

Montana's Mountain Goats

WHAT WE KNOW AND DON'T KNOW FROM 55 YEARS OF RECORDS

By Bruce L. Smith and Nicholas J. DeCesare

We've all done it while tramping through their mountain strongholds — head cocked skyward, binoculars pressed to orbits, scanning the cliffs and couloirs, ridgelines and snowfields and searching for telltale movement of white specks.

Like our homegrown pronghorn (*Antilocapra americana*), the American mountain goat (*Oreamnos americanus*) is a uniquely North American ungulate. It left behind its nearest relatives in Asia and Europe — gorals (*Naemorhedus* spp.), serows (*Capricornis* spp.) and the chamois (*Rupicapra rupicapra*) — some 40,000 years ago when it crossed the Bering Land Bridge during the Pleistocene. Today, these sure-footed climbers roam high in the mountains beyond the public eye, making them exceedingly challeng-

ing to study and perhaps the least well-known and understood member of the continent's megafauna. Numbering around 100,000 animals, the mountain goat is the least abundant artiodactyl in North America after bighorn sheep (*Ovis canadensis*).

A recent survey of Canadian and U.S. wildlife biologists and managers revealed marked declines in goat numbers over the past 50 to 75 years across parts of the animal's native range in southern British Columbia, Alberta, Washington and Idaho (Smith 2014). Our personal observations for 45 years in Montana's Bitterroot Mountains fit this larger pattern of decline. Conversations with agency biologists and others "in the know" suggested a similar pattern elsewhere among Montana's native goat populations.



► From the moment they are born, mountain goat kids are imprinted on a vertical world and take to it instinctively. Goats are bound to rugged terrain 12 months a year.

Credit: Bruce Smith



To learn more, we proposed a review of the status of the state's goat populations. Montana Fish, Wildlife and Parks (MFWP) funded our proposal in 2015, which ultimately compiled and synthesized 55 years of mountain goat harvest and population information. We also developed and distributed an expert-opinion survey to solicit the insights and opinions of MFWP biologists regarding population trends, limiting factors, monitoring practices, and future research and management needs (Smith and DeCesare 2017). Here we provide a snapshot of what we learned.

Where they roam

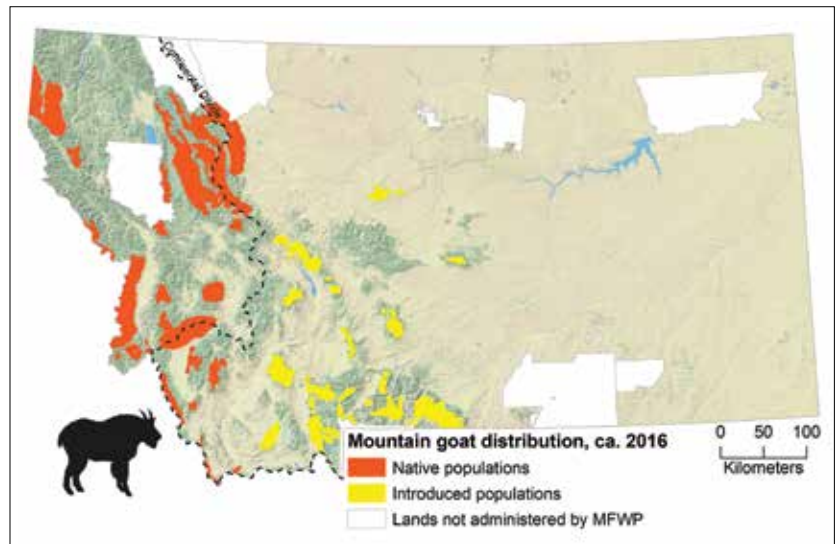
The mountain goat has inhabited the mountain ranges of western Montana and adjacent habitat along the Continental Divide for thousands of years. Its distribution is mostly on public lands: national forest, wilderness areas, Glacier National Park, plus some state and tribal lands. Steep, rugged terrain, snow, and remoteness are defining features of goat ranges.

But the lack of traditional ecological knowledge and fossil evidence suggested that none lived in the eastern part of the state. In 1941, MFWP began establishing additional populations in these previously unoccupied areas by translocating goats. The translocations — which included 495 animals introduced at 27 different sites — ended in 2008, with some mountain ranges receiving multiple introductions (Picton and Lonner 2008). Today Montana hosts more introduced populations of goats than any other state, province or territory.

Harvest data

Our analysis of harvest data showed a striking dichotomy between native and introduced populations. The number of hunting licenses issued and goats harvested from native goat populations plummeted from an average of 967 licenses and 329 animals annually during the 1960s to an average of 50 licenses and 33 goats from 2007 to 2015. In contrast, introduced populations have generally prospered and increased. Over the same time periods the number of licenses rose from 169 to 225 and harvested goats increased from 71 to 165.

Indeed, harvest management has received much attention in the literature. Using population modeling to evaluate historical trends of mountain goats, Rice and Gay (2010) found that population declines in Washington were attributable primarily to harvest.



