

# Great Basin Wildlife Disease Concerns

Russ Mason

*Nevada Department of Wildlife, Reno, NV*

In the Great Basin, wildlife diseases have always represented a significant challenge to wildlife managers, agricultural production, and human health and safety. One of the first priorities of the U.S. Department of Agriculture, Division of Fish and Wildlife Services was Congressionally directed action to eradicate vectors for zoonotic disease, particularly rabies, in Nevada, Oregon, and Idaho in 1916 (Hawthorne 2004). Addressing disease as it affects the host of interests in these states, and identifying the prerequisite funding to respond proactively and effectively across departmental and jurisdictional boundaries, represents one of the most significant challenges to fish and wildlife managers in the 21<sup>st</sup> century.

## Key Issues

Within the past decade, in addition to the chronic challenges presented by tularemia (Friend 2006), salmonella (Daszak and others 2000), rabies (Krebs and others 2005), plague (Centers for Disease Control 2006b), brucellosis (McCorquodale and DiGiacomo 1985), anthrax, and clostridial diseases (Williams and others 2002b), a host of new (or newly recognized) diseases are now, or soon may be, threatening wildlife, agricultural operations, and human health in both rural and urbanizing areas (Chang and others 2003).

For terrestrial wildlife, diseases of concern include Pasturella (Callan and others 1991), Chronic Wasting Disease (Williams and others 2002a), Hantavirus (Calisher and others 2005, Calisher 1994), Avian Influenza H5N1 (Centers for Disease Control 2006a, Rappole and Hubalek 2006), and West Nile Virus (Clark and others 2006). Some of these concerns, such as Pasturella impacts on bighorn sheep and West Nile Virus impacts on sage grouse, may represent critical limiting factors that complicate re-establishment and recovery efforts on behalf of these species. For aquatic species and amphibians, diseases of concern include Whirling Disease (Nehring and Walker 1996), Cytrid fungus (Daszak 1999), various cyprinid diseases (Hoole and others 2001) and viruses that infect important exotic beneficial species such as catfish

and black bass (for example, Plumb and Zilberg 1999). In addition to disease, *per se*, nutritional concerns that include selenium deficiencies and various micronutrient deficiencies are known or suspected causes of big game mortalities (for example, McKinney and others 2006) and may represent limiting factors in the re-establishment of native species such as bighorn sheep.

## Management Challenges

Great Basin states often lack the financial resources and personnel to mount proactive disease and nutritional surveillance. This obviously limits the effectiveness of management attempts to devise and implement strategies that resolve or mitigate risks. In addition, because existing resources are almost always focused on known challenges (reflecting public concern, political pressure, and the availability of funding), little if any effort is devoted to diseases or nutritional issues that may become problems in the foreseeable future or have not yet captured popular attention. Even for those diseases, such as Chronic Wasting Disease, where resources are available and focused on surveillance (and to a lesser degree, management), surprisingly little is known about the actual impacts of disease processes on population size or demographics. At the regional and national level, there is little coordination among state and federal agencies in surveillance, reporting, and the development of public information capabilities so that the actual and potential risks of diseases is understood. As a result, effective management strategies are rarely implemented across jurisdictional boundaries, and efficient and consistent public information strategies are few.

## Highest Priority Research and Management Questions

Very little is known about the potential or actual hazards presented to wildlife by most zoonotic disease. Among the highest research priorities for Great Basin species, data

are needed on actual impacts of selenium deficiencies on big game and the actual risk of *Pasteurella* transmission between domestic sheep and bighorn. Similarly, although micronutrient deficiencies are suspected as causes of mortality in pronghorn and mule deer, little or no pertinent data have been collected. Coincident with these research needs, little is known about environmental (for example, climatic) or social (for example, bighorn population density) factors that may predispose animals to infection.

Also of very high priority is research on the range-wide impacts of West Nile Virus on sage grouse. Data are needed on factors that may place grouse populations at relatively greater risk and management strategies are needed that could effectively and economically eliminate, reduce, or mitigate those risks.

## Existing Programs and Resources

Most Great Basin state agencies are developing wildlife health programs. For example, the Nevada Department of Wildlife and the Idaho Department of Fish and Game have, or are in the process of hiring, wildlife veterinarians and other specialists to develop proactive wildlife health programs. In most cases, funding from the federal government is being used to start these programs. Where federal funding is available, state veterinary laboratories are providing analytical services for diseases that have agricultural or human health implications. The U.S. Geological Survey National Wildlife Health Laboratory in Madison, WI, the U.S. Department of Agriculture National Veterinary Services Laboratory in Ames, IA, the Southeastern Cooperative Wildlife Disease Study in Athens, GA, and university laboratories throughout the Great Basin and neighboring regions can and do provide diagnostic and testing capabilities for some diseases in some situations. At least in Nevada, sportsmen's organizations such as the Reno Chapter of Nevada Bighorns Unlimited are providing funding to defray diagnostic and pathological examinations of certain species of concern when disease is suspected as a cause of mortality. Other programs include:

U.S. Geological Survey, National Wildlife Health Center. <http://www.nwhc.usgs.gov/> [2007, July 17]

