

# Forest Yield quick help

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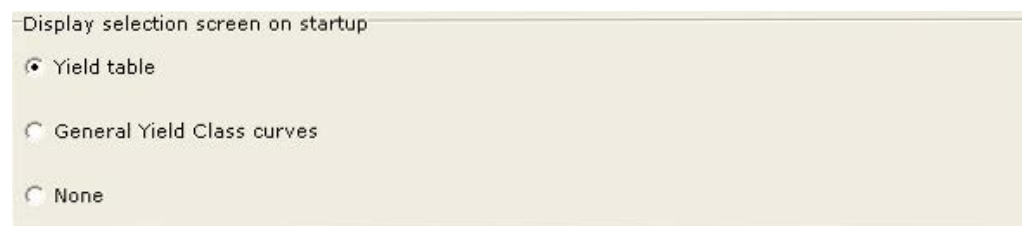
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## How do I set up Forest Yield so that it always opens with the 'Select yield table' window?

The start-up options for Forest Yield are described in the 'Preferences' part of the 'Using Forest Yield' section in the user manual which accompanies this software.

Within the software, the options controlling the start-up appearance can be set using 'Preferences' (found under the 'Edit' menu).

The 'Display selection screen on start-up' section of the 'Preferences' sub-window can be used to customise the start-up screen of Forest Yield. The default is for the yield table selection window to be displayed on start-up. This can be kept as the default or, alternatively, Forest Yield can be started so that it displays the General Yield Class curves window or simply the menu bar and icons for the two main functions.



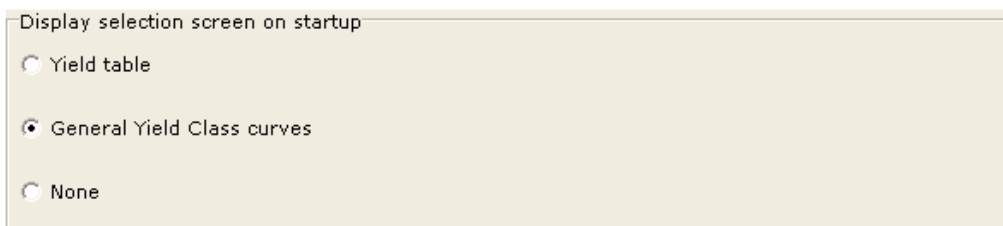
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## How do I set up Forest Yield so that it always opens with the 'Display General Yield Class curves' window?

The start-up options for Forest Yield are described in the 'Preferences' part of the 'Using Forest Yield' section in the user manual which accompanies this software.

Within the software, the options controlling the start-up appearance can be set using 'Preferences' (found under the 'Edit' menu).

The 'Display selection screen on start-up' section of the 'Preferences' sub-window can be used to customise the start-up screen of Forest Yield. The default is for the yield table selection window to be displayed on start-up. This can be kept as the default or, alternatively, Forest Yield can be started so that it displays the General Yield Class curves window or simply the menu bar and icons for the two main functions.



Display selection screen on startup

- Yield table
- General Yield Class curves
- None

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## What start-up preferences can be set in Forest Yield?

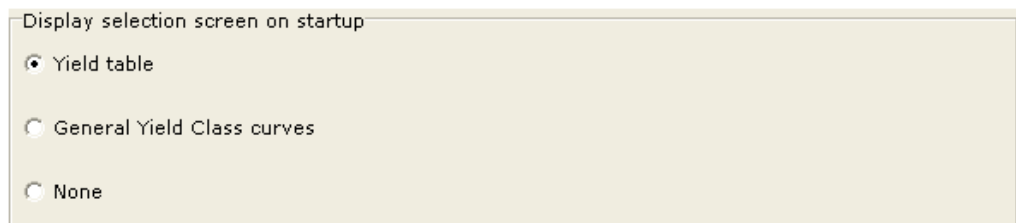
The start-up options for Forest Yield are described in the 'Preferences' part of the 'Using Forest Yield' section in the user manual which accompanies this software.

