

## Grizzly Bear Program Quicknote #2

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Large-scale, human-caused changes to the environment often have negative effects on wildlife populations, or do they? Often though, the mechanistic factors coupling these events are undefined. Yet, without knowing what these factors are, and how they link to each other, the question of whether the events represent cause and effect or are merely coincidental remains unresolved. More important, from the standpoint of taking wildlife management and conservation actions, how can you mount an appropriate response if you don't know what you're up against?

This dilemma applies well, but is certainly not unique, to the current situation with grizzly bears in Alberta. This is a province that in recent years has experienced unprecedented economic growth coupled with increased exploitation of its lands for resource extraction, agriculture, urbanization, and recreation, and many of these activities are occurring throughout the province's distributional range for grizzly bears.



Although the research team of the Foothills Research Institute Grizzly Bear Program (FRIGBP) has been active for 10 years now, their recognition of a potential role for wildlife health in coupling human-caused environmental change with poor population performance (e.g., low rates of birth and survival, high mortality rate) of grizzly bears was gradual and unexpected. Over the first 5 years of research,

grizzly bear populations were the major unit of focus as is common with many wildlife research programs.

The value of information collected from individual animals lay largely in the insight provided about population characteristics and processes. However, one area where the team concentrated considerable effort toward understanding individuals was in recording their responses to capture and handling, and minimizing adverse health effects caused by these procedures wherever possible. Through this endeavor came appreciation for the wide range of health conditions that exist among individual bears, this being wildlife health in the broadest sense – as a composite view of numerous biological functions that include growth, reproduction, immunity, stress, and activity. As appreciation grew, so too did questions. What factors shape grizzly bear health? What consequences does health of individuals have for population performance? Is it possible to predict where and when health of individuals or performance of populations will be poor? These and other questions prompted an extensive review of research reports concerning health in humans and domestic animals, some preliminary analyses with existing health-based grizzly bear data, and from this a shift in focus toward the potential role of health and stress in coupling human-caused environmental change with poor population performance.

Since 2005, the research team has been investigating linkages between human-caused environmental change, long-term physiological stress, health of individual grizzly bears, and performance of grizzly bears populations. The working hypothesis is that long-term physiological stress in individual animals is the predominant mechanism linking environmental change with impaired wildlife population performance (Fig. 1). Wild animals like grizzly bears are exposed to many “stressors” throughout their life, but often cope successfully through a suite of physiological and behavioural mechanisms, collectively known as the “stress response”.

However, the duration of a stressor is important. Whereas short-term stress encountered during the normal activities and experiences of daily life rarely pose a threat to healthy animals, long-term stress as can occur with human alteration of the environment and may exceed an animal’s ability to cope. When “stressed” for weeks, months, or years an animal may lose capacity to sustain biological functions at normal levels and gradually develop signs of impaired health (or distress) including reduced growth, reproductive output, infection, and sometimes premature death.



Whether or not population-level effects occur will depend on the proportion of the population that is distressed and, of particular relevance in light of Alberta grizzly bear DNA inventory results, the size of the population. Because considerable time may lapse between human-caused alteration of the environment and measurable effects on the performance of resident wildlife populations, broadening the focus of wildlife monitoring and conservation strategies to include assessment of long-term stress and health in individual animals could provide opportunity to alleviate environmental stressors before population performance is affected. In particular, development of tools to detect long-term stress offers potential to anticipate problems at the individual or population level before they arise – in essence, an early warning system. This improved understanding will allow managers to recognize signs that ecosystem “pressures” may be exceeding the capacity of animals, like grizzly bears, to cope with anthropogenic change.