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## MANAGEMENT CHALLENGES FROM PREDATOR-PREY EFFECTS ON THE GALLATIN CANYON ELK HERD

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The Gallatin Canyon elk (*Cervus elephus*) herd northwest of Yellowstone National Park (YNP), is among the most historic and heavily-researched herds in Montana. Counts, classifications, and harvest records extend from 1919 to present, with intensive wolf-elk research conducted over 2001-2006. The herd remained remarkably stable for more than 80 years, averaging ~1900 wintering elk from 1919-1985. After a data gap spanning 1985-

1996, wintering elk counts showed alarming declines, with an average of 960 wintering elk counted over 1996-2010 and 511 counted in 2010. We used harvest records, aerial surveys, and telemetry on elk and wolves (*Canis lupus*) to determine mortality/predation rates and elk numbers, movements and distribution. From these data we developed a variety of population models to quantify effects of wolf predation and hunter harvest on elk in the Gallatin Canyon. Closed population models suggested a yearly elk population decline of 1-15 percent, whereas open population models suggested a decline of 30 percent, indicating losses due to deaths and emigration. Predator-prey ratios in the Gallatin are among the highest recorded in Montana, similar only to the unhunted elk populations of the Madison Headwaters (YNP). Like the Madison Headwaters, the Gallatin elk herd showed declines from direct predation and emigration loss. matrix models suggested hunting has a negligible population effect compared to predation, yet hunting is the only factor MFWP is currently able to moderate. We are left with a management paradox: hunting is not sustainable in this declining population, yet cessation of hunting will not reverse the elk population declines and will eliminate a treasured hunting opportunity that some families have enjoyed for generations.