My NASA Data - Mini Lesson/Activity

Do Fireworks Create Air Pollution?

Grade Band

- 6-8
- 9-12

Time

- 30 minutes

Overview

Using hourly graphs of PM 2.5 data and HYSPLIT model trajectories, students will collect evidence for the effects of fireworks on air quality.

Student Directions

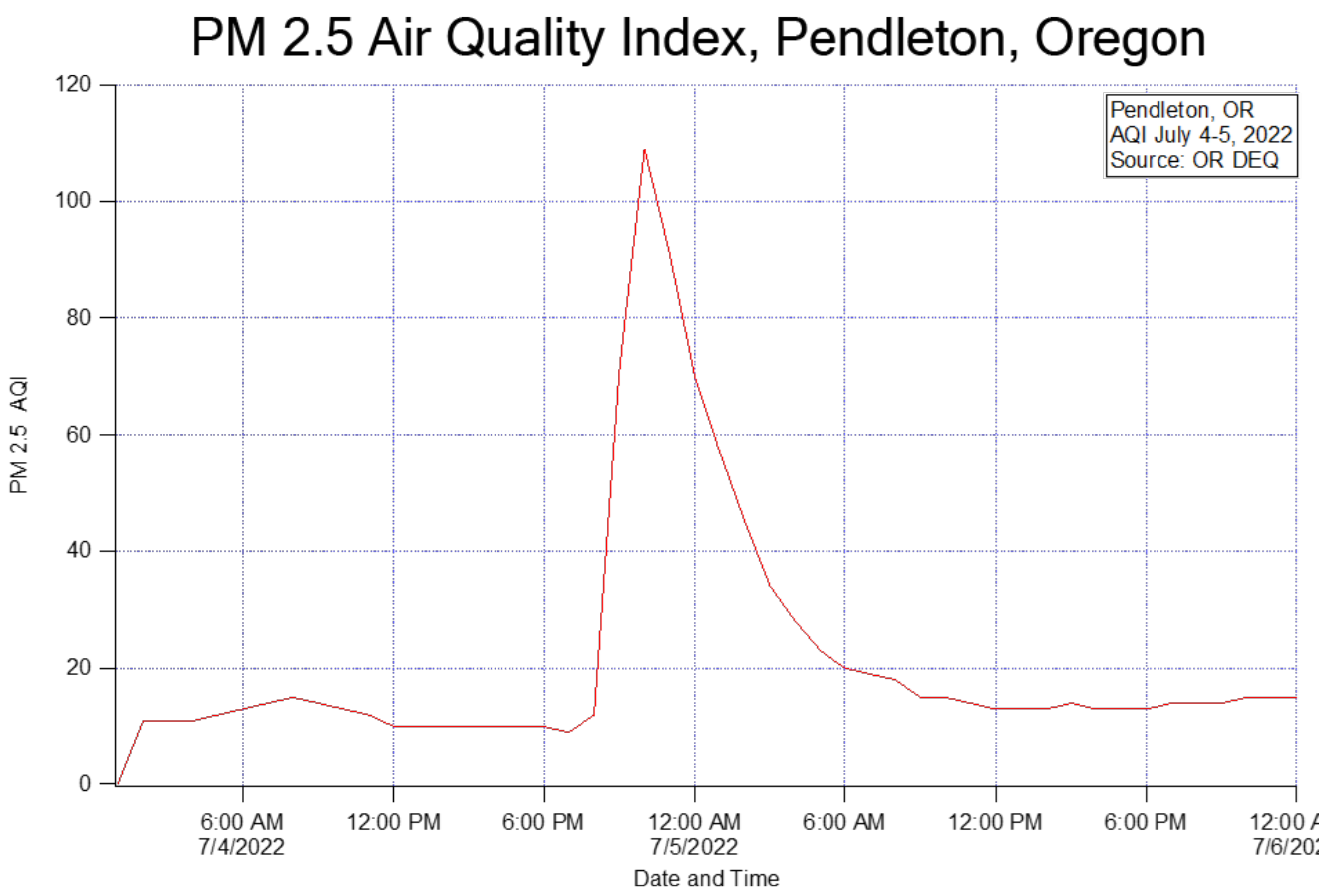
Fireworks are commonly used to celebrate or mark special events. Creating “fire in the sky” requires combustion, producing smoke, which is measured as PM, or particulate matter. PM is sometimes used to determine the air quality index rating. Is enough smoke produced by fireworks to impact air quality? Where does the smoke go after the fireworks show?

Review the graphs below and answer the questions.