Within the software, the options available under 'Preferences' (under the 'Edit' menu) are used to set the preferred settings for the appearance and display formats of Forest Yield as well as the top diameter classes for volume assortments. Options can be set for:

- **Start-up appearance**
- **Model version**
- **Display format**
- **Assortment specification**

### Start-up appearance

The 'Display selection screen on start-up' section of the 'Preferences' sub-window can be used to customise the start-up screen of Forest Yield. The default is for the yield table selection window to be displayed on start-up. This can be kept as the default or, alternatively, Forest Yield can be started so that it displays the General Yield Class curves window or simply the menu bar and icons for the two main functions.



Display selection screen on startup

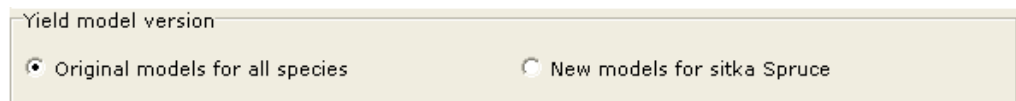
Yield table

General Yield Class curves

None

### Model version

The 'Yield model version' section of the 'Preferences' sub-window can be used to select which set of yield tables to use for Sitka spruce. The original set of yield tables was previously published by the Forestry Commission in the Booklet *Yield models for forest management*. For Sitka spruce, an alternative set is now available – produced using a new dynamic yield model. Whether the original or new tables are selected for Sitka spruce, tables for all other species are based on the original models.



Yield model version

Original models for all species

New models for sitka Spruce

- **Which yield model version should I use?**
- **When should I use the original models for all species?**
- **When should I use the new models for Sitka spruce?**

## Display format

'Yield table display frequency' is used to select the preferred age intervals. Conventionally, yield table results are only displayed for defined ages – usually five years apart. Yield tables can be displayed using these standard intervals or as an annual sequence.

Yield table display frequency

Standard  Annual

'Display yield table main crop values' is used to select how the main crop results are displayed. Conventionally, yield table results for the main crop take into account the removal of thinnings. The main crop results can be displayed either before or after thinning.

Display yield table main crop values

After thinning  Before thinning

'Yield table rounding convention' is used to select the rounding conventions for yield table results. Standard conventions round results to a fixed number of decimal places. Forest Yield can be set to display unrounded results, if required.

Yield table rounding convention

Standard  No rounding

## Assortment specification

Top diameter classes, in cm over bark

	Min top diameter	Max top diameter
	<input type="text" value="7"/>	<input type="text" value="14"/>
	<input type="text" value="14"/>	<input type="text" value="18"/>
	<input type="text" value="18"/>	

Number of top diameter classes (Max 5)

The **default categories** for stand volume assortments reported by Forest Yield can be changed using the volume assortment specification section at the foot of the Edit > Preferences sub-window.

More details are given in the section '[How do I specify categories for a stand volume assortment?](#)'

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## Which yield model version should I use?

The original set of yield tables was previously published by the Forestry Commission in the Booklet *Yield models for forest management*. For Sitka spruce, an alternative set is now available – produced using a new dynamic yield model.

There are greater numbers of new Sitka spruce yield tables, covering a wider range of combinations of management regime and initial planting spacing, than were published in *Yield models for forest management*. The updated tables for Sitka spruce also address some of the shortcomings of the original models for this species, particularly with respect to the predicted growth of no-thin stands. However, the new Sitka spruce dynamic yield model is still a research tool at this stage. Hence, it is recommended to continue using the original tables for Sitka spruce as the main source of information for this tree species. The new tables may be useful when considering Sitka spruce stands managed according to prescriptions not covered in the original yield tables, including stands managed on long rotations, and in providing improved predictions for unthinned stands.

The **yield model version** for Sitka spruce used by Forest Yield is specified through '**Preferences**' (under the 'Edit' menu).

It is important to note that, whether the original or new tables are selected for Sitka spruce, tables for all other species are always based on the original models.

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## When should I use the original models for all species?

The original set of yield tables was previously published by the Forestry Commission in the Booklet *Yield models for forest management*. For Sitka spruce only, an alternative set is now available – produced using a new dynamic yield model.

The **yield model version** for Sitka spruce used by Forest Yield is specified through '**Preferences**' (under the 'Edit' menu).

