

## 2014 - JCR Evaluation Form

SPECIES: Moose

PERIOD: 6/1/2014 - 5/31/2015

HERD: MO105 - SUBLETTE

HUNT AREAS: 3-5, 10, 20-25

PREPARED BY: DEAN CLAUSE

	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Trend Count:	1,217	1,080	1,350
Harvest:	233	206	205
Hunters:	262	235	235
Hunter Success:	89%	88%	87%
Active Licenses:	262	235	235
Active License Success	89%	88%	87%
Recreation Days:	1,926	1,886	1,890
Days Per Animal:	8.3	9.2	9.2
Males per 100 Females:	64	73	
Juveniles per 100 Females	41	33	

Trend Based Objective ( $\pm 20\%$ ) 1,500 (1200 - 1800)

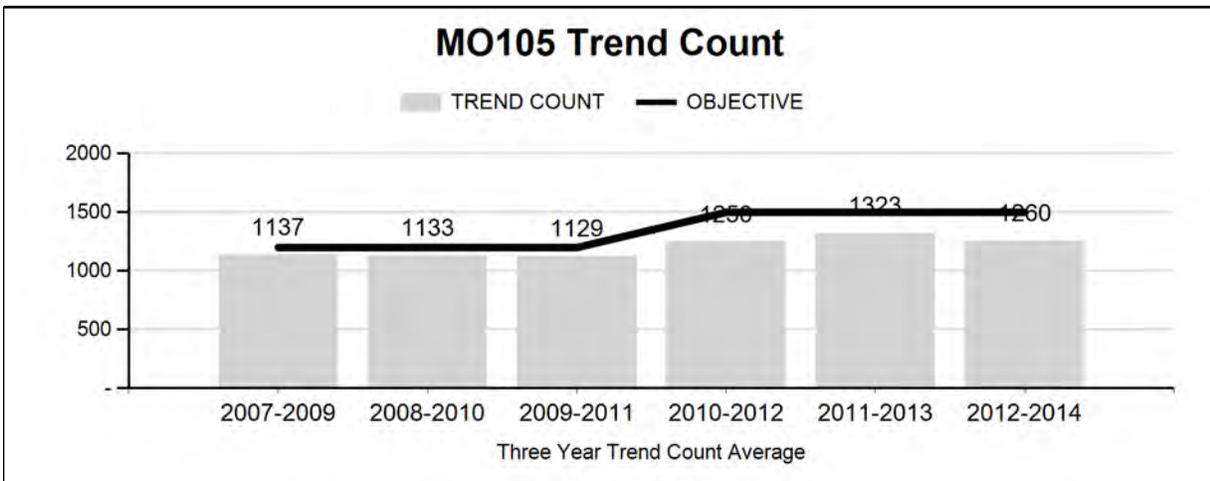
Management Strategy: Special

Percent population is above (+) or (-) objective: -28%

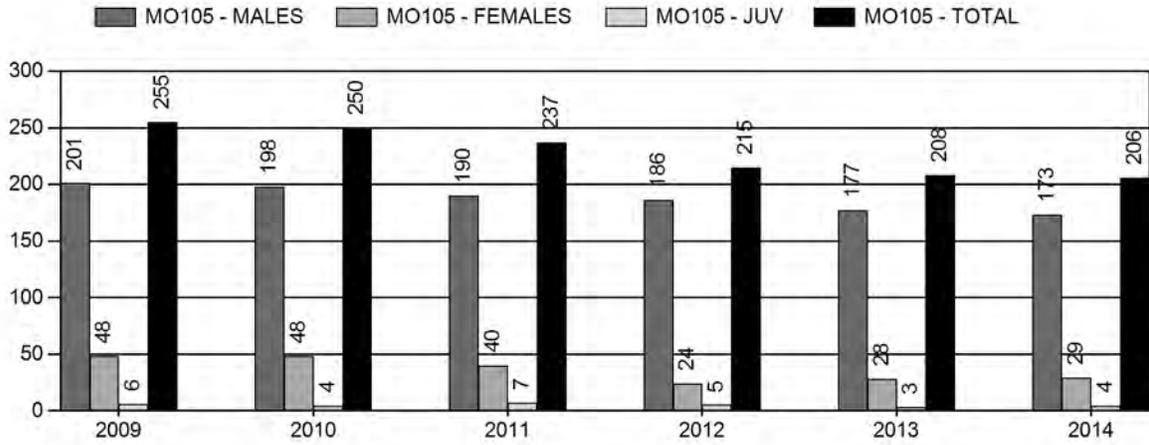
Number of years population has been + or - objective in recent trend: 0

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

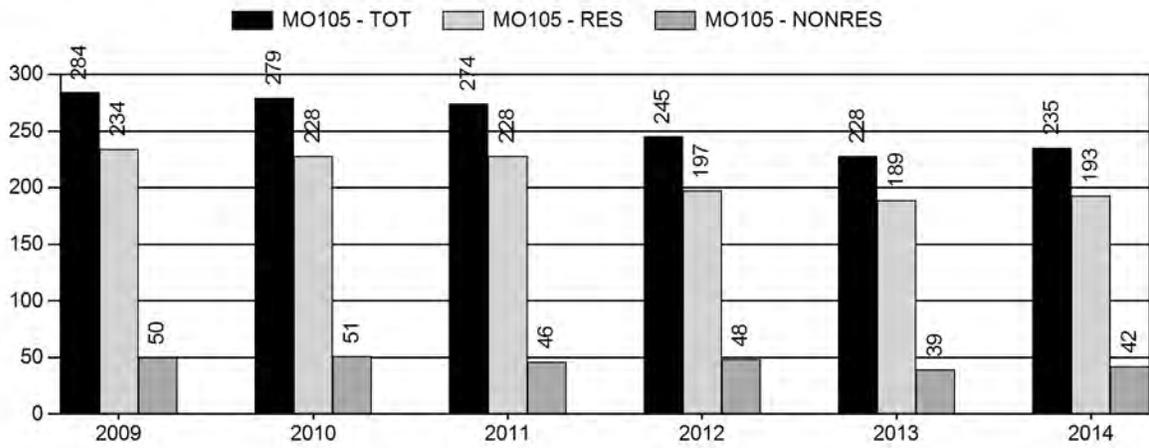
	<u>JCR Year</u>	<u>Proposed</u>
Females $\geq 1$ year old:	0%	0%
Males $\geq 1$ year old:	0%	0%
Juveniles (< 1 year old):	0%	0%



