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Wildlife Diseases: A Global Expert Takes Stock Of Greater Yellowstone

ANDREW DOBSON DISCUSSES THE CONSEQUENCES OF ARTIFICIALLY FEEDING ELK IN WYOMING, THE POSITIVE ROLE OF PREDATORS IN CONFRONTING DISEASE, AND WORRIES RELATED TO CWD

by **Todd Wilkinson**



Andy Dobson says feedgrounds have worsened the prevalence and problem of brucellosis in elk and could be setting Greater Yellowstone up for serious problems with Chronic Wasting Disease

As a globally-renowned scientist, Andy P. Dobson specializes in studying a topic that most people don't like to think about, but which is titillating nonetheless: diseases that make both people and animals sick.

From his [office in the Department of Ecology and Evolutionary Biology at Princeton University](#), Dobson has partaken in major research efforts, mentored some of the biggest young thinkers in conservation biology, and served on advisory panels examining disease outbreaks in animals. "Parasitic worms, bacteria and viruses are a constant feature of the daily

In the Lower 48 states, nothing rivals the Greater Yellowstone Ecosystem in terms of large wild animals moving across it and sharing terrain with non-native domestic animals that haven't really been here that long. With regard to disease issues such as brucellosis, Chronic Wasting Disease and other pathogens, he says Greater Yellowstone commands a high profile.

We caught up with him not long ago as he was in route to New Mexico where he serves as external professor with [Santa Fe Institute](#). Here is how our conversation went.

Todd Wilkinson: How did you first become interested in epizootic diseases?

Andrew Dobson: I became interested in parasites and pathogens when I worked as a research assistant for Roy Anderson and Phillip Whitfield at Kings College, London in 1977. I did experiments for 18 months quantifying the infection dynamics of a fish parasite— done on the same corridor as Rosamund Franklin took her photographs of DNA that inspired James Watson and Francis Crick! [Watson and Crick are credited with discovering the chemical structure of DNA].

Roy Anderson got me very interested in mathematical models for parasites and after going to Oxford to do my PhD on birds and climate variability, I went back to London to work with Roy as a post-Doc on models for interactions between parasites. This led to a post-Doc with Bob May at Princeton, where I was allowed to both develop interests in the role that pathogens play in conservation problems and also develop deeper interests in using mathematical models to explore these problems.

Wilkinson: Our mutual friend, Bozeman-based writer David Quammen, explored the subject in his book *[Spillover: Animal Infections and the Next Human Pandemic](#)*. Why should inhabitants of the modern world be paying attention to diseases that can spread from wild areas to people/livestock and vice versa?

Dobson: I've watched what can happen. One of the problems I got interested in was rinderpest virus. This was the result of going on a field trip to Tanzania and Kenya with Princeton graduate students and realizing that the spillover of rinderpest from cattle to wildlife in the 1890's had caused the biggest pandemic of wildlife ever recorded/observed. So I got a small grant from the Wildlife Conservation Society in New York to work on this in Tanzania. I was then hired at the University of Rochester in upstate New York and used my start up funds to start working in Serengeti on rinderpest.

Wilkinson: You've had an eye on the Greater Yellowstone Ecosystem, which represents a smaller scale version of the Serengeti region, for a long while. You've been critical of the fact that more than 11,500 Yellowstone bison have been killed in Montana or sent to slaughter based on the suspicion and claims from the livestock industry they represent a grave risk of passing along brucellosis to domestic cattle. In fact, the National Academies of Sciences a



Ecologist Andy P. Dobson

happening here that intrigues you, both the relative uniqueness of the region and the threats facing it.

Dobson: The first-ever meeting of the Society for Conservation Biology was held at Bozeman at the end of my first year in Rochester. I was invited to speak in the first symposium which was about the importance of parasites and disease to conservation. This was the first time I visited Yellowstone and people at the meeting were talking about bison and brucellosis, so I realized there may be similarities with rinderpest around Serengeti. So this got me

interested in developing more general mathematical models for "spillover" of diseases between wildlife and domestic livestock. I actually flew straight from Bozeman to Serengeti at the end of that 1987 meeting and lots of those ideas developed on those flights and the month I spent in Serengeti.

