Cesar Villegas
Wildlands School
Wednesday, May 23, 2007

Squirrel Population and Density Summery

Introduction

In April and May of 2007, a squirrel population and density project was conducted to determine how many squirrels inhabit a 10.5 Hectare section (25.95 acres). The survey was done in Eau Claire County, West-Central Wisconsin (Picture to the right) on a section of the Beaver Creek Reserve property (Red Area). "Populations of tree squirrels can vary greatly in their size and density (number of individuals per 2.47 acres [individuals/Ha]), depending in part on the quality of the habitat," (Steele and Koprowski, 2001).

The proper techniques and methods were derived from other sources: "Research and Management Techniques for Wildlife and Habitats", and "North American Tree Squirrels". The methods used were a capture-recapture method with the Lincoln-Peterson equation.

Methods

The research first started in the center of Pine Loop (Grid in Northern BCR Property), but due to the lack of squirrel activity and cold tempatures, it was postponed for slightly warmer conditions and relocated to a less human interrupted area (Grid in Southern BCR Property).

To the Left, is a grid created to allow the traps to be accurately placed at all 30 data points 50 meters apart. The data collection period would last for a total of four weeks. The first two weeks would consist of capturing, marking with a numbered ear tag, recording the species, and then releasing the squirrel. Then, weeks three and four would consist of capturing, recording the species, recording if they were marked or not and if so what is the number, and releasing the squirrel. Weeks one and three were located at the odd data points and weeks two and four were located at the even data points.

The traps were rotated on Friday so they could be locked open to prevent mortality and for a pre-baiting session. They would be unlocked on the following Monday and were always checked around 10:00 am.

Results

A total of 8 different squirrels were captured and marked in the first two weeks. A total of 34 squirrels were captured in the recapture period, and 4 of them were marked individuals (See table 1). The Lincoln-Peterson equation is N = n1n2/m2. N is the total population equals n1, the total amount of squirrels captured, marked, and released, multiplied by n2, total squirrel capture in second sample, divided by m2, total marked squirrels captured in second sample.

Table 1

Week of Collection	#Marked (n1)	#Captured (n2)	#Marked Captures (m2)	Lincoln-Peterson (N)
1	8	19	4	38
2	8	15	2	60
Total	8	34	4	68

There are several ways to calculate true population from the data. The one being used is the Lincoln-Peterson which consists of many steps: calculating the original Lincoln-Peterson equation, calculate the modified version, and the variance can be calculated and used with the modified version to determine the confidence level of the true population estimation.

The modified version of the Lincoln-Peterson has less bias, originally developed by Chapman:

$$Nc = [(n1+1)(n2+1) / (m2+1)] -1$$
$$= [(9)(35)/5] -1$$
$$=63$$

And the variance estimated:

$$Var(Nc) = (n1+1)(n2+1)(n1-m2)(n2-m2) / (m2+1)2\ (m2+2)$$
$$= (9)(35)(4)(30) / (25)(6)$$
$$= 252.$$

An approximate 95% Confidence Interval (normality for Nc is assumed):

$$Nc \pm 1.965 \sqrt{Var(Nc)}$$
$$63 \pm 1.965 \sqrt{252}$$
$$63 \pm 31$$

The approximate 95% CI would be from 32-94, a rather wide range.

Discussion

Thus, using the Lincoln-Peterson equation:

3 squirrels/acre = 7 squirrels/hectare

Using the modified version:

2 squirrels/acre = 6 squirrels/hectare

Or using the CI with the modified version:

1 squirrels/acre = 3 squirrels/hectare

To

4 squirrels/acre = 9squirrels/hectare.

Predators can influence the population, in a small isolated urban woodlands the populations may raise to record high like in Lafayette Park, Washington D.C. were the density of gray squirrels is >21/hectare. The current summary has a calculated range of 3-9 squirrels/hectare. This figure falls well between other accepted survey values from 0-21, as stated in North American Tree Squirrels.

Densities in marginal habitats can be excessively low and even approach zero. A negative relationship exists between woodlot size and density: the smaller the woodlot, the greater the density of squirrels. This survey was conducted on a woodlot well over 405 hectares(>1,000 acres)d.

Comments

It is recommended that the traps are staked down to avoid deer disturbance. Collect preliminary data as a test run in a different location so there will be no complications with the squirrel handling methods, and be aware that squirrels may not be the only animals captured so be ready to handle them.