

2015 - JCR Evaluation Form

SPECIES: Moose

PERIOD: 6/1/2015 - 5/31/2016

HERD: MO545 - SNOWY RANGE

HUNT AREAS: 38, 41

PREPARED BY: WILL SCHULTZ

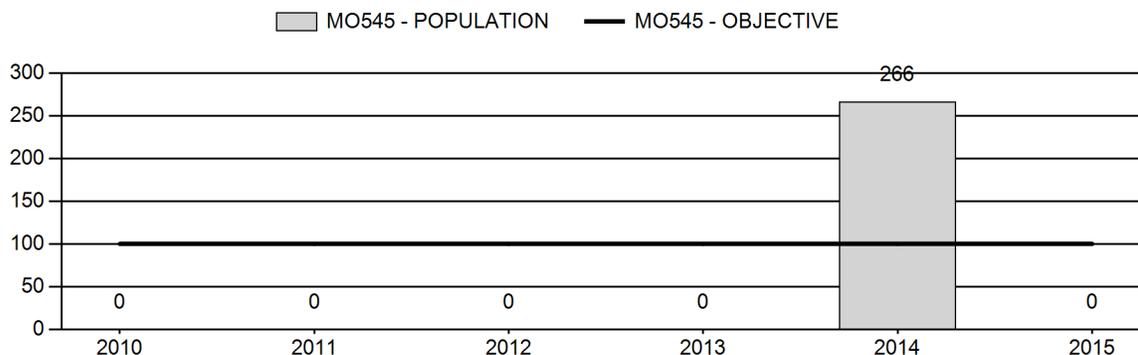
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	53	N/A	N/A
Harvest:	49	36	40
Hunters:	54	46	45
Hunter Success:	91%	78%	89 %
Active Licenses:	54	46	45
Active License Success:	91%	78%	89 %
Recreation Days:	441	311	350
Days Per Animal:	9	8.6	8.8
Males per 100 Females	97	212	
Juveniles per 100 Females	49	62	

Population Objective ($\pm 20\%$) :	100 (80 - 120)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	N/A%
Number of years population has been + or - objective in recent trend:	20
Model Date:	None

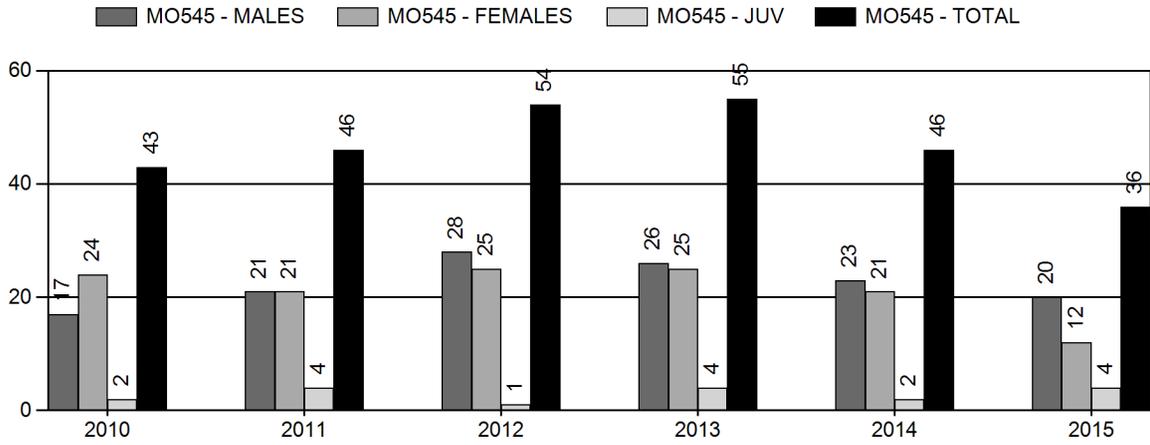
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	NA%	NA%
Males ≥ 1 year old:	NA%	NA%
Juveniles (< 1 year old):	NA%	NA%
Total:	NA%	NA%
Proposed change in post-season population:	NA%	NA%

