

# USING RATIOS IN A CAPTURE-RECAPTURE MODELING LESSON



- The sandwich baggy representing a lake
- A small container.
- The white beans (approximately 1 cup) in the bag represent the untagged fish in the lake
- The red beans (approximately 1/4 cup) will be used to replace white beans and represent tagged fish

**Your goal is to estimate the total number of fish in the lake.**

- Step 1: Reach into the lake and remove a small container of fish to tag. Count and record the number of fish you removed. Replace all of these fish (white beans) with an equal number of tagged fish (red beans). Return the tagged fish to the lake. Set aside the white beans. By completing step 1 you have modeled taking one random sample of fish from the lake.
- Step 2: Allow the tagged fish and untagged fish to mingle (seal the bag and shake it). Again remove a small container of fish. Try not to catch certain types of fish. Count all fish, tagged and untagged. In the table record the total in the catch, and the number of untagged and tagged fish. By shaking the bag before step 2 you have modeled letting the tagged fish to mix in with the untagged fish in the lake. When you took a random sample from the lake after you have already tagged some fish there is a chance you will capture some tagged and untagged fish. Determine the ratio of the tagged fish to the total for that sampling. Use this ratio to estimate the number of fish in the lake. Replace this sample to the lake.
- Step 3: You will repeat step 2 until you have completed five or six samplings. From each sampling you will get an idea of the ratio of tagged fish to fish in the lake. Mix the pond of fish well and repeat the sampling until you have completed five or six samples.

Tagging Simulation				
Sample number	Number of captured fish	Number of tagged fish	Number of untagged fish	Ratio of tagged fish to total fish
1		0		----
2				
3				
4				
5				
6				

- Step 4: Study the ratio of the tagged fish to the total in the last column. Choose one ratio to represent the five ratios. Explain how you decided this was a representative ratio.
- Step 5: If you mixed the fish well, should the fraction of tagged fish in a sample be nearly the same as the fraction of tagged fish in the whole lake? Why or why not? Write and solve a proportion to find the number of fish in the lake.

Using proportions, estimate how many fish were in your lake?

Why is this method called capture-recapture?

How accurate are predictions using this method? Why?