

Topic 9: Ecology – 9a. Population

9a2. Human Population Web Quest

Resources: Miller, K., Levine, J. (2004). *Biology*. Boston, MA: Pearson Prentice Hall.

Pison, G., van Blyenburgh, N. 6 Billion Human Beings [Internet].
Muséum National d'Histoire Naturelle. 1997. Cited 3 Aug. 2009. Available
from: <http://www-popexpo.ined.fr/english.html>

Calhoun, J. Abstract: Population Density and Social Pathology [Internet].
Feb. 1962. Original Document: *Scientific American* 206(2), 139-148.
Abstract: Johns Hopkins Bloomberg School of Public Health. Cited
3 Aug. 2009. Available from:
<http://www.popline.org/docs/0152/620189.html>

Ramsden, E., Adams, J. Escaping the Laboratory: The Rodent
Experiments of John B. Calhoun and Their Cultural Influence. Dept. of
Economic History, London School of Economics [Internet]. 2008.
Available from:
[http://www.lse.ac.uk/collections/economicHistory/pdf/FACTSPDF/2308R
amadams.pdf](http://www.lse.ac.uk/collections/economicHistory/pdf/FACTSPDF/2308R
amadams.pdf)

Building on: The study of *ecology* is the study of *interactions* among organisms and between organisms and their environment. A *population* is defined as one specific organism at a specific time and specific place. The study of populations focuses on their roles in the ecosystem, their *niches*. These niches interact to achieve a balance in the *ecosystem*. When they are not in balance, *changes* take place. The number in a population plays a large role in the balance of the ecosystem. If a *predator* population becomes too large, the *prey* population is going to decline. If too many fish inhabit an aquarium, the *wastes* will build up too fast and many of the fish will die. All of these laws of nature apply to humans as well.

This activity is designed to take a look at *human population* growth both globally, and by different regions of the world. Factors that increase and slow human population growth will be examined through the use of this website.

Links to Chemistry
and Physics:

Rate of change

Stories:

A scientific paper was published in 1962 about the behavioral changes that took place in rats that were living in overcrowded conditions. John B. Calhoun, working at the National Institute of Mental Health set up the experiment. He constructed a large habitat for Norway rats. The habitat

had a central, open area and radiating from it were limited access nesting sites. He placed a number of rats into the habitat and allowed them to live and reproduce freely. He always provided them with enough food, water, nesting materials and he always disposed of waste materials. The only limit on the population was the amount of space available.

What Calhoun discovered was that aggressive male rats took over the limited access nesting sites, preventing other males from coming into the area. The aggressive males began establishing harems of female rats. In these limited access areas the rat behavior remained normal. The birth rate remained steady and the number of rats remained fairly constant.

As mice matured, they were either kept in the local nest or pushed out by the dominant male into the center open area of the habitat. Many of the males that were pushed into the open area became very aggressive toward each other and toward the female mice in the open area. Some of these male mice even banded together. The birth rate in the center area went up, but the mortality among the newborn was almost at 90%. The females of the center area stopped building nests for the newborn, sometimes giving birth right on the sawdust. Many females stopped nursing and caring for the newborns. The males in the central area often ate the young, further contributing to the high mortality rate.

This study has been used many times as a model of human behavior, particularly in overpopulated urban areas. Whether that is an accurate comparison or not is debatable.

The entire of article by John B. Calhoun was published in the February issue of the 1962 *Scientific American* magazine. I have been unable to find it on the Internet, but have supplied the URLs for two web sites that summarize his research.

Materials for This Activity:

- Internet access
- Internet Explorer web browser

Notes to the Teacher for This Activity:

I have had trouble using this website with other web browsers. I would recommend trying it with your web browser prior to giving it out to your class or just direct the class to Internet Explorer.

One of the valuable aspects of this activity is the attempt to let the students see that conditions are very different in different parts of the world. The fact that the average age of marriage in Africa is 19 years or that 10,000 children die of diarrhea each day is very surprising to most kids.

Ecology: Population Web Quest 6 Billion Human Beings

Using **Internet Explorer** as your web browser, go to the following URL:

<http://www-popexpo.ined.fr/english.html>

This site is sponsored by the Muséum d'Histoire Naturelle in Paris, France.

Select the "6 Billion Human Beings" link and follow the program, and answer the following questions as you go through the website:

1. Record the world population as you begin this activity. (Note that the numbers may stack up on themselves, but if you scroll a little bit up or down, they will become clear.)
Beginning World Population = _____
2. Record the time when you begin this activity.
Beginning Time = _____
3. On what date did the world population reach 6 billion? _____
4. According to the website, what is the doubling time for the world population of humans? _____
5. Guess how many humans were on earth when you were born? _____
6. Enter your age and record the correct answer. _____
7. By what % has the world population increased since you were born? _____
8. How many babies can a woman theoretically have in her lifetime? _____
9. Globally, women get married on average at what age? _____
 - a. In North America? _____
 - b. In Africa? _____
 - c. In Asia? _____
10. Globally, women breastfeed for an average of _____ months.
What is the average length of breastfeeding in the following areas:
 - a. North America = _____
 - b. Africa = _____
 - c. Asia = _____
 - d. Europe = _____
 - e. South America = _____
11. What does breastfeeding have to do with population control?
12. What % of couples in North America use birth control? _____
In Africa? _____
13. How many children die from diarrhea each day? _____
14. Recent global population growth is primarily due to what? _____
15. What % of all babies born in North America the same year as you are still **living**? _____
In Africa? _____

16. What % of the world population is younger than you? _____
What % will be younger than you in 25 years? _____
In 50 years? _____
17. In North America today, what % of the population is younger than you? _____
In Africa? _____
18. In the 1750s human population began to rise quickly. Why?
19. If the world population was 10-15 billion people, how would our quality of life change?
Examine the following issues, give an opinion and support your opinion.
- a. Will our natural resources run out?
 - b. Will we all live in larger cities?
 - c. Will starvation increase?
 - d. Is population aging going to be a threat?
 - e. Will AIDS decimate our population?
20. For this next question, you may need to return to the first page of this website (a shortcut to that first page is in the column on the right-hand side of the website).
What is the world population as you finish this activity?
Finishing World Population = _____
21. What is the time as you finish this activity?
Finishing Time = _____
22. By how many people did the world population increase while you were working on this activity? _____
23. How many total minutes (round to the whole minute) did you spend working on this activity? Time = _____
24. According to your data, what was the increase in human population per minute while you were working on this activity? _____
25. Doubling time is the amount of time needed for a population to increase by 100% (to double its current number). Using the population when you started this activity and the population increase per minute from question #24, calculate the doubling time for world human population. Set up your formulas and show your work. (Circle your final answer.)
26. Does your answer agree with the website (your answer to question #4)? _____
27. Write a hypothesis that might explain the difference in the two values.