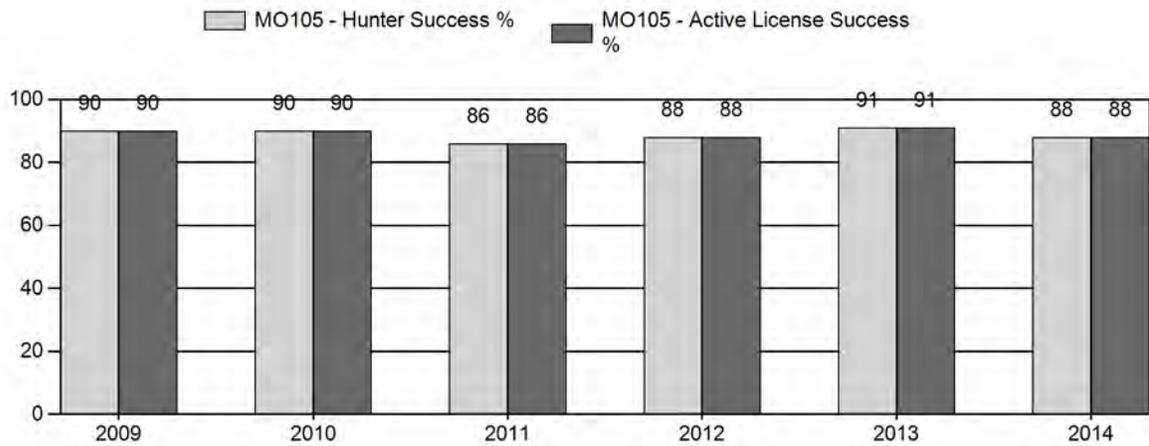
# Harvest



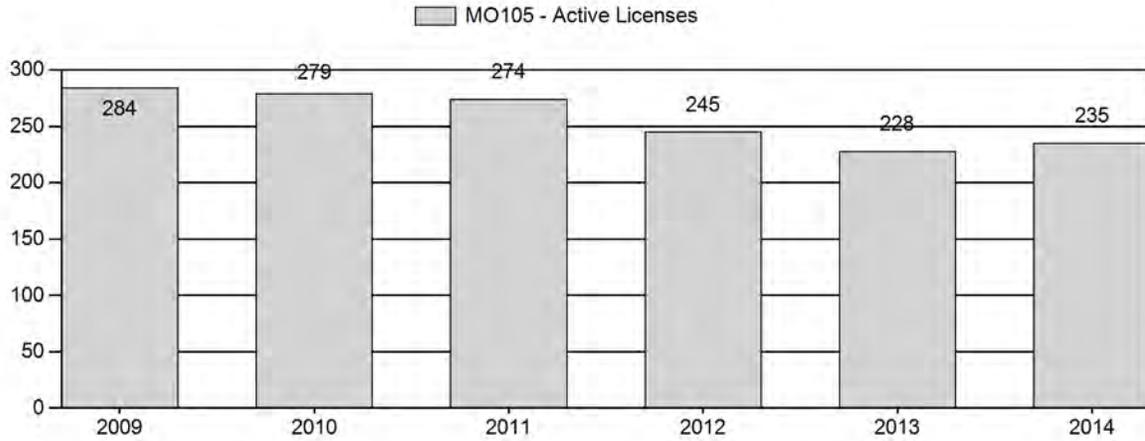
# Number of Hunters



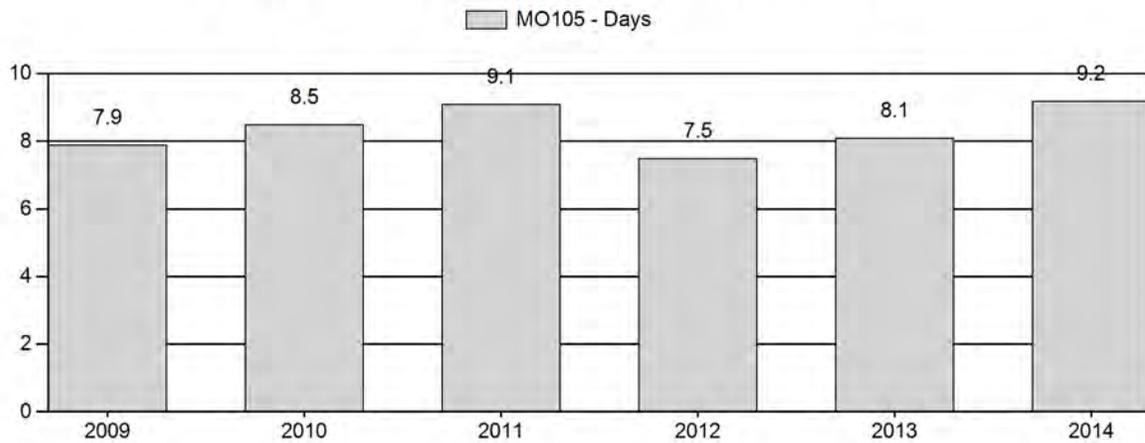
# Harvest Success



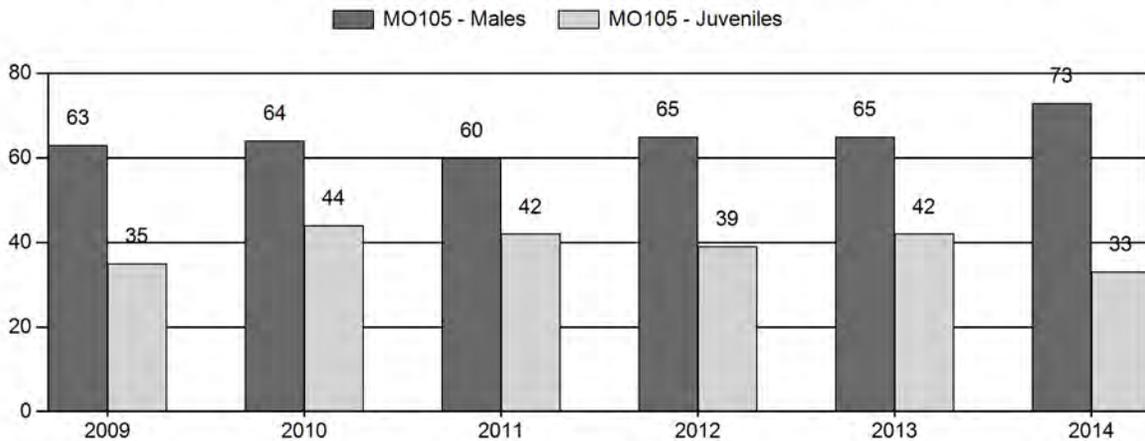
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



**2009 - 2014 Postseason Classification Summary**

for Moose Herd MO105 - SUBLETTE

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females			Young to			
		Ylg	Adult	Total	%	Total	%	Total	%			Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	4,701	0	295	295	32%	465	50%	163	18%	923	1,041	0	63	63	± 0	35	± 0	21
2010	4,908	0	361	361	31%	563	48%	246	21%	1,170	1,111	0	64	64	± 0	44	± 0	27
2011	5,000	0	377	377	30%	625	49%	262	21%	1,264	1,016	0	60	60	± 4	42	± 3	26
2012	0	0	413	413	32%	632	49%	247	19%	1,292	1,118	0	65	65	± 0	39	± 0	24
2013	0	0	435	436	31%	669	48%	282	20%	1,387	909	0	65	65	± 0	42	± 0	26
2014	0	0	380	380	35%	518	48%	173	16%	1,071	800	0	73	73	± 0	33	± 0	19

**2015 Seasons – Sublette Moose Herd Unit (MO105)**

Hunt Area	Type	Opens	Closes	Quota	License	Limitations
3	1	Sept. 20	Oct. 31	10	Limited quota	Antlered moose
4	1	Sept. 20	Oct. 31	10	Limited quota	Antlered moose
	4	Sept. 20	Oct. 31	5	Limited quota	Antlerless moose, except cow moose with calf at side
5	1	Oct. 1	Oct. 31	30	Limited quota	Antlered moose
	4	Oct. 1	Oct. 31	15	Limited quota	Antlerless moose, except cow moose with calf at side
10	1	Sept. 15	Oct. 31	15	Limited quota	Antlered moose
20	1	Sept. 15	Oct. 31	15	Limited quota	Antlered moose
21	1	Sept. 15	Oct. 31	5	Limited quota	Antlered moose
22	1	Oct. 1	Oct. 31	15	Limited quota	Antlered moose