Steps:

1. Check with your instructor on how to submit your answers.

   The graph below displays data from the Oregon Department of Environmental Quality, collected with a sensor in Pendleton, Oregon. Pendleton is a rural town in Northeast Oregon.

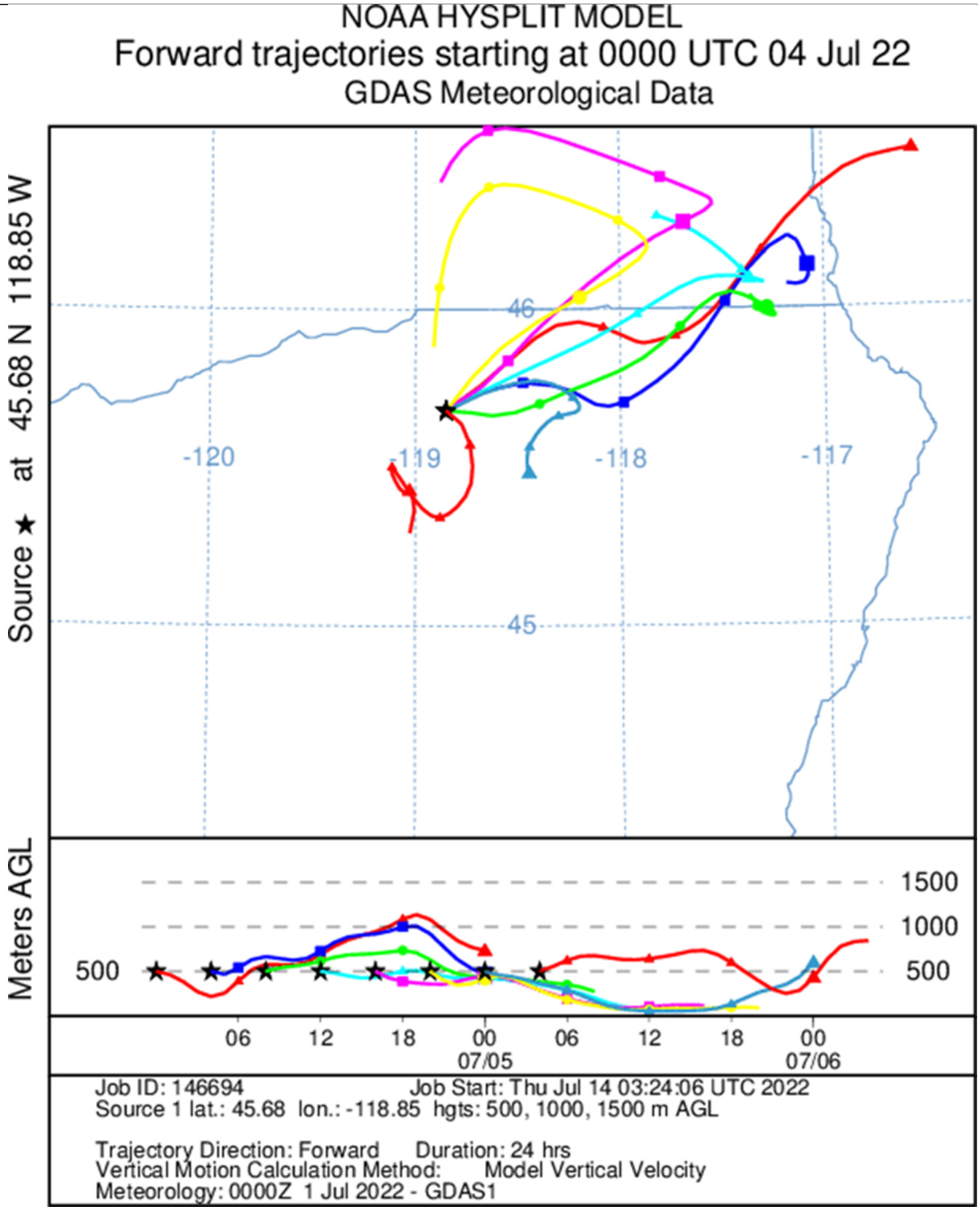


PM 2.5 of Pendleton, Oregon. Source: Oregon Department of Enviromenmental Quality | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Oregon_final_0.png

2. Identify the highest value reached for PM 2.5?

3. Approximately what time was the highest value reached?

A HYSPLIT graph from NOAA below shows the movement of air from or toward a specific location at a selected time for Pendleton, Oregon. A different color is used every 6 hours, so it looks a little confusing. Look at one color at a time, noticing the direction the wind is moving at that particular time. These graphs are useful when predicting the movement of smoke or other pollutants.

