

CURRICULUM

Science: Environment

MATERIALS

Materials: SLOC video “The Salt Lake Valley Watershed and You” (sent to each school), four plastic bottles, red food coloring, hot and cold water, index cards, copies of the Olympic Cleaner and Greener home checklist and student checklist (Can be downloaded from www.cleanerandgreener.org).

Help the Salt Lake Games get to Net Zero Air Emissions with Olympic Cleaner and Greener

Temperature inversions often create air pollution in Salt Lake City. These problems cause health concerns. SLOC is working with local industries and schools to decrease air pollution and create the first Olympic Winter Games with net zero air emissions. This activity demonstrates air pollution in the Salt Lake Valley during a temperature inversion, discusses where air pollution comes from and how we can all participate in its reduction.



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Objectives: STUDENTS WILL

- ▶ Discuss temperature inversions and air pollution
- ▶ Participate in an inversion and pollution experiment

Introduction:

Show students the ten minute video “The Salt Lake Valley Watershed and You” hosted by Bill Nye the Science Guy. Brainstorm sources and effects of air pollution.

Activity: DEMONSTRATE “INVERSION IN A BOTTLE” TO THE CLASS

- a. Fill two plastic bottles with hot water and red food coloring.
- b. Fill two plastic bottles with cold water.
- c. Place one of the bottles of hot water on one tray.
- d. Cover the mouths of the other bottles with the index cards.
- e. Without spilling the water, apply pressure to the index card on the bottle of hot water and turn it over, placing it on top of the bottle of cold water on the tray.
- f. Without spilling the water, apply pressure to the index card on the bottle of cold water and turn it over, placing it on top of the bottle of hot water on the tray.
- g. Without spilling the water, very gently pull out the cards.
- h. Observe the activity in the bottles and discuss how temperature inversions are caused by local weather conditions and the unique topography of the area (See text box).

DISCUSS: The degree that inversions affect people’s health depends on efforts to decrease air pollution. Ask the class what things cause air pollution and what might be done to reduce it.

Use an internet connection and the emissions calculator at www.cleanerandgreener.org/pollution-from-electricity.htm

HAVE STUDENTS:

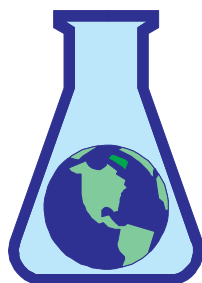
1. Calculate personal annual emissions contribution from electricity usage by finding their cost for electricity monthly.
2. Fill out the Home Emissions Reduction Action Checklist. Consider some of the suggested activities.
3. Collect checklists and calculate totals – submit these totals to the Olympic Cleaner and Greener program to help the Salt Lake 2002 Games be the Greenest Games ever.



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TEMPERATURE INVERSION

- Usually, the air that is close to the ground is warmer than that which is found at higher altitudes. This is because there is less pressure at higher altitudes than near the ground and as a volume of air expands, it cools.
- Since there is less pressure, there are fewer collisions of molecules because they have to travel farther before they encounter another molecule. (It is the collisions that give off heat, which we measure as air temperature.)
- However, this is only true for a column of air with uniform density. When the density of the air at the surface is dramatically different than the air above it (that is, dense, cold, DRY air is at the surface and less dense, warmer, moister air is above), then we see a warmer temperature at say 5,000 feet than at the surface. This almost always happens at night and happens frequently during the day in the winter months. When the air is especially still, the cooler air, because of its greater density, settles close to the ground, and the warmer air forms a blanket above it in a temperature inversion. Pollutants in the air, such as smoke and soot, are also trapped close to the ground. Fog, formed when moisture in the cool air condenses close to the earth's surface, becomes smog when combined with these pollutants.



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