Region One
Mountain Goat Report
2016
Montana Fish, Wildlife & Parks

Since this is a progress report only, results herein are not necessarily final and may be subject to change. The information in this report may not be published or used for other purposes without permission of MFWP.

Montana Fish, Wildlife & Parks
Region One Headquarters
490 Meridian Road
Kalispell, Montana 59901

Prepared by Jessy Coltrane, PhD
Kalispell Area Wildlife Biologist

INTRODUCTION

Mountain goats (*Oreamos americanus*) historically occupied most available montane cliff habitat throughout northwest Montana (Fish Wildlife & Parks, Administrative Region 1); however, since the 1950s, native mountain goat numbers have experienced a dramatic decline. Thus, once occupied habitat is now devoid of goats, and current mountain goat range is significantly reduced from its historic expanse.

In the 1940s and 1950s, mountain goats were considered an abundant and not easily depleted resource in northwest Montana. Population estimates for mountain goats in the region described 350 mountain goats in the Swan Mountains, 20 in the North Fork of the Flathead, 315 in the Clark's Fork, 900 in Glacier Park, 100 near Coram, 450 from Spotted Bear to Schaffer Meadows, and 250 in Big Prairie (Montana Department of Fish and Game 1958). Native herds in the South Fork of the Flathead River and the Swan Mountains were used as source populations to establish new goat herds in mountain ranges throughout Montana and Colorado. From 1948 to 1953, 66 goats were transplanted from the South Fork of the Flathead River and 13 from Van Lookout in the Swan Range (Picton and Lonner 2008). In addition to capture removals, wildlife managers allowed for unlimited harvest of mountain goats. At the time, little was known about the ecology of mountain goats, and they were managed similarly to other ungulates, such as bighorn sheep (*Ovis canadensis*) and white-tailed deer. Local biologists believed that increased harvest pressure would increase the productivity of the herd (Montana Department of Fish and Game 1958), which we now know is untrue.

Compounded with the lack of understanding of goat biology, biologists thought the remoteness of mountain goat habitat would impede access, and therefore harvest would never significantly impact the population. However, by the 1960s, timber harvest and associated logging roads pioneered routes into the backcountry, opening the way for hunters. Mountain goats began to decline in numbers and entire herds disappeared. By 1960, biologists observed a dramatic decline in goat numbers in certain areas due to increased accessibility, and the first restrictions were placed on goat harvests in the West Thompson area. In 1964, harvest success began to drop throughout most of northwest Montana, and goats became scarce in the Whitefish Range. In 1965, permits were limited in Unit 14 due to large numbers of logging roads constructed into goat habitat from both sides of the Swan Range. Restrictions were also placed on the number of permits available in the lower South and Middle Forks of the Flathead River.

By 1972, all hunting districts in the region were being managed by a limited permit system. Unfortunately, it was too late for some goat herds. By 1976, goats had all but disappeared from the once productive area around Thompson Falls. Access to the area was excessive and biologists recommended road closures to protect goats; however, they still issued 2 permits in 1977. In 1978, hunting in this area was eliminated, citing excessive road access and subsequent hunting and suspected poaching that had resulted in dangerously low goat numbers. By 1978,

increasing access and declining goat populations were a serious concern throughout the region; Hunting District (HD) 121 and portions of 100 were closed to mountain goat hunting. In an attempt to restore goat numbers in parts of their historic range, 7 goats (4 adult females, 2 male kids and 1 yearling male) were reintroduced in June 1980 into Drift Creek, a tributary of Keeler Creek (south of Troy). These goats were transplanted from the Royal Basin area of Olympic National Park. While this area had once held viable numbers of goats in the 1950s, an extensive road system to accommodate logging resulted in increased susceptibility of goats to harvest and the extirpation of this population. Unfortunately, the reintroduction did not result in the reestablishment of goats in the area.

Within 30 years, native goat herds had gone from a seemingly unlimited resource, to depleted and declining. Concern for the species generated studies to better understand their biology and population dynamics. By the early 1980s, research on mountain goats revealed insights into their natural history that distinguishes them from other northern ungulates. Biologists found that female mountain goats exhibit late primiparity (4.5 to 5 years) and recruitment is extremely low (Adam and Baily 1982, Swenson 1985, Smith 1986, Festa-Bianchet et al. 1994, Côté and Festa-Bianchet 2001a). Productivity for adult females typically increases from 6 to 9 years of age, and senescence begins around 10 years (Côté and Festa-Bianchet 2001a;c). In addition, there is evidence that females produce more male young as they age (Côté and Festa-Bianchet 2001b). Unlike other ungulates, annual production varies dramatically, as well as kid survival (Festa-Bianchet et al. 1994). While yearling survival appears high, natural mortality of 2- and 3-year-old goats is higher than for other ungulate species, making population recruitment relatively low (Festa-Bianchet et al. 1994). Furthermore, female mountain goats exhibit high site fidelity, which limits dispersal into open habitat, making natural reestablishment of herds difficult (Festa-Bianchet and Côté 2008). These unique biological and social characteristics make them extremely susceptible to over-harvest.

As research began to provide a better understanding of mountain goat biology and goats' susceptibility to over-harvest, biologists began to further limit harvest of native herds. Current goat hunting districts were established in 1986 (Figure 1), and wildlife biologists have been reducing the number of licenses available ever since. Despite dramatically reduced harvest, mountain goat populations in Region 1 have not rebounded to historic levels, and most populations are described by the local management biologists as declining, with a few potentially stable populations.

METHODS

Harvest Management and Monitoring. — Mountain goat harvest is managed by licenses issued through a drawing for the following goat hunting districts in Region 1: 100, 101, 131, 132, 133, 134, 140, 141, 142, 150, and 151 (Figure 1). The number of licenses issued varies by hunting district. A license permits a hunter to harvest one either-sex mountain goat, and successful

hunters must present the complete head, with horns attached or the top portion of the skull with horns attached, to a department official within 10 days of the date of kill. Mountain goat ages are obtained by counting horn rings.

Population Monitoring. — Since the 1970s, goats have been counted exclusively using rotary wing aircraft; however, weather and funding have restricted the ability to conduct mountain goat surveys on an annual basis. Many hunting districts have not been afforded a survey for several years, and some areas have only partially been surveyed. In 2015 and 2016, mountain goats were surveyed in HDs 100, 101, and 141 using a Hughs 500 and a Bell Ranger helicopter. Surveys were flown in the early morning or late evening hours to coincide with peak activity and sightability of goats. For the morning surveys, we departed the airport at sunrise and surveyed no later than 10:00 a.m. to avoid the heat of the day and to coincide with peak goat activity. When we encountered potential goat habitat, we flew 2 to 4 passes to maximize goat detections. This was particularly important in cliff bands. Goats observed were classified as juveniles and adults only, as kids and yearlings are often misclassified from the air (Gonzalez-Voyer et al. 2001).

Winter Severity Monitoring. — Winter severity can impact recruitment in mountain goat populations (White et al. 2017); therefore, developing an index to estimate winter severity may be useful in helping track mountain goat population status. Winter severity index was calculated as maximum snow depth x number of days with consistent snow coverage data collected at Noisy Basin and Poorman Creek SNOTEL (SNOwpack TELemetry) stations. These stations were selected due to their proximity to goat habitat, as well as elevation best associated with goat habitat. Snow depth data (mm of accumulated snowfall) were available for the winters of 1997/1998 – 2015/2016 and 1998/1999 – 2015/2016 for Noisy Basin and Poorman Creek, respectively. Noisy Basin Station is located at 48.15ºN, -113.95ºW (Datum: WGS84) at an elevation of 1841.0 m. Poorman Creek Station is located at 48.13ºN, -115.62º W (Datum: WGS84) at an elevation of 1555 m.

RESULTS

Harvest Management and Monitoring. — In 2016, 23 either-sex goat licenses were issued in Region 1, and 16 goats (10 males and 6 females) were harvested (Table 1; Figure 2). This harvest was slightly down from 2015/2016, when 18 goats (16 males and 2 females) were harvested in the region. License numbers varied by hunting district, with the highest number of licenses (6) issued in HD 100 (Appendix A). The amount of harvest associated with each hunting district over time is related to the number of licenses issued (Figure 2). From 2007 through 2016, the majority of the harvest (51%) occurred during October; 35% and 14% occurred in September and November, respectively.

Estimated ages were recorded for 15 out of 16 mountain goats harvested in 2016. Adult females (≥4 years) comprised 38% of the harvest (Table 2). Since 2005, the percent of adult females in the harvest has ranged from 6% to 38%, with an average of 20 ± 9% (Figure 7).

Population Monitoring. — Survey data were compiled for all hunting districts in Region 1 (Figure 3; Appendix B). Age and sex data were consolidated into "adult" and "juvenile" classes; juvenile classes included yearlings and kids. Data quality, survey coverage, and conditions were unknown for most surveys prior to 2005. HDs 100 and 101 had the most complete survey dataset, with surveys conducted almost biannually. The most recent survey data were compiled in Table 3, and population ranges were estimated by survey quality and completeness by applying sightability correction factors ranging from 50% to 80% (Gonzalez-Voyer et al. 2001). Only 4 of the recent hunting district surveys were considered complete, and survey quality ranged from "unknown" to "good," with the majority of survey quality considered "poor" to "unknown" (7 out of 11 surveys). Within the past 2 years, HDs 100, 101, and 141 were surveyed and the results are described below.

Jessy Coltrane surveyed goats in HD 141 on 13, 15, 28, and 29 August 2016. Temperatures for morning flights ranged from 45°F to 55°F. Evening surveys were conducted from 18:35 to 20:42, at which time it became too dark to reliably observe goats. Survey conditions for all flights were optimal, winds were calm, and there was no snow cover. All drainages in HD 141 were flown for a complete coverage of the area. We observed a total of 50 goats (39 adults and 12 kids) in HD 141, and an additional 13 goats (8 adults and 5 kids) in HD 142 (Figure 4; Table B-8). A total of 6 nanny-kid groups were observed in HD 141. All goats were associated with cliff bands. All goats reacted to the presence of the helicopter, either by walking or running towards cliff bands (escape terrain). Nanny-kid groups responded most severely, running when approached by the helicopter. Due to lack of survey reports, it is difficult to determine the extent and quality of historic goat surveys. Similar numbers of goats were observed in HD 141 in 1980 (Table B-8), but no information on how that survey was conducted exists.

On 23 August 2016, Tonya Chilton-Radandt surveyed goats in HD 101, the west Cabinet Mountains. Survey conditions were good; air temperature at the airport was 50°F, winds were calm, and skies were mostly sunny. There was patchy snow cover at 7400 ft and higher. Unfortunately, due to inclement weather and pilot availability, the southern section of the hunting district was not surveyed. A total of 25 goats (8 nannies, 6 kids) were observed among 12 groups (Figure 5; Table B-2).

Between 17 and 18 August 2015, Tonya Chilton-Radandt surveyed goats in HD 100. She completed a total of 4 survey flights (2 morning and 2 evening flights). Local fires created smoke and additional air traffic that hindered both effort and visibility. Smoke greatly impeded visibility during the evening flight on the 17th and the morning flight on the 18th. In addition, the area from Berray Mountain to Dad Peak were not surveyed due to smoke conditions and fire-

related air traffic. The north slopes were green and lush, whereas the south-facing slope vegetation appeared to be turning brown already, even at lower elevations. Tonya observed 40 total goats, including 12 billies, 13 nannies, 10 kids, and 5 unclassified goats, among 18 groups (Figure 6; Table B-1). The nannies, especially those with kids, were feeding in brushy areas, whereas most of the billies were feeding in open areas at higher elevations.

Winter Severity Index. — Average annual maximum snow depth was similar between SNOTEL stations, with 323.5 ± 52.1 cm and 270.0 ± 70.6 cm for Noisy Basin and Poorman Creek, respectively (Figure 8). However, the number of consistent days with measurable snow was greater at Poorman Creek (216 ± 20 days) compared to Noisy Basin (81 ± 18 days) for the recording period. The resulting severity indices revealed a stable to slightly increasing winter severity at Noisy Basin since 1997, whereas winter severity at Poorman Creek appears to have declined slightly since 1998.