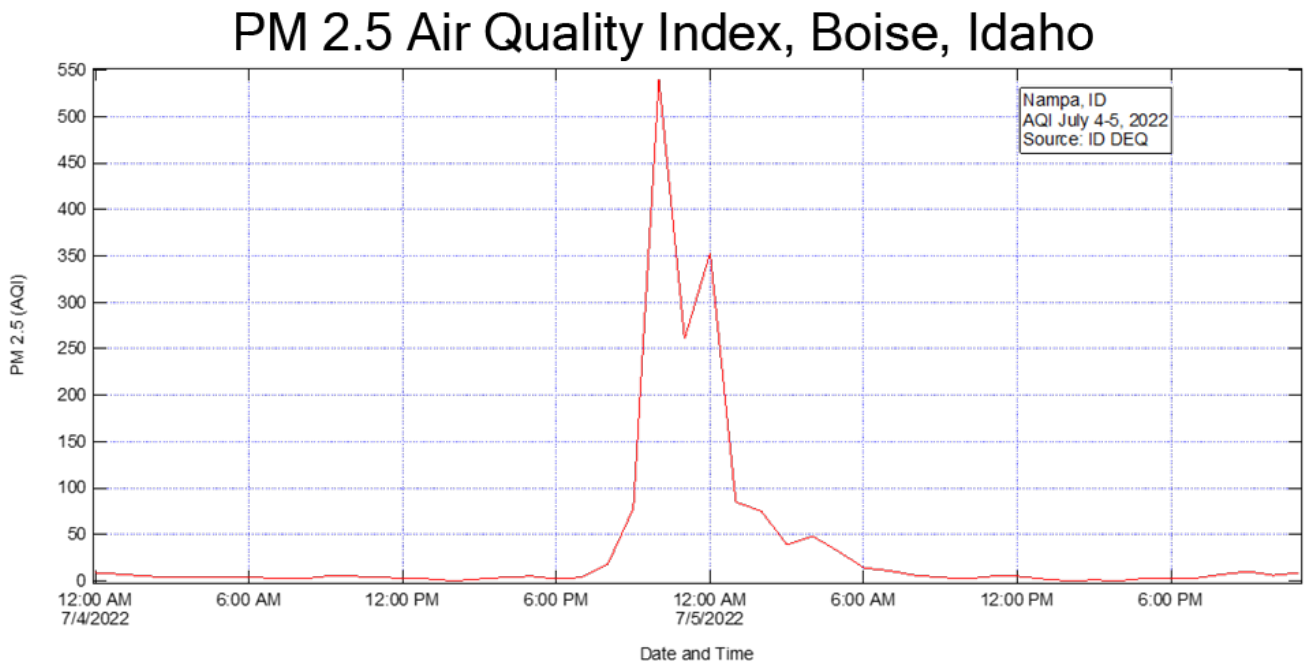


HYSPLIT model of wind going FROM Pendleton, Oregon. Source: NOAA | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Picture3_5.png

4. Indicate the general direction the wind moving from Pendleton, Oregon on July 4th (look at the light blue, pink and yellow lines on the map)?

5. Identify which state(s) were in line to encounter PM 2.5 from Pendleton fireworks?

Nampa, Idaho is very close to Boise, Idaho. Fireworks are very popular in this area, which has a large population compared to Pendleton. The data below was collected by the Idaho Department of Environmental Quality.

