

Wildlife Conservation Society, Climate Change, Wildlife and Human Health

This commentary is to try and pull together some seemingly diverse themes, and to introduce readers to some useful documents on climate change and health (some of which are reproduced in this section) as well as to provide opportunities for acquiring a range of scientific documents free of cost, about this timely subject as well as many others.

The themes and items are :

- linking zoos and field conservation ... short history of the Wildlife Conservation Society.
- linking wildlife research and monitoring with emerging diseases and human health, (*via* a paper by WCS scientists called "Wildlife Health as an Indicator of Climate Change", and how to get an e-copy - free.
- a whole book linking climate change to health, e.g. *Global Climate Change and Extreme Weather Events: Understanding the Contributions to Infectious Disease Emergence* - how to get an e copy - free.
- a new report from WCS, summarised in a brochure called *The Deadly Dozen*, which has been reproduced in this section, but which also can be downloaded from the web, and finally
- the National Academies Press, an amazing resource where you can download these items about global climate change and its relationship to the emergence of infectious diseases (and many other books and papers as well).

Since many of our readers are zoo employees or zoo enthusiasts we would like to highlight the fact that WCS - Wildlife Conservation Society, is one of the major wildlife organisations in the world today. There is hardly a country that WCS has not infiltrated and put its wildlife under the microscope. The historical background provided in the adjacent box will help readers appreciate its role in conservation in USA, the world and, in this instant, the link between wildlife studies, climate change and human health. The history illustrates the very close link WCS has with New York zoos historically and provides a model of excellence of which zoos everywhere can be proud. I particularly like the point that wildlife studies can aid humanity directly as well as indirectly. This history has been summarised directly from the WCS website www.wcs.net.

Wildlife Conservation Society is an outstanding example of zoos and field biologists working together to achieve conservation goals. It is not the only example in the world, but it is surely one of the very best.

WCS health experts have come out with a report which provides specific examples of disease agents which pose a threat to wildlife and human health. This is because of their ability to spread as a result of environmental changes due to climate. The Report was released in October 2008 at the IUCN World Conservation Congress, Barcelona, Spain; the report describes 12 WCS identified pathogens which could

Historical Brief of NYZS and WCS

WCS originated as New York Zoological Society NYZS in 1895 when New York State chartered the organization. One of the first conservation organizations in USA, NYZS had a clear mandate to forward wildlife conservation, promote the study of zoology, and create a first-class zoological park. The New York Zoological Park was designed to complement other of New York's "cultural icons" such as the American Museum of Natural History. NYZS thus gained the confidence of city government and later took over management of New York Aquarium. The society later built a new aquarium in Brooklyn. Later the Society renovated three city zoos in Manhattan, Brooklyn, and Queens. Later NYZS effected a total transformation of the old Central Park Zoo (1988), then Prospect Park Zoo (1992) & Queens Zoo (1993). During its history NYZS activities balanced a great variety of significant field conservation projects the world over, while running the zoos entrusted to it.

NYZS' conservation activities began before their first zoo opened, when Director William Hornaday surveyed wildlife conditions in America and sounded an alarm on behalf of population declines of birds and mammals in NYZS's annual reports. As far back as 1897, Hornaday engaged a field researcher to study wildlife in Alaska and lobbied for wildlife protective legislation in Alaska and in USA. He led the reintroduction of the American bison, nearly extinct in wild, from 1905-1907 when the first 15 bison travelled from Bronx Zoo to Wichita Reserve, and more added later. Even today, this reintroduction, insuring Bison survival in the wild up to now, is a seminal conservation success story.

William Beebe, Curator of birds at Bronx Zoo, started field research as soon as the zoo opened. He conducted research on wild pheasants of Asia 1908 to 1911. His work also inspired NYZS's Department of Tropical Research. He recorded the first human observations of deep sea bottom in a bathysphere, an underwater boat.

After World War II NYZS expanded its activities in field biology and conservation, including helping to start the Jackson Hole Wildlife Park that morphed into part of the Grand Teton National Park in 1962.

In late 1950's NYZS began wildlife surveys / projects in Kenya, Tanzania, Uganda, Ethiopia, Sudan, Burma, and the Malay peninsula. NYZS funded George Shaller's research of the Congo's mountain gorilla.

