various grassland and sand dune communities most noteably SD8d and SD8e	Machair is a distinctive type of coastal grassland found in the north and west of Scotland, and in western Ireland. It is associated with calcareous sand, blown inland by very strong prevailing winds from beaches and mobile dunes.
Maritime Cliff/Slope NVC: MC1-MC3, MC5 – MC10, MC12, Possibly W21 – W23	Maritime cliffs and slopes comprise sloping to vertical faces on the coastline where a break in slope is formed by slippage and/or coastal erosion. There appears to be no generally accepted definition of the minimum height or angle of slope which constitutes a cliff, but the zone defined as cliff-top should extend landward to at least the limit of maritime influence (i.e. limit of salt spray deposition), which in some exposed situations may continue for up to 500 m inland. This may therefore encompass entire islands or headlands, depending on their size. On the seaward side, the habitat extends to the limit of the supralittoral zone and so includes the splash zone lichens and other species occupying this habitat.
Saline Lagoons	Lagoons in the UK are essentially bodies, natural or artificial, of salinewater partially separated from the adjacent sea. They retain a proportion of their seawater at low tide and may develop as brackish, full saline or hyper-saline water bodies. The largest lagoon in the UK is in excess of 800 ha (Loch of Stenness) although the rest are much smaller and some may be less than 1 ha. Lagoons can contain a variety of substrata, often soft sediments which in turn may support tasselweeds and stoneworts as well as filamentous green and brown algae. In addition lagoons contain invertebrates rarely found elsewhere.
SUPRALITTORAL	Supralittoral rock occurs above high water mark, in areas

ROCK	influenced by wavesplash and sea-spray. Features that may be present include vertical rock, boulders, gullies, ledges and pools. Salt-tolerant species are the characteristic colonisers, and a number of distinct biotypes can be recognised under this broad habitat type. In very exposed conditions the gree algae Enteromorpha and Cladophora may be found in the supralittoral rockpools and the black lichen Verrucaria maura on rock surfaces. Where there is more shelter from wind and spray, yellow and grey lichens such as Caloplaca marina, Xanthoria parietina and Lecanora spp are typically found on the rock surfaces. In pits and crevices littorinid molluscs and acarid mites are common.
SUPRALITTORAL SEDIMENT	Supralittoral sediment occurs above high water mark, but in areas influenced by wave splash and sea-spray. Salt-tolerant species are the characteristic colonisers of this habitat and the biotopes present are strongly influenced by sediment size as well as degree of wave exposure of the shore. Strandline communities are often present on moderately exposed sandy shores, particularly on flat, slightly mobile beaches with little or no human disturbance. Under these conditions annual vegetation can develop on the accumulations of drift material rich in nitrogenous organic matter at or near the high water mark. Characteristic vascular plants include the sea sandwort Honckenya peploides, saltwort Salsolakali, and sea beet Beta maritima. Rare/scarce species, such as the shore dock Rumex rupestris in SW Britain, and the oysterplant Mertensia maritima in N Britain, may also be present.

Table 8 - 13: Freshwater Habitats

Aquifer Fed Naturally Fluctuating Water Bodies	This habitat category consists of natural water bodies which have an intrinsic regime of extreme fluctuation in water level, with periods of complete or almost complete drying out as part of the natural cycle. They have no inflow or outflow streams at the surface, except at times of very high water level, when temporary out-flows may develop. Instead, they are directly connected to the underlying groundwater system and periodically empty and are recharged via swallow holes or smaller openings in their beds. There are two known variants of the habitat in the UK: turloughs, found over Carboniferous limestone in Northern Ireland and Wales, and fluctuating meres, which occur over chalk in the

	Norfolk Breckland.
Eutrophic Standing Waters	Eutrophic standing waters are highly productive because plant nutrients are plentiful, either naturally or as a result of artificial enrichment. These water bodies are characterised by having dense, longterm populations of algae in mid-summer, often making the water green. Their beds are covered by dark anaerobic mud, rich in organic matter. The water column typically contains at least 0.035 mg L –1 total phosphorus (which includes phosphorus bound up in plankton and 0.5 mg L -1 or more total inorganic nitrogen (mainly in the form of dissolved nitrates). This action plan covers natural and man made still waters such as lakes, reservoirs and gravel pits but it excludes small pools, field ponds and brackish waters
Oligotrophic & Dystrophic Lakes	Oligotrophic and dystrophic lakes are water bodies mainly more than 2 ha in size, which are characterised by their low nutrient levels and low productivity. Their catchments usually occur on hard, acid rocks, most often in the uplands. This habitat type encompasses a wide range of size and depth, and includes the largest and deepest water bodies in the UK. Good examples may support some of the least disturbed aquatic assemblages in the UK. Oligotrophic lakes usually have very clear water, whilst some examples with dystrophic characteristics have peat-stained waters.
Mesotrophic Lakes	Mesotrophic lakes (i.e. those in the middle of the trophic range) are relatively infrequent in the UK and largely confined to the margins of upland areas in the north and west. They are characterised by having a narrow range of nutrients, the main indicative ones being inorganic nitrogen (N) and total phosphorus (P). Typically, mesotrophic lakes have nutrient levels of 0.3-0.65 mgNl-1 and 0.01-0.03 mgPl-1.
Ponds	Priority habitat ponds can be readily identified by standard survey techniques such as those developed for NVC, Common Standards Monitoring, the National Pond Survey or for specific species groups. Ponds will need to be distinguished from other existing priority habitat types. The general principle to be applied is that where the standing water element is functionally a component of another priority habitat and that priority habitat definition takes account of the standing water element then it should be treated as part of that habitat. For example small waterbodies within blanket bog should be considered as part of the blanket bog priority habitat, but ponds in heathland (which are not dealt with through the heathland HAP) should be

	considered under the pond priority habitat. Agreement has been reached with the lake HAP group that the pond priority habitat will cover most water bodies up to 2 ha while the lake priority habitat will cover most water bodies greater than 2ha. As with other potentially overlapping priority habitat types a small proportion of cases will need to be individually assessed to decide how they are best dealt with.
Rivers	This habitat type includes a very wide range of types, encompassing all natural and near-natural running waters in the UK (i.e. with features and processes that resemble those in 'natural' systems). These range from torrential mountain streams to meandering lowland rivers.
RIVERS & STREAMS	Use this for rivers & streams/burn with heavily altered and artificial banls
STANDING OPEN WATER/CANALS	Use this for Canals

Table 8 - 14: Non-Coastal Rock Habitats

Limestone Pavements	Limestone pavements are a scarce and non-renewable resource. They were exposed by the scouring action of ice sheets during the ice age, which ended some 10,000 years ago. Since then water action has widened the cracks in the pavements to form a complex pattern of crevices known as *grikes* between which are massive blocks of worn limestone called *clints*. The habitat is widely scattered in Britain, on Carboniferous limestone in Wales, Northern England and Northern Ireland, and Durness limestone in Scotland. Limestone pavements are of both geological and biological importance. The vegetation is rich in vascular plants, bryophytes and lichens and varies according to geographical location, altitude, rock type and the presence or absence of grazing animals. Limestone pavement vegetation may also contain unusual combinations of plants, with woodland and wood-edge species well-represented inthe sheltered grikes. The clints support plants of rocky habitats or are often unvegetated. In the absence of grazing scrub may develop. In oceanic areas scrub over limestone pavement is important for epiphytes.
INLAND ROCK	Use this for inland rock that doesn't fit any other Priority Habitat
Inland Rock Outcrop & Scree	This habitat covers a wide range of rock types, varying from acidic to highly calcareous and includes five Habitats Directive Annex 1 habitat types. The habitat occurs throughout the

Habitats NVC: U16-U18, U21, OV38-OV40	uplands, and is particularly characteristic of high altitudes, but is also found at low altitudes notably in northern Scotland. Representation of the two Habitats Directive Annex I chasmophytic vegetation types in the lowlands is also included. Coastal cliff and ledge habitats are excluded as they form part of the maritime cliffs and slopes priority habitat. Inland rock outcrop and scree habitats are widespread in upland areas of the UK, with more limited occurrence in the lowlands. Acidic rock and scree are especially widespread, whereas calcareous communities are restricted by the underlying geology, and good stands of tall-herb vegetation also tend to be restricted by heavy grazing.