As a result, populations of less than 100 animals are generally no longer hunted in the state. Hamel et al. (2006) modeled population dynamics of mountain goats in Alberta and showed high sensitivity to adult female survival and a detrimental role of female harvest on population trends. They recommended hunting only populations with greater than 50 individuals and at conservative harvest rates of 1 to 4 percent.

Over the years, Montana has reduced its goat harvest rates; and 12 of 52 hunting districts are now closed to hunting, ostensibly due to populations too small to support removal. In 2015, statewide harvest rates averaged 2 percent for native and 6.3 percent for introduced goat populations.

The records also indicated that since 1960 38 percent of harvested mountain goats were females. Unlike other North American ungulates, mountain goats exhibit little sexual dimorphism; and subtle differences in horn morphology and behavior can be challenging for untrained observers to identify (Smith 1988). Consequently, MFWP — like most other state and Canadian wildlife agencies — has consistently offered either-sex licenses. However, MFWP biologists are encouraged that the proportion of females harvested annually has been declining, possibly coinciding with the availability of more educational material on distinguishing the sexes.

We found that rates of hunter success did not predict the performance of populations, particularly as permit levels were reduced. Long-term

▲ The map shows the 2016 distribution of extant native and introduced populations of mountain goats in Montana. Today the total number of goats is estimated to be just under 6,000.



fidelity of goats to preferred areas of their ranges (Festa-Bianchet and Côté 2008) may predispose hunted populations to apparent “hyperstability” when monitored with hunter statistics alone. In such cases, hunter success may convey a deceptively stable trend — even for declining populations — because hunters continue to find and harvest goats in the same areas and with the same efficiency regardless of decreased numbers overall (Hatter

2001). According to the survey responses, Montana’s wildlife biologists recognize the limited value of harvest statistics and place greater importance on the demographic data obtained from their population surveys when establishing annual hunting regulations.

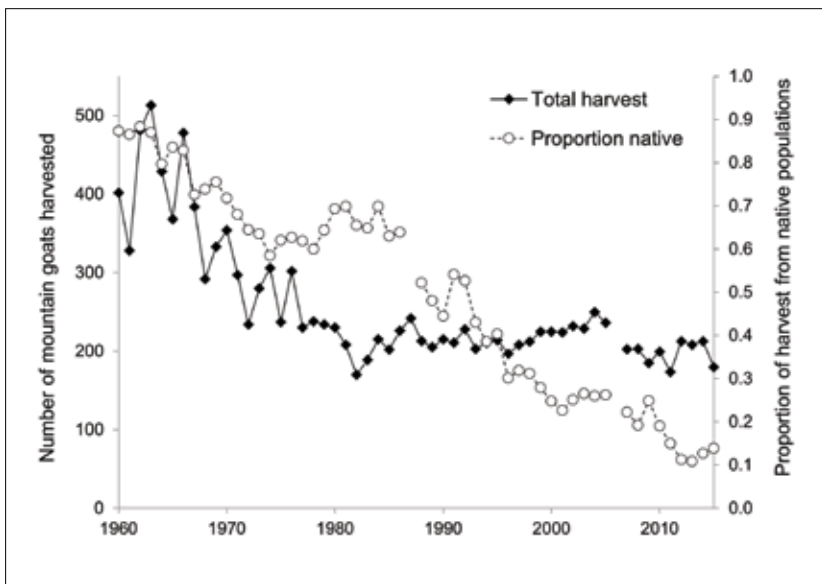
Population estimates and trends

MFWP biologists conduct periodic surveys, mostly by helicopter, of goat populations. After adjusting survey results with estimates of sightability bias from the literature, they estimate the number of goats in each survey unit. Across 52 hunting districts, plus another five populations outside hunting districts, biologists estimated the total goat population in 2016 under MFWP jurisdiction at 3,685 animals, with 2,526 or 69 percent of the total in introduced populations and 1,159 animals or 31 percent in native populations. Adding in another estimated 225 goats in Yellowstone and 2,000 in Glacier National Park, Montana’s total goat population is 5,910.

To put these current numbers in perspective, we compared them to the first statewide population surveys that were conducted on foot and horseback 70 years ago. From 1943 to 1946, some 4,100 goats occupied native ranges across Montana — excluding 940 more in Glacier National Park — a figure three to four times larger than the 1,159 native goats estimated by Montana’s biologists in 2016.

MFWP biologists corroborated this downward trend. Of the state’s 30 native populations, they judged that at least 23 (77 percent) had declined or been extirpated since 1960, while trends for four were stable and three others uncertain. In contrast, 54 percent (15 of 28) of introduced populations were judged as stable or increasing, with trends of the other thirteen declining or uncertain.

Survey responses suggested a variety of causes for declines in native populations. During the 50 years prior to 2010, the limiting factors most often mentioned were total hunter harvest, female harvest and unknown reasons. Ranking of current and future threats indicated a shift in factors influencing native goat populations. Following a gradual reduction of hunting licenses during those 50 years, biologists now identify habitat changes, small population risks, disturbance from off-road vehicles and snowmobiles, and climate change as the most impactful influences on native populations. For introduced populations,



▲ The graph shows the total harvest of mountain goats and the proportion of the harvest coming from native populations in Montana from 1960 to 2015.



