HISTORY AND STATUS OF MOOSE IN OREGON

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ABSTRACT: Moose (*Alces alces*) were not present in Oregon at the time of European settlement. Five Alaskan moose were transplanted to the central Oregon coast in 1922, but the effort ended in failure. The first recorded sighting of moose in northeast Oregon occurred in 1960, and 20 sightings were reported at various locations throughout northeast Oregon from 1960-2000. From 2001-2006 the number of sightings increased substantially in the northern Blue Mountains of Oregon, including the first documented calf in 2005. Moose in the northern Blue Mountains became established through natural dispersal, with most believed to have dispersed southwest across the Palouse Prairie from the Moscow Mountain area of Idaho. Moose habitat in the Blue Mountains is characterized by managed coniferous forest with a mixture of mature timber and logged areas in various stages of succession. Survey efforts were established in 2006, with the present population estimated at 60. In 2008, 6 moose were radio-collared to obtain baseline information on reproduction, habitat use, and seasonal movements. Captured moose appeared healthy and were without external parasites, although the carotid worm (*Elaeophora schneideri*) was identified in a bull moose that died accidentally in 2010. The Oregon Department of Fish and Wildlife plans to continue monitoring population status, range expansion, and health of moose in Oregon.

ALCES VOL. 48: 63-66 (2012)

Key words: *Alces alces*, Blue Mountains, carotid worm, moose, Oregon, range, population, range.

There is no historic evidence indicating that moose (*Alces alces*) ever occurred in Oregon. Verts and Carraway (1998) did not include moose in their list of mammals of Oregon due to lack of physical evidence of the species. However in his book "The Mammals and Life Zones of Oregon", Bailey provides an account of moose on the basis of a report (Dice 1919 in Bailey 1936) that the species formally occurred in the Blue Mountains of southeast Washington. My review of early literature pertaining to Oregon, including diaries of explorers and settlers, provided no reference to moose in Oregon at the time of European settlement. The first documented moose in Oregon were 5 bottle-fed calves (3 females, 2 males) transplanted from the Kenai Peninsula, Alaska to the south central Oregon Coast at Tahkenitch Lake in October 1922 (Shay 1976). Individuals from the transplant and their offspring were habituated to humans resulting in constant damage complaints from rural residents; this effort ended when the last moose was dispatched in 1931.

The first record of moose in northeast Oregon occurred in August 1960 when a single cow was observed by residents along the Imnaha River in Wallowa County (Matthews 2006). In 1968 a cow moose was reported by Dick Rivers, a jet boat operator on the Snake River at Pittsburg Creek (Bartels 1968). In August 1971 a photograph of a young bull near Battle Creek on the Snake River was taken by another jet boat operator, James Zanelli (Coggins 1971). From 1960-2000, 20 different sightings were reported at various locations in northeast Oregon (Matthews 2006); all were believed to be individual transient moose that eventually disappeared. From 2001-2006, the number of moose sightings increased, particularly north of Elgin in the Wenaha Wildlife Management Unit in the northern Blue Mountains (Matthews 2006). In 2005 a photograph taken by Robert Larison in the

Wenaha Unit documented the first calf moose observed in Oregon (Matthews 2006).

Moose expanded their range and increased in numbers during the last half of the 20th century in both Washington (Base et al. 2006) and Idaho (Compton and Oldenburg 1994). Moose in the northern Blue Mountains of Oregon became established through natural dispersal, and most are believed to have moved southwest across the Palouse Prairie from the Moscow Mountain area of Idaho. Other moose sightings in northeast Oregon occur occasionally in and around the Wallowa Mountains, indicating that moose are probably still expanding their distribution in northeast Oregon. Based on information from radio-collared moose and surveys, the current range is principally associated with the Blue Mountains (Fig. 1).