DISCUSSION

The management history of mountain goats in northwest Montana is one based on misunderstanding. High harvest rates and translocation removals in the 1940s through the 1970s resulted in dramatic declines and extirpations of native goat populations. None of these populations have recovered to pre-1940 status, and some continue to decline. It is estimated that statewide native goat numbers are 3 to 4 times fewer than in the 1940s (Smith and DeCesare 2017). Currently, wildlife biologists in the region are faced with uncertainty concerning the future of native herds and a need for additional data to better ensure their persistence.

Population Monitoring and Trends. — Enumerating mountain goats has proven difficult. Surveys have been conducted infrequently and are of varying quality. Funding and helicopter availability are some of the biggest constraints, in addition to weather; however, estimating population size based on the number of goats observed in a survey is also problematic. In general, mountain goats are a readily observable species, and helicopter surveys are effective in detecting trends in population size and number of adult mountain goats (Gonzalez-Voyer et al. 2001). Sightability is typically high 55% to 83% (Cichowski et al. 1994, Gonzalez-Voyer et al. 2001), but varies among habitat types, geographical regions, time of day, and sex. Gonzalez-Voyer et al. (2001) cautions that individual surveys are primarily useful for trend analysis and should be conducted annually. Multiple surveys during a single season produce more reliable population estimates; however, this is unrealistic in most areas due to time and funding. Sightability correction factors can help estimate populations from raw count data, but these do not exist for habitat in Region 1.

Age and sex data collected during surveys has varied dramatically among years and wildlife biologists. Some biologists attempted to classify adults into males and females, as well as separate juveniles into kid and yearling classes. While occasionally it is possible to distinguish

adult males and females from the air, determination of sex is typically not consistent. Furthermore, it is assumed that adult males are less detectable, because they are often found alone or in groups of 2 to 4. This further confounds error in sex ratio data. Distinguishing kids from yearlings from the air has proved unreliable, as well (Gonzalez-Voyer et al. 2001). While kids and yearlings can be distinguished from ground surveys by examining body size, horn-to-ear ratio, and facial appearance, observers in helicopters rely primarily on differences in body size. Horn size is not readily determined from the air, and yearlings will flee with their mothers when a helicopter approaches and are thus often misclassified as kids. Misidentification of kids and yearlings renders comparisons of kid:adult ratio from one year to yearling:adult ratio the following year of little value; therefore, it is recommended to place yearlings and kids into a single juvenile class (Gonzalez-Voyer et al. 2001) and examine juvenile:adult survival instead. For these reasons, the available survey data was reclassified as adult and juveniles only. Sub-adults were placed in the adult category, because the assumption was that these were most likely smaller adults, possibly 2- and 3-year-olds.

Comparisons of historic survey data to data collected post-1980 indicate a dramatic decline in goat numbers throughout northwest Montana; however, evaluation of goat status in more modern times has proven difficult. Due to the sporadic nature of the quality and timing of goat surveys after 1980, it was not possible to complete any statistically valid trend analysis for most hunting districts. The most complete survey datasets were for HDs 100 and 101, where surveys were typically conducted biannually since 1979. Smith and DeCesare (2017) estimated population growth rates (λ) from survey data for HDs 100 and 101 for 2000 – 2015 using exponential growth state-space models. These models account for process variance in annual growth rates, as well as observation error that can create additional sampling variation associated with annual count data (Humbert et al. 2009). Unlike simple regression models, exponential growth state-space models have been shown to perform well with a minimum of 5 data points spanning a ten-year survey period (Humbert et al. 2009, Flesch et al. 2016). Point estimates of λ and 95% confidence intervals for HDs 100 and 101 were 0.98 (0.84 – 1.14) and 0.95 (0.91 – 0.99), respectively (Smith and DeCesare 2017). For HD 101, West Cabinet Mountains, the estimated λ (0.95) indicates a decline in overall population since 2000, whereas the results are less clear for HD 100. While $\lambda < 1$ suggests a declining population for HD 100, the 95% confidence intervals overlapped with 1. Smith and DeCesare (2017) concluded that the wide confidence intervals and the overlap with a λ of 1 casts uncertainty about trends in survey data for HD 100 when using survey data alone. They also found that small populations that are surveyed infrequently pose additional challenges in statistical rigor.

While statistically valid trend analyses were not possible for the remaining hunting districts in Region 1, none of the data indicated growing population trends. At best, it appears that a few hunting districts in the region may have obtained stable numbers of goats since allowable harvest

was severely restricted beginning in the mid-1980s. Goat numbers in additional hunting districts continue to decline.

Harvest Trends. — Prior to 1960, harvest reporting was not consistent, and therefore harvest data are difficult to interpret. Regardless, regional harvest of mountain goats has declined dramatically since the reported high harvest of 295 goats in 1958 to 16 goats in 2016. Prior 1972, there were few restrictions placed on harvesting goats, and hunter numbers often exceeded 600 hunters annually. In 1963, hunter numbers reached a high of 817 and then steadily declined to 297 hunters in 1970. Presumably, this decline in hunter participation was in part a response to declining goat availability, as success rates dropped from an average of 32% (1960-1963) to 26% (1964-1970), as well. Since 1972, hunter success rate has been a function of available licenses. Since 1984 when permits were reduced to 78, success rate has consistently exceeded 50% (50% to 96%). With few licenses currently available, success rate is not reliable metric to evaluate goat population status, beyond ascertaining that some goats remain.

Biologists often use hunter effort data (harvest per hunter days) to help evaluate trends in game populations; however, these data are difficult to interpret. A "day" of hunting is often subjective and can vary greatly in meaning from one person to the next. In addition, travel days often are included in the tally of "days hunted." The validity of such data is often questioned, as modeling these data may not provide statistically defensible patterns when evaluated alone or incorporated into an integrated population model (Skalski et al. 2007); therefore, I do not recommend using hunter effort data by itself to assess population trends.

Adult survival, particularly survival of older-aged females, and not annual recruitment, appears to drive population changes in mountain goats (Côté and Festa-Bianchet 2001a, Hamel et al. 2006); therefore, harvesting adult females can have a profound impact on mountain goat populations, and biologists managing native goat populations typically encourage hunters to select males. Some state wildlife management agencies even weight the harvest of females when calculating harvest quotas (Coltrane 2012). Historically, hunters harvested male and female mountain goats relatively indiscriminately. For example, from 1972 – 1980, females comprised 43 ± 7% of the total annual harvest. The relatively high number of females in the harvest might be attributed to the lack of understanding of goat biology on part of the managers and resulting lack of education imparted to hunters. After 1980, biological understanding of mountain goats improved, as did educational efforts to curtail female harvest; however, 10-year averages of percent females in harvest did not drop significantly until 2011 – 2016 (23 ± 11%), but the percentage of adult females (≥4 years old) in the harvest has remained high (38% in 2016). The continued harvest of adult females may reflect low overall population numbers and availability of males. Female mountain goats are typically found in larger nanny-kid groups, whereas adult males are often solitary or in smaller groups (Festa-Bianchet and Côté 2008). As populations decline, nanny groups are more easily located due to the relatively larger group size and, therefore, may be more susceptible to harvest than males.

Sustainable Harvest Rates. — Mountain goats are highly susceptible to over-harvest (Smith 1986, Festa-Bianchet et al. 1994, Côté et al. 2001), as hunting appears almost completely additive to natural mortality in native populations (Adam and Baily 1982, Swenson 1985, Smith 1986, Côté and Festa-Bianchet 2001a). While hunting can be sustainable when managed conservatively, over-harvest has been associated with declines of mountain goat populations across their range (Gonzalez-Voyer et al. 2003, Hamel et al. 2006, Festa-Bianchet and Côté 2008, Rice and Gay 2010). For example, Washington state has cited overharvest as the reason for declines in native goat herds and has prohibited hunting of populations with less than 100 individuals (Rice and Gay 2010). Declines of goat populations in Alberta in the 1970s and 1980s have been attributed to the high harvest of adult females and the total harvest rate (Hamel et al. 2006). Native herds in northwest Montana were extirpated by hunting and suspected poaching in the 1960s and 1970s, as well.

While most biologists recognize the need for conservative management of native mountain goat populations (Smith and DeCesare 2017), determining sustainable harvest rates is challenging. Variability in vital rates and population size influence sustainable rates of harvest (Rice and Gay 2010); however, these data seldom exist for individual populations. In Alberta, Hamel et al. (2006) found that native mountain goat populations (> 100 individuals) could tolerate harvest rates of about 1%, and harvest rates greater than 3% were considered not sustainable (Gonzalez-Voyer et al. 2003, Festa-Bianchet and Côté 2008). Rice and Gay (2010) determined that a rate of 4% was sustainable for populations ≥ 100, but indicated that this rate may also cause periodic declines. Regardless of sustainability, native goat populations are typically harvested at a rate of 4% to 6% (Herbert and Turnbull 1977, Kuck 1977, Smith 1988, Coltrane 2012), often with no understanding of the impacts on population status. In addition to harvest rate, size of native populations should also be considered carefully when managing mountain goats. Hamel et al. (2006) found that a population of 25 individuals or less would always have a negative growth rate, even in the absence of hunting, and would face extinction in 40 years. For a population of 50 individuals, a harvest of 1 goat every 20 years would be sustainable, whereas a population of 75 individuals could sustain a harvest of 1 goat every 2 years (Hamel et al. 2006).

Determining sustainable rates of harvest for mountain goat populations in Region 1 is wrought with difficulty due to lack of pertinent data, including current or complete survey data for many hunting districts and vital rate data for specific populations. Furthermore, defining what constitutes a population is challenging. Topographic or anthropogenic barriers may not necessarily delineate population boundaries if isolation further impedes dispersal among remnant herds. It is reasonable to assume that HDs 100 and 101 are relatively distinct populations of mountain goats and that the goats inhabiting the Mission Mountains (HD 131) are another population due to highway and vegetative boundaries encompassing the range; however, assigning goat herds occupying the remaining hunting districts to a single population is questionable. Currently, we manage goats based on administrative hunting district boundaries as

if these were distinct populations, in the absence of more comprehensive and informative data; therefore, we consider the impacts of harvest at hunting district levels. The number of licenses available in each district is considered the "allowable harvest." Based on the mid-point of estimated number of goats and the allowable harvest for each hunting district in 2016, harvest rates for all but one district (HD 142) could range from 3% to 12%. Furthermore, no hunting district was estimated to have goat numbers reaching 100, except for possibly HD 100. If we consider hunting districts within the Bob Marshall Complex (HDs 132, 133, 140, 141, 142, 150, and 151) as a single population, the estimated population would be 359 mountain goats. Current allowable harvest would be approximately 4%. Based on these limited data, it is probable that the current allowable harvest for mountain goats is not sustainable.

Winter Severity. — Winter severity can impact mountain goat survival and population recruitment. Nutritional constraints due to low food availability and poor quality equate to reduced energy intake during a period when thermoregulatory and locomotion costs are high (Fox 1983, Dailey and Hobbs 1989, Fox 1989). These energetic and nutritional costs have resulted in high winter mortality rates (White et al. 2011) that are most often associated with malnutrition (White 2012). Years with above average snowfall and cumulative snow depth have resulted in population declines (White 2012).

The winter severity analysis at the SNOTEL sites does not indicate dramatic increases in winter severity that would result in higher energetic costs for mountain goats; therefore, it is unlikely that winter conditions since the mid-1990s have suppressed population growth or recovery. Regardless, winter snow depth can vary across goat ranges, and therefore definitive conclusions pertaining to specific herds cannot be drawn from these data.

