

## REFLECTION

What ways can one reduce their own ecological footprint?

### **What part of my Footprint can I influence?**

Some of each person's Ecological Footprint is dependent upon choices they make in their own life, such as how much they drive, recycle and purchase new products, and some of it is their per person share of their societies' infrastructure. The first part can be influenced directly. The second part is equally critical to living within the means of one planet, but must be influenced through more indirect action such as political engagement, green technology and innovation, and other work toward large-scale social change. For more information on these distinctions, [click here](#).

## Population Growth...

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- A population is a group of organisms of one species that interbreed and live in the same place at the same time (e.g. deer population).
- **Organism** → a living thing
- **Species** → level of classification
- The term "**population growth**" refers to how the number of individuals in a population increases (or decreases) with time.
- If a population has a constant birth rate through time and is never limited by food or disease, it has what is known as **exponential growth**.

### **EXAMPLE of Exponential Growth**



### Fluctuations of Human Populations...

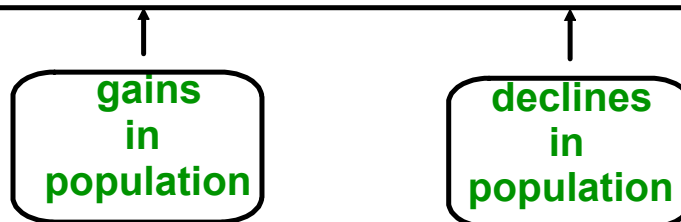
- LOCALLY
- REGIONALLY
- GLOBALLY

## Changing Population Sizes

Four variables affect changes in population sizes...

1. births
  2. deaths
  3. **immigration** - act of entering a nation
  4. **emigration** - act of leaving a nation
- [A person emigrates **from** Germany and then immigrates **to** Canada.]

$$\text{population change rate} = (\text{births} + \text{immigration}) - (\text{deaths and emigration})$$

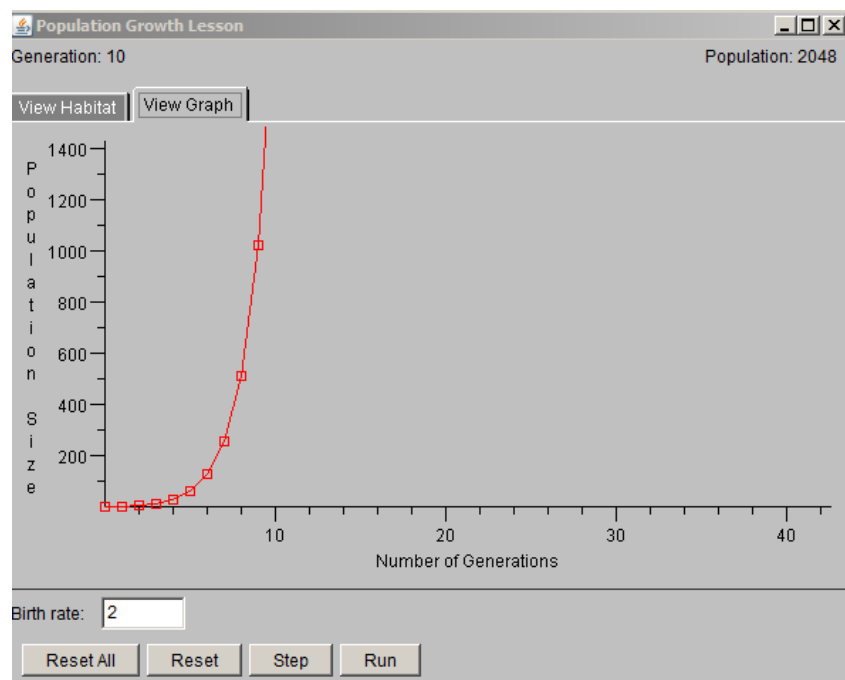


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Under ideal conditions:

1. the **biotic potential** of a population is the maximum rate at which it can increase
2. **exponential growth** occurs - the population increases by the same percent from one time period to the next.

<http://www.otherwise.com/population/exponent.html>



## Calculating Exponential Growth

Formula for Exponential Growth

A quantity  $A$  that has exponential growth can be modeled by

$$A = P(1 + r)^n$$

A measures the quantity at any time.

P is the initial value of A, when  $n = 0$ .

r is the rate (%) of growth, in decimal form.

n is the elapsed time.

<http://www.math.andyou.com/pdf/152.pdf>

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**EXAMPLE:** The growth rate of a bacteria culture is 52% each hour. Initially, there are two bacteria. How many bacteria are there after 12 hours?

$A = ?$

$P = 2$

$r = 52\% \rightarrow 0.52$  (decimal)

$n = 12$

$$\begin{aligned}
 A &= P(1+r)^n \\
 &= 2(1+0.52)^{12} \\
 &= 2(1.52)^{12}
 \end{aligned}$$



12	$A = 2(1.52)^{12}$	$A = 304$
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SOLUTION