If you are not intending to access any yield tables for Sitka spruce, it makes no difference which of the two yield model versions you choose to use. This is because, whether the original or new tables are selected for Sitka spruce, tables for all other species are based on the original models.

If you wish to make direct comparisons with forecasts of production for Sitka spruce which were previously derived from the original Booklet, then you should use the original models for all species.

In other cases see the guidance on when to use the **new tables for Sitka spruce**.

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## When should I use the new models for Sitka spruce?

The original set of yield tables was previously published by the Forestry Commission in the Booklet *Yield models for forest management*. For Sitka spruce, an alternative set is now available – produced using a new dynamic yield model.

There are greater numbers of new Sitka spruce yield tables, covering a wider range of combinations of management regime and initial planting spacing, than were published in *Yield models for forest management*. The updated tables for Sitka spruce also address some of the shortcomings of the original models for this species, particularly with respect to the predicted growth of no-thin stands. However, the new Sitka spruce dynamic yield model is still a research tool at this stage. Hence, it is recommended to continue using the original tables for Sitka spruce as the main source of information for this tree species. The new tables may be useful when considering Sitka spruce stands managed according to prescriptions not covered in the original yield tables, including stands managed on long rotations, and in providing improved predictions for unthinned stands.

The **yield model version** for Sitka spruce used by Forest Yield is specified through '**Preferences**' (under the 'Edit' menu).

It is important to note that, whether the original or new tables are selected for Sitka spruce, tables for all other species are always based on the original models.

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## How do I select a yield table?

A yield table is accessed by specifying a species, yield class and management regime – the latter defined in terms of initial spacing and thinning treatment. All these parameters are defined and explained in detail in the Forest Yield handbook which accompanies this software.

Yield tables have been constructed for all the main tree species currently growing in the British Isles – as listed in Appendix 1 of the user manual which accompanies this software. Species that were historically considered to be ‘commercial’ generally have their own set of yield tables. Other species are mapped to these more ‘commercial’ species on the basis of growth and silvicultural characteristics.

If the ‘Select yield table’ sub-window is not already open in Forest Yield, click on the Yield table icon to display the sub-window where values for species, yield class, initial spacing and thinning treatment can be entered.

Start by selecting the tree species from the drop down menu (top left of the sub-window). If relevant, Forest Yield will automatically display the mapped species.

The yield class for the species of interest is automatically set by Forest Yield to the lowest available value in the range of yield tables. This value can be changed, in steps of two, up to the maximum available yield class for the species.

If yield class is not known, this can be estimated by entering values for top height and age – see description under ‘Estimating the General Yield Class of a stand of trees’ in the user manual which accompanies this software.

Management regime is specified by choosing either the initial spacing first or the thinning treatment first – as appropriate to the species and yield class. It may be useful to toggle between both options in order to explore what management regimes are available for a given species and yield class – especially if there is likely to be a limited range of yield tables available.

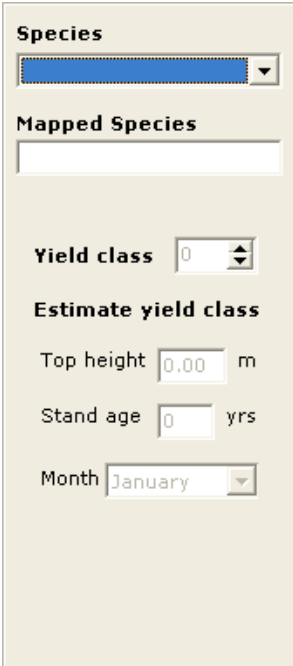
Having selected a yield table, there are three ways of accessing yield information, all of which are accessed using the on-screen buttons on the right-hand side of the sub-window.

[Display yield table](#)

[Display volume assortment](#)

[Display yield values for a specified stand age](#)

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The screenshot shows a sub-window titled 'Select yield table' with a light beige background. At the top, there is a 'Species' dropdown menu with a blue selection bar. Below it is a 'Mapped Species' text input field. The 'Yield class' is shown as a numeric spinner set to '0'. Under the heading 'Estimate yield class', there are three input fields: 'Top height' set to '0.00' with a unit 'm', 'Stand age' set to '0' with a unit 'yrs', and 'Month' set to 'January' with a dropdown arrow.

