POPULATION CONNECTION
Education and Action for a Better World

The Basics of Population Education

Dear Teacher: The following facts and principles form the backbone of our Population Education materials. Each of our activities is designed to communicate one or more of the following concepts, all of which are integral to a working understanding of the relationships between people, resources and the environment. You may wish to use this collection as a whole to prepare an introduction to a unit on population, or you may wish to use one segment at a time as preface or conclusion to individual activities.

The History of Human Population Growth

Years Elapsed	Year		Human Population
3,000,000	10,000 B.C.	*(Agricultural Revolution)*	5-10 Million
10,000	1 A.D.		170 Million
1,800	1800	*(Industrial Revolution)*	1 Billion
130	1930		2 Billion
30	1960		3 Billion
15	1975		4 Billion
12	1987		5 Billion
12	1999		6 Billion
12	2011	*(projected)*	7 Billion

Enabling Growth

Agriculture: About 12,000 years ago, several cultures shifted from hunting and gathering to farming. Humans became the first and only species ever to control our own food supply, and steady population growth was the result. In the absence of other limiting factors, *any* population will expand to the limit of its food supply; this happens so reliably that it is considered a law of ecology.

Technology: The development of agriculture led to urban shift, division of labor, and advancements in mathematics, literacy, and science. By about 1800, major advances collectively referred to as the "Industrial Revolution" were occurring. Breakthroughs in medicine, nutrition and sanitation brought down child mortality rates and led to longer life spans. The mechanization of agriculture and improvements in food preservation led to even greater increases in food production and availability. Human numbers began doubling at an unprecedented pace.

Rates of Growth

Past: A graph of human population before the agricultural revolution would likely have suggested a wave, reflecting growth in times of plenty and decline in times of want, as graphs of other species' populations continue to look to this day. The graph of recent human population growth is referred to as a "**J curve**," as it follows the shape of that letter, starting out low and skyrocketing straight up.

Present: World population reached 6 billion people in 1999, and is projected to reach 7 billion in the late fall of 2011. At the present rate of growth, over 75 million a year, the world adds a Hong Kong every month, an Iran every year and a Europe each decade.[1] The United States, with over 300 million people, is growing by more than 2.8 million people each year.[2] At this rate, we are one of the fastest growing industrialized nations in the world, and we have the third largest population of all nations, preceded only by China and India.[3] Teen childbearing rates in the US are the highest in the developed world with more than 400,000 births to teenagers each year.[4]

Future: With a current annual growth rate of 1.2%, world population is projected to double in just 58 years.[5] Our doubling times will be realized *if and only if* growth rates remain constant. Today, the world's birth rate is about two and a half times its death rate. The closer these two rates are, the slower population growth will be.

Zero population growth is the demographic term for the state of equilibrium reached when birth and death rates are the same. Momentum is also a factor in population growth. Some countries, like the U.S., are growing even though the average woman has just two children. In such cases, a population can still take 60-70 years to stabilize, and will do so only when the percentage of elderly people is equal to the percentage at child-bearing age.

Density vs. Consumption

Space vs. Carrying Capacity: "The entire world's population could fit into the state of Texas." This statement is frequently cited by people who don't understand the difference between *land not currently **occupied by** humans*, and *the **amount** and **type** of land required to **support** human life*. People are only able to live in densely populated areas if enough space elsewhere is left much less densely populated. For instance, arable land must be available to grow the food for people living in cities and suburbs, and trees and other plants must be left to produce the oxygen we all need.

An area's carrying capacity is the number of a given species that area can support without impairing its ability to continue supporting that population. The land within Texas could not provide enough food, water, or energy to meet the needs of nearly 7 billion people; nor could it accommodate all the waste generated by so many. Because that area could not come close to *sustaining* all the world's people, the fact that we could all physically *fit* into that space is virtually meaningless.

What is Overpopulation? Most people equate overpopulation with crowding, but, in fact, density is largely irrelevant to questions of overpopulation. What *is* relevant is carrying capacity. An area is overpopulated when its long-term carrying capacity is being degraded by its current human occupants.

