

World Real Estate

Introduction:

Every environment has a **carrying capacity** — the point at which it can no longer support additional members of a species with the natural resources they need to survive. When asked to determine how much land a human being needs for survival, students may think only in terms of their living space. They often do not realize how much land is needed to provide them with food, fuel, shelter and textiles for clothing.

Carrying capacity for each animal species depends upon the amount of natural resources available on a given area of land. For example, to raise one cow, you would need one acre (about the size of a football field) of very rich pasture land, or ten acres of range land, or 100 acres of scrub land. Likewise, our land needs depend on our lifestyles. For instance, do we eat mostly vegetables or a lot of meats and dairy products? Do we live in a small apartment or have a large house with lots of energy-using conveniences? These are just a few of the variables that determine how many people the Earth can support.

Materials:

Student Worksheets (one per student)
Graph Paper
Calculator (optional)

Procedure:

Duplicate the student worksheet so that each student will have a copy. Have students answer each question on the worksheet. They may be instructed to work independently or in pairs or small groups. Then lead a class discussion of the answers (given below) and the extended learning questions.

Answers to Student Worksheet Questions:

1. All student estimates should be allowed, no matter how farfetched. For the sake of class discussion, the actual amounts of land needed for the animals listed are as follows:
 - a. 1 acre.
 - b. 1.2 acres.
 - c. 32,000 acres, or 50 square miles.
 - d. 38,400 acres (60 square miles) if it is male or 3,200-12,800 acres (5-20 square miles) if it is female.
 - e. 8,000 pounds of fish (in a pond 40 feet deep at the center).



Understanding
Population Dynamics

Concepts:

The size of any population, including the human population, must have an upper limit, as there is only a finite amount of essential resources to support the population. Because many resources come from the land, the way land is used is a factor in determining how many people the Earth can support.

Objectives:

Students will be able to:

- ◆ Define carrying capacity.
- ◆ Calculate land availability per person, both current and historical.

Subjects:

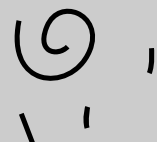
Math, Science, Social Studies, Family and Consumer Sciences, Geography, History

Skills:

Estimating, calculating percentages, dividing, graphing, critical thinking

Method:

Students calculate how much land there is for each person on Earth, given different population sizes, and what types of habitat make up the land.



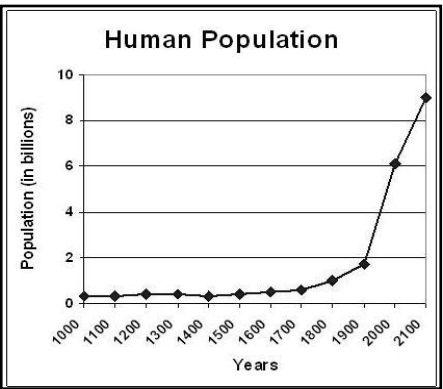
f. There is no one right answer to this question, since different lifestyles would determine how much land a human requires. A wealthy American celebrity may require millions of acres to gratify his/her desire for fine clothes, food and homes, while a resident of a poor African village may only require two or three acres of land.

2. a. Student estimate.
b. How many people there are and how many acres of land there are on Earth.
c. 5.3 acres.
d. It will get smaller.

3.

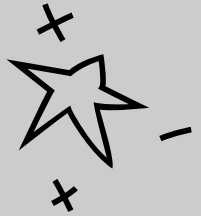
YEAR	POPULATION (BILLIONS)	ACRES/PERSON
1000	0.3	123.3
1100	0.3	123.3
1200	0.4	92.5
1300	0.4	92.5
1400	0.3	123.3
1500	0.4	92.5
1600	0.5	74.0
1700	0.6	61.7
1800	1.0	37.0
1900	1.7	21.8
2000	6.1	6.1
2025	8.1	4.6

4.



5.

	Land Area (ha)	Percentage of World Total	Your "Fair Share" (ha)	Your "Fair Share" (acres)
World	15 Billion	100.0	2.5	6.18
Forest	3.5 Billion	23.3	0.57	1.41
Cropland	1.5 Billion	10.0	0.25	0.62
Permanent Pasture	3.5 Billion	23.3	0.57	1.41
Other	6.5 Billion	43.4	1.1	2.72



Bonus question: 84,000,000 people (84 million)

Discussion Questions:

1. How do you explain the dip in population between 1300 and 1500?
What are some possible explanations for the sharp increase in population from 1800 to the present?

