28 April 2005
Jeffrey L. Beck
Department of Zoology and Physiology
University of Wyoming
Laramie, WY 82071-3166
Phone: 307-766-3127
Email: jlbeck@uwyo.edu

This response was prepared following discussion about our use of an alpha of 0.20 (Type I error rate) in a power analysis to detect a 10% decline in snowshoe hare using pellet plot counts over 10 years on the Medicine Bow National Forest. The discussion was held on April 22 at the Medicine Bow National Forest Supervisor's Office.

==========

Our evaluation of the influence of sample size on power employed an alpha (probability of Type-I error rate) of 20% (alpha = 0.20). Doing so will lead to a relatively high rate of false inferences regarding population change. Allowing a Type-I error rate of 20% has been defended as a reasonable compromise in endangered species monitoring (Kendall et al. 1992, Beier and Cunningham 1996) because of the relative importance of Type I versus Type II error rates. Type I errors (concluding there is a change when in reality a change has not occurred) must be tightly controlled in most research settings. However, Type II errors, denoted by beta (concluding that a change has not occurred when in reality there has been a change) are often of most concern in management contexts. Therefore, we opt to relax alpha and accept higher Type I errors because of the reciprocal gain in power ([1 – beta], or the probability of making a correct decision that a change has occurred when, in fact it has) and therefore reduction in probability of Type II errors. Reducing the frequency of false alarms will lead directly to a reduced ability to detect declines, thus we are more interested in reducing beta to avoid false negatives (concluding that a decline has not occurred when in fact it has), to avoid delaying the initiation of further conservation management.

Literature Cited

Beier, P. and S. C. Cunningham. 1996. Power of track surveys to detect changes in cougar populations. Wildlife Society Bulletin 24:540–546.

Kendall, K., L. H. Metzgar, D. A. Patterson, and B. M. Steele. 1992. Power of sign surveys to monitor population trends. Ecological Applications 2:422–430.

White, G. C., D. R. Anderson, K. P. Burnham, and D. L. Otis. 1982. Capture-recapture and removal methods for sampling closed populations. Los Alamos National Laboratory, Los Alamos, N. M., LA-8787-NERP.