Research Recommendations

for the
Wyoming
State-wide Bighorn/Domestic Sheep
Interaction

Working Group
January, 14 2008
IV. Research Agenda  It is recognized that there are more research topics listed below than will likely ever be funded or completed. Although research topics are not prioritized, we have generally listed more critical items earlier. We encourage collaboration with other state and federal agencies and universities. High quality research is being done in other locations and there is no need to duplicate these efforts in Wyoming. We also encourage collaborative efforts particularly between wildlife and livestock interests. This will not only ensure better acceptance of the results by all parties but also will tend to reduce bias in project design.

A. DISEASE/HEALTH

1. Veterinary tools and techniques
   a. Develop vaccines and delivery techniques for *Pasteurella/Mannheimia* pneumonia for both domestic and wild sheep. Different vaccines or techniques may be needed in different situations (e.g. an outbreak or as preconditioning prior to translocation)
   b. Determine the role of viruses, *Mycoplasma*, and other bacteria in sheep pneumonia. Develop vaccines and delivery techniques for pathogens that threaten domestic and wild sheep, as they're identified.
   c. Test delivery methods such as oral delivery, biobullets, inhalants, and using domestic sheep to plant self-vaccinating medications.
   d. Develop effective methods of treating wild sheep parasites (possibly with medicated feed or licks).
   e. Develop effective treatments and delivery methods for antibiotic treatments of bighorn sheep in the wild during disease outbreaks. For example, the topical use of tetracyclines on feeds could be attempted.
   f. Determine if there is a benefit to exposing bighorn sheep transplantees to a few resident bighorn sheep or domestic sheep during preconditioning to provide a low-level exposure to indigenous diseases

2. Disease Transmission
   a. Evaluate the potential for pneumonia transmission from domestic sheep to bighorn under simulated natural conditions.
   b. Evaluate the potential for intraspecies pneumonia transmission (i.e. bighorn to bighorn as it relates to translocation and preconditioning).
   c. Evaluate the potential for disease transmission from bighorn to domestic sheep.
   d. Determine the potential for other wildlife to spread diseases important to bighorn sheep.
3. Stress
   a. Develop and test long-term tranquilizers and sedatives as a means of reducing capture and translocation stress.
   b. Determine the role of stress (to include nutritional and predator-induced stress) in bighorn disease transmission and development or outbreak.
   c. Develop methods to analyze sheep for chronic stress.
   d. Determine whether or not fecal cortisol is an effective method for assessing clinically significant stress in free-roaming herds.

4. Disease sampling and evaluation of isolates
   a. Type the varieties of *Pasteurella/Mannheimia, Mycoplasma*, and other pathogens contributing to pneumonia in both bighorn sheep and domestic sheep.
   b. Determine the sensitivity and specificity of diagnostic tests for pathogens affecting bighorn sheep.

5. Genetics and management techniques
   a. Determine if certain genetic lineages of domestic sheep are more/less likely to carry diseases of concern for bighorn sheep.
   b. Identify genetic components that are important for disease resistance, ensure there are no deleterious effects to the population, and look at ways to incorporate resistant genes into the genome of bighorn sheep.
   c. Examine the role of inbreeding on disease resistance in bighorn sheep.
   d. Determine if certain lambing management techniques are more/less likely to have any affects on respiratory disease prevalence and transmission.

B. NUTRITION/HABITAT/PREDATION
1. Determine what micronutrients are essential for healthy immune systems, reproductive systems, respiratory systems and other physiologic systems in bighorn sheep, and how to best insure the sheep obtain adequate amounts in the wild.
   a. Develop and test protein/mineral supplement blocks for bighorn sheep
2. Determine how habitat improvements influence nutritional status and health in bighorn sheep.
3. Radio-collar translocated bighorn sheep and monitor closely, to understand habitat and forage selection by the newly-released bighorns (Wyoming includes this as standard protocol).
5. Determine general nutritional requirements of Bighorn sheep (especially for lambs and pregnant and lactating ewes).
C. **Predation**

1. Determine predation impacts on bighorn sheep.
   a. Determine the species of predator responsible for bighorn sheep predation
   b. Identify the seasonal timing of predation
   c. Evaluate the stress to bighorn sheep from predation.
   d. Determine public perceptions of predator control to enhance bighorn sheep survival.
   e. Determine the benefit of predator control for bighorn sheep

2. Understand the balance and interaction between predators and bighorn sheep diseases and how the balance/imbalances affect population health and numbers.

D. **Related Action Items**

1. Use state of the art mapping and tracking remote sensing techniques for determining forage types and extents of sheep ranges.
   a. Use GPS (Global Positioning System) collars to accurately document bighorn sheep movements.

2. Use the Western Association of Fish and Wildlife Agencies standard protocol detailing uniform methods for routinely collecting samples from captured bighorn sheep, for disease analyses.

3. Use the standard protocol detailing uniform methods for routinely collecting samples from domestic sheep, for disease analyses.

4. "Bank" a variety of isolated respiratory pathogens and serum samples from captured bighorn sheep for future reference and research and summarize information collected.

5. "Bank" a variety of isolated respiratory pathogens and serum samples from domestic sheep for future reference and research and summarize information collected.

6. Locate and list all bighorn and domestic sample "banks".

7. Support the United States Animal Health Association subcommittee on domestic and bighorn sheep diseases.