

Unit 5 Discussion Example - Modeling Population Growth

Post 1: Initial Response

I am going to model the population growth of the prairie dog population that exists across from my children's school. I live in Boulder, CO and prairie dogs are very common and protected quite a bit in various places. We have lots of space that is designated as "open space" here in Boulder and so we have an organization part of the city government, Open Space and Mountain Parks (OSMP), that manages this land.

1) A goal of the OSMP is to consider future growth of prairie dogs to maintain a healthy balance between people and the environment. The change in the prairie dog population, if left unchecked and un-managed, is definitely growth versus decline in nature! However, even though it feels like they reproduce often, they only mate one a year with litters of 3-8 pups, and often many young die. A few variables that would affect the growth rate are.

1. Size of litter each year
2. Weather conditions
3. Disease

They are listed in order of importance for which is most likely to impact the population growth. I will create my mathematical model taking into account the new babies being born since I believe that to be the most important variable for population change in this case.

2) I am assuming that the growth is geometric since for every female/male pair, they have 3-8 pups in their litter – let's say they have 4 pups on average in each litter. Therefore, each female/male pair (2) will increase the population to 6. Going from 2 prairie dogs to 6 is a multiplication factor of 3!

Let's say the initial prairie dog colony starts at $a_0 = 100$ prairie dogs.

The multiplication factor, $r = 3$

The very simple model then would be :

$$a_n = 100(3)^n$$

3) Here is an algorithm for the next 10 years, $n = 10$. The variables to trace are a_n and n .

$a_0 := 100, n := 1$

while ($n \leq 10$)

$a_n := 100(3)^n$

$n := n + 1$

end while

Notice how I first calculated the population and then updated the value of n !