Table 8 - 15: Woodland Habitats

All wooded areas should fall into one of the following:

BROADLEAVED; MIXED/YEW WOODLANDS	All broadleaved woodlands that do not fit into one of the native categories, or planted broadleaved woodlands that are not site native.
CONIFEROUS WOODLANDS	All coniferous woodlands that do not fit into Native pine, Non-HAP pine, or Yew categories.
Lowland Beech/Yew NVC : W12,W14, W15 most W13	Beech/Yew woodlands within the beech zone or long-established beech plantations outside this range with high conservation value. Yew stands on Carboniferous & Magnesian limestones of central & northern Britain are classified as upland mixed ashwoods.
Lowland Mixed Deciduous Woodland NVC: W8a-c, W10a-d, may include W8d-g, W10e, W16	A wide variety of native broadleaved woodland throughout the lowland regions of the UK on acid base-rich freely drained soils. Covers most semi-natural woods in lowland Britain that is not beech/yew, wet wood or wood pasture.
Montane Habitat (now Mountain Heath and Willow Scrub) NVC: H13-H15, H17-H20, H22; U7-U15, U18, W20	This habitat encompasses a range of natural or near-natural vegetation occurring in the montane zone, lying above or beyond the natural tree-line. It includes dwarf-shrub heaths, grass-heaths, dwarfherb communities, willow scrub, and snowbed communities. The most abundant vegetation types are heaths dominated by *Calluna vulgaris* and *Vaccinium myrtillus* typically with abundant bryophytes (e.g. *Racomitrium lanuginosum*) and/or lichens (e.g. *Cladonia* species) and siliceous alpine and boreal grasslands with *Carex bigelowii* moss

	and sedge heaths. Rarer vegetation types include snowbed communities with *Salix herbacea* and various bryophytes and lichens, and sub-arctic willow scrub.
Native Pine woodlands NVC: W18	Relict indigenous forests of Scotland dominated by native Scots pine often with a strong element of birch, rowan, alder and/or bird cherry.
Non-HAP native pinewood	Use this for SP woodlands outside the pine zone
Upland Birchwoods NVC: may contain W4a&b, W10e, W11, W16, W17	Birch dominated woodland in the uplands, which do not fit into other woodland categories.
Upland Mixed Ashwoods NVC: W9, may contain W7c, W8d-g, W13 See flowchart for more info	Woodland within the 'upland region' generally dominated by ash though locally oak, birch, elm or hazel may be prominent/ or even dominant. Upland ashwoods tend to be on steeper and more uneven slopes than there lowland counterparts with more ferns.
Upland Oakwoods NVC: May contain W10e, W11, W16, W17	Woodland in the 'upland region' with at least 30% of the canopy cover comprising oak. Birch may also be present/ or even dominant. Small areas of other communities may occur, for example along streams or towards the base of slopes which experience flushing.
Wet Woodland NVC: W1, W2, W3, W4c, W5, W6, W7a&b, may also contain W4a&b, W7c, floodplain W8, boggy W18	Woodland occurring on poorly drained or seasonally wet soils usually dominated by alder, birch or willows, but sometimes including ash, oak, pine or beech on the drier riparian areas. Ashwoods within floodplains area also best described as this HAP type.
Hedgerows	A native hedgerow is defined as any boundary line of trees or shrubs over 20m long and less than 5m wide, with more than 80% native woody species
Traditional Orchard	Traditional orchards are structurally and ecologically similar to wood-pasture and parkland, with open-grown trees set in herbaceous vegetation, but are generally distinguished from these priority habitat complexes by the following characteristics: the species composition of the trees, these being primarily in the family Rosaceae; the usually denser arrangement of the trees; the small scale of individual habitat patches; the wider dispersion and greater frequency of occurrence of habitat patches in the countryside. Traditional orchards include plantings for nuts, principally hazel nuts, but also walnuts. Management of the trees is the other main feature distinguishing traditional orchards and wood-pasture and parkland. Trees in traditional orchards are,

	or were, grown for fruit and nut production, usually achieved through activities such as grafting and pruning; whereas timber has been the main product from trees in wood-pastures and parkland, mostly derived from pollarding or selective felling.
Wood Pasture & Parkland NVC: could be woodland or grassland types	Wood-pastures are described as areas that have been managed by a long-established tradition of grazing. Typically this has resulted in large, open-grown or high forest trees (possibly with a high content of veterans)

Forestry Practice Guides 1- 8 for the management of semi natural woodlands contain further information on each HAP type and are available from the Forestry Commission.

There are also individual Flowcharts for each Woodland NVC type.

Table 8 - 16: Heathlands and Ericaceous Wetlands

DWARF SHRUB HEATH	This type includes vegetation dominated by species from the heath family or dwarf gorse species. It includes the moss and lichen dominated heaths of the East Anglian Breckland but not of mountain summits, which should be included in the "Montane habitats" broad habitat type.
Lowland Heathland NVC: H10, H12, M15 and M16 in the lowlands on less than 50cm peat in the lowlands M25 in the lowlands on less than 50cm peat with more than 25% ericaceous dwarf shrubs.	Lowland heathland is described as a broadly open landscape on impoverished, acidic mineral and shallow peat soil, which is characterised by the presence of plants such as heathers and dwarf gorses. It is generally found below 300 metres in altitude in the UK, but in more northerly latitudes the altitudinal limit is often lower. Areas of heathland in good condition should consist of an ericaceous layer of varying heights and structures, plus some or all of the following additional features, depending on environmental and/or management conditions; scattered and clumped trees and scrub; bracken; areas of bare ground; areas of acid grassland; lichens; gorse; wet heaths, bogs and open waters. Lowland heathland can develop on drift soils and weathered flint beds over calcareous soils (limestone or chalk heath). Lowland heathland is a dynamic habitat which undergoes significant changes in different successional stages, from bare ground (e.g. after burning or tree clearing) and grassy stages, to mature, dense heath. These different stages often co-occur on a site. In terms of distinguishing between lowland heathland and genuine acid grassland, less than 25% dwarf shrub cover should be assessed as grassland, over 25% as heathland. Montane heaths, restricted to high-altitude mountain summits and ridges, are also excluded from Upland Heathland.
MONTANE	See woodland category for description of this habitat.

HABITAT	
Upland Heath NVC: H10, H12, H21 H16, M15, M16 on less than 50cm deep peat in the uplands M25 on less than 50cm deep peat with more than 25% ericaceous dwarf shrubs.	Heathland vegetation occurs widely on mineral soils and thin peats (<0.5 m deep) throughout the uplands and moorlands of the UK. It is characterised by the resence of dwarf shrubs at a cover of at least 25%. Blanket bog vegetation may also contain substantial amounts of dwarf shrubs, but is distinguished from heathland by its occurrence on deep peat (>0.5 m). For the purposes of this plan upland heathland is defined as lying below the alpine or montane zone (at about 600-750 m) and usually above the upper edge of enclosed agricultural land (generally at around 250-400 m, but descending to near sea-level in northern Scotland). Upland heath in 'favourable condition' is typically dominated by a range of dwarf shrubs such as heather *Calluna vulgaris*, bilberry *Vaccinium myrtillus*, crowberry *Empetrum nigrum*, bell heather *Erica cinerea* and, in the south and west, western gorse *Ulex gallii*. In northern areas juniper *Juniperus communis* is occasionally seen above a heath understorey. Wet heath is most commonly found in the wetter north and west and, in 'favourable condition', should be dominated by mixtures of cross-leaved heath *Erica tetralix*, deer grass *Scirpus cespitosus*, heather and purple moor-grass *Molinia caerulea*, over an understorey of mosses often including carpets of *Sphagnum* species. This habitat is distinct from blanket mire which occurs on deeper peat and which usually contains frequent occurrence of hare's-tail cotton-grass *Eriophorum vaginatum* and characteristic mosses.