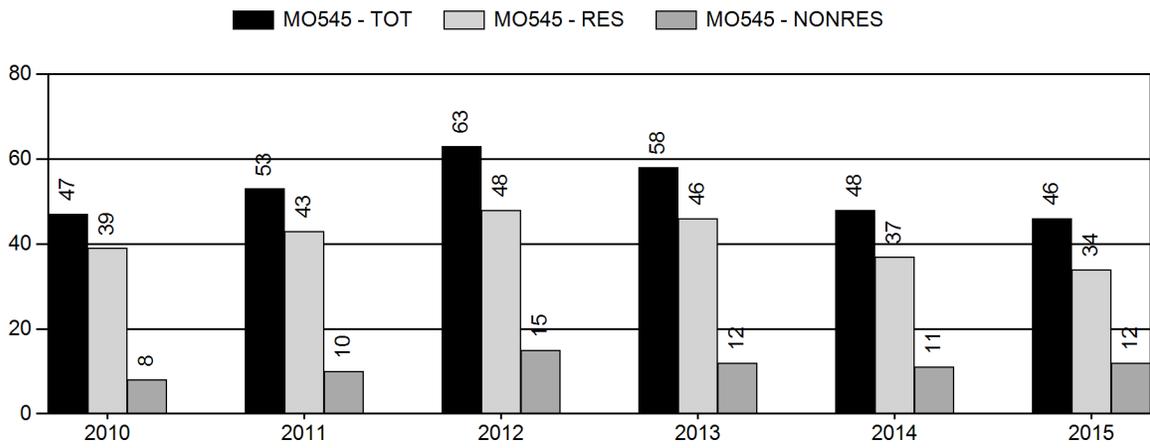
Population Size - Postseason



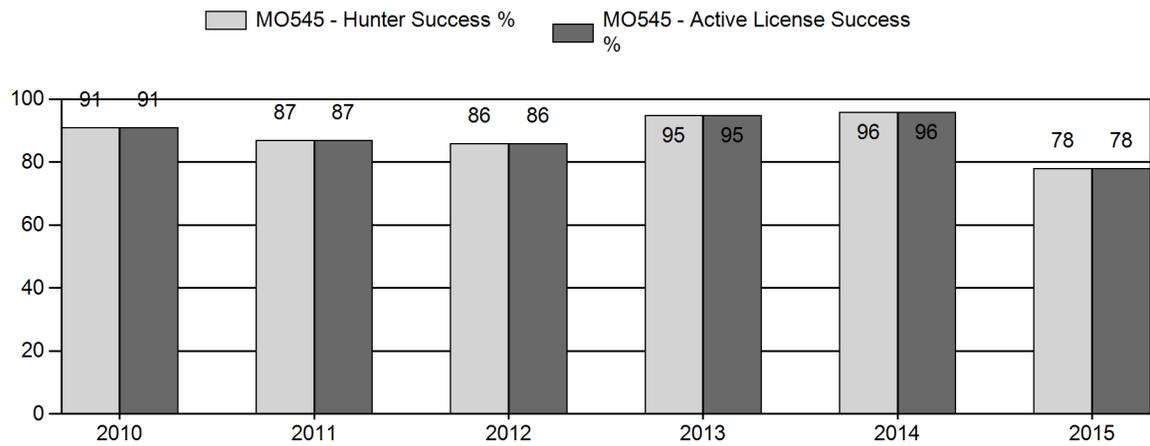
Harvest



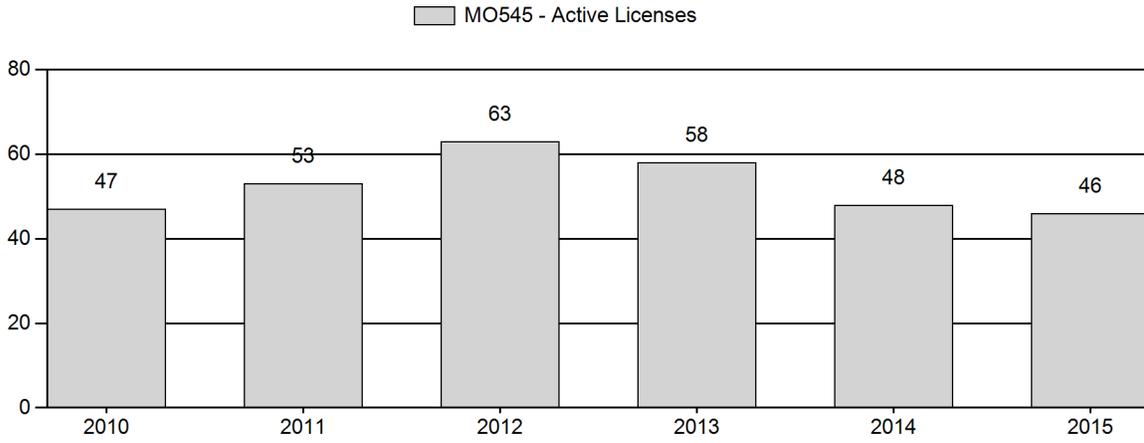
Number of Hunters



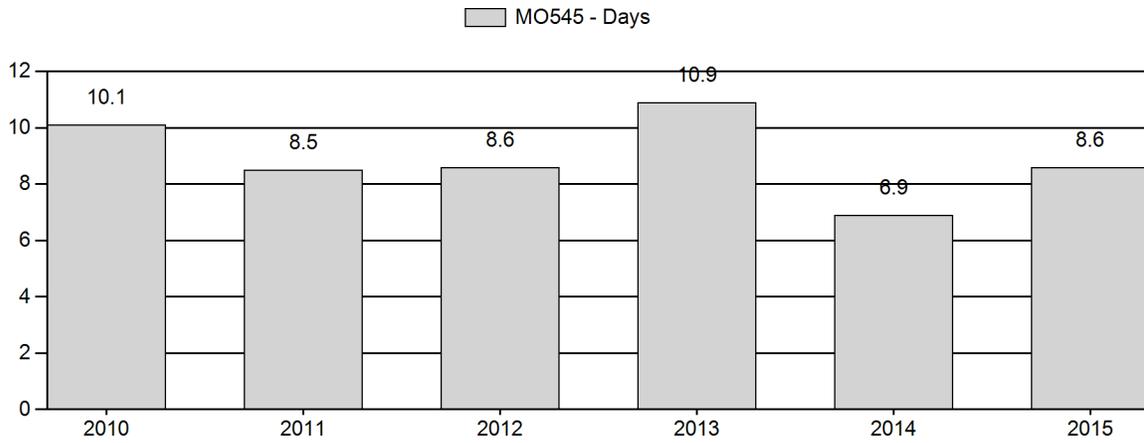
Harvest Success



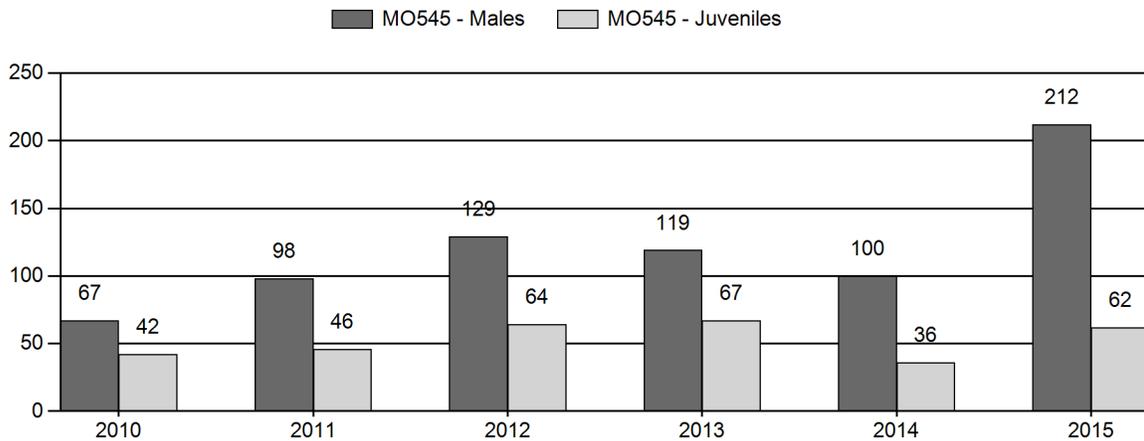
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2010 - 2015 Postseason Classification Summary

for Moose Herd MO545 - SNOWY RANGE

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylg	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2010	0	7	17	24	32%	36	48%	15	20%	75	0	19	47	67	± 0	42	± 0	25
2011	0	3	46	49	40%	50	41%	23	19%	122	0	6	92	98	± 0	46	± 0	23
2012	0	4	14	18	44%	14	34%	9	22%	41	0	29	100	129	± 0	64	± 0	28
2013	0	5	27	32	42%	27	35%	18	23%	77	0	19	100	119	± 0	67	± 0	31
2014	266	2	20	22	42%	22	42%	8	15%	52	254	9	91	100	± 35	36	± 17	18
2015	0	0	17	17	57%	8	27%	5	17%	30	246	0	212	212	± 0	62	± 0	20

