National Park Service
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Greater Yellowstone Network
Yellowstone National Park

Yellowstone Wildlife Health Program

A partnership between Yellowstone National Park, the University of California–Davis, Montana State University and the Yellowstone Park Foundation.

2008 Annual Report

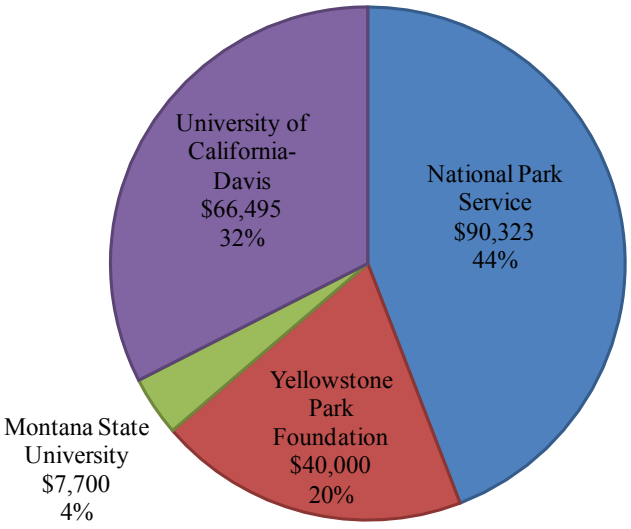
Much of the interest in disease ecology and wildlife health has been prompted by the emergence, or resurgence, of many parasites that move between livestock, wildlife, and/or humans. Wildlife and their parasites do not recognize political or jurisdictional boundaries and, as a result, can affect the natural ecosystems of national parks and human health in nearby communities.

Wildlife diseases are important because of their impact on both the natural ecosystem and human health. Wildlife, domestic animals and humans share a large and increasing number of infectious diseases. The continued globalization of society, human population growth, and associated landscape changes, will multiply opportunities for contact between wildlife, domestic animals, and humans, facilitating emerging infectious diseases (EID).

In response, Yellowstone National Park signed a Memorandum of Understanding with Montana State University and the University of California–Davis School of Veterinary Medicine Wildlife Health Center to establish the Yellowstone Wildlife Health Program. This program combines expertise from several disciplines to address existing and potential diseases in the park.

As Yellowstone National Park is home to one of the most intact remaining wildlife ecosystems, it is fitting that the park should serve as a proving ground for the state-of-the-art research that will be necessary to conserve these wildlife resources for future generations. This report highlights the Yellowstone Wildlife Health Program projects and initiatives undertaken in 2008.

Program Funding $204,518



ASSESMENT OF BRUCELLOSIS TRANSMISSION RISK

Wild, free-ranging, bison and elk in the Greater Yellowstone Area persist as the last reservoir of brucellosis in the United States. The ability of bison and elk to serve as alternate hosts and transmit brucellosis to cattle complicates disease management. The Yellowstone Wildlife Health Program supported an assessment of brucellosis transmission risk among bison, elk and cattle in the northern portion of the Greater Yellowstone Area by Drs. Brant Schumaker and Tim Carpenter from the University of California at Davis. This work is ongoing, with risk calculations being developed using a combination of information on overlap between wildlife and livestock combined with information on brucellosis exposure, bison and elk demographics (reproduction, survival), herd densities, and brucellosis dynamics. Models will also be developed to simulate management strategies such as bison vaccination and evaluate their effects on brucellosis transmission risk. While many research investigations claim sweeping relevance, this information is unquestionably fundamental for policy makers to advance towards the suppression and eventual eradication of brucellosis in the Greater Yellowstone Area.

BRUCELLOSIS SURVEILLANCE PROGRAM

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Yellowstone bison are currently managed pursuant to the Interagency Bison Management Plan, which was agreed to by the federal government and the State of Montana in 2000. The goals of this plan are to conserve a wild, free-ranging bison population, while concurrently reducing the risk of brucellosis transmission from bison to cattle. Yellowstone National Park staff developed a surveillance plan to implement a long-term monitoring and research program for Yellowstone bison that obtains relevant information to guide decision-making regarding the conservation of bison, adaptive management of the Interagency Bison Management Plan, and evaluation of the effectiveness of vaccination. As part of this effort, the Yellowstone Wildlife Health Program supported analyses and model simulations by Dr. Paul Cross from the U.S. Geological Survey and Dr. Michael Ebinger from Montana State University to develop a rigorous sampling and statistical approach for detecting a decrease in brucellosis infection resulting from the vaccination of bison. Findings and recommendations from this effort will be considered by managers deciding whether to proceed with an intensive vaccination program for bison inside Yellowstone National Park.

BRUCELLOSIS SURVEILLANCE LABORATORY

Many infectious diseases found in wildlife, such as brucellosis, can also infect humans. Therefore, a proper laboratory facility is necessary to work with potentially infectious samples while ensuring human safety. The Yellowstone Wildlife Health Program supported the acquisition of specialized equipment and development of operating procedures to enable Yellowstone National Park staff to store and prepare biological samples potentially exposed to brucellosis in a safe environment. The equipment will be used to isolate and incubate bison cells for analyses of immune responses by bison to brucellosis. This information will be considered by decision-makers before they decide to embark on an intensive vaccination program. If intensive vaccination is undertaken, the laboratory will be used to facilitate the long-term surveillance of bison exposure to brucellosis and their immune responses to vaccination.