The conservation activities of the Bronx Zoo and the Society continued to expand under the leadership of William Conway, who became director of the zoo in 1962 and President of NYZS in 1992. Bill Conway promoted a new vision of zoos as conservation organizations, designed new types of zoo exhibits aimed at teaching visitors about wildlife habitats and encouraged the expansion of NEZS field activities. The Society, known as New York Zoological Society for almost 100 years, got a new and more appropriate name, Wildlife Conservation Society. This was spearheaded by Dr. Conway during his Directorship a few years before he retired. Today, Dr. Steven Sanderson is President and Chief Executive Officer of WCS. Dr. Sanderson has a background in biodiversity conservation and environmental change, as well as political science. He guides WCS's innovative approach to conservation that prioritises wildlife and people. WCS manages approximately 300 field programs in 50 countries.

expand their range as a consequence of altered temperature and precipitation. They suggest that monitoring wildlife health to find out their path and behaviour can provide information to scientists which would possibly prevent a health disaster. Their approach, as described in a brochure, is driven by their "One World, One Health" programme, which is its own initiative to address human, wildlife and domestic animal health. The Earth's ecosystems' good health is dependent on how disease and health are monitored throughout the globe. WCS proposes that since wildlife is affected first by emerging diseases which then get passed to human beings, monitoring wildlife health will play a large part in addressing human health issues in time.

"One World, One Health" is a holistic programme introduced by WCS some years ago which makes the point that human, wildlife and domestic animal health issues are inextricably linked in "one health" affecting the health of all our ecosystems. See the next pages for information and a succinct review of this initiative.

The paper mentioned earlier "Wildlife Health as an Indicator of Climate Change" which appears in the aforementioned book. The article **Wildlife Health as an Indicator of Climate Change** is authored by Pablo M. Beldomenico, M.V., M.P.V.M., Ph.D.; Damien O. Joly, Ph.D.; Marcela M. Uhart, M.V. and William B. Karesh, D.V.M. all of Wildlife Conservation Society. A very brief summary of the paper is provided in its introduction, e.g., *The changes in climate we are experiencing as global warming and disturbance in precipitation regimes (IPCC, 2001) are having an impact on the health of wild animals, with resulting deleterious impacts on major human interests. In this paper, we review the relationship between climate change and wildlife health and argue that monitoring wildlife health provides an effective and sensitive indicator and predictor of climate-related emerging infectious diseases.*

The Deadly Dozen brochure was built on a paper published by WCS entitled "Wildlife Health as an Indicator of Climate Change," which appears in the book, *Global Climate Change and Extreme Weather Events: Understanding the Contributions to Infectious Disease Emergence* Workshop Summary edited by David A. Relman, Margaret A. Hamburg, Eileen R. Choffnes, and Alison Mack, Rapporteurs, Forum on Global Health and published by the National Academy of Sciences/Institute of Medicine following a project and workshop on the subject.

After the book publication, WCS created a "Deadly Dozen" brochure as a summary of their report, which you can access on the web at <http://www.wcs.org/media/file/DEADLYdozen\screen.pdf> and is also reproduced in this section.

As a matter of fact you can access the entire book mentioned above and read chapters on line or even download a free PDF of the book! A hard copy of the

paperback book also can be ordered through the National Academy of Sciences or other distributors.

Finally, we want to introduce readers to the National Academies Press on line.

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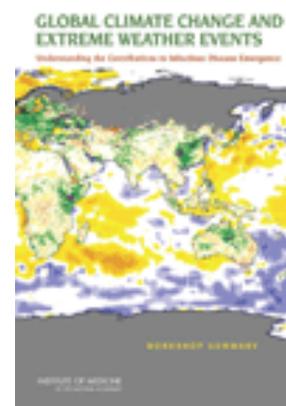
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The DEADLY DOZEN

http://www.wcs.org/deadly-dozen/wcs_deadly_dozen

Health experts from WCS have identified 12 pathogens that could spread into new regions as a result of climate change, with potential impacts to human and wildlife health as well as to global economies. Called *The Deadly Dozen: Wildlife Diseases in the Age of Climate Change*, the new report provides examples of diseases that could spread as a result of climate-induced changes in temperatures and precipitation levels. The best defense, according to the report, is a good offense—monitoring wildlife to detect how these diseases move so health professionals can prepare to mitigate their impact. In addition to the health threats that diseases pose to human and wildlife populations, the pathogens that affect wildlife have, in many cases, destabilized trade and caused significant economic damage. For example, several diseases that have emerged since the mid-1990s—including avian influenza and SARS—have caused an estimated \$100 billion in losses to the global economy. Monitoring wildlife health will help us predict where trouble spots will occur and plan how to prepare for them.