Department of Health and Human Sciences. Centers for Disease Control and Prevention. <http://www.cdc.gov/> [2007, July 17]

## Strategic Plans

The Nevada Department of Wildlife, together with the Nevada Department of Agriculture and input from other constituencies, is developing a Wildlife Health Initiative. Other Great Basin states are attempting similar collaborations. In every case, there is a dynamic tension between the missions of the respective agencies. More broadly, the Association of Fish and Wildlife Agencies is proposing implementation of a National Fish and Wildlife Health Initiative by a multi-disciplinary consortium of state, federal, university, tribal, corporate, and non-profit organizations dedicated to advancing the science, awareness, and cooperation related to all aspects of fish and wildlife health issues. The initiative will be a policy framework through which all interested parties may seek to minimize the negative impacts of disease issues involving fish and wildlife in the United States.

## References

- Calisher, C. H. 1994. Medically important arboviruses of the United States and Canada. *Clinical Microbiology Reviews*. 7(1): 89-116.
- Calisher, C. H.; Root, J. J.; Mills, J. N.; Rowe, J. E.; Reeder, S. A.; Jentes, E. S.; Wagoner, K.; Beaty, B. J. 2005. Epizootiology of Sin Nombre and El Moro Canyon hantaviruses, Southeastern Colorado, 1995-2000. *Journal of Wildlife Diseases*. 41(1): 1-11.
- Callan, R. J.; Bunch, T. D.; Workman, G. W.; Mock, R. E. 1991. Development of pneumonia in desert bighorn sheep after exposure to a flock of exotic and domestic sheep. *Journal of the American Veterinary Medical Association*. 198(6): 1052-1056.
- Centers for Disease Control and Prevention. 2006a. Avian Influenza (Bird Flu). [Homepage of Centers for Disease Control and Prevention], [Online]. Available: <http://www.cdc.gov/flu/avian/> [2007, July 17].
- Centers for Disease Control and Prevention. 2006b. CDC Plague Home Page. [Homepage of Centers for Disease Control and Prevention], [Online]. Available: <http://www.cdc.gov/ncidod/dvbid/plague/> [2007, July 17].
- Chang, M.; Glynn, M. K.; Groseclose, S. L. 2003. Endemic, notifiable, bioterrorism-related diseases, United States, 1992-1999. *Emerging Infectious Diseases*. 9(5): 556-564.
- Clark, L.; Hall, J.; McLean, R.; Dunbar, M.; Klenk, K.; Bowen, R.; Smeraski, C. A. 2006. Susceptibility of Greater Sage Grouse to experimental infection with West Nile Virus. *Journal of Wildlife Diseases*. 42(1): 14-22.
- Daszak, P. 1999. Emerging infectious diseases and amphibian population declines. *Emerging Infectious Diseases*. 5(6): 735-748.
- Daszak, P.; Cunningham, A. A.; Hyatt, A. D. 2000. Emerging infectious diseases of wildlife: threats to biodiversity and human health. *Science*. 287(5452): 443-449.
- Friend, M. 2006. Tularemia. Reston, Virginia, U.S. Geological Survey Circular 1297. 68 p.
- Hawthorne, D. W. 2004. The history of federal and cooperative animal damage control. *Sheep and Goat Research Journal*. 19: 13-15.
- Hoole, D.; Burke, D.; Burgess P.; Wellby, I. 2001. Disease of Carp and other cyprinid fishes. United Kingdom: Blackwell Science. 264 p.

- Krebs, J. W.; Mandel, E. J.; Swerdlow, D. L.; Rupprecht, C. E. 2005. Rabies surveillance in the United States during 2004. *Journal of the American Veterinary Medical Association*. 227(12): 1912-1913.
- McCorquodale, S. M.; DiGiacomo, R. F. 1985. The role of wild North American ungulates in the epidemiology of bovine brucellosis: a review. *Journal of Wildlife Diseases*. 21(4): 351-357.
- McKinney, T.; Smith, T. W.; deVos Jr., J. C. 2006. Evaluation of factors potentially influencing a desert bighorn sheep population. *Wildlife Monographs*. 164(1): 1-36.
- Nehring, R. B.; Walker, P. G. 1996. Whirling disease in the wild: the new reality in the Intermountain West. *Fisheries*. 21(6): 28-31.
- Plumb, J. A.; Zilberg, D. 1999. The lethal dose of largemouth bass virus in juvenile largemouth bass and the comparative susceptibility of striped bass. *Journal of Aquatic Animal Health*. 11: 246-252.
- Rappole, J. H.; Hubalek, Z. 2006. Birds and influenza H5N1 virus movement to and within North America. *Emerging Infectious Diseases*. 12(10): 1486-1492.
- Williams, E. S.; Miller, M. W.; Kreeger, T. J.; Kahn, R.; Thorne, R.H. 2002a. Chronic wasting disease of deer and elk: A review with recommendations for management. *Journal of Wildlife Management*. 66(3): 551-563.
- Williams, E. S.; Yuill, T.; Artois, M.; Fisher, J.; Haigh, S. A. 2002b. Emerging infectious diseases in wildlife. *Reviews in Science and Technology*. 21(1): 139-157.