



## **WILDLIFE HEALTH AS SENTINELS OF COMMUNITY VULNERABILITY TO CLIMATE CHANGE**

### **SUMMARY**

The effects of climate change are already being witnessed in Canada. Actions are needed to reduce vulnerability and risk because the anticipated consequences of climate change are occurring faster than expected. Wildlife health information helps to identify four key determinants of public health vulnerability: (i) the character of the hazard(s) of concern, (ii) the nature and magnitude of harm(s) that can result, (iii) the probability of exposure to the hazard, and (iv) impacts on social determinants of health that may affect the ability of the population(s) to cope with the harm. Wildlife disease provides understandable biological evidence of the effects of an environmental hazard, helping in risk assessment and risk communication that can inspire risk reduction changes in advance of human harm.

### **BACKGROUND**

To achieve effective climate change preparedness, it is important to not only have the best current intelligence but also an indication of what the future may bring. Early warning systems for climate change adaptation, preparedness and response will need to take into consideration the range of factors that can drive risk and vulnerability. Wildlife impact many determinants of human health through both direct and indirect mechanisms, several of which are strongly interconnected. There is a long history of wildlife serving as bio-sentinels for the effects and distribution of environmental pollutants and pathogens. Wildlife health could support public health threat detection, risk assessment and risk communication by detecting and tracking infectious and non-infectious hazards, being bio-sentinels of effects of new or changed hazards, providing biologically understandable information to motivate changes in personal risk behaviours, and providing insights into new and unanticipated threats. Given wildlife's role as sources of new and emerging infections; their position at the interface between the natural environment, domestic animals and people; and their intimate and ongoing interaction with their environment, it can be anticipated that wildlife will signal changing epidemiological patterns important to public health.



## ANTICIPATING PUBLIC HEALTH HAZARDS

Given the projections for changing distributions and burdens of pathogens and pollutants in the face of climate change, the role of wildlife as bio-indicators is anticipated to increase. Climate change is affecting the (i) abundance or distribution of the host, pathogen or vector; (ii) lifecycle traits of the host, pathogen or vector; and (iii) physiological capacity of the host, pathogen or vector. It is shifting host, vector and pathogen species northward resulting in new ecological relationships that can affect disease dynamics such as the spread of Lyme disease vectors by birds that have begun to shift their migratory timing and locations. New, re-emerging, invasive or introduced pathogens and vectors are often first found in wildlife which subsequently maintains them in environments, causing human exposures. Changes in temperature, precipitation, and weather patterns will alter the use, pathways, persistence, and concentrations of pollutants entering the environment via air and ocean currents. Wildlife have a well-established history as biologically meaningful sentinels of thyroid and other endocrine disorders, metabolic diseases, altered immune function, reproductive impairment, developmental toxicity, genotoxicity, and cancer linked to environmental contaminants in Canada, such as seen in birds in the Great Lakes and whales in the St. Lawrence River. Arctic wildlife and fish, both essential to combat the food insecurity crisis, are at the highest potential risk for certain persistent organic compounds and organohalogen contaminants. Wildlife (including fish) mortality events associated algae blooms are becoming increasingly recognized including die-offs resulting from exposure to saxitoxin, domoic acid, brevetoxin and other algal toxins.

## SAFEGUARDING DETERMINANTS OF COPING CAPACITY

Changes to wildlife migration routes, population size, body condition, and infection and contamination status are affecting northern food security as well as economic opportunities from wildlife hunting. Recommendations for seafood consumption to combat heart disease and return to traditional diets in aboriginal communities rely on access to safe, traditional, wildlife-based foods. Hunting, trapping and fishing not only contribute to aboriginal culture and rights and the quality of life of many Canadians, but also generate \$14-15 billion annually for the rural economy. Over half of all Canadians take part in non-consumptive wildlife oriented activities, like bird or whale watching. Direct tourist expenditures on eco-tourism in the province of British Columbia alone is approximately \$1.5 billion dollars per year. Wild animal contributions to ecological service far outweigh their direct economic benefits, supporting people through more than just its contribution to material welfare and livelihoods. Bats, for example, save the agriculture and forestry industries billions of dollars in pesticide use and reduce occupational exposures to chemicals because of their voracious consumption of insect pests. Vibrant wildlife populations provide people positive lifestyles choices related to outdoor activity, food sources, community activity, and occupational options as well as contributing to good mental health through outdoor recreation and cultural belonging.

## SENTINELS OF VULNERABILITY

Signals of population vulnerability in advance of harm requires attention be paid not only to sub-populations of wildlife most likely to yield hazards of concern but also to analyzing the pathways of exposure by taking a health intelligence approach that considers social, behavioural, ecological and health data. Wildlife health information helps to identify four key determinants of vulnerability: (i) the character of the hazard(s) of concern, (ii) the nature and magnitude of harm(s) that can result, (iii) the probability of exposure to the hazard, and (iv) the ability of the population(s) of concern to cope with the harm. Wildlife disease provides understandable biological evidence of the effects of an environmental hazard, helping in risk assessment and risk communication that can inspire risk reduction changes in advance of human harm.

## NEXT STEPS

Canada is working on a national approach to wildlife health that could systematically collect, integrate and communicate the direct and indirect effects of climate change on wildlife health for public health purposes. Until such a time as this approach can be implemented, ad hoc early warning can be cultivated by increasing regular contact between public health agencies and the Canadian Wildlife Health Cooperative.

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