23	1	Sept. 15	Oct. 31	20	Limited quota	Antlered moose
24	1	Sept. 15	Oct. 31	25	Limited quota	Antlered moose
	4	Sept. 15	Oct. 31	5	Limited quota	Antlerless moose, except cow moose with calf at side
25	1	Oct. 1	Oct. 31	45	Limited quota	Antlered moose
	4	Oct. 1	Oct. 31	15	Limited quota	Antlerless moose, except cow moose with calf at side
<b>Archery Seasons</b>						
3,4		Sept. 1	Sept. 19		Limited quota	Refer to Section 3
5,22, ,25		Sept. 1	Sept. 30		Limited quota	Refer to Section 3
10,20,21, 23, 24		Sept. 1	Sept. 14		Limited quota	Refer to Section 3

**Summary of Changes in License Numbers**

Hunt Area	License Type	Quota Changes from 2014
23	1	-5
<b>MO105 Totals</b>	<b>1</b>	<b>-5</b>

## **Management Evaluation**

**Current Mid-Winter Trend Count Management Objective:** 1,500

**Management Strategy:** Special

**2013 Trend Count:** 1,100

**Most Recent 3-year Running Average Trend Count:** 1,260

The Sublette Moose Herd Unit encompasses approximately 3,306 square miles of occupied moose habitat that lies within portions of Lincoln, Sublette, and Teton Counties. The Wyoming Range and Salt River Range Mountains, along with a portion of the Wind River and Gros Ventre Mountains lie within this herd unit. A total of 10 Hunt Areas (Areas 3, 4, 5, 10, 20, 21, 22, 23, 24, & 25) make up the Sublette Herd Unit. A mid-winter trend objective of 1,500 ( $\pm 20\%$ ) moose is the management objective for this herd unit. This herd unit is also under a “special” management strategy to maintain an average harvest age of 4 years old for bulls as a measure to maintain “trophy” harvest opportunities.

