

Northern Yellowstone Cooperative Wildlife Working Group

2006 Annual Report (October 1, 2005-September 30, 2006)

Member Agencies

Montana Fish, Wildlife & Parks

National Park Service, Yellowstone National Park

U.S. Forest Service, Gallatin National Forest

U.S. Geological Survey, Biological Resources Division

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October 13, 2006

This report was prepared to document achievements, record new goals, and provide a current source of biological information on the status of northern Yellowstone wildlife and wildlife-related studies to agency decision makers and the public. It has not been formally peer reviewed or disseminated by the agencies. It does not represent and should not be construed to represent any agency determination or policy.

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Introduction

On February 12, 1974, representatives from the Gallatin National Forest, Montana Fish and Game Commission, and Yellowstone National Park formed the Northern Yellowstone Elk Working Group to focus on the management of the northern Yellowstone elk population. Over time, the focus of this committee evolved by necessity and consensus from a single species interest group into a multiple species and wildlife habitat oriented working group. Thus, a revised Memorandum of Understanding with expanded goals and objectives, individual agency commitments, organizational procedures, and a name change to the Northern Yellowstone Cooperative Wildlife Working Group was completed in 1994. The National Biological Survey was added to the group as a technical support member. Subsequently, the National Biological Survey was transferred to the U.S. Geological Survey and renamed the Biological Resources Division. The Memorandum of Understanding was revised again in October 2004 to reflect changes since 1994 and increase the group's effectiveness.

The purpose of the Working Group is to cooperatively preserve and protect the long-term integrity of the northern Yellowstone winter range by increasing scientific knowledge of its species and habitats, promoting prudent resource management activities, and encouraging an interagency approach to data collection, answering questions, and solving problems. The Working Group is composed of one designated manager and one wildlife biologist from each member agency. The Gallatin National Forest, Montana Department of Fish, Wildlife, and Parks, and Yellowstone National Park are units of natural resource management agencies with responsibility for management of wildlife and their habitats on the northern Yellowstone winter range. The Northern Rocky Mountain Science Center is a research institution of the U.S. Geological Survey with responsibility for scientific investigation of natural resources and technical support for natural resources management, primarily for the Department of the Interior. Group funds are spent primarily on annual wildlife surveys.

The designated members of the Working Group during this report period were as follows:

<u>Agency</u>	<u>Manager</u>	<u>Wildlife Biologist</u>
National Park Service, Yellowstone National Park	Glenn Plumb	P. J. White
Montana Department of Fish, Wildlife and Parks	Kurt Alt	Tom Lemke
U.S. Forest Service, Gallatin National Forest	Ken Britton	Dan Tyers
U.S. Geological Survey	Peter Gogan	Kim Keating

The Working Group meets twice a year, typically in May and October. Additional meetings or subgroup meetings may be held, as necessary, to discuss issues and projects. All decisions are based on consensus and made following open discussion and debate. The Chair of the Working Group is rotated annually between member agencies. The Chair is responsible for producing an annual report that summarizes the group's activities on a federal fiscal year basis (i.e., October 1 through September 30). Additional information on the Working Group is available in the 2004 Memorandum of Understanding, which can be obtained from group members.

This report summarizes the cooperative activities conducted by the Working Group during October 1, 2005, through September 30, 2006. The report is organized by species and special project sections and includes a cost summary of cooperatively funded wildlife surveys.

Elk Surveys

The status and distribution of northern Yellowstone elk is monitored using aircraft to conduct annual winter counts, surveys of elk migrating north of Yellowstone National Park, late-winter classification surveys, and spring carcass counts. The Working Group also monitors the results of the general and late season elk hunts managed by Montana Fish, Wildlife, and Parks.

Cooperative Winter Elk Counts

Since 1986, the Working Group has conducted annual trend counts of northern Yellowstone elk during December/January using four Super Cub airplanes; each covering a segment of the winter range (both inside and outside the park). Ideally, the range is surveyed during one day prior to the start of the Gardiner Late Elk Hunt in the first week of January. Due to sightability (i.e., detection) bias, these aerial counts provide a variable underestimate of the elk population size. No counts were conducted during the winters of 1996 and 1997 and counts in 1989 and 1991 were deemed “poor” owing to unfavorable survey conditions.

Due to a lack of snow cover and windy conditions, biologists were unable to complete the annual winter trend count of northern Yellowstone elk during the typical period in late December or early January. Biologists attempted to conduct a count on March 22, 2006. Ambient temperatures at the Gardiner airport during the survey ranged from 30-40 degrees Fahrenheit. Skies were overcast with light snow and winds 5-15 miles per hour. There was incomplete snow cover in most survey units. Biologists were unable to count elk in the Landslide Cree to Reese Creek area due to bison capture operations. Unfortunately, elk inside the park were widely distributed at higher elevations and in timbered areas, which made detection of elk difficult and unreliable compared to previous winters. Thus, the count was considered poor and inaccurate and can not be compared to counts from previous surveys conducted under good conditions. The last reliable count conducted under good conditions occurred on January 5, 2005, when 9,545 elk were observed. Cooperative winter elk counts from 1976 to the present are depicted in Figure 1. The long-term trend in counts of northern Yellowstone elk suggests their abundance has decreased approximately 50% during the past decade. Predation by wolves and other large carnivores, as well as moderate human harvests of antler-less elk during the Gardiner Late Elk Hunt, have been the primary factors contributing to this decreasing trend. Other factors include a substantial winter-kill owing to severe snow pack during 1997 and, possibly, drought-related effects on pregnancy and survival.

Elk Migration Surveys

Elk wintering north of Yellowstone Park are counted two to three times each year (early, mid- and late winter) between December and March. These counts are used to evaluate trends in abundance and distribution of elk wintering north of Yellowstone Park and help establish permit numbers for the Gardiner Late Elk Hunt. Surveys are

flown before, during, or after the Gardiner Late Elk Hunt, but not on hunt days. The number of elk removed by late season hunters (legal and known illegal) before the survey date is added to the number of elk observed during the survey. One survey occurs after the late hunt, but before the major migration back into the park. This flight attempts to count elk that may have migrated out of the park after the Gardiner Late Elk Hunt. The largest number of elk calculated for a single survey is considered that year's minimum estimate of elk wintering north of the park.

A minimum estimate of 3,549 elk wintered north of Yellowstone National Park during 2006, compared to an estimate of 3,243 in 2005. The number of elk wintering north of Yellowstone National Park was within the State's management objective of 3,000-5,000 elk, which was established to help protect the long-term quality of winter range habitat north of the park. The number of elk wintering outside Yellowstone National Park in the last 7 years is considerably lower than the previous 5 years (Figure 2). Relatively large numbers of elk wintered north of the park (5,296-8,626 elk; mean = 6,923 elk) during 1995-1999. During 2000-2006, the number of elk wintering north of the park decreased to an annual average of 3,816 elk. An estimated 2,782 elk wintered north of Dome Mountain during 2006, compared to an estimate of 2,095 elk in 2005. The number of elk wintering north of Dome Mountain is within the State's management objective of 2,000-3,000 elk. In 6 of the last 7 winters, elk numbers north of Dome Mountain were less than 3,000 elk (i.e., 2,092-2,758) compared to 3,502-4,547 elk (mean = 3,807) in this area during 1996-1999 (Figure 3). Similar to recent years, the majority (81%) of elk were located north of Dome Mountain by late winter 2006.

These results indicate that a significant portion of the northern Yellowstone elk population still depends on winter range habitat north of Yellowstone National Park, despite a 50% decrease in total counts since 1995. The area north of Dome Mountain continues to be a critical "destination" winter range for up to a third of the entire northern Yellowstone elk population. From a habitat management perspective, lower elk numbers help protect the long-term quality of winter range habitat in this area. Also, elk use of private property north of Dome Mountain during late winter and early spring when low elevation grasslands green up could conflict with local ranching operations and create social and wildlife management problems.

Late Winter Elk Classification Surveys

Since 1986, the Working Group has conducted annual classification surveys of northern Yellowstone elk during February or March. A helicopter is used to survey randomly selected sampling units from the lower, middle, and upper elevation sectors of the range. The objectives of these surveys are to: 1) classify a representative sample of the population; 2) estimate the overall sex and age (adult, juvenile) structure of the population; and 3) obtain an index of winter calf survival and recruitment (i.e., calf:cow ratio). The survey was conducted from the ground during winter 1991. No classification estimates were obtained during winters 1993, 1994, and 1997.

A late winter elk classification of northern Yellowstone elk was completed on March 23, 2006. Estimated sex and age ratios for elk classified were 24 calves and 20 bulls per 100 cows. Calf ratios averaged 20 calves per 100 cows inside the park (i.e., Gardiner to Lamar Valley) and 27 calves per 100 cows outside the park (i.e., Gardiner to Dailey Lake). The mean ratio of 24 calves per 100 cows is higher than the late-winter ratios during 2002-2205 (i.e., 12-14 calves per 100 cows), but less than the average of 29 calves per 100 cows observed during 1968-2005 (Figure

4). The estimated ratio of 20 bulls per 100 cows is lower than the average ratio (i.e., 46 bulls per 100 cows; range = 22-65 bulls per 100 cows) since 1995, but similar to the ratios of 20-22 bulls per 100 cows during 2003-2005 (Figure 5). This winter fewer bulls were observed on the Blacktail Deer Plateau than during previous years.

Gardiner Late Elk Hunt Statistics

The Gardiner Late Elk Hunt is a special, limited-access, management tool designed to harvest northern Yellowstone elk that migrate into Montana. Since 1976, this hunt has had two primary objectives: 1) help regulate the number of elk that winter north of Yellowstone National Park at levels that will maintain winter range habitat on a sustainable long-term basis without reducing forage productivity or plant species diversity; and 2) harvest elk in ways that will minimize the effect of hunting on migratory behavior, allowing traditional elk winter use to be distributed over the winter range in proportion to forage availability. To accomplish these objectives, the hunt was highly biased towards harvesting females so that elk numbers would not exceed the carrying capacity of the winter range and cause long-term changes in plant communities or declines in forage production. Also, Montana Fish, Wildlife, and Parks adopted a series of special regulations that control the timing of the harvest, total and daily numbers of hunters, distribution of hunters, and composition of the harvest, while providing non-hunting periods throughout the season.

Montana Fish, Wildlife, and Parks incrementally decreased the number of antler-less elk permits from 2,882 in 2000 to 1,193 permits in 2005 owing to decreases in elk abundance and migration north of Yellowstone National Park. This trend was continued during 2006, with the Department implementing a very conservative season type with 163 permits (104 antler-less and 59 either-sex permits) based largely on 4 consecutive years of low calf recruitment. One hundred and thirty-two elk (57 bulls, 74 cows, and 1 calf) were legally harvested during the January 6-30 late hunt (Figure 6). Another 5 elk (2 yearling bulls, 2 cows, 1 calf) were illegally harvested. Overall success for 140 hunters was 94% (Figure 7), with success rates for the four 4-day hunt periods ranging from 91-97%.

Spring Elk and Mule Deer Carcass Counts

Fresh elk and deer carcasses in the Gardiner basin have been counted annually since 1989. The counts are made from a helicopter during spring mule deer surveys in late April or early May. The survey area includes open sagebrush/grassland winter range from Yankee Jim Canyon to Mammoth. The Gardiner basin has relatively mild winter conditions compared to ranges further inside Yellowstone National Park owing to its lower elevation and windswept slopes. The aerial count does not distinguish the age or sex of dead elk and deer. The spring mule deer survey was not conducted in 2006 due to observer/pilot availability and as a result there was no carcass count this year. Likewise there was no carcass survey in 1993 and only a partial count was conducted in 2004.

The last complete elk and mule deer aerial carcass count occurred during April 25-28, 2005, when 3 elk and 3 mule deer carcasses were detected in the Gardiner basin area. An average of 5 elk (range = 3-9) and <1 deer (range = 0-2) carcasses have been observed per year during 1998-2005. Since 1989, the number of elk and deer carcasses counted from the air has fluctuated from 4 to 599 carcasses (Figure 8). The largest numbers of carcasses were

observed following the severe winters of 1989 (206 elk and 38 deer carcasses) and 1997 (534 elk and 65 deer carcasses). Also, 93 carcasses were counted during 1995. Only 4 to 69 elk and deer carcasses (mean = 17) were counted following other winters. These results suggest that winterkill was occasionally an important limiting factor during severe snow pack winters prior to the biological recovery of wolves on the northern range. However, winterkill does not appear to be a major mortality factor in most years and has had a negligible effect on the population dynamics of northern Yellowstone elk and mule deer since 1997 (mean = 6 carcasses).