**2016 HUNTING SEASONS
SNOWY RANGE MOOSE (MO545)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
38, 41	1	Oct. 1	Nov. 14	20	Limited quota	Any moose, except cow moose with calf at side
	4	Oct. 1	Nov. 14	20	Limited quota	Antlerless moose, except cow moose with calf at side
	Archery	Sep. 1	Sep. 30			Refer to license type and limitations in Section 3 of Chapter 8

Hunt Area	License Type	Quota change from 2015
38	4	-5
Herd Unit Total	4	-5

Management Evaluation

Current Postseason Population Management Objective: 100 (80 – 120)

Management Strategy: Special

2015 Postseason Population Estimate: NA

2016 Proposed Postseason Population Estimate: NA

Moose in the Snowy Range herd unit are managed toward a numeric objective of 100. A moose population model has not been developed for this herd unit. The herd is managed under a special management strategy. The management objective was last reviewed in 1997. We plan to review the management objective in 2016.

Herd Unit Issues

The Snowy Range herd unit stretches across southern Wyoming, along the Colorado border, from Baggs to Cheyenne. Moose are found year-round in areas on Pole Mountain, Sierra Madre Mountains, and most notably, the Snowy Range Mountains. These moose descended from moose transplanted in Colorado and historically were not native to this area. Challenges for managing moose in this herd unit include a rapidly changing forest ecosystem, high infestation rates for parasites, and human conflict/safety. Limited population monitoring for moose has been an issue in this herd unit.

Weather

Precipitation during the growing season (April thru June 2015) across all seasonal ranges, and growing season precipitation in higher elevation spring/summer/fall ranges (May thru July 2015) was notably higher than the 30-year average. As is consistent with most prominent mountain ranges in Wyoming, the majority of precipitation accumulated during the period outside of the primary growing season, primarily in the form of snow. From August – October, conditions were very mild and dry. Winter 2015 - 2016, as of mid-February, has been fairly mild, with upper elevations in the Snowy Range near 100% of normal for snowpack (Figure 1), but lower elevations lacking in persistent snow through most of the winter.

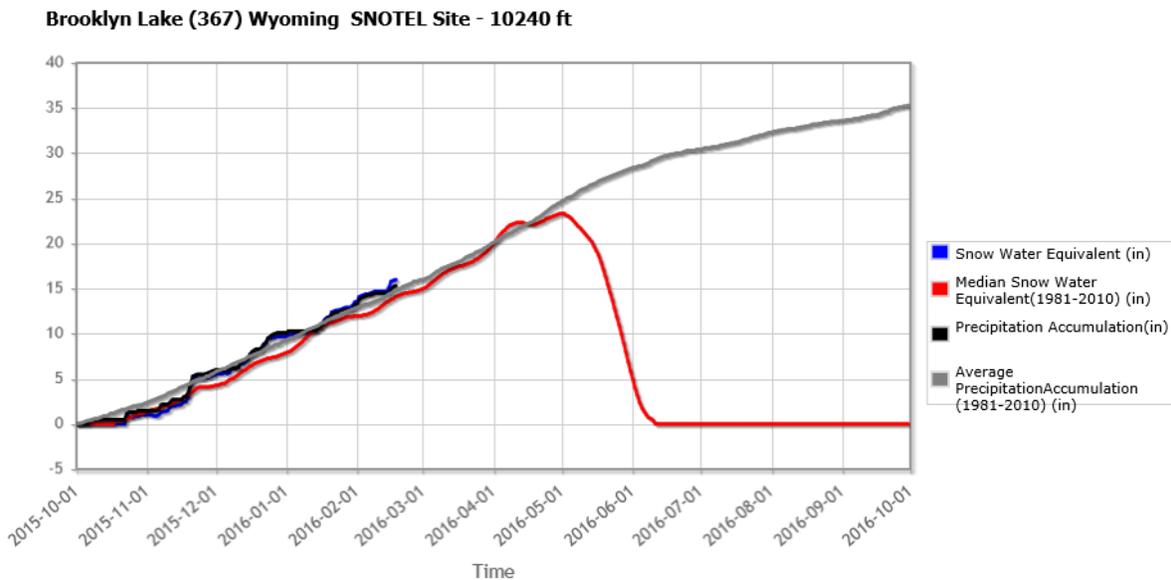


Figure 1. Snotel Site within Snowy Range Moose Herd Unit, Wyoming (October 2015 – February 2016).

Habitat

Growing season precipitation was above normal in 2015, resulting in excellent growth of grasses, forbs, and shrubs across all seasonal ranges. Exceptional fall precipitation in 2014 resulted in green-up of forages. High soil moisture levels from fall 2014 precipitation events and normal snowpack in winter 2015 likely positively impacted vegetation growth in spring 2015. However, despite favorable precipitation levels, many important shrub habitats continue to underperform due to maturity and decadence, caused by a lack of disturbance. Moose fecal pellets were collected in winter 2015 in the southernmost portions of the herd unit, south of Woods Landing, to determine winter dietary preferences within the herd unit. In summary, fecal collections were comprised of 73% *Salix spp* and 20% *Betula spp*. It will be important to monitor these riparian plant communities in the future knowing these dietary preferences.

Moose habitat conditions were monitored 2012-2014 across Wyoming and in the North Park, Colorado area through a University of Wyoming project. Preliminary results published in a recent annual report for this project indicated the Snowy Range's willow habitat quality and moose fitness were relatively low when compared to the other areas (Jesmer, et. al. 2014).

Habitat conditions improved in 2015 with an increase in timely seasonal precipitation. However, much of the transition and winter ranges were severely impacted by the drought conditions experienced in bio-year 2012. No WGFD moose habitat production/utilization data was available for this herd unit. However, annual production rates were assumed to have improved from the previous year, while utilization rates on winter ranges were assumed to have continued to be high.

