Abstract: There are many reasons why we would want to estimate the number of members of a species that are living at a given site. This is however, difficult to do well because the observations we would like to make can be and typically are affected by various measurement errors. In particular nondetection, when no members of the species are detected, so that the species is incorrectly marked as absent, can lead to misleading conclusions. Considerable effort has been made to develop methods of collecting and analysing data to deal with the problem of nondetection.

I will discuss some general methods which deal with nondetection and then consider a currently popular method called occupancy modelling in more detail. I will show how we use statistical thinking to understand occupancy modelling and evaluate its properties. It is obviously important to understand when a method will or will not work well and to understand its limitations. We will see that occupancy models are more difficult to fit and interpret than is generally appreciated because the estimating equations often have multiple solutions and the estimates are unstable when the data are sparse. When the abundance of a species varies from site to site the standard analysis runs into difficulties and in this case, occupancy modelling can be just as poor as analyses which ignore nondetection completely. This raises broader philosophical questions about the use of incorrect models and the value of trying to make complicated adjustments in difficult problems.

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