Modeling for Containment (student)

Part 1: Modeling

- Open Behave Plus 6.0
- Ensure the SURFACE module is set to its default settings
- Enable the CONTAIN module
- Click on the options for CONTAIN and read the input options
    - What is the difference in modeling approach between the “single resource” and “multiple resources” options?
    - Review/read the Resource Line Production Rate description.

Example 1

- Description: Containment 1
- Fuel model: TU1
- Fuel moistures
    - 1-hr 6
    - 10-hr 7
    - 100-hr 8
    - Live herbaceous 50
    - Live woody 50
- Wind speed: 5
- Slope: 0
- Fire size at report: 0.1
- Suppression tactic: rear
- Line construction offset: 0
- Resource line production rate: 10 to 50, increment 5
- Resource arrival time: 0.5
- Resource duration: 4, 8, 12, 16
- Run the model and answer:
    - Why is there only one rate of spread expected?
    - Is the flame length appropriate for direct attack?
    - What is the minimum line production rate needed to contain the fire if it slops over or spots in one location?
    - The CONTAIN feature assumes your holding resources need to be split to the two flanks of the escaping fire, so their line production rate is cut in half. Why does our fire require more than double its predicted ROS to be contained?
- Save as Run
    - Name it Containment1

Example 2

- Click ^^ arrow
- Change description to Containment 2
- Change the 1-hr fuel moisture to 4

- Run it
    - Did changing 1-hr fuel moisture to 4 (from 6) change the containment requirements?
    - Why or why not?
- Change the wind speed to 10
    - How did that change alter containment requirements?
- Experiment with wind speeds
    - What is the maximum wind speed that can be contained with a 15 ch/hr production rate within 4 hours? How about 8 hours?
- Save as run
    - Name it Containment2

Example 3

- ^^
- Description: Containment 3
- Fuel model TL8
- Wind speed 5
- What is the minimum line production rate to contain an escape to this fuel type?
- If have 30 ch/hr of line production capacity, for 8 hours maximum, what's the maximum wind speed you can accept?
- Save as run
    - Name it Containment3

Example 4

- Description: Containment 4
- Fuel model GR4
- Can an escaped fire be contained in this fuel model with the available resources?
- Change the live herbaceous fuel moisture to 120
- How did this change the results?
- Experiment with different live fuel moisture levels
    - What is the minimum live fuel moisture at which containment can be achieved with 25 ch/hrs of line production capacity?
    - How many acres will this escaped fire have grown to before it's contained under the scenario above, and how long will it take?
- How do your results change if your containment resources are already on scene and can respond more quickly?
    - Change the resource arrival time to .25
    - How did the expected ROS or FL change?
    - How did the contain status change?
    - How did the time from report change?
    - How did the contained area change?
- Save as run
    - Name it Containment4

Part 2: Application

In previous lab exercises we used the SURFACE, SCORTCH, and MORTALITY modules to help us identify prescription parameters consistent with our resource objectives. Those parameters included ranges of weather and fuel moisture conditions under which we would anticipate a successful burn. We did that modeling based on the fuel, topography, and weather conditions expected within our burn unit.

Today's exercises challenge us to think about what might happen if fire escapes from our burn unit into adjacent fuels. The CONTAIN module models resource requirements to contain a spot fire or slop-over in one location. It is one approach to estimating what resources are needed at the burn, or available to respond to the burn, in order to manage the fire should it escape.

When taking this approach, you need to configure your Behave runs for the conditions outside of the unit – as these are the places where the escaped fire would be active. Use fuel models, slope, shading and weather conditions consistent with those locations. These conditions can be quite different than those inside your burn unit.

When modeling for containment, it's generally advisable to use set fuel moistures to the minimums expected, and wind and slope to maximums. Assume fires will be heading. Note the significant impact live fuel moisture can have on the fire's behavior and the required containment resources. Burning under conditions when live fuel will mitigate fire behavior (particularly ROS) is a key way fire practitioners can manage burns with available resources – but they need to be cautious and an over-estimate of live fuel moisture could have dramatic consequences on fire behavior.

The output from the CONTAIN module (as we've configured it) is an estimate of resources needed based on line production rate. Line production rates can be effectively estimated for properly trained and equipped wildland firefighters. You can find estimates in Behave's help resources or here. Note that there are various ways to get to a desired production rate using different types of resources (or combinations).

- What is the initial attack production rate of a Type 2 hand crew

- What is the initial attack production rate of a 2-person engine crew

- If I'm anticipating a need for several hours of line production to catch my escaped fire, is that still initial attack?

For those of us operating in the private landowner world it can be challenging to estimate line production rate for less formal resources. Is a guy in a pickup with a pump, water and hose equivalent to a trained crew of three in a type 6 engine? Probably not. Is a farmer on a dozer able to match the production rate of a similar type dozer in a wildland setting? Could be.

Other Approaches

Catching a spot fire or slop-over is an important consideration for prescribed fire, but it's not the only way to help ensure containment.

What other ways can you:

A) Minimize the likelihood that fire would escape your burn unit?

B) Maximize the likelihood that your resources can promptly contain a spot fire or slop-over?

C) Keep a fire from getting large if it is too fast or intense for your initial response capacity (e.g., what's your back-up plan)?

Tying to the Burn Plan

- How might modeling for containment influence your burn prescription?

- How else is your burn plan influences by your containment modelling and associated planning?