The number of individuals in a population, or ***population size***, is perhaps the most important thing to know about a population. This is most clear in cases where ecologists are working to help endangered species, when an accurate count or estimate of population size is critical to assessing their success. Ideally, population ecologists would have an exact count of all the individuals in a population at all times. Obviously, this would rarely be the case and, in most cases, accurately counting all the individuals in a population is impossible. Imagine trying to count the fire ants that are invading the southeast US. This population would be growing far faster than they could be counted! For this reason ecologist rely on various techniques to estimate population size. There are several established methods for this, and each has advantages and disadvantages that make them appropriate for different situations.

Model Details

This model simulates a pond full of tadpoles which swim around randomly, independent of one another. In this virtual experiment you will sample the population by dipping a net into the pond and emptying it into a bucket (Fig. 1). The program reports the number of tadpoles in the bucket. At that point, you can release them back into the pond, mark them, or sequester them in a holding pen. The volume of the pond and the nest are known, so all the data needed for the three estimation methods are provided. Note that the sampling is done by moving all the tadpoles from within a radius around a point in the center of the pond. You should allow enough time between samples for the tadpoles to move around sufficiently to ensure independence of the samples. When working with this model, it will be useful to have a spreadsheet open in which to record data directly.

Table 1: Model controls and parameters

Control/Parameter	Action
Setup	Sets the model ready to go with the assigned parameters
Go	Puts the tadpoles in motion
Pond Size	Sets the volume of the pond in liters (Small = 76.5, Med = 127.5, Large = 178.5)
Population Size	Sets the population size (Small = 25, Medium = 100, Large = 250)
Net Size	Sets the volume of the net in liters (Small = 3, Medium = 11, Large = 25)
Mark	Marks one of the unmarked tadpoles in the bucket red
Unmark	Unmarks one of the marked tadpoles in the bucket
Release	Places all of the tadpoles in the bucket back in the pond
Hold	Places all of the tadpoles in the bucket in the holding pen
Unmark All	Unmarks all the tadpoles in the bucket, pond, and pen
Empty Pen	Places all of the tadpoles in the pen back in the pond
Dip Net	Samples the population

Table 2: Model reporters

Reporter	Description
Pond Volume	The volume of the pond in liters
Total Marked	The total number of marked tadpoles in the pond, bucket, & pen
Marked in Bucket	The number of marked tadpoles in the sample bucket
Total in Bucket	The number of tadpoles in the bucket (marked & unmarked)
Current Sample	The number of tadpoles in the bucket only
Total Caught	The number of tadpoles in the bucket and pen combined

Figure 1: screen shot of the Population Estimation simulation