RESOURCE NOTES

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Effects of Contraception and Removal Treatments on Pryor Mountain Wild Horse Population Demographics and Genetics

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Background

Most free-ranging horse populations in the United States inhabit Bureau of Land Management (BLM) lands and the BLM is mandated to manage these herds. Wild horse populations have the ability to rapidly increase in size, and land managers are thus faced with the need to control the size of a rapidly increasing population. Because the management objective for many horse populations is small (<150 horses), there are also concerns about the long-term genetic viability of these small populations. Managers are thus faced with conflicting needs to minimize population size to control habitat damage or forage use, and to maximize population size to preserve genetic variation. To evaluate consequences of population control strategies that used contraception, periodic removals, or a combination of the two, I developed a population viability model that simulated population dynamics and changes in genetic variation and applied the model to horses on the Pryor Mountain Wild Horse Range. Simulated management actions were applied to horses that were young, old, or a random selection from the population.

Discussion

Computer simulations were used to evaluate management alternatives that included changes in population objective (AML), contraceptive treatment, and removals. Management actions (contraception and/or removal) focused on treatment/removal of young horses, old horses, or a random selection of individuals. Population responses included average population size, variation in population size, population age structure, growth rate, changes in genetic variation (heterozygosity), and loss of alleles.

Model results showed that simulated control strategies had striking differences in terms of population structure and persistence of genetic diversity. When comparing contraceptives to removal, it was found that use of contraceptives can greatly reduce the variation in yearly population size, and average population sizes remained much closer to the objective. However, population growth rate is relatively insensitive to low levels of infertility, and there are sharp contrasts between the dynamics of populations controlled by harvest or contraception. With contraception, populations can increase rapidly if a high level of infertility is not achieved, but population size declines slowly because natural mortality is typically low. In contrast, removals permit managers to rapidly reduce population size, modify sex ratio, or adjust the age structure of the population. For most wild horse populations, about 70% of all reproductively active females will need to be maintained in an infertile state to achieve a stable population size. For the conditions simulated, the age of animal treated had a huge impact on the rate of loss of genetic variation. Control

strategies that delayed the age of first reproduction, such as contraception or removal of young animals, greatly reduced loss of genetic variation. In contrast, strategies that emphasized reproduction by young animals (contraception or removal of old horses) increased the rate of loss of genetic diversity. To retain genetic diversity, a particularly poor suggestion is to permit a horse to reproduce and then rendering it infertile. These effects result from changes in generation time – rate of loss of genetic variation is directly proportional to generation time, and strategies that increase generation time (e.g., delaying reproduction) reduce the rate of loss of genetic resources. For the sizes of populations simulated (AML of 90 to 180 horses), the age of treatment had a greater effect than an overall change in AML (total population size).

Conclusion

Regardless of control strategy, genetic variation is lost much more slowly if young animals are treated (e.g., removed or rendered temporarily infertile). The most practical control program will likely involve both contraceptives and periodic removals. Contraceptives can reduce growth rate and are likely to be cost-effective, while removals permit managers to rapidly adjust sex ratio, age structure, or overall population size. If single-year contraceptives are used to maintain infertility, a very intensive management program will be necessary. In small populations, changes in the age of horses treated will likely have more impact on loss of genetic variation than changes in the number of horses in the population.

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