MANAGEMENT

Recognizing that Oregon likely had a resident population of moose, Oregon Department of Fish and Wildlife (ODFW) biologists began ground and aerial search efforts to locate and classify individual moose in the Wenaha unit in 2006. Biologists also contacted members of the public and employees of other resource agencies who had reported visual sightings of moose. Photographs were used, when available, to identify and record individual moose. A minimum of 19 moose were classified in 2006 (9 cows, 8 calves, and 2 bulls), and similar classification efforts continued through 2010 (Table 1). Location of moose tracks was recorded during aerial and ground searches when visual observation was unsuccessful. Track information coupled with classification of individual moose was used to derive a conservative population estimate of 60 moose in Oregon during winter 2010-11.

No formal management plan has yet been established to guide moose management in Oregon. However, by statute, the ODFW will manage moose to protect and perpetuate moose and their habitats to provide optimum recreational and aesthetic benefits to citizens of the state. In cooperation with the Confederated Tribes of the Umatilla Indian Reservation, and the Umatilla National Forest, the ODFW initiated research to capture and radio-collar moose in the northern Blue Mountains to gather baseline information on habitat use, seasonal movements, and recruitment of resident moose. In 2008, 6 adult moose (5 cows and 1 bull) were captured by net-gunning and radio-collared; 1 collar (cow) quit transmitting shortly after capture. In 2009 an additional cow was radio collared, another collar quit operating, and 3 collared moose died of unknown causes. In 2010, radio-collars were deployed on 3 more adult cows. Of 10 collared moose, 4 received GPS transmitters and 6 VHF transmitters. The GPS transmitters were programmed to obtain 8 locations per 24 h, and the VHF moose were ground or aerially located 1-4 times per month. All moose were captured during winter months, and appeared healthy with no observed winter ticks (*Dermacentor albipictus*) or other external parasites.

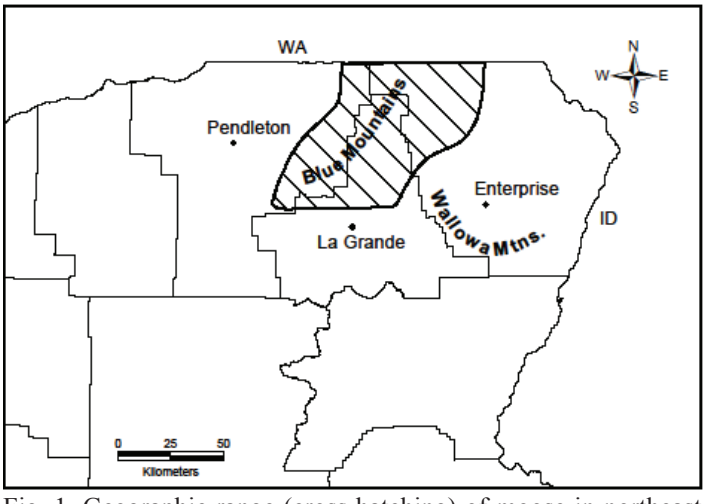

Fig. 1. Geographic range (cross hatching) of moose in northeast Oregon, USA, 2011.

Table 1. Gender, age, and composition ratios of moose observed in ground and aerial surveys during fall and winter in the northern Blue Mountains of Oregon, 2006-2010.

Year	Observed	Cows	Calves	Bulls	Calves: 100 cows	Bulls: 100 cows
2006	19	9	8	2	89	22
2007	21	11	6	4	55	36
2008	28	16	7	5	44	31
2009	31	18	7	6	39	33
2010	29	15	7	7	47	47

HABITAT

The northern Blue Mountains of Oregon contain coniferous forests managed by private landowners, timber companies, ODFW, and the Umatilla National Forest. Much of the Blue Mountains are bisected by steep rugged drainages. Preliminary information from radio tracking indicates moose are utilizing much of the same range during winter and summer months, at elevations of 1100-1700 m. Currently 7656 and 109 locations have been generated from the GPS and VHF moose, respectively. Formal analysis of location data has not been completed; however, visual observations of radioed moose and plotted locations on orthoimagery indicate most habitat use by moose occurs in the upper reaches of drainages where topography is less precipitous. Past and current silvicultural practices, wildfires, and controlled burns in the region have resulted in a wide variety of timber stands and openings in various stages of succession.

