

Game Setup and Rules

Setup:

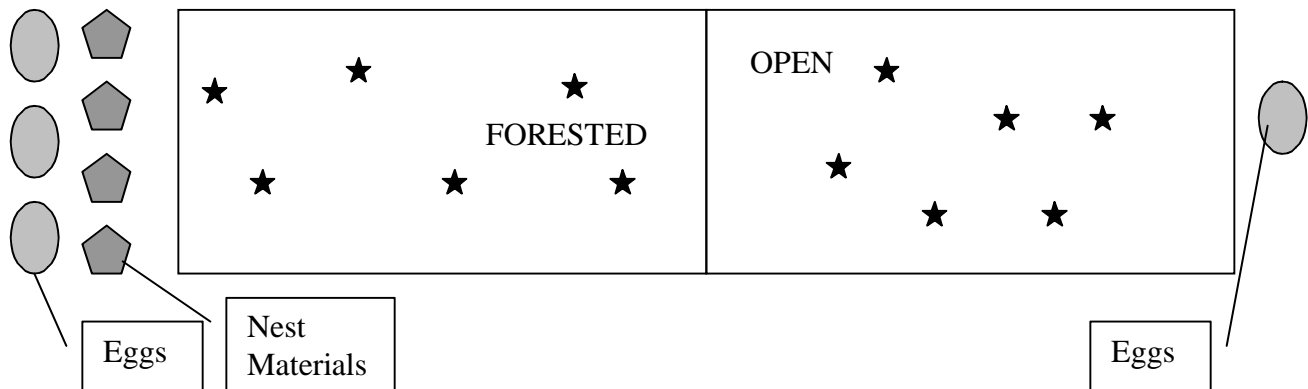
Use containers with lids (Tupperware, Glad-ware, anything plastic) for the food. Use two kinds of candies for the food – warblers and cowbirds should have different kinds of individually wrapped candies (lifesavers, mints, and suckers work well). In each of the food containers, place some food types for each bird. Half the food containers will be spread out on each end of the playing field. All the forested areas containers should have $\frac{2}{3}$ warbler food and $\frac{1}{3}$ cowbird food. All open area food containers should have $\frac{2}{3}$ cowbird and $\frac{1}{3}$ warbler food. Using containers with different color lids or some other distinguishable feature will make it easier to see what ratio of candies is in the container. You will need to decide ahead of time if food scarcity is going to be an issue, as we would recommend. If so, only place enough candies out for the number of players in the game. For example, if you have 15 players, 7 warblers and 8 cowbirds, place out approximately 70 warbler candies and 120 cowbird candies out for the game, distributed among all the containers.

Layout two large areas – one “forested” habitat and one “open” habitat. Depending on space available, these areas should be as large as possible but touching. Outside areas work best (play field, part of the playground, etc.), but you can use a gym or hallway to allow traveling time. We suggest that using actual wooded and open areas if they are available will increase the difficulty and give realistic results. Another option is to have the playground equipment as the forested area so the warblers have plenty of nesting spots. Flat open field will work just as well though. Use string, flags, masking tape, or other item to show the line between the forested and open areas.

Mark the cowbird eggs with numbers, letters, colors, or some other marks. There should be enough eggs so that each player has 3 eggs. Each cowbird is assigned a number and must find their eggs, one at a time, before they can lay them. Place all the eggs in a single container – no lid is needed. Even though cowbirds do not make nests in the wild, they produce larger eggs and need to put effort into the egg, so the numbered eggs makes the cowbirds in the game work to get their egg. Along the “open” habitat rectangle’s far end place the egg containers with the numbered eggs. Spread the food containers randomly around this area. Use the food containers that are have $\frac{2}{3}$ cowbird food. Take advantage of all the areas and spread the food containers out as much as possible.

The warbler eggs are not marked and can all be the same color. They can be placed in one container or multiple containers– no lid needed. There should be more than 3 eggs per warbler in the container since some warblers may abandon their nest and re-nest, therefore they would need more eggs. Along the “forested” habitat rectangle’s far end place the nesting materials (flags) and the egg container with unnumbered eggs. Place the food containers scattered around the rectangle, taking advantage of the space available. These should be the containers with $\frac{2}{3}$ warbler food.

Example of layout:



Rules:

Give each player a card with their species information on it. For the first run you will give ½ the people cowbird cards, ¼ of the people susceptible warbler cards, and ¼ of the people non-susceptible warbler cards. Give all the warblers a small container that will be the base of their nest (paper cups or other small containers will work). Have everyone read the information within their groups. Make sure all of them know the rules of the game for their specific species. In addition tell them these rules that apply to everyone:

- ◆ You can only get one food item from a container at a time and not from the same container twice in a row – you can only take your designated candy type. Each player needs to open the container, take their food, then reclose the container before moving on and before another bird can access it.
- ◆ Warblers can move all 3 of their eggs at a time
- ◆ Cowbirds can only move one egg at a time
- ◆ All birds can move around the area freely but any cowbird caught near a warbler's nest by the nest owner must leave that nest and not parasitize it.
- ◆ A nest is completed when there are 4 flags in place. No eggs can be laid in a nest before it is finished. For larger groups in small areas, you can allow multiple cowbirds to parasitize a nest, but the last one placed in the nest is the only one that survives. This can be kept track of by having the newest cowbird remove the egg of the old cowbird and place it next to the nest. Having cowbird eggs of a different color than warbler eggs will help keep this process clear.
- ◆ Candies must be held onto and cannot be stashed in the nests. Birds can carry the candies in baggies if you choose, or leave them to deal with the issue while they forage