Nonhunting Anthropogenic Impacts. — In addition to hunting-related mortality, human activity and resource extraction in goat habitat can impact mountain goat populations by altering habitat use and/or behavior (Chadwick 1974, Foster and Rahs 1983, Côté et al. 2013, St-Louis et al. 2013, Richard and Côté 2016, White and Gregovich 2017). For example, mining activities have been shown to alter winter range use in Alaska (White and Gregovich 2017). In British Columbia, mountain goats elicited severe behavioral responses to hydroelectric exploration activities, including temporary range abandonment, habitat use, and activity patterns (Foster and Rahs 1983). Aircraft over-flights, in particular, can alter goat behavior and incite negative physiological responses, which may ultimately lead to reduced survivorship (MacArthur et al. 1979, MacArthur et al. 1982, Foster and Rahs 1983, Bleich et al. 1994, Côté 1996, Frid and Dill 2002, Service 2003). Furthermore, there is evidence that goats do not habituate to helicopter and other motorized disturbance (Côté et al. 2013, St-Louis et al. 2013); over time, these impacts can perpetuate and become cummulative.

Logging has played a role in altering the landscape of northwest Montana since the 1800s. Logging activities and associated road construction in the 1960s and 1970s not only displaced

mountain goats, but opened the high country to human access, resulting in increased harvest and poaching (Chadwick 1974). Chadwick (1974) documented altered use patterns and dramatic declines of mountain goats in the Bunker Creek Drainage in the early 1970s when logging roads were forged into the area. Previously occupied goat habitat was abandoned, and increased hunting access and poaching cumulatively reduced goat numbers in the drainage. Future road building and timber sales should be carefully evaluated in the context of potential impacts on remaining goat herds.

Recreational activities can also have negative effects on mountain goats, especially during winter and early summer, critical periods when disturbance can result in cumulative negative impacts on survival. In winter, mountain goats are physiologically stressed due to high energetic costs of thermoregulation coupled with low quality and limited nutritional resources. Winter motorized activity, such as helicopter-assisted skiing and snowmobiling, can cause stress responses in goats and displace goats from wintering areas (Hurley 2004). During kidding and post-kidding periods, adult female mountain goats have heightened sensitivity to disturbances (Penner 1988). Compared to other ungulates, mountain goats have a low recruitment rate (Bailey 1991, Festa-Bianchet et al. 1994), and reproductive success and survivorship of goat populations are closely tied to the health of mountain goat nursery groups. Since females are highly sensitive to disturbance, the Northern Wild Sheep and Goat Council recommends that helicopter activities be prohibited in areas inhabited by nursery groups during spring and early summer (Hurley 2004).

The demand for motorized recreational activities is increasing in and around mountain goat habitat on National Forest Lands (USDA Forest Service 2016). The Forest Service has created alternatives that do not allow for a net increase in winter motorized travel in mountain goat habitat; however, over-snow motorized travel is allowed in some historic mountain goat habitat, which may continue displacement and/or impede recolonization in these areas. We recommend that the Forest Service work closely with FWP to address additional requests for both summer and winter motorized use in areas that may impact mountain goats.

MANAGEMENT RECOMMENDATIONS

The biggest management challenge facing mountain goats in Region 1 is the lack of data. Comprehensive and current survey data are needed for most hunting districts, as well as vital rate data for native populations. Determining viable populations of goats within the region is paramount to assessing sustainable harvest rates. In lieu of these data, goats should be managed conservatively, including reducing harvest quotas and potentially eliminating licenses in some hunting districts. Based on the available data, we have reduced harvest quotas to one either-sex mountain goat in all hunting districts, except HD 100 (reduced to 2) for the 2017 hunting season.

During summer 2017, aerial surveys will be prioritized for hunting districts lacking current or complete survey information.

Reintroduction of mountain goats in Region 1 to help restore native populations should be considered only after additional data are collected. The following research is needed before such actions are taken:

1. Estimation of vital rate of target population.
2. Evaluation of available mountain goat habitat.
3. Evaluation of connectivity among herds.
4. Disease screening of target population and transplant population.

LITERATURE CITED

Adam, L. G., and Baily. 1982. Population dynamics of mountain goats in Sawatch Range, Colorado. The Journal of Wildlife Management 46:1003-1009.

Bailey, J. A. 1991. Reproductive success in female mountain goats. Canadian Journal of Zoology 69:2956-2961.

Bleich, V. C., R. T. Bowyer, A. M. Pauli, M. C. Nicholson, and R. W. Anthes. 1994. Mountain sheep (*Ovis canadensis*) and helicopter surveys: ramifications for the conservation of large mammals. Biological Conservation 70:1-7.

Chadwick, D. H. 1974. Mountain goat ecology: logging relationships in the Bunker Creek drainage of western Montana. Masters Thesis. University of Montana, Missoula.

Cichowski, D. B., D. Haas, and G. Schultze. 1994. A method used for estimating mountain goat numbers in the Babine Mountains Recreation Area, British Columbia. Proceeding of the Biennial Symposium of the Northern Wild Sheep and Goat Council 6:56-64.

Coltrane, J. 2012. Subunit 14C mountain goat management report. Pp. 153-168, P. Harper, editor. Species Management Report ADF&G/DWC/SMR 2012-3. Alaska Department of Fish and Game, Juneau.

Côté, S. D. 1996. Mountain goat responses to helicopter disturbance. Wildlife Society Bulletin 24:681-685.

Côté, S. D., and M. Festa-Bianchet. 2001a. Birthdate, mass and survival in mountain goat kids: effects of maternal characteristics and forage quality. Oecologia 127:230-238.

_____. 2001b. Offspring sex ratio in relation to maternal age and social rank in mountain goats (*Oreamnos americanus*). Behavioral Ecology and Sociobiology 49:260-265.

_____. 2001c. Reproductive success in female mountain goats: the influence of maternal age and social rank. Animal Behaviour 62:173-181.

Côté, S. D., M. Festa-Bianchet, and K. G. Smith. 2001. Compensatory reproduction in harvested mountain goat populations: a word of caution. Wildlife Society Bulletin 29:726-730.

Côté, S. D., S. Hamel, A. St-Louis, and J. Mainguy. 2013. Do mountain goats habituate to helicopter disturbance? The Journal of Wildlife Management 77:1244-1248.

Dailey, T. V., and N. T. Hobbs. 1989. Travel in alpine terrain: energy expenditures for locomotion by mountain goats and bighorn sheep. Canadian Journal of Zoology 67:2368-2375.

Festa-Bianchet, M., and S. D. Côté. 2008. Mountain Goats: Ecology, Behavior and Conservation of an Alpine Ungulate. Island Press, Washington, D.C.

Festa-Bianchet, M., M. Urquhart, and K. G. Smith. 1994. Mountain goat recruitment: kid production and survival to breeding age. Canadian Journal of Zoology 72:22-27.

Flesch, E. P., R. A. Garrott, P. J. White, D. Brimeyer, A. B. Courtemanch, J. A. Cunningham, S. R. Dewey, G. L. Fralick, K. Loveless, D. E. McWhirter, H. Miyasaki, A. Pils, M. A. Sawaya, and S. T. Stewart. 2016. Range expansion and population growth of nonnative mountain goats in the Greater Yellowstone Area: challenges for management. Wildlife Society Bulletin 40:241-250.

Foster, B. R., and E. Y. Rahs. 1983. Mountain goat response to hydroelectric exploration in British Columbia. Environmental Management 7:189-197.

Fox, J. L. 1983. Constraints on winter habitat selection by the moutain goat (*Oreamnos americanus*) in Alaska. PhD Dissertation. University of Washington, Seattle, WA.

_____. 1989. Relation between mountain goats and their habitat in southeastern Alaska. Technical Report. Pacific Northwest Research Station.

Frid, A., and L. M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology 6:11.

Gonzalez-Voyer, A., M. Festa-Bianchet, and K. G. Smith. 2001. Efficiency of aerial surveys of mountain goats. Wildlife Society Bulletin 29:140-144.

Gonzalez-Voyer, A., K. G. Smith, and M. Festa-Bianchet. 2003. Dynamics of hunted and unhunted mountain goat, *Oreamnos americanus*, populations. Wildlife Biology 9:213-218.

Hamel, S., S. D. Côté, K. G. Smith, and M. Festa-Bianchet. 2006. Population dynamics and harvest potential of mountain goat herds in Alberta. The Journal of Wildlife Management 70:1044-1053.

Herbert, D. M., and W. G. Turnbull. A description of southern interior and coastal mountain goat ecotypes in British Columbia. 1977.

Humbert, J.-Y., S. Mills, J. S. Horne, and B. Dennis. 2009. A better way to estimate population trends. Oikos 118:1940-1946.

Hurley, K. 2004. Northern Wild Sheep and Goat Council position statement on helicopter-supported recreation and mountain goats, July 2004.

Kuck, L. 1977. The impact of hunting on Idaho's Pahsimeroi mountain goat herd. Proceedings of the First International Mountain Goat Symposium, Kalispell, Montana. 114-125.

MacArthur, R. A., V. Geist, and R. H. Johnston. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journal of Wildlife Management 46:351-358.

MacArthur, R. A., R. H. Johnston, and V. Geist. 1979. Factors influencing heart rate in free-ranging bighorn sheep: a physiological approach to the study of wildlife harassment. Canadian Journal of Zoology 57:2010-2021.

Montana Department of Fish and Game. 1958. District Big Game Surveys and Investigations.

Penner, D. F. 1988. Behavioral response and habituation of mountain goats in relation to petroleum exploration at Pinto Creek, Alberta. Proceeding of the Biennial Symposium of the Northern Wild Sheep and Goat Council 6:141-158.

Picton, H. D., and T. N. Lonner. 2008. Montana's Wildlife Legacy: Decimation to Restoration. Media Works Publishing, Bozeman, Montana.

Rice, C. G., and D. Gay. 2010. Effects of mountain goat harvest on historic and contemporary populations. Northwestern Naturalist 91:40-57.

Richard, J. H., and S. D. Côté. 2016. Space use analyses suggest avoidance of a ski area by mountain goats. The Journal of Wildlife Management 80:387-395.

Skalski, J. R., R. L. Townsend, and B. A. Gilbert. 2007. Calibrating statistical population reconstruction models using catch-effort and index data. Journal of Wildlife Management 71:1309-1316.

Smith, B. L., and N. J. DeCesare. 2017. Status of Montana's mountain goats: A synthesis of management data (1960-2015) and field biologists' perspectives. Montana Fish, Wildlife & Parks.

Smith, C. A. 1986. Rates and causes of mortality in mountain goats in Southeast Alaska. The Journal of Wildlife Management 50:743-746.

Smith, K. G. 1988. Factors affecting the population dynamics of mountain goats in west-central Alberta. Proceeding of the Biennial Symposium of the Northern Wild Sheep and Goat Council 6:308-329.

St-Louis, A., S. Hamel, J. Mainguy, and S. D. Côté. 2013. Factors influencing the reaction of mountain goats towards all-terrain vehicles. The Journal of Wildlife Management 77:599-605.

Swenson, J. E. 1985. Compensatory reproduction in an introduced mountain goat population in the Absaroka Mountains, Montana. The Journal of Wildlife Management 49:837-843.

USDA Forest Service. 2003. Evaluating mountain goat response to helicopter overflights in Alaska. USFS Region 10 Administrative Study.

_____. 2016. Draft Environmental Impact Statement, Volume 1: Revised Forest Plan Flathead National Forest.

White, K. S. 2012. Mountain goat population ecology and habitat use along the Juneau Access road corridor, Alaska. Wildlife Research Final Report, Alaska Department of Fish and Game, Division of Wildlife Conservation. Juneau, Alaska.

White, K. S., and D. P. Gregovich. 2017. Mountain goat resource selection in relation to mining-related disturbance. Wildlife Biology.

White, K. S., G. W. Pendleton, D. Crowley, H. Griese, K. J. Hundertmark, T. McDonough, L. Nichols, M. Robus, C. A. Smith, and J. W. Schoen. 2011. Mountain goat survival in coastal Alaska: effects of age, sex, and climate. The Journal of Wildlife Management 75:1731-1744.

Table 1. Region One mountain goat harvest, 1972-2015.

