

**Earthwatch Institute**  
**Climate Change, Canopies, and Wildlife Expedition Lesson Plan**  
Debra Mescal

**Lesson Title:** *Snake in the Grass: Capture/Recapture Activity*

**Grade Level:** 6<sup>th</sup>

**Content Area:** Math, Science

**Skills:** Data collection  
Data interpretation  
Problem solving  
Observation

Communication  
Proportion/Ratios  
Cooperative group work

**Time Allotted:** 1½ blocks (108 min.)

**Academic Standards:** New Jersey Core Curriculum Content Standards (NJCCS)  
5.1 B, 5.2 A, 5.3 A & D, 5.4 A, 5.5 B, 5.10 A & B

**Abstract:** Scientists are studying the quality of the habitat of the Santa Lucia Cloudforest Reserve in Ecuador. They do this by collecting data on the diversity and the total number of the different species that live there. To determine the total population of a species scientists often use the “Capture/Recapture” method. Animals are captured, counted, tagged and returned to their habitat. Additional samples of animals are then recaptured and counted with those already tagged from the first capture counted and documented. Scientists then apply the concepts of ratio and proportion to estimate the total number of animals in the population. Students will act as members of an expedition team assigned to estimate the total number of snakes in the Santa Lucia Cloudforest Reserve.

**Goals:** 1. SWBAT solve a real-life environmental problem by applying ratio and proportion to estimate population size.  
2. SWBAT work cooperatively as a team member toward a common goal.  
3. SWBAT collect, analyze, and calculate data.  
4. SWBAT apply knowledge learned to solve a local problem.

**Performance Indicators:** Following directions  
Working cooperatively  
Accurate data collection and documentation  
Accurate computation of ratio and proportion equation  
Application of new knowledge

**Background Knowledge:** Math - Students need to have knowledge of: ratio, proportion, and average. Review definitions and reinforce with practice problems.  
Science - Review definitions of: habitat, diversity, and species.

**Materials:** (for each group of 3 – 4 students)

- 1 large beaker (simulates the habitat)
- 1 cup of elbow macaroni (simulates the snakes)
- 1 colored marker (simulates tagging)
- 1 small plastic cup (simulates trap)
- 1 paper plate (for counting and tagging)
- 1 data sheet

**Technology:** PowerPoint presentation of *Earthwatch Institute* expedition  
Computers for follow-up research

**Instructional Procedure:**

**Introduction:**

1. Introduce topic with PowerPoint presentation of Earthwatch Institute expedition
2. Ask students how they would determine the total population of a particular species in a habitat.

**Before Experiment:**

3. Students are divided into “expedition teams” of 3-4 by counting off
4. Team members unite and decide on individual jobs:
  1. **Materials** - collects all necessary materials, sets up materials in preparation of experiment, cleans up and returns materials
  2. **Recorder** – neatly and carefully records data collected
  3. **Mathematician** – carefully calculates data
  - ~ **All** team members take turns in the capturing/recapturing portion
  - ~ **All** team members help fellow team members with their jobs and double-check each other’s work for accuracy
5. **Materials** person obtains materials

**Capture:**

6. Using small plastic cup as a trap, one expedition team member will “capture” or scoop a sample of snakes simulated by elbow macaroni
7. “Captured snakes” are placed on paper plate, then counted and “tagged” by marking each snake on **both sides** with a colored marker.
8. Record the total number of “tagged snakes” in the Santa Lucia Cloudforest Reserve on data sheet.
9. Return “tagged snakes” (elbow macaroni with colored marks) to their “natural habitat” (the beaker) and gently mixed together with the general population.

**Recapture:**

10. Use small plastic cup to “recapture” or scoop up snakes for Sample #1
11. Count the amount of “tagged snakes” in Sample #1 and record it in the 1<sup>st</sup> column of the data sheet.
12. Count the overall total number of “snakes” in Sample #1 and record it in the 2<sup>nd</sup> column of the data sheet.
13. Return all snakes to their habitat and gently mix together with the general population.
14. Repeat steps 10 –13 until you have data for 10 samples.