## How do I display yield tables?



Click on the 'Yield table' button.

The yield table is displayed in a new sub-window. Results are given for a default stand area of 1 hectare. An explanation of the information shown in a yield table is given below.

Table heading	Description
Age	Stand age in years. Typically, a yield table presents values at 5-year intervals, starting 5 years before the age of first thinning. However, this format may vary in individual tables, depending on the timing of thinnings. Forest Yield can also be set to display annual values.
Top height	Top height is the mean height, in metres, of the 100 trees of largest dbh per hectare. (See also 'Height' in the Forest Yield handbook which accompanies this software.)
Trees per ha	Number of measurable trees per hectare, i.e. only those with a dbh of at least 7 cm overbark. In yield tables for thinned stands, the numbers of trees per hectare are presented separately for trees comprising the main crop and for trees assumed to be removed in thinning operations. (See also 'Number of trees' in the Forest Yield handbook which accompanies this software.)
Mean dbh	Quadratic mean dbh (diameter at breast height), in centimetres, of the measurable trees. In yield tables for thinned stands, mean diameters are presented separately for trees comprising the main crop and for trees assumed to be removed in thinning operations. (See also 'Diameter' in the Forest Yield handbook which accompanies this software.)
BA	Basal area (BA) per hectare is the sum of the basal areas, in square metres, of the individual measurable trees, expressed on a per-hectare basis. (The basal area of an individual tree is the cross-sectional area of the tree at its breast height point.) In yield tables for thinned stands, values of basal area per hectare are presented separately for trees comprising the main crop and for trees assumed to be removed in thinning operations. In all yield tables, values are also given for cumulative basal area. (See also 'Basal area' in the Forest Yield handbook which accompanies this software.)
Mean vol	Mean volume per tree is the volume per hectare, in cubic metres, divided by the number of trees per hectare. In yield tables for thinned stands, values of mean volume per tree are presented separately for the trees comprising the main crop and for trees assumed to be removed in thinning operations. (See also 'Volume' in the Forest Yield handbook which accompanies this software.)
Vol	Volume per hectare is the sum of stem volumes, in cubic metres, for individual measurable trees to a top diameter of 7 cm overbark, expressed on a per-hectare basis. In yield tables for thinned stands, values of volume per hectare are presented separately for trees comprising the main crop and for trees assumed to be removed in thinning operations. In all yield tables, values are also given for cumulative volume. (See also the sections on 'Volume' and 'Measuring volume productivity' in the Forest Yield handbook which accompanies this software.)
Per cent mortality	Only applicable to yield tables for unthinned stands. Per cent mortality is defined as the cumulative volume lost due to mortality expressed as a percentage of the sum of stand cumulative volume production and cumulative volume lost due to mortality.
MAI	Mean Annual Increment (MAI) is the cumulative per hectare volume production divided by the stand age. It is the average rate of volume production achieved from time of planting up to a given stand age. (See 'Measuring volume productivity' in the Forest Yield handbook which accompanies this software.) However, for unthinned stands values for mean annual increment are based on standing volume rather than cumulative volume, i.e. they do not include volume effectively lost due to mortality.

Note: Volume is assessed to a minimum top diameter of 7 cm overbark, or the point at which no main stem is distinguishable – whichever comes first. The minimum timber length to 7 cm top diameter considered to have measurable volume is 1.3 m. The minimum dbh of a tree considered to have measurable volume is 7 cm.

The tabulated values can be recalculated for a whole stand with known area by entering the stand area, in hectares, into the box labelled 'Stand area' (at the top right-hand side of the sub-window). This is the only thing that can be changed in the sub-window.



Yield table information can be exported using the 'export' button on the right hand side of the sub-window. Available export formats are:



- Microsoft Excel® Spreadsheet (.xls)
- Rich Text Document File (.rtf)
- Comma Separated File (.csv)
- Text File (.txt)

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## How do I display yield values for a specified stand age?



Click on the 'values for age' button in the 'Select yield table' window.

