

CONSERVATION AND MANAGEMENT: The overhunting of bison to the brink of extinction, followed by the protection and fostering of the last remaining wild bison in and around Yellowstone National Park is one of the iconic stories of wildlife conservation in the United States.<sup>13</sup> In 1902, the last 20 or so free-ranging bison in Yellowstone National Park were augmented by 21 bison brought from private herds elsewhere. The captive herd grew to >1000 animals, and the free-ranging herd increased slowly as well. As of 2012, Yellowstone National Park managed to achieve a population size of 2500–4500. The Jackson Hole population was estimated at 927 in 2012, and the population objective was 500.<sup>14</sup> Brucellosis, an Old World bacterial disease of bison, cattle and elk, was discovered in Yellowstone in 1917, and all bison in the state have subsequently been managed so as to reduce possible contact with domestic cattle. Of 199 animals from the Jackson Hole herd tested for brucellosis during 2000–2008, 40–83% were positive, depending on year.<sup>15</sup>

#### NOTES AND REFERENCES

1. Meagher (1986).
2. Commission Regulation 41.
3. Wilson and Reeder (2005).
4. Wilson (1996).
5. Halbert and Derr (2007).
6. Hedrick (2009).
7. Fryxell (1926, 1928), Cannon (2007), author for Hunt Mountain.
8. Russell (1921).
9. Hornaday (1887).
10. Bruggeman et al. (2007).
11. Fuller et al. (2007).
12. Laundré et al. (2001).
13. Plumb and Sucec (2006).
14. Wyoming Game and Fish Department (2011).
15. Baskin (1998), Scurlock and Edwards (2010).

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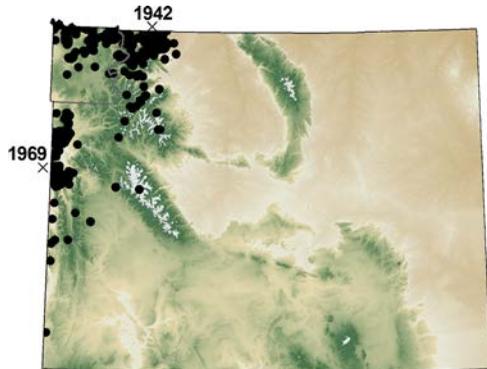
#### Mountain goat, *Oreamnos americanus*

DESCRIPTION: A medium-sized even-toed ungulate with all-white pelage; pelage is short and pure white in late summer, and shaggy and soiled by late spring. Males and females have slender, slightly curved, pointed horns, black in color, that grow throughout life. Sexual differences in horn size and body shape are subtle except to an experienced observer. Measurements (**Sex** [n] mean (kg), range):  $\geq 4$  years, Olympic National Park, Wash.; **WT = F** [57] 61, 50–74; **M** [15] 96, 50–117.<sup>1</sup> Dental formula: 0/3, 0/1, 3/3, 3/3 = 32.

STATUS: The paleontological record is puzzling, with a few specimens occurring in sites in Wyoming far from the geographic range at the time of European settlement. A few early historical records suggest the presence of individuals, but not breeding populations within the state. The populations currently in the state are naturalized nonnatives, having expanded



Mountain goat, Fremont Peak, 2009.



Locations from which the mountain goat ( $n = 5988$  observations) has been identified from western Wyoming during 1946–2011, collected by the Greater Yellowstone Area Mountain Ungulate Project. Areas of concentration and sites where solitary dispersing animals were observed are apparent. The southeasternmost point in the Wind River Range is the 2009 sighting on Fremont Peak (see photograph). The two dated x's were the sites of introduction that were closest to the state line, in both cases less than 10 km (6 mi).

into Wyoming from sites of introduction in adjacent Montana and Idaho.<sup>2</sup> The species is a “big game animal” under state law.<sup>3</sup>

**NOMENCLATURE AND SYSTEMATICS:** The genus name has been in use since the early twentieth century; the specific epithet is 100 years older. Of the four subspecies recognized as of 1975, the one that occurred closest to Wyoming before translocations was *O. a. missoulae*. The species is closely related to the European chamois, *Rupicapra*, and first appears in North American deposits 125,000–75,000 years ago.<sup>4</sup> Fragmentation of populations by glaciation during the Pleistocene is thought to account for low levels of genetic variability observed in interior populations.<sup>5</sup>

**DISTRIBUTION AND HABITAT ASSOCIATIONS:** The species was native to mountains of the northwest coast and northern Rocky Mountains (shown) before being translocated widely. Fossil remains of the species from the Late Pleistocene have been described from Wyoming, and historical anecdotes from westernmost Wyoming date from the 1840s to 1914.<sup>6</sup> The species has been introduced to South Dakota (first releases in 1924) and Colorado (first releases in 1948), but only animals from sites in Montana (first released in 1942) and Idaho (first released in 1969) have colonized Wyoming. The first recorded occurrence of the species in Wyoming was in the Beartooth Mountains in 1946. The first appearance in Yellowstone National Park was in the 1960s, with marked range expansion in the 1990s.<sup>7</sup> Reports from 2011 placed the species near Jenny Lake and Death Canyon in Grand Teton National Park.<sup>8</sup> Habitats are alpine meadows or areas near the upper limit of trees with cliffs or rocky slopes nearby for escape from predators.

