In a changing ecosystem, Yellowstone grizzly bears are resilient

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Grizzly Bears in Greater Yellowstone. Credit: United States Geological Survey

Grizzly bears in the Greater Yellowstone Ecosystem have been able to

gain the body fat they need for hibernation even as population densities have increased and as climate change and human impacts have changed the availability of some foods, according to a new study by the U.S. Geological Survey and its partners. The study is published in the journal *Global Change Biology*.

In recent decades, several high-calorie foods for grizzly bears in the Greater Yellowstone Ecosystem have declined, most notably the cutthroat trout and seeds of the now federally threatened whitebark pine, as well as some elk herds in and near Yellowstone National Park. At the same time, grizzly bear population densities have increased due to concerted interagency conservation efforts following the bear's 1975 listing as threatened under the federal Endangered Species Act. The Greater Yellowstone Ecosystem, a 22-million-acre region encompassing portions of Wyoming, Montana and Idaho, including Yellowstone and Grand Teton National Parks, is home to one of the largest grizzly bear populations in the contiguous United States.

Body composition can serve as an indicator of how grizzly bears have coped with these changes. Using more than 20 years of data, the new study found that lean body mass (total body weight minus body fat) was lower in areas with higher grizzly bear population density. However, body fat levels stayed the same over the study period, regardless of bear population density. These findings suggest that grizzly bears were still able to gain sufficient energy reserves and able to cope with changes in food availability and increased competition by prioritizing body fat storage.

Body fat is vital for grizzly bears because it is an energy source during winter hibernation. Fat is especially important for reproductive-age female bears, who need to have enough energy to support pregnancy, birth and lactation during this time.

"Our analyses indicate grizzly bear population density influenced lean body mass, but fat storage wasn't affected in the same way," said Andrea Corradini, lead author and post-doctoral researcher at Fondazione Edmund Mach, Italy. "The capacity of grizzly bears to shift feeding tactics allowed them to respond to changing conditions and prioritize calorie intake for fat storage during late summer and fall, regardless of bear density."

The study found that the pattern of lower lean body mass was most pronounced in still-growing female bears, but they too were able to gain the high levels of body fat they needed. Even though these bears had lower lean body mass while growing, they reached their typical total body mass as they matured, possibly by delaying reproduction or moving to areas with fewer bears.

When it comes to their diets, grizzly bears are omnivores, meaning they eat many different types of foods, including elk, bison, insects, fish, roots, seeds and berries. They are also opportunistic in their use of those foods. Big, long-lived omnivores like grizzly bears have large home ranges and they can rapidly shift to more readily available food resources to compensate for dwindling ones. This flexible feeding strategy helps grizzly bears respond to changing environmental conditions more easily than animals that depend on a specific food source. The Greater Yellowstone Ecosystem is a large, well-protected landscape, which has facilitated bears' shifting diets and allowed them to expand to new areas, although that increasingly comes at the cost of more human-bear conflicts.

"The study findings demonstrate the resilience of grizzly bears in the face of ecosystem change and enhance our understanding of their life history strategy," explained Frank van Manen, USGS scientist and team leader of the Interagency Grizzly Bear Study Team. "Interagency investment into long-term research data allowed us to disentangle these

complex relationships."

Though the grizzly bears of the Greater Yellowstone Ecosystem have been able to maintain fat levels and overall body size as environmental conditions changed over the past two decades, it is not known how they will adapt to more extreme disturbances in the future, such as continued warming, changing wildfire patterns and increasing human development and recreation.

More information: Andrea Corradini et al, Evidence for density-dependent effects on body composition of a large omnivore in a changing Greater Yellowstone Ecosystem, *Global Change Biology* (2023). DOI: 10.1111/gcb.16759

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