Year	Number of Permits	Number of Hunters	Total Harvest*	Percent Success	Male	Female	Hunter Days	Days per Harvest
1972	150	114	34	30	17	17		
1973	170	153	58	38	31	26		
1974	150	138	65	47	35	29		
1975	130	114	51	45	27	23		
1976	128	112	62	55	38	23	272	4.4
1977	117	99	46	46	29	13	495	10.8
1978	119	104	51	49	23	24	416	8.2
1979	115	105	45	43	23	20	520	11.6
1980	105	88	49	56	26	23	440	9.0
1981	105	99	50	51	24	16	594	11.9
1982	82	74	34	46	26	7	420	12.4
1983	78	56	26	46	12	13	280	10.8
1984	78	66	39	59	17	22	330	8.5
1985	78	61	30	49	17	11	305	10.2
1986	75	69	40	58	27	12	345	8.6
1987	65	58	40	69	34	7	354	8.9
1988	63	60	39	65	26	13	348	8.9
1989	63	52	34	65	23	10	260	7.6
1990	59	54	33	61	18	15	300	9.1
1991	54	50	34	68	20	13	263	7.7
1992	51	48	39	81	16	23	220	5.6
1993	50	50	30	60	21	9	296	9.9
1994	52	50	30	60	17	13	306	10.2
1995	48	46	33	72	23	9	381	11.5
1996	48	45	26	58	16	10	342	13.2
1997	44	42	27	64	17	10	322	11.9
1998	44	41	33	80	20	12	226	6.8
1999	44	42	29	69	15	14	409	14.1
2000	44	41	21	51	10	10	348	16.6
2001	44	40	26	65	14	12	237	9.1
2002	44	42	26	62	13	11	336	12.9
2003	44	39	32	82	27	5	199	6.2
2004	44	42	32	76	22	10	331	10.7
2005	44	41	33	80	19	13	303	9.2
2006	37	30	23	230	16	6		
2007	34	31	26	84	14	9	160	6.2

2008	34	31	23	74	18	5	214	9.3
2009	34	32	28	88	16	10	158	5.6
2010	25	23	22	96	14	8	107	4.9
2011	23	22	13	59	10	2	179	13.8
2012	23	22	17	77	11	6	129	7.6
2013	22	20	15	75	13	2	140	9.3
2014	23	19	13	68	10	3	145	11.2
2015	23	22	18	n/a	16	2	n/a	n/a
2016	23	n/a	16	n/a	10	6	n/a	n/a

* Total Harvest includes goats of unknown sex.

Table 2. Age structure of harvested male (M) and female (F) mountain goats from 2005-2016 in FWP Region 1, northwest Montana. Total does not include goats whose ages were not identified.

	1.5		2.5		3.5		4.5		5.5		6.5		7.5		8.5		9.5		10.5+		
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Total
2005	2	0	1	2	3	0	2	1	1	2	3	0	0	1	1	1	0	0	2	1	23
2006	0	0	1	1	4	0	1	0	4	2	3	0	0	0	0	0	0	0	5	1	22
2007	1	1	3	0	2	2	1	2	2	1	1	0	1	0	1	0	0	0	2	1	21
2008	1	0	2	0	2	1	3	1	4	1	1	0	0	0	1	1	0	0	1	0	19
2009	1	0	2	1	3	1	3	0	2	0	2	0	1	0	1	2	0	1	1	1	22
2010	0	0	0	0	0	3	2	2	2	0	4	2	1	0	3	0	0	0	1	0	20
2011	0	0	1	0	3	0	0	0	2	1	0	0	0	1	2	0	0	0	1	0	11
2012	0	0	1	0	0	1	2	1	1	1	2	1	0	0	1	0	0	0	3	2	16
2013	0	0	1	0	1	0	3	0	3	0	2	1	2	0	0	0	2	0	1	0	16
2014	0	0	0	0	0	0	0	2	3	0	3	0	3	1	1	0	0	1	0	0	14
2015	0	0	1	0	1	0	3	0	1	0	2	0	1	1	2	0	1	0	3	0	16
2016	0	0	0	0	0	0	0	3	2	3	1	0	0	0	1	0	2	0	3	0	15

Table 3. Most recent survey data, estimated population size, survey quality and coverage, and of mountain goats in hunting districts in Region 1, northwest Montana.

HD	Last Surveyed	Complete Survey	Survey Quality	Minimum Count	Estimated Population	Estimated Status Since 2000
100	2015	No	Poor	40	80-95	declining
101	2016	No	Good	25	45-60	declining
131	2011	Yes	Fair to Poor	12	16-18	declining
132	2005	No	Fair	24	31-36	unk
133	2004	unknown	unknown	48	36-42	declining
134	2010	unknown	unknown	10	13-15	declining
140	2013	Yes	Good	50	60 -70	stable
141	2016	Yes	Good	50	58-65	unk
142	2012	Yes	unknown	56	67-73	stable
150	2008	No	unknown	44	57 -66	stable
151	2008	No	unknown	16	unknown	unk

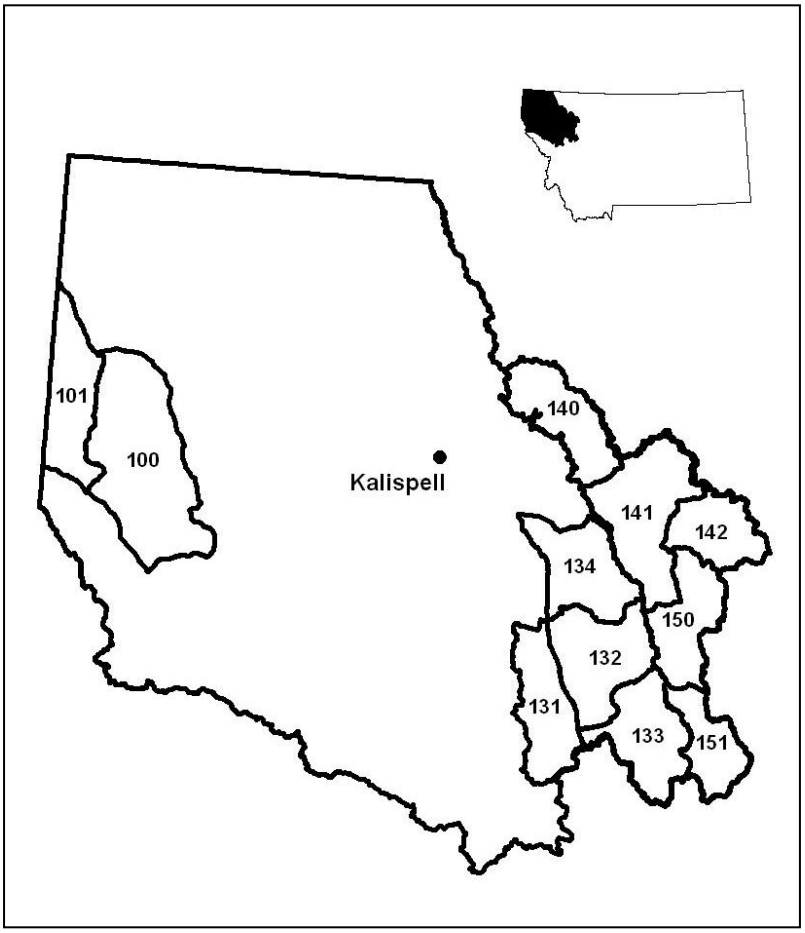


Figure 1. Montana Fish, Wildlife & Parks' mountain goat hunting districts in FWP's Region 1, northwest Montana.

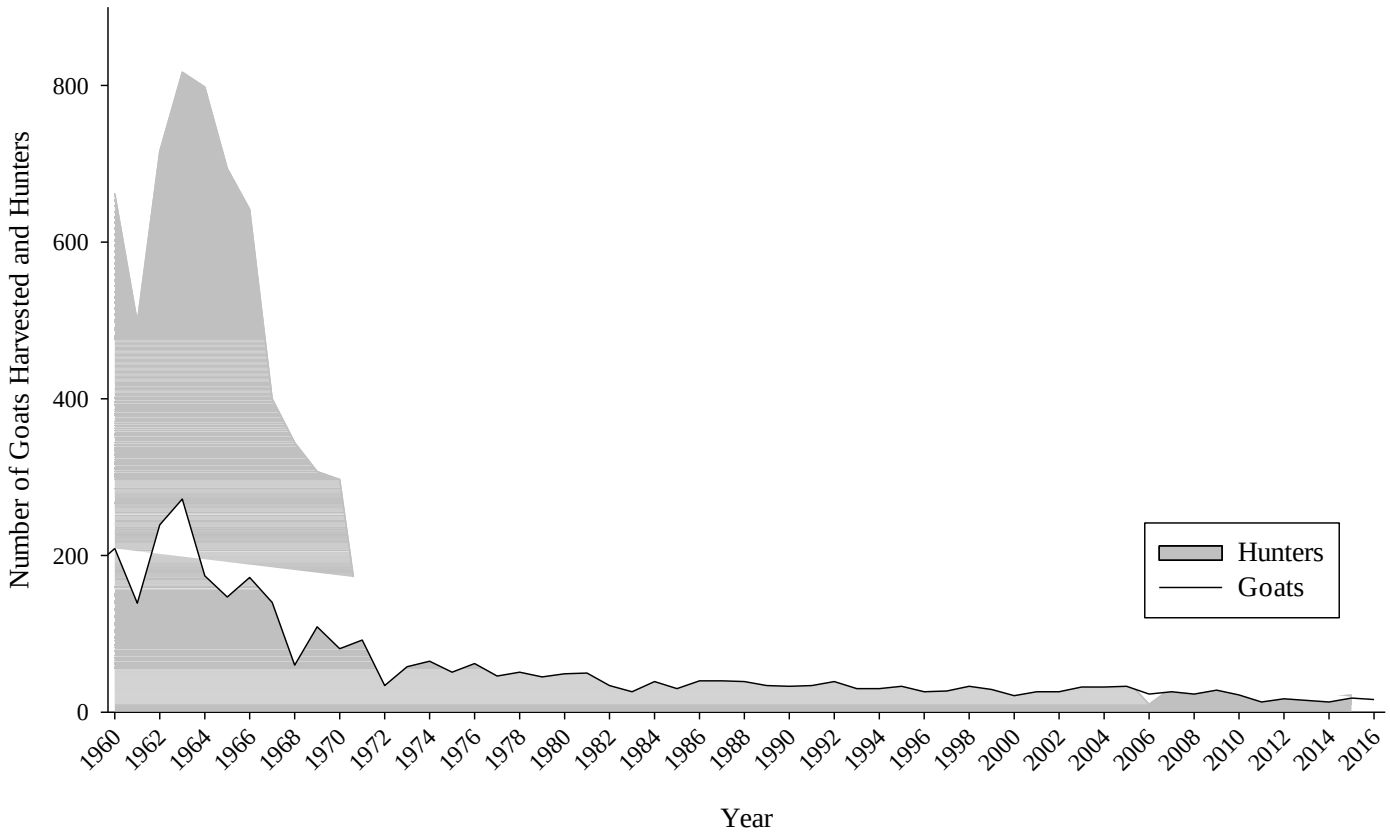
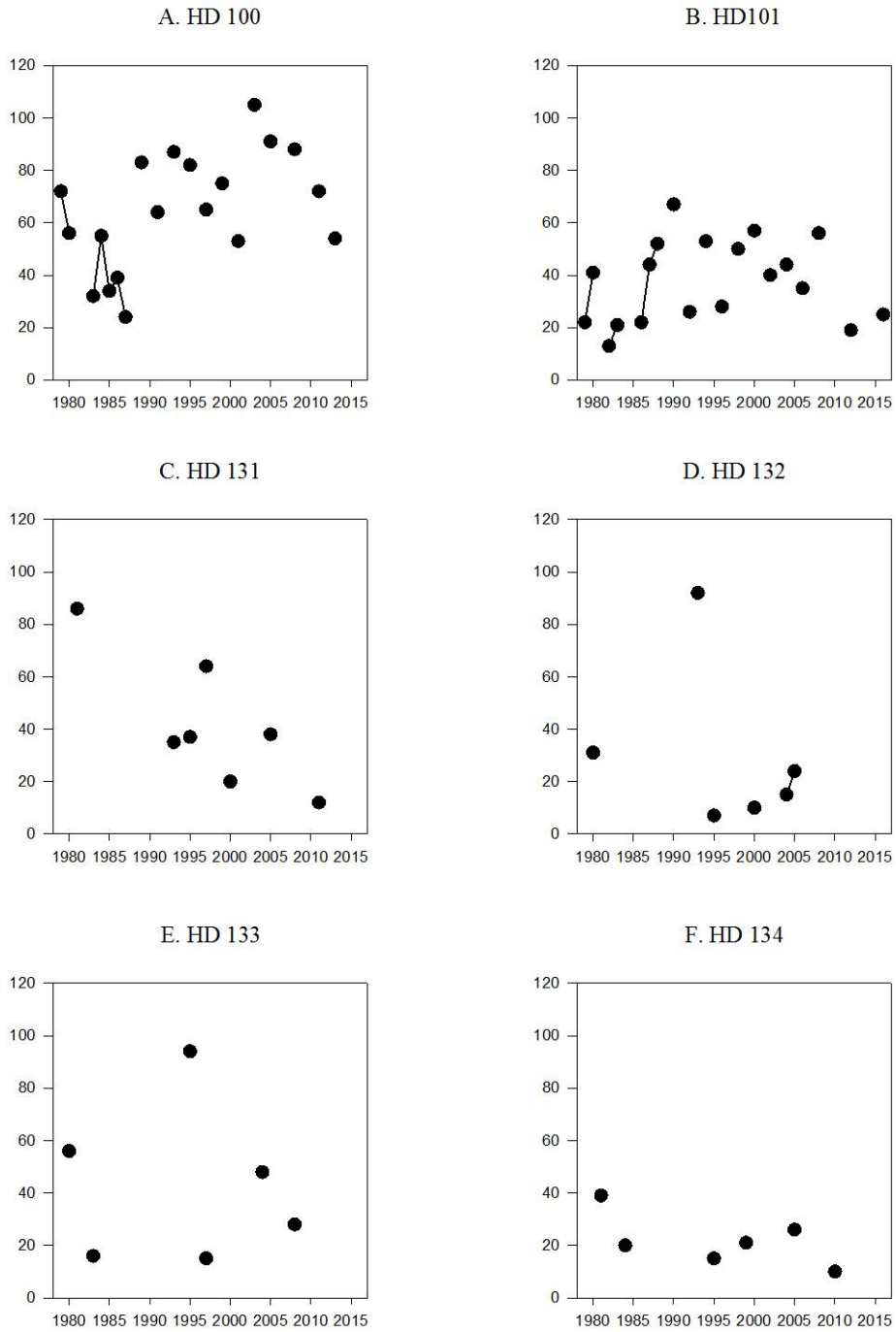