In summer months moose appear to be utilizing older stands of mixed lodgepole pine *(Pinus contorta)*, western larch *(Larix occidentalis)*, Engelmann spruce *(Picea engelmannii)*, Douglas fir *(Pseudotsuga menziesii glauca)*, and true firs *(Abies* spp.*)* that are adjacent to logged openings. Recently logged areas often contain Scouler willow *(Salix scouleriana)*, ceanothus (*Ceanothus* spp.*)*, serviceberry *(Amelanchier alnifolia)*, common chokecherry *(Prunus virginiana)*, Rocky Mountain maple *(Acer glabrum)*, sticky current *(Ribes viscosissimum)*, and other deciduous species.

During winter moose remain in mountainous areas where past logging activity has created dense stands of mixed conifer and deciduous species, until deep snow apparently causes them to move to slightly lower elevations. Moose move across deep drainages, but rarely remain on canyon side walls for extended periods. Only 2 of 10 radio-collared moose spent a substantial amount of time in riparian habitats along river corridors during summer months; river bottoms were not used during winter months.

REPRODUCTION AND MORTALITY

At the time of capture, 6 of 9 captured cow moose were accompanied by 7-9 month old calves. All radio-collared cows were believed to have produced calves each year they were monitored based on observation of calves or typical maternal behavior. One of 4 calves born to radio-collared cows survived to at least 11 months of age in 2008, as did 1 of 2 in 2009. In 2010, 5 cows produced 5 calves that survived to at least 11 months of age, including 1 set of twins.

Of 3 adult mortalities in 2009, 1 was in late April and 2 were in July; no cause of death was determined for any. The adult cow moose that died in April was captured and collared 2 months earlier, and immediately prior to capture, was observed to be slightly ataxic, but otherwise of normal body condition. When captured, it was noted that 4-6 cm of her left ear tip was sloughed. Both moose that died in July appeared to be in normal body condition at the time of death; 1 was observed to have necrosis of the left ear tip. Ear tip sloughing, observed in 2 of the 3 deaths, can be a clinical sign of the presence of carotid worm in moose, as is loss of muscular coordination (Madden et al. 1991) such as observed in the April death. However, none of the 3 carcasses

were examined for presence of carotid worm. During the 2010 captures, a 3-year old bull was accidentally killed, and 3 adult carotid worms were found during gross examination of its carotid arteries. Several other cow moose have been observed with ear tip necrosis in the northern Blue Mountains of Oregon, yet appear to be healthy normal individuals.

FUTURE DIRECTION

Although management of moose in Oregon is not a high priority, current monitoring of radio-collared moose will continue into 2012 followed by analysis of habitat use. In the near future, management will include continued monitoring of population growth and distribution, particularly north of Wallowa in the Sled Springs Wildlife Management Unit where recent timber harvesting has created extensive forest openings. Efforts will be made to establish annual winter aerial surveys as a means to monitor population trends. Limited hunting opportunities may be initiated if moose numbers continue to expand. I also recommend that future research and management include monitoring dead and sick animals for presence of carotid worms.

ACKNOWLEDGEMENTS

I am grateful for the financial support and cooperation provided by the Oregon Hunters Association, Oregon Wildlife Heritage Foundation, Confederated Tribes of the Umatilla Indian Reservation, Blue Mountain Habitat Restoration Council, and the Umatilla National Forest which paid for radio-collaring, monitoring, and survey flights. I thank 2 anonymous reviewers, Mike Hansen, and Vic Coggins for comments on earlier drafts of this manuscript. I thank Greg Rimbach for his help preparing Fig. 1.

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