Credit: Bruce Smith

▲ One of Montana’s prime native goat habitats is the 1.3-million-acre Selway-Bitterroot Wilderness Area, which was one of the original wilderness areas established by the Wilderness Act of 1964.



effects of harvest levels (total and female goats), predation and habitat changes ranked highest in importance among current and future concerns.

We believe concerns about small population effects raised by several biologists are justified, given the small and potentially isolated nature of many of Montana's goat populations. They estimated that 70 percent (21 of 30) of native populations may number less than 50 individuals and just one has more than 100 goats. Such populations risk heightened consequences of stochastic events and inbreeding depression, compared to larger populations or metapopulations (Johnson et al. 2011). In some of Montana's larger landscapes, research and monitoring of movement and yearlong distribution patterns to determine if some populations are reproductively isolated would benefit conservation planning.

Population monitoring

Reliable information on population status and trends of goats, such as minimum counts and recruitment ratios, is logistically difficult to obtain. Minimum counts obtained from MFWP's population surveys can be a valid means of monitoring trends as long as the mean sightability of animals remains constant over time (DeCesare et al. 2016). Minimum counts, however, cannot be used to estimate abundance without adjusting for sightability. Measured sightability rates of marked goats vary from approximately 40 to 80 percent in British Columbia, Idaho and Washington (Pauley and Crenshaw 2006, Rice et al. 2009, Mountain Goat Management Team 2010). Sightability likely also varies among goat populations across Montana, but it has not been measured.

Our estimations of population growth rates from survey counts suggested that using aerial surveys alone have not, for the most part, been adequate to distinguish increasing versus decreasing population trends with statistical rigor. On the survey, MFWP biologists submitted that better and more frequent monitoring of goat populations was their top management need along with research leading to a better understanding of population demographics.

Habitat condition and effectiveness

Because of their high and rugged nature, mountain goat ranges are less subject to human development and alteration than habitats of Montana's other big game species. Yet, the biologists we surveyed



Credit: Bruce Smith

offered a range of direct or indirect effects — both natural and anthropogenic — that they suspected or knew were affecting mountain goats.

Road construction into goat habitat to facilitate mining, energy and timber extraction, and motorized recreation have altered goat habitat, distributions and harvest vulnerability in Montana and elsewhere (Mountain Goat Management Team 2010). Studies in Canada and the U.S. have demonstrated that mountain goats are particularly sensitive to helicopter disturbance, which prompted the Northern Wild Sheep and Goat Council to recommend restricting the timing and proximity of flights near goat ranges (Hurley 2004). In general, we also don't know much about the cumulative effects of motorized disturbance, wildfire or its suppression, and climate change on habitat quality and carrying capacity.

The upshot

For the first time in 55 years, we now have a pretty good idea of the status of Montana's mountain goats. But even more importantly, the findings of our study have the potential to guide future monitoring and research to sustain or enhance goat populations and the recreational opportunities they provide. The results also suggest the value of a comprehensive approach to conservation and management planning for the species.

Yet as so often happens, the findings raised more questions than they answered. Foremost is the dichotomy between the population status of native and introduced goats. Although transplants were introduced to habitats unoccupied by goats, native

▲ An adult female mountain goat rests at a secure bed site favored by the animals in winter. Many questions remain about what is leading to declining native populations in Montana.



populations presumably had long ago colonized the most suitable places for their kind. Particularly striking is the observation that even as Montana's native goats declined by as much as 70 percent since the 1940s, goats in Glacier National Park have continued to flourish.

Other questions come to mind. Although past liberal hunting of native goats in Montana and elsewhere may have eroded numbers, why do suppressed herds recover so slowly, if at all, when hunting is relaxed? Has restoration of cougars and wolves in some areas impacted goat numbers, even though large carnivores were historically far more abundant? With many populations now so small, might predation and stochastic events have become disproportionately consequential?

As the rates of climate warming and cascading ecological effects accelerate faster at high altitudes than at lower elevations (Beever and Belant 2011, Wang et al. 2014), we might expect this cold-adapted obligate of the high country to be among the more sensitive species. The changing climate may alter distributions of predators, parasites, pathogens and disease vectors, just as it's altering fire regimes and shrinking permanent snowfields and glaciers. Those frozen features of the alpine zone facilitate ther-

moregulation in summer, offer refuge from insects and shed meltwaters that irrigate alpine meadows favored by goats for grazing to promote fat accumulation. As subalpine forests march upward, might some populations become sequestered on shrinking islands in the sky? Alternatively, might milder winters and longer growing seasons yield nutritional and energetic benefits to mountain goats?

Clearly, in Montana and elsewhere, there's much we don't know and plenty of reason for concern about this reclusive alpine icon. It may prove resilient enough, but the jury remains out. ■



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