Table 8 - 17: Bogs; Fens/Marshes (not coastal)

Blanket Bog NVC: M1, M2, M3, M17 to M20 always Blanket Bog M15 & M25 in the uplands if the peat depth is greater than 50cm	Found throughout the UK but most common in the north and west. They are found on deep peat generally between 0.5 – 3m in wetlands formed exclusively from rain-fed sources. This may occur on flat ground or on slopes up to 30^0. On undisturbed sites the ground may be predominantly Sphagnum, but on more disturbed sites there may be varying amounts of Hare's-tail cotton grass *Eriophorum vaginatum*, Common cotton grass *Eriophorum angustifolium*, Heather *Calluna vulgaris*, Cross-leaved heath *Erica tetralix*, and Deer grass *Scirpus cespitosus*, plus other species. This habitat also includes Sphagnum bog pool communities, and *Eriophorum angustifolium* bog pools. All examples of M17-20, with or without bog pools (M1-3), forming a blanket bog topography, should be recorded as Blanket Bog. Upland stands of M15 and M25 should be recorded as Blanket Bog, when they are on peat of greater than 50cm deep. Upland stands of M15 on peat of less than 50cm should be classed as Upland Heathland, even in cases where there is less than 25% cover of dwarf shrubs.
BOGS Derived from PHT Survey Manual NVC: M15 & M25 if not qualifying for other priority habitats, peat less than 50cm	This habitat comprises wetlands that currently support, or previously supported vegetation, that is/was, peat forming. The peat must be at least 50cm deep, to separate this habitat from wet examples of Dwarf Shrub Heath. The water table is at or just below the peat surface (lower in degraded examples), and is completely derived from rain water (ombrotrophic), i.e. there is no water input from groundwater or surface water courses, thus separating this habitat from Fen, Marsh and Swamp. All bogs in the agricultural enclosed lowlands should be classed as the Lowland Raised Bog. Blanket bogs in the uplands should be recorded as Blanket Bog. Intermediate bogs and upland raised bogs, which are not connected to a blanket bog system, should be recorded as Bogs.
FEN; MARSH/SWAMP	Areas of Fen; Marsh/Swamp not qualifying as Upland Flushes, Fens & Swamps, Lowland Fens or any other similar priority habitat e.g Purple Moorgrass/ Rush Pasture.

Lowland Fens NVC: lowland examples of S1 to S28 excluding S4 & S26 M15, M23, M25 & M26 on greater than 50cm deep peat in the lowlands.	Fens are peatlands that receive water and nutrients from the soil, rock and ground water as well as from rainfall: they are minerotrophic. Two types of fen can broadly be distinguished: topogenous and soligenous. Topogenous fens are those where water movements in the peat or soil are generally vertical. They include basin fens and floodplain fen. Soligenous fens, where water movements are predominantly lateral, include mires associated with springs, rills and flushes in the uplands, valley mires, springs and flushes in the lowlands, trackways and ladder fens in blanket bogs and laggs of raised bogs. There are many small fens throughout the UK, but two extensive areas are Insh Marshes by the River Spey and the Broadlands of East Anglia.
Lowland Raised Bog NVC: M1, M2, M3, M18	Lowland raised bogs are peatland ecosystems that develop primarily, but not exclusively, in lowland areas such as the head of estuaries, along river flood-plains and in topographic depressions. Continued accrual of peat elevates the bog surface above regional groundwater levels to form a gently-curving dome from which the term 'raised' bog is derived. Such Bogs are found in the lowlands of: NW England, Central & NE Scotland and throughout lowland Wales.
Purple Moorgrass / Rush Pasture NVC: M23, M25 & M26 in the lowlands on less than 50cm deep peat, and less than 25% ericaceous cover	Purple moor grass and rush pastures occur on poorly drained, usually acidic soils in lowland areas of high rainfall in western Europe. In the UK, they are found in south-west England, particularly in Devon, southern Wales, south-west Scotland, perhaps extending as far north as northern Argyll, and in Northern Ireland, especially Fermanagh. Their vegetation, which has a distinct character, consists of various species-rich types of fen meadow and rush pasture. Purple moor grass Molinia caerulea, and rushes, especially sharp-flowered rush Juncus acutiflorus, are usually abundant. Key species associated with purple moor grass and rush pastures include: wavy St. Johns-wort Hypericum undulatum, whorled caraway Carum verticillatum, meadow thistle Cirsium dissectum, marsh hawk`s beard Crepis paludosa, greater butterfly orchid Platanthera chlorantha, and the lesser butterfly orchid Platanthera bifolia.
Reedbeds	Reedbeds are wetlands dominated by stands of the common reed Phragmites australis, wherein the water table

NVC: S4, S26	is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them.
Upland Flushes, Fens & Swamps NVC: M27 & M28 M25 on less than 50cm deep peat, and less than 25% ericaceous shrubs present M26 on less than 50cm deep peat in the uplands M23 in the uplands regardless of peat depth	Upland flushes, fens and swamps are defined as peat or mineral-based terrestrial wetlands in upland situations, which receive water and nutrients from surface and/or groundwater sources as well as rainfall. The soil, which may be peaty or mineral, is waterlogged with the water table close to or above the surface for most of the year. Includes both soligenous mires (springs, flushes, valley fens) and topogenous mires (basin, open-water transition and flood-plain fens), as well as certain Molinia grasslands and rush pastures, but excludes blanket bog priority habitat. Also excluded are species-poor Molinia swards (M25 except M25c) and species-poor or 'weedy' Juncus effusus swards (M23b and MG10). Swamps are included except for those forming a fringe less than 5m wide adjacent to standing waters, which are included in the relevant standing water priority habitat type; and those reedbeds (S4) which qualify as the reedbed priority habitat.

Table 8 - 18: Grasslands and Agricultural/Horticultural

ACID GRASSLAND Covers all Acid Grassland not classified as Lowland NVC: U1-U4, SD10b, SD11b Not M25: Molinia mire	Acid grassland typically occurs on nutrient-poor, generally free-draining soils with pH 4 to 5.5 overlying acid rocks or superficial deposits such as sands and gravels. Acid grassland is characterised by a range of plant species such as heath bedstraw *Galium saxatile*, sheep`s-fescue *Festuca ovina*, common bent *Agrostis capillaris*, sheep`s sorrel *Rumex acetosella*, sand sedge *Carex arenaria*, wavy hair-grass *Deschampsia flexuosa*, bristle bent *Agrostis curtisii* and tormentil *Potentilla erecta.* These grasslands tend to have a yellowish colour, and are dominated by fine-leaved grasses. N.B. Molinia mire is not acid grassland but some type of wetland habitat.
Arable Field Margins	Arable field margins are herbaceous strips or blocks around arable fields that are managed specifically to provide benefits for wildlife. The arable field must be in a crop rotation which includes an arable crop, even if in certain years the field is in temporary grass, set-aside or fallow.

	Arable field margins are usually sited on the outer 2-12m margin of the arable field, although when planted as blocks they occasionally extend further into the field centre. In general terms, the physical limits of the arable field margin priority habitat are defined by the extent of any management undertaken specifically to benefit wildlife. The outer edge refers to the edge closest to the field boundary. Where there is a living field boundary (hedgerow or line of trees), any herbaceous vegetation within 2m from the centre of the living boundary is considered to be part of the living boundary habitat. The inner edge refers to the edge closest to the centre of the field. In all cases, the inner edge is defined by the extent of any management undertaken specifically to benefit wildlife.
ARABLE/ HORTICULTURE	All Arable/Horticultural areas that don't fit into the Field Margin category, one of the grassland habitats or some other priority habitat.
BRACKEN	This includes areas dominated by continuous bracken. It does not include areas with scattered patches of bracken or areas of bracken, which are less than 0.25ha, which should be included in the broad habitat type that they are associated with.
Calaminarian Grasslands	Calaminarian grasslands include a range of semi-natural and anthropogenic sparsely vegetated habitats on substrates characterised by high levels of heavy metals such as lead, chromium and copper, or other unusual minerals. These are associated with outcrops of serpentine and river gravels rich in heavy metals, as well as with artificial mine workings and spoil heaps. Seral succession is slowed or arrested by the toxicity of the substrate. Open-structured plant communities, sometimes known as 'Calaminarian grasslands', typically occur, composed of ruderal/metallophyte species of lichens, bryophytes and vascular plants, such as spring sandwort *Minuartia verna*, alpine pennycress *Thlaspi arvense*, and genetically adapted races of species such as thrift *Armeria maritima* and bladder campion *Silene maritima*.
Calcareous Grassland All calcareous grasslands will be either upland or lowland types. NVC: all CG types	Calcareous grasslands are found on lime-rich soils, which are normally shallow. They cover a range of plant communities in which lime-loving plants are abundant. Typical species are sheep`s-fescue *Festuca ovina*, wild thyme *Thymus polytrichus (formerly praecox)*, basil thyme *Calamintha acinos* (formerly *Acinos arvensis*), glaucous sedge *Carex fla*cca, rough hawkbit *Leontodon hispidus*, fairy flax *Linum*