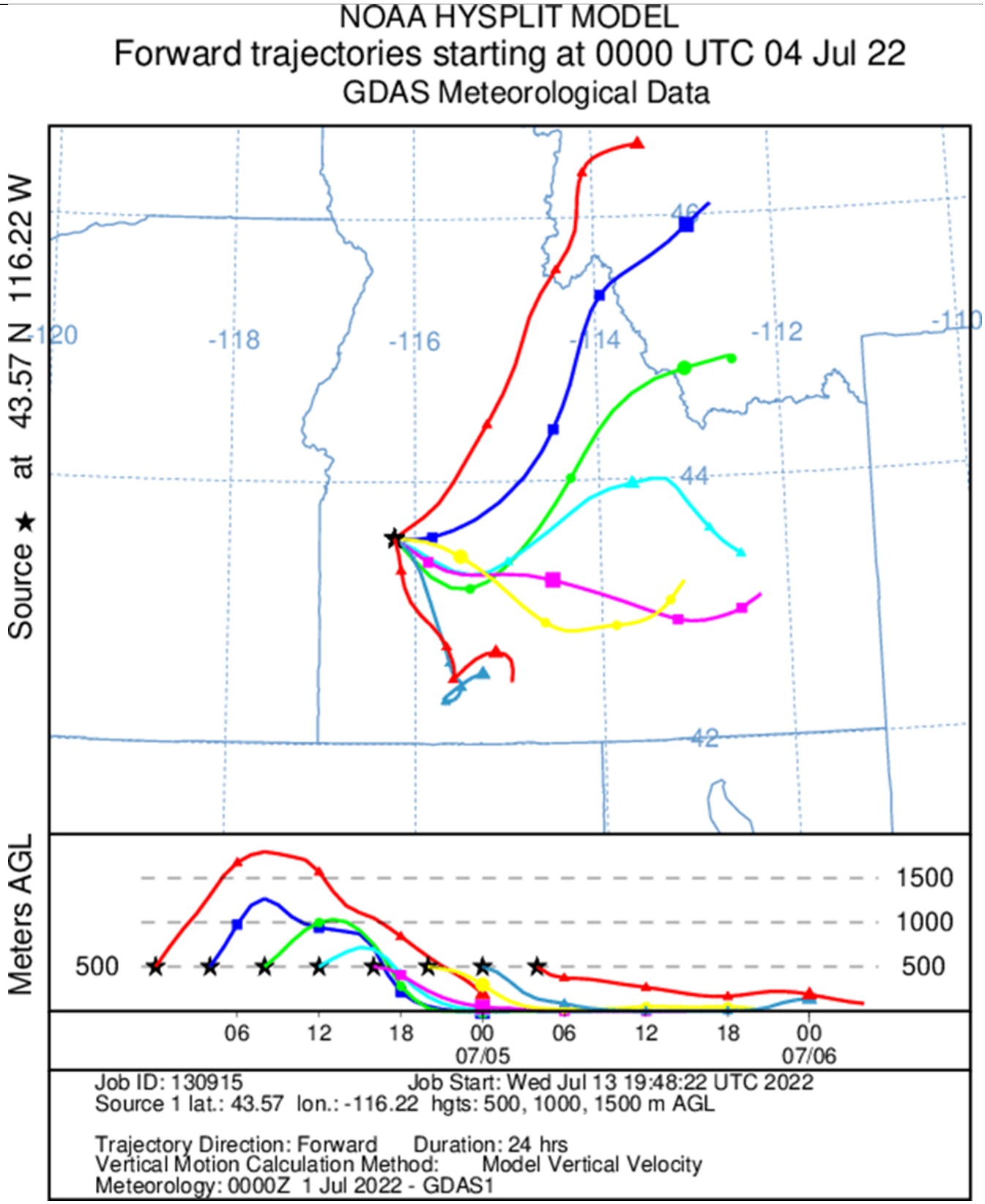


PM 2.5 of Boise, Idaho. Source: Idaho Department of Environmental Quality | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Idaho_final_0.png

6. Identify the highest value reached for PM 2.5?

7. Approximately what time was the highest value reached?

Now, review the graph of the HYSPLIT model for Boise, Idaho.



HYSPLIT model of winds FROM Boise, Idaho. Source: NOAA | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/HYSPLIT%20Idaho.png

8. Indicate the general direction the wind moving from Boise, Idaho on July 4th (Look at the green, light blue and pink lines on the map)?
9. Identify which state(s) were most likely in line to encounter PM 2.5 from Boise fireworks?

Sources:

1. Oregon Department of Environmental Quality : Air Quality Home : Air Quality : State of Oregon. (n.d.). Oregon.gov. Retrieved August 23, 2022, from https://www.oregon.gov/deq/aq/pages/default.aspx
2. (2022, April 20). Welcome to Idaho Department of Environmental Quality. Retrieved September 13, 2022, from https://www.deq.idaho.gov/
3. Air Resources Laboratory - HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory model. (2022, January 4). https ://www.ready .noaa.gov. Retrieved August 23, 2022, from https://www.ready.noaa.gov/HYSPLIT.php

Teacher Note

Teachers, these mini lessons/student activities are perfect "warm up" tasks that can be used as a hook, bell ringer, exit slip, etc. They take less than a class period to complete. Learn more on the "My NASA Data What are Mini Lessons?" page.

Teachers who are interested in receiving the answer key, please complete the Teacher Key Request and Verification Form. We verify that requestors are teachers prior to sending access to the answer keys as we've had many students try to pass as teachers to gain access.

NGSS Three Dimensional Learning

NGSS Disciplinary Core Ideas

- ESS3C: Human Impacts on Earth Systems

Crosscutting Concepts

- Patterns
- Cause and Effect

Science and Engineering Practices

- Asking Questions and Defining Problems
- Developing and Using Models

Document Resources

- Do Fireworks Create Air Pollution Student Sheets

Google Docs Interactive Files

Do Fireworks Create Air Pollution Student Sheets