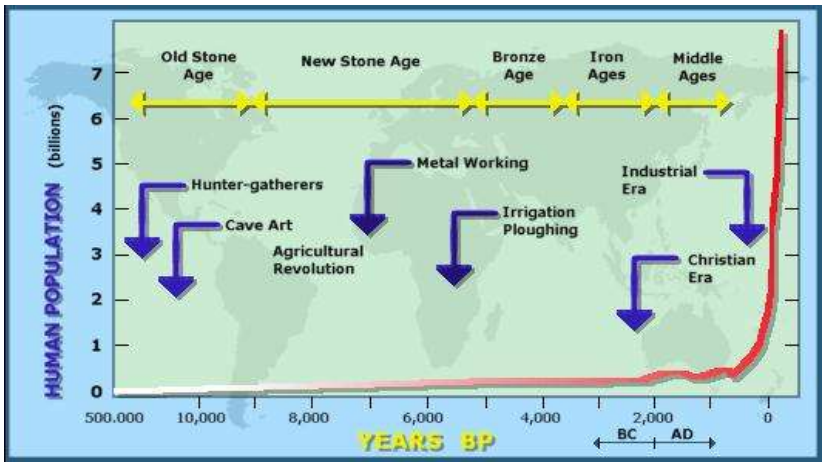
TEACHER BACKGROUND:
CLIMATE CHANGE AND POPULATION

The largest single threat to the ecology and biodiversity of the planet in the decades to come will be global climate disruption due to the buildup of human-generated greenhouse gases in the atmosphere. People around the world are beginning to address the problem by reducing their carbon footprint through less consumption and better technology. But unsustainable human population growth can overwhelm those efforts, leading us to conclude that we not only need smaller footprints, but fewer feet.

The world's population is on track to reach 8 billion people. In the meantime, global climate change, as a result of human activities, is having unprecedented effects on the planet's sea level rise, weather patterns, species habitat and freshwater resources. The United States' uniquely demonstrates how two issues – population and climate change – are intricately linked.

The United States has the largest population in the developed world, and is the only developed nation experiencing significant population growth: Its population may double before the end of the century. Its 300 million inhabitants produce greenhouse gases at a per-capita rate that is more than double that of Europe, five times the global average, and more than 10 times the average of developing nations. The U.S. greenhouse gas contribution is driven by a disastrous combination of high population, significant growth, and massive (and rising) consumption levels, and thus far, lack of political will to end our fossil-fuel addiction. More than half of the U.S. population now lives in car-dependent suburbs. Cumulatively, we drive 3 ***trillion*** miles each year. The average miles traveled per capita is increasing rapidly, and the transportation sector now accounts for one-third of all U.S. carbon emissions.

A population increases through a process called ***exponential growth***. The human population grew at the slow rate of only about 0.002 percent a year for the first several million years of our existence.

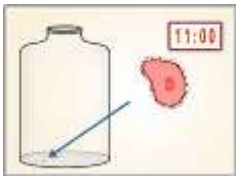


Since then the average annual rate of human population has increased to an all-time high of 2.06 percent in 1970. It has taken less and less time to add each new billion people. It took 2 million years to add the first billion people; 130 years to add the second billion; 30 years to add the third billion; 15 years to add the fourth billion; and only 12 years to add the fifth billion.

When most people talk about "growth" in our country, they consider it a completely positive and necessary thing, essential for maintaining the vitality and health of our economy and society. Our society's economic indicators are all based on this fundamental idea: that continuing growth is vital for the health and preservation of our economy and country. However, natural scientists know that this assumption is false. In order for growth to go on forever, we would need an infinite amount of space, energy, and other resources to keep the growth going... and those resources are not infinite. So what happens to steady growth in a limited space?

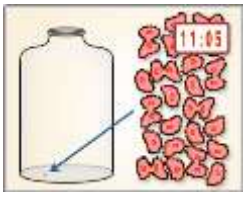
To help explain, we're going to use a simple example of bacteria growing in a bottle. Let's say that these bacteria have all the food they need. In this story, the only limits to the bacteria's growth are the walls of their bottle.

