**DEP Environmental Education Curricula**

**Lesson Plan**

**GRADE: High School**

**LESSON TITLE: Health Effects of Air Pollution**

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| **Next Generation Science Standards** |  |  | | |
| **HS-LS2-7** | **HS-LS2-7** | Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. | | |
|  | **Science and Engineering Practices** | Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. | | |
|  | **Disciplinary Core Ideas** | [Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.](http://www.nap.edu/openbook.php?record_id=13165&page=154) | | |
|  | **Crosscutting Concepts** | Much of science deals with constructing explanations of how things change and how they remain stable. | | |
| **Objectives** | | | | |
|  |  | **Objective 1:** Students will list and discuss the six criteria air pollutants in the United States.  **Objective 2:** Students will discuss the detrimental health effects of exposure to the criteria air pollutants.  **Objective 3:** Students will determine the air quality of their town on the day of their Health Effects of Air Pollution Project. | | |
| **Vocabulary** |  |  | | |
|  | **Accretion** | The process of growth or increase, typically by the gradual accumulation of additional layers or matter. | | |
|  | **Anthropogenic** | Originating in human activity. | | |
|  | **Micrometer** | The symbol for micrometer is μm. It is equal to 1 x 10 -6 meters, or one millionth of a meter. | | |
|  | **Volatile Organic Compounds** | The abbreviation is VOC. VOC are any compounds of carbon, excluding certain identified compounds, which participate in atmospheric photochemical reactions. | | |
| **Background** |  |  | | |
| **Teacher Version** Selected Materials from … **Criteria Air Pollutants** | | **Sources:** <https://www.epa.gov/criteria-air-pollutants>  And as noted below. | | |
| **Why Should We Care About Air Pollution?**  Ask students why they feel it is important to have clean air. Air Pollution can cause damage to health, the environment and property.  **Air Pollution**  The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants (also known as “criteria air pollutants"). These pollutants are found all over the U.S., some from natural sources and some from man-made sources. They can harm your health and the environment, and cause property damage.  (Source - https://www.epa.gov/criteria-air-pollutants)  **Criteria Air Pollutants**   * carbon monoxide (CO) * lead (Pb) * ground-level ozone (O3) * particulate matter (PM) * nitrogen dioxide (NO2) * sulfur dioxide (SO2)   Non-criteria pollutants include benzene, dioxins and pesticides.  (Source - https://www.epa.gov/criteria-air-pollutants)  **Carbon Monoxide**  Incomplete oxidation of carbon results in the production of carbon monoxide.   * + Natural CO formation occurs from photochemical reactions in the troposphere, volcanoes, forest fires, etc.   Breathing air with a high concentration of CO reduces the amount of oxygen that can be transported in the blood stream to critical organs like the heart and brain. At very high levels, which are possible indoors or in other enclosed environments, CO can cause dizziness, confusion, unconsciousness and death.  \*Anthropogenic sources are “man-made” sources, typically by incomplete combustion. CO can become high indoors by incomplete combustion in an improperly operating furnace.  Very high levels of CO are not likely to occur outdoors. However, when CO levels are elevated outdoors, they can be of concern for people with some types of heart disease. These people already have a reduced ability for getting oxygenated blood to their hearts in situations where the heart needs more oxygen than usual.  They are especially vulnerable to the effects of CO when exercising or under increased stress. In these situations, short-term exposure to elevated CO may result in reduced oxygen to the heart accompanied by chest pain also known as angina.  (Source - https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution#What is CO).  **Lead**  Sources of lead emissions vary from one area to another. At the national level, major sources of lead in the air are ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other sources are waste incinerators, utilities, and lead-acid battery manufacturers. The highest air concentrations of lead are usually found near lead smelters#. Volcanic activity and airborne soil are the primary natural sources of atmospheric lead.  #Plants that produce of lead are known as lead smelters.  Some feel leaded gas provides more power and less engine knocking for airplane engine operation. Piston aviation engines have historically used leaded gas to provide these desired qualities.  (Source - https://www.epa.gov/lead-air-pollution/basic-information-about-lead-air-pollution#how)  As a result of EPA's regulatory efforts including the removal of lead from motor vehicle gasoline, levels of lead in the air decreased in the U.S. by98percent between 1980 and 2014.  Some countries (as of 2014) still use leaded fuel, or a combination of leaded and unleaded fuel may be available: Afghanistan, Algeria, Iraq, Burma, Yemen and North Korea. It is not always clear how much leaded gas may be used by these countries.  Once taken into the body, lead distributes throughout the body in the blood and is accumulated in the bones.  Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system.  Lead exposure also affects the oxygen carrying capacity of the blood.  The lead effects most commonly encountered in current populations are neurological effects in children and cardiovascular effects (e.g., high blood pressure and heart disease) in adults.  Infants and young children are especially sensitive to even low levels of lead, which may contribute to behavioral problems, learning deficits and lowered IQ.  Lead Is a cumulative poison. It is ingested in food and water (5-10% absorbed) as well as being inhaled (20-50%).  (Source - https://www.epa.gov/lead-air-pollution/basic-information-about-lead-air-pollution#how)  **Ground Level Ozone**  Ozone is formed in the atmosphere when energetic ultraviolet (UV) radiation dissociates molecules of oxygen, O2, into separate oxygen atoms. Free oxygen atoms can recombine to form oxygen molecules but if a free oxygen atom (O-2) collides with an oxygen molecule (O2), it joins up, forming ozone (O3).  High level atmospheric ozone is desired - it absorbs ultraviolet radiation from the sun - but ground level ozone is not.  **Ozone**  Breathing ozone can trigger a variety of health problems, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma. Ground level ozone can also have harmful effects on sensitive vegetation and ecosystems    Photo: http://www.theozonehole.com/images/ozoneform.gif  Volatile Organic Compounds, shown in the figure above as VOCs, are a large group of carbon-based chemicals that easily evaporate at room temperature. While most people can smell high levels of some VOCs, others have no odor - Odor does not indicate the level of risk from inhalation of this group of chemicals. They can be found in household products including: paints, paint strippers, and other solvents; wood preservatives; aerosol sprays; cleansers and disinfectants; moth repellents and air fresheners; stored fuels and automotive products; hobby supplies; dry-cleaned clothing.    **Particulate Matter**  Examples of natural sources of particulate matter include sea salt, soil dust, volcanic particles, and smoke from forest fires. Small particles are removed from the atmosphere by accretion to water droplets, which grow in size until they are large enough to precipitate. Larger particles are removed by direct washout by falling raindrops.  EPA groups particle pollution into two categories:   * "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter. * "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.     Photo: https://www.epa.gov/sites/production/files/2016-09/pm2.5\_scale\_graphic-color\_2.jpg  Particulate matter (PM) contains microscopic solids or liquid droplets that are so small that they can be inhaled and cause serious health problems.  Particles less than 10 micrometers (μm) in diameter pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. Fine particles (PM2.5) are the main cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas.  (Source: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#effects>)  **Nitrous Oxides**  Nitrogen Dioxide (NO2) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NOx). Although some is naturally occurring, NO2 primarily gets in the air from the burning of fuel. NO2 forms from emissions from cars, trucks and buses, power plants, and off-road equipment.  Other nitrogen oxides include nitrous acid and nitric acid. NO2 is used as the indicator for the larger group of nitrogen oxides. (Source - https://www.epa.gov/no2-pollution/basic-information-about-no2#What is NO2)  Breathing air with a high concentration of NO2 can irritate airways in the human respiratory system.  Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms. Longer exposures to elevated concentrations of NO2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO2. NO2 along with other NOx reacts with other chemicals in the air to form both particulate matter and ozone. Both of these are also harmful when inhaled due to effects on the respiratory system.  Asthma attacks and respiratory issues can cause lost school days for students and lost work days for parents, not to mention the discomfort and scare caused by the inability to breath comfortably.  (Source - https://www.epa.gov/no2-pollution/basic-information-about-no2#What is NO2)  **Sulfur Oxides**  The largest source of SO2 in the atmosphere is the burning of fossil fuels by power plants and other industrial facilities. Smaller sources of SO2 emissions include: industrial processes such as extracting metal from ore, natural sources such as volcanoes, and locomotives, ships and other vehicles and heavy equipment that burn fuel with a high sulfur content.    (Source - https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#what is so2)  In an attempt to lower sulfur emissions international conventions now require that most ships burn low sulfur fuels, or that the ship has a “scrubber” to remove sulfur from the exhaust stream from the ship.  At high concentrations, gaseous SO2 can harm trees and plants by damaging foliage and decreasing growth and can contribute to acid rain which can harm sensitive ecosystems.  Short-term exposures to SO2 can harm the human respiratory system and make breathing difficult. Children, the elderly, and those who suffer from asthma are particularly sensitive to effects of SO2.  Unpolluted rain is naturally acidic because CO2 from the atmosphere dissolves to a sufficient extent to form carbonic acid. Rainwater typically has a ph = 5.0-5.6. Carbon dioxide and water in the air react together to form carbonic acid, a weak acid. Thus, normal rainwater has a pH of 5.6, not a neutral 7 as you might expect on the pH scale. When the pH level of rainwater goes below 5.6 (not 7) it is considered acid rain. (Source - https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#what is so2) | | | | |
| **Cross Cutting Concepts** | | Much of science deals with constructing explanations of how things change and how they remain stable. | | |
| Ask the students if they think their actions have any effect on the air quality around them. Discuss how the air quality in Maine is greatly affected by “upstream” states to their west where industrial activities may be greater. The United States has a rule that says if a downstream state can not meet their required air quality standards due to the action of an “upstream” state than the “upstream” state may be required to change their actions to reduce the pollution that might travel to another state. | | | | |
| **In Class Project**  **What is the Air Quality Today in Your Town?** | | | **Reference Data from Source:**  http://www.maine.gov/dep/air/ozone/ | |
| 1. Do you think like the air quality in your town is good today? Why or why not?   *Have the students write how they feel about the air quality and ask them to explain why or why not they think the air quality is good or poor.*   1. Have students access the following web site: <http://www.maine.gov/dep/air/ozone/>, which is the Maine Department of Environmental Protection Air Quality Page. *The following information is an example of the information you can find on this page for the date of access. Students will be able to find information for the day of site access as well as a forecast for the following day.*  |  |  |  | | --- | --- | --- | | **Region** | **Ozone** | **Particle** | | Northern | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Good](http://www.maine.gov/dep/air/ozone/pG.html?width=375) | | Western Mtns | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Moderate](http://www.maine.gov/dep/air/ozone/pM.html?width=375) | | Western Interior | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Moderate](http://www.maine.gov/dep/air/ozone/pM.html?width=375) | | Eastern Interior | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Good](http://www.maine.gov/dep/air/ozone/pG.html?width=375) | | Southwest Coast | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Moderate](http://www.maine.gov/dep/air/ozone/pM.html?width=375) | | Mid-Coast | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Good](http://www.maine.gov/dep/air/ozone/pG.html?width=375) | | Downeast | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Good](http://www.maine.gov/dep/air/ozone/pG.html?width=375) | | High Elevation | [Good](http://www.maine.gov/dep/air/ozone/G.html?width=375) | [Good](http://www.maine.gov/dep/air/ozone/pG.html?width=375) |   Map displaying today's Ozone forecast conditionsMap displaying today's Particle Pollution forecast conditions  Ozone Particle Pollution  *Note that the information is listed by forecast region. Have your students scroll down the site page and select their town in the following block on the web site page to see what region they live in.*  Not sure what forecast region your town is in? Select it from the list:   1. List the ozone and particle pollution conditions for your region.   *Good, Moderate, Unhealthy for sensitive groups, Unhealthy, Very unhealthy.*   1. Have the students scroll down to the Forecast Legend to list what health effects are expected with these air quality levels.  |  |  |  | | --- | --- | --- | | **Forecast Legend** | | | | **Air Quality Descriptor** | **Color Code** | **Health Effects** | | Good | **GREEN** | **No Health Notice**. No health impacts expected in this range. It’s a great day to be active outside! | | Moderate | **YELLOW** | **Limited Health Notice**. Sensitive people should consider reducing prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easy. | | Unhealthy for Sensitive Groups | **ORANGE** | **Health Notice**. People with heart or lung disease, the elderly, teenagers and children should reduce prolonged or heavy exertion. It is okay to be active outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. Asthmatics should follow their action plans and keep quick relief meds handy. Those with heart disease should watch for palpitations, shortness of breath or unusual fatigue and contact your health provider of necessary. | | Unhealthy | **RED** | **Health Advisory**. People with heart or lung disease, the elderly, teenagers and children should avoid prolonged or heavy exertion and consider moving activities indoors or rescheduling. Everyone else should reduce prolonged or heavy exertion. Take more breaks during all outdoor activities. | | Very Unhealthy | **PURPLE** | **Health Alert**. People with respiratory or heart disease, the elderly, teenagers and children should avoid any outdoor activity. Move activities indoors or reschedule to a time when air quality is better. Everyone else should avoid prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better. |   *Answers will vary*   1. What air quality descriptor is associated with the color purple?   *Very unhealthy*   1. What health effects are associated with the Very Unhealthy air quality descriptor?   ***Health Alert****. People with respiratory or heart disease, the elderly, teenagers and children should avoid any outdoor activity. Move activities indoors or reschedule to a time when air quality is better. Everyone else should avoid prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.* | | | | |
| **Teacher Prep** |  |  | | |
|  | **Advanced Preparation Steps &**  **Duration** | 1. Read and consider associated background material and in class project. (1 hour) 2. Review NASA video clip (1:55 minutes) 3. Review Air Pollution Health Effects PowerPoint (20 minutes) 4. Assemble Project Materials & Practice Project (1 hours) | | |
| **Needed Materials** |  |  | | |
|  |  | 1. NASA: U.S. air quality improving (1:55), <https://www.youtube.com/watch?v=L_6F0N2Ep3A> 2. Health Effects of Air Pollution PowerPoint (with embedded NASA video 3. Health Effects of Air Pollution Lesson Plan 4. Student Worksheet 5. Student Laptops with internet access | | |
|  | **Duration of activities** | 60 minutes | | |
|  | **Safety notes** | Always follow your school’s computer policy when going online. | | |
| **Procedures for instruction** |  |  | | |
|  |  | Introduce the class to the idea of air pollution and its health effects. | | ~2 minutes |
|  |  | Introduce the Idea of Air Pollutants, Criteria Air Pollutants, and the adverse health effects of exposure to such pollutants. | | ~25 minutes  (PowerPoint and embedded video) |
|  |  | What is the Air Quality Today in Your Town? | | ~20 minutes  (Class Project) |
|  |  | Discussion | | ~10 minutes |
| **Student Materials** |  |  | | |
|  | Background Informational Sheet | Reading assignment prior to the demonstration day. | | |
|  | Vocabulary List | Available for clarification of terminology as students read their Background Informational Sheet and In Class Procedure. | | |

