

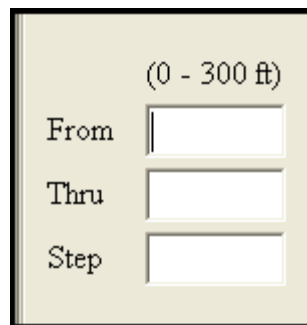
### **Exercise Answers**

- To develop the worksheet, start by closing any open worksheets using **File > Close** (not required, but helpful).
- In the module selection window, select SCORCH and MORTALITY and deselect SURFACE. Click **Ok**. (None of the defaults are changed.)

#### **1. Question – What is the valid input range for Canopy Height?**

0 to 300 ft.

- Click the Guide button associated with canopy height to see




The image shows a dialog box with a light beige background and a black border. At the top right, the text "(0 - 300 ft)" is displayed. Below this, there are three input fields arranged vertically. The first field is labeled "From" to its left, the second is labeled "Thru" to its left, and the third is labeled "Step" to its left. Each label is aligned with the left side of its corresponding input field.

## 2. Question – Which modules use the canopy height variable?

MORTALITY and SPOT.

- Click on the guide button associated with canopy height and look at the **Help** window.



## Canopy Height

Canopy height describes the stand as it affects calculation of the wind adjustment factor in SURFACE. If canopy height is less than 6 feet (1.8 meters), then the unsheltered WAF calculation is used.

In the CROWN Module, canopy height is multiplied by canopy bulk density to get crown load, which is used to calculate crown flame length.

In the MORTALITY module, canopy height is used to find tree crown length scorched, which is used to calculate probability of mortality.

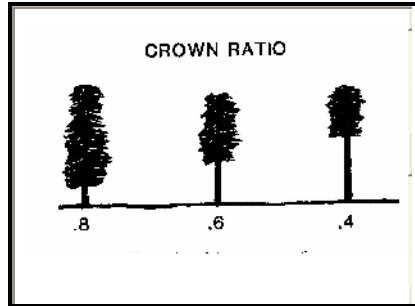
Canopy height at the site of the fire may be different from downwind canopy height in the direction firebrands are carried. Downwind canopy height is used to calculate maximum spotting distance in SPOT and is the mean cover height in the downwind direction as it affects the distance a firebrand is carried. If the forest cover is open, a value of half the tree height should be entered.

I/O	Module	If	Notes
Input	SURFACE		If wind adjustment factor is calculated.
	CROWN		
	MORTALITY		
Output	None		

## 3. Question – Is there a diagram that helps explain crown ratio?

Yes.

- Click on the guide button associated with crown ratio, scroll down in the help window to see a diagram that helps you visualize crown ratio.



#### 4. Question – How many mortality tree species are available to choose from?

206.

- Click on the guide button associated with mortality tree species. The list is in the center pane. The number is given in the description in the help window.

Value	Description
ABIAMA	Abies amabilis (Pacific silver fir)
ABIBAL	Abies balsamea (Balsam fir)
ABICON	Abies concolor (White fir)
ABIGRA	Abies grandis (Grand fir)
ABILAS	Abies lasiocarpa (Subalpine fir)
ABIMAG	Abies magnifica (Red fir)
ABIPRO	Abies procera (Noble fir)
ABISPP	Abies species (Firs)
ACEBAR	Acer barbatum (Florida maple)
ACELEU	Acer leucoderme (Chalk maple)
ACEMAC	Acer macrophyllum (Bigleaf maple)
ACENEG	Acer negundo (Boxelder)
ACENIG	Acer nigrum (Black maple)
ACEPEN	Acer pensylvanicum (Striped maple)
ACERUB	Acer rubrum (Red maple)
ACESACI	Acer saccharinum (Silver maple)
ACESACU	Acer saccharum (Sugar maple)
ACESPI	Acer spicatum (Mountain maple)
ACESPP	Acer species (Maples)
AESGLA	Aesculus glabra (Ohio buckeye)

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### Mortality Tree Species

Mortality tree species determines the model used to calculate tree mortality in the MORTALITY module. It is also used to estimate bark thickness for some species. Two hundred and six species are available for the MORTALITY module. There are 12 mortality equations and 39 bark thickness equations.

Tree species is also an input to SPOT. Because 14 species are used in the SPOT module, to avoid confusion, there are two tree species variables:

- Spot tree species, and
- Mortality tree species.

The same tree species codes are used for both variables.

I/O	Module	If	
Input	MORTALITY		
Output	None		

The tree species available to the MORTALITY module are listed in

- [Tree Species Bark Thickness & Mortality Equations.](#)

#### 5. Question – What is mortality tree species used for?

A description of the variable is in the right hand help window. It is used to determine the model used to calculate tree mortality. It is also used to estimate bark thickness for some species.