Field Data

Traditionally there has been little allocation of funding in this herd unit to collect moose classification data. Moose classification data in the Snowy Range herd unit has been collected incidentally during annual mule deer and elk classification surveys. A classification sample of 30 moose was collected in December of 2015 in conjunction with mule deer and elk surveys. Although moose were known to be present in Hunt Area 41, no moose were observed there during the classification flight. The 2015 classification ratios were 212 bulls/100 cows and 62 calves/100 cows. Although no yearling bulls were observed during the classification survey, total bull ratios were considered to be inflated substantially for this less than adequate classification sample.

Harvest Data

A total of 20 bulls were harvested by 23 hunters in 2015, for a harvest success rate of 87%. In addition to the hunters who drew licenses in the regular drawing, there were 4 nonresidents who harvested in the Snowy Range herd unit with Wyoming Governor's licenses, and the 2015 Wyoming Super Trifecta Tag winner also harvested in the Snowy Range herd unit. Overall antlerless harvest was 16 moose by 23 hunters for a success rate of 70%. As is typically the case in this herd unit, many of the antlerless moose hunters struggled to locate a cow without calves at side, and influenced the overall antlerless success rate. A bull moose was illegally harvested by an elk hunter in Hunt Area 41, on the west slope of the Sierra Madres.

The Snowy Range herd unit has a reputation for producing trophy quality bulls, and this continued again in 2015. Median age for tooth samples (n=17) from harvested bulls remained at 5-years of age in 2015 (Figure 1). The 3-year running average for median age of harvested bulls decreased slightly to 4.7 years of age (Figure 2). The proportion of bulls in the harvest which were 5-years or older increased to 70% (Figure 3). Overall, the bull harvest continued to be within the Department's parameters for "prime-age bulls."

The age of antlerless moose in 2015 harvest was similar to the 2014 results (Figure 4). The proportion of antlerless harvest ≤ 2 years in age (60%) was considered acceptable.

Figure 1. Median age of bulls harvested for the Snowy Range moose herd unit, from lab aged teeth (n=17), Wyoming,

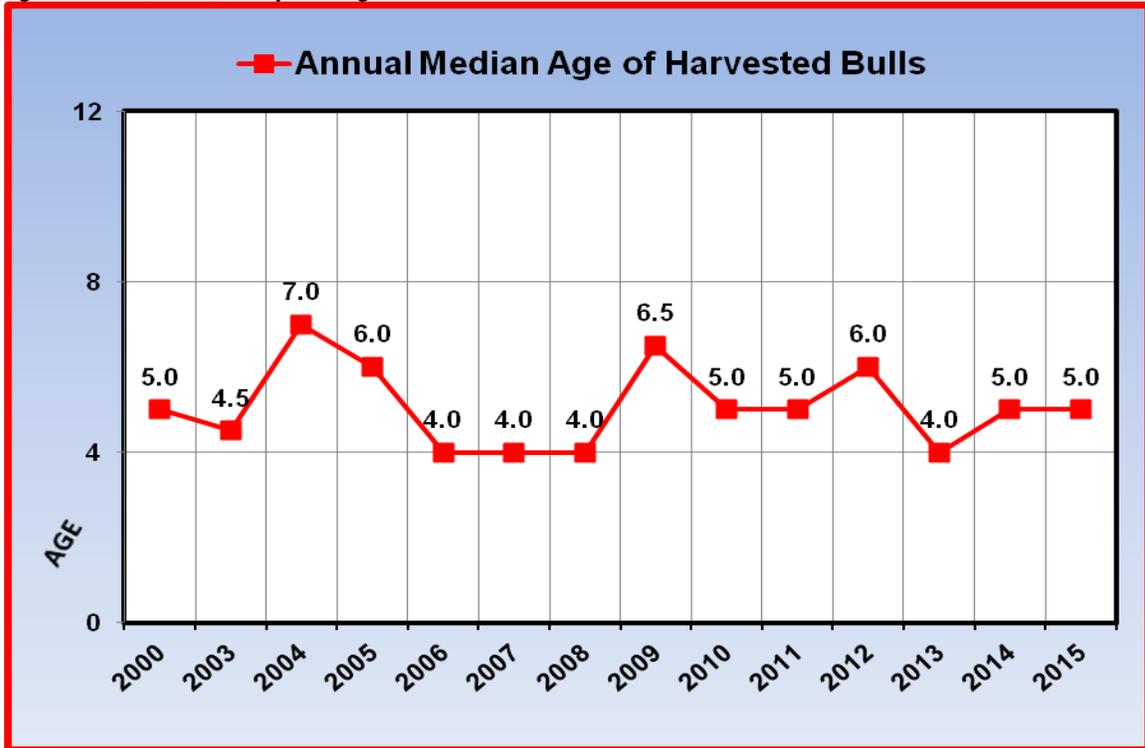


Figure 2. Average (3-year running) median age of bulls harvested for the Snowy Range moose herd unit, from lab aged teeth (n=17), Wyoming,