Figure 2. Mountain goats harvested and hunter numbers for FWP Region 1, northwest Montana (1960-2016)


A. HD 100
B. HD101
C. HD 131
D. HD 132
E. HD 133
F. HD 134
0
20
40
60
80
100
120
1980 1985 1990 1995 2000 2005 2010 2015

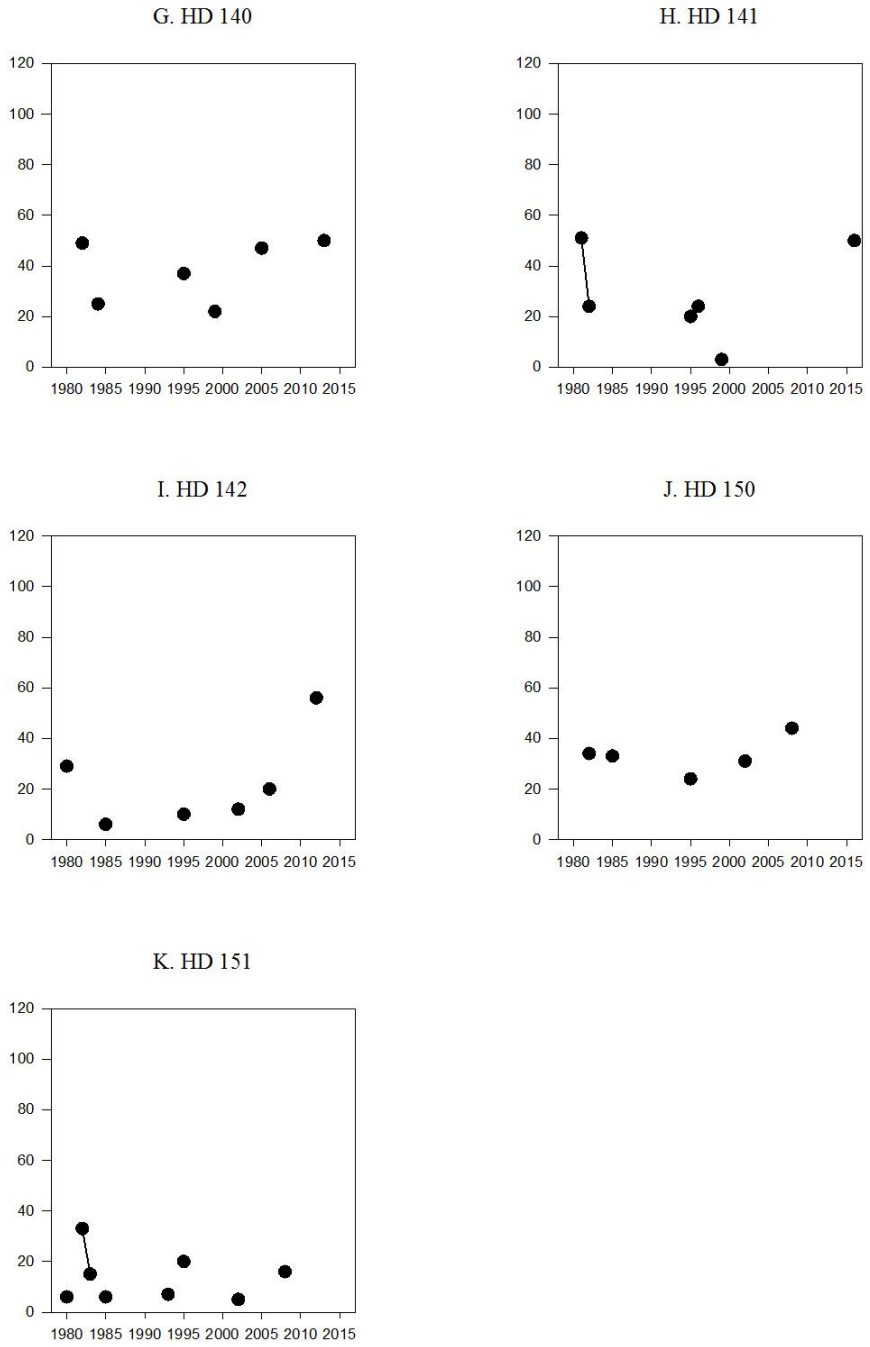


Figure 3. Minimum count of mountain goats observed during aerial surveys in hunting districts in Region 1, northwest Montana (1979-2016).

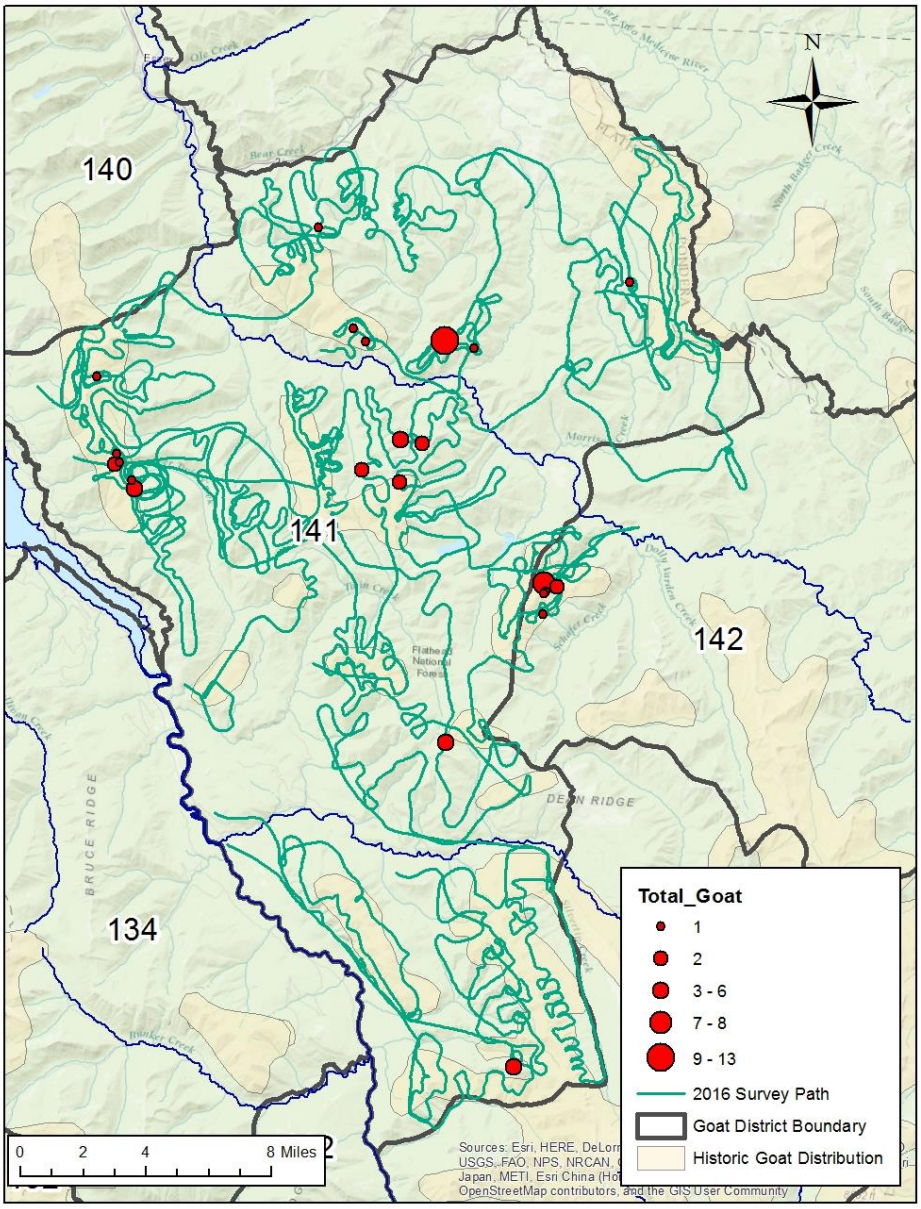


Figure 4. Aerial goat survey flight path and goat observations in Hunting District 141 in northwest Montana, August 2016.