## **Herd Unit Issues**

Undetermined moose deaths have been documented within this herd unit during the past years. The significance of these spring mortalities are currently unknown, and it appears other factors besides hunter harvest is slowing population growth. A study is currently being conducted within a portion of this herd unit to document moose demographics, body condition, and survival rates to help managers better understand issues and problems within this moose population. Preliminary findings from this study have indicated lower than expected adult female survival, fluctuating pregnancy rates, and normal calf survival rates. Factors such as habitat conditions, disease, predation, etc. may be attributing to limited population growth in this herd and hopefully this study will identify problems and issues associated with this moose population.

## **Weather**

Although winter snow accumulations appear to influence winter trend count data as counts increase at lower elevations on winters with above average snow loads, little is known of other affects of weather on this moose herd. Recent weather trends have been drier and warmer, with sporadic periods of harsh winter conditions. More specific information can be accessed from the following websites:

<http://www.ncdc.noaa.gov/temp-and-precip/time-series/>

<http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/pdiimage.html>

## **Habitat**

The main plant community associations in this herd unit are willow, sagebrush, aspen, conifer, and alpine communities from lower to higher elevations (6,500 to 12,500 feet). Moose in this herd unit can be found on both private and public land managed by the U.S. Forest Service and Bureau of Land Management (BLM) during summer and fall periods. During the winter months most moose migrate to lower elevation willow bottom or aspen dominated habitats, typically associated with private lands. Roughly 700 square miles of native winter range have been identified in this herd unit, which encompasses all types of land ownership (private, public, and state trust land).

Habitat assessments were conducted in 2009-2011 within portions of this moose herd unit. Specific information about this habitat assessment along with other ongoing habitat project information can be found at the following source: Please see the [2014 Annual Report Strategic Habitat Plan Accomplishments, Jackson and Pinedale Region sections](#) located at either the Jackson or Pinedale Game & Fish Regional Office for detailed summaries of habitat work within the Sublette Herd Unit.

## Field Data

The number of moose documented during 2014 postseason classification surveys decreased compared to 2013. Snow conditions were well below normal during the 2014-2015 winter and classification counts were conducted roughly 3 months later than usual. These 2014 conditions resulted in a higher proportion of moose observations scattered outside riparian bottom habitats, which most likely attributed the lower trend count. High concentrations of moose at lower elevations (Areas 4 and 25) and fewer moose at higher elevation habitats is typical during winter surveys on all years, see Table 1. Trend counts are influenced by winter snow depths, as an even higher proportion of moose concentrate at lower elevation willow bottom habitats on heavy snow years, and vacate higher elevation forested habitats where moose observability is limited. Budgeted survey time limits the coverage of forested habitats, concentrating survey efforts to lower elevation habitats where moose congregate and observability is good. Overall, trend counts have slightly increased annually since 2010, with the exception of 2014.

Postseason classification surveys for 2014 produced a bull:100 cow ratio of 73:100, higher than the previous 5-year average of 64:100. The 2014 calf: 100 cow ratio of 33:100 was lower than the 5-year average of 41:100. In past years observed bull and calf ratio have annually only experienced slight changes, compared the more drastic changes in 2014. Although these more abrupt changes can't be fully explained, the different distribution of moose due to mild winter conditions and a later survey period could possibly account for the increase in the bull ratio and decrease in the calf ratio.

**Table 1. Trend counts by Hunt Area for the Sublette Moose Herd Unit, 2005-2014.**

<u>Hunt Area</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
3	29	24	19	11	56	18	38	21	24	22
4	247	248	244	271	212	261	320	319	346	224
5	93	75	76	106	48	100	44	82	79	34
10	18	52	11	7	13	10	8	4	0	10
20	61	13	39	19	10	16	28	13	32	65
21	4	12	10	22	4	30	23	18	11	7
22	11	6	17	28	30	23	27	49	47	17
23	75	60	50	28	60	46	26	52	55	37
24	0	0	0	0	0	0	0	0	0	0
<u>25</u>	<u>749</u>	<u>606</u>	<u>729</u>	<u>788</u>	<u>503</u>	<u>679</u>	<u>754</u>	<u>742</u>	<u>806</u>	<u>664</u>
<b>Total</b>	<b>1287</b>	<b>1096</b>	<b>1195</b>	<b>1280</b>	<b>936</b>	<b>1183</b>	<b>1268</b>	<b>1300</b>	<b>1400</b>	<b>1080</b>

## Harvest Data

A total harvest of approximately 205 moose (170 bulls and 35 cows/calves) was reported in 2014. This was slightly lower than the 2013 harvest. Harvest has continued to decline slightly during the years, as managers have continued to make slight reduction in licenses. The total number of licenses issued declined from 630 in 2002 to 240 in 2014, a total decrease of 390 (62%). These reductions in license types since 2002 equates to declines of 83% (n=190) in cow/calf and 50% (n=200) in bull licenses. Compared to the previous 5-year averages, hunter success was similar at 88% in 2014, while hunter effort increase to 9.2 days per animal harvested.

A total of 134 teeth representing approximately 65% of the reported 2014 harvest were aged using cementum annuli analysis. The 2014 tooth age results from the WGF D lab showed an average age of 3.9 (derived from 66% of reported harvest) for bulls and 4.6 (derived from 69% of reported harvest) for cows. Average age of harvest remained similar for bulls and increased for cows compared to the 2013 (Figure 1). The 10-year average (2005-2014) age of harvest for this herd unit is approximately 4.0 years for both bulls and cows.

