**Background Information**

**Greenhouse Gases and Climate Change:**

The Earth’s Climate system is complex. It is not only affected by what happens in the atmosphere, but in the ***cryosphere*** (sea ice, glaciers, ice caps, river and lake ice, snow, and frozen ground,) the oceans, the ***geosphere*** (land areas) and the biosphere. The interaction of these systems is difficult to predict. Understanding the changes in the Earth’s climate is one of the biggest questions facing scientists today.

Carbon Dioxide (CO2), nitrous oxide, methane and fluorinated gases are referred to as ***greenhouse gases.*** These gases along with others, let in infrared radiation given off by the sun but prevent some of the radiation that is emitted by the Earth from leaving the atmosphere, similar to the way glass panes of a greenhouse trap heat. CO2 is the primary greenhouse gas emitted by human activities. In 2011, CO2 accounted for 84% of all U.S. greenhouse gas emissions from human activities.

The concentrations of the many greenhouse gases have fluctuated during the history of the planet. However, air samples from ice cores representing the past several thousand years indicate that CO2 levels in the Earth’s atmosphere have been fairly stable at about 280 parts per million (ppm). Around 1860, at the beginning of the industrial revolution, CO2 levels began to rise. By 1958, CO2 levels were up to 316 ppm. In 2010, CO2 levels topped 390 ppm for the first time – a 40% increase since 1860. On May 9, 2013, another record was broken when scientists reported the CO2 levels in the atmosphere surpassed 400 ppm for a 24-hour period. Many scientists believe that the rise of CO2 levels will lead to changes in the Earth’s climate, referred to as ***global warming*** or ***global climate change***.

**Effects of Climate Change**

While scientists agree that the increase in atmospheric CO2 and other greenhouse gases will raise average world temperatures, there is some debate about the effects of such global warming. Most researchers believe that global warming could disrupt weather pattern worldwide, causing coastal flooding, an increased range of some of the disease causing organisms, an altering of natural habitats, and the potential extinction of some plants and animals. Other researchers believe that farming may benefit from warmer temperatures, but it is unclear how available those benefits would be with the unstable weather patterns expected with increase in greenhouse gas levels.

**Controlling Atmospheric CO2**

Most increases in carbon dioxide emissions come from burning fossil fuels to run automobiles, power plants, and industrial operations; however, the second largest CO2  source is the land use change, mainly clearing of forests for agriculture or development. Trees take up CO2 through photosynthesis and store the carbon in their trunks, branches, foliage, and their roots. This process is known as ***carbon sequestration***. When trees die and decompose, they release this carbon. By storing carbon, trees slow the rate at which CO2 accumulates in the atmosphere. One way people hope to reduce or reverse the buildup CO2 in the Earth’s atmosphere – and thus, reduce global climate change- is to increase the amount of carbon stored in forests through planting trees and sustainable forest management.

As scientists debate the possible side effects of the increase CO2 levels in the atmosphere, we can each examine our energy use and make efforts to reduce our own contribution to greenhouse gas emissions. ***Carbon footprint*** is a measure of how much CO2 one organization, person, or product produces – directly or indirectly- in a certain amount of time (usually a year). One way we can reduce our carbon footprint is by being more efficient in our energy use at home and at school. Reducing energy use helps to lower CO2 levels because in most areas of the United States, energy is produced by burning fossil fuels.