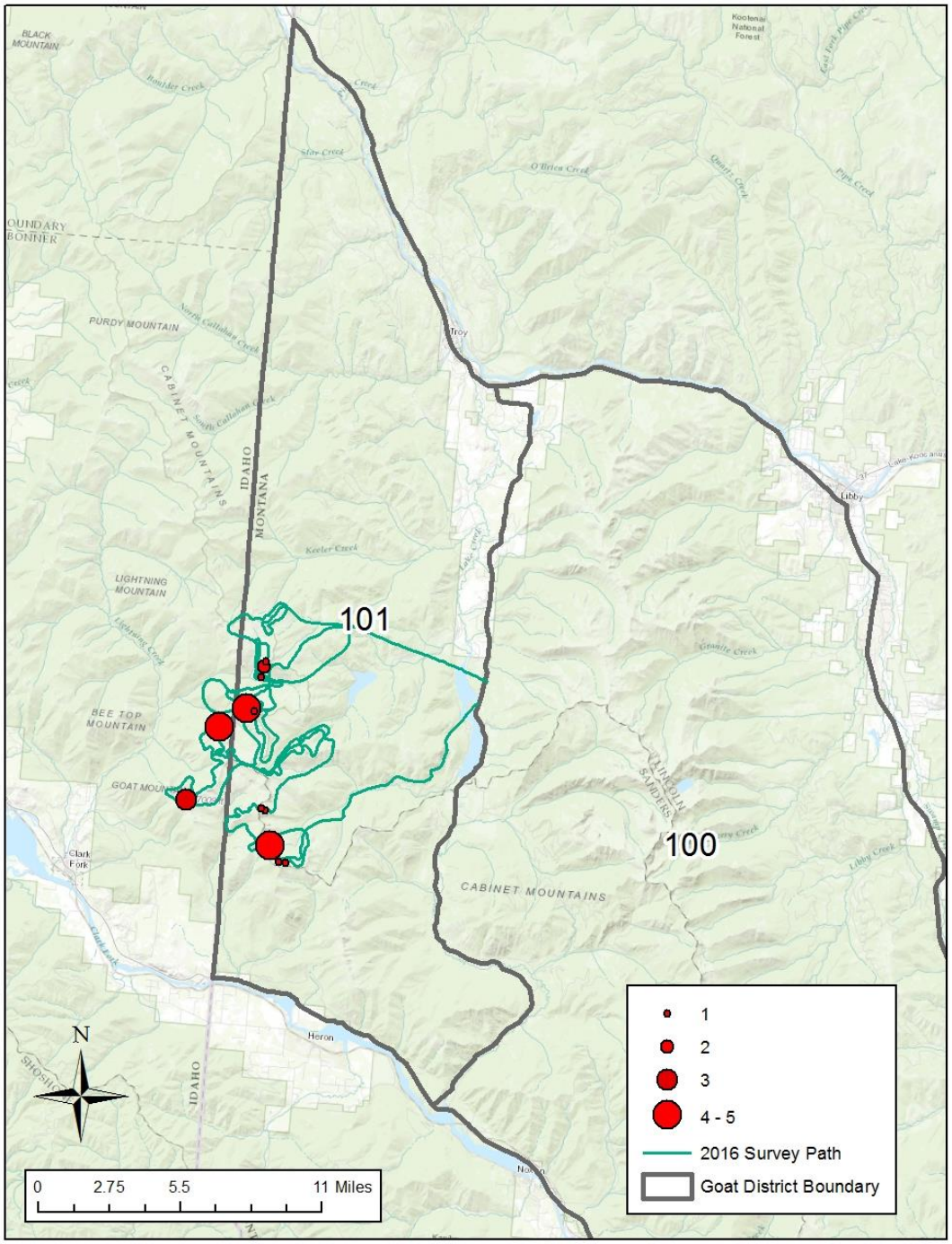


Figure 5. Aerial goat survey flight path and goat observations in Hunting District 101 in northwest Montana, August 2016.

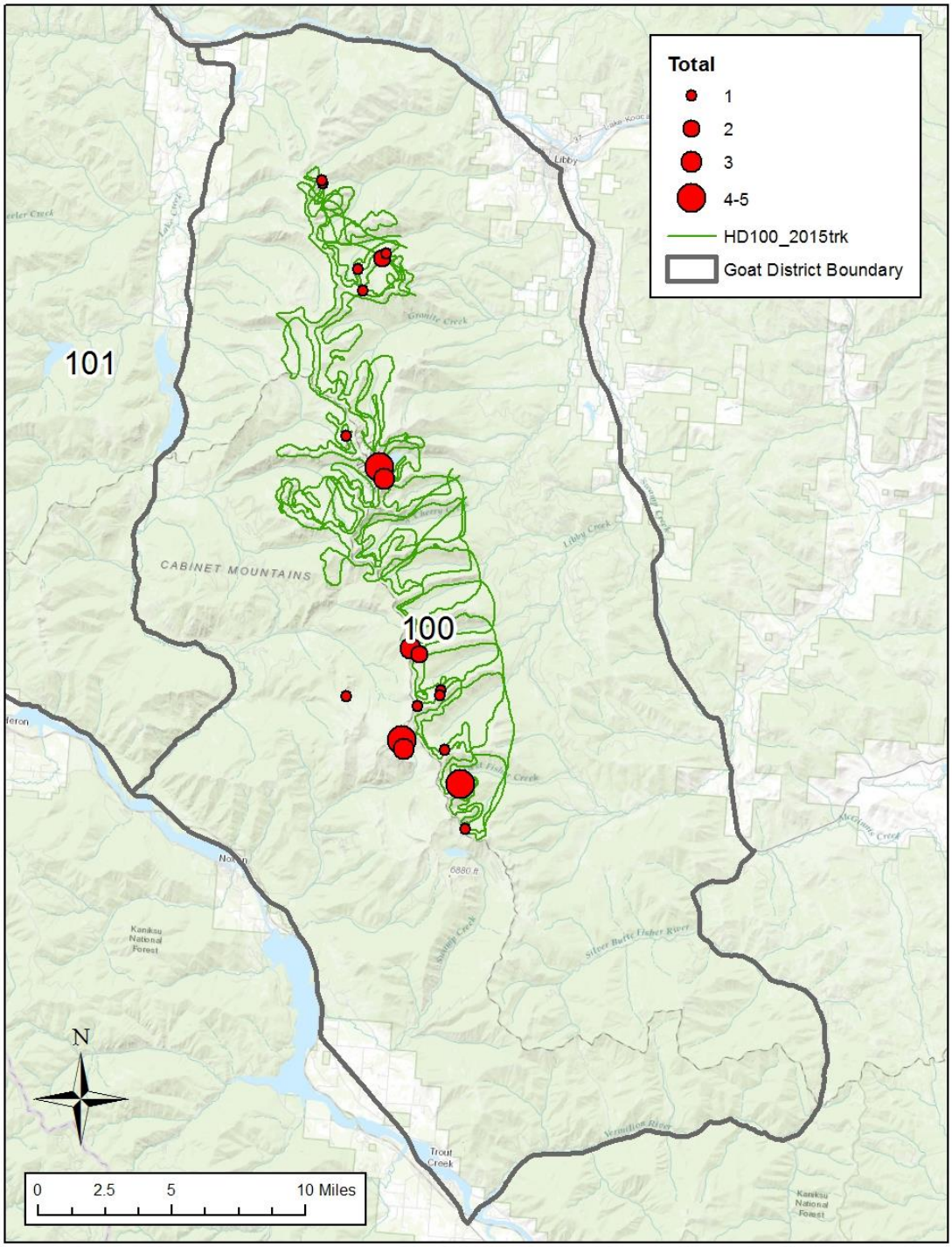


Figure 6. Aerial goat survey flight path and goat observations in Hunting District 100 in northwest Montana, August 2015.

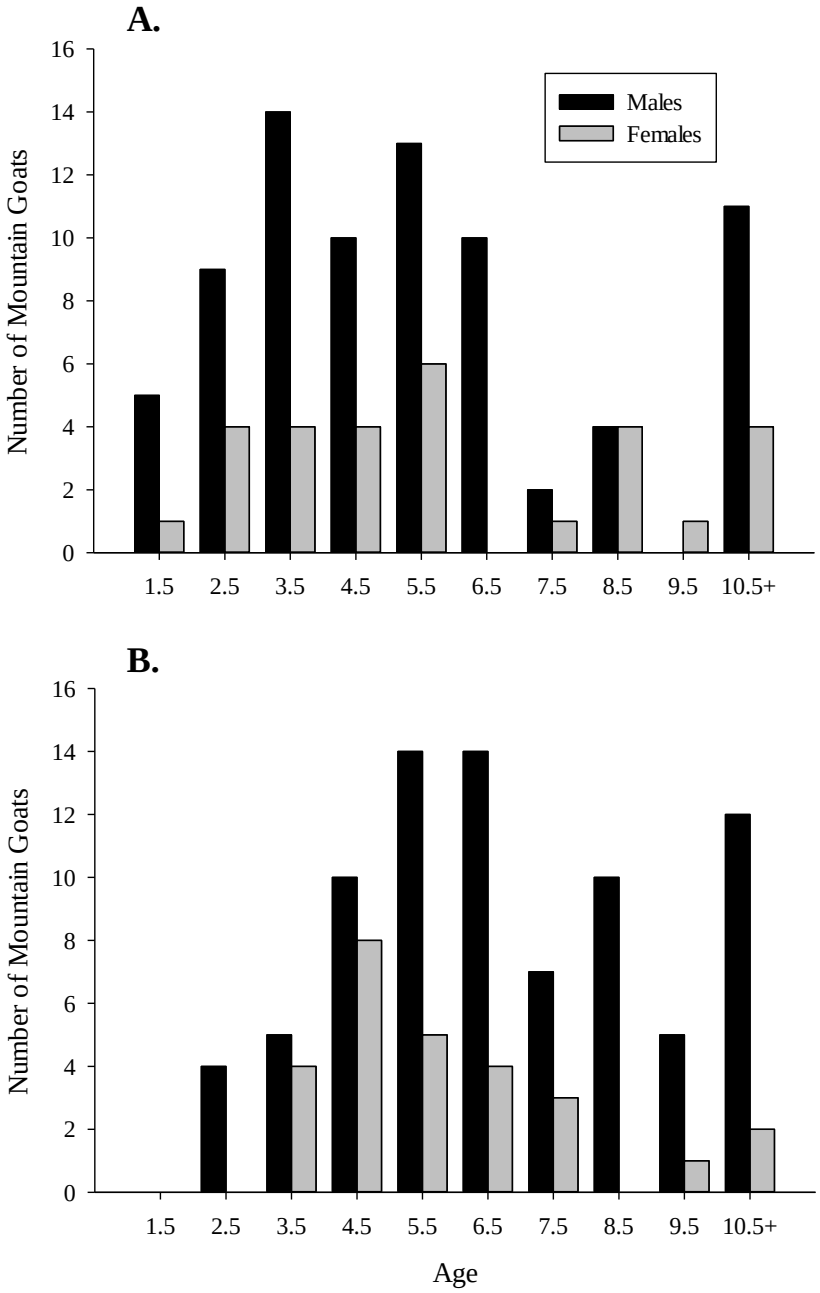


Figure 7. Age structure of harvested mountain goats in Montana Fish, Wildlife & Parks administrative Region 1, northwest Montana, for 2005-2009 (A) and 2010-2016 (B).