	catharticum, pyramidal orchid *Anacamptis pyramidalis*, mountain everlasting *Antennaria dioica*, kidney vetch *Anthyllis vulneraria*, and common rock rose *Helianthemum nummularium*. They tend to have a significant amount of sedges, and have a bluey/green tinge.
IMPROVED GRASSLAND (this type has no NVC)	Grasslands which have been artificially sown, and or fertilised. More than 50% cover of perennial rye grass *Lolium perenne*, white clover *Trifolium repens* and other agricultural species
Lowland Calcareous Grassland NVC CG1-CG10	Lowland Calcareous Grassland occurs only in England and Wales. It includes all calcareous grasslands of types CG1 to CG10 below the upper level of agricultural enclosure for a given district
Lowland Dry Acid Grassland NVC: U1-U4, SD10b, SD11b	Lowland Acid Grassland is defined as both enclosed and unenclosed acid grassland throughout the UK lowlands (normally below 300m). It covers all acid grassland managed in functional enclosures.
Lowland Meadow NVC: MG4, MG5, MG6	These include most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK, either managed for hay or grazed.
NEUTRAL GRASSLAND NVC: MG1, MG2, MG7 – MG13	Grasslands on neutral or mesotrophic soils dominated by grasses and/or associated dicotyledonous herbs, which lack either pronounced lime or acid loving plants. Typical species are false oat-grass *Arrhenatherum elatius*, Yorkshire fog *Holcus lanatus*, sweet vernal grass *Anthoxanthum odoratum*, creeping bent *Agrostis stolonifera*, perenial rye grass *Lolium perenne*, and large herbaceous plants such as hogweed *Heracleum sphondylium*. Such grasslands tend to be quite lush and deep green in colour.
Upland Calcareous Grassland NVC CG1, CG2, CG9, & CG10 upland types, CG11 – CG14	Upland Calcareous Grassland occurs throughout Britain above the level of enclosed lands both in the sub-montane and montane zones, and in Scotland covers all calcareous grasslands regardless of altitude. Apart from species typical of commuities CG1-10 they may also contain alpine lady's mantle *Alchemilla alpina*, the mosses *Hylocomium splendens* and *Ctenidium molluscum*, common dog-violet *Viola riviniana*, moss campion *Silene acaulis*, mountain avens *Dryas octopetala*, and the lesser clubmoss *Selaginella selaginoides.*
Upland Hay Meadow	Found only in northern England and in Scotland. Characterised by a dense growth of grasses and herbaceous

NVC: MG3 only	dicotyledons up to 60 - 80 cm high. No single grass species is consistently dominant and the most striking feature of the vegetation is generally the variety and abundance of dicotyledons, including wood crane`s-bill *Geranium sylvaticum*, pignut *Conopodium majus*, great burnet *Sanguisorba officinalis* and lady`s mantles *Alchemilla* spp.

Table 8 - 19: Other Categories

SURVEYED, UNKNOWN HABITAT	Self explanatory, but surveyor should be sure to check that it would not qualify as one of the priority habitats or broad categories
UNKNOWN	This should not be used, make some effort to define the habitat.

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', if 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.

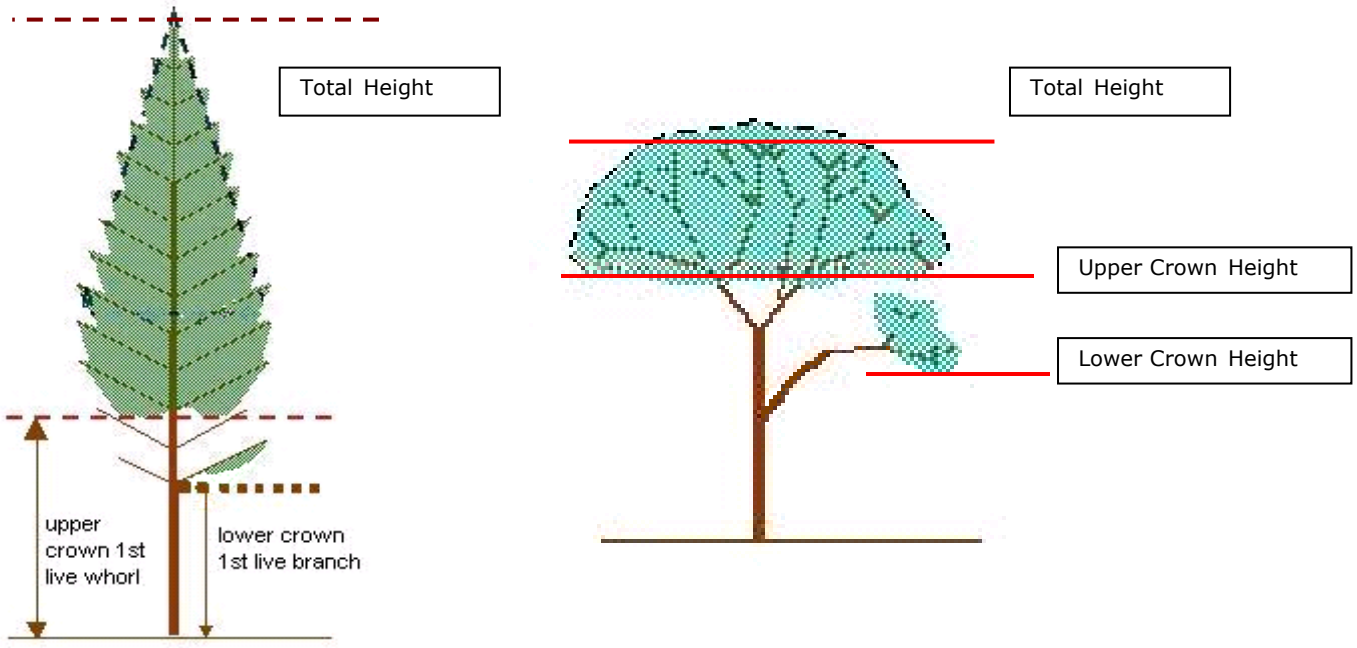


Figure 8 - 9: Height categories

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 however in certain situations 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. *Note that surveyors will need to let the QA team know which height has been used in the Checkpoint reports*.

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.

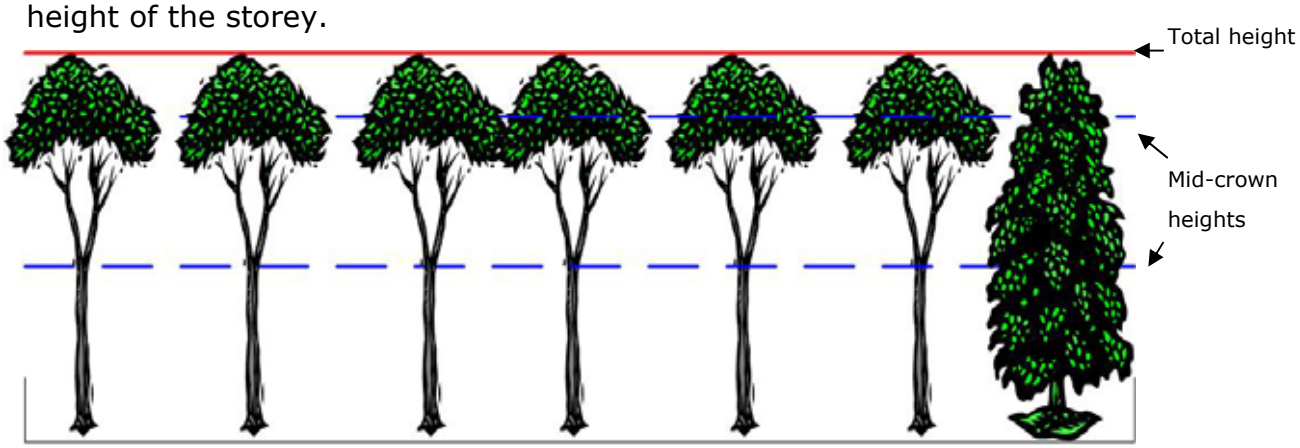


Figure 8 - 10: Use of total height 1

- 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.