Mule Deer Surveys

The status and distribution of mule deer on the northern range is monitored using helicopters to conduct a classification survey during winter and total count, carcass count, and recruitment estimate during spring. These data are used by Montana Fish, Wildlife, and Parks to determine population trends and set harvest levels.

Winter Mule Deer Classification Survey

The Working Group has conducted aerial mule deer classification surveys in the Gardiner basin since 1990 (Figure 9). The helicopter survey is flown in late December or early January, after the autumn hunting season and before antler shed. Portions of all major drainages in the Gardiner basin are sampled with a goal of observing at least 500 to 600 mule deer. The winter classification survey is not designed to obtain complete coverage of the Gardiner basin. The classification survey was not flown during 2006 because of chronically poor flying conditions in December and January (see above).

Spring Mule Deer Count and Recruitment Survey

The Working Group has conducted a spring helicopter survey of mule deer on the Gardiner basin winter range (Yankee Jim Canyon to Mammoth) since 1986, with the exception of 1993 and 2004 when no survey was flown. The intent of the survey is to obtain a total count of mule deer and to classify a large sample of deer to estimate recruitment. Aerial surveys were not completed in 2006 due to observer/pilot availability. The usual observer (T. Lemke) was grounded for medical reasons. Another FWP observer (K. Alt) was able to step in to complete some of the spring helicopter surveys during the period when the FWP pilot was available. A decision to complete the bighorn sheep surveys during the available time was made. The most recent spring mule deer survey conducted April 25-28, 2005, detected 2,336 mule deer on their core winter range between Yankee Jim Canyon and Mammoth, which is the highest count since 1996 (Figure 10). A ratio of 52 fawns per 100 adults was observed, which compares to an average spring recruitment estimate of 41 fawns per 100 adults (range = 14-57) during 1987-2005 (Figure 11). The growth rate of the population appears to be increasing in response to recent high recruitment, compared an average count of 2,032 (range = 1,616–2,544) mule deer during 1986-2005. The relative distribution of deer on winter range segments has remained similar since 1986, with the 53-76% of deer east of the Yellowstone River, 29-44% west of the Yellowstone River, and 1-9% inside Yellowstone National Park.

Pronghorn Surveys

The status and distribution of pronghorn is monitored using Super Cub airplanes to conduct a count in spring and classification in late summer. The spring counts have been conducted annually since 1988, with the exception of 1994. Late summer classification surveys were initiated in 1998.

Spring Pronghorn Count

The 2006 count of Yellowstone pronghorn was conducted on March 10, March 24, and April 19, 2006, using a Super Cub airplane. Our objectives were to: 1) obtain a minimum count of pronghorn; 2) use radio-collared (i.e., marked) pronghorn to estimate confidence intervals for counts; and 3) use radio-collared pronghorn to identify factors influencing the detection of pronghorn (e.g., group size, vegetative cover type, percent vegetation cover, percent snow cover, and if pronghorn were on the summer or winter range). The March counts occurred prior to spring migration and the survey area encompassed the 30-km² winter range extending from Mammoth to Mol Heron Creek on the west side of the Yellowstone River. The April count occurred after the initiation of spring migration and the survey area encompassed both the winter and summer ranges between Mol Heron Creek in the Gardiner Basin and Mt. Norris in the upper Lamar Valley. The numbers of pronghorn counted were 235 on March 10th, 233 on March 24th, and 147 on April 19th. The counts obtained during March 2006 are similar to those during 1995-2005 (range 196-235), suggesting pronghorn numbers were quite stable during this period (Figure 12).

Immediately after each count, the pilot/observer team used telemetry to locate 19 radio-collared pronghorn and determine if each group containing at least one radio-collared pronghorn was observed during the original count. The team observed 13 of 13 groups with radio-collared pronghorn on March 10th, 14 of 18 groups on March 24th, and 12 of 14 groups on April 19th. The minimum number of pronghorn known to be alive during March 24th survey was 269, including 233 pronghorn counted during the original survey and another 36 pronghorn in 2 groups with radio-collared animals that were not detected during the original count. Peterson estimates of abundance based on observed group sizes were 171-285. We will continue to develop sightability data during the next 1-2 years until enough data are collected to rigorously determine significant factors influencing the detection of pronghorn.

In addition, a small number of pronghorn winter north of Yellowstone National Park in the Carbella/Point of Rocks area of the Paradise Valley. On June 6, 2006, in conjunction with a bald eagle fledgling survey, Tom Lemke of Montana Fish, Wildlife, and Parks counted 28 pronghorn in this area ranging from elevations of 5,000'-6,800' in the Rock Creek drainage (GPS locations provided). The survey was flown when does were about to give birth (1 newly born fawn was observed). As a result, antelope were widely scattered hiding as singles and small groups; i.e., a poor time to get a good total antelope count. Antelope numbers in this area are growing, in part due to increased irrigation of alfalfa between Carbella and Big Creek. Based on ground observations following fawning there were approximately 40-60 antelope in this area in 2006.

Summer Pronghorn Classification Survey

Summer classification flights for Yellowstone pronghorn were conducted on August 8, August 11, and September 1, 2006, using a Piper Super Cub airplane and a single observer. We classified 679 pronghorn (391 adult females, 156 adult males, and 132 fawns) in 100 groups during these flights. Mean estimates of sex and age ratios

were 34 fawns per 100 adult females (range 28-40) and 40 adult males per 100 adult females (range 34-46). The total number of adult pronghorn classified on summer range during the three flights was 442 (81%) compared to 105 (19%) adult pronghorn on winter range west of Mount Everts. The ratio of fawns per 100 adult females was higher in the migratory groups (33-46) than non-migratory groups (0-33).

Bighorn Sheep Surveys and Harvests

The status and distribution of bighorn sheep on the northern range is monitored using a helicopter to conduct a total count and recruitment estimate during spring. The Working Group also monitors the results of bighorn sheep hunts adjacent to Yellowstone National Park that are managed by Montana Fish, Wildlife, and Parks.

Spring Bighorn Sheep Surveys

The spring bighorn sheep surveys started in 1991 with an experimental helicopter survey in Tom Miner basin and Point of Rocks winter ranges. The survey area was expanded into the Gardiner basin (Yankee Jim to Mammoth) during 1992 and sheep were surveyed during the spring mule deer counts. In 1995, the Working Group initiated helicopter surveys of historic bighorn winter ranges in the interior of Yellowstone National Park from the Black Canyon of the Yellowstone River to the upper Lamar valley. During these surveys, sheep are classified as ewes, lambs, or rams, which are further classified by horn size.

Aerial surveys during April 26-27, 2006, detected 208 sheep (124 ewes, 30 lambs, and 54 rams) between Point of Rocks and Soda Butte on the northern range (Figure 13). One hundred and fifty-eight of these sheep were observed on winter ranges north of Mammoth (Figure 14). Sheep were detected in the following areas: Point of Rocks; Tom Miner basin; Yankee Jim Canyon/Corwin Springs/LaDuke; Beattie Gulch/Devil's Slide/Cinnabar Mountain; Mount Everts to Mammoth; Mount Norris to Tower Junction; and Black Canyon to Barronette Peak. A ratio of 24 lambs per 100 ewes was observed, which compares to an average spring recruitment estimate of 24 lambs per 100 ewes (range = 7-32) during 1995-2005. Recruitment has been relatively high (21-34 lambs per 100 ewes) since 1999 compared to 7-22 lambs per 100 ewes during 1995-1998.

The growth rate of the northern Yellowstone population appears to be increasing compared to the average count of 189 (range = 134-244) sheep since 1995. Sheep numbers and recruitment in the upper Yellowstone are at relatively high levels since the early 1990s. Thus, there is reason for some guarded optimism regarding the future of these relatively small and isolated sheep populations. However, there remains concern about the small number of sheep observed (0-5 sheep) on Travertine/Bear Creek/Deckard Flats since 2000 and reduced presence of sheep on the Hellroaring slopes since 1998.

Bighorn Sheep Harvests

Bighorn sheep in the surveyed populations are hunted north of Yellowstone Park in Hunting Districts 300, 303 and 305. Hunting District 300 is located in the Gallatin Mountain range between the Gallatin and Yellowstone Rivers from the Yellowstone Park boundary north to Moose Creek on the Gallatin side and Big Creek on the Yellowstone River side. Hunting District 303 is in the Absaroka Mountains north of the Park between the

Yellowstone River and Hellroaring Creek. Hunting District 305 runs from the Park boundary near Beattie Gulch north to Sphinx Creek in the Gallatin Range. Sheep hunting in Hunting District 300 and 303 is regulated by an unlimited access season with a set harvest quota. Hunting District 305 was first opened in fall of 2000 and is a limited access one license per year by drawing. Hunters may take only mature legal rams. By Montana's definition, a ram is legal when a straight line extending from the front base of the horn through any portion of the eye opening intercepts any portion of the horn. If the horn is not long enough to be intercepted by the line, the ram is not legal. Most legal rams are at least 3-4 years old.

The sheep season ran from September 1-10, 2005, in Hunting District 300 and September 15 to October 31, 2005, in Hunting Districts 303 and 305. Hunting Districts 300 and 303 had a quota of 2 legal rams, while district 305 had one available license. All 44 applicants received a license in Hunting Districts 300 and 303, while 73 applicants applied for the one available license in Hunting District 305. A hunter who kills a legal ram is required to present the complete head and cape intact within 48 hours to any FWP office, game warden or designated employee. The season is closed in Hunting Districts 300 and 303 after a 48-hour notice if the harvest quota is reached.

In 2005, 30 sheep licenses were issued in Hunting District 300, 14 were issued in Hunting District 303, and one was issued in Hunting District 305. One legal ram was harvested in Hunting District 300, three legal rams were harvested in Hunting District 303 (the third ram was taken during the 48 hr closure period) and one legal ram was harvested in Hunting District 305. Since 1988, 1-7 rams have been harvested annually in Hunting District 300 and 303 (Figure 15). During this period, sheep regulations in Hunting District 303 have remained much the same. Hunting District 300 has experienced several short-term changes dealing with season length, quota numbers and no quotas. Not all of the rams surveyed occur in the hunting districts during the hunting seasons. These two unlimited access sheep seasons are supported by a small number of resident sheep that remain outside YNP and sheep that migrate out of YNP during the hunting season. Hunting success in Hunting District 300 varies based largely on the distribution of sheep during the short ten-day season. Since the limited-entry Hunting District 305 was created in 2000, 5 out of a possible 6 rams have been harvested (Figure 15).

Mountain Goat Surveys

The status and distribution of mountain goats on the northern range is monitored using a Super Cub airplane to count goats in the southern portions of Hunting Districts 314 (Gallatin Range) and 316 (Cooke City), and adjacent areas inside Yellowstone Park, during September or October. The Working Group also monitors the results of mountain goat hunts in districts 314 and 316 that are managed by Montana Fish, Wildlife, and Parks.

Mountain Goat Numbers and Surveys

Since the late 1980s, mountain goat numbers have increased substantially in the Absaroka and Gallatin Mountains north of Yellowstone National Park. Surveys by Montana Fish, Wildlife, and Parks have documented a two to three-fold increase in mountain goats in Hunting Districts 323 and 329 since 1988. Surveys and other observations indicate that mountain goats have expanded their range southward into Yellowstone National Park and along its northern border.

By 1996, mountain goat numbers increased sufficiently in both areas to warrant the creation of new Hunting Districts and a limited hunting season. Mountain goat hunting districts 314 (Gallatin Range) and 316 (Cooke City) were established in autumn 1996, with two either-sex licenses issued in each unit. Standardized fixed-wing mountain goat surveys began in 1997. Currently, the survey areas cover only the southern portions of each district where goat densities are the highest. Goats located just inside Yellowstone National Park are also counted on this flight. Additional goats occur farther north in lower numbers and are not currently surveyed. Hunting Districts 314 and 316 are surveyed every other year.

Montana Fish, Wildlife, and Parks was unable to survey for mountain goats in the Gallatin Range (H.D. 314), the Cooke City area of the Absaroka Mountains (H.D. 316), or adjacent areas inside Yellowstone National Park during autumn 2006 owing first to forest fires/smoke/flight restrictions and then early snow fall that made the observability of goats difficult and unreliable. The NPS staff surveyed mountain goat habitat inside YNP on Sept 18 and 30, 2006, but were significantly hampered by snow conditions. During the NPS surveys 3 goats were observed in the Thunderer/Abiathar/Cache Creek area and 8 goats were observed in the Electric Peak/Sepulcher area. No goats were observed along the eastern border area or in several isolated mountain peak areas within the park. Snow conditions on both days were judged to be too extensive to allow for efficient detection of mountain goats this year.

