ABM Project 1: Food Chain

**Why this example?**

* Since this prompt was the most “vague,” it leaves the most room for interpretation and allows the mind to wander on what can be added and what correlations can be derived from the data.
* Additionally, this model is similar to what would be needed to model the ecological disaster known as the “Four Pests Campaign” that took place in China in 1958 led by Mao Zedong.
  + Essentially Mao thought sparrows were a nuisance and ordered people to kill them.
  + Once the sparrow population was nearly wiped out completely, the locusts began to decimate the crops.
  + This unlikely correlation exacerbated the Great Chinese Famine which killed between 15 and 45 million people from 1958 to 1962.

**What is it?**

* This project depicts the food chain as it pertains to bugs, birds, and grass. Grass is a food resource for the bugs, and the bugs are a food source for the birds. The model allows us to tweak the number of agents to examine the relationships between these species.

**How does it work?**

* Bugs will eat the grass and gain energy from eating, birds will seek out and eat the bugs and gain energy from eating, and the grass will eventually regenerate after being eaten. In addition to gaining energy from food, energy is expended from movement and checks are in place so that if agents run out of "energy" they will die and be removed from the population.

**Things to Notice**

* It's an uphill battle to get the sparrows to survive since they have to seek out their food source whereas there is a food source readily available for the locusts. However, despite this, the parameters can be tweaked to where the sparrows will wipe out the locusts before they ultimately die of starvation from a lack of food source.

**Things to Try**

* Try toggling the number of eggs that are hatched when a bird or bug reproduces
* See what happens when one breed starts out at a significant number advantage
* Toggle the grass regrowth and see how it affects the locusts.
* Experiment with the "flight" of the sparrows and see what different levels yield.

**Extending the Model**

* Add patches with grain to simulate the bugs eating "crops"
* Add a human population count that is correlated to the "crop" levels
* The crop levels can be used to model the "Four Pests Campaign" that was an ecological disaster that was initiated by Mao Zedong in 1958
* <https://www.ozy.com/true-and-stories/the-enemy-chairman-mao-could-not-defeat/95332/>
* <https://en.wikipedia.org/wiki/Four_Pests_campaign>

**Related Models**

* Wolf Sheep Predation model from the Biology section
* Wilensky, U. (1997). NetLogo Wolf Sheep Predation model. <http://ccl.northwestern.edu/netlogo/models/WolfSheepPredation> Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.

**Credits and References**

* Wilensky, U. (1999). NetLogo. http://ccl.northwestern.edu/netlogo/. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL