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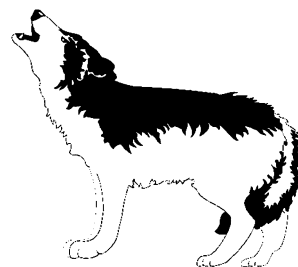
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In My Opinion



Harvest as a component of Greater Yellowstone Ecosystem grizzly bear management

Bruce J. Mincher

Abstract The United States Fish and Wildlife Service (USFWS) has begun a process that might delist the Greater Yellowstone Ecosystem (GYE) grizzly bear (*Ursus arctos*) population under the provisions of the Endangered Species Act. Idaho, Montana, and Wyoming are preparing management plans that include provisions for harvest as the bears continue to expand their range beyond the recovery zone. Given the history of this isolated population, the hunting of the GYE bears will be contentious. Human-induced mortality plays a key role in limiting the grizzly bear population. However, there is evidence that the effort to limit mortality, especially female mortality, over the last 15 years has resulted in a recovered population. Given continued protection, and barring unprecedented habitat degradation, demographic models indicate that this population will continue to expand. Such a population could support a carefully regulated harvest, which might benefit long-term grizzly bear conservation by shifting human-induced mortality to male bears, and by increasing public tolerance for increased range. This paper examines the status of the current population of the GYE grizzly bear and the possible effects of harvest mortality.

Key words delisting, grizzly bear, harvest, Idaho, Montana, viability, Wyoming, Yellowstone National Park

Under the Interagency Grizzly Bear Committee (IGBC) draft Conservation Strategy, the Greater Yellowstone Ecosystem (GYE) population of the grizzly bear (*Ursus arctos*) might be delisted under the provisions of the Endangered Species Act (ESA) (Servheen 2000). The strategy outlines a cooperative plan implemented by state and federal agencies to ensure continued viability. It provides for a conservatively managed Primary Conservation Area (PCA) that protects 24,000 km² of secure habitat, including Yellowstone and Grand Teton National Parks. Grizzly bears also currently occupy habitat outside the PCA, and their range and density appear to be increasing (Schwartz et al. 2002). Current and future range includes portions of Idaho, Montana, and Wyoming. In 2000 the governors of these states

appointed a citizen roundtable to review the Conservation Strategy. The roundtable concluded that state management plans for areas outside the PCA should be developed that would seek to: 1) ensure the long-term viability of grizzly bears and preclude relisting; 2) support expansion of grizzly bears beyond the PCA in areas that are biologically suitable and socially acceptable; and 3) manage grizzly bears as a game animal, including allowing regulated hunting when and where appropriate (United States Fish and Wildlife Service [USFWS] 2000).

The states are currently preparing management plans in accordance with these recommendations. I represented sportsmen on the delisting advisory team (DAT), which drafted Idaho's plan. Ranchers, forest users, Native Americans, preservationists, and

federal and state agencies were also represented. The DAT met 7 times through the summer and fall of 2001 and produced a plan we believed provided for the long-term conservation of bears while also protecting the interests of the people who share their habitat. The plan includes provisions for the limited hunting of grizzly bears (Fifty-sixth Idaho Legislature 2002).

However, it is reasonable to ask how a hunt could be justified, since it is well known that human-caused mortality was one factor that resulted in the initial ESA listing. Also, given the recent controversy surrounding established grizzly bear hunting seasons in British Columbia, the implementation of hunting in the GYE is sure to be contentious. This might be because the public perceives the grizzly bear as being threatened with extinction (Kellert 1994). I will argue that a regulated harvest will not impair the viability of the GYE grizzly bear population but might increase their range and distribution by shifting human-induced mortality to male bears and because of increased acceptance of the bears by the GYE public.

A brief review of the history of the GYE bears might help provide perspective. Following the National Park Service open-pit dump closures of 1968-1970, a 50% decline occurred in the GYE grizzly bear population (Craighead 1998). At least 158 mortalities were recorded during 1969-1972, mostly due to control actions against bears seeking alternate foods. This, coupled with fragmentation of the United States grizzly bear populations, resulted in "threatened" listing under the ESA in 1975. The population decline continued through the 1980s at a rate of -1.8%/year (Knight and Eberhardt 1985). These authors also concluded that the fate of only 1 or 2 female bears/year could determine the future viability of the GYE population. Therefore, in 1983 the IGBC implemented new management strategies designed to reduce human-caused mortality (Knight et al. 1988), resulting in improved female survival (Knight and Eberhardt 1987). This was apparently successful, and Eberhardt et al. (1994) later calculated a population rate of increase of 4.6%/year.

The IGBC has established quantifiable recovery criteria for the GYE that include an estimate of abundance based upon a count of uniquely identifiable females with cubs of the year (COY) (Servheen 2000). Standard protocols have been established to accumulate visual counts that minimize the chances of duplicate sightings. This esti-

mate has increased since about 1986, with a 6-year running average for 1995-2000 of 31 (Haroldson and Frey 2001). The 2001 survey documented a record of 42 females with COY (USFWS 2001). This can be contrasted with the 1985-1990 average of 18, and still lower values previously. While the survey method has been criticized (Craighead et al. 1995), Boyce et al. (2001a) have compared statistical models designed to overcome sighting variability, and all models show an increasing trend in the number of females with COY since 1986. Boyce et al. (2001b) proposed an optimized statistical model that compensates for annual and individual sighting variability, results that confirm the population has been increasing since 1986.

The adult female population is estimated from the COY count and the assumption of a 3-year breeding cycle (Knight and Eberhardt 1984). Thus, the estimated minimum adult female population for 2001 was 126. The total population estimate, based upon a demographic composition of 27% adult females (Eberhardt and Knight 1996), was a minimum of 467 bears. A minimum population of 400 is 6 times the minimum viable population suggested by Shaffer (1983), 3 times the minimum proposed by Suchy et al. (1985), and greater than the pre-dump closure population estimate suggested as an ESA delisting target by Craighead (1998). Using available demographic data, Boyce et al. (2001a) calculated a >96% probability for the persistence of the GYE grizzly bear population for 500 years. These demographic analyses assume that habitat quality will remain suitable. The state plans and Conservation Strategy recognize the importance of habitat maintenance.

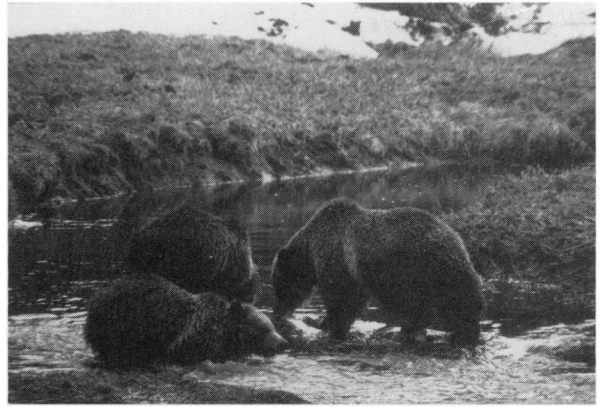
Other evidence also suggests an increasing population. As of 2000, all bear management units in the GYE are currently occupied by females with COY (Podrutzny 2001). Bear sightings outside Yellowstone National Park are increasing (Boyce 2001a), and the Interagency Grizzly Bear Study Team (IGBST) reports that the current distribution extends beyond the recovery zone identified in the USFWS Recovery Plan (Schwartz et al. 2002). Occupied habitat has increased by approximately 48% since the 1970s. Thus, there is evidence that the GYE grizzly bear population is viable and growing and that ESA protection has been successful. Having apparently achieved recovery goals, the return of bear management to state fish-and-game agencies is appropriate, assuming that state plans protect the future viability of the population. The

state plans contain provisions for grizzly bear harvest. I will argue that a grizzly bear harvest can be implemented without threatening population viability. I do not expect that these arguments will convince those philosophically opposed to hunting; however, there is little biological reason to oppose a hunt. In fact, I will argue that a limited harvest might benefit grizzly bear conservation.

Human-induced mortality

Barring unprecedented habitat degradation, human-induced mortality will continue to play a key role in limiting the GYE grizzly bear population under any management plan. Despite the cessation of grizzly bear hunting in 1974, humans still cause more than 90% of all grizzly bear deaths in the GYE (Boyce et al. 2001a). These bears are killed during management control actions and by private citizens in defense of life or property, sometimes maliciously. Most bears are killed near roads or other areas of high human use (Knight et al. 1988). Half of all bears destroyed first become nuisance animals due to human-habituation (Boyce et al. 2001a), food conditioning (Herrero 1985), or livestock depredation (Peek et al. 1987). Mattson et al. (1992) showed an inverse relationship between number of bears killed in control actions and forage availability. Illegal killing was the major cause of female grizzly bear mortality during the low-productivity years of 1977 and 1981 (Knight et al. 1988), and female bears are believed to engage in foraging in front country areas to avoid competition from males (Mattson 1990). Thus, nonhunt, human-caused mortality might disproportionately affect females. For example, when mortality data from IGBST reports were summarized for 1995–2000, a 1:1 ratio for the sexes of adult bears was found. Conversely, hunt mortality for grizzly bears is biased toward males (Miller 1990a). Control actions or defense-of-life-and-property (DLP) killings of females also often result in cub mortality, while harvest regulations are generally protective of females and cubs.

In 2001 16 grizzly bear mortalities were recorded, 14 due to management control actions (USFWS 2001). One bear was killed in a hunting-related incident. Nearly half were female, and most control actions occurred in the southeast portion of the GYE, coincident with a whitebark pine crop (*Pinus albicaulis*) failure. As bears colonize areas peripheral to the PCA, they will experience greater expo-



Protecting females is key to maintaining a viable grizzly bear population, but competition with males might force some females to engage in risky, front-country foraging. The author photographed this female grizzly with young feeding on a bison carcass in Obsidian Creek within 30 m of a road in Yellowstone National Park.

sure to human residents of the ecosystem, resulting in additional possibility of habituation, food conditioning, and human-caused mortality. Yet, the current recovery has shown that mortality need not be reduced to 0 to maintain a viable population. The population can, and has, increased while sustaining a reasonable level of human-induced mortality when female losses are minimized. With an intact PCA, losses in peripheral areas will almost certainly be sustainable (Knight and Eberhardt 1987).

Under optimal conditions, an annual loss rate of 5.7% of a total grizzly bear population is sustainable, and populations have been hunted elsewhere without threatening their viability (Miller 1990a). McLellan (1989) recorded survival rates for various demographic classes of grizzly bears to be the same as or higher in the hunted Flathead Valley of British Columbia than in the unhunted GYE. The draft Conservation Strategy conservatively allows for 4% loss of the PCA minimum population estimate; 30% of this figure might be female (Servheen 2000). Further, Boyce et al. (2001a) suggest that the population estimate itself is conservative. Thus, if a grizzly bear harvest were managed as a component of human-induced mortality totaling $\leq 4\%$, the population would remain viable. A harvest quota could be designed based on a percentage of the minimum estimated population, corrected for an expected nonhunt level of human-induced mortality. Harvest within the 2 national parks would remain prohibited. Most hunting would occur in area peripheral to this core range, where human-induced mortality is likely to be highest for other causes. Further,

grizzly bear harvest could be directed toward areas where it is not appropriate for bears to expand their range, to areas with a history of nuisance bear problems, or even toward individual bears under special circumstances. Removal of bears in such cases might not be additive mortality. This option would satisfy the demand for a unique recreational hunting experience and could help mitigate management expenses. A flexible program would allow for permit numbers to be reduced during seasons of heavy nonhunt mortality.