For the first run, the playing field should be set up as shown and allow it to run for 5-10 minutes (depending on the number of players and the size of the field). At the end of the game, have all warblers report their number of candies and their nest success (fail or succeed). Any parasitized nests, the adult warbler lives, but all the eggs will die. Any warblers that do not have 10 candies will die and their nests will not succeed. Have all cowbirds report their number of candies and number of successful eggs. Any cowbird without at least 15 candies will die and but their eggs will survive if the host nest survives. If the warbler in the host nest dies due to a lack of food, all the eggs, including the cowbird egg, die. Determine the survivorship and number of offspring produced by the warblers and the number of survivors and offspring from the cowbirds.

Example of data sheet. See attached excel file for the full size form

RUN #1

Warblers - non-susceptible

Names	Candies	Nest Success	Offspring Produced
TOTAL			

Warblers - susceptible

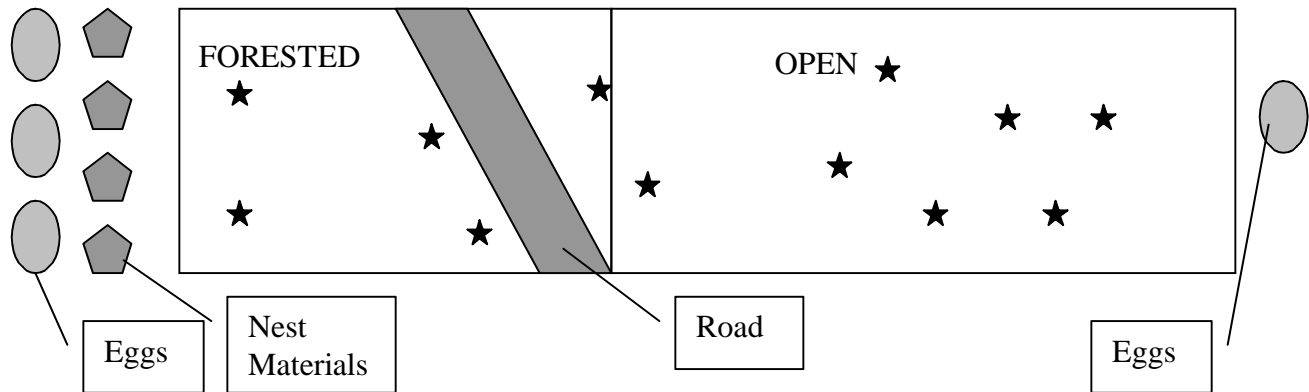
Names	Candies	Nest Success	Offspring Produced
TOTAL			

Cowbirds

Names	Candies	Nest Success	Offspring Produced
TOTAL			

For the second run change the “forested” area by placing a road across the forest or expanding the open area (see diagram for an example of road). Rerun the game. The rest of the rules apply the same but the warblers have less area and not all the warbler food containers are in the forested area. Record the results the same way. These results can be graphed in excel to graphically show how the populations change over this time. You can also make this an iterative process by changing each dead cowbird into a warbler and each dead warbler into a cowbird in each successive run of the game and determine which population will thrive and which will go extinct.

Example of a second run layout:



Other possible options for reruns:

- 1) Leave the habitat the same, do not increase the open area or add a road. Instead at the end of the first run, all warblers that die will become cowbirds and all the cowbirds that die will become warblers. Repeat the game at least 3 times, more if time allows, and see if the cowbird or warbler population increases. If one increases, does it get to the point that there are resource scarcity issues that then start forcing the populations down? Will one species push the other to extinction, and if so how many generations does it take?
- 2) Each run of the game remove a food container from each area. Is one group better able to survive? How do the birds change their behavior because of the decrease in resources?
- 3) Make all the warblers non-susceptible for the second run. Are there changes in the number of warblers surviving and successful? How does the cowbird population change?
- 4) Start the game with only 3 warblers and 3 cowbirds. For each egg that survives, add that many players to represent that breeding success (births). Remove any adults that die due to a lack of food. Rerun the game. On the third run, all the original birds die off (deaths = end of their life expectancy), all birds that did not get enough food die, and players are added to represent the successful eggs. Run the game multiple times and see how the populations change. If you have multiple classes involved in this lesson, have the first class start it, then have subsequent classes pick up where they left off. Keep all counts on the data table or in a visible place so the students can see the changes over time. If time allows, restart the game and change the habitat to more open areas due to deforestation or road construction. Shift food resources accordingly. See how the populations respond. Does one species force the other to extinction? Is there a point when one population gets too big and begins to decline again?

Allow the cowbirds to lay more eggs. Monitor which cowbirds are most successful and try to determine why. Which warblers are more successful and why?