Previous mountain goat survey results from 1997-2005 suggest that mountain goat numbers increased substantially in and adjacent to Yellowstone National Park during the past decade. Mountain goats thoroughly colonized and established breeding populations in and adjacent to the northeast (i.e., Cutoff Mountain, Barronette Peak, Wolverine/Abundance Peak, The Thunderer/Mount Norris) and northwest (i.e., Bighorn Peak, Sheep Mountain, upper Tom Miner basin, Sepulcher Mountain) portions of the park. Relatively high numbers of goats were observed in these areas during surveys in recent years, including numerous young-of-the-year. The recruitment ratio of observed mountain goats during 2005 (25 kids per 100 adults) was within the range observed during 1997-2004 (13-48 kids per 100 adults). Colonization of the eastern boundary area of Yellowstone National Park south of The Thunderer and Mount Norris is occurring more slowly than in the northeast and northwest portions of the park. However, sporadic observations of females with young of the year suggest that mountain goats may eventually colonize this area.

Mountain Goat Harvests Adjacent to Yellowstone National Park

For fall, 2005, 14 goat licenses were issued for H.D. 314 and 12 licenses were issued for H.D. 316. Mountain goat harvest data for the fall, 2005 season is not yet available. In 2004, 26 mountain goat licenses were issued in H.D. 314 and 316; 14 in H.D. 314 and 12 in H.D. 316. A total of 18 goats (10 males, 8 females) were harvested in autumn 2004; 10 in H.D. 314 and 8 in H.D. 316. From 1996-2004, 112 either-sex mountain goat licenses were issued in H.D. 314 and 316 and 85 goats were harvested by 107 participating hunters (i.e., 79% harvest success rate). In autumn 2006, 26 mountain goat licenses were again issued in H.D. 314 and 316 with harvest data expected in late 2007.

Cooperative Wildlife Survey Funding

Members of the Working Group have mutually agreed to cooperatively support and fund regularly scheduled wildlife surveys to monitor population trends of elk and other ungulate species on the northern Yellowstone winter range. Member agencies either pay the costs of surveys and other activities directly or contribute funds to the Yellowstone Wildlife Working Group Project Account (Project #53484), which was established by Montana Fish, Wildlife, and Parks to support these surveys and other Working Group projects. Unspent funds in this account are carried forward annually to include any existing funds. Expenditures by the Working Group during federal fiscal year 2006 were as follows:

Survey	Date	NPS	MFWP	USGS	USFS	Total
Elk Count	March, 22, 2006	\$1,735	\$625			\$2,360
Spring Mule Deer Survey	Not flown (observer/pilot availability)					
Bighorn Sheep Survey	April 26-27, 2006	\$2,396	\$1,416			\$3,812
Pronghorn Count	March 10 & 24, 2006, April 19, 2006	\$1,750				\$1,750
Winter Mule Deer Survey	Not flown (poor conditions; pilot availability)					
Elk Classification	March 23, 2006	\$5,350				\$5,350
Elk Migration Survey	March 22, 2006		\$625			\$625
Mountain Goat Survey	Partial Survey September 18 & 30, 2005	\$1,603				\$1,603
Pronghorn Classification	August 8 & 11, 2006, September 1, 2006	\$2,300				\$2,300
TOTAL		\$15,134	\$2,666	\$0	\$0	\$17,800

This year was a difficult year for completing aerial wildlife surveys. As mentioned above poor flying conditions, particularly high winds, from late December to March did not allow us to fly the annual coop elk flight or the winter mule deer survey. We were also unable to complete the spring mule deer survey in April due to observer/pilot availability issues. In the fall, scheduled FWP mountain goat surveys along the northern boundary of YNP were frustrated first due to forest fires and flight restrictions and then early snow fall. YNP personnel did fly a goat survey inside YNP on September 18 and 30, 2006, but were hampered by early snow conditions.

Special Projects

Working Group members participate in many special projects, including studies conducted by members from a mutually prioritized list of topics, assisting graduate students on northern range research studies or attempting to initiate outside interest in a particular research issue. Working Group involvement in special projects ranges from complete design and completion, technical/financial support and soliciting investigators to minor review of proposals. Working Group members participated in the following special projects during fiscal year 2006.

Pronghorn Migration Project: The Yellowstone Center for Resources, Montana State University, University of Idaho, and Yellowstone Ecological Research Center used 5,743 telemetry locations of 44 adult, female pronghorn during June 1999-August 2005 to determine migration patterns, seasonal distributions, and individual fidelity to migratory strategies. Yellowstone pronghorn were partially migratory, with >70% of the pronghorn population migrating 15-50 km to 4 contiguous summering areas and <30% remaining year-long on the winter range. Most radio-collared pronghorn showed fidelity across years to their migration strategy and summer use area, but approximately 20% migrated in some years, but not in others. This behavioral flexibility is consistent with the hypothesis that migration in Yellowstone pronghorn is a conditional strategy and likely contributed to dynamic and rapid changes in the proportion of migrants from 80% to 20% and back to 70% during 1967-2005. All migrant pronghorn traveled 10 km over a topographic bottleneck (Mt. Everts) separating the winter and summer ranges, primarily using grassland-sagebrush pathways through conifer forest. The Bernice Barbour Foundation graciously contributed \$25,000 to the Yellowstone Park Foundation for this study

Elk Calf Mortality Study: The Yellowstone Center for Resources, U.S. Geological Survey, and University of Minnesota completed a 3-year study (May 2003–April 2006) of mortality in northern Yellowstone elk calves. Montana Fish, Wildlife, and Parks also provided funding and staff participation. The primary objectives of the study are to: 1) estimate the relative causes and timing of calf deaths; 2) estimate calf survival rates; and 3) evaluate factors that may predispose calves to death. We captured, fit with radio-transmitters, and evaluated survival for 151 calves \leq 6-days old. Annual survival was 0.22 and did not vary among years. Calves captured in the Stephens Creek/Mammoth area had higher annual survival rates (0.54) than calves captured in the Lamar Valley area (0.17), likely due to the higher predator density in Lamar Valley. Summer survival was 0.29, while survival during the winter was 0.90. Sixty-nine percent of calves died within the first year of life, 24% survived their first year, and 7% had unknown fates. Grizzly bears and black bears accounted for 58-60% of deaths, while wolves accounted for 14-17%. Summer predation (95% of summer deaths) has increased, while winter malnutrition (0% of winter deaths) has decreased, compared to a similar study during 1987-1990 (72% and 58%, respectively).

Adult Elk Survival, Movements, and Habitat Use: The Yellowstone Center for Resources, Working Group, U.S. geological Survey, Biological Resources Division, Northern Prairie Wildlife Research Center, and Montana State University continued collecting information on key vital rates and limiting factors of Yellowstone elk during 2006. Thirty adult female elk were captured and collared on the northern range (inside Yellowstone National Park) during March 2006. We monitored radio signals of 70 adult female elk on the northern range during winter and summer 2006 to obtain gross estimate of distribution and survival. One collared elk was harvested during the

Gardiner Late Elk Hunt, one died of an accident (slip/fall), and two collared elk died during the summer (unknown causes of death). Aerial telemetry monitoring has been reduced to 2-4 times per year owing to lack of funding.

Chronic Wasting Disease (CWD) and Brucellosis Surveillance: Montana Fish, Wildlife & Parks collected lymph node and brain stem tissue samples from approximately 40 elk at the check station during the 2006 Gardiner Late Elk Hunt. These samples were sent to the Colorado State Veterinary Laboratory in Fort Collins for ELISA screening. All of the samples tested negative for CWD. Blood samples from 1 out of 31 harvested elk (3.2%) tested positive for brucellosis, compared to 3.7% and 4.1%, in 2004 and 2005, respectively. The range of positive tests has been 1-4% during the last 10 years. The State of Montana would consider increasing surveillance and sampling efforts in the future if >5% of samples test positive for brucellosis. Substantially fewer samples for disease surveillance were collected this year as a result of the reduced number of permits issued (104 antlerless, 59 either-sex) for the 2006 late hunt. FWP will continue to collect disease samples during the Gardiner Late Elk Hunt, however, the sample sizes will be relatively small due to smaller harvests.

Gardiner Basin Restoration Workshop: The Gallatin National Forest, Yellowstone Center for Resources, and Center for Invasive Plant Management, convened a group of 30 agency staff and invited restoration experts during April 2005 to develop restoration recommendations for select sites in the Gardiner basin winter range for pronghorn that were once tilled for agriculture and now support invasive alien plant species. The experts visited these sites and then developed recommended restoration prescriptions for each site. Findings of the experts were: 1) areas that were tilled and irrigated generally had soils with altered physical and chemical properties; 2) low annual precipitation, high winds, and heavy use by native ungulates presents a challenge to restoring desired native plant associations; 3) seed availability of local ecotypes may be a constant depending on site goals; 4) lack of known reference sites hampers restoration goal setting; and 5) each of the proposed restoration sites can successfully be restored to a functioning native plant assemblage despite these constraints. The experts worked with a Steering Committee to finalize restoration recommendations for each site and identify guiding principles to oversee the restoration projects (e.g., site characterization and goal setting; site preparation; soil stabilization; seed selection and planting; site maintenance; monitoring and maintenance). Both the Gallatin National Forest and Yellowstone Center for Resources have begun implementing these recommendations at selected sites in the Cutler Meadows and Gardiner basin inside YNP, respectively.

Bighorn Sheep Population Dynamics: Yellowstone Center for Resources, Gallatin National Forest, and Montana Fish, Wildlife and Parks biologists analyzed a time series of counts, index of recruitment, and estimates of survival for bighorn sheep during 1995-2005 to evaluate the prediction that sheep numbers would decrease in the northern portion of Yellowstone owing to lower survival and recruitment following wolf reintroduction. The number of wolves residing on the northern range increased from 21 to a maximum of 106 in response to an abundant elk population and legal protection. Counts of bighorn sheep decreased following the severe winter of 1997, but then increased 7% annually during 1998-2005. Recruitment followed a similar temporal pattern, decreasing to 7-11 lambs/100 ewes during the severe winter of 1997 and the following winter, but then increasing to 21-34 lambs/100 ewes during 1998-2005. Annual estimates of survival for 14 adult females and 4 males 1-3 years old were high (0.94) and indicative of an increasing or constant population. Thus, the presence of wolves did not prevent the

bighorn sheep population from increasing slowly during the decade following reintroduction. However, sheep counts remain low compared to 487 sheep observed before an outbreak of keratoconjunctivitis caused 60% mortality during 1982; suggesting other factors limited the recovery of this relatively isolated, high elevation, native sheep population. Increases in abundance and recruitment of bighorn sheep during 1998-2005 were concurrent with a 50% decrease in numbers of northern Yellowstone elk after wolf reintroduction. The findings of this project have been accepted for publication in the journal Wildlife Biology.

Wolf Project: (This project needs to be updated; 2005 summary follows) Preliminary data from the summer of 2005 indicates that the wolf population in Yellowstone National Park has declined. One pack (Biscuit Basin) moved out of the park, two others (Geode Creek, Specimen Ridge) appear to have dissolved, and the Swan Lake pack has declined from 12 to 3 wolves. Very high adult mortality was recorded over summer and pup survival for the northern range also appears to be low (~20%) due to a likely outbreak of disease (not confirmed but probably an outbreak of canine parvo-virus). In short, the current wolf population in the park is estimated to be down by 30% park-wide and 45% on the northern range. The number of packs on the northern range had declined from 7 to 5.

Beaver Surveys: (This project needs to be updated; 2005 summary follows) Aerial surveys of Yellowstone National Park have been conducted since 1996 to record the number and location of active beaver colonies. Complete counts and comparisons for accuracy to ground counts have been conducted since 1998. Aerial surveys are conducted every other year and compared to a sample of colonies counted every year outside the park in the Gallatin National Forest (Dan Tyers, personal communication). Colonies are sampled by searching for food caches which are visible from aircraft flying at about 500 feet above the ground. Caches are collections of woody vegetation made by the beavers for use throughout the winter. Beaver colonies have been increasing on the northern range since surveys began. In 1996 there was one colony and in 2003 there were ten. The survey is scheduled to be flown again in 2005.

Wolverine Study: : (This project needs to be updated; 2005 summary follows) Yellowstone National Park and the U.S. Forest Service, Rocky Mountain Research Station began a comprehensive 5-year (2005–2009) field study to evaluate wolverine status, ecology, and interactions with humans in the eastern half of the greater Yellowstone ecosystem. The study area includes the eastern portion of Yellowstone National Park and the Gallatin, Shoshone, and Bridger-Teton National Forests. Other cooperators include the Wyoming Game and Fish Department, Rocky Mountain Cooperative Ecosystems Studies Unit, U.S. Forest Service Region 1 Carnivore Program, and the Yellowstone Park Foundation. The study is specifically designed to address and remedy the important information shortfalls that currently impede conservation planning and management of the species in this region. The goal is to improve existing information on wolverine and their environmental requirements, particularly in context with broad-scale anthropogenic effects of park and national forest management. A second goal is to foster appreciation and support for wolverine conservation through public education. The objectives of the project are to: 1) collect basic data on the residency and breeding status of wolverines; 2) document aspects of their population, including sources of death, genetic characteristics, and extent of connectivity with other wolverine populations in the Northern Rockies; 3) document habitat requirements related to birthing dens and potential human disturbance; and 4) describe interactions with other carnivores such as wolves and grizzly bears. The study involves

capturing wolverines in live traps during the winter and radio-marking them with GPS technology that provides location and movement information across a broad range of temporal and spatial scales. A detailed study plan was written during winter 2005 and distributed to relevant national forest units and state wildlife agencies for comment. The plan was approved by Yellowstone National Park. During the summer and autumn 2005, approximately 30 total live traps were constructed in the park and on the Shoshone and Gallatin National Forests. Efforts to capture wolverines in the traps will begin during early December and continue through March 2006. Other fieldwork will include snow-tracking wolverines and documenting reproduction and natal dens.

Ungulate Carcass Transect Project: This is a graduate student project under the guidance of the USFS. Heidi Bergsjö is a graduate student from Sweden who is evaluating/comparing carcass data collected along 11 standard transects to expanded contour transects in adjacent areas to include the Dome Mtn. WMA. There was a marked increase in the number of carcasses discovered this year (41 elk, 67 deer) compared to recent years (typically less than 10). This was the highest carcass count since the winter of 1996/97. Fifty three carcasses were found on the old transects (multiple visits) compared to 55 carcasses on the new transects (1 visit). Heidi and her field crew collected a great deal of information that will be analyzed later this year for Heidi's masters thesis. The final results will be available in 2007.

Eagle Creek Aspen Project: This is a graduate student project under the guidance of the USFS. Sam McColley is an MSU graduate student who is looking at the long-term impact of the return of beavers on aspen regeneration and riparian communities in the Eagle Creek drainage near Gardiner. Sam is interested in how ungulate herbivory may impact any aspen regeneration that is stimulated by beaver activity based on a sample of 6 active, 6 control and 16 inactive beaver sites. Sam will also look to see if there are any significant changes in ungulate impacts on vegetation at current relatively low elk numbers compared to higher elk numbers in the mid-1990s.

Gardiner Basin Aspen Project: this is a graduate student project under the guidance of the USFS. Dave Kimble is an MSU graduate student who is revisiting and updating Rob Saint John's Gardiner Basin aspen inventory thesis project completed in 1990/91. Dave is revisiting 343 aspen stands that were sampled and analyzed by Rob. Dave will attempt to find out what has happened with aspen over the past 15 years in the Gardiner Basin and see if Rob's predictions were accurate. Results of this thesis will help guide any future USFS aspen management efforts in the area.

Cinnabar Basin Aspen/Forest Management Project: (Dan, could you please provide a brief summary/status of this project).

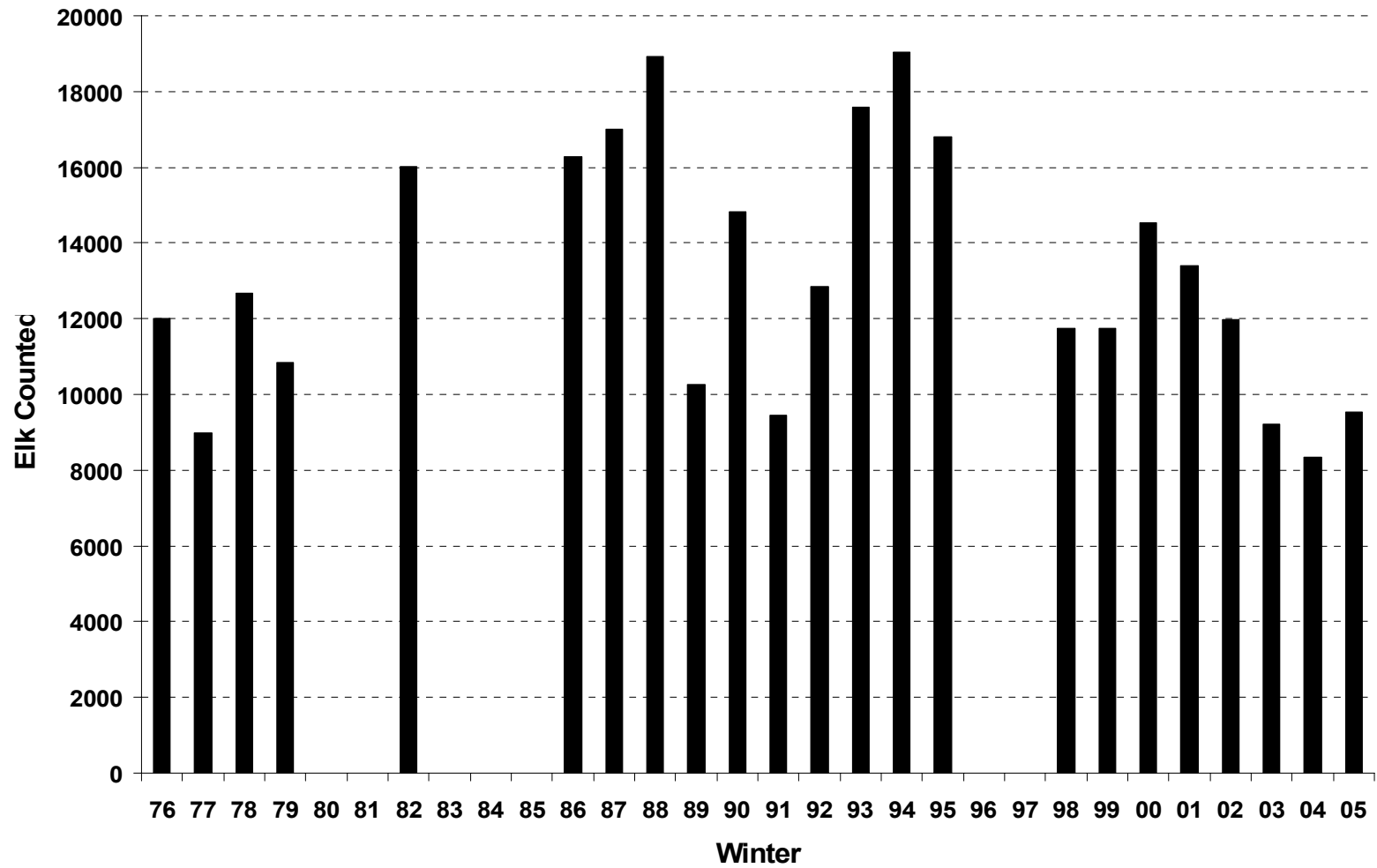


Figure 1. Cooperative winter counts of northern Yellowstone elk during 1976-2005. Winter "76" refers to the winter of 1975-76. Survey conditions were poor in 1977, 1989, and 1991.

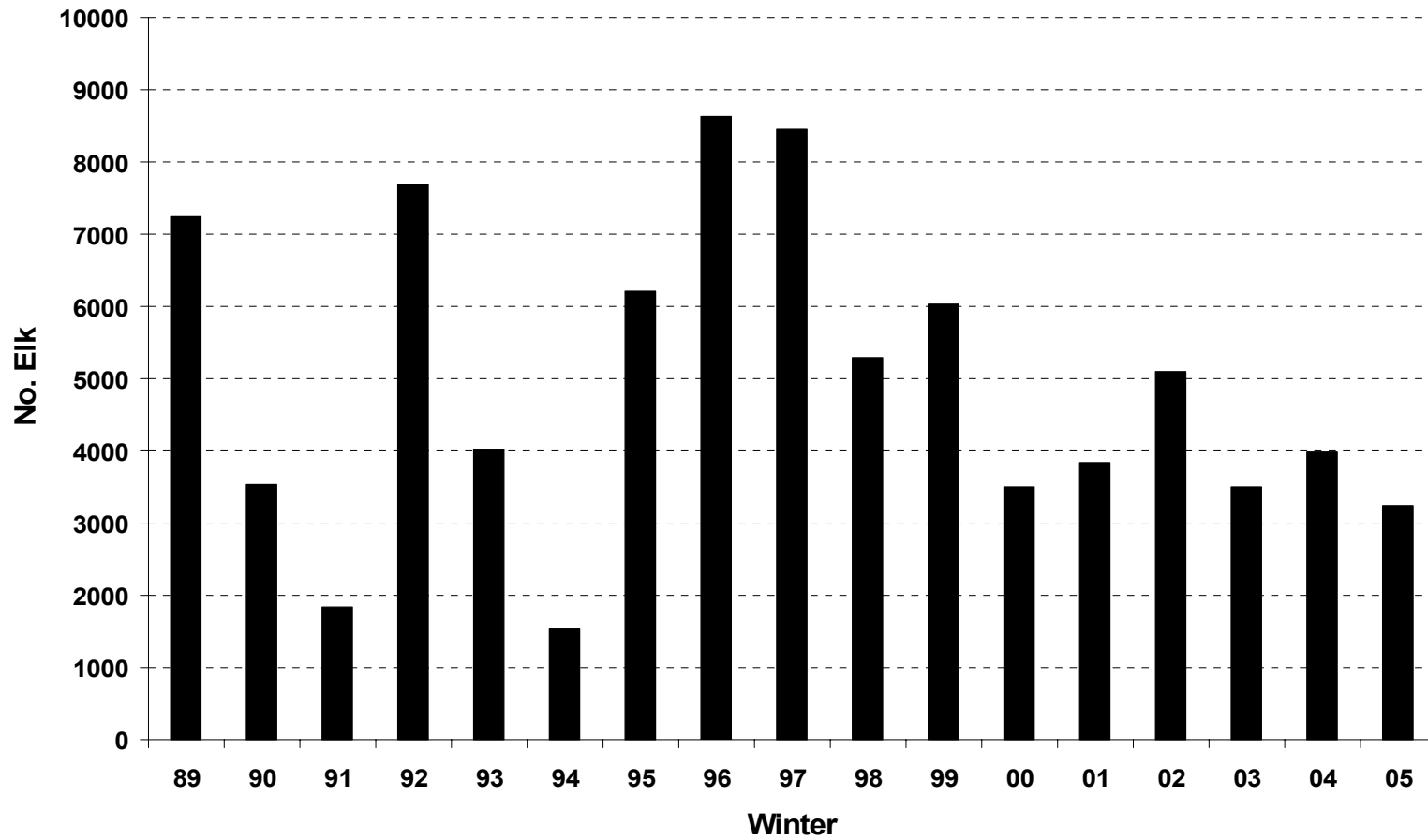


Figure 2. Estimated minimum number of northern Yellowstone elk that migrated north of Yellowstone National Park based on winter aerial counts during 1989-2005. Winter "89" refers to the winter of 1988-89.