- At 11:00, we place a single bacterium in a bottle.



- In one minute, it grows to twice its original size and divides in half, reproducing itself, so at 11:01 there are two bacteria in the bottle.
- The bacteria continue growing and dividing, doubling their numbers every minute, so by 11:02 there are four, and by 11:03 there are eight.

At the end of five minutes, there are 32 bacteria where there used to be just one ... but even all together they're still so small they can't be seen without a microscope.



- The bacteria keep doubling their numbers every minute, until 12:00, when the bottle fills up.

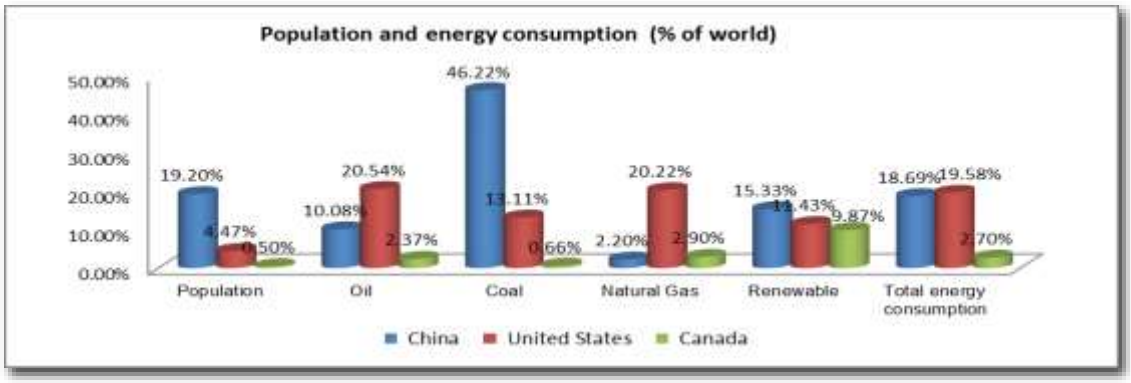
What happened to the bacteria is simply a case of over population in a world where the resources to maintain that species in a healthy, sustainable world were dissipated at such an incredible rate until that the species could no longer survive.

The population problem isn't just a matter of the number of people. People consume food, fresh water, wood, minerals, and energy as we go about our daily lives. And producing food, pumping groundwater, harvesting wood, mining minerals, and burning fuel all deplete our resource base and produce pollution. ***One critical indicator of environmental impact is to measure our energy consumption***.

A 2009 study of the relationship between population growth and global warming determined that the ***"carbon legacy"*** of just one child can produce 20 times more greenhouse gas than a person will save by driving a high-mileage car, recycling, using energy-efficient appliances and light bulbs, etc.

Each child born in the United States will add about 9,441 metric tons of carbon dioxide to the carbon legacy of an average parent. The study concludes, "Clearly, the potential savings from reduced reproduction are huge compared to the savings that can be achieved by changes in lifestyle."

The size of the carbon legacy is closely tied to ***consumption patterns.*** Under current conditions, a child born in the United States will be for almost seven times the carbon emissions of a child born in China and 168 times the impact of a child born in Bangladesh. In fact, the way of life in the United States, on average, requires approximately 5 times the resources available on Earth today



The globalization of the world economy, moreover, can hide the true carbon footprint of individual nations. China, for example, recently surpassed the United States to become the world's leading greenhouse gas emitter. But a large portion of those gases is emitted in the production of consumer goods for the United States and Europe. Thus a large share of "China's" greenhouse gas footprint is actually the displaced footprint of high-consumption western nations.

Like the bacteria, the human population is growing, using resources and expelling their by-products (greenhouse gases) at an exponential rate. The maximum population the Earth can sustain at some reasonable average living standard for its inhabitants is called the ***carrying capacity***. The human population today is well over 7 billion. Can we adequately provide the minimal needs for 8 billion people without sacrificing the quality of our environment, more specifically the Earth's climate? Raising their standard

of living to anything approaching that in developed countries may be impossible. Therefore, the population issue, along with many others, must receive our most serious consideration as we plan for the years ahead. If we do not control our global population, natural forces may do it for us.