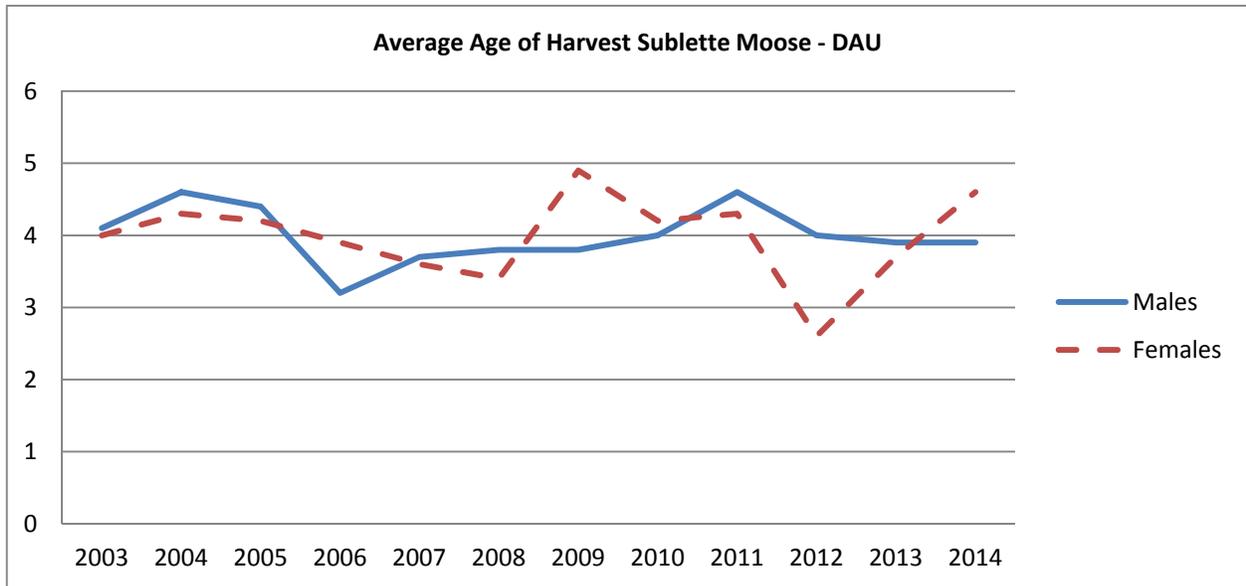


Figure 1. Average age of harvested male and female moose, Sublette Herd Unit, 2003-2014.

### Population

Starting in 2013, a mid-winter trend count was approved as the management objective for this herd unit instead post-hunt population estimates. The mid-winter trend objective for this herd is 1,500 moose ( $\pm 20\%$ ). The 2013 mid-winter trend count was 1100 moose and the 3-year average (2011-2013) trend average was 1260 moose.

Past population modeling efforts for this herd have typically produced estimates higher, usually ~75% higher, than what annual trend counts document. Maintaining comparable classification survey efforts (flight time) compared to past years will provide managers a reliable data set that will reflect population trends in this herd unit. These mid-winter trend counts do not reflect the actual moose population, as not all areas with wintering moose are surveyed and not all moose are observed in those areas that are surveyed.

### Management Summary

Data for this herd unit suggest this postseason moose population was declining in the late 1990's, stabilized in 2004 and 2005, then began slowly increasing through 2013. During 2014, reproduction rates dropped to 33 calves:100 cows, male ratios increased to 73 bulls:100cows, trend counts decreased, harvest success remained high at 88% and hunter satisfaction appears good. In addition, average age of harvested males is adequate and maintaining good bull quality throughout the herd unit. Since 2010 trend data suggest the population is slowly increasing, with the exception of the lower 2014 count that local managers believe is attributed to poor counting conditions and not a decline in the moose population.

Only one change was made for the 2015 season, a reduction of 5 Type 1 licenses in Area 23 (25 to 20 licenses). A total of 190 Type 1 (antlered) and 40 Type 4 (antlerless) licenses are available for 2015. Harvest for 2015 is estimated at 175 bulls and 30 cows/calves for a total harvest of 205 moose. Given average reproduction and survival, this harvest should result in a 2015 mid-winter trend count near 1,400 moose.



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# Sublette Moose Project ♦ 2014 Annual Report

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# Background

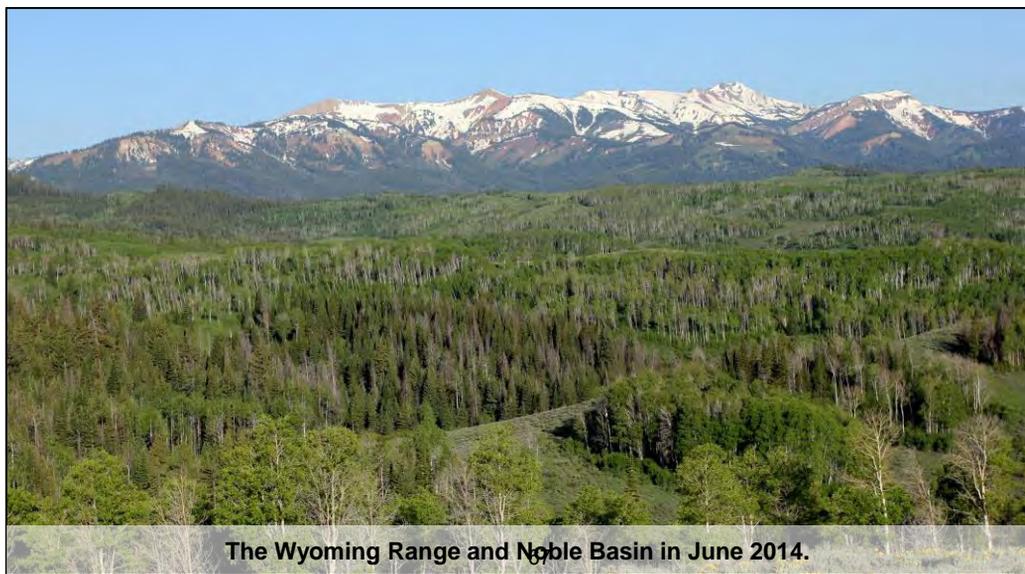
In 2010, we initiated the Sublette moose project at the behest of the Wyoming Governor’s office to provide information on the survival and fecundity of female moose, rates of juvenile recruitment, and seasonal home ranges. The motivation for this study was to provide baseline information prior to potential energy development by Plains Exploration and Production Company (PXP) in the Hoback Basin. During Fall 2012, a consortium of sportsmen and sportswomen, conservationists, outdoor enthusiasts, private philanthropists, and Wyoming government officials organized to offer a buyout of the leases owned by PXP. The Trust For Public Land brokered the \$8.75 million deal with PXP in December 2012.