**Calculations:**

15. Calculate the average number of “tagged snakes” from 1<sup>st</sup> column (**A**)
16. Calculate the average total number of snakes in each sample from 2<sup>nd</sup> column (**B**)
17. Use number from data sheet obtained from step 8 for **C**
18. Calculate the estimate of the total number of snakes in the Santa Lucia Cloudforest Reserve (*X*) using the following equation:

$$\frac{\mathbf{A}}{\mathbf{B}} = \frac{\mathbf{C}}{\mathbf{X}}$$

**A** = Average # of tagged snakes in samples  
**B** = Average # of total snakes in samples

**C** = # of tagged snakes to start with  
*X* = estimated total population

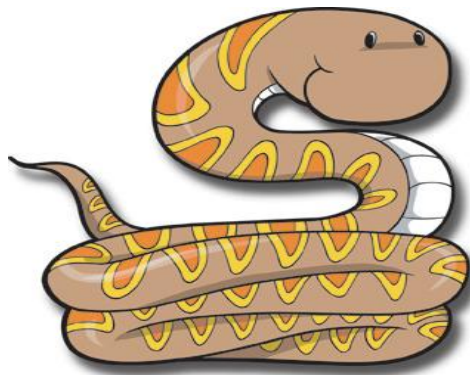
Example:

$$\frac{\mathbf{5}}{\mathbf{30}} = \frac{\mathbf{35}}{\mathbf{X}}$$

$$\frac{\mathbf{5}}{\mathbf{30}} \begin{matrix} (\times 7) \\ (\times 7) \end{matrix} = \frac{\mathbf{35}}{\mathbf{210}}$$

$$\mathbf{X} = \mathbf{210}$$

19. Record your Estimated total population (*X*) number on data sheet.
20. Count out the Actual total population number of snakes (all the elbow macaroni in beaker) and record on data sheet.



**Assessment:**

1. Teacher interaction and observations of cooperative teamwork and individual job responsibilities being carried out by each student.
2. Data sheets collected and checked for accuracy
3. Follow-up application problem assignment:

*Local fisherman are claiming that the number of fish in the Matawan Lake have been rapidly declining recently. You are a scientist who has been assigned to investigate this. Using the capture/recapture method you learned, develop a plan that will help determine if the fish population is truly declining. Explain clearly and completely.*

To be collected and numerically graded based on application of new knowledge, quality of explanation, accuracy of information, and thoroughness of plan developed.

**Connection to Content Areas:**

Math – average, ratio, proportion, calculation, problem solving

Science – data collection and interpretation, observation, cooperative group work; habitat, diversity, species

Writing – communication, follow-up application problem assignment

Social Studies – locating Santa Lucia Cloudforest Reserve on map, Santa Lucia community and culture

**Extensions:**

1. Research methods used by fieldwork scientists to tag snakes.  
Define PIT tagging  
Explain PIT tagging snakes
2. Compile a list of animal species that live in the Santa Lucia Cloudforest Reserve.
3. Research and describe the location and habitat of the Santa Lucia Cloudforest Reserve.

**Acknowledgements:**

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**Snake in the Grass  
CAPTURE / RECAPTURE DATA SHEET**

Date: \_\_\_\_\_

Class: \_\_\_\_\_

Expedition Team Members: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Record total # of tagged snakes in the Santa Lucia Cloudforest Reserve  
 (step 8) \_\_\_\_\_ **(C)**

Sample #	# of tagged snakes	total # of snakes collected
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Average (add up, divide by 10)		

**(A)**

**(B)**

**Calculate:** (steps 15 – 18)

$$\frac{A}{B} = \frac{C}{X}$$

Estimated Population = \_\_\_\_\_

Actual Population = \_\_\_\_\_