Enter stand age to display yield values – the default is the first age in the relevant yield table. However, this can be changed by using the 'age' buttons at the bottom right-hand side of the sub-window.



Yield table information can be exported using the 'export' button on the right hand side of the sub-window. Available export formats are:

- Microsoft Excel® Spreadsheet (.xls)
- Rich Text Document File (.rtf)
- Comma Separated File (.csv)
- Text File (.txt)

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## What can I do if I don't know the yield class of the stand?

See also the section on 'General Yield Class' in the Forest Yield handbook which accompanies this software.

General Yield Class for a stand of a particular tree species can be estimated from an assessment of stand top height at a specified age. Stand top height is defined as the mean total height, in metres, of the 100 trees of largest diameter at breast height (dbh) in a hectare of woodland. This is usually assessed from a sample of the trees of largest dbh in a series of circular plots of 0.01 ha in area.

The top height and age of a stand of trees, together with an optional **month of measurement**, can be entered into either of the two Forest Yield **start-up windows** in order to give an estimate of the General Yield Class of the stand.

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## What can I do if I don't know the top height of the stand?

Stand top height is defined as the mean total height, in metres, of the 100 trees of largest diameter at breast height (dbh) in a hectare of woodland. This is usually assessed from a sample of the trees of largest dbh in a series of circular plots of 0.01 ha in area.

If an estimate of the General Yield Class of the stand is already known, then neither stand top height nor stand age are required in order to access the relevant yield table for the stand in question.

If there is no current estimate of top height, but top height was assessed at an earlier stand age, this earlier height estimate can be used with caution. For example, it can be used in conjunction with the stand age at which the height assessment was made in order to estimate the General Yield Class of the stand at that point in time. However, when using historical stand data, it is important to note that stand top height development, and therefore yield class, can be affected by various external factors (such as variations in the nutrient status of different soil horizons). Top height can therefore occasionally deviate from its anticipated (GB average) trajectory which may result in a change in General Yield Class over time. The less recent the date measurement, the greater is the danger of introducing unintentional bias.

It is never recommended to subjectively estimate stand top height as relatively small differences in top height can have an apparently disproportionate effect on the estimation of yield class. Top height should therefore always be assessed from objectively obtained field measurements.

See also the section on 'General Yield Class' in the Forest Yield handbook which accompanies this software.

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## What can I do if I don't know the age of the stand?

Knowing stand age is an essential prerequisite to using the yield tables in Forest Yield, not least because values in the tables are presented by stand age.

Furthermore, stand age is a prerequisite for estimating the General Yield Class of a stand of trees. See also the section on 'General Yield Class' in the Forest Yield handbook which accompanies this software.

The conventional way to obtain stand age is from records detailing the year in which the stand was planted or the year in which the stand originated if arising as a result of a natural regeneration. However, in cases where such records are not available, there are a number of methods that can be used to estimate the age of a stand of trees.

However, if using any of the following methods to estimate the age of a stand of trees, it is important to note that an error of only a small number of years may result in a significant over- or under-estimate of General Yield Class, with consequent effects on the outputs of any forecast of future production.

The approximate age at which a tree was felled can be estimated by counting the annual rings on a tree stump. This is usually easiest to perform on a relatively freshly-cut stump. The stump age, in years, combined with the number of years that have elapsed since the tree was felled, will give an approximate age for the trees still standing.

Breast height age can be estimated by counting the number of annual rings in a core (taken with a suitable instrument, such as a Pressler borer) taken at breast height. It is important to remember that breast height age will always be less than the true age of the stand and an adjustment (equivalent to the time taken for the tree to achieve 1.3 metres total height) will need to be made to breast height age in order for it to approximate stand age. Because of the risk of introducing bias, this method should therefore only be considered where planting records are unavailable and stump age cannot be obtained.

In conifers, it is possible to gain an approximate estimate tree age by counting the number of 'whorls' of branches (and branch scars) on the main tree stem. However, because of the inherent inaccuracy of this method, it is not recommended for use in conjunction with Forest Yield.

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## (Why) Do I need to know the month of measurement?

