1. **LITERATURE REVIEW**

* **Line transect and distance sampling introduction [1]**

Book by S.T. Bucklnad and B.R. Anderson highlights that distance sampling, primarily line transect and point transect sampling has had a relatively short history. The earliest attempts to use distances to detected animals to estimate abundance date back to the 1930s, and the ﬁrst line transect estimator with a rigorous mathematical basis was due to Hayne (1949). Nearly 20 years later, Gates et al. (1968) and Eberhardt (1968) made important contributions to the development of line transect sampling methodology.

* **A Study on how to estimate the abundance of a species [2]**

You can use line transect sampling in order to get a good estimate of density of fecal counts. This would give you an index of relative abundance of the animal assuming defecation rates are similar across time, space, between sexes, within ages. You could justify, based on the data, that if you find 10 fecal groups in one area, and 5 in another, that the first has double the relative abundance. Assuming equal detection rates between areas.

* **Monitoring Gray Squirrel Populations [3]**

The paper by Healy, W. M. & Welsh focuses on using transect sampling to monitor urban gray squirrel population in a large oak forest with a minimum of 94 square km to measure the density. Gray squirrels (Sciurus carolinensis) are used as a habitat indicator species by forest managers (Healy and Welsh 1992). Natural resource managers may, therefore, estimate gray squirrel population density to evaluate the effects of anthropogenic activity (e.g., habitat management), and is used to demonstrate the general application of line transect sampling and to illustrate that survey effort and cost of conducting surveys can vary within species.

* **Design and Analysis of distance sampling Surveys [4]**

The literature is related to the estimation of animal population parameters such as population size or survival rate. The type of method used for estimation depends on the nature of the population investigated, namely whether it is closed or open. The simplest methods are based on counting individuals or their signs on a random sample of plots where the plots may be quadrats or strips.

* **Optimization of ordered distance sampling [5]**

Plotless density estimators are those that are based on distance measures rather than counts per unit area (quadrats) to estimate the density of some usually stationary event, e.g. burrow openings, damage to plant stems, etc. These estimators typically use distance measures between events and from random points to derive an estimate of density. The error and bias of these estimators for the various spatial patterns found in nature have been examined using simulated populations only. Plotless density estimators can provide an estimate of density in situations where it would not be practical to layout a plot or quadrat and can in many cases reduce the workload in the field.

1. **REFERENCES**

[1] Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. London: Oxford University Press.

[2] Burnham, K. P. & Anderson, D. R. 1984. The need for distance data in transect counts. Journal of Wildlife Management 48, 1248-1254.

[3] Healy, W. M. & Welsh, C. J. E. 1992. Evaluating line transects to monitor gray squirrel populations. Wildlife Society Bulletin 20: 83-90.

[4] Seber, G.A.F. 1982. The Estimation of Animal Abundance and Related Parameters. Chapters 7, 9. 2nd edition. Griffin, London. Distance software: design and analysis of distance sampling surveys for estimating population size. Journal of Applied Ecology 47(1):5-14.

[5] Nielson, R. M., R. T. Sugihara, T. J. Boardman, and R. M. Engeman. 2004. Optimization of ordered distance sampling. Environmetrics 15 (2):119-128.