

# Moose

## *Alces americanus*

### **REGULATORY STATUS**

USFWS: No special status  
USFS R2: No special status  
USFS R4: No special status  
Wyoming BLM: No special status  
State of Wyoming: Big Game Animal (see regulations)

### **CONSERVATION RANKS**

USFWS: No special status  
WGFD: NSS4 (Bc), Tier II  
WYNDD: G5, S4  
Wyoming Contribution: LOW  
IUCN: Least Concern

### **STATUS AND RANK COMMENTS**

Moose (*Alces americanus*) is classified as a big game animal in Wyoming by W.S. § 23-1-101 <sup>1</sup>. Harvest is regulated by Chapter 8 of Wyoming Game and Fish Commission Regulations <sup>2</sup>.

### **NATURAL HISTORY**

#### **Taxonomy:**

Bradley et al. (2014), following Boyeskorov (1999), has recognized North American/Siberian Moose as *A. americanus*, separate from European Moose (*A. alces*) based on chromosome differences <sup>3, 4</sup>. Bowyer et al. (2000) cautions against using chromosome numbers to designate speciation in large mammals <sup>5</sup>. Molecular <sup>6</sup> and morphological <sup>7</sup> evidence supports a single species. The International Union for Conservation of Nature recognizes two separate species but acknowledges this is not a settled matter <sup>8</sup>. George Shiras III first described this unique mountain race of Moose during his explorations in Yellowstone National Park, from 1908 to 1910 <sup>9</sup>. In honor of Shiras, Dr. Edward W. Nelson named the Yellowstone or Wyoming Moose *A. alces shirasi* <sup>10</sup>. That original subspecies designation is now recognized as *A. americanus shirasi*, Shiras Moose, which is the only recognized subspecies of Moose in Wyoming and surrounding states. Three other recognized subspecies occur in distant portions of North America, with an additional 4 subspecies in Eurasia <sup>6, 11</sup>.

#### **Description:**

Moose is the largest big game animal in Wyoming and the largest member of the cervid family. Shiras Moose is the smallest of the four subspecies of Moose found in North America. It is the least social ungulate in Wyoming and is often observed alone or in small groups <sup>12</sup>. Moose is easily identifiable by its large size, dark brown color, long legs, large ears, long bulbous muzzle and bell shape dewlap under the throat. Male Moose weigh up to approximately 816 lbs (370 kg) and generally grow palmicorn antlers each year <sup>13</sup>. Some males, particularly young animals, may grow antlers that are more cervicorn shaped or similar to Elk (*Cervus canadensis*) antlers. Adult

males without antlers can be identified by pedicel scars. Adult female Moose weigh up to 750 lbs (340 kg)<sup>13</sup>. Female Moose can generally be identified from bulls due to the absence of antlers and the presence of a vulva patch or area of light colored hair around the genital area. Calf Moose typically remain close to the cow and body size is the most useful criteria for distinguishing calves from cows. However, head features can also be used to identify larger calves. Calves typically have small ears and a short pointed nose compared to older animals<sup>12</sup>.

**Distribution & Range:**

Shiras Moose occurs in portions of Wyoming, Idaho, Utah, Colorado, Montana, Washington, and southern Alberta and southeastern British Columbia. Moose is believed to have entered Wyoming through Yellowstone National Park and along the Teton Range from southeast Idaho during the 1800s. There is no archaeological evidence of Moose populations in Wyoming prior to the 1800s<sup>14</sup>. By the 1930s Moose began to occupy portions of the Wind River Range. In addition to natural colonization of western Wyoming, Moose was translocated from northwest Wyoming to the Bighorns (1948, 1950, 1974, and 1987), and Colorado (1979, 1987)<sup>15</sup>. Moose colonized the Snowy Range and Sierra Madre Mountains from Colorado. Moose currently occupies the mountain ranges of northwestern and western Wyoming, as well as the Bighorn Mountains in north central Wyoming and the Snowy Range and Sierra Madre Mountains in southeastern Wyoming. Individuals are occasionally observed far from mountain population centers.