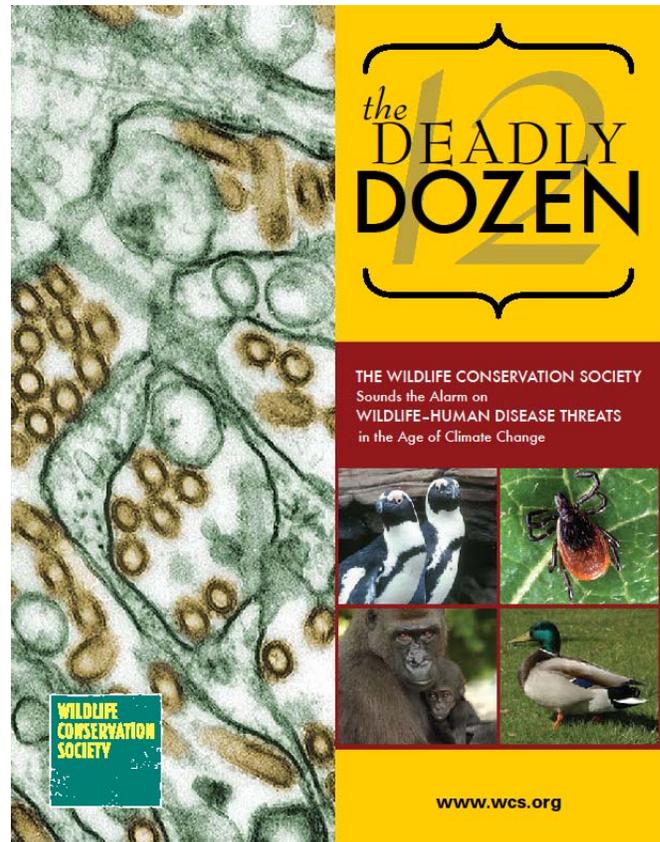
The “Deadly Dozen” report builds upon the recommendations included in a recently published paper, “Wildlife Health as an Indicator of Climate Change,” which appears in the newbook, **Global Climate Change and Extreme Weather Events**, published by the National Academy of Sciences/Institute of Medicine.

The Deadly Dozen pathogens

Red tides: Harmful algal blooms off global coasts create toxins that are deadly to both humans and wildlife. These occurrences—commonly called “red tides”—cause mass fish kills, marine mammal strandings, penguin and seabird mortalities, and human illness and death. Similar events in freshwater have resulted in animal die-offs in Africa. Altered temperatures or food-web dynamics resulting from climate change will have unpredictable impacts on the occurrences of these worldwide phenomena.

Rift Valley fever: Rift Valley fever virus (RVFV) is an emerging zoonotic disease of public health, food security, and overall economic importance, particularly in Africa and the Middle East. It commonly causes abortions and high death rates in cattle, sheep, goats, and camels. In people (who can contract the virus from butchering infected animals), the disease can be fatal. The role of wildlife in the epidemiology of this extremely devastating disease could be a significant piece of the RVFV puzzle.

Sleeping sickness: Also known as *trypanosomiasis*, this disease affects people and animals. Caused by a protozoan and transmitted by the tsetse fly, the disease is endemic in regions of sub-Saharan Africa—an area covering 36 countries, with estimates of 300,000 new cases and the deaths of 40,000 people each year in eastern Africa. Direct and indirect effects of climate change on tsetse fly distributions could play a role in the distribution of this disease.



WCS Sounds Alarm on Wildlife/Human Disease Threats in the Age of Climate Change

Tuberculosis: As humans have moved cattle around the world, bovine tuberculosis has spread. It now has a global distribution and is especially problematic in Africa, where it infects vital wildlife populations such as buffalo and lion in Kruger National Park in South Africa. The disease also infects humans in southern Africa through the consumption of un-pasteurized milk. Human forms of tuberculosis can also infect wild animals. Climate change impact on water availability due to drought is likely to increase the contact of wildlife and livestock at limited watersources, resulting in increased transmission of the disease.

Yellow fever: Found in the tropical regions of Africa and parts of Central and South America, this virus is carried by mosquitoes that may spread into new areas as temperature and rain levels change. One type of yellow fever—jungle yellow fever—can spread from primates to humans and vice-versa via mosquitoes. Recent outbreaks in Brazil and Argentina have had devastating impacts on wild primate populations.

Avian influenza: A highly pathogenic strain of avian influenza—H5N1—has proven deadly to domestic and wild birds as well as humans. It has the potential to mutate into a strain that can spread from human to human. Current data indicate that the movement of H5N1 from region to region is driven by the poultry trade, but changes in climate, such as severe winter storms and drought, can disrupt normal movements of wild birds and bring wild and domestic bird populations into greater contact at water sources.