**ECOLOGY:** The species has been studied little in Wyoming or Yellowstone National Park, but elsewhere has been found to eat a mixture of grasses, forbs, and shrubs that is similar to the diet of bighorn sheep. Across studies conducted in summer, mean grass component was 52%, forbs were 30%, and browse was 16%. In winter, the respective values were 60%, 8%, and 32%.<sup>9</sup> Mineral licks are important to the species and can result in travel across dangerous terrain to sites where goats concentrate.<sup>10</sup> Seasonal shifts in elevation are common but variable across studies; goats in southeastern British Columbia used sites in winter that were restricted in area, more rugged, with more southerly exposures and farther from trees than in summer.<sup>11</sup> Twinning is rare, and females produce their first young at 3–7 years, so population productivity is low.<sup>12</sup> Predation is likely the primary cause of death in native populations, with wolves, bears, and mountain lions contributing.<sup>8</sup> Deaths attributed to accidental falls and avalanches also have been reported.<sup>13</sup>

**CONSERVATION AND MANAGEMENT:** Considerable discussion attends the issue of whether mountain goats were present in Wyoming (or Colorado) at the time of settlement, and before the time of translocations to near the border. Accordingly, there is some uncertainty as to whether the species should be managed as a native or an introduced species. This is especially relevant in Yellowstone and Grand Teton National Parks, where nonnative mammals are regarded as nonnatural members of the animal community, which also includes bighorn sheep.<sup>14</sup> The overpopulation of Olympic National Park by introduced mountain goats in the late twentieth century, followed by population reduction and attendant public

controversy, is regarded by many as an undesirable outcome.<sup>15</sup> In the case of nonnational park lands, the question is further complicated by the fact that mountain goats are appealing to the public, and desirable to some as a big game species (21 killed by hunters in Wyoming in 2009). The estimated number of animals in Yellowstone National Park was 175–225 as of 2011; in Wyoming outside of Yellowstone and Grand Teton, it was 280 as of 2009.<sup>16</sup>

#### NOTES AND REFERENCES

1. Estimated from Houston et al. (1989, fig. 2).
2. Schullery and Whittlesey (2001), McWhirter (2004).
3. Wyoming Statutes 23-1-101-a-i.
4. Rideout and Hoffman (1975), Kurtén and Anderson (1980).
5. Mainguy et al. (2007).
6. Schullery and Whittlesey (2001).
7. Lemke (2004), McWhirter (2004).
8. Dewey (2011).
9. Laundré (1994).
10. Côté and Festa Bianchet (2003).
11. Poole et al. (2009).
12. Hamel et al. (2006).
13. Chadwick (1983).
14. Cain (2012).
15. Scheffer (1993), Laundré (1994).
16. Wyoming Game and Fish Department (2010b), Yellowstone Center for Resources unpublished data (March 2011).

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#### Bighorn sheep, *Ovis canadensis*

**DESCRIPTION:** A medium-sized ungulate with well-developed horns. Body size and proportions differ markedly between sexes, with adult males larger, having better-developed neck muscles, visible scrotal testes as adults, and horns that grow, with age, longer and more massive than those of females. Fur is reddish to dark brown on the back, with white muzzle, belly, rump, and hind legs. Measurements (**Sex** [n] mean (kg), *range*): western Alta.; WT = F  $\geq$  4 years [65] 72, 54–91; M  $\geq$  7 years [15] 108, 101–120.<sup>1</sup> Dental formula: 0/3, 0/1, 3/3, 3/3 = 32.

**STATUS:** A “big game animal” by state statute, this is a state Species of Greatest Conservation Need as of 2012.<sup>2</sup> It is rare to common in occupied habitats statewide.

**NOMENCLATURE AND SYSTEMATICS:** One of two North American species of wild sheep, the genus and species names have been stable through time. Of the seven subspecies recognized in 1981, two occurred in Wyoming in presettlement times: *O. canadensis canadensis* over most of the state and *O. c. auduboni* along the eastern margin, including Inyan Kara Mountain.<sup>3</sup> This eastern subspecies (Audubon’s bighorn), which occupied the Badlands and Missouri Breaks of eastern Montana and the Dakotas, and the Black Hills, is now extinct. Bighorns have been translocated in recent decades into Wyoming from Nevada, Idaho,