While the potential for energy development in the Hoback Basin has subsided, there are still natural gas leases (41,00 acres; hereafter the 41k leasing zone) that fall within the core of the Sublette Moose herd unit in the drainages of South Beaver, North Horse, and Cottonwood. Although moose are relatively abundant in the 41k leasing zone, very little was previously known about their demography or movement. Over the past year, we completed a fourth round of captures and calf surveys to further our understanding of Sublette moose demography. Information from this project will help inform the Wyoming Game and Fish Department (WGFD) and USFS regarding critical moose habitat relative to the placement of well pads, should the leasing zone be developed. Further, our study is providing comprehensive data on the influence of nutritional condition on the demography of this important Wyoming moose herd.



An adult female and her calf move through the willows of Horse Creek during 2013 captures.

© Mark Gocke



The Wyoming Range and Noble Basin in June 2014.

## Captures

This year marked the fourth consecutive capture effort for the project and was funded largely by generous landowners in the study area. The data we collected has informed the USFS-Bridger Teton of Sublette moose movement, demography and nutritional condition, and will aid the agency as they finalize their evaluation of the Supplemental Environmental Impact Statement (SEIS) of the 41k leasing zone.



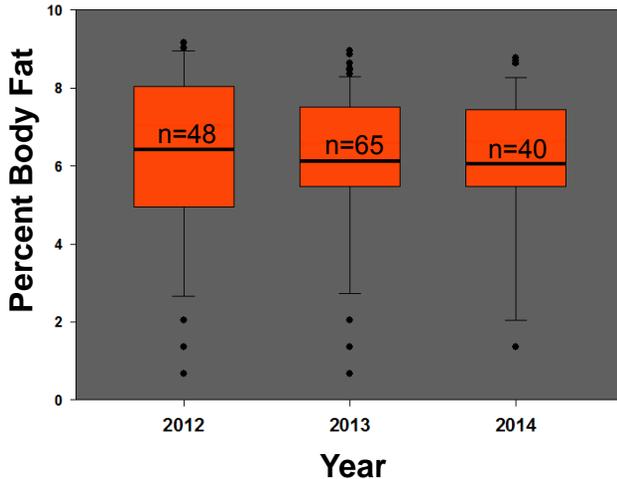
Similar to previous years, we: (A) measured nutritional condition using ultrasonography; (B) took body measurements to estimate body mass; (C) collected blood samples for pregnancy and *Elaeophora* testing; (D) downloaded location data from GPS collars and (E) added new VHF collars to 25 females. Photos by Mark Gocke (WGFD).





# Nutrition

During summer, moose spend much of their time foraging on willow, aspen and other shrubs and forbs in an effort to regain fat reserves lost over the winter. Similar to previous years, percent body fat of adult females was low overall (mean=6.1%), suggesting that poor habitat quality is still constraining pregnancy and adult survival.

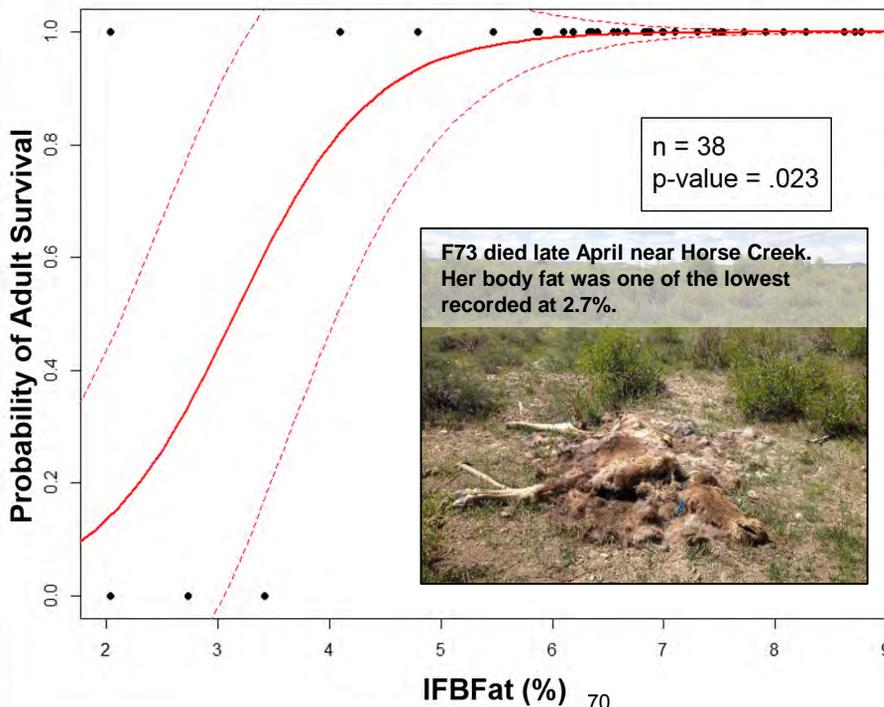


**Fig. 1 (above):** Boxplots showing nutritional condition of adult females per year captured (Black bars represent sample means). Winter severity can create a lag effect on nutritional condition. The winter of 2010/2011 was notably harsh along the Wyoming Range, possibly creating more variation in percent body fat observed in 2012.