Wilkinson: Where did your work go from there?

Dobson: For a few decades, I tried to find ways to work in both Yellowstone and Serengeti as I see them as the two large iconic ecosystems where most of the original fauna of the last 1000 years is still intact. They are also areas where spillover of pathogens between domestic animals and wildlife and vice versa, strongly shapes conservation discussions. Both areas are threatened by expanding human land use and pathogens are intrinsic to this. I was lucky in that when I moved back to Princeton in January 1990, David Wilcove who was then working with Michael Scott, then northern Rockies director at the Wilderness Society in Bozeman, asked me to put together an independent assessment of the viability of grizzly bears in Greater Yellowstone.

Wilkinson: And....?

Dobson: This led to a series of meetings where I met many people working in the park and for conservation and policy entities. When bison and brucellosis arose as a management problem they asked me to provide opinions and work with Dr. Mary Meagher. [Meagher, a Yellowstone-based researcher and ecologist, laid the groundwork for modern scientific study of Yellowstone bison]. Much later when the wolves started getting disease problems, such as distemper and mange, Doug Smith [Yellowstone's chief wolf biologist] asked me to look into the dynamics of these problems, curiously matching similar problems with African wild dogs in Serengeti following their reintroduction.

Wilkinson: You are fascinated by how diseases can become virulent and how pathogens can

Dobson: I worked on a bunch of emerging disease problems within the National Science Foundation/National Institute of Health Infectious Diseases program that started up in around 2000. It began with looking at pathogens in carnivores in the Serengeti such as rabies and distemper as well as Nipah and Hendra viruses in Malaysia and Australia.

Raina Plowright, now in the disease ecology lab at Montana State University, was a student on this project. We chose a canonical emerging disease which no one cares about so we can study it without trying to eliminate it. The disease, mycoplasma, hit house finches. The disease spread across the entire US between 1993 and today, reducing the house finch population by greater than 50 percent. It evolved to be both more and less virulent due to selection at the CRISPR locus in the pathogen. Studying diseases doesn't get sexier than that! [EDITOR'S NOTE: Mycoplasma, a bacterium that can cause pneumonia in humans and wildlife, is also considered a serious health disease by the livestock industry].

REVISITING BRUCELLOSIS IN THE GREATER YELLOWSTONE AREA



In 2017, the National Academies of Sciences released this report examining the issue of brucellosis, wildlife and livestock. It found that elk, not bison, represent the most serious threat of transmitting the disease to cattle, debunking the argument used by the livestock industry and politicians that resulted in the deaths of more than 11,500 park bison. The report also said that artificially feeding elk made the disease threat worse.

Wilkinson: The answer seems obvious, but why does the public need to be paying more attention to diseases that exist at the intersection of humans, wildlife and livestock?

Dobson: Two reasons spring to mind. First, we just cleared 1000 people infected with Ebola in Central African Republic this spring and probably similar numbers with measles. These are two diseases you really don't want to get, nor should you expose your children to them. So

MYTHS OF INFECTIOUS DISEASE

Wilkinson: What's the second reason?

Dobson: Ecologists ironically have been slow to understand the central role that pathogens and parasites play in natural ecosystems. It could be that as much 90 percent of biodiversity is parasitic on the 10 percent we have spent most of the last century studying. This has given us a false impression of the importance of predators and herbivores in structuring communities. Both of these groups carry pathogens that constantly drain their nutritional resources and occasionally gain an advantage that leads to epidemic outbreaks. [Note: [read recent assessment on impact that infectious diseases have had on Yellowstone wolves](#), for which Dobson served as a co-author.]

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Wilkinson: Are you saying you believe that diseases play a much larger role in the health of wildlife but management agencies are focused on other things?