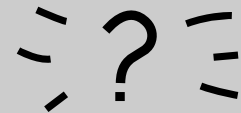
The dip in population between 1300 and 1500 was largely due to the spread of the deadly bubonic plague (also called the Black Death). It killed about 75 million people in Europe and Asia. The sharp increase in population has been a result of advances in science and technology that have allowed people to live longer. These include better nutrition, sanitation, food production and modern medicine. At the same time, birth rates have not dropped to the levels of death rates in most parts of the world.

2. How do you think the quality of life will change by additional increases in human population? How might it get better? How might it get worse?

Resources on the Earth are limited, and, as population grows, we have to share those resources with more and more people. Quality of life might get better if we were able to find ways to reduce waste and use resources more efficiently. Quality of life would get worse if people could not meet their basic needs because their share of resources was too small.

3. As we use more and more land for the needs of people, what will happen to the animals and plants that are now living on the land? Why?

As animal and plant habitats are used for human habitats, the populations of those other species are likely to decrease, creating more extinct and endangered species.



Adapted with permission from Mike Weatherby, Kilo Junior High School, Federal Way, WA.

Source for land use figures: United Nations Food and Agriculture Organization, www.fao.org

Name: _____ Date: _____

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Student Worksheet – Page 1 of 2

1. How many acres of land do you think each of the animals below would require to accommodate all their needs? The acres could be jungle, grassland, pond or whatever your animal required. Remember, an acre is about the size of a football field and the animal must get all of its needs from its habitat.

- a) A cottontail rabbit needs_____ acres of land.
- b) A chipmunk needs_____ acres of land.
- c) An African elephant needs_____ acres of land.
- d) A black bear needs_____ acres of forest land.
- e) You could raise_____ pounds of fish in one acre of a deep pond.
- f) A human being needs_____ acres of land.

2. a) If we divided the entire land area of the world up into acres and gave every person on Earth an equal share of acres, how many acres do you think your fair share of land would be?_____.

b) To determine the actual amount, what would you need to know?

_____.

c) If there are about 7 billion people on earth and the Earth contains about 37 billion acres of land, what is your fair share of land?_____ acres.

d) What will happen to your fair share of Earth if the world's population continues to grow?

_____.

3. In fact, each person's "fair share" of land has decreased over time as the human population has grown, but the amount of land has stayed the same. Fill out the table to find out how many acres of land people had in the past and how many acres people will have in the future for the years listed. Remember, divide billions of people into 37 billion acres of land.

YEAR	POPULATION (BILLIONS)	ACRES/PERSON
1000	0.3	
1100	0.3	
1200	0.4	
1300	0.4	
1400	0.3	
1500	0.4	
1600	0.5	
1700	0.6	
1800	1.0	
1900	1.7	
2000	6.1	
2025	8.1	

4. Create two graphs based on your answers on the table. On one, graph population growth for each of the years listed. On the other, graph land per capita for each of those same years. For comparison, make both graphs about the same size.

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5. The chart below shows how the world's land can be grouped by land use. Calculate the percentages of the world's total land that these categories comprise. Then, using these percentages, calculate how much of your current "fair share" (use 2000 data from your chart on page 1) is forest, cropland, etc. (Note: The land area is given in hectares (ha). 1 ha = 2.47 acres.)

	Land Area (ha)	Percentage of World Total	Your "Fair Share" (ha)	Your "Fair Share" (acres)
World (all land)	15 billion			
Forest	3.5 billion			
Cropland	1.5 billion			
Permanent Pasture	3.5 billion			
Other	6.5 billion			

* Includes built-up land, uninhabitable land (e.g. frozen tundra, deserts, high mountains, wetlands, etc.). Antarctica alone is 1.4 billion acres, 9.3% of all the world's land.

Bonus Question:

If the world's population of 7 billion is growing by 1.2%, how many additional people will there be after one year?