- At the bottom of the help window click on

• [Tree Species Bark Thickness & Mortality Equations.](#)


Scroll down to see the mortality equation used for each species.

Summary Inputs to Predicted Probability of Fire Mortality Equations						
Mortality Equation	Scientific Name	Common Name(s)	Bark Thickness (BT)	D. B.H.	Crown Length Scorched (CLS)	Crown Volume Scorched (CVS)
1		Non-Spruce, unless listed below	X			X
3		Spruce, unless listed below	X			X
4	<i>Abies concolor</i>	White fir			X	
5	<i>Abies magnifica</i>	Red fir			X	
6	<i>Libocedrus decurrens</i>	Incense cedar			X	
7	<i>Pinus lambertiana</i>	Sugar pine			X	
8	<i>Abies lasiocarpa</i> / <i>Abies grandis</i>	Subalpine fir / Grand fir				X
9	<i>Picea engelmannii</i>	Engelmann spruce				X
10	<i>Pinus ponderosa</i> / <i>Pinus jeffreyi</i>	Ponderosa pine / Jeffrey pine				X
11	<i>Pseudotsuga menziesii</i>	Douglas-fir				X
12	<i>Larix occidentalis</i>	Western larch		X		X
13	<i>Pinus albicaulis</i> / <i>Pinus contorta</i>	Whitebark pine / Lodgepole pine		X		X

## 6. Question – Which modules use air temperature?

SCORCH and IGNITE, but not SURFACE

- Click the guide button and look at the description and table in the Help window.



## Air Temperature

Air temperature is the ambient dry bulb temperature measured in the shade. It is used to calculate scorch height and probability of ignition from a firebrand. Note that air temperature is not included in the SURFACE rate of spread and intensity calculations.

I/O	Module	If	
Input	SCORCH		
	IGNITE	If <i>Probability of ignition from a firebrand</i> is calculated.	
Output	None		

### 7. Question – Can you calculate flame length rather than entering it as an input?

Yes. It can be calculated in SURFACE.

- Look at the help window for Flame length.
- Read the line that describes flame length as a required input to SCORCH.

I/O	Module	If	Notes
Input	CROWN	If SURFACE is not selected and if <i>Surface fire intensity is entered as flame length</i> is selected as an input option.	
	SCORCH	If SURFACE is not selected and if <i>Fire intensity is entered as flame length</i> is selected as an input option.	If SURFACE and SCORCH are both selected, the flame length in the direction of fire spread is calculated in SURFACE and used by SCORCH.
	SAFETY	If SURFACE is not selected.	If SURFACE and SAFETY are both selected, the flame for the head fire is used to estimate safety zone size (even if another spread direction is specified on the worksheet).
	SPOT	If SURFACE is not selected and spotting distance from a wind-driven surface fire is calculated.	If SURFACE and SPOT are both selected, the flame length is for the head fire, in the direction of maximum spread.
Output	SURFACE		

- Select SURFACE and look at the change in the worksheet.  
Recall that indentations indicate that output from one module is used as input to the next.

<input checked="" type="checkbox"/> Surface Fire Spread (SURFACE)	Options...
<input type="checkbox"/> Crown Fire (CROWN)	Options...
<input type="checkbox"/> Safety Zone (SAFETY)	Options...
<input type="checkbox"/> Size of a Pt Source Fire (SIZE)	Options...
<input type="checkbox"/> Fire Containment (CONTAIN)	Options...
<input type="checkbox"/> Spotting Distance (SPOT)	Options...
<input checked="" type="checkbox"/> Crown Scorch (SCORCH)	Options...
<input checked="" type="checkbox"/> Tree Mortality (MORTALITY)	Options...
<input type="checkbox"/> Probability of Ignition (IGNITE)	Options...

The worksheet has changed, and Flame Length is no longer an input variable.

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<b>Inputs: SURFACE, SCORCH, MORTALITY</b>		
Description		
<b>Fuel/Vegetation, Surface/Understory</b>		
Fuel Model		
<b>Fuel/Vegetation, Overstory</b>		
Canopy Height	ft	
Crown Ratio	fraction	
Mortality Tree Species		
D.B.H.	in	
<b>Fuel Moisture</b>		
1-h Moisture	%	
10-h Moisture	%	
100-h Moisture	%	
Live Herbaceous Moisture	%	
Live Woody Moisture	%	
<b>Weather</b>		
Midflame Wind Speed (upslope)	mi/h	
Air Temperature	oF	
<b>Terrain</b>		
Slope Steepness	%	