**Habitat:**

Wyoming Moose occupies lacustrine and palustrine habitats associated with Engelmann Spruce (*Picea engelmannii*), Douglas (*Pseudotsuga menziesii*) and Subalpine Fir (*Abies lasiocarpa*), and Lodgepole Pine (*Pinus contorta*) forests. In western Wyoming, Moose moves to higher elevations during summer and selects for areas close to aspens (*Populus tremuloides*) and conifers<sup>16</sup>. The selection of summer range appears to be highly influenced by landscape features that provide high quality forage and also limit thermal stress. During winter, Moose generally selects low elevation riparian/deciduous shrub vegetation dominated by willow (*Salix* spp.). In areas where riparian habitats are limited or during more severe winters, Moose selects for mature conifer forests that provide abundant cover and forage. Some Wyoming Moose move up in elevation during the winter<sup>17</sup>. In the Bighorn Mountains, Moose rarely exhibits elevational movements seasonally. It usually shifts from willow riparian habitats to conifer habitats during the winter months.

**Phenology:**

Moose is a year round resident in Wyoming with most individuals in a population moving between distinct summer and winter ranges. Movement from summer range to winter range typically involves descending to lower elevations where snow depths are shallower and animal mobility is greater. Radio collared Moose exhibited a high degree of variability in the onset of spring and fall migrations in western Wyoming ( $N = 118$ ). Unlike other cervids, Moose generally does not collect harems or associate in large groups during the breeding season<sup>18, 19</sup>. Breeding occurs during late September – early October and males usually travel extensively during the rut to locate and breed receptive females. Because of the short breeding season, males likely breed only a few females each year. The gestation length is approximately 231 days, although the literature reports some variability<sup>18</sup>. Moose parturition peaks across much of North America around May 25<sup>20</sup>. In the Sublette and Jackson herds parturition occurred from May 10 to June 19, with a mean date of May 25 ( $N = 129$ )<sup>21</sup>. In other Moose populations, twinning is common

when habitats are in good shape although it is unclear if Shiras Moose exhibit this trait. Ritchie (1978) reported 12% twinning rate in Idaho and Houston (1968) reported 5% twinning rate in the Jackson area<sup>22, 23</sup>. While twinning rates may not be a good indicator of habitat condition for Shiras Moose, pregnancy rates may be. In the Sublette herd unit, Oates et al. (In prep.) observed an average pregnancy rate of only 63% from 2001–2014, with one set of twins in 2014.

**Diet:**

Willow is an important forage, constituting approximately 60% of the winter diet<sup>17</sup> and approximately 90% of the summer diet<sup>24-26</sup>. Moose also takes advantage of other available high quality forage including Bitterbrush (*Purshia tridentata*), Serviceberry (*Amelanchier alnifolia*) and other mountain shrubs. During winter, Subalpine Fir was the second most important winter forage for Moose in the Snowy Range<sup>17</sup>, and Yellowstone National Park<sup>27</sup>.

**CONSERVATION CONCERNS**

**Abundance:**

**Continental:** WIDESPREAD

**Wyoming:** UNCOMMON

In 2014, local Wyoming Game and Fish Department (WGFD) managers estimated the statewide Moose population at 4,050 animals<sup>28</sup>.

**Population Trends:**

**Historic:** INCREASE

**Recent:** STABLE

Currently Moose herds across the state are exhibiting a wide range of population performance<sup>29</sup>. Local populations in Teton County have exhibited a large decline over the last two decades, the Sublette County herd has remained relatively stable while other areas of the state have increased during that time<sup>16, 21, 29</sup>. These trends are similar to Moose populations in the northern mid-west states. Populations in what were considered historic Moose range in Wyoming have declined significantly, while Moose populations in newer habitats (e.g., southeastern Wyoming) have fared much better.

**Intrinsic Vulnerability:**

MODERATE VULNERABILITY

Moose is strongly adapted to cool climates, and may be physiologically stressed by high temperatures. In the southern reaches of the species' range, such as Wyoming, temperature is the most critical factor determining distribution. During winter Moose may become stressed by temperatures greater than 23° F (5° C). In summer Moose may become stressed when temperatures exceed 57° F (14° C)<sup>30</sup>. Moose may be affected by climate change and the regional variation in habitat quality that will occur as temperatures rise and preferred foraging areas become drier<sup>31</sup>. Moose are susceptible to diseases and parasites, although the effects of such on Moose populations are still being elucidated. Chronic wasting disease, a fatal neurological prion disease, was discovered in a free-ranging Moose in western Wyoming in 2008. Subsequent surveillance has not found additional positive animals. Statewide monitoring of hunter-harvested Moose and other Moose mortalities for Carotid Arterial Worm (*Elaeophora schneideri*) was conducted in 2010. Approximately 50% of the Moose sampled had arterial worms present<sup>32</sup>. Winter tick loads vary considerably year-to-year, and may affect overwinter survival when tick loads are high<sup>33</sup>. Very little is known about the implications of these and other diseases (e.g., West Nile virus, keratoconjunctivitis) on Moose population performance.

