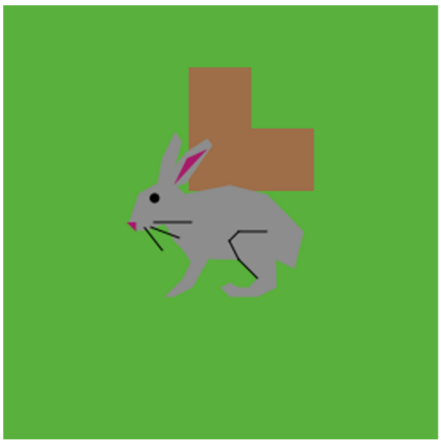
CARRYING CAPACITY

Carrying capacity refers to the maximum population size of an organism that can be sustained by an environment. It is determined by the availability of key resources in the environment, such as food, water, and habitat. These resources are known as limiting factors. As populations approach carrying capacity, the environment can sustain less population growth, and population growth will slow and eventually reach

The Model

This model consists of two components: animals and food sources. The animals in this case are hares, while the food sources are vegetation in the hare's environment. Some parts of the environment have food (green) while others do not (brown).



Hares require food from their environment. Each day, a hare will consume the food in its immediate environment. This removes the food from the source for now, but it will regrow after a certain number of days. If there is no food available in the hare's environment, the hare dies.

If the hare survives, it will try to move to a surrounding food sources that has no other hares on it. If one of those sources has food, the hare will choose to move there; otherwise, it will move to any free source nearby. If there are no free sources in the surrounding area, the hare will stay where it is.

After all the surviving hares have moved, a percentage of the existing hares will reproduce. The new hare will then move to any free food source with food available. If there are no free sources with food, then environment cannot sustain the new animal and the reproduction fails.

How the Model Works

The Carrying Capacity model can be used to experiment with the effects of food availability on carrying capacity. To set up an experiment, you will need to

1) Set the starting number of hares using the *start-hare-population* slider (default is 10, max is 100)

2) Set the amount of time it takes for food to regrow with the *food-regrowth-time* slider (default is 2 days, max is 10 days)
3) Press the *Setup* button to initialize the model, and then press *Go* to let the model run
4) While the model is running, you can control the speed of the model with the slider at top
5) Press the *Go* button again to stop the model

As the model runs, the animals will interact with their environment as described in the section above, repeating these actions each day. A graph on the right side of the model tracks the total population over time.

Questions

1. What would you estimate the carrying capacity to be when food takes 3 days to regrow?

   Answer: Around 190 (between 180 and 200 OK)

2. What happens to carrying capacity when you increase or decrease the time it takes for food to regrow?

   Answer: Increasing the time it takes food to regrow lowers the carrying capacity, decreasing it

3. What kind of effect does changing the start population have on carrying capacity?

   Answer: None or not much. This only changes how quickly carrying capacity is reached.

4. Once the population reaches the carrying capacity, does it remain steady? Why do you think this is?

   Answer: No, it goes up and down slightly due to stochastic effects of reproduction and death

5. Is this model realistic? What would make it more reaslistic?

   Answer: Open ended (e.g temporal and spatial relationships, adaptations, predators, water needs, etc)

About the model

This model is built using the NetLogo modeling platform. You can see the code that's used in the model by opening the *Code* tab at the bottom of the screen. Comments in the code (lines that begin with a ; semicolon) describe how each part of the code works in the model. If you want to learn more about