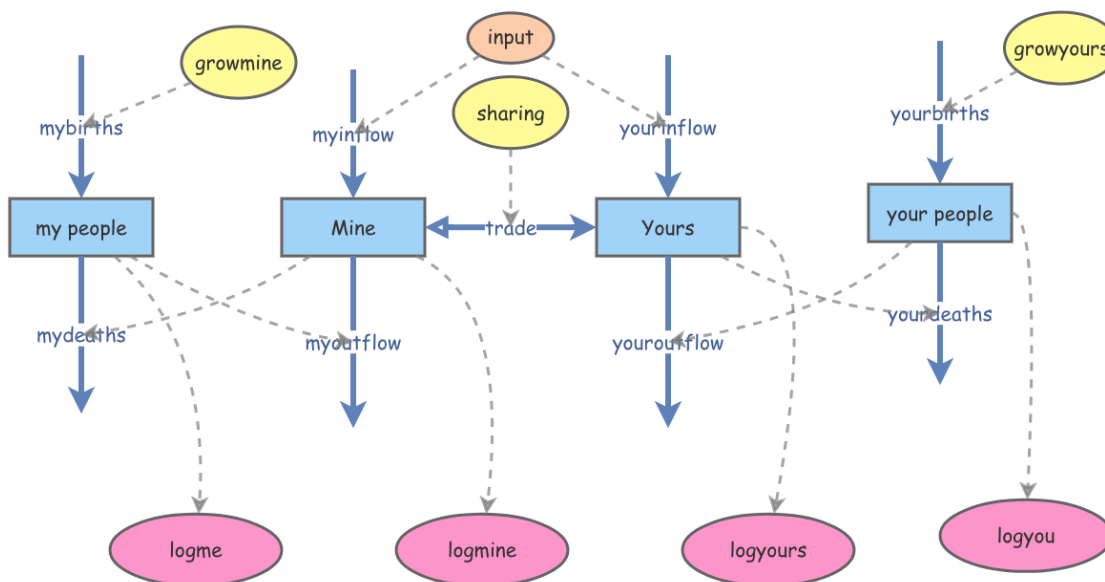# Human Population 2018 Homework 5. Due April 3 by email.

Exploring the effect of sharing resources (or not) on the population dynamics of two peoples.

Create a model that looks like this. Then set it up as described in the following.

Population stocks

[my people] and [your people] grow exponentially at the rate [growmine] and [growyours] (sliders). [mydeaths] are proportional to [my people] at 1%, but if [Mine] is less than [my people], then 5% starve, and if [Mine] reaches zero, then 50% starve. Same story for [yourdeaths].

Resource stocks

[myinflow] and [yourinflow] have the same, constant [input]. However, [myoutflow] and [youroutflow] are proportional to [my people] and [your people], respectively. If there is a difference between [Mine] and [Yours], then we split that difference, 1/2 of it flowing to the other (lower) side. Multiply this flow by [sharing]. If [sharing] is one, the flow is one-half the difference. If [sharing] is zero, then [trade] is zero. Make [sharing] a slider between zero and one. [trade] flow can be positive, from [Mine] to [Yours], or negative, from [Yours] to [Mine].

Make log-scale output variables (pink) for each stock. Add 1 to avoid log of zero error. For example, Log([Mine]+1).

Set [my people] and [your people] to 1e9
Set [Mine] and [Yours] to 1e9

Set [input] to 1e8

Illustrate, describe and interpret:

1) Simulate with [growmine] > [growyours] and [sharing] = 0.
Describe and explain the shape of [logmine] and [logyours]. In what way is this a demonstration of Malthus' most famous statement?

2) How is the periodicity of [logmine] related to [growmine]? Explain.

3) Simulate with [growmine] > [growyours] and [sharing] = 1.
Compare and contrast this simulation with the one in **(1)**. Who does [sharing] benefit most? [my people] or [your people]? Explain.

4) Set [trade] to positive values only, so that the arrow goes only from [Mine] to [Yours]. Simulate with [growmine] > [growyours] and [sharing] = 1. Describe what happens with one-way trade from the faster growing to the slower growing people.

5) Reverse the direction of [trade] and repeat the simulation with [growmine] > [growyours] and [sharing] = 1. Describe what happens with one-way trade from the slower growing to the faster growing people.