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GRIZZLY BEAR NUTRITION AND ECOLOGY STUDIES IN YELLOWSTONE NATIONAL PARK

Photo: Doug Dance

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What's Inside...

The chance to see a wild grizzly bear is often the first or second reason people give for visiting Yellowstone National Park. Public interest in bears is closely coupled with a desire to perpetuate this wild symbol of the American West. Grizzly bears have long been described as a wilderness species requiring large tracts of undisturbed habitat. However, in today's world, most grizzly bears live in close proximity to humans (Schwartz et al. 2003). Even in Yellowstone National Park, the impacts of humans can affect the long-term survival of bears (Gunther et al. 2002). As a consequence, the park has long supported grizzly bear research in an effort to understand these impacts. Most people

continued on page 2

GRIZZLIES CONTINUED

are familiar with what happened when the park and the State of Montana closed open-pit garbage dumps in the late 1960s and early 1970s, when at least 229 bears died as a direct result of conflict with humans. However, many may not be as familiar with the ongoing changes in the park's plant and animal communities that have the potential to further alter the park's ability to support grizzly bears.

These changes include the decline in Yellowstone Lake cutthroat trout due to the unplanned introduction of the predaceous lake trout, the spread of whirling disease, and a long-term drought (Koel et al. 2004; McIntyre 1996). Cutthroat trout have been consumed for thousands of years by grizzly bears from mid-May to mid-August, when they spawn in the small streams that flow into Yellowstone Lake (Haroldson et al. 2005). Whitebark pine, one of the most important fall foods of the grizzly bear, is infected with an exotic fungus, white pine blister rust. The high-fat, energy-rich whitebark pine nuts are consumed during the fall when the crop is limited or during the entire year when the crop is abundant (Felicetti et al. 2003; Lanner and Gilbert 1994). Although blister rust has not killed a great number of trees to date, it has the potential to do so if climatic conditions change and weaken the trees' resistance. Whitebark pines, along with most conifers, are also facing an epidemic of mountain pine beetles. These tiny creatures, which are native to the ecosystem, burrow under the bark and feed voraciously on the trees' living cambium. Trees weakened by summer drought or old age are particularly susceptible. Mountain pine beetles have the potential to kill a significant portion of the mature whitebark pines in the park, although outbreaks have occurred previously. Reductions in the quantity or quality of such high-value foods decrease birth rates, growth rates, and the survival of bears (Mattson, Blanchard, and Knight 1992).

For more than 30 years, members of the Interagency Grizzly Bear Study Team (IGBST) have been investigating grizzly bear biology in the park. Much of the early work was gleaned by tracking radio-collared bears, examining scats and foraging sites, and observing bears in general. In recent years, the IGBST has used the newest research techniques and cooperated with outside specialists in chemistry, genetics, and nutrition to advance the understanding of grizzly bear ecology. The new research techniques used by the IGBST include highly accurate Global Positioning System (GPS) collars that pinpoint a bear's location many times a day, hair snares fashioned of barbed wire that collect small clumps of hair when bears rub against them, and DNA and nutritional analyses that determine the sex, identity, and diet of each bear that left a hair sample. Both DNA and nutritional analyses can be performed on very small samples, such as bone flakes, a drop of dried blood, or a few hairs. Even samples from museum specimens can be used to determine family lineages and diets of bears that died long ago.

One of the major outside collaborations has been with scientists from the Washington State University Bear Research, Education, and Conservation Program in Pullman, Washington. This program is the only facility in the world in which a significant number of captive grizzly bears are held for the purpose of developing new techniques or knowledge that will directly assist in understanding the needs of wild bears. The facility normally has 10–12 grizzly bears, ranging from newborn cubs weighing one and a half pounds to 20-year-old adults weighing more than 800 pounds. Undergraduate and graduate students majoring in the biological sciences have the unique opportunity to work with the captive bears on a daily basis and to conduct field studies as needed.

QUANTIFYING DIETS

One of the first studies jointly conducted by scientists of the IGBST and Washington State University examined how diets of grizzly bears changed either as the West was settled or park management changed (Jacoby et al. 1999). For historical studies, skins and skulls in museums, including the Smithsonian Institution, are valued treasures. However, techniques of scat analysis or direct observation that are used to quantify diets of living bears could not be used on these long-dead bears. The new technique we used to quantify the diets of both living and dead bears is called "stable isotope analysis." Isotopes are different forms of the same element, for example 14N and 15N. They are both nitrogen, but the far rarer form, 15N, has one extra neutron, is non-radioactive, has been on Earth for billions of years, and is preferentially retained relative to 14N when consumed by animals.

TABLE OF CONTENTS:

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