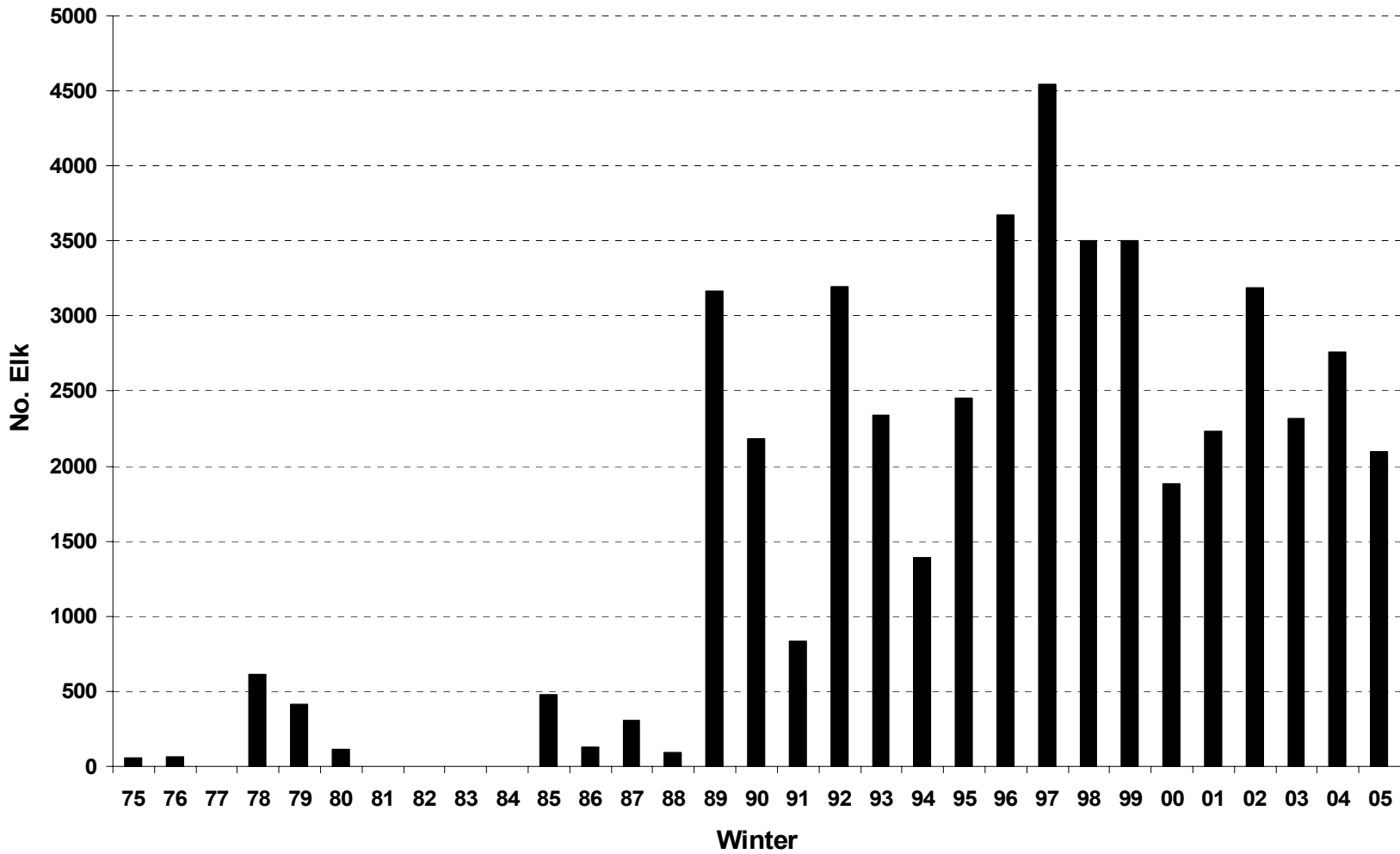


Figure 3. Maximum number of northern Yellowstone elk counted north of Dome Mountain during winter aerial counts, 1975-2005. Winter "75" refers to the winter of 1974-75.

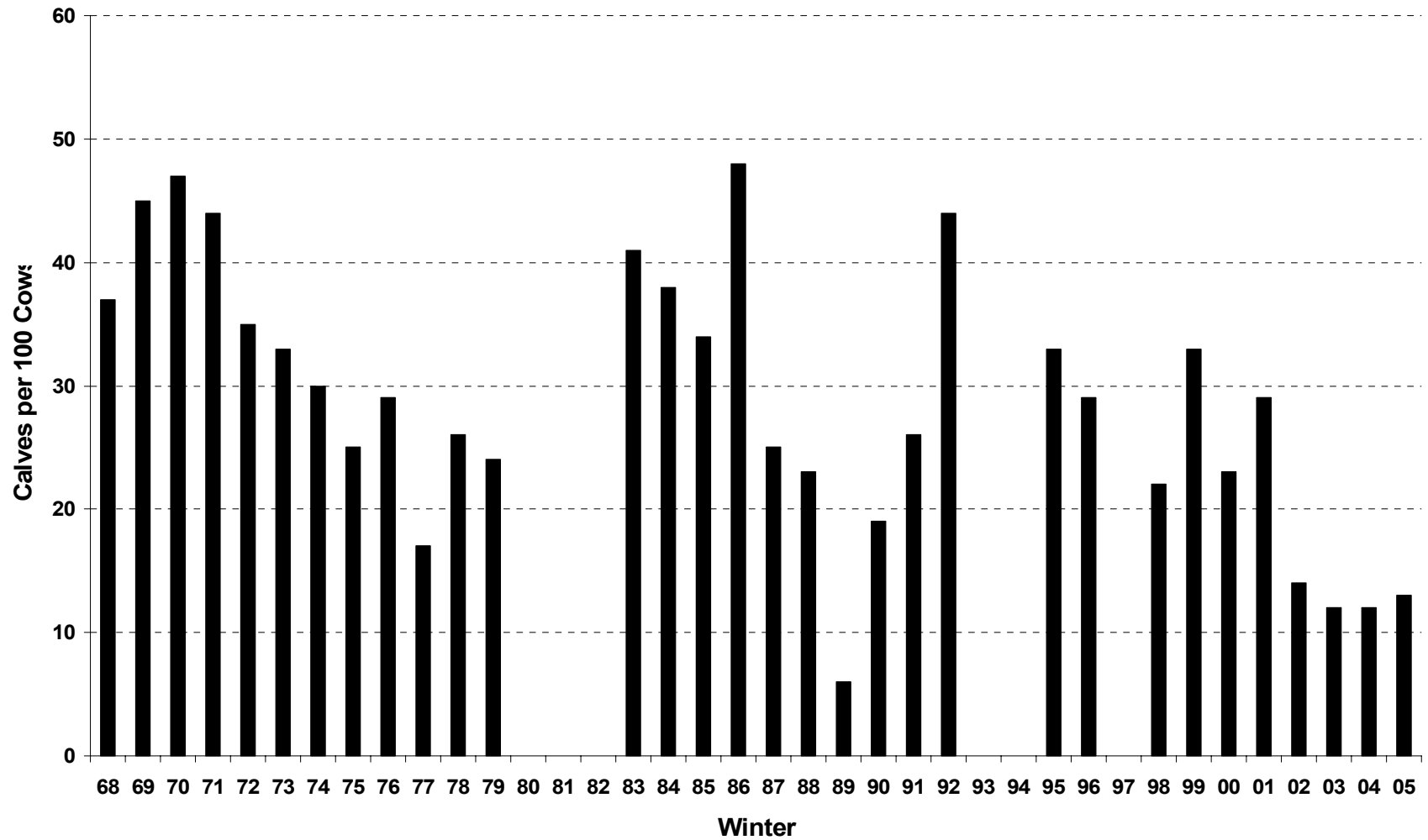


Figure 4. Number of calves per 100 cows observed during late winter classification surveys of northern Yellowstone elk, 1968-2005. Winter "68" refers to the winter of 1967-68.

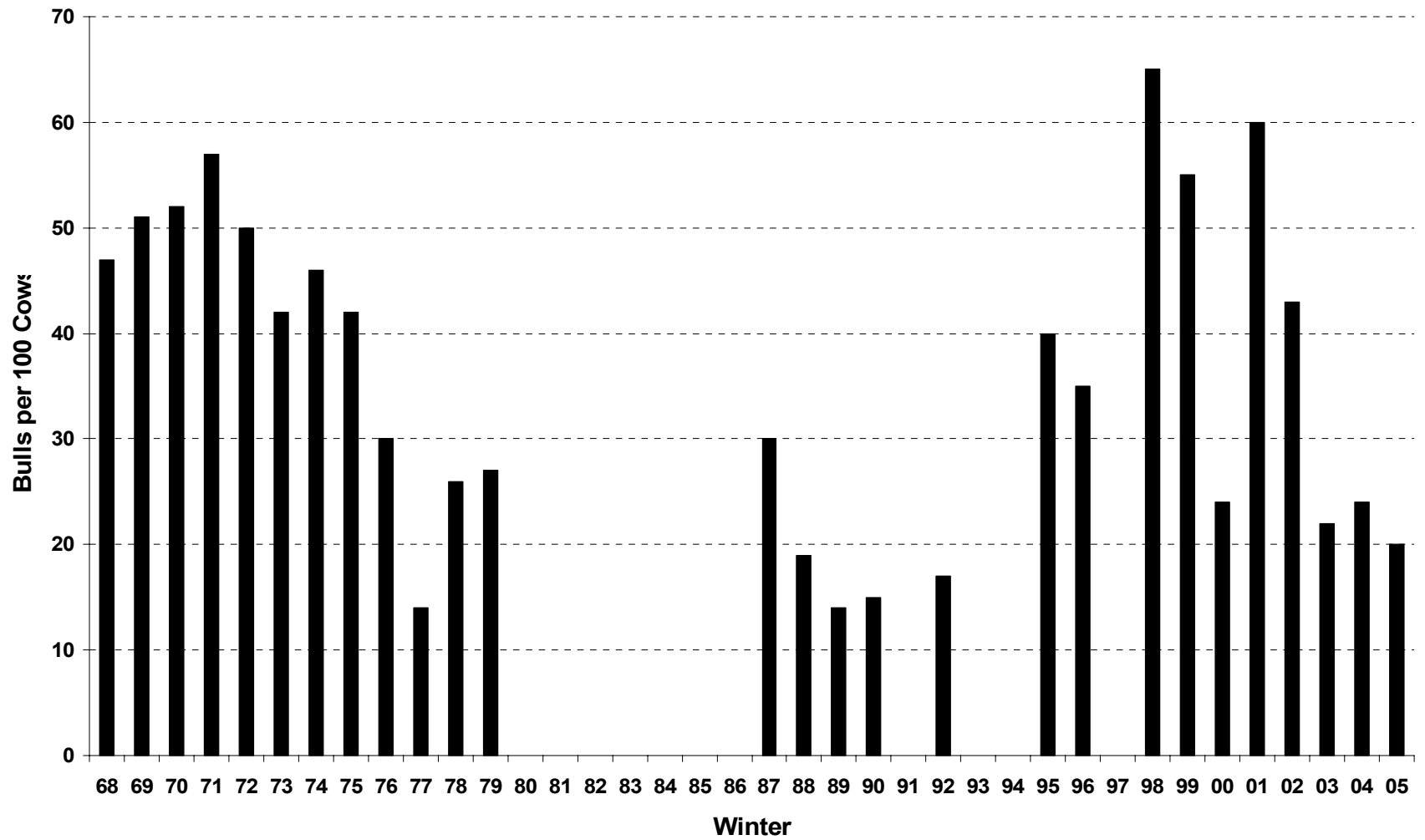


Figure 5. Number of bulls per 100 cows observed during late winter classification surveys of northern Yellowstone elk, 1968-2005. Winter "68" refers to the winter of 1967-68.

