**Lotka Volterra**

***The two populations in this model are described by the following equations:***



***H (herbivore), P (predator), b (prey birth rate), a (predator attack rate), e (conversion efficiency of prey to predators), s (predator death rate)***

***1. The conceptual model***

Located in Directory Lotka Volterra, file LotkaVolterraConceptualModel1.png

***2. Dynamics with initial conditions and parameters of b=.5, a=.02, e=.1, s=.2, Ho=25, Po=5***

Located in directory Lotka Volterra, sub-directory Lotka-Volterra-Plots, file LV.png

***3. Additional simulations changing different parameters at each time:***

Located in directory Lotka Volterra, sub-directory Lotka-Volterra-Plots

Vary Initial Conditions= varying the initial number of prey and predators alters the graphs and its primary shape, to keep the other simulations under the same conditions, the initial conditions provided in part 2 were used instead.

Vary A= .01, .04, .005, .08

Vary B= .1, .3, 1, 2

Vary S= .1, .4, .05, .8

Vary E= .2, .4, .05, .025

Each variable is located in its own folder.

All of the conditions varied held the other variables constant at the initial condition parameters from step 2. The graphs were formed separately then combined into one. The combined graph is easily labeled LV-(variable, a/b/s/e).png.

***The Role of Each Parameter:***

***Role of Predators:***

***Parameter Values and Predator-Prey Cycle Length:***

**Rosenzweig MacArthur**

***The two populations in this model are described by the following equations:***

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***H (herbivore), P (predator), b (prey birth rate), a (carrying capacity), e (conversion efficiency of prey to predators), s (predator death rate), w (attack rate), d (prey camouflage ability)***

***1. The conceptual model***

Located in Directory Rosenzweig MacArthur, file Rosenzweig MacArthur ConceptualModel1.png

***2. Dynamics with initial conditions and parameters of b=.8, a=.001, e=.07, s=.2, Ho=500, Po=120, d=400, w=5***

Located in directory Rosenzweig MacArthur, sub-directory Rosenzweig-MacArthur -Plots, file RM.png

***3. Additional simulations changing different parameters at each time:***

Located in directory Rosenzweig MacArthur, sub-directory Rosenzweig-MacArthur -Plots

Vary a= .001, .002, .004, .005, .00025

Vary b= ..2, .4, .8, .1.6

Vary d= 100, 200, 400, 500, 800

Vary e= .05, .06, .07, .08, .09

Vary s= .05, .1, .2, .3, .4

Vary w= 3, 4, 5, 6, 7

Each variable is located in its own folder.

All of the conditions varied held the other variables constant at the initial condition parameters from step 2. The graphs were formed separately then combined into one. The combined graph is easily labeled RM-(variable).png

***Difference from Lotka-Volterra:***

***Role of Each Parameter:***

***Parameter Values and Predator abundance:***

**Paradox of Enrichment**

***Simulated dynamics with capacity varying from 800 to 2000***

Located in Directory Paradox of Enrichment, file PE800.png and PE2000.png

The code is the same as used in the Rosenzweig MacArthur code. The carrying capacity, variable a (alpha) was changed from .00125 to .0005 which gave capacities from 800 to 2000.

***Increase in Carrying Capacity:***

***Paradox of Enrichment:***

The growth of herbivores is proportional to the size of the herbivore population. The proportionality constant for this growth is b. show plots…

Larger b, quicker growth and regeneration

The parameter ‘a’ shows up in two places of the equations. The negative change of the herbivore population is proportional to the product of the size of the herbivore and predator population with the proportionality constant ‘a’. Likewise, the growth of the predator population is proportional to the product of the herbivore and predator populations with the the constants ‘a’ and ‘e’. The function of a is therefore that it modulates how strong the predator-prey interaction is. A large ‘a’ means that the predators are very effective at finding and eating the pray. Show plots

Result, when a becomes large we see a steep decrease in herbivores and a sharp increase in predators.

The constant e shows up as a factor in the predator growth term. The function of e is to modulate how fast the predators will multiply in numbers in response to eating prey.

The parameter s only shows up in the negative growth term for P. The term indicates that the predators die at a rate the is proportional the size of the predator population. So the effect of s is analogous to the lifetime of the predators. Large s equates to a short lifetime of the predators