Basic Start Lesson

Exercise Answers

1. **Question: Why are no graphs produced for this Run? Describe the fire behavior that you see.**
   Only a single value was entered for each variable. Graphs are created when multiple values are entered for either one or two variables.

Exercise 1 - Hardwood stand, leaf-off
Head Fire

Surface Fire Rate of Spread	7.7	ch/h
Surface Fire Flame Length	2.7	ft

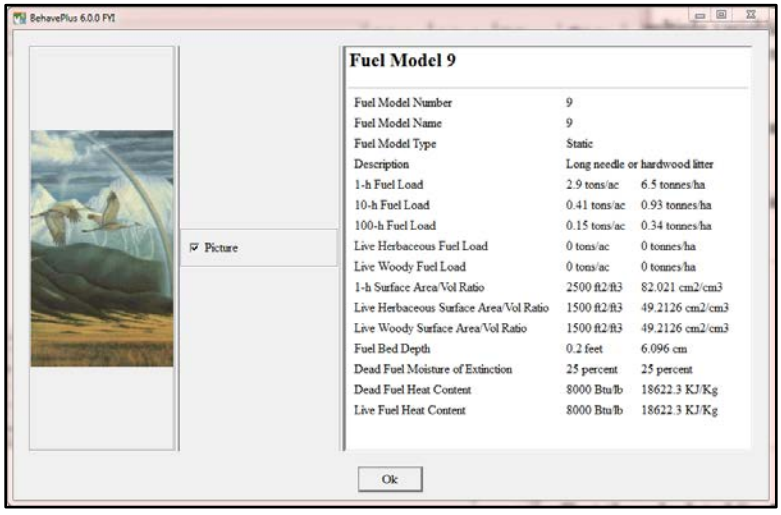
   Fire behavior is relatively low as would be expected for a Fuel Model 9. Surface Fire Rate of Spread is 7.7 ch/h, while Surface Fire Flame Length is 2.7 ft.

2. **Question: How does 10-h Fuel Moisture affect the calculated Surface Fire Rate of Spread and Flame Length?**

Exercise 1 - Hardwood stand, leaf-off
Head Fire

10-h Fuel Moisture %	Surface Fire Rate of Spread ch/h	Surface Flame Length ft
4	7.8	2.7
8	7.7	2.7
12	7.7	2.7

   The 10-h Fuel Moisture has little to no effect on calculated fire behavior in this scenario. If you look at the fuel model parameters for a Fuel Model 9, most of the fuel load is in the 1-h Fuel Load class (2.9 tons/ac). Only 0.41 ton/ac is in the 10-h Fuel Load class. The response would be different if you selected a different fuel model.



3. Question: How do changes in 1-h Fuel Moisture affect calculated Surface Fire Rate of Spread and Flame Length differently than 10-h Fuel Moisture does?

Exercise 1 - Hardwood stand, leaf-off
Head Fire

1-h Fuel Moisture %	Surface Fire Rate of Spread ch/h	Surface Flame Length ft
4	10.1	3.3
8	7.3	2.6
12	6.0	2.3

As 1-h Fuel Moisture increases, fire behavior decreases. Surface Fire Rate of Spread drops from 10 ch/h at 4% fuel moisture to 6 ch/h at 12% fuel moisture. Surface Fire Flame Length drops a foot from about 3 ft to about 2 ft. Fire behavior is still relatively mild under these conditions. Changes in 1-h Fuel Moisture have a greater effect on both rate of spread and flame length than changes in 10-h Fuel Moisture do.

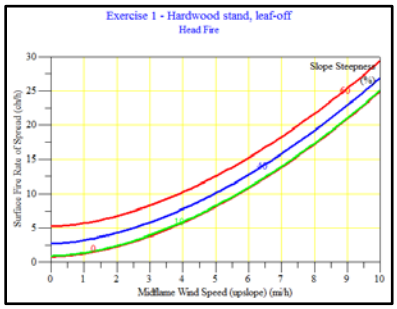
4. How much does the change in Slope Steepness from 0% to 10% change the fire behavior? From 40 to 60%?