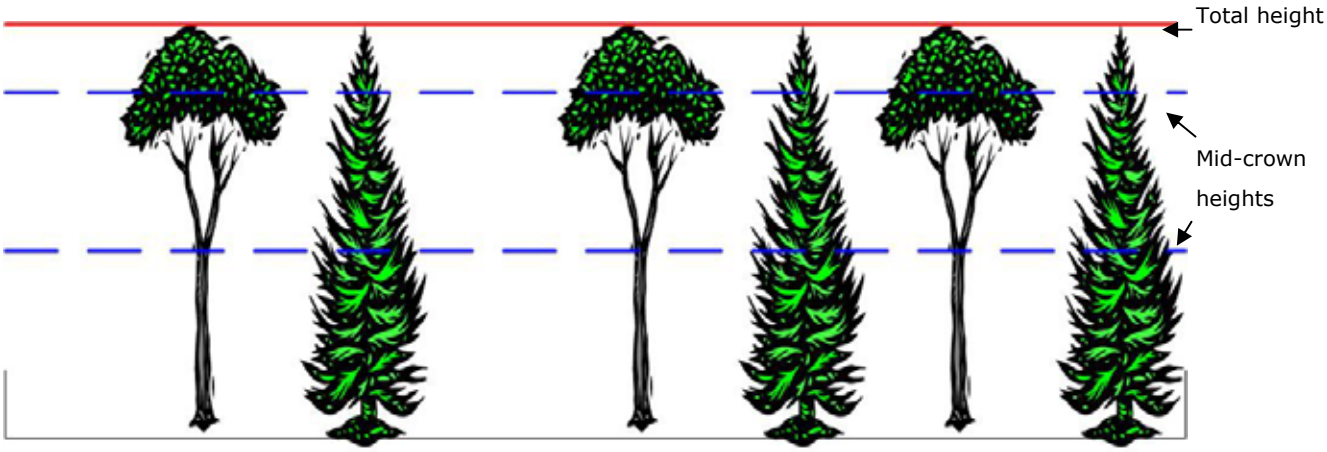


Figure 8 - 11: Use of total height 2

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.

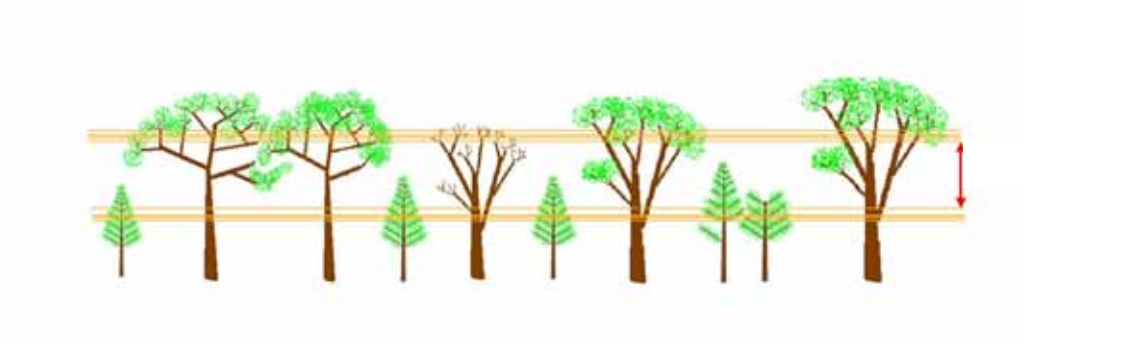


Figure 8 - 12: Two storeys Section

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.

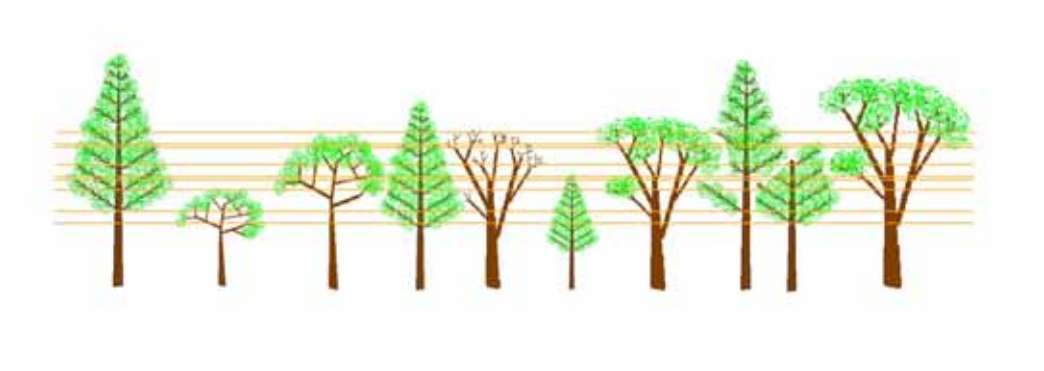


Figure 8 - 13: Complex or Single storey Section

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:

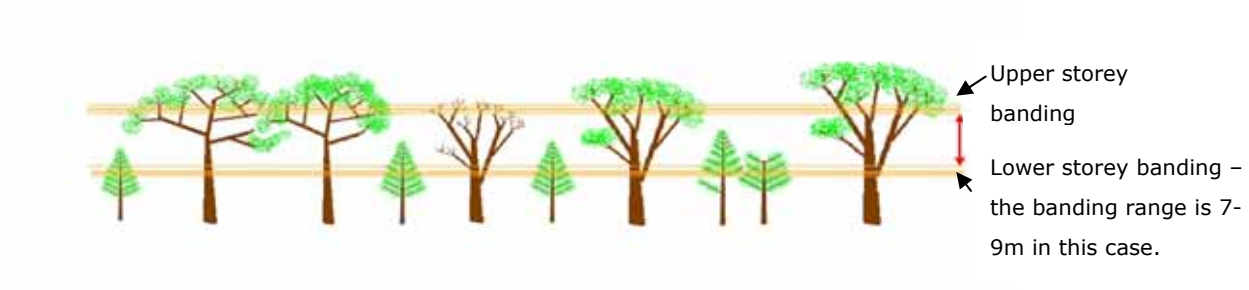


Figure 8 - 14: Storey Banding

In Figure 8 - 148 - 14 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

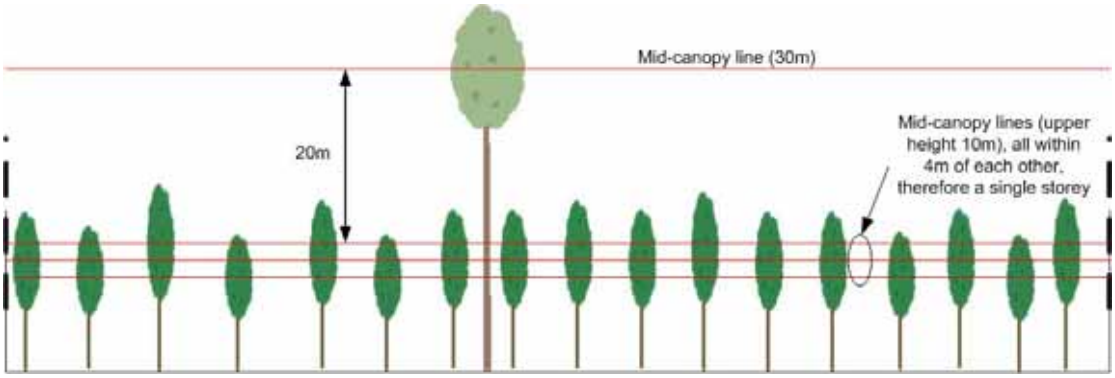


Figure 8 - 15: Multi-storey Section

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 - 168 - 16) then there is a case for bringing this tree into the single storey below it.