Bison blood samples are tested for *Brucella abortus* (above).

IMMUNE RESPONSES TO BRUCELLOSIS VACCINATION

Yellowstone staff draw blood from immobilized bison to test immune responses to vaccination.

Brucellosis is a bacterial disease caused by *Brucella abortus* that may induce abortions or the birth of non-viable calves in livestock and wildlife. To reduce the risk of brucellosis transmission from Yellowstone bison migrating outside the park to cattle herds near the park boundary, Yellowstone National Park is considering a vaccination program for bison. The effectiveness of this program would depend on the vaccine's ability to induce a protective immune response to brucellosis infection. However, there is much uncertainty about the level of protection offered by the existing vaccine. The Yellowstone Wildlife Health Program supported a study by John Treanor from Yellowstone National Park, Dr. Ryan Clarke from the U.S. Animal and Plant Health Inspection Service, and Dr. David Pascual from Montana State University to compare the immune responses of vaccinated free-ranging Yellowstone bison to those maintained in captivity outside the park.

POPULATION MODEL OF YELLOWSTONE BISON

The need to make decisions without having all the relevant information is a common dilemma faced by wildlife managers. Models serve as important tools for assimilating data from many sources and providing managers with the best information for decision making. The Yellowstone Wildlife Health Program supported Dr. Tom Hobbs from Colorado State University to develop a model based on 40 years of bison data from Yellowstone National Park that predicts future trends in the Yellowstone bison population and its exposure to brucellosis. This work is ongoing, but the modeling approach will identify the level of uncertainty associated with model predictions and serve as an invaluable tool for evaluating the probability that a management action being considered for Yellowstone bison or to reduce brucellosis transmission would result in the desired outcome.

BRUCELLOSIS TRANSMISSION BETWEEN ELK & BISON

Most livestock natural resources personnel view bison in Yellowstone National Park as the primary sources for brucellosis transmission to elk and livestock in the northern portion of the Greater Yellowstone Area. However, the role of bison in possibly sustaining brucellosis in Yellowstone elk is uncertain. The Yellowstone Wildlife Health Program supported analyses by Drs. Kelly Proffitt and Bob Garrott from Montana State University to evaluate the overlap in distribution between bison and elk in an area of Yellowstone where elk often commingle with bison during winter and spring. Findings indicated that elk had much lower rates of exposure to brucellosis (<3%) than bison (40-60%) in this area. Thus, brucellosis transmission risk from bison to elk was quite low in this area, despite a high degree of spatial overlap during the period of late-pregnancy abortions and birthing.

CANID DISEASE ECOLOGY

Researcher Emily Almberg (front) and Wolf Project Staff member Josh Irving.

Wolf abundance in Yellowstone National Park decreased by about 10% in 1999 and 30% in 2005. Pup survival was poor during these years, and disease was implicated as a contributing factor. The Yellowstone Wildlife Health Program supported Emily Almberg from the University of Minnesota to analyze blood serum collected from wolves, coyotes, and red foxes during 1991-2007 for exposure to various diseases. All three species had high exposure to canine distemper virus during both 1999 and 2005, suggesting that this virus contributed to the observed mortality. Canine distemper virus does not appear to jeopardize the long-term existence of Yellowstone wolves, coyotes, or foxes, but could cause short-term decreases in the abundances of these species. Model simulations indicated that wolf numbers in the Greater Yellowstone Area including the area surrounding Yellowstone National Park are too small to independently sustain canine distemper virus in the long term. Thus, there is likely one or more other carnivore species that transmit the virus to wolves and enable the long-term persistence of canine distemper virus in the area.

TRUMPETER SWANS

The abundance of trumpeter swans residing year-round in Yellowstone National Park has decreased over the past 40 years, raising concerns that this population, which helped facilitate the restoration of the species across North America, may disappear. The Yellowstone Wildlife Health Program supported the analysis of Yellowstone trumpeter swan data by Drs. Kelly Proffitt and Bob Garrott from Montana State University to identify the factors influencing swan abundance and reproductive success. Findings indicated that decreases in swan abundance became more dramatic after supplemental feeding of grain outside of ellowstone National Park was terminated in winter 1992-93. There was little evidence that decreasing abundance was due to competition for forage with increasing numbers of migratory swans from Canada that wintered in the park. Yellowstone appears to provide marginal conditions for nesting and productivity is continually low, suggesting that the decrease in abundance will likely continue unless swans from nearby areas immigrate into the park. Park staff are conducting habitat assessments this summer to assist in developing more effective conservation strategies for the future.

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Center for Animal Disease Modeling and Surveillance
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National Park Service
www.nps.gov

Yellowstone National Park
www.nps.gov/yell

Greater Yellowstone Inventory and Monitoring Network
http://science.nature.nps.gov/im/units/gryn/

Rocky Mountains Cooperative Ecosystem Studies Unit
www.forestry.umt.edu/research/cesu

Yellowstone Park Foundation
www.ypf.org

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YELLOWSTONE WILDLIFE HEALTH PROGRAM
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