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| **Student Background Information Sheet – Health Effects of Air Pollution** | | |
| **Air Pollution**  The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants (also known as “criteria air pollutants"). These pollutants are found all over the U.S., some from natural sources and some from man-made sources. They can harm your health and the environment, and cause property damage.  (Source - https://www.epa.gov/criteria-air-pollutants)  **Criteria Air Pollutants**   * carbon monoxide (CO) * lead (Pb) * ground-level ozone (O3) * particulate matter (PM) * nitrogen dioxide (NO2) * sulfur dioxide (SO2)   Non-criteria pollutants include benzene, dioxins and pesticides.  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| **Student Vocabulary List– Health Effects of Air Pollution** | | |
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| **Student Worksheet: What is the Air Quality Today in Your Town?** |
| Name |
| Date |
| Do you feel like the air quality in your town is good today? Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  With your teacher’s permission access the following web site: <http://www.maine.gov/dep/air/ozone/>, which is the Maine Department of Environmental Protection Air Quality Page. List the ozone and particle pollution conditions for your region. Note that the information is listed by forecast regions. To find your region scroll down the site page and select your town in the following block on the web site page to see what region in which you live.  Not sure what forecast region your town is in? Select it from the list:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Scroll down to the Forecast Legend to list what health effects are expected with these air quality levels. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  What air quality descriptor is associated with the color purple? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  What health effects are associated with the Very Unhealthy air quality descriptor? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Project Assessment**

