

OK-FIRE WORKSHOP - LAB EXERCISE #3

SMOKE DISPERSION Products and FIRE PRESCRIPTION PLANNER

CURRENT DISPERSION CONDITIONS

Go back to the Home page (click the OK-FIRE logo at the top of the page where you are at).

For your default (primary) Mesonet site, what are the most recent surface dispersion conditions (from the Oklahoma Dispersion Model)? (consult the “Weather” section of the data table)

Click on “Dispersion” in that table to get to the most current map of dispersion conditions and winds across Oklahoma. You can also access this map in the “Current Maps” section of the OK-FIRE module.

- a) *Where are the worst smoke dispersion conditions currently in the state (if at all)? Note that 6 = excellent, 5 = good, 4 = moderately good, 3 = moderately poor, 2 = poor, and 1 = very poor.***
- b) *In what direction would a smoke plume move if a fire were in your county? Use the wind vectors (arrows) to answer this question.***

PAST DISPERSION CONDITIONS

As with the fire weather and fire danger variables, note that map animations of dispersion over past periods are available in the “Past & Forecast Animated Maps” section (left menu item) and that charts and tables showing values at specific Mesonet sites over past periods are available in the “Past & Forecast Charts/Tables” section (left menu item). In both of these sections, the user has the ability to go back 30 days for dispersion conditions.

FORECAST DISPERSION CONDITIONS

Note, as with the fire weather and fire danger variables, forecast charts and tables of dispersion conditions are available in the “Past & Forecast Charts/Tables” section. Let’s look at the forecast dispersion chart for your default Mesonet station.

Click on “Past & Forecast Charts/Tables” in the left menu section. “Forecast” and “Charts” are already the defaults on this page, so nothing need be changed there. In the Variable pull-down menu select “Dispersion and Wind Conditions” and then “Get Data”.

Look at the forecast over the next 84 hours.

- a) *What is the predicted range of dispersion conditions during this forecast period?***
- b) *What are the forecast wind speeds and directions during the times of worst dispersion?***

Note: During very poor to poor dispersion conditions, winds are typically very light to calm and varying in wind direction. Under such conditions, forecasted wind directions can be unreliable as topographical effects come into play and the heavier and colder surface air will tend to drain toward lower elevations.

FIRE PRESCRIPTION PLANNER

Click on “Fire Prescription Planner” in the left menu section. In the prescription table that appears, note that you can click on the name of each variable in the table to learn more about it.

While there are many applications for this product, two major ones come to mind with respect to wildland fire management: prescribed fire (A), the most common application for this product, and wildfire (B).

A. PRESCRIBED FIRE PLANNING

Note that you can either enter your own prescriptions for your burn, or use pre-set prescriptions if you’re a beginning burner. To do the latter, click on “Use Conditions for Beginning Burners” at the upper left of the table. If you enter your own values, note that you need not enter all the variables listed, just the ones in your prescription. Likewise, you need not enter both Lower and Upper Limits; use only one if desired. To erase all the values you’ve entered, you can hit “Reset Values” above the table.

Let’s take a simple case, which represents conservative burning conditions -

**Air Temperature between 35F and 85F, Relative Humidity between 40% and 80%,
and Wind Speed between 5 and 15 mph**

Enter 35 as the “Lower Limit” and 85 as the “Upper Limit” for Air Temperature; 40 as the “Lower Limit” and 80 as the “Upper Limit” for Relative Humidity; and 5 for the “Lower Limit” and 15 for the “Upper Limit” for Wind Speed.

At the bottom of the prescription table, there are options for how far you wish to go through the forecast (the default in the “Show” pull-down menu is for the full 84 hours of the forecast) and whether to show only the prescribed variables in the resulting forecast table. The default is to show just the prescribed variables, but if you wish to show all variables in the forecast table, you can uncheck that box. Note if wind speed is one of the prescribed variables, then wind direction, whether prescribed or not, will also be shown because of its importance for smoke movement. Also note that you can change the Mesonet station to a different one than the default station. Just click the green oval containing the station name at the bottom left of the table, and change to another Mesonet station. When you have finished everything on this page, click “Get Data” in the green oval at the bottom right of the prescription table.

The first column after the “Date/Time” column in the resulting forecast table is the “Criteria Met?” column. For those times when ALL of your criteria are met (in this case the three variables - temperature, relative humidity, and wind speed), the cells in that column will be shaded in bright GREEN and contain “Yes”; those times not meeting all criteria will be shaded in bright RED and contain “No”.

Note that for each hour of the forecast period, each prescription variable’s cell is shaded either muted green or muted red, depending on whether its criteria were met or not at that hour. To be able to get a green cell in the “Criteria Met?” column, all prescription variables must have their cells green for that hour.