**Below:** Dr. Kevin Monteith measures the body fat of moose F40 in Horse Creek using ultrasonography. The image on the right shows where body fat is deposited below the skin. She carried a total of 6.8% body fat, slightly higher than the population average (6.1%).



## Adult Survival to Body Fat

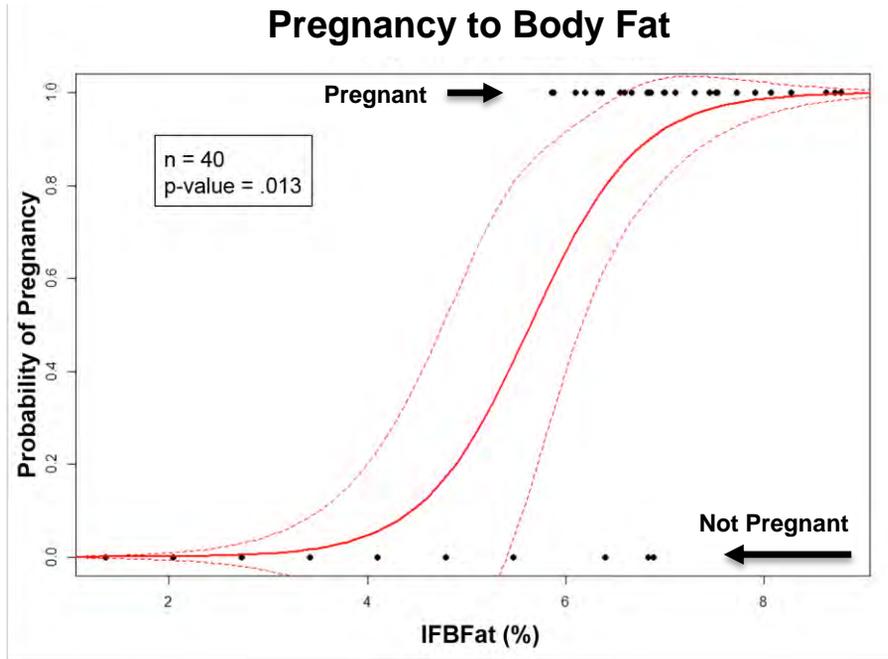


← **Survived**

**Fig. 2 (left):** The estimated effect ( $\pm 95\%$  CI, red dashed lines) of percent body fat (IFBFat) on probability of survival for adult (>2 yr. old) female Shiras moose in February 2014 from Sublette County, Wyoming. Females with lower percent body fat had lower probability of surviving. Black circles on top indicate moose that survived and circles on bottom represent moose that died.

← **Died**

## Nutrition



**Fig. 3 (left):** The estimated effect ( $\pm 95\%$  CI, red-dashed lines) of percent body fat on probability of pregnancy for adult (>2 yr. old) female Shiras moose in February 2014 from Sublette County, Wyoming. During February captures, we took blood samples determine pregnancy status. Females with lower percent body fat had lower probability of being pregnant. Black circles on top indicate moose that were pregnant at capture and circles on bottom represent moose that were not pregnant.

## Demographic Rates

A priority of this research is to quantify the demographic rates of the Sublette moose herd. Similar to previous years, we observed depressed levels of adult survival (86%), pregnancy (68%), and parturition (77%), as well as high levels of neonate survival (96%)—see table below. Only one set of twins was observed this year during summer calf flights. Demographic data we have collected indicate that Sublette moose are in poor nutritional condition, which is contributing to their low rates of pregnancy. These data indicate the potential for habitat limitation for moose inhabiting the Wyoming Range front, the same area encompassed by the 41k leasing zone. We are providing much needed baseline information on how moose use the available habitat that exists in the area (see map on page 8).