Dobson: Yes. A fuller understanding of how natural communities operate and how populations are regulated requires a better ecological and mathematical understanding of the role that parasites and pathogens play in natural—and unnatural, e.g. farmland—ecological communities. Many ecological and wildlife management debates are acrimonious because people forgot to consider the role of disease.

Wilkinson: When it comes to some of the major maladies that are present in Greater Yellowstone—brucellosis, bovine TB, CWD, and pneumonia in mountain sheep—are there any

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management. Brucellosis is largely a consequence of feeding elk in winter in Wyoming when it might be better to let their populations settle to lower levels with healthier populations.

Similarly, CWD presents an expanding and increasingly worrying threat to elk, mule deer *and cattle*. It's a consequence of loss of coyotes, wolves and other predators from the West over the last fifty years, combined with early attempts to ranch stock on really poor soils where they are so nutritionally deprived that they gnaw on old carcasses and become infected with prions from animals that have died from CWD.

Wilkinson: You've spoken out about the value of predators.

Dobson: If you **have wolves and coyotes they kill and consume these weakened animals and effectively remove CWD from the ecosystem.**

Wilkinson: And you've warned about the risk of disease transmission when domestic livestock moves into areas where wildlife lives.

Dobson: Pneumonia in bighorn [wild mountain] sheep is always spilling over *from* domestic sheep. It's a serious problem in the West and bighorn numbers are declining in many places.



Dobson says wolves and other predators, far from being enemies of ecosystem health, play an important role in slowing the spread of disease. Photo courtesy Gary Kramer/US Fish and Wildlife Service

Wilkinson: What role can wild native predators play in slowing the progression of CWD? In the northern Rockies, there are some that deny they can function as a gauntlet. Your thoughts?

Dobson: Wolves and coyotes are our strongest defense against CWD, particularly wolves – they are pursuit predators who always focus on the weakest animals in a group of potential prey. As CWD manifests itself by reducing locomotory ability, wolves will key in on this and selectively remove those individuals from the population. These animals are then not available to infect uninfected individuals in the herd – so there's a bonus knock-on effect of selective predation.

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Dobson: Canids are not susceptible to prions, many millions of years of evolution as scavengers have insured this. During the BSE [Mad Cow Disease] crisis in the UK, it was estimated that a large number of domestic dogs in the UK was exposed to the prions. Not a single dog was ever recorded as infected. So wolves and canids do not transmit the prions/CWD in their feces and urine. It is nonsense to suggest so. Carnivores are also much more territorial in the West and only dispersing individuals range over areas comparable to those of elk, mule deer and pronghorn.

Wilkinson: Okay, last question: Given your experience globally, look at the artificial feeding of upwards of 20,000 elk at the National Elk Refuge in Jackson Hole and Wyoming's 22 state-run feed grounds. What's your best scientific opinion?

Dobson: As mentioned above, I think it's really dumb. It's much better to let natural regulation reduce elk populations down to levels naturally supported by the landscape. Aggregating elk on feedgrounds at the time of peak *Brucella* transmission and with CWD looming is arguably the stupidest form of animal management I can imagine.

EDITOR'S NOTE: For more on the threat of Chronic Wasting Disease in Greater Yellowstone, please read *Mountain Journal's* ongoing series of investigative reports, beginning with part 1 (click on link): [Greater Yellowstone's Coming Plague](#)



About **Todd Wilkinson**

Todd Wilkinson, founder of *Mountain Journal*, is an American author and journalist proudly trained in the old school tradition. He's been a journalist for 35 years and writes for publications ranging from *National Geographic* to *The Guardian*. He is author of several books on topics ranging from scientific whistleblowers

to Ted Turner and the story of Jackson Hole grizzly mother 399, the most famous bear in the world which features photographs by Thomas Mangelsen. For more information on Wilkinson, [click here](#). (Photo by David J Swift).

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