- a) ***Are there any times during the 84-h forecast period when your criteria are met? Are the wind directions consistent (no major shifts) during these periods?***

- b) ***If so, what days/times are indicated as “windows of opportunity” for your prescribed burn? Do these periods occur during the daytime and are they of sufficient length to finish your burn?***

Now let's do a more sophisticated prescription. Click "Change Prescription or Site" at the upper left of the forecast table, or use your browser back button. When you're back at the initial page, hit "Reset Values" above the prescription table, which will clear all your data fields. Let's put in the following prescription:

Wind Speed \geq 5 mph (Lower Limit) but \leq 20 mph (Upper Limit)
Dispersion Conditions \geq Moderately Good (Lower Limit)
1-h Dead Fuel Moisture \geq 7% (Lower Limit) but \leq 20% (Upper Limit)
KBDI \leq 650 (Upper Limit)
Wind Direction from the SW, SSW, S, SSE, or SE sectors

Enter the above values in the table (click on the five adjoining wind direction sectors) and observe the results (click "Get Data") for the same station. Note, in contrast to the last prescription, that we're not using relative humidity (rather, 1-h dead fuel moisture), allowing higher wind speeds between 15 and 20 mph, and also factoring in dispersion conditions, KBDI, and wind directions. So results will likely be different.

c) Are there any times during the 84-h forecast when these criteria are met? Do these periods occur during the daytime and are they of sufficient length to finish your burn?

Let's keep everything in the above prescription the same, but now specify:

Wind Direction from the NW, NNW, N, NNE, or NE sectors

Use your browser back button (or click "Change Prescription or Site") to get back to the prescription table. Deselect the existing specified wind direction sectors by clicking on them and then select the new sectors. Run the new prescription.

d) Has anything changed? Are there more suitable hours for your burn?

Note that we also have pre-set conditions for beginning burners that can be selected at the upper left of the prescription table. Click on "Use Conditions for Beginning Burners" (note this does not involve wind direction, but wind direction will still be shown in the forecast table) and run the Planner. Choose a different Mesonet location this time. Also, this time UNCHECK the "Show Prescribed Variables Only" to see how the resulting forecast table changes.

e) Are there any times during the 84-h forecast when these criteria are met? Are these periods expected to be rain-free (look at the 1-hr PRECIP variable column)?

NOTE: The forecast table in the Fire Prescription Planner, as with other OK-FIRE products, is based solely on output from the latest 84-h NAM forecast. As no weather forecast model is perfect, users are encouraged to check the official forecasts of the National Weather Service (NWS) for consistency or discrepancies in the weather variable portion of this forecast. In particular, consult the "NWS Forecast Chart (station name)" or "NWS Forecast Table (station name)" links in the left menu section. These provide the NWS hourly forecasts for your default (primary) station. To see these forecasts for another station, you'll have to temporarily change your default station to the other Mesonet station of interest. Finally, also remember that the further one goes out into the forecast period, the greater the uncertainty.

B. WILDFIRE (Fire Danger)

You can also use the Planner from a public safety standpoint to anticipate conditions when fire danger is high and the need for additional personnel may be in order. For this purpose, primary weather variables to consider are relative humidity and wind speed; 1-h dead fuel moisture is also important, as are Burning Index and Ignition Component.

Recall that the fire danger variables (Burning Index, Ignition Component, Spread Component, and Energy Release Component) are influenced by the satellite's daily assessment of surface greenness and by the currently assigned fuel model for the Mesonet site. If you don't like the currently assigned relative greenness (RG) or fuel model, you should change to a nearby Mesonet site having a more realistic RG and/or change the fuel model. Or you may wish to just stick with the weather variables and dead fuel moisture which are not influenced by greenness or fuel model.

Let's do a simple "fire danger prescription" using just Burning Index and Ignition Component. Let's say we're concerned about

Burning Index \geq 40 (Lower Limit) and Ignition Component \geq 25% (Lower Limit)

Go back to the first step of the Planner and click "Reset Values" to clear the data fields. Then enter these values in the table and choose a site of interest. Check the "Show Prescribed Variables Only" box at the bottom if it's not already checked. Note that in this application, GREEN shaded cells in the "Criteria Met?" column indicate the times of concern for possible wildfires according to your criteria.

Are there any times during the 84-h forecast when these criteria are met, indicating possible periods to be on guard?

Note that you can also just enter criteria for one variable (e.g., Burning Index) if you wish.

Now do a more sophisticated, but not necessarily better, "fire danger prescription" using just weather variables and dead fuel moisture (*note with such a prescription you don't need to worry about station or fuel model selection, as weather variables and dead fuel moisture are not influenced by relative greenness or fuel model*). Go back to the first step of the Planner and click the "Reset Values" button again to clear the fields. Let's say we're concerned about:

***Relative Humidity \leq 35% (Upper Limit)
Wind Speed \geq 15 mph (Lower Limit)
1-h Dead Fuel Moisture \leq 6% (Upper Limit)***

Enter these values in the table. This time uncheck the "Show Prescribed Variables Only" box at the bottom of the table. Hit "Get Data" and see if there are any times in the upcoming 84 hours when there might be high fire danger based on these criteria (look for the GREEN cells in the "Criteria Met?" column).

Are there any times during the 84-h forecast when these criteria are met, indicating possible periods to be on guard?