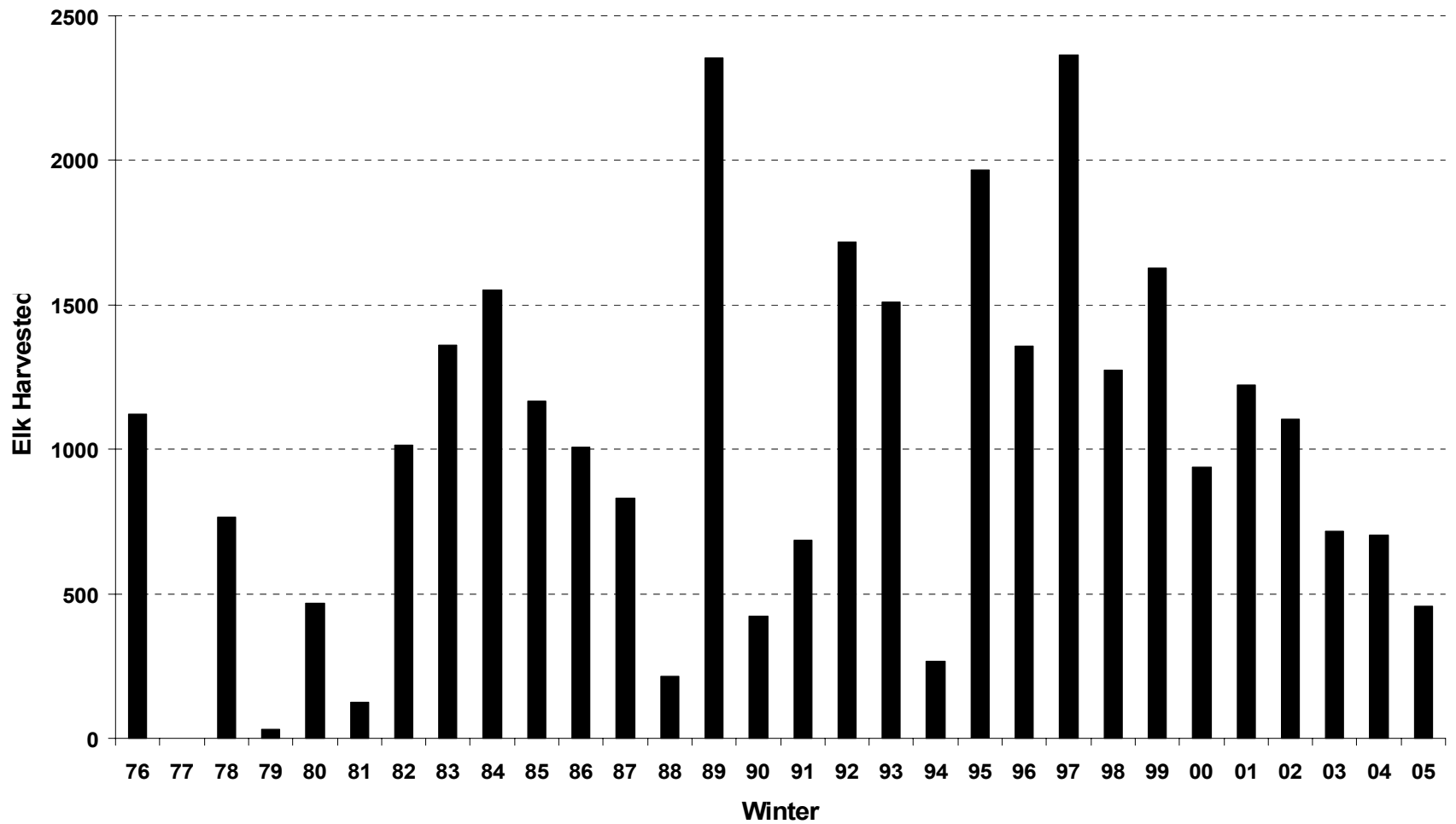


Figure 6. Number of northern Yellowstone elk legally harvested during the Gardiner Late Elk Hunt, 1976-2005. Winter "76" refers to the winter of 1975-76. No late hunt was held in 1977.

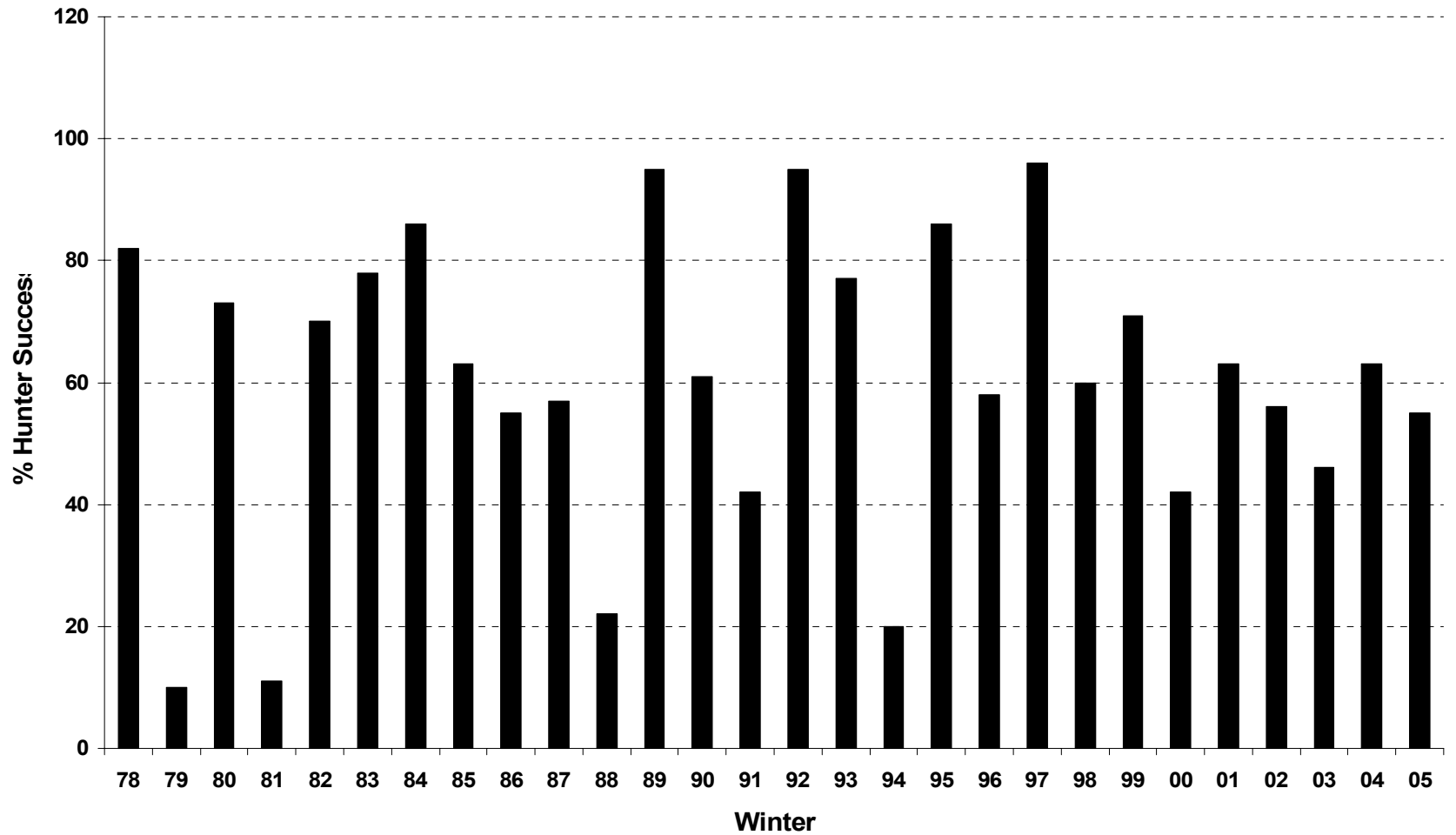


Figure 7. Percent hunter success during the Gardiner Late Elk Hunt, 1978-2005. Winter "78" refers to the winter of 1977-78.

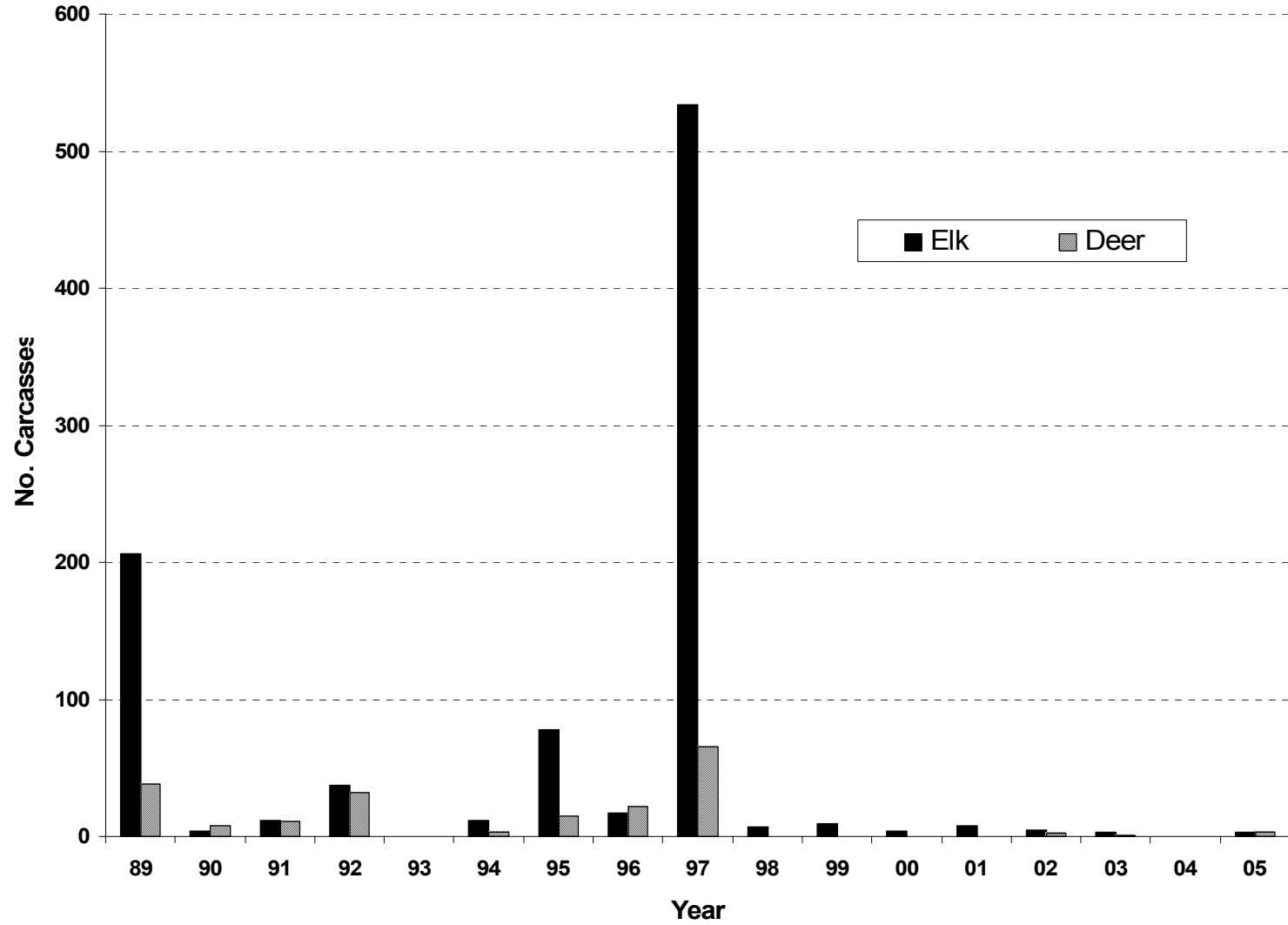


Figure 8. Results of spring helicopter surveys for carcasses in the Gardiner basin during 1989-2005. No surveys were conducted during 1993 and 2004.

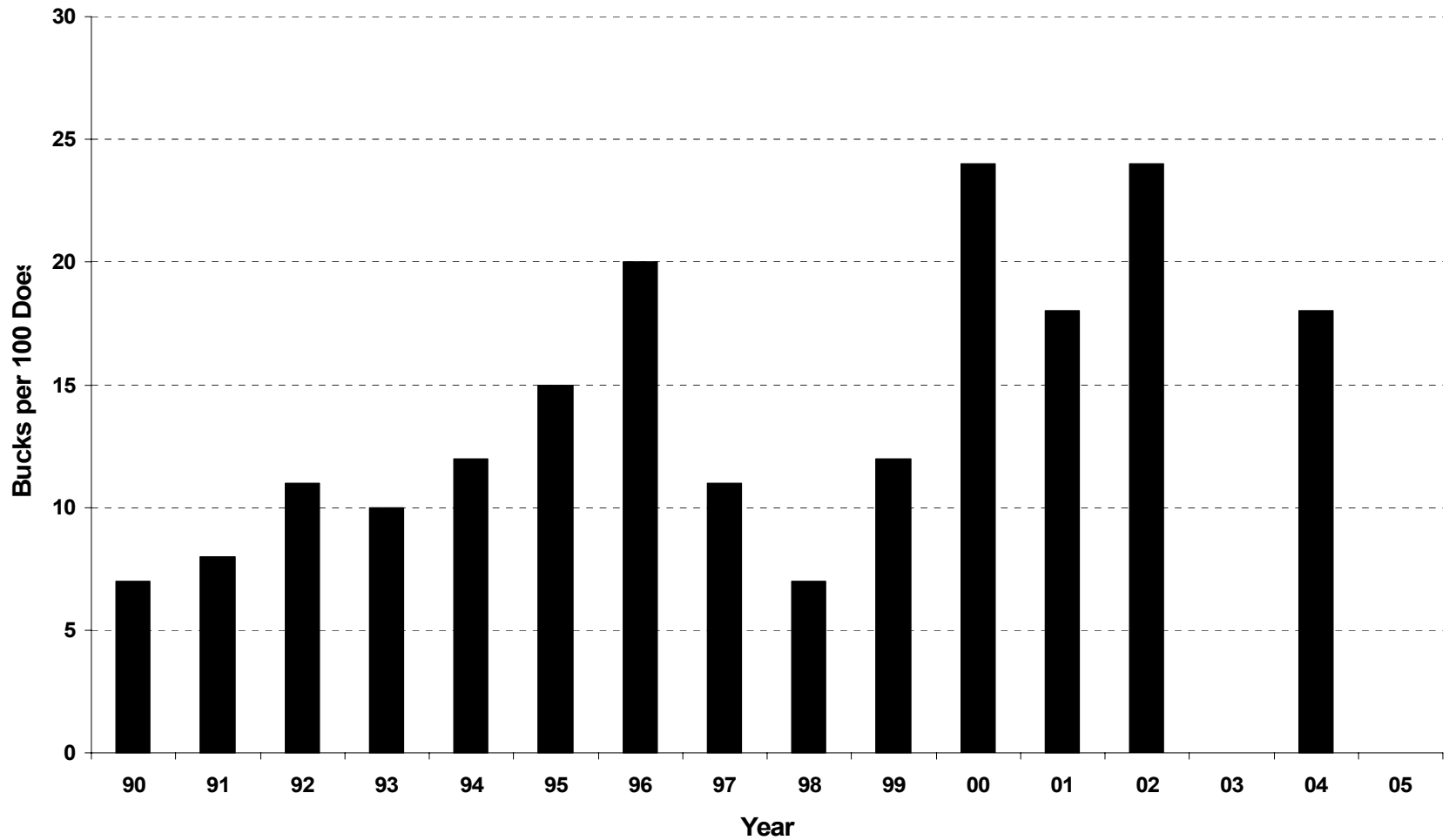


Figure 9. Number of mule deer bucks per 100 does observed during early winter classification surveys in the Gardiner basin, 1990-2005. Winter "90" refers to the winter of 1989-90. No surveys were conducted during 2003 and 2005.