Babesia: These tick-borne diseases affect domestic animals and wildlife, but are being recognized as emerging diseases in humans. When infections are severe due to large numbers of tick bites, the host becomes more susceptible to other infectious diseases. This has been seen in large die-offs of lions in East Africa due to canine distemper. In Europe and North America, the disease is becoming more common in humans, also linked with tick distributions.

Cholera: Cholera is a water-borne diarrheal disease affecting humans mainly in the developing world. It is caused by the bacterium *Vibrio cholerae*, which survives in small organisms in contaminated water sources. Cholera is highly temperature dependent; rising global temperatures due to climate change are expected to increase incidence of this disease.

Ebola: Ebola hemorrhagic fever virus and its closely related cousin—Marburg fever virus—easily kill humans, gorillas, and chimpanzees, and there is no known cure. There is significant evidence that outbreaks of both diseases are related to unusual variations in rainfall/dry season patterns. As climate change disrupts and exaggerates seasonal patterns, we may see more frequent outbreaks of these diseases in new locations.

Intestinal and external parasites: Parasites are widespread in terrestrial and aquatic environments. As temperatures and precipitation levels shift, survival of parasites will increase in many places, affecting more humans and animals. Many species of parasites are zoonotic—spread between wildlife and humans. Monitoring of parasite species and loads in wildlife and livestock helps us identify transmission modes of these infections among domestic and wild animals and humans.

Lyme disease: Caused by a bacterium, Lyme disease is transmitted to humans through tick bites. Tick distributions will shift as a result of climate change, bringing this disease into new regions to infect more animals and people. Human-induced changes in the environment and on wildlife population patterns of the species that can carry the ticks—such as white-tailed deer and white-footed mice—have large-scale effects on the distribution of this disease.

Plague: Plague, *Yersinia pestis*, is one of the oldest infectious diseases known, and it still causes significant death rates in wildlife, domestic animals, and humans in certain areas of the world. Plague is spread by rodents and their fleas. Alterations in temperatures and rainfall are expected to change the distribution of rodent populations around the globe, which would impact the range of plague and other rodent-borne diseases.

The Wildlife Conservation Society saves wildlife and wild places worldwide. We do so through science, global conservation, education, and the management of the world's largest system of urban wildlife parks, led by the flagship Bronx Zoo. Together, these activities change attitudes toward nature and help people imagine wildlife and humans living in harmony. WCS is committed to this mission because it is essential to the integrity of life on Earth. Visit: www.wcs.org

One World, One Health

The Wildlife Conservation Society's "One World, One Health™" program is a holistic initiative that manages human, wildlife, and domestic animal health issues according to a fundamental truth—the "one health" that affects all is the health of the planet's ecosystems.

Protection of the environment is often treated as a low-priority issue when compared with more immediate concerns, such as domestic security or the economy. But a healthy environment is not a luxury—it is a prerequisite for human health. The rise of emerging and resurging infectious diseases threatens not only humans—and their food supplies and economies—but also the wildlife comprising the biodiversity that supports the living infrastructure of our world.

Winning the disease battles of this century and ensuring the biological integrity of the Earth for future generations require interdisciplinary, crosscutting approaches to disease prevention, surveillance, monitoring, control, and mitigation as well as to environmental conservation. Outbreaks of West Nile virus, Ebola hemorrhagic fever, SARS, monkeypox, mad cow disease, and avian influenza remind us that human and animal health are intimately connected.

A broader understanding of health and disease demands a unified approach achievable only through a consilience of human, domestic animal, and wildlife health. "The monitoring of wildlife health provides us with a sensitive and quantitative means of detecting changes in the environment. Without wildlife, we may not see what's coming until a crisis has occurred. Wildlife monitoring provides a new lens to see what is changing around us to help governments, world health agencies, and regional communities detect threats and mitigate them before they become health crises". Dr. William Karesh, Vice President and Director, WCS—Global Health.

"The term 'climate change' conjures images of melting ice caps and rising sea levels that threaten coastal cities and nations. But just as important is how increasing temperatures and fluctuating precipitation levels will change the distribution of dangerous pathogens. The health of wild animals is tightly linked to the ecosystems in which they live and influenced by the environment surrounding them. Even minor disturbances can have far reaching consequences on what diseases they might encounter and transmit as climate changes". Dr. Steven E. Sanderson, President and CEO of the Wildlife Conservation Society.



one world • one health