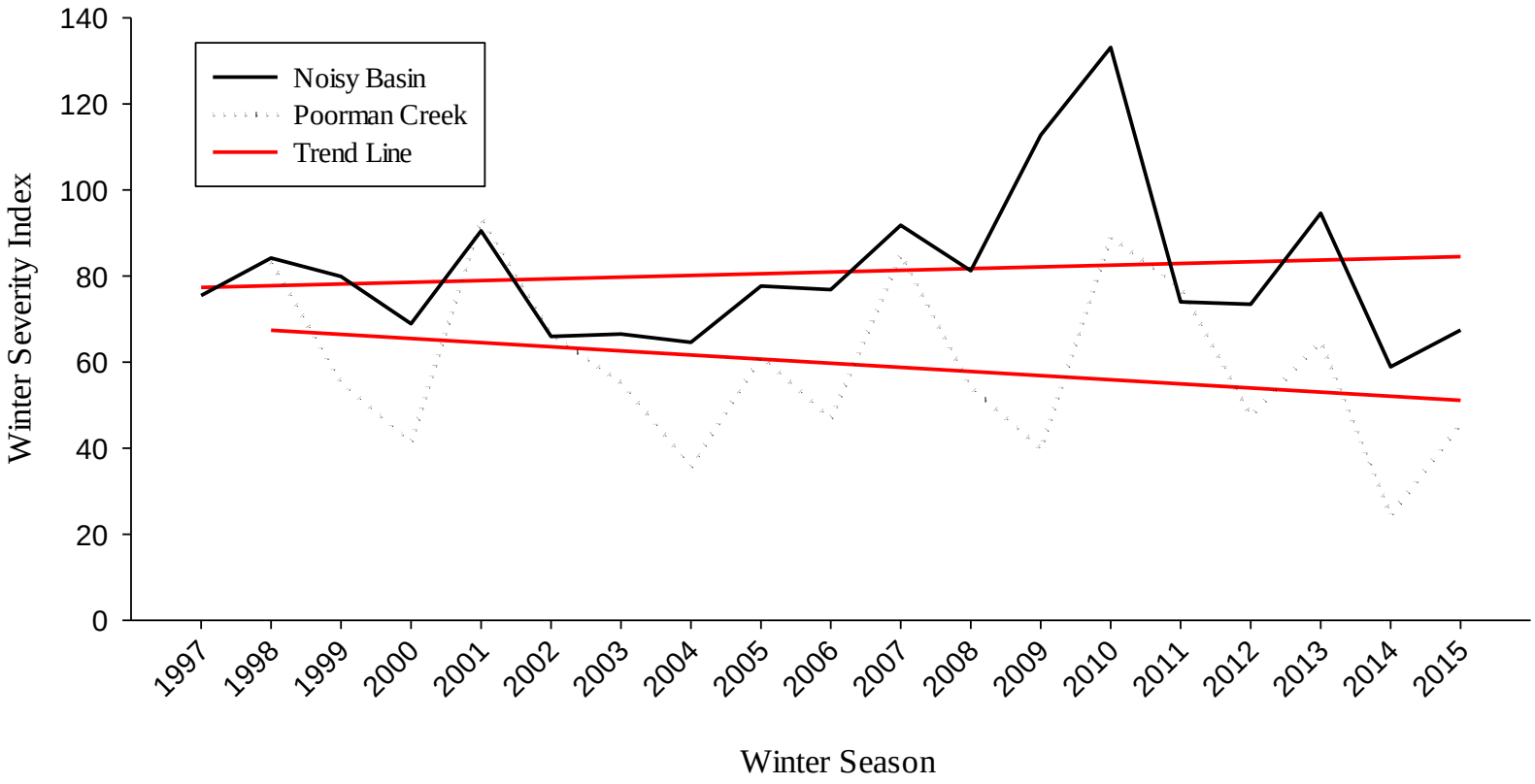


Figure 8. Winter severity index (maximum snow depth x numbers of consecutive days with measurable snow coverage) calculated from snow depth data at Poorman Creek and Noisy Basin SNOTEL stations in northwest Montana. The red trend line is a linear regression of the data in comparison to winter season.

APPENDIX A

Table A-1. Hunting District 100 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	5	5	3	60	2	1	0	0	7
1987	5	5	5	100	3	2	0	0	3
1988	7	7	6	86	5	1	0	0	5
1989	7	6	5	83	4	1	0	0	6
1990	8	8	7	88	2	5	0	0	6
1991	8	8	7	88	4	3	0	0	5
1992	5	5	5	100	3	2	0	0	5
1993	5	5	4	80	4	0	0	0	5
1994	7	7	7	100	5	2	0	0	2
1995	8	8	8	100	4	4	0	0	6
1996	8	8	7	88	5	2	0	0	12
1997	8	7	7	100	3	4	0	0	10
1998	8	7	6	86	3	3	0	0	7
1999	8	8	7	88	3	4	0	0	15
2000	8	8	4	50	1	3	0	0	24
2001	8	8	7	88	3	4	0	0	3
2002	8	7	5	71	1	4	0	0	13
2003	8	8	7	88	5	2	0	0	5
2004	8	8	8	100	7	1	0	0	13
2005	8	7	5	71	3	2	0	0	13
2006	8		7		5	2	0	0	0
2007	8	6	6	100	3	2	0	0	4
2008	8	8	5	63	2	3	0	1	18
2009	8	8	8	100	4	3	0	1	5
2010	6	6	6	100	2	4	0	0	10
2011	6	6	5	83	5	0	0	0	11
2012	6	6	5	83	5	0	0	0	9
2013	6	6	5	83	4	1	0	0	9
2014	6	6	4	67	4	0	0	0	7
2015	6	n/a	5	n/a	5	0	0	0	n/a
2016	6	n/a	5	n/a	2	3	0	0	n/a

Table A-2. Hunting District 101 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	2	2	2	100	1	1	0	0	1
1987	2	2	1	50	1	0	0	0	27
1988	3	3	3	100	2	1	0	0	4
1989	3	3	3	100	2	1	0	0	8
1990	3	2	2	100	1	1	0	0	4
1991	3	3	2	67	0	2	0	0	9
1992	3	3	3	100	1	2	0	0	4
1993	3	3	2	67	1	1	0	0	7
1994	3	2	1	50	1	0	0	0	12
1995	4	4	4	100	4	0	0	0	15
1996	4	4	3	75	2	1	0	0	22
1997	4	4	3	75	2	1	0	0	8
1998	4	4	4	100	2	2	0	0	1
1999	4	4	4	100	3	1	0	0	12
2000	4	4	4	100	1	3	0	0	8
2001	4	4	3	75	2	1	0	0	17
2002	4	4	4	100	3	1	0	0	7
2003	4	4	2	50	1	1	0	0	10
2004	4	4	3	75	2	1	0	0	13
2005	4	4	4	100	3	1	0	0	7
2006	4		3	75	3	0	0	0	
2007	4	4	4	100	2	1	0	1	12
2008	4	4	1	25	1	0	0	0	27
2009	4	4	3	75	3	0		0	9
2010	2	2	2	100	1	1	0	0	6
2011	2	2	1	50	1	0	0	0	10
2012	2	2	0	0	0	0	0	0	2
2013	2	2	1	50	1	0	0	0	11
2014	2	2	1	50	1	0	0	0	11
2015	2	n/a	1	n/a	1	0	0	0	n/a
2016	2	n/a	1	n/a	1	0	0	0	n/a

Table A-3. Hunting District 131 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	12	12	8	67	4	4	0	0	9
1987	12	12	8	67	4	4	0	0	14
1988	12	12	8	67	4	4	0	0	8
1989	12	11	4	36	2	2	0	0	13
1990	12	11	4	36	3	1	0	0	24
1991	9	8	5	63	2	3	0	0	12
1992	9	8	7	88	2	5	0	0	4
1993	6	6	1	17	1	0	0	0	47
1994	6	6	4	67	2	2	0	0	8
1995	5	5	4	80	2	1	0	1	8
1996	5	4	4	100	2	2	0	0	4
1997	5	5	2	40	1	1	0	0	22
1998	5	5	2	40	0	2	0	0	1
1999	5	5	1	20	1	0	0	0	53
2000	5	5	3	60	0	3	0	0	7
2001	5	4	2	50	1	1	0	0	7
2002	5	5	2	40	1	1	0	0	25
2003	5	5	5	100	4	1	0	0	4
2004	5	5	4	80	1	3	0	0	5
2005	5	4	2	50	1	1	0	0	12
2006	5		2	40	1	1	0	0	
2007	5	5	5	100	2	3	0	0	4
2008	5	4	4	100	4	0	0	0	4
2009	5	5	5	100	2	3	0	0	3
2010	2	2	2	100	2	0	0	0	7
2011	2	2	0	0	0	0	0	0	8
2012	2	2	1	50	1	0	0	0	5
2013	2	1	0	0	0	0	0	0	8
2014	2	2	0	0	0	0	0	0	11
2015	2	n/a	0	n/a	0	0	0	0	n/a
2016	2	2	2	100	0	2	0	0	n/a

Table A-4. Hunting District 132 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	20	16	10	63	10	0	0	0	11
1987	10	9	3	33	3	0	0	0	22
1988	5	5	4	80	3	1	0	0	9
1989	5	4	3	75	0	3	0	0	5
1990	5	5	2	40	1	1	0	0	10
1991	5	5	4	80	2	2	0	0	5
1992	5	5	4	80	1	3	0	0	6
1993	7	7	2	29	1	1	0	0	29
1994	7	7	1	14	0	1	0	0	91
1995	5	4	2	50	2	0	0	0	27
1996	5	4	1	25	1	0	0	0	29
1997	5	5	5	100	4	1	0	0	3
1998	5	5	5	100	2	3	0	0	5
1999	5	5	3	60	2	1	0	0	20
2000	5	5	1	20	1	0	0	0	46
2001	5	5	3	60	2	1	0	0	8
2002	5	5	3	60	2	1	0	0	7
2003	5	5	4	80	4	0	0	0	10
2004	5	4	1	25	0	1	0	0	48
2005	5	5	4	80	3	1	0	0	13
2006	2	2	2	100	1	1	0	0	
2007	2	2	1	50	1	0	0	0	32
2008	2	1	1	100	1	0	0	0	10
2009	2	2	0	0	0	0	0	0	9
2010	2	2	1	50	0	1	0	0	5
2011	2	2	1	50	1	0	0	0	7
2012	2	2	2	100	1	1	0	0	8
2013	2	2	2	100	2	0	0	0	3
2014	2	0	0	n/a	0	0	0	0	0
2015	2	2	2	100	1	1	0	0	n/a
2016	2	2	2	100	2	0	0	0	n/a

Table A-5. Hunting District 133 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	10	9	2	22	2	0	0	0	20
1987	10	6	6	100	6	0	0	0	6
1988	10	9	7	78	4	3	0	0	6
1989	10	9	6	67	4	2	0	0	9
1990	5	5	3	60	3	0	0	0	11
1991	5	5	4	80	2	2	0	0	7
1992	5	4	3	75	0	3	0	0	14
1993	5	5	4	80	2	2	0	0	5
1994	5	5	4	80	3	1	0	0	3
1995	5	5	5	100	5	0	0	0	4
1996	5	5	4	80	2	2	0	0	9
1997	5	5	3	60	1	2	0	0	14
1998	5	5	4	80	4	0	0	0	5
1999	5	5	4	80	2	2	0	0	9
2000	5	5	1	20	1	0	0	0	35
2001	5	5	3	60	0	3	0	0	7
2002	5	5	2	40	1	1	0	0	28
2003	5	3	3	100	3	0	0	0	3
2004	5	5	3	60	3	0	0	0	12
2005	5	4	3	75	1	2	0	0	8
2006	3		1	33	1	0	0	0	
2007	3	3	2	67	1	0	0	1	11
2008	3	3	2	67	2	0	0	0	5
2009	3	2	1	50	0	1	0	0	4
2010	2	2	2	100	2	0	0	0	1
2011	2	2	2	100	2	0	0	0	9
2012	2	2	1	50	1	0	0	0	3
2013	1	1	1	100	1	0	0	0	1
2014	2	1	1	100	1	0	0	0	3
2015	2	n/a	1	n/a	1	0	0	0	n/a
2016	2	n/a	1	n/a	1	0	0	0	n/a

Table A-6. Hunting District 134 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	2	2	0	0	0	0	0	0	
1987	2	2	1	50	1	0	0	0	3
1988	2	2	0	0	0	0	0	0	
1989	2	0	0	0	0	0	0	0	
1990	2	2	2	100	0	2	0	0	1
1991	2	2	2	100	2	0	0	0	2
1992	2	2	2	100	1	1	0	0	4
1993	2	2	2	100	1	1	0	0	6
1994	2	2	2	100	1	1	0	0	5
1995	2	2	2	100	1	1	0	0	5
1996	2	2	1	50	0	1	0	0	5
1997	2	2	1	50	0	1	0	0	19
1998	2	2	0	0	0	0	0	0	
1999	2	2	1	50	1	0	0	0	20
2000	2	2	1	50	1	0	0	0	14
2001	2	2	1	50	0	1	0	0	8
2002	2	2	2	100	1	1	0	0	18
2003	2	1	1	100	1	0	0	0	3
2004	2	2	2	100	1	1	0	0	2
2005	2	2	2	100	2	0	0	0	5
2006	2	2	2	100	2	0	0	0	
2007	2	2	2	100	1	1	0	0	3
2008	2	1	1	100	1	0	0	0	1
2009	2	2	2	100	1	1	0	0	4
2010	1	1	1	100	0	1	0	0	1
2011	1	1	0	0	0	0	0	0	1
2012	1	1	1	100	0	1	0	0	5
2013	1	1	1	100	0	1	0	0	7
2014	1	1	1	100	0	1	0	0	4
2015	1	1	1	100	1	0	0	0	n/a
2016	1	1	1	100	0	1	0	0	n/a