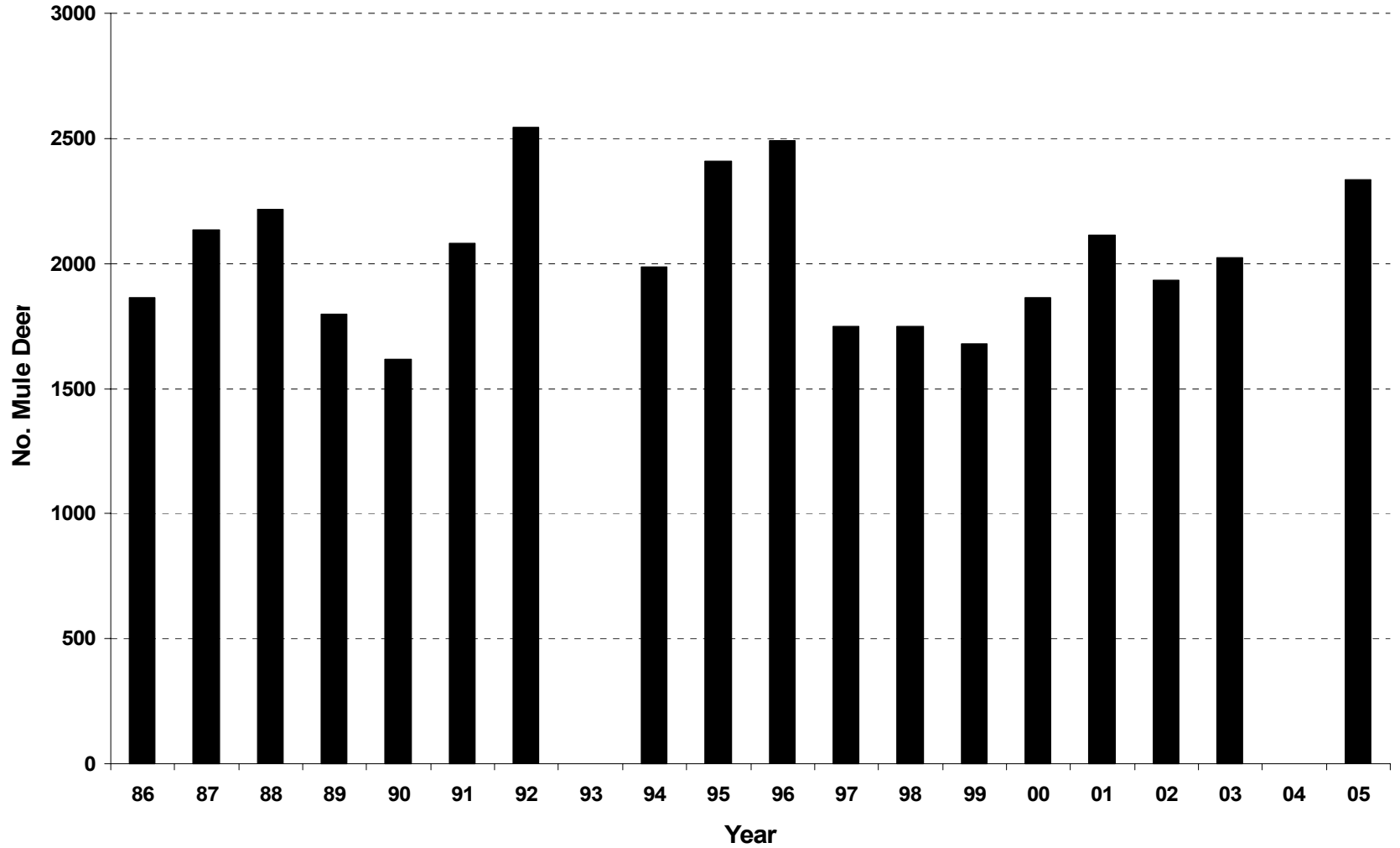


Figure 10. Spring helicopter counts of mule deer in the Gardiner basin during 1986-2005. No surveys were conducted during 1993 and 2004.

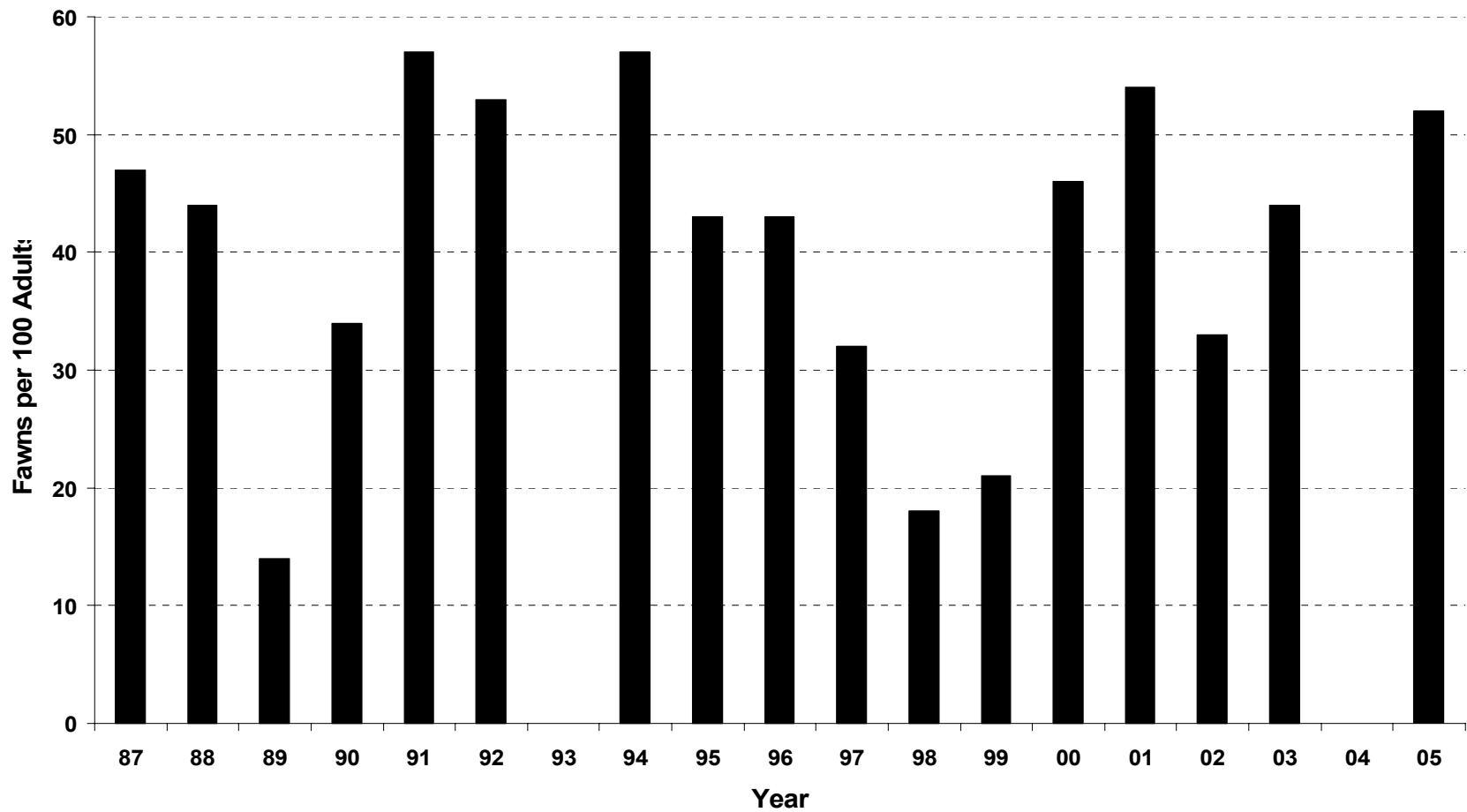


Figure 11. Number of mule deer fawns per 100 adults observed during spring classification surveys in the Gardiner basin, 1987-2005. No surveys were conducted during 1993 or 2004.

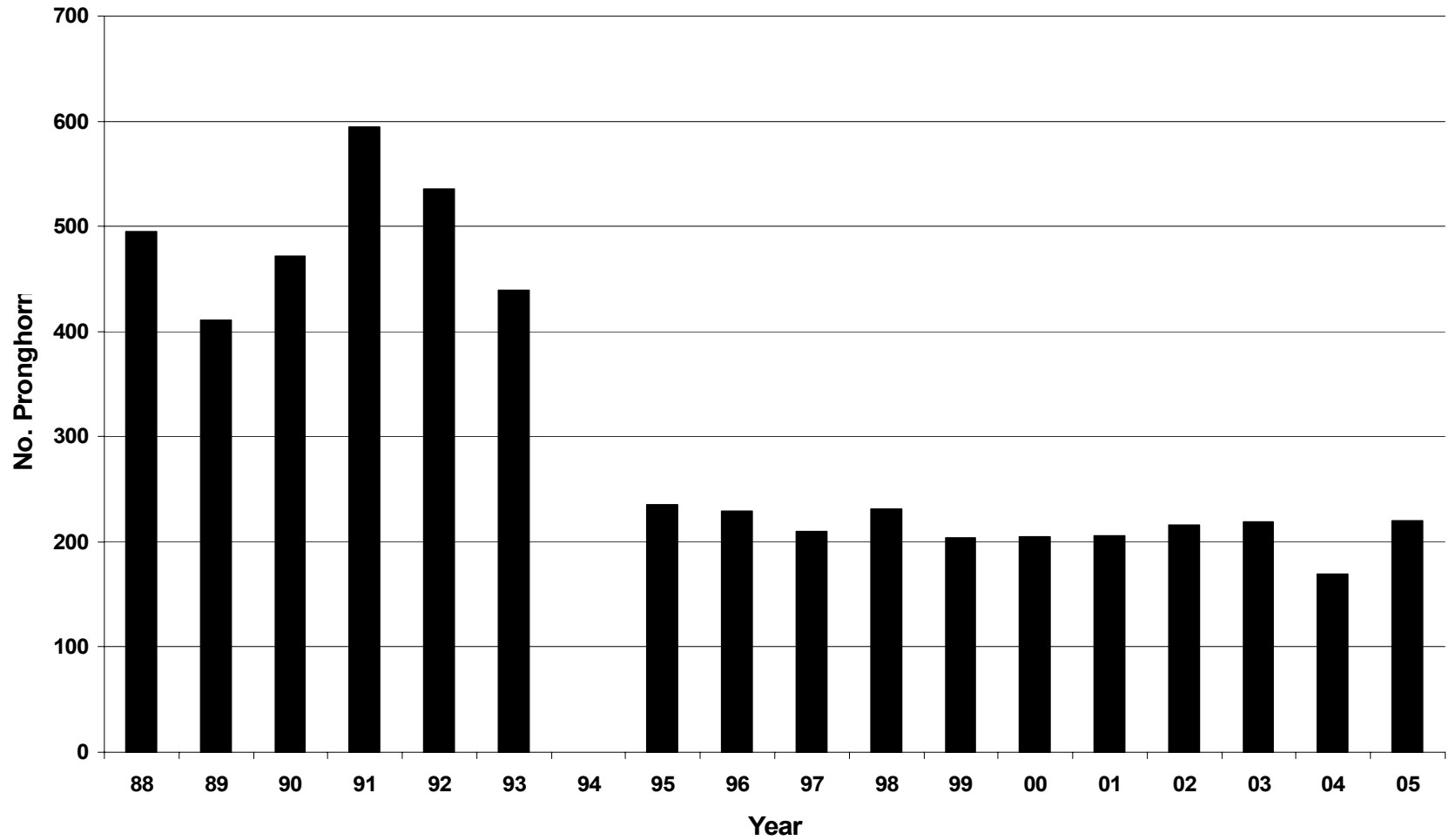


Figure 12. Spring aerial counts of Yellowstone pronghorn, 1988-2005. No survey was conducted in 1994 and survey conditions were poor for the 2004 count.