### **Extrinsic Stressors:**

#### **SLIGHTLY STRESSED**

Threats to Moose populations in Wyoming and range wide are primarily from degradation, fragmentation, and loss of habitats through urban development, mineral exploration, human disturbance, winter recreation, expanding large predator populations (see Becker 2008, Jesmer et al. 2014) and motor vehicle collisions. In addition, large scale wild fires may reduce habitat quality<sup>34</sup>, and could increase in frequency and severity as the climate warms.

### **KEY ACTIVITIES IN WYOMING**

The WGFD and the University of Wyoming Cooperative Fish and Wildlife Research Unit have implemented research projects on Moose in an effort to evaluate population performance in relation to habitat condition and to collect baseline demography and movement data. In Teton County, habitat quality was likely influencing Moose demography although the impacts of predation could not be ruled out. Research also determined that wildfire on summer ranges may be partially responsible for observed population declines<sup>16, 34</sup>. In Sublette County, baseline information was collected on the Sublette Moose herd in response to potential energy development and to develop a comprehensive data set to help managers understand the influence of nutrition on population demography. Adult female Moose exhibited low survival and low pregnancy rates suggesting that habitat quality may be limiting this Moose population. High neonate survival likely allows the population to remain stable<sup>21</sup>. In southeast Wyoming the seasonal habitat requirements and the distribution of Moose in the Medicine Bow Mountains were studied. Global positioning collars confirmed the importance of riparian shrub, deciduous forest and mixed forest cover types for Moose. A habitat suitability index model was developed for this population<sup>17</sup>. In addition, regional habitat-performance research evaluating linkages between habitat, nutritional condition and population performance is underway<sup>29</sup>. In 2007, the Conservation Research Center of Teton Science School initiated a habitat evaluation starting with the northwest Wyoming<sup>35</sup>.

### **ECOLOGICAL INFORMATION NEEDS**

Specific herd unit knowledge of Moose demographics linked to habitat and nutrition is lacking. More refined estimates of population trend would be useful, since some populations have experienced declines while other herds have been relatively stable or increasing. Current trend data usually isn't sensitive enough to detect population changes until they are well underway. More effort is needed to identify cause specific mortality to further evaluate the effects of predation. Further assessments of Moose response to habitat modifications from large scale wild fire, energy development and climate change are needed.

### **MANAGEMENT IN WYOMING**

*This section authored solely by WGFD; Doug Brimeyer and Tim Thomas.* Moose is classified as a Species of Greatest Conservation Need in Wyoming<sup>36</sup>. Moose populations in Wyoming are delineated into 10 distinct herd units that are further divided into 38 hunt areas. Seven hunt areas are currently closed to Moose hunting<sup>2</sup>. All Moose herds are designated in the "Special" management category. Each herd unit is managed towards an objective based on population trend data and or harvest indices (e.g., animal age, hunter effort). A median age of harvested bulls > 4.5 yr and a male to female ratio of 50–70 males/100 females is desired<sup>37</sup>. After each

hunting season all moose license holders are surveyed by mail and phone, and data are used to estimate total harvest, harvest composition, and to develop harvest statistics including hunter success, hunter effort (days hunted per moose harvested) and total recreation days. Age data and antler width measurements are collected from harvested moose and non-hunting mortalities. Age is determined through cementum analysis of the primary incisor (I1) <sup>37</sup>. Moose poses unique challenges for managers trying to census populations because they occur in small groups, tend to segregate according to sex and age, and are found in diverse vegetation cover types. Ground or aerial surveys are conducted during the pre-hunting season or post hunting season period on Moose herds in Wyoming. Composition data are expressed as the number of bulls and calves per 100 cows and used to estimate recruitment of calves into the population and to evaluate the presence of bulls.