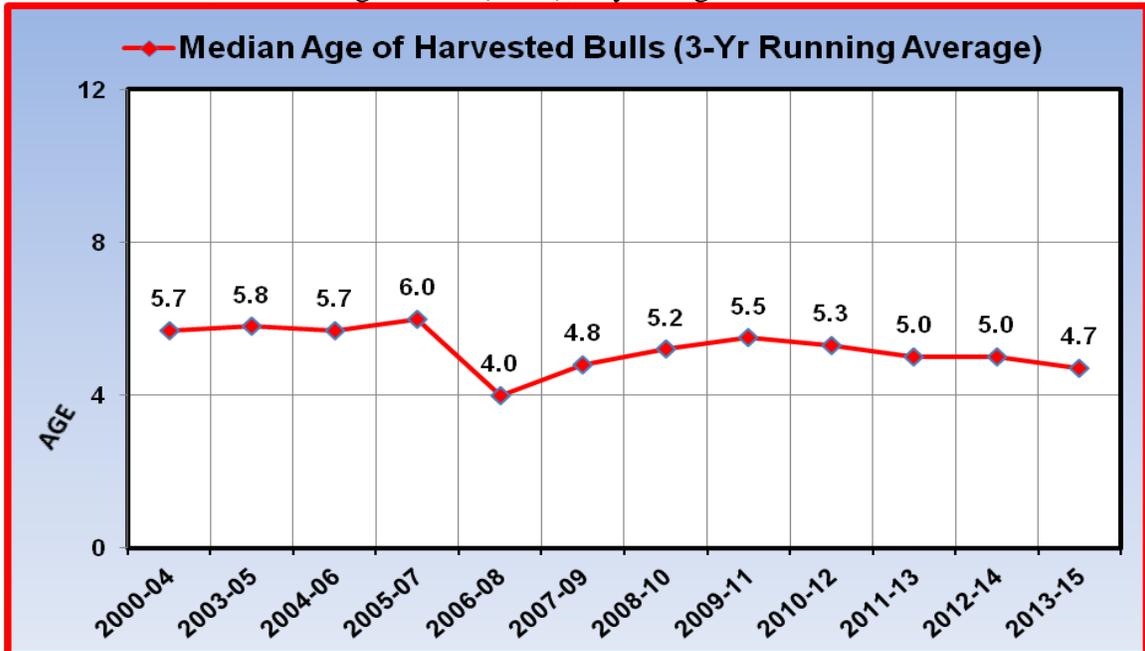


Figure 3. Annual Percentages of the bull harvest ≥ 5 -years in age from Snowy Range Moose Herd Unit, from lab aged teeth (n=17), Wyoming,

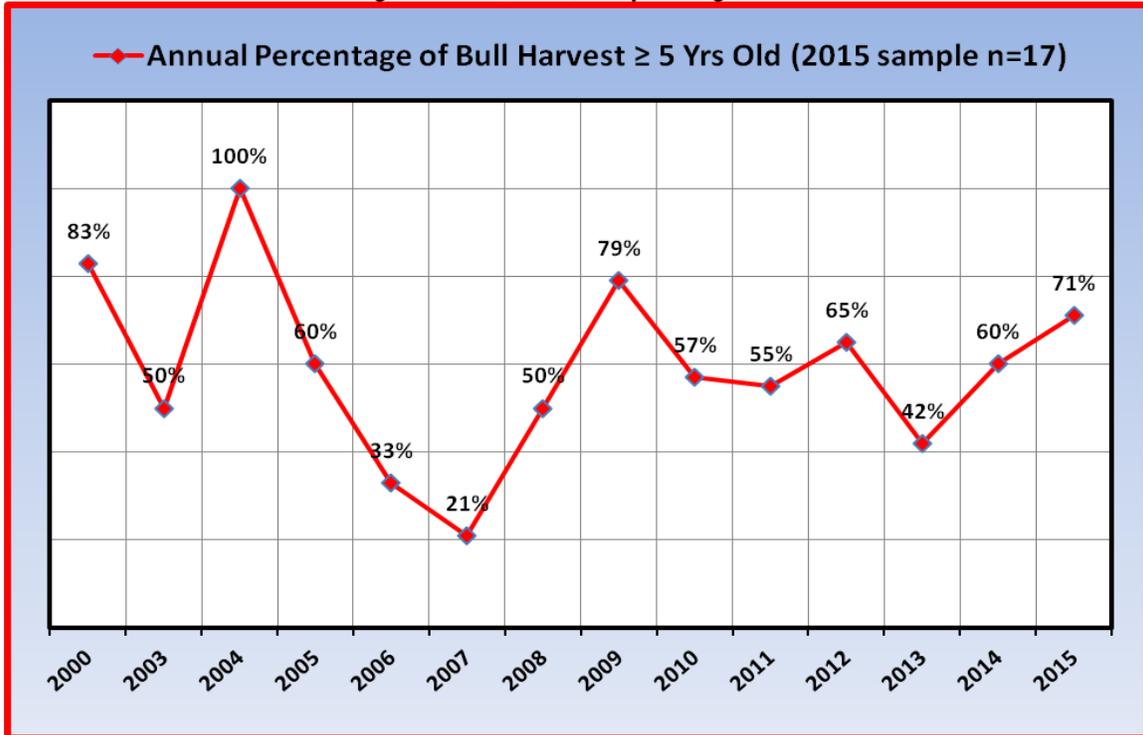
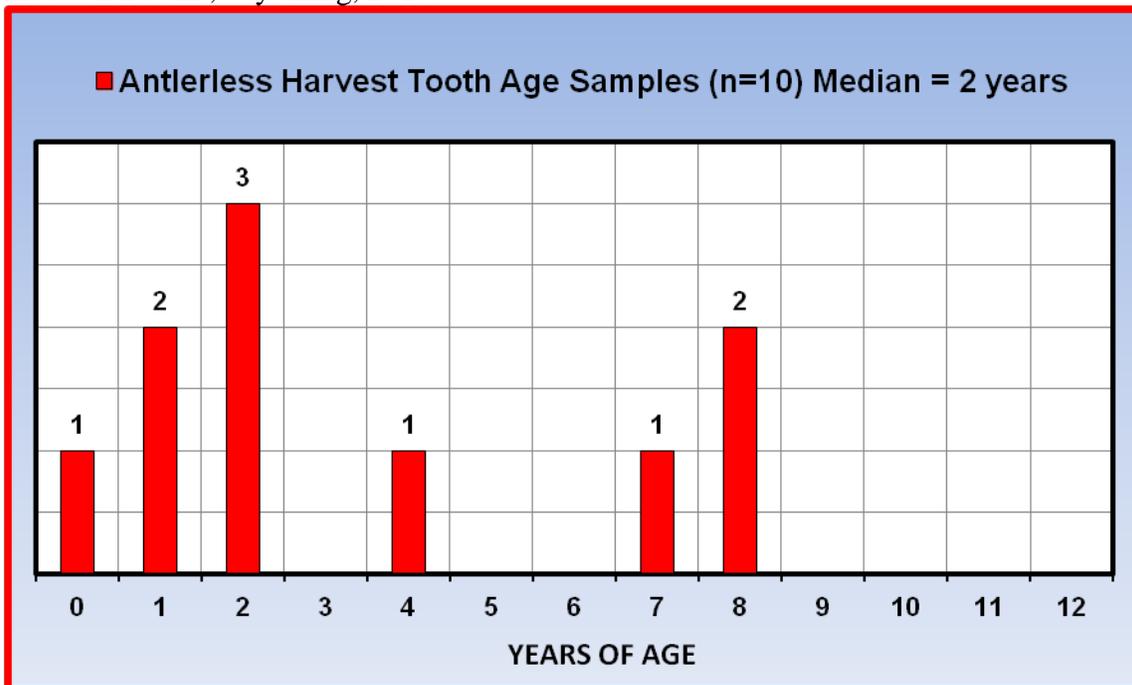


Figure 4. Age class distribution for antlerless moose harvested from Snowy Range moose herd unit, Wyoming, 2015.