Stand age represents the number of growing seasons a stand has experienced since planting or establishment. The month in the year in which the top height was assessed has a small but significant effect on the total number of growing seasons and hence the effective age of a stand. Suppose a stand recorded as planted in 1950 was assessed in October 2007. In this example the stand age at time of assessment would be calculated as  $2007 - 1950 = 57$  years. Now suppose that the stand was assessed in March 2008. This is in the period following the end of the 2007 growing season and before the start of the 2008 growing season, so the stand age would still be calculated as  $2007 - 1950 = 57$  years. However, if the stand was assessed in October 2008 then the stand age would be calculated as  $2008 - 1950 = 58$  years. Assessments made between March 2008 and October 2008 would be assumed to have taken place during the growing season and a fractional adjustment might be made to the stand age of 57 years as follows:

- January to March: add 0.0 years
- April: add 0.2 years
- May: add 0.4 years
- June: add 0.6 years
- July: add 0.8 years
- August: add 0.9 years
- September to December: add 1.0 years

If a month is selected from the drop-down list in Forest Yield the above adjustments will be automatically be applied to the stand age already entered.

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## How do I display a stand volume assortment?

Click on the 'Volume assortment' button in the 'Select yield table' or 'Display yield table' windows.



The volume assortment table is displayed in a new sub-window. Results are given for a default stand area of 1 hectare. This area can be changed, if desired, using the 'Stand area' text box at the top right-hand side of the sub-window. Results will then be updated for the user-specified stand area.

The assortment volumes are separately displayed for the main crop and for thinnings along with stand age and mean dbh from the selected yield table. **User-specified assortment categories**, in terms of selected top diameters, can be set using the 'Preferences' sub-window within Forest Yield.

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## Do I (always) need to specify top diameter categories for a volume assortment?

The default stand volume assortment categories are 7-14 cm, 14-18 cm and 18+ cm top diameter over bark. These **default categories can be changed** using the volume assortment specification sub-window.

You can check what assortment categories are set by opening the Edit > Preferences sub-window.

Top diameter classes, in cm over bark		
	Min top diameter	Max top diameter
	7	14
	14	18
	18	

Number of top diameter classes (Max 5): 3

See also the section on 'Displaying volume assortments' in the user manual which accompanies this software and also 'Volume assortment' in the Forest Yield handbook which accompanies this software.

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## How do I specify top diameter categories for a volume assortment?

The **default categories** for stand volume assortments reported by Forest Yield can be changed using the volume assortment specification section at the foot of the Edit > Preferences sub-window.

The screenshot shows a window titled "Top diameter classes, in cm over bark". On the left, there is a label "Number of top diameter classes (Max 5)" next to a spin selector set to "3". To the right, there are two columns of input fields: "Min top diameter" and "Max top diameter". The "Min top diameter" column contains three fields with values 7, 14, and 18. The "Max top diameter" column contains three fields with values 14, 18, and an empty field.

	Min top diameter	Max top diameter
1	7	14
2	14	18
3	18	

The number of top diameter classes can be set using the spin selector at the left-hand side of this area of the preferences sub-window. The minimum number of top diameter classes is 1 and the maximum number is 5 (default setting 3, as illustrated above). Note: If selecting only 1 top diameter class, the only additional yield information that will be displayed within the 'Display volume assortments' sub-window is the volume less than 7 cm top diameter over bark.

Except for the first and final categories, the minimum top diameter set in any row will be used as the maximum top diameter in the previous row. In the example illustrated below, two additional top diameter categories have been added by setting the spin selector to '5' and entering '24' and '30' as the minimum top diameters (in centimetres, over bark) for the next two classes.

The screenshot shows the same window as above, but the spin selector is now set to "5". The "Min top diameter" column now has five fields with values 7, 14, 18, 24, and 30. The "Max top diameter" column has five fields with values 14, 18, 24, 30, and an empty field.

	Min top diameter	Max top diameter
1	7	14
2	14	18
3	18	24
4	24	30
5	30	

The five top diameter classes specified in the above example are therefore:

- 7 cm to 14 cm;
- 14 cm to 18 cm;
- 18 cm to 24 cm;
- 24 cm to 30 cm; and
- 30 cm+

To reduce the number of top diameter classes, simply adjust the spin selector to indicate the desired number of classes and enter the desired minimum top diameter values.