Degree of Impact: The impact of any human group on its environment has to do with three equally important factors. The first is the number of people. The second factor encompasses the ways in which we manufacture goods, design communities and use technology. The third is the actual amount of resources consumed by each person. Unfortunately, the rate at which industrialized nations consume resources makes their populations' effect on the planet vastly greater than that of developing countries. Consider the following examples:

> **Energy:** Americans constitute less than 5% of the world's population, but are responsible for nearly 21% of the world's annual energy consumption, including 22% of fossil fuels. On average, one American consumes as much energy 2 Germans, 9 Syrians, 11 Colombians, 20 Indians, 112 Haitians, or 304 Ethiopians.[6]
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> **Natural Resources:** A person living in an industrialized country consumes twice as much grain, three times as much meat, nine times as much paper and eleven times as much gasoline as someone in a developing country.[7] North America, with 5% of the world's population, consumes 30% of the aluminum.[8]
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> **Land Use:** In the last 200 years the United States has lost at least: 71% of its topsoil, 50% of its wetlands, 90% of its northwestern old-growth forests, and 99% of its tallgrass prairie.[9, 10] In the United States, more than 8,000 square miles of land per year disappear under suburban sprawl—most often land of superior quality for agriculture.[11]

Global Warming: In 2007, the U.S. was responsible for 20% of the world's carbon dioxide emissions, more than any other country.[12] China, with over four times more people than the U.S., now produces more total carbon dioxide, but the U.S. leads in per capita emissions.[13] Carbon dioxide is the primary greenhouse gas, responsible for 60% of global warming caused by greenhouse gases.[14]

Water Pollution: In the U.S., 44% of streams, 64% of lakes, and 30% of estuaries are unfit for swimming or fishing.[15] Agricultural chemicals, eroded sediment, and animal wastes have fouled over 173,000 miles of waterways.[16] Almost 45% of our drinking water comes from groundwater sources, and 38 states reported finding pesticides, some or which cause cancer, in their groundwater.[17]

Waste: The more we consume, the more waste we produce. By the time a baby born today in the United States reaches the age of 82 years, he or she will have produced at least 60 tons of garbage.[18] The average American generates 4.4 lbs. of solid waste each day.[19] Average people in France produce 2.9 pounds[20] and in South Africa 1.5 pounds[21], while residents of Egypt and Pakistan produce less than 1 pound per day.[22]

Population growth and rapid consumption of resources are equal parts in the problem of environmental degradation, so addressing only one of these problems will not be enough. For example, the United States could reduce our consumption of resources and generation of pollution by half today, but *if we did so without slowing our growth rate*, the difference would be made up in 116 years, when our population is expected to double what it is now.

THE ENVIRONMENT

The Importance of Biodiversity: The greater the variety of species within it, the more robust an ecosystem will be. It is the biodiversity, the variety of life on Earth, all inter-connected to each other, that makes our survival possible. Biodiversity provides crucial "ecosystem services"--clean water, breathable atmosphere, and natural climate control, upon which all species depend. The extermination of plant populations changes climates locally and has severe regional effects through disturbance of the water cycle. Food, medicine and shelter are all derived from the abundant organic resources of the Earth. In fact, more than 50% of the prescription drugs dispensed worldwide are derived from wild plant species.[23]

As human numbers grow, we demand more space and resources from the Earth, and taking more for ourselves means leaving less for other species. Loss of wildlife habitat results in the extinction of countless numbers of plant and animal species every year. Currently, 20-75 plant and animal species are lost every day as a result of deforestation. It is estimated that by 2015 some 6-14% of all species will have gone extinct.[24]

Everything Is Connected: Failing to anticipate *all* the results of our actions may have negative effects no one wants. For example:

> Scientists in the Netherlands recently found that some bird eggs were not hatching because the eggshells were breaking in the nests. They traced this problem back to the burning of fossil fuels. Birds get calcium for their eggshells from the shells of the snails they eat. Snails absorb calcium for their shells from the soil, but in this area, the soils had become acidic from acid rain. The rain was acidic because of air pollutants caused by the burning of fossil fuels (such as gasoline and coal). The acidic moisture in the soil dissolved its calcium, thus depriving the snails of their calcium, which in turn deprived the birds of calcium, weakening their eggshells.[25]

No one burns fossil fuels with the intent of causing acid rain *or* making it so difficult for birds to reproduce. Nevertheless, we are equally as responsible for the unintended consequences of our actions as for the intended ones.

Recommended Resources

50 Simple Things Kids Can Do to Save the Earth, John Javna, EarthWorks Group, 1990, Kansas City, MO: Andrews and McMeal, 156 pp. This book is full of experiments, facts, things kids can do to keep the planet healthy and make a difference. For grades K-8.

Overpopulation, Rebecca Stefoff, 1992, Broomal, PA: Chelsea House, 111 pp. Part of the ***Earth at Risk*** series, ***Overpopulation*** gives an accurate and comprehensive understanding of the social and environmental impacts and causes of population growth. The author's inclusion of adequate preliminary information and simple vocabulary enables even middle school students to grasp the concepts. For grades 5-12.