**Project Title:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Instructor/School/Grade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructor Contact Information: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date assigned: \_\_\_\_\_\_\_\_\_\_\_\_\_ Number of Students Participating \_\_\_\_\_\_\_\_\_\_\_\_**

The following questions are intended to help us understand your feelings regarding the presentation and materials. Your sincerity in answering these questions is appreciated. Please feel free to use the space at the end of the form for any additional comments that you may have. *This form has been left in Microsoft Word format so that you may fill it in electronically. Please fill out the form completely and email your assessment to* [david.madore@maine.gov](mailto:david.madore@maine.gov).

**Ranking System**

1 ~ Excellent / Strongly agree

2 ~ Good – Above average / Moderately agree

3 ~ Average – ok / Neutral in agree or disagree

4 ~ Poor – below average / Moderately disagree

4 ~ Very poor – not acceptable / Strongly disagree

NA / not applicable

*Please continue on the second page…*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** | **NA** | **Questions** |
|  |  |  |  |  |  | **Course Content** |
|  |  |  |  |  |  | 1. Value of course content to you. |
|  |  |  |  |  |  | 1. Importance of course content given your teaching topic. |
|  |  |  |  |  |  | 1. Overall rating of course content. |
|  |  |  |  |  |  | 1. Ease of implementing materials into daily lessons. |
|  |  |  |  |  |  | **Materials/Project** |
|  |  |  |  |  |  | 1. Movie (if applicable) was easy to present. |
|  |  |  |  |  |  | 1. Student worksheet was useful and easy to follow. |
|  |  |  |  |  |  | 1. Student project stimulated thinking & conversation. |
|  |  |  |  |  |  | 1. The project put ideas across effectively. |
|  |  |  |  |  |  | 1. Teacher materials were useful and easy to follow. |
|  |  |  |  |  |  | 1. The method of material presentation encouraged students feel free to ask questions, disagree, express ideas, etc. |
|  |  |  |  |  |  | **Self-Evaluation (Instructor)** |
|  |  |  |  |  |  | 1. What was your level of knowledge concerning this topic prior to this presentation? |
| **Please share any recommendations you feel would be helpful.** | | | | | | |

**Thank you for providing your feedback!**

Please email your assessment to david.madore@maine.gov.