Top diameter classes, in cm over bark

	Min top diameter	Max top diameter
	<input type="text" value="7"/>	<input type="text" value="17"/>
Number of top diameter classes (Max 5)	<input type="text" value="2"/>	<input type="text" value="17"/>



Pressing the Save preferences button will register and save your changes.

In every case, the final top diameter class will always have no upper limit.

See also the section on 'Displaying volume assortments' in the user manual which accompanies this software and also 'Volume assortment' in the Forest Yield handbook which accompanies this software.

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## (When) Should I use yield tables with values presented before or after thinning?

The yield tables for thinned stands published in *Yield models for forest management* all gave the 'main crop' (standing tree) values after thinning. This is the default setting in Forest Yield.

Using this setting, the expected volume and other stand characteristics at each thinning can be read directly from the yield table, and the results for the felling can easily be calculated by combining the estimates for the thinning at that age with the main crop after thinning at the same age.

Alternatively, the Forest Yield software includes an option to display results for the main crop before thinning. This option can be **set using 'Preferences'** (found under the 'Edit' menu).

The volume estimates are for one hectare, so they must be multiplied by the net area, either manually or by entering an appropriate value into the stand area text box in the 'Display yield tables' sub-window, to give the forecast for a whole stand with known area.

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## What are the standard rounding conventions used in the yield tables?

Standard conventions round results to a fixed number of decimal places. Specifically:

- Top height is rounded to the nearest 0.1 metre (i.e. to 1 decimal place)
- Mean diameter is rounded to the nearest centimetre (i.e. no decimal places)
- Basal area is rounded to the nearest  $\text{m}^2$  per hectare (i.e. no decimal places)
- Mean volume is rounded to the nearest  $0.01 \text{ m}^3$  (i.e. to 2 decimal places)
- Volume is rounded to the nearest  $\text{m}^3$  per hectare (i.e. no decimal places)
- MAI is rounded to the nearest  $0.1 \text{ m}^3$  per hectare (i.e. to 1 decimal place)

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## What thinning regime should I use?

In general, if you know that a stand has been thinned, but you don't know what thinning regime was used then:

- if there is only one thinning treatment available for the species and yield class in question, use that;
- if there is more than one thinning treatment available for the species and yield class in question, use 'intermediate' (if available) or 'crown' (for Douglas fir).

See also the sections on 'Thinning treatment', 'Range of thinning treatments in Forest Yield' and 'Selecting a yield table' in the Forest Yield handbook which accompanies this software.

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# What initial spacing should I use?

## Field assessment possible

If it is not possible to obtain the initial (planting) spacing from forest records, it may be possible to derive an estimate of initial spacing by visiting the stand in question and measuring the within-row and between-row distances (where trees have been removed, it may still be possible to use the remaining tree stumps to obtain these distances). Where a stand has arisen from natural regeneration, an estimate of the number of trees per hectare immediately following establishment (derived from a plot-based count of trees and stumps) can be used in combination with the following simple formula to obtain an estimate of the initial spacing of the stand as if the trees had been planted according to a perfectly square pattern.

$$\text{Spacing} = \frac{100}{\sqrt{\text{stems per hectare}}}$$

So, if a field survey suggests there was originally an average of 3762 stems per hectare, the equivalent square spacing would be:

$$\text{Spacing} = \frac{100}{\sqrt{3762}} = \frac{100}{61.335} = 1.63 \text{ metres}$$

## Field assessment not possible

In Britain, the initial (planting) spacing has tended to change over time. This has generally been driven by the prevailing forest policy and often encouraged by the rules for claiming planting grants.

If it is not possible to obtain initial planting spacing by any other means, the following very general spacing assumptions can be made based on the year in which the stand was established.

Planting year	Assumed initial spacing
1980 and later	2.0 × 2.0 metres
1970 to 1980	2.1 × 2.1 metres
1920 to 1970	1.5 × 1.5 metres

Whichever method is used, you should aim to select the yield table for the spacing nearest to the estimated spacing.

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