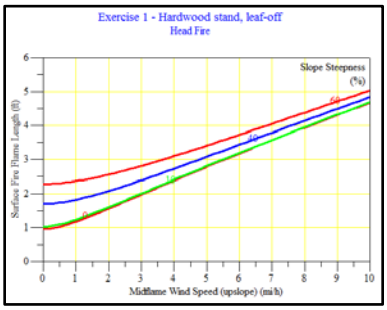
Exercise 1 - Hardwood stand, leaf-off
Head Fire
Surface Fire Rate of Spread (ch/h)

Midflame Wind Speed mi/h	Slope Steepness % 0	10	40	60
0	0.8	0.9	2.8	5.2
5	8.1	8.2	10.1	12.6
10	24.9	25.1	26.9	29.4

Exercise 1 - Hardwood stand, leaf-off
Head Fire
Surface Fire Flame Length (ft)

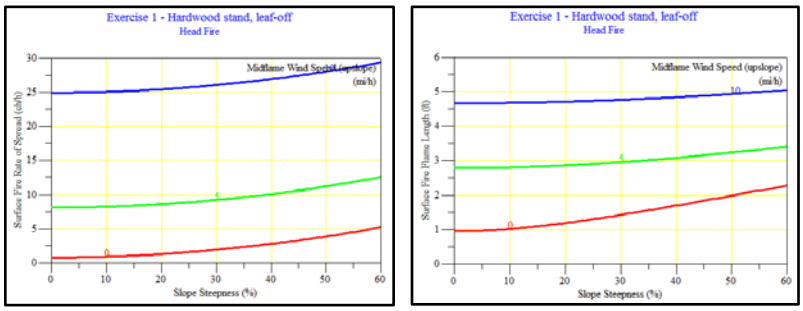
Midflame Wind Speed mi/h	Slope Steepness % 0	10	40	60
0	0.9	1.0	1.7	2.3
5	2.8	2.8	3.1	3.4
10	4.7	4.7	4.8	5.0





Changing the Slope Steepness from 0% to 10% does not affect fire behavior very much if at all in this scenario. The difference in Surface Fire Rate of Spread is about 0.1 ch/h, while the change in Surface Fire Flame Length is about 0.1 ft. Changing the slope from 40% to 60% has a slightly greater impact, but that impact decreases as wind speed increases, as demonstrated in the graph for Surface Fire Flame Length.

5. Comparing the graphs from Question 4 and Question 5, does wind or slope have a greater effect on fire behavior? How do the graphs help you reach that conclusion?



In this example, wind speed has more effect on Surface Rate of Spread and Flame Length than slope does. The graph in Question 4 with an X-Axis of Midflame Wind Speed shows Surface Rate of Spread increasing substantially with an increase in wind. There is very little difference among the four slope curves. When the X-Axis is Slope Steepness, the curves are quite flat showing little increase in Surface Rate of Spread with an increase in slope. There is a considerable difference between curves for different wind speeds

6. Try Exercises 1-5 with other fuel models, such as Fuel Model 13. How do the results differ?
You have been using Fuel Model 9, which represents long needle or hardwood litter. Fuel Bed Depth is 0.2 ft. Most of the fuel is in the 1-h category. Fuel loadings are:

- 1-h = 2.9 tons/ac,
- 10-h = 0.41 tons/ac, and
- 100-h = 0.15 tons/ac.

Fuel Model 13, representing heavy logging slash, is very different. Fuel Bed Depth is 3 ft. Most of the fuel is in the 10-h and 100-h fuel categories. Fuel loadings are:

- 1-h = 7 tons/ac,
- 10-h = 23 tons/ac, and
- 100-h = 28 tons/ac.

Neither Fuel Model 9 nor 13 includes live fuel, which may have a different impact.

10-h Moisture has a greater influence for Fuel Model 13 than for Fuel Model 9 because of the relative amount of 10-h fuel in the fuel models. 1-h has a greater influence than 10-h in both cases. The following output table corresponds to that shown for Question 2, but for Fuel Model 13 instead of Fuel Model 9.

Exercise 6 - Heavy logging slash
Head Fire

10-h Fuel Moisture %	Surface Fire Rate of Spread ch/h	Surface Flame Length ft
4	16.7	10.7
8	16.1	10.4
12	15.6	10.1

The graphs for a Fuel Model 13 look very similar to those of a Fuel Model 9. Although the magnitude of the fire behavior is different, midflame wind speed still has a greater effect on fire behavior than slope.