Table A-7. Hunting District 140 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	2	2	1	50	1	0	0	0	14
1987	2	2	2	100	2	0	0	0	10
1988	2	2	2	100	1	1	0	0	6
1989	2	2	1	50	1	0	0	0	20
1990	2	2	2	100	0	2	0	0	3
1991	2	2	2	100	2	0	0	0	9
1992	2	2	1	50	1	0	0	0	2
1993	2	2	0	0	0	0	0	0	
1994	2	2	1	50	0	1	0	0	6
1995	2	2	1	50	0	1	0	0	25
1996	2	2	1	50	1	0	0	0	20
1997	2	2	2	100	2	0	0	0	12
1998	2	2	2	100	1	1	0	0	5
1999	2	2	1	50	1	0	0	0	18
2000	2	2	1	50	1	0	0	0	46
2001	2	2	2	100	1	1	0	0	17
2002	2	2	1	50	0	1	0	0	20
2003	2	2	2	100	1	1	0	0	4
2004	2	2	0	0	0	0	0	0	
2005	2	2	1	50	0	1	0	0	13
2006	2		1	50	0	0	0	0	
2007	2	2	2	100	2	0	0	0	1
2008	2	2	2	100	1	1	0	0	6
2009	2	2	2	100	1	1	0	0	4
2010	2	2	2	100	1	1	0	0	8
2011	2	2	1	50	1	0	0	0	7
2012	2	2	2	100	1	1	0	0	10
2013	2	2	1	50	1	0	0	0	2
2014	2	2	0	0	0	0	0	0	21
2015	2	2	2	100	2	0	0	0	n/a
2016	2	n/a	1	n/a	1	0	0	0	n/a

Table A-8. Hunting District 141 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	10	10	5	50	1	4	0	0	10
1987	10	9	8	89	8	0	0	0	3
1988	10	1	3	300	2	1	0	0	17
1989	10	7	3	43	1	1	0	1	14
1990	10	9	6	67	4	2	0	0	6
1991	10	9	5	56	3	1	1	0	12
1992	10	10	7	70	3	4	0	0	4
1993	10	10	7	70	4	3	0	0	10
1994	10	9	4	44	1	3	0	0	15
1995	8	7	3	43	2	1	0	0	27
1996	8	8	3	38	1	2	0	0	13
1997	4	4	1	25	1	0	0	0	28
1998	4	3	3	100	3	0	0	0	2
1999	4	4	3	75	0	3	0	0	16
2000	4	4	2	50	1	1	0	0	18
2001	4	4	2	50	2	0	0	0	12
2002	4	3	1	33	0	1	0	0	22
2003	4	4	3	75	3	0	0	0	5
2004	4	4	4	100	4	0	1	0	2
2005	4	4	4	100	3	0	0	0	11
2006	4		2	50	2	0	0	0	
2007	2	2	2	100	1	1	0	0	1
2008	2	2	2	100	2	0	0	0	5
2009	2	2	2	100	2	0	0	0	7
2010	2	2	2	100	2	0	0	0	1
2011	2	1	1	100	0	0	0	1	20
2012	2	2	2	100	0	2	0	0	4
2013	2	2	1	50	1	0	0	0	8
2014	2	2	2	100	2	0	0	0	2
2015	2	2	2	100	2	0	0	0	n/a
2016	2	n/a	0	n/a	0	0	0	0	n/a

Table A-9. Hunting District 142 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	5	5	5	100	3	2	0	0	6
1987	5	5	4	80	3	1	0	0	9
1988	5	4	4	100	3	1	0	0	9
1989	5	4	4	100	4	0	0	0	5
1990	5	4	1	25	0	1	0	0	24
1991	3	2	1	50	1	0	0	0	3
1992	3	3	2	67	1	1	0	0	11
1993	3	3	3	100	3	0	0	0	2
1994	3	3	2	67	1	1	0	0	9
1995	3	3	2	67	1	1	0	0	5
1996	3	3	0	0	0	0	0	0	
1997	3	2	2	100	2	0	0	0	3
1998	3	3	3	100	3	0	0	0	6
1999	3	3	1	33	0	1	0	0	4
2000	3	3	2	67	2	0	0	0	5
2001	3	0	0	0	0	0	0	0	
2002	3	3	2	67	2	0	0	0	6
2003	3	3	3	100	3	0	0	0	8
2004	3	2	2	100	2	0	0	0	5
2005	3	3	3	100	1	2	0	0	5
2006	3		1	33	1	0	0	0	
2007	2	2	0	0	0	0	0	0	
2008	2	2	2	100	2	0	0	0	5
2009	2	2	2	100	0	1	0	1	2
2010	1	1	1	100	1	0	0	0	2
2011	1	1	1	100	0	1	0	0	1
2012	1	0	0	0	0	0	0	0	
2013	1	1	0	0	0	0	0	0	16
2014	1	1	1	0	1	0	0	0	3
2015	1	1	1	0	1	0	0	0	
2016	1	n/a	0	n/a	0	0	0	0	n/a

Table A-10. Hunting District 150 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	2	1	0	0	0	0	0	0	
1987	2	2	1	50	1	0	0	0	7
1988	2	2	1	50	1	0	0	0	18
1989	2	2	2	100	2	0	0	0	1
1990	2	2	2	100	2	0	0	0	1
1991	2	2	2	100	2	0	0	0	4
1992	2	2	2	100	1	1	0	0	4
1993	2	2	2	100	1	1	0	0	8
1994	2	2	1	50	1	0	0	0	14
1995	2	2	1	50	1	0	0	0	14
1996	2	2	1	50	1	0	0	0	7
1997	2	2	1	50	1	0	0	0	15
1998	2	1	1	100	1	0	0	0	3
1999	2	2	2	100	0	2	0	0	1
2000	2	0	0	0	0	0	0	0	
2001	2	2	2	100	2	0	0	0	2
2002	2	2	2	100	1	1	0	0	4
2003	2	1	1	100	1	0	0	0	5
2004	2	2	2	100	2	0	0	0	10
2005	2	2	2	100	0	2	0	0	4
2006	2		1	50	0	1	0	0	
2007	2	2	2	100	1	1	0	0	1
2008	2	2	2	100	1	1	0	0	6
2009	2	2	2	100	2	0	0	0	3
2010	2	2	2	100	2	0	0	0	1
2011	2	2	1	50	0	1	0	0	5
2012	2	2	2	100	1	1	0	0	4
2013	2	2	0	100	2	0	0	0	5
2014	2	2	2	100	1	1	0	0	4
2015	2	2	2	100	2	0	0	0	n/a
2016	2	n/a	1	100	1	0	0	0	n/a

Table A-11. Hunting District 151 mountain goat harvest, 1986-2016.

Year	Number of Permits	Number of Hunters	Harvest	Percent Success	Male	Female	Kid	Unk	Days per Hunter
1986	5	4	3	75	3	0	0	0	3
1987	5	5	2	40	2	0	0	0	15
1988	5	4	1	25	1	0	0	0	30
1989	5	4	3	75	3	0	0	0	7
1990	5	4	2	50	2	0	0	0	12
1991	5	4	0	0	0	0	0	0	
1992	5	5	3	60	2	1	0	0	6
1993	5	5	3	60	3	0	0	0	9
1994	5	5	3	60	2	1	0	0	12
1995	4	4	1	25	1	0	0	0	27
1996	4	3	1	33	1	0	0	0	25
1997	4	4	0	0	0	0	0	0	
1998	4	4	2	50	1	1	0	0	8
1999	4	3	2	67	2	0	0	0	9
2000	4	3	1	33	1	0	0	0	13
2001	4	4	1	25	1	0	0	0	29
2002	4	4	1	25	1	0	0	0	22
2003	4	4	1	25	1	0	0	0	16
2004	4	4	3	75	2	1	0	0	10
2005	4	4	3	75	2	1	0	0	9
2006	4		1	25	1	0	0	0	
2007	2	1	0	0	0	0	0	0	
2008	2	2	1	50	1	0	0	0	24
2009	2	1	1	100	1	0	0	0	5
2010	1	1	1	100	1	0	0	0	3
2011	1	1	0	0	0	0	0	0	4
2012	1	1	1	100	1	0	0	0	11
2013	1	1	1	100	1	0	0	0	2
2014	1	0	0	n/a	0	0	0	0	0
2015	1	1	1	100	0	1	0	0	n/a
2016	1	1	1	100	1	0	0	0	n/a

APPENDIX B

Table B-1. Mountain goat surveys, HD 100 (1979-2016).

Year	Total	Adults	Juveniles
1979	72	60	12
1980	56	40	16
1983	32	27	5
1984	55	45	10
1985	34	28	6
1986	39	28	11
1987	24	22	2
1989	83	70	13
1991	64	54	10
1993	87	72	15
1995	82	77	5
1997	65	55	10
1999	75	65	10
2001	53	41	12
2003	105	90	15
2005	91	76	15
2008	88	67	21
2011	72	60	11
2015	40	28	12

Table B-2. Mountain goat surveys, HD 101 (1979-2015).

Year	Total	Adults	Juveniles
1979	22	18	4
1980	41	29	12
1982	13	12	1
1983	21	20	1
1986	22	17	5
1987	44	41	3
1988	52	48	4
1990	67	58	9
1992	26	25	1
1994	53	42	11
1996	28	24	4
1998	50	39	11
2000	57	46	11
2002	40	37	3
2004	44	39	5
2006	35	30	5
2008	56	46	10
2012	19	16	3
2016	25	15	10

Table B-3. Mountain goat surveys, HD 131 (1981-2011).

Year	Total	Adults	Juveniles
1981	86	64	22
1993	35	30	5
1995	37	37	0
1997	64	55	9
2000	20	16	4
2005	38	31	7
2011	12	9	3

Table B-4. Mountain goat surveys, HD 132 (1980-2005).

Year	Total	Adults	Juveniles
1980	31	22	9
1993	92	74	18
1995	7	6	1
2000	10	9	1
2004	15	12	3
2005	24	19	5

Table B-5. Mountain goat surveys, HD 133 (1980-2008).

Year	Total	Adults	Juveniles
1980	56	39	17
1983	16	14	2
1995	94	77	17
1997	15	13	2
2004	48	38	10
2008	4	3	1
2008	28	18	10

Table B-6. Mountain goat surveys, HD 134 (1981-2010).

Year	Total	Adults	Juveniles
1981	39	32	7
1984	20	13	7
1995	15	15	0
1999	21	15	6
2005	26	16	10
2010	10	9	1

Table B-7. Mountain goat surveys, HD 140 (1982-2013).

Year	Total	Adults	Juveniles
1982	49	38	11
1984	25	22	3
1995	37	31	6
1999	22	17	5
2005	47	36	11
2013	50	28	12

Table B-8. Mountain goat surveys, HD 141 (1981-2016).

Year	Total	Adults	Juveniles
1981	51	42	9
1982	24	21	3
1995	20	18	2
1996	24	20	4
1999	3	1	2
2016	50	39	12

Table B-9. Mountain goat surveys, HD 142 (1980-2012).

Year	Total	Adults	Juveniles
1980	29	24	5
1985	6	5	1
1995	10	10	0
2002	12	12	0
2006	20	14	6
2012	56	42	14

Table B-10. Mountain goat surveys, HD 150 (1980-2008).

Year	Total	Adults	Juveniles
1980	5	5	0
1982	34	27	7
1985	33	26	7
1995	24	19	5
2002	31	20	11
2008	44	34	10
2008	33	28	5

Table B-11. Mountain goat surveys, HD 151 (1980-2008).

Year	Total	Adults	Juveniles
1980	6	5	1
1982	33	26	7
1983	15	9	6
1985	6	6	0
1993	7	7	0
1995	20	14	6
2002	5	3	2
2008	16	15	1
2008	2	2	0