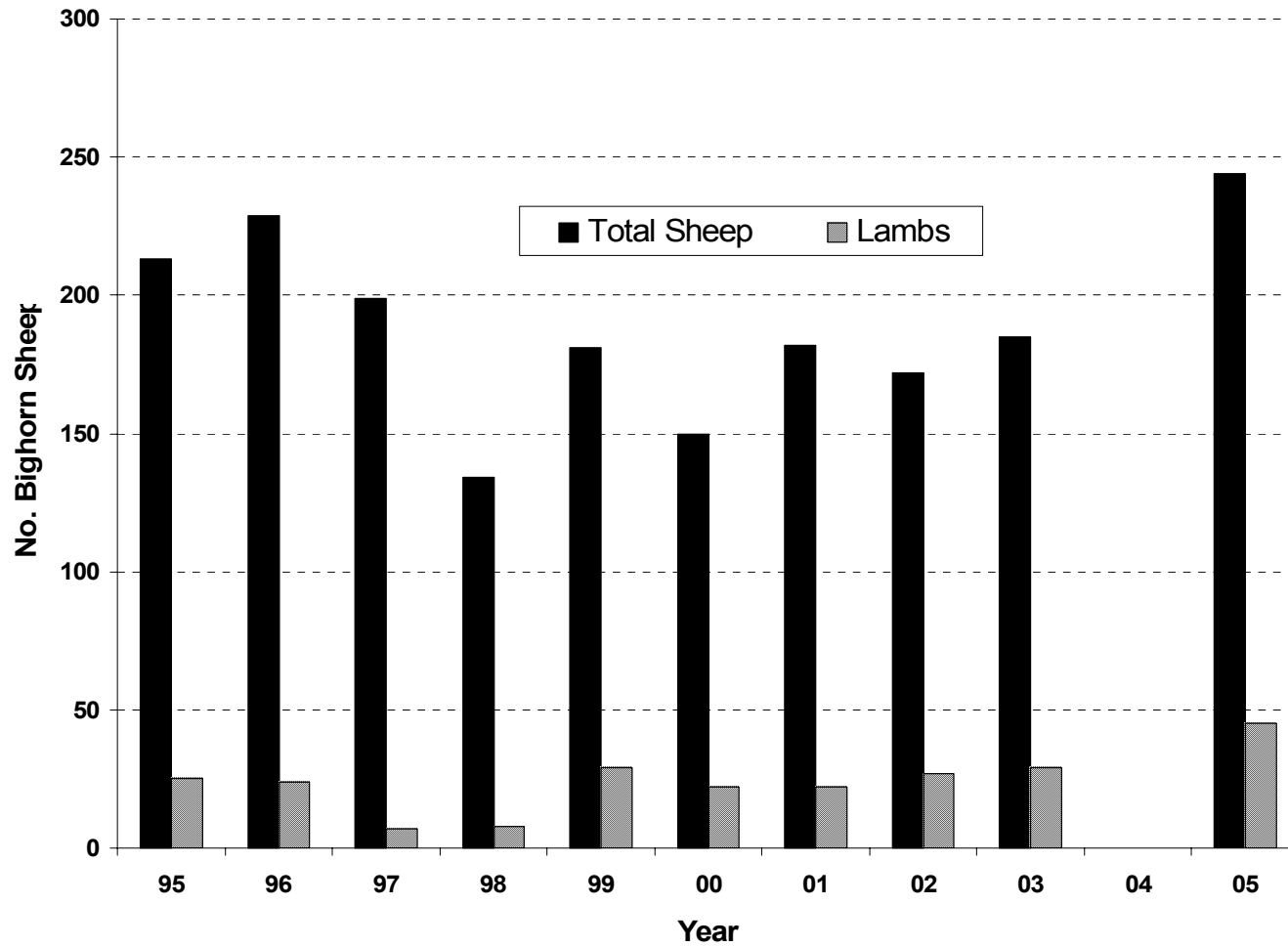


Figure 13. Number of bighorn sheep observed between Soda Butte and Point of Rocks during spring aerial surveys, 1995-2005. Incomplete survey results during 2004 are not reported.

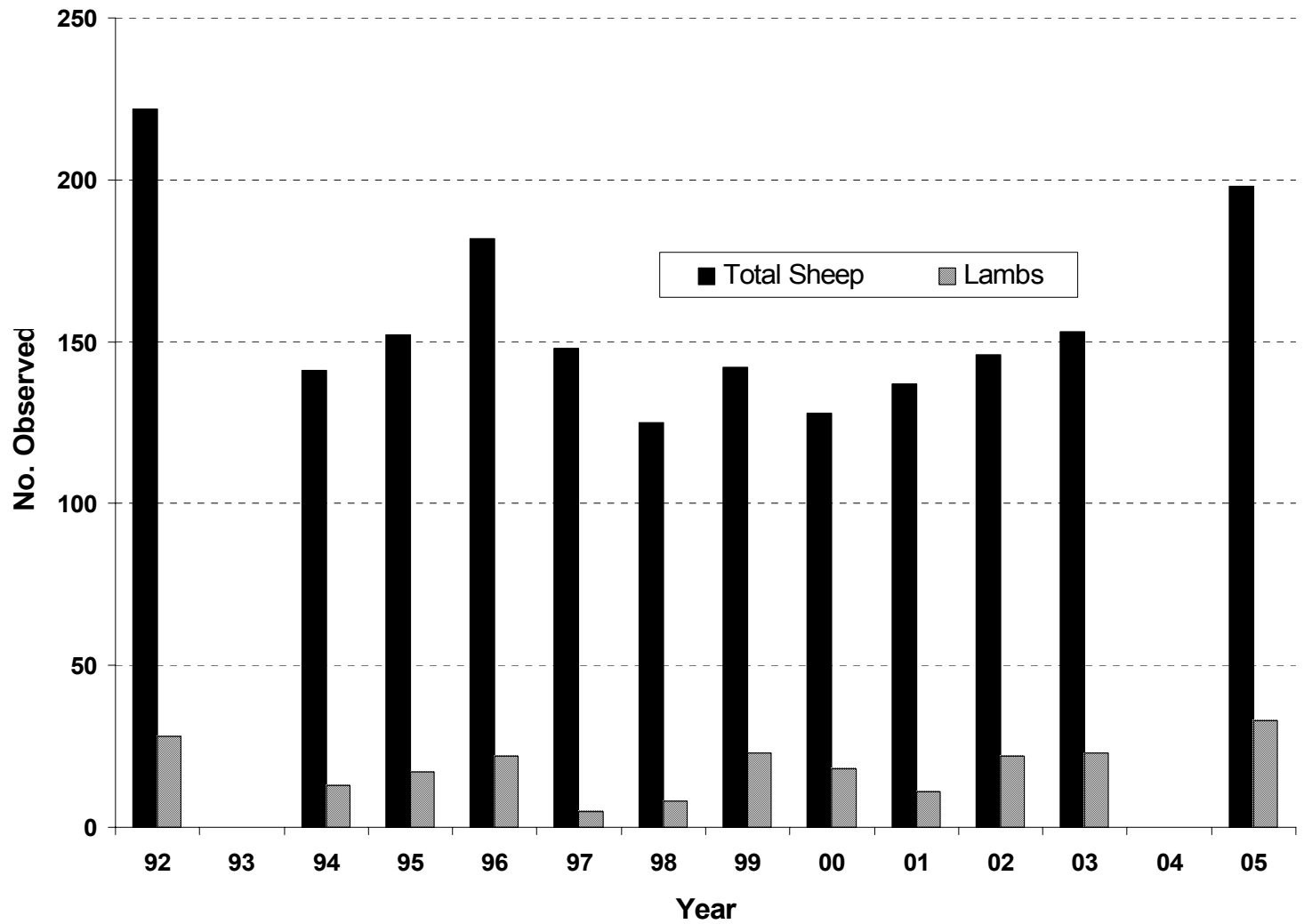


Figure 14. Number of bighorn sheep observed between Mammoth and Point of Rocks during spring aerial surveys, 1992-2005. Incomplete survey results during 2004 are not reported.

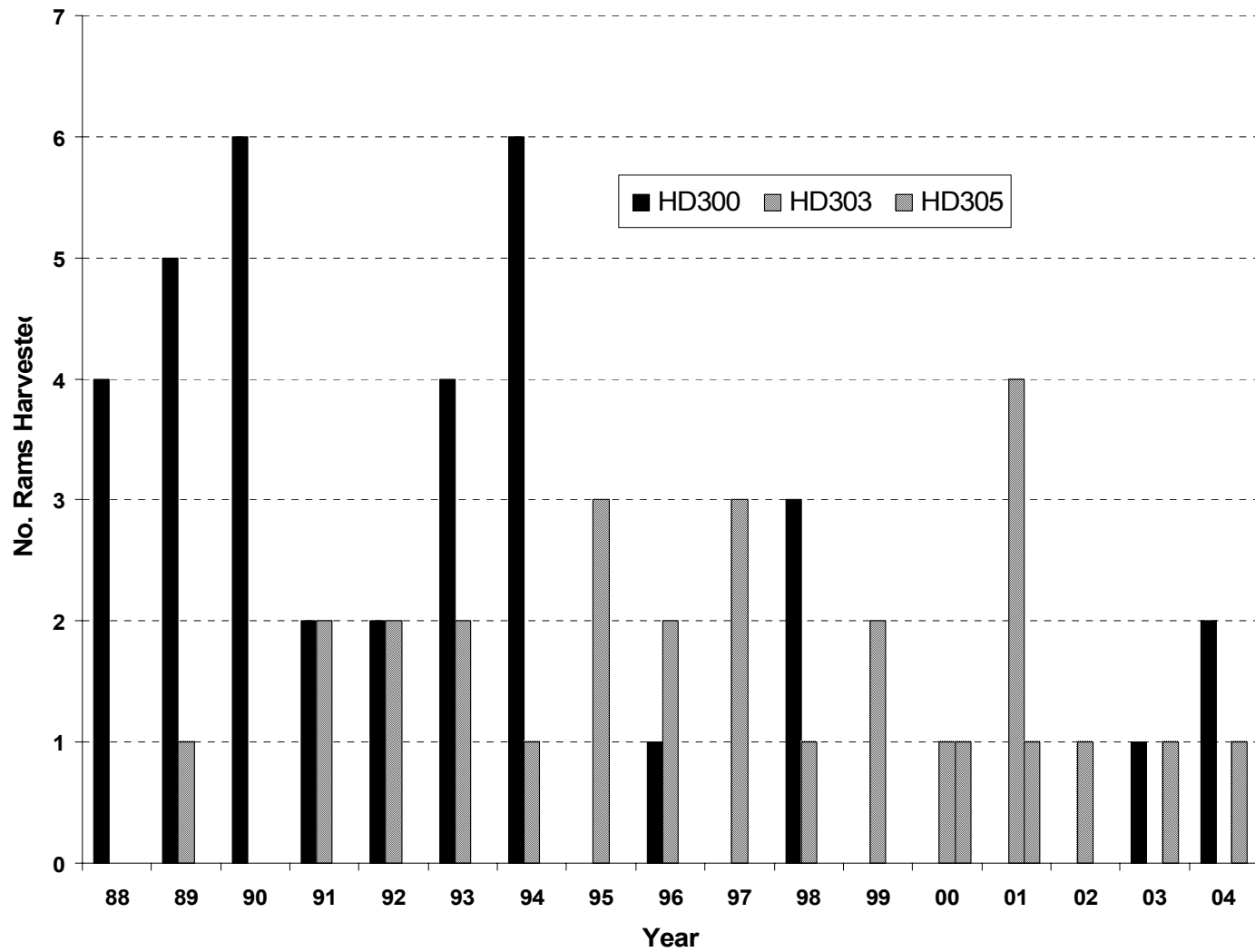


Figure 15. Bighorn sheep harvest in Hunting Districts 300, 303 and 305 during 1988-2004.