**BlueSky Playground Smoke Dispersion Exercises**

Go to: <https://tools.airfire.org>

Select: “v3” Under “BlueSky Playground”

NOTE: There is extensive HELP available at the “More Info / help (v3)” link

***Case #1 – Rx Burning in the wildland urban interface (WUI) of Bend, Oregon***

**STEP 1 – EMISSIONS INPUTS – Subway Map #1**

**Fire Information**

* Enter latitude: 44.0 degrees
* Enter longitude: -121.4 degrees
* Enter Size: 120 acres
* Select Fire Type: Prescribed

**Fuels**

* Click on the fuels “>” pull-down tab
	+ What FCCS Fuelbed # do you see?
* Select the Advanced tab to get into edit mode
* What is your default fuel loading?
* What are the top common fuelbeds near the fire location?
* What happens to your total fuel loadings when you select FCCS fuelbed #60?
* Select “Update from Map” to reset to the default fuelbed for the location

**Fuel Moisture**

* Click on the “>” pull-down tab
	+ What are your default fuel moisture values?
	+ How do those values change if you change the fire type to “Wildfire”?
* Select the Advanced tab to modify values.
* Set fire type back to prescribed fire.
* Change the moisture to “Dry”

**Consumption**

Click on the “>” pull-down tab to view data values.

**Timing**

* This section controls how emissions are allocated hourly over 1-3 days.
* Click on the “>” pull-down tab.
* Click on the pull-down menu to view the time profile for smoldering emissions.
* Change fire type to wildfire (in Fire Information tab).
	+ How does this change your flaming time profile?
	+ How does this change your smoldering time profile?
* Change your fire type back to Prescribed
* Click on the Advanced tab.
* Click “Shift 1 Hour Earlier”.
	+ What is your ignition time?
* Click “Shift 1 Hour Later” twice.
	+ What is your ignition time?
* Click “Reset to Default” to reset the time profiles to their default settings.

Select “I’m not a Robot”

Select “Run”

This will run the emission calculation stream of models.

**STEP 2 – EMISSIONS RESULTS – subway map #2**

What was your total fuel consumption? How does this compare to your total fuel loading?

Select “Run HYSPLIT”

**STEP 3 – METEOROLOGY INPUTS – subway map #3**

Select: “Pacific Northwest 4-km”

Select: 2018-04-30

Select: 48 hours

Select: Continue

**STEP 4 – DISPERSION INPUTS – subway map #4**

**Plumerise Tab**

* Select Advanced
	+ What is the maximum plume rise calculated?
* Adjust Plume Top: Select “50%”
	+ What is the maximum plume rise now?
* Adjust plume top back to “100%”
* Vertical Emissions Profile: This option allows you to modify how emissions are distributed vertically in the atmosphere.
* You can also control how much of the emissions are emitted near the surface (to simulate smoldering emissions) versus how much of the emissions are lofted into the atmosphere.

**Dispersion Tab**

* This is where you can set options specific to the HYSPLIT model.
* Select the Advanced tab
* The grid size is the extent over which PM2.5 concentrations will be calculated.
	+ What is the default grid size? What does it mean?
* HYSPLIT is run in the background in particle mode, so thousands of particles are used to simulate fire emissions. The greater the number of particles then the more improved the solution, but also the longer the runtime.
* Grid Resolution: This is the dispersion output grid resolution. The higher the grid resolution then the more calculations the model is doing, however, higher grid resolution helps resolve complex terrain features.

**\*\*\*\*\*\*\*\*\*\*\*\* STOP HERE – ASSESS HOW MANY HYSPLIT RUNS ARE GOING \*\*\*\*\*\*\*\*\*\*\*\***

Select Run HYSPLIT

**DISPERSION RESULTS – subway map #5**

After a minute or so you should see that the model run has successfully started. This run should take about 5 min to complete running HYSPLIT if you left all the options in the default mode.

Viewing your dispersion output: Playground

* Animation controls
* Timezone control

Viewing your dispersion output – Google Earth

* Clicking on the Google Earth link in the upper right section of the page to download the file.
* Once it has downloaded, open it in Google Earth.

**Question**: At about 4PM on May 1, where are the highest smoke concentrations?

Continue stepping through the output to about 4AM on May 2.
**Question**: What do you see?

***Case #2 – Rx Burning in the Deschutes National Forest***

Go to: <https://haze.airfire.org/playground/v3/emissionsinputs.php>

DO NOT GO BACK INTO YOUR CURRENT RUN

The goal with this second case is to duplicate everything about the first run, but use the 1.33-km resolution NW meteorology.

Follow Steps 1-2 in Case #1

**STEP 3 – METEOROLOGY INPUTS – subway map #3**

Select: “Pacific Northwest 1.33-km”

Select: 2018-04-30

Select: 48 hours

* Select: Continue

This run should take about 10-15 minutes to complete.

**Overall Questions:**

1. What are the primary differences between the two model runs?
2. How does this affect the output?
3. Are daytime and nighttime smoke dispersal patterns similar or different, how so?

***Case #3 – Smoldering Fuels***

We know that from prior research measurements in the region, that the combination of fuels smoldering overnight and nighttime south/SW wind flows are typically responsible for smoke intrusions into Bend, OR.

**Question**: How well do you think Exercises #1 and #2 captured these behaviors? Was smoke light or heavy?

**TO DO**: create an emissions scenario to simulate the smoldering fuels. Hint: work with duff fuel loadings. Use your time profile of emissions to examine how those emissions are distributed across the day, and how much is in smoldering versus flaming.

Note that by default, flaming emissions are distributed vertically in the atmosphere while smoldering emissions are emitted close to the ground. The plumerise tab gives you control of this, letting you decide how to vertically allocate emissions, and how much of the emissions to keep near the surface.

***Case #4 – Wildfire Simulation***

Use Case #2 to setup a wildfire simulation. Compare your Rx run with your wildfire run. How are your fuels and fuel consumption different? How is your time profile different? How does your smoke dispersion differ?