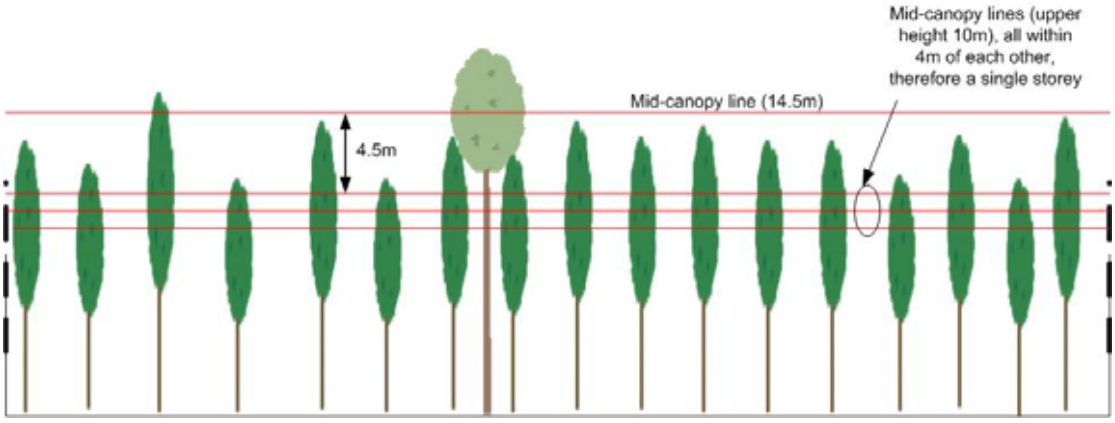


Figure 8 - 16: Single storey Section

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 - 16 - 16 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 Young Tree Storey

This is a storey of **non-measurable** trees (<4cm DBH) regardless of age and is NOT counted towards whether a Section is Complex or not or the total number of measurable tree storeys.

In some situations the Young 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 single component for each species of seedling (trees <50cm height) and each species of sapling (trees ≥50cm tall and <4cm DBH).

8.8.5 Leaning and Windblown trees

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

8.8.6 Standing Dead Trees

Where a Component of Trees has an element of dead trees within it the surveyor must assess what proportion of the component is dead by stem numbers. If the proportion of dead trees is ≥30% of the Component then the Component must be split into two separate components, one detailing the Live trees and the other detailing the Dead trees. As the components are potentially very similar it is important to make the Live/Dead distinction here. For all Dead Components two extra fields: Est. Top Height and Estimated Mean DBH will appear and need to be filled in.

If the dead Component is deemed <30% and then dead trees are captured in a mensuration plot there is no requirement to make a component of dead trees at section level as no validation is undertaken by the software in this respect.

If, by following the conventions for creation of storeys, the dead proportion of a crop technically forms a different storey to other components, it is not necessary to actually create a different storey for the dead trees. Use the mean Total height of the dead stems to determine height band.

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

A crop storey should not be deemed 'Complex' on the basis of any height differential that the Dead trees present compared to other components within a component Group.

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.

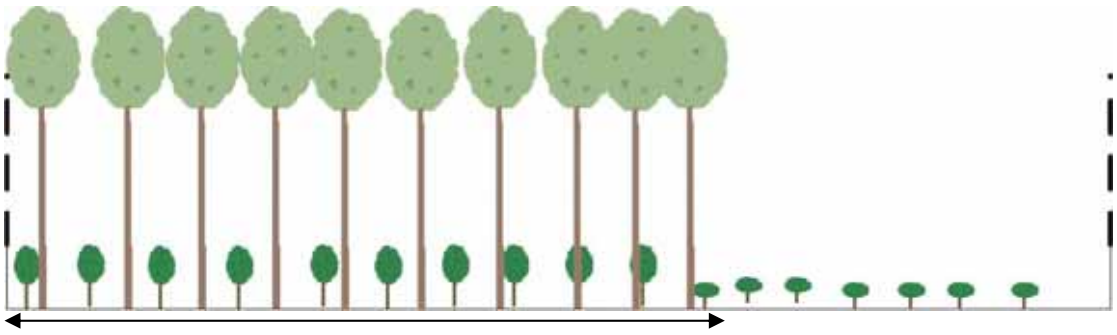
8.8.8 Defining and Recording Storeys within Sections with more than one Component Group

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, (see Chapter **8.8.1.5** for determining rules for allowable gaps when deciding on presence of different storeys.)

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)

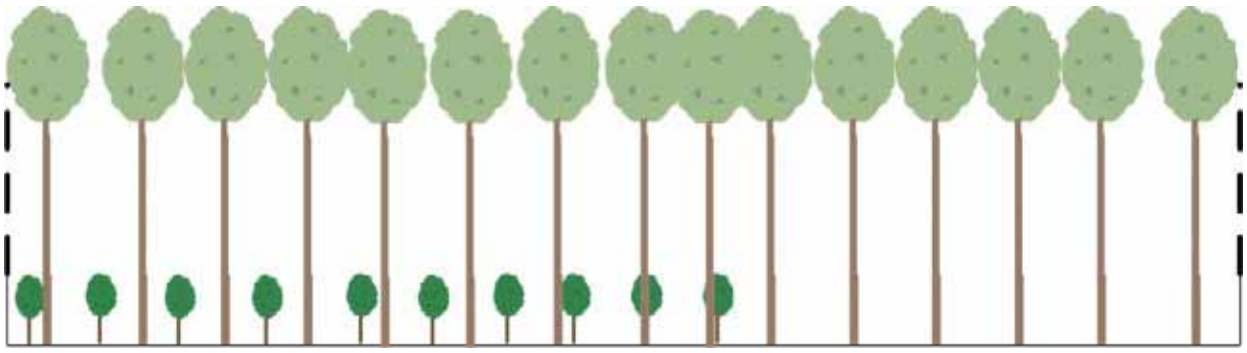
Across the *Section*:

- 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 GC2 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:

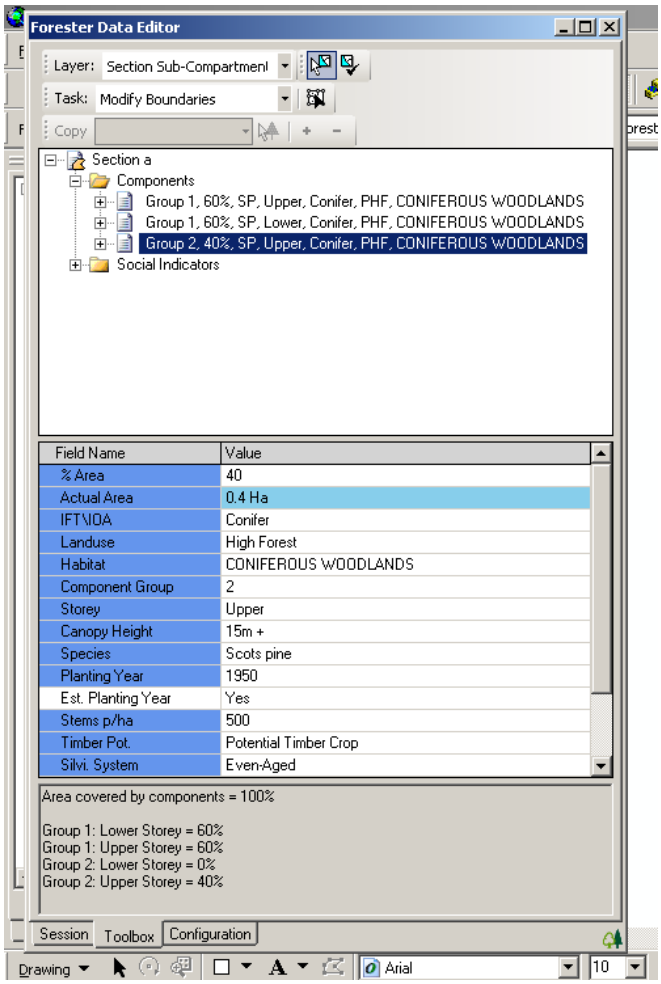
Example 8 - 10: Two Component Groups and two Storeys, 100% Upper and 60% Lower storey



