Abstract: Use-availability designs compare characteristics of ‘used’ resources (e.g., geographic location, habitat) to characteristics of resource units that could have been ‘used’ (i.e., ‘available’ resources). Typically, these analyses are applied to habitat selection by animals and appear in the wildlife literature. Presence-only analyses estimate relative probability of a positive location given characteristics, ostensibly based on presence-only information. Typically, these analyses are applied to locations of historic or museum specimens and appear in the broader conservation literature. Over the past decade, controversy has surrounded these analyses, particularly the former, and has lead to no small amount of confusion. In this seminar, I hope to clear up the controversies. I will briefly discuss the following points:

1. Use-availability and presence-only analyses are synonyms. Both require two samples (one containing known locations, one containing potential locations), both estimate the same parameters, and both use the same fundamental likelihood.

2. The use-availability likelihood can be generalized from pixels to point locations. Fithian & Hastie (2012) use a case–control argument and Bayes theorem to derive the same likelihood. I use Lagrangian multipliers to maximize the two-sample likelihood, and I admit a general link function.

3. Resource selection functions (RSF) are ratios of density functions. As such, RSFs must be positive and unbounded. Proper link functions must provide proportionality over their entire range. Given these conditions, the exponential link is the most logical and appropriate link function for RSFs. These conditions exclude the logistic link.

4. Estimation of an RSF does not involve ‘running logistic regression’. By assigning 0 and 1 (pseudo-) responses to vectors of covariates associated with locations in the used and available sample, it is possible to ‘trick’ logistic regression software into maximizing the use-availability likelihood. However, representing the analysis as ‘logistic regression’ is misleading because logistic regression implies use of the logistic link, which is inappropriate for RSF’s. It is most accurate to state that the ‘use-availability likelihood was maximized’.

5. RSFs are more general, intuitive and useful than resource selection probability functions (RSPF). RSPFs depend heavily on sampling mechanisms and the number of used and available locations selected. Consequently, the objective of estimation in use-availability studies should be the RSF, not the RSPF.

6. The general log likelihood can be maximized without the aid of logistic regression software.