Population

A population model has not been developed for this herd unit. A moose abundance survey was completed in the Snowy Range herd unit in March 2015. Results of this bi-year 2014 survey were a mid-winter total abundance estimate of 266 ± 56 (90% *CI*) (*SE* = 34) moose. These results provided managers with the first plausible abundance estimate for moose wintering in the Snowy Range herd unit. The abundance estimate will be useful in constructing a population model and making future harvest recommendations for moose in this herd unit. The management objective of 100 moose postseason will be reviewed later in 2016.

Management Summary

In 2016, hunting season lengths remained the same as in 2015. Type 1 license numbers remained at 20 licenses. Type 4 antlerless moose licenses were decreased from 25 to 20 because of concern for over harvest. This decrease was completed in part to keep the Snowy Range moose population from reaching a less than acceptable population level.

Current Herd Specific Studies

A current study initiated in fall 2014 by the Wyoming Cooperative Fish and Wildlife Research Unit and the Wyoming Game and Fish Department presents an excellent opportunity to examine the relationship between moose habitat use and seral changes brought about by bark beetles (Appendix I). By making use of an existing GPS dataset collected prior to extensive beetle damage (Baigas 2008), comparing it to new GPS data, and examining current individual movement strategies through the lens of body condition, this project will provide new information on the status of moose in the Snowy Range and their response to its beetle-killed forests.

The project began its field component in March 2015. Thirty (30) female moose (29 adults and one yearling) were captured via helicopter darting on winter habitats within and surrounding the Medicine Bow National Forest. Moose were fitted with GPS store-on-board collars set to collect 90-minute fixes. The fix-rate is identical to that used in the previous study, which will allow us to compare movement strategies and space use of moose prior to and following the extensive bark beetle damage. Collars will remain deployed until the spring of 2017; during which study animals will be recaptured twice per year to gather longitudinal data on demography and body condition (measured via ultrasonography). Monitoring body condition in the context of pregnancy (during winter) and lactation costs (in summer) will allow the project to critically examine the habitat quality of the Snowy Range, with the goal of understanding where the herd sits relative to nutritional carrying capacity.

Bibliography of Herd Specific Studies

Baigas, P. E. 2008. Winter Habitat selection, winter diet, and seasonal distribution mapping of Shiras moose (*Alces alces shirasi*) in southeastern Wyoming. M.S. Thesis, Univ. Wyoming, Laramie, Wyoming, USA. 220 pp.

Wyoming Game and Fish Department [WGFD]. 2000. Snowy Range – Sierra Madre Moose Herd Management Plan. Wyoming Game and Fish Department, Laramie. USA. 15 pp.

Literature Cited

Jesmer, B., Jacob Goheen, Matthew Kauffman, Kevin Monteith, Aly Courtemanch. 2014. Statewide Moose Habitat Project: Linking Habitat and Nutrition with Population Performance in Wyoming Moose. Annual Report 2014. Department of Zoology and Physiology, University of Wyoming, Laramie. 11 pp.

Thomas, T. P. 2008. Moose Population Management Recommendations. Wyoming Game and Fish Department, Cheyenne. 17 pp.



Snowy Range Moose Project

January 2016 Update

Alex May¹, Kevin Monteith¹, Matt Kauffman¹, Corey Class², Lee Knox², Will Schultz³

¹ Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie, Wyoming 82071

² Wyoming Game and Fish Department, Laramie Region, Laramie, WY 82070

³ Wyoming Game and Fish Department, Laramie Region, Saratoga, WY 82331

Project Description

Shiras moose have seen declines in recent decades across much of their statewide range due to a multitude of factors. The Snowy Range herd, which colonized the area following an introduction into North Park Colorado in the 1970s, is thought to be robust to these changes. Relatively new, lacking wolves or grizzly bears, and with liberal human harvest, the Snowy Range herd may be free of density-dependent pressures and existing as a small but highly productive population. Despite the impressions of stable population performance, the landscape of the Snowy Range has been altered dramatically by the mountain pine beetle, and the moose herd has not been studied since 2006. Moreover, effects of pine beetle outbreak on large mammals are almost entirely unknown. A collaborative study initiated in fall 2014 by the Wyoming Cooperative Fish and Wildlife Research Unit and the Wyoming Game and Fish Department presents an excellent opportunity to examine the relationship between moose habitat use and seral changes brought about by bark beetles. By making use of an existing GPS dataset collected prior to extensive beetle damage (Baigas 2008), comparing it to new GPS data, and examining current individual movement strategies through the lens of body condition, this project will provide new information on the status of moose in the Snowy Range and their response to its beetle-killed forests. The project began its field component in March 2015; 30 female moose (29 adults and one yearling) were captured via helicopter darting on winter habitats within and surrounding the Medicine Bow National Forest. Moose were fitted with GPS store-on-board collars set to collect 90-minute fixes, which will allow us to compare movement strategies and space use of moose prior to and following the extensive bark beetle damage. Collars will remain deployed for a period of two years, during which study animals will be recaptured twice per year to gather longitudinal data on demography and body condition (measured via ultrasonography). Monitoring body condition in the context of pregnancy (during winter) and lactation costs (in summer) will allow the project to critically examine the habitat quality of the Snowy Range, with the goal of understanding where the herd sits relative to nutritional carrying capacity.

Project Update

A summer field season has been completed and the first recapture was executed in early December. Calf survival was monitored during two ground survey efforts (one at the beginning of July and the other at the end of August) and calves with collared females were noted during December recaptures. Willow communities were sampled by Philip Baigas and Brett Jesmer in 2007 and 2013 respectively; a selection of survey locations were re-visited this summer for long term habitat quality monitoring. Vegetation sampling was conducted in pine forests in an effort to quantify differences in thermal cover and forb communities across a gradient of tree canopy losses attributed to bark beetle mortality. Four collared moose died since initial collaring, although no deaths were attributed to capture mortality. 25 of the remaining 26 moose were recaptured in December, and three recovered collars were deployed on new moose, bringing the current sample size up to 29. One collar suffered minor damage that prohibited immediate redeployment; this collar is being repaired and will be deployed in March. One moose slated for recapture was in terrain inaccessible to the helicopter; we expect to recapture her in March. The March recapture will be followed by an expanded second summer field season.

