RESOURCE NOTES

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Methods to Collect Required Data to Develop Rigorous Population Viability Analysis (PVA) Models

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Background

Population viability analysis (PVA) examines the question of whether a biological population of a given size will persist (remain viable) for some specified time period. To develop useful estimates of population viability, stochastic population models must be developed that incorporate demographic, temporal, and individual variation. The lack of individual heterogeneity in previous population viability analyses has resulted in underestimates of persistence, making the conclusions overly pessimistic. Additionally, spatial and genetic variation may be required, depending on the population being modeled and the time frame of the analysis. Estimates of these variance components must be constructed by removing the sampling variation inherent in estimates of population parameters. Most previous population viability analyses have not separated sampling variation from process variation in the parameter estimates, so they underestimate population persistence. Further, the uncertainty (sampling variance) of parameter estimates must be incorporated into estimates and confidence intervals of persistence if valid inferences are to be made back to the population under consideration.

Discussion

Marked animals have been widely used to estimate population size, survival rate, and recruitment in biological populations. Wild horse populations seem particularly suited to methods of analysis based on marked animals because of the individual heterogeneity in appearance makes many individuals uniquely identifiable, so that capture to apply marks is not required. In addition, DNA techniques provide alternative methods to obtain data on identifiable individuals. Estimation methods based on the Cormack-Jolly-Seber model available in Program MARK (White and Burnham, 1999, in press) seem well-suited to estimation of wild horse survival rates from inferences on identifiable individuals. Procedures to separate sampling variation from process variation are already available in the program. Recruitment to reproductive age can be estimated from age ratios estimated by population surveys. Population size can be estimated from ratios of uniquely identifiable individuals to unidentifiable animals during the same surveys with estimators provided in Program NOREMARK (White 1996). Thus the techniques required to obtain the data to develop rigorous PVA models for wild horse populations are available and manageable. However, the cost of information is always high, so the real question is whether this information is considered worth the expense by policy makers, and ultimately, the voting public.

Conclusion

Rigorous statistical methods and associated field data collection procedures are available to estimate the necessary parameters to model defensibly wild horse populations. To obtain defensible models, a

commitment to consistent and long-term data collection and analysis must be made by the agency.

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For further reading:

White, G. C. 1996. NOREMARK: population estimation from mark resighting surveys. Wildlife Society Bulletin 24:50-52.

White, G.C. 1999. (a) Modeling Population Dynamics. pp. 84-107 in S. Demarais and P. Krausman, eds. Ecology and Management of Large Mammals in North America.

White, G.C. 1999. (b) Population viability analysis: data requirements and essential analysis. pp. 288-327. in L. Boitani and T. K. Fuller, editors. Research techniques in animal ecology. Columbia University Press, New York, New York, USA.

White, G. C., and K. P. Burnham. 1999. Program MARK: survival estimation from populations of marked animals. Bird Study. In Press.

Software and more information are available via WWW at:

http://www.cnr.colostate.edu/~gwhite