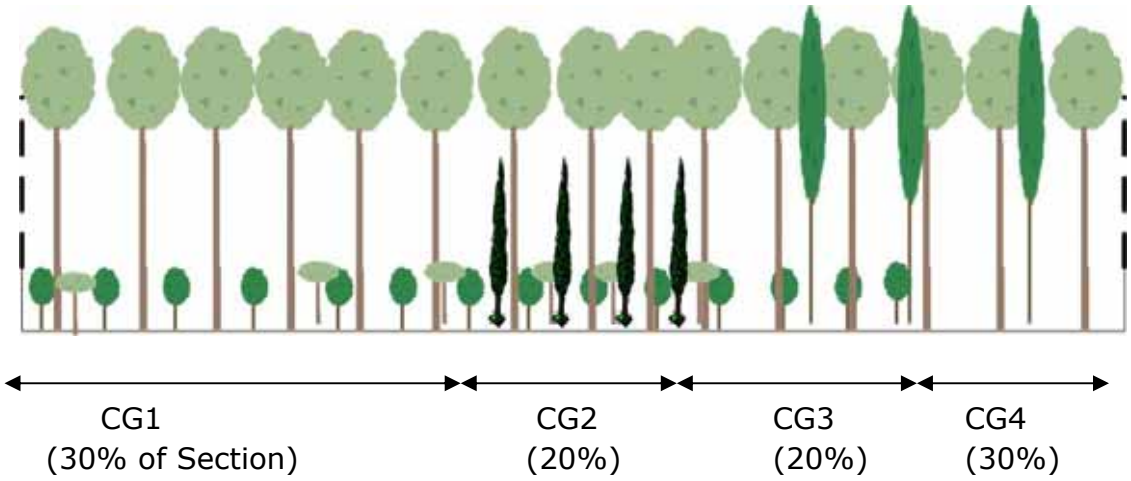
CG1 (60% of Section area) CG2 (40% of Section area)

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



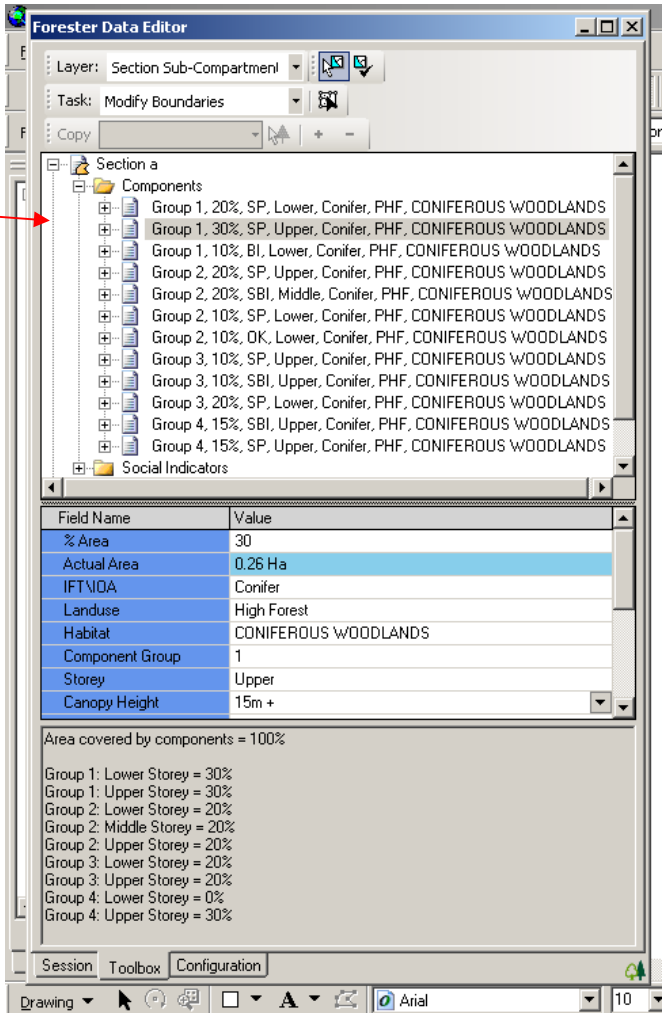
Example 8 - 11: Four Component Groups and 3 Storeys



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)

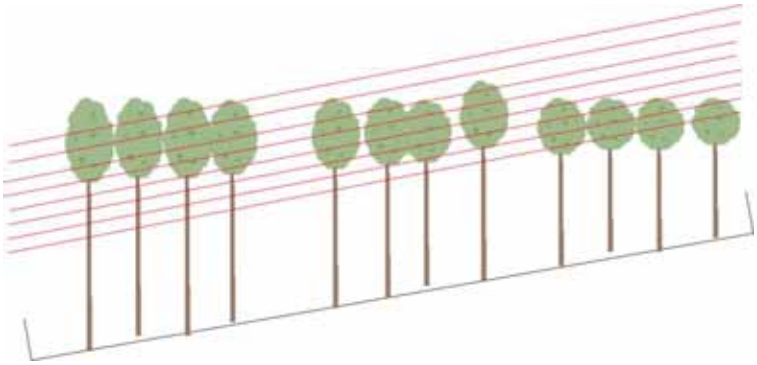


Figure 8 - 17: Storey assessment on a slope 1

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

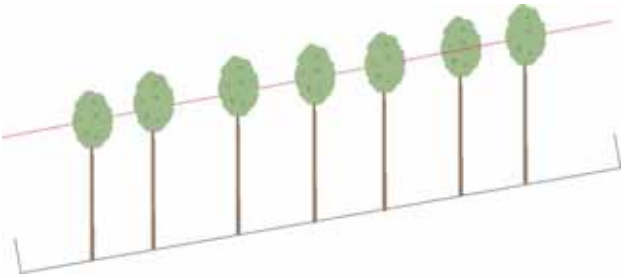


Figure 8 - 18: Storey assessment on slope 2

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.

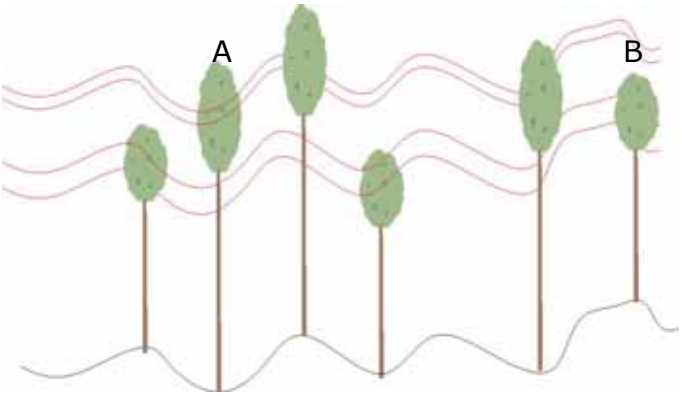


Figure 8 - 19: Storey assessment on undulating ground 1

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.

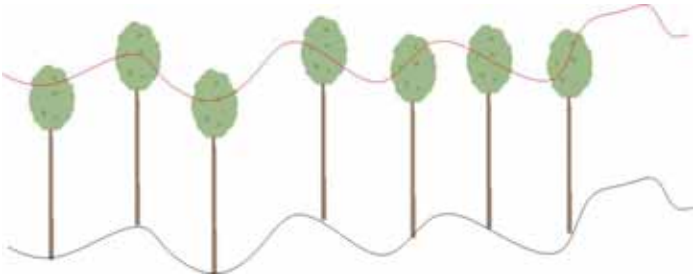


Figure 8 - 20: Storey assessment on undulating ground 2

8.9 NFI Tree Species list

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. In the list below **species native 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).