Project Moose Status (as of December 2015)

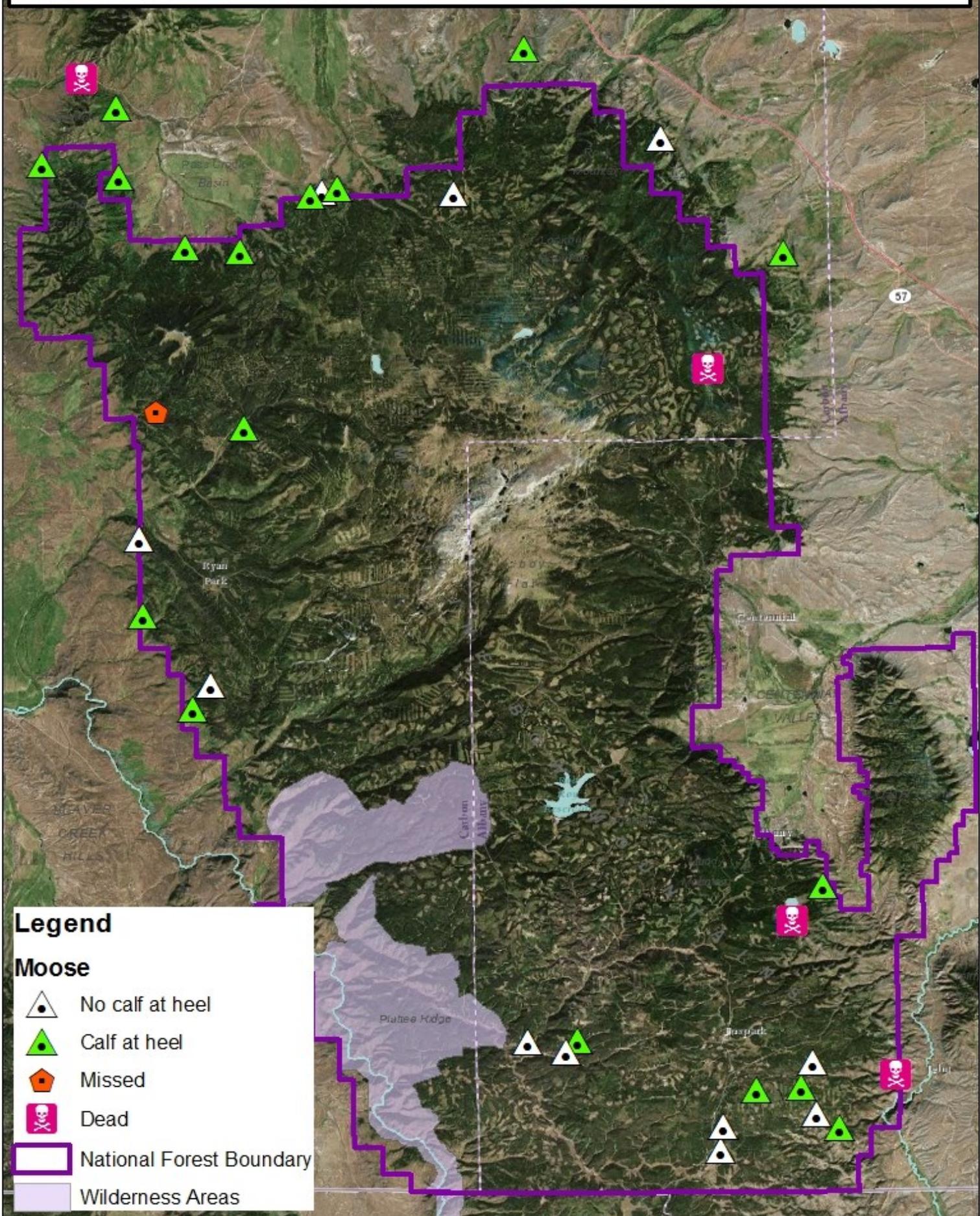


Figure 1: Most recent pertinent locations of all moose collared for the project. Calf status current as of December 2015.



Summer Calf Surveys

Collared moose that were found to be pregnant in March (n=22) were re-sighted in early July and late August/early September to determine calf survival. One pair of twins was seen during the summer surveys. Two moose that were pregnant in March failed to produce a calf that survived to July. Two calves were lost between the July and September survey. An additional calf was lost between the last calf survey and the recapture earlier this month. All told, 16 moose calves have been produced from the 30 moose initially collared in March.



Habitat Quality and Vegetation Monitoring

Willow communities are extremely important food sources for moose in the Rocky Mountains. A metric of browsing pressure developed by Richard Keigley was employed by two other University of Wyoming students working in the area in 2007 and 2013. Previously established transects (n=20) were revisited this past summer with the intention of quantifying habitat quality trends for moose. Vegetation sampling and habitat monitoring efforts will continue in an expanded capacity next summer.

Plots were established in conifer patches within the National Forest in an effort to evaluate how the bark beetle epidemic has potentially modified moose habitat. Tree death and resulting canopy loss may affect moose forage availability and the ability of a pine stand to provide thermal cover and snow refuges. Canopy closure, visual obstruction, and forb/shrub cover was measured within each plot (n=23). Percent tree death will be calculated for each surveyed plot by remote sensing to examine whether heavily affected areas are different in these respects compared to less affected stands.