### **CONTRIBUTORS**

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Figure 1: Adult male Moose in Seedskae National Wildlife Refuge, Sweetwater County, Wyoming. (Photo courtesy of Tom Koerner, USFWS)

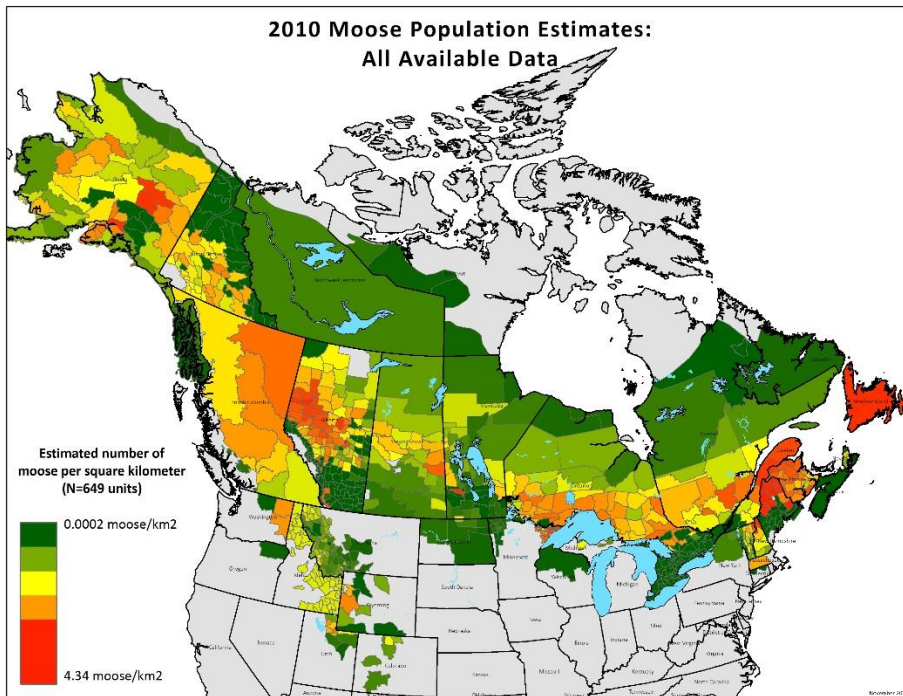


Figure 2: North American range of *Alces americanus* as of 2010 (Map from: Jensen, W. F., et al. (In Prep.) Mapping continental range distribution of moose over time using geographic information systems technology.)



Figure 3: Willow wetland Moose habitat in Albany County, Wyoming. (Photo courtesy of Kaylan A. Hubbard)

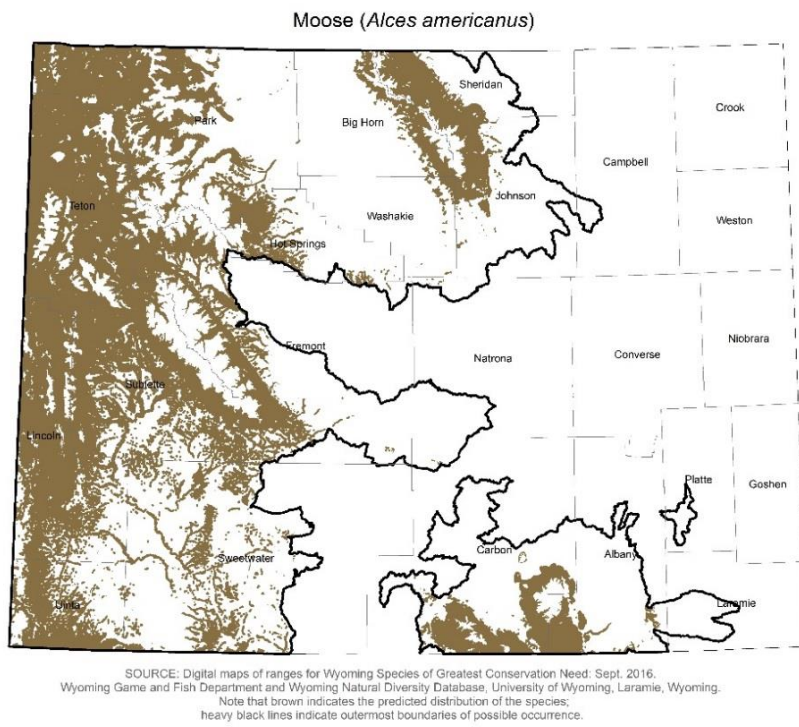


Figure 4: Range and predicted distribution of *Alces americanus* in Wyoming.





Figure 5: Adult female Moose with calf in Seedskaadee National Wildlife Refuge, Sweetwater County, Wyoming. (Photo courtesy of Tom Koerner, USFWS)