It is also important to note that not all native species are native to all parts of the UK. In addition, not all native species will necessarily occur on all site types (i.e. are not necessarily site native). Ensure that the Beech zone and pine zone layers are used to help determine site nativeness where applicable. See **Using Local Stock for Planting Trees & Shrubs** in the Additional Documents folder for additional information.

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 - 20: Tree species list

Common Name	Latin Name
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***
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*
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*
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	
Mixed conifers	
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***
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*
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*

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.

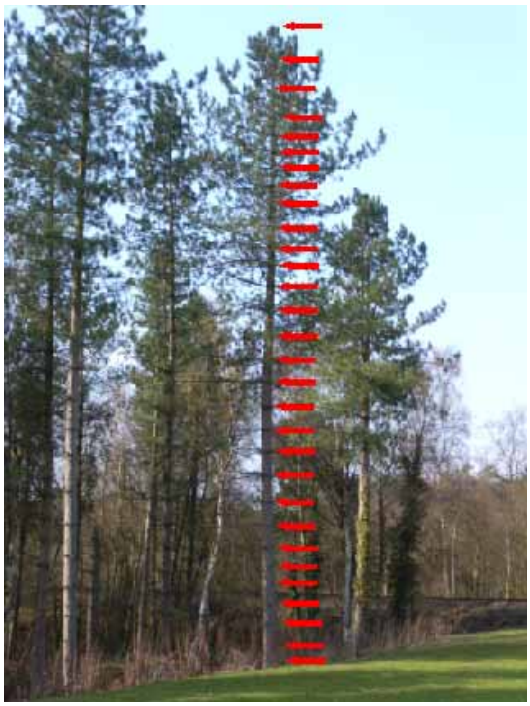
There are several methods of ageing trees:

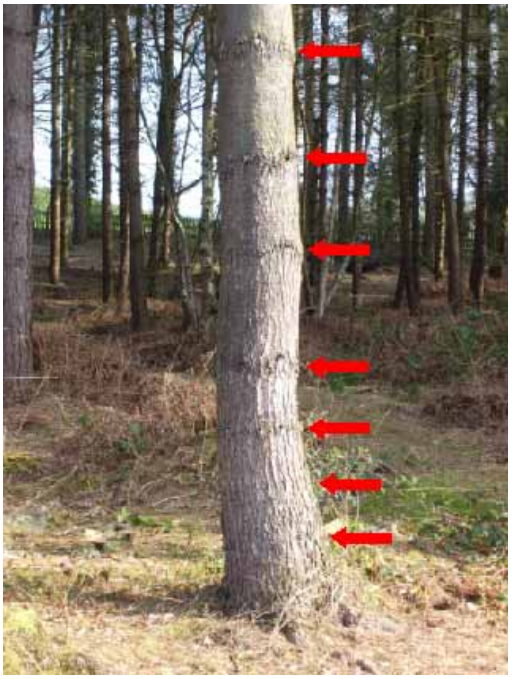
8.10.1.1 Estate/Owner Information

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

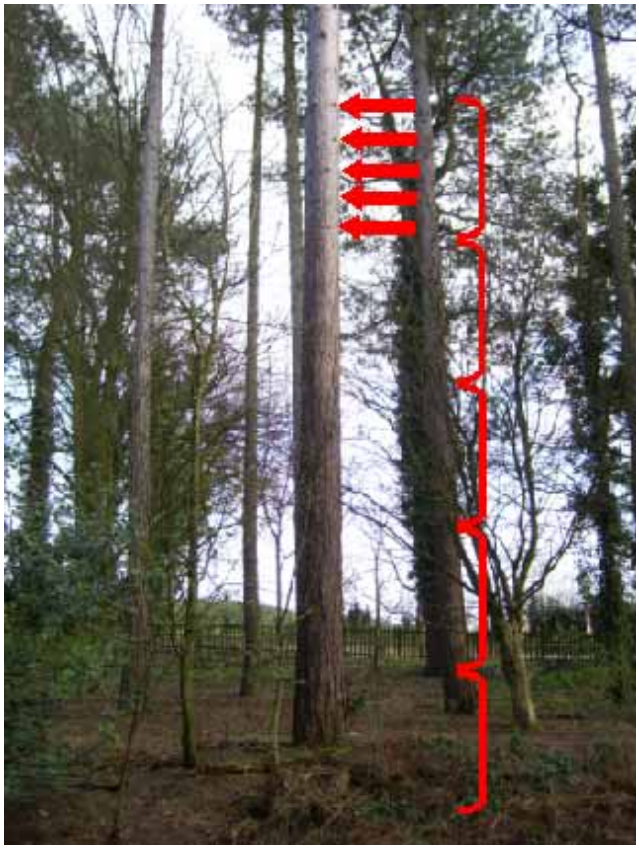
8.10.1.3 Flattened and stag tops

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)

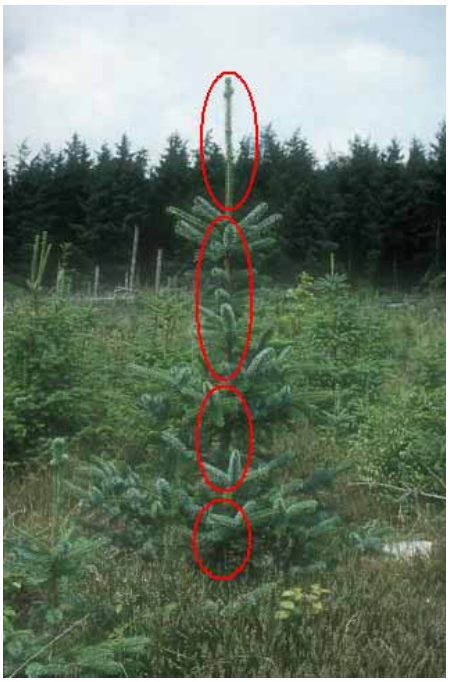
- All external evidence of whorls can be lost on the lower stems
- The method of bracketing should be used to estimate number of whorls in the stem



8.10.1.5 Young Conifers

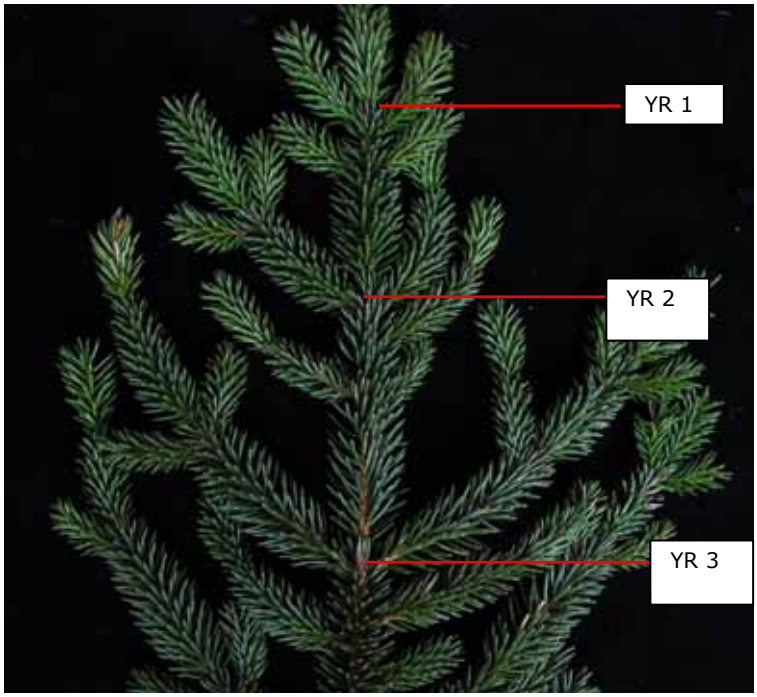
- Whorl counting should be used to estimate seedling age
- Current years seedlings and 1-year olds have no growth whorls

- 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 - 21: 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 - 22: 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 - 23: 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**