Seasonal Change in Body Fat Among Individuals

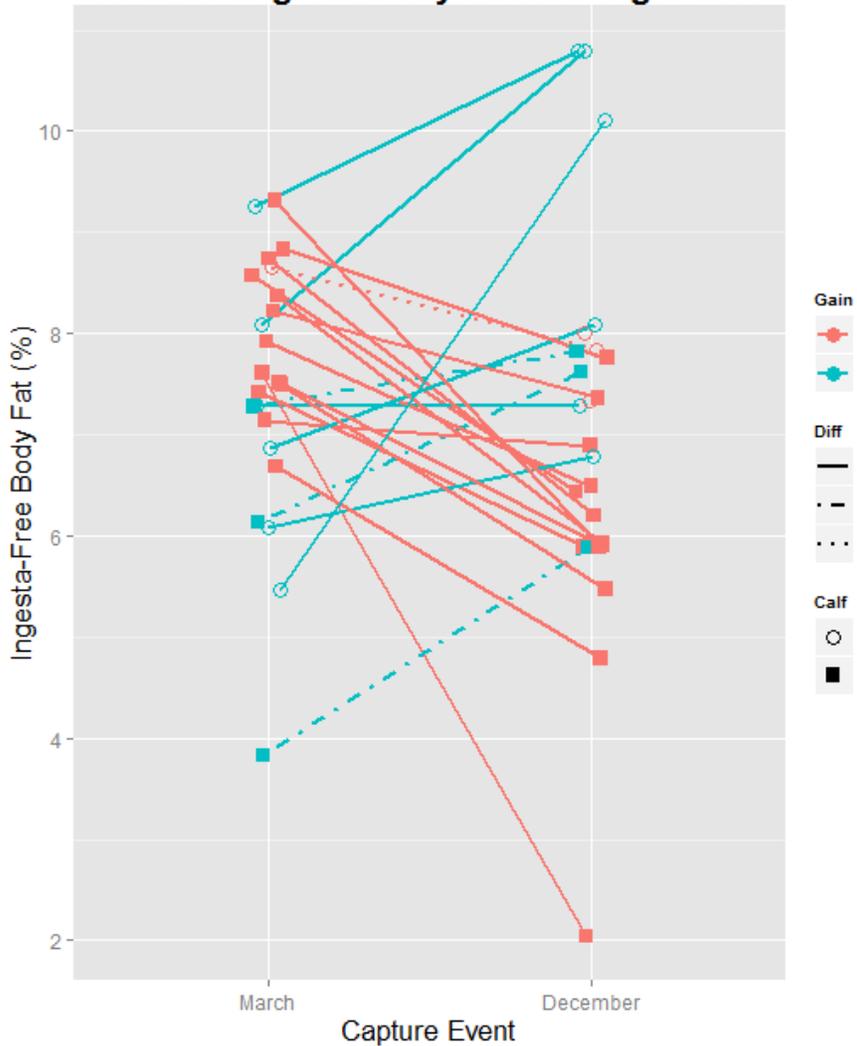


Figure 2: A gain of 0 indicates that moose lost fat reserves between March and December. Gain of 1 indicates that a moose gained fat. Dotted lines represent moose that had trends opposite of the majority given their reproductive status (i.e. moose with calves that gained fat, and lone cows that lost fat).

December Recapture

Assessing longitudinal trends in body condition as a function of habitat selection and reproduction is a crucial component of this project. Measuring percent ingesta-free body fat (IFBFat) through ultrasonography is an informative method to determine nutritional condition. The majority of moose with calves lost fat reserves between captures, which likely reflects the costs associated with lactation and associated behavioral sacrifices related to calf rearing. Some females who raised calves were able to gain fat reserves (indicated by blue dashed lines in Figure 2) and some lone cows lost fat reserves (red dashed lines in Figure 2). Overall, median IFBFat was lower among all females in December than in March (Figure 2, 7.08 and 7.35, respectively). Mean IFBFat was somewhat higher (7.12 in December and 6.84 in March), which was likely attributable to large fat gains in a few individuals.

Ear-cropping (a clinical presentation of *Elaeophora schneideri* infection) was unchanged between the two captures; moose with cropped ears did not display additional cropping, and moose without cropping in March did not lose ear tissue between captures. Tick monitoring continued during the December capture, though most ticks existed as nymphs in December and were very difficult to detect. Comparisons in the upcoming March capture should be more interesting.

2015 Distribution of IFBFat

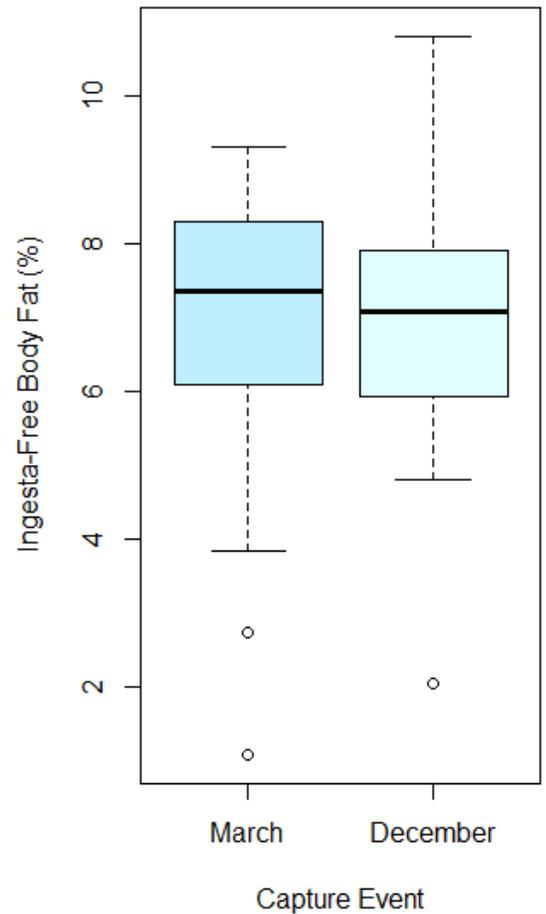


Figure 3: Distributions of percent ingesta-free body fat of all females between capture events. Bolded lines represent means.



Hunter Samples

WGFD personnel facilitated collection of kidney, tooth, and blood samples from moose harvested in units 38 and 41. 22 out of 45 tag holders submitted at least one sample for study. Teeth were obtained from 19 moose, which will help expand age structure sample size for females and add valuable information about males. At least 8 pairs of kidneys were contributed in analyzable condition; kidneys from hunter harvested moose will develop our understanding of moose body condition in the Snowies beyond those already radio-collared.



Acknowledgments

Research is funded by the Wyoming Game and Fish Department and the Wyoming Governor’s Big Game License Coalition. We are grateful to Laramie Region WGFD personnel for their extensive summer field support, landowner contacts, and for facilitating capture operations this December. We are deeply indebted to private landowners around the Medicine Bow National Forest; many project moose resided on private lands throughout the summer and into the December capture. Their willingness to provide access to project personnel for field surveys and recaptures has been critical to the success of this project. Moose were also captured on public lands administered by the USFS, BLM, and State of Wyoming.



Moose (M545) -- Snowy Range/Sierra Madre
HA 38, 41
Revised 6/2004