Ishmael, Daniel Quinn, 1995 (reissue), New York: Bantam, 263 pp. This novel won the Turner Tomorrow Fellowship in 1991 for a work of fiction offering positive solutions to global problems. It is the story of a man in search of a teacher. The teacher he finds provides his student with an entirely new vision of both humanity's history, and its potential role in the universe. For grades 6-12.

Beyond the Numbers: A Reader on Population, Consumption, and the Environment, Laurie Ann Mazur editor, 1994, Washington, DC: Island Press, 450 pp. Divided into eight topic sections, this reader covers a number and variety of issues tied to population. Thoughtful essays address both the causes and effects of population growth including the social, political, and economic factors involved. For grades 9 and up.

The State of the World Population, serial, New York: United Nations Population Fund. Each year UNFPA publishes a report dedicated to specific population issues. The 2009 edition highlights the connections between women, climate, and our changing population, while previous editions have focused on resources and the environment, urbanization, women, and population and development. All are in PDFs free for download from http://www.unfpa.org. For grades 9 and up.

The Population Explosion, Paul and Anne Ehrlich, 1991, New York: Touchstone, 320 pp. A follow up to ***The Population Bomb***, it examines human population growth as it relates to a host of environmental and social problems. This work illustrates many of the issues through detailed facts and examples, and the final chapters are dedicated to solutions. For grades 9 and up.

Collapse: How Societies Choose to Fail or Succeed, Jared Diamond, 2005, New York: Penguin Books, 592 pp. Diamond explores the factors that led to the collapse of ancient civilizations such as Easter Island and the Mayan civilization, including overpopulation and outstripped resources as a lesson for modern-day societies. For grades 9 and up.

National Center for Health Statistics: www.cdc.gov/nchs/
Population Action International: www.populationaction.org
Population Reference Bureau: www.prb.org
U.S. Census Bureau: www.census.gov
United Nations Population Fund: www.unfpa.org
World Bank, Development Education Program: www.worldbank.org/depweb
Population Connection: www.populationconnection.org
Education Program: www.populationeducation.org

Works Cited

[1,3] US Census Bureau, International Database, http://www.census.gov. [2] US Census Bureau PopClock. www.census.gov/main/www/popclock.html, viewed May 2007. [4] Alan Guttmacher Institute. *Facts on American Teens' Sexual and Reproductive Health.* 2006, http://www.guttmacher.org/pubs/fb_ATSRH.pdf. [5]Population Reference Bureau, *2006 World Population Data Sheet*, Washington, DC. [6, 12] U.S. Department of Energy, Energy Information Agency, 2007, http://www.eia.doe.gov [7] World Resources Institute, *EarthTrends Data Tables: Resource Consumption*, 2005. [8] Natural Resources Canada, www.nrcan.gc.ca. [9] Robbins, John. *Diet for a New America*. Walpole, NH: Stillpoint, 1987. [10] The World Resources Institute. *The 1993 Information Please Environmental Almanac.* New York, Houghton Mifflin, 1993. [11] Ehrlich, Paul and Anne. *One with Nineveh.* Shearwater Books, Washington, DC. 2004. [13] Netherlands Environmental Assessment Agency, www.mnp.nl/en [14]*Summary for Policymakers: The Science of Climate Change- IPCC Working Group I.* The United Nations, 1995. [15] EPA National Water Quality Inventory http://www.epa.gov/owow/305b/2004report/factsheet2004305b.pdf [16] New York Times. "Farms are polluters of nation's waterways." May 14, 1998. p. A19. [17] EPA Region 5 and Purdue University, "Ground Water Primer," http://www.epa.gov/seahome/groundwater/src/ground.htm#toc. [18] Laszlo, Ervin. *The Choice: Evolution or Extinction?*. New York: G.P. Putnam's Sons, 1994. [19, 20] Organisation for Economic Co-operation and Development http://www.oecd.org. [21]South Africa Department of Environmental Affairs and Tourism www.environment.gov.za [22] WWF Pakisatan www.wwfpak.org; American Chamber of Commerce in Egypt. http://www.amcham.org.eg [23] Sugal, Cheri. "Forest Loss Continues". *Vital Signs 1997.* Washington, DC: Worldwatch. [24] Wilson, E.O. 1992. *The Diversity of Life.* Cambridge: Beknap Press of Harvard University Press. [25] National Wildlife Federation, http://www.nwf.org.