Effects of harvest

Hunting selects for male mortality because of bear behavior and hunter preference for large bears. Seasons may be structured to enhance male harvest, through regulations that protect females with young and by timing the harvest in early spring (Miller 1990a). However, removing adult males from an area allows subadult male immigration (Wielgus and Bunnell 2000). Some have argued that these immigrants might negatively affect cub recruitment. If they are more likely than sire males to prey on local cubs, hunting would have a negative effect on cub survival (Swenson et al. 1997, Wielgus et al. 2001). However, these conclusions have been criticized for inadequate study design, and no such effect is found in analyses from large, hunted populations (Miller and Sellers 2002). In addition, I am not aware of any demonstration that nonsire males are more likely to prey on cubs than sire males. Thus, the argument that hunting has a negative effect on recruitment is weak. Conversely, removal of adult males could benefit recruitment and female survival. The physiological and social stress of competition with adult males is believed to result in less-fit females and cubs (Stringham 1983) and to encourage risky foraging in front-country areas (Mattson 1990). Wielgus and Bunnell (1994) reported that females used less desirable forage and had decreased litter sizes (Wielgus and Bunnell 2000) in a male-dominated study area. Thus, a decrease in adult male density due to hunting might improve female nutrition and cub survival and result in less control actions against female bears. Increased recruitment has not been demonstrated in hunted populations, possibly because comparisons of hunted and unhunted study areas are confounded by habitat differences (Miller 1990b, Taylor 1994). Despite the inability to adequately demonstrate improved recruitment, a

strategy that shifts mortality from females to males should benefit population viability.

The human social effects of grizzly bear hunting might be more difficult to quantify than the biological ones, but they are ignored at the peril of successful conservation. As participants in a natural resource-based economy, many GYE residents share a utilitarian view of wildlife (Kellert 1994). State management plans for grizzly bears have been met with suspicion. While the larger public may view bears in an abstractly positive light, in the GYE they elicit concerns about restrictions on forest access, livestock losses, and public safety (Primm 1996). In Wyoming, for example, about half the respondents surveyed were opposed to increasing numbers of grizzly bears (Kruckenberg 2001). In Idaho members of the resources committees of both houses of the Legislature have publicly criticized grizzly bear recovery. For example, tenth-term Representative JoAn Wood, vice chair of the Idaho House Resources and Conservation Committee, stated in a letter to the DAT, "We the people are not going to insure the viability of grizzly bears. We certainly are not going to support the expansion of grizzly bears anywhere in Idaho." Grizzly bears co-exist with humans in a large part of their range in North America, Europe, and Asia with only rare evidence of conflict. However, in my experience much of the GYE public remains uncomfortable with grizzly bear recovery in their backyards.

Classification of the grizzly bear as a game animal can only improve the acceptability of grizzly bears to the GYE public. Regulated sport hunting of grizzly bears to maintain population objectives was favored by 79% of survey respondents (Kruckenberg 2001). Even a limited hunt will demonstrate that bears will be managed pragmatically and need not present a significant threat to GYE residents' way of life. The hunt might also serve as a management tool to prevent range expansion into socially unacceptable areas, to minimize human habituation, and to discourage bears living in areas peripheral to the PCA from behaving in an aggressive fashion (Herrero 1985). While it might be argued that the grizzly bear is a national resource on public land, acceptance by the GYE public is key to long-term conservation (Strickland 1990). Classification of the grizzly bear as a game animal will have the added benefit of creating a new group of pro-grizzly bear conservation stakeholders, sportsmen across the country (Van Tighem 1998).

Conclusion

The GYE grizzly bear is being considered for a return to state management. State plans call for habitat maintenance, population monitoring, and potential future harvest. Harvest will not occur within the national parks and would be limited by the PCA draft Conservation Strategy within core grizzly bear habitat. Most harvests would occur in peripheral areas, often in locations where it might be socially unacceptable for grizzly bears to occur. The loss of individual bears due to hunting will not decrease the viability of the population, as long as total mortality is maintained within the limits established by the draft Conservation Strategy (Servheen 2000) and management remains adaptive to changing conditions. Harvest of adult males might improve female survival by minimizing competition for safe foraging areas. Female survival is key to population viability.

A hunt would also demonstrate to the GYE public that grizzly bears will be managed in a pragmatic fashion and that bears do not represent a significant threat to lifestyle, life, or property. Harvest is also likely to make bears more wary and less aggressive in areas of high human use, also increasing the level of acceptance of grizzly bears by the GYE public. Increased acceptance is necessary if bears are to expand their range. I conclude that a well-regulated harvest will accrue benefits to long-term grizzly bear conservation in the GYE that may not be realized through a strictly preservationist approach.

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