LAB # 3

Modeling a Predator-Prey Relationship

Goals.
To develop an interactive model of predator-relationships, and investigate the sensitivity of the model to the input parameters.

Procedure.
Study the “Intro to STELLA” materials and familiarize yourself with the basic operation of the software.

Begin by constructing a simple exponential model of rabbit growth. Run it, check the graph, and make sure that you have a population that is growing exponentially, but not too explosively!

Next, construct a parallel model of Coyote growth. Add in an outflow of coyote deaths. At this point, the coyotes have no food, so deaths should exceed births and the population should be declining (but not too precipitously).

Now, link the two populations so that the population of coyotes inversely affects the rabbits, whilst the population of rabbits positively affects the coyote population.

Set the initial populations of coyotes and rabbits to 10 and 200. Adjust the remaining variables (coyote birth rate, rabbit birth rate, coyote starvation rate, and rabbit deaths due to predation) one at a time, and observe the results. Persevere, and you can get coupled oscillations.

What is the general relationship between these parameters that leads to coupled oscillations?

THINGS TO CONSIDER

If you were asked to construct a model of deer populations which is to be used to determine the number of annual “deer tags” (i.e. hunting licenses) to be issued by a State management agency, what parameters would you need/want to know to input into your model?