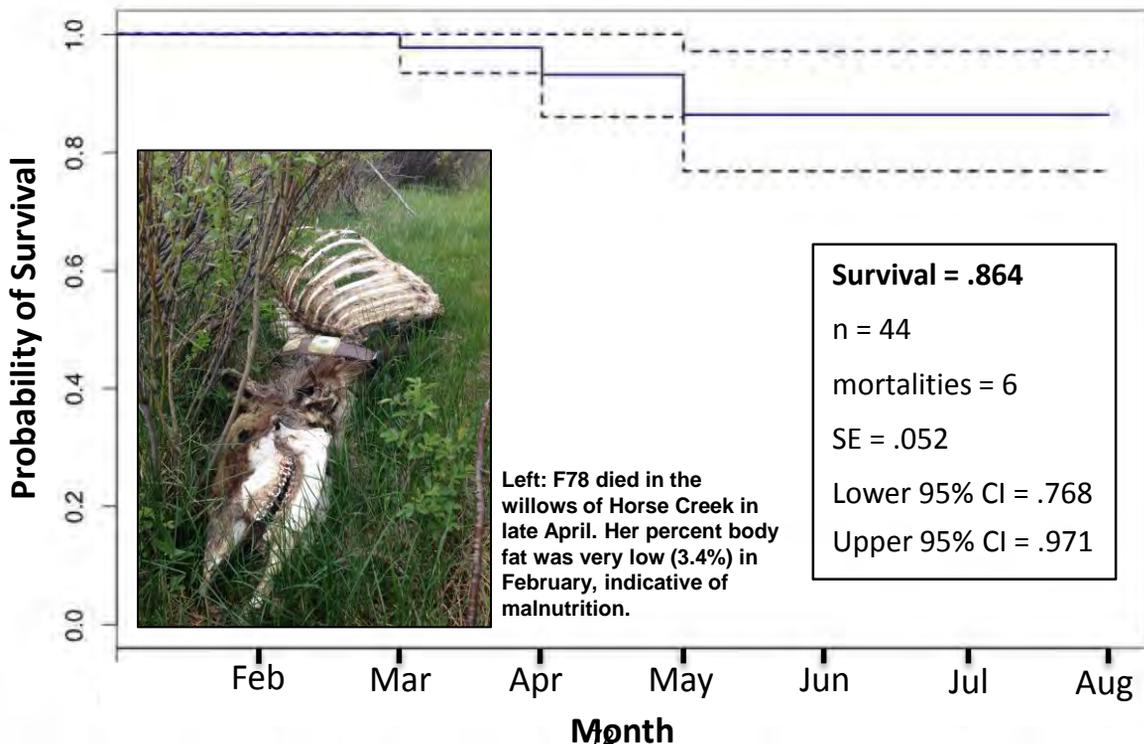
Vital Rate	2014 % (n)	2013 % (n)	2012 % (n)	2011 % (n)
Adult Survival	<b>86.4 (44)</b>	77.7 (66)	87.1 (48)	82.6 (23)
Pregnancy	<b>67.5 (40)</b>	73.8 (65)	64.5 (48)	47.8 (23)
Parturition	<b>76.7 (27)</b>	73.1 (41)	96.1 (26)	77.7 (9)
Neonate Survival	<b>95.5 (22)</b>	96.5 (29)	85.7 (28)	75.0 (8)
9-month Calf Survival	<b>75.0 (24)</b>	64.5 (31)	66.6 (27)	n/a

## Adult Survival

Most adult mortalities in this population occur during late spring, when fat reserves are at their annual minimum. Moose spend their summers foraging to fatten up for winter, but poor habitat condition along the Wyoming Range front has slightly depressed adult survival (see Kaplan-Meier plot below). When habitat is not limiting, ungulate populations usually experience higher rates of adult survival (>90%) and almost all females are pregnant.



### 2014 Adult Survival\_\_Kaplan-Meier Estimate



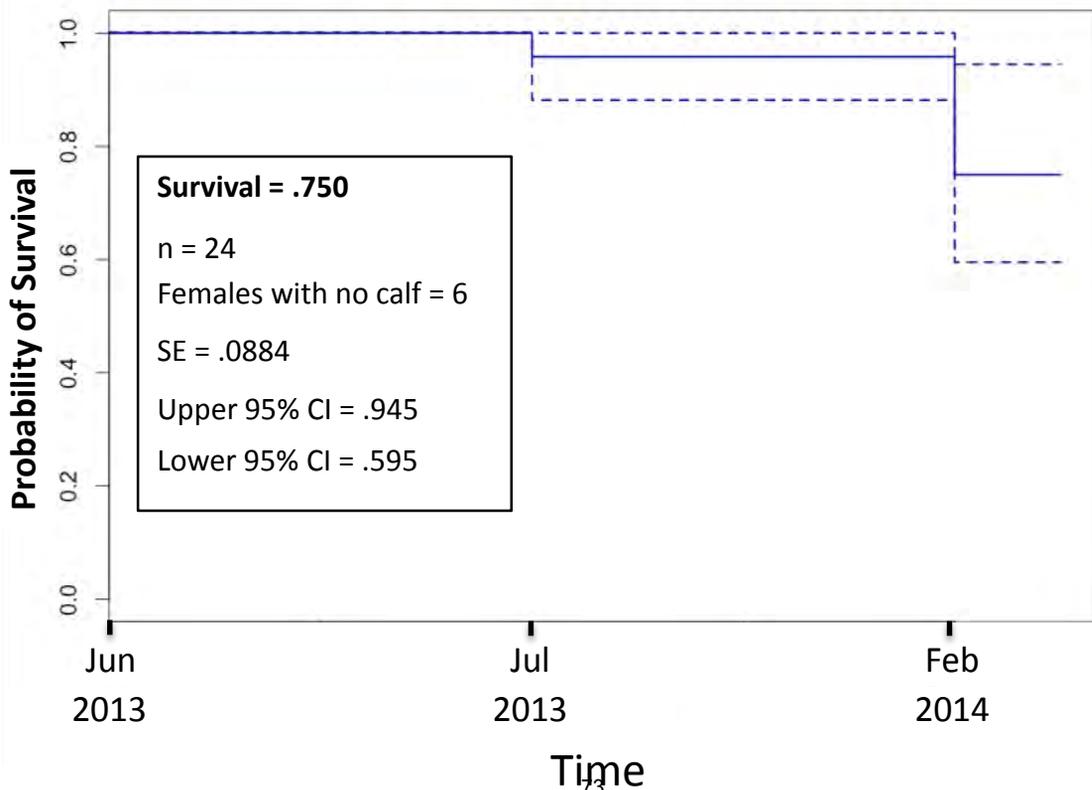
## 9-month Calf Survival

As late May approaches, pregnant females seek out a secluded site to give birth and nurse a calf. We located each pregnant moose via helicopter once in June to estimate parturition (i.e., birth rate) and then again in early July to assess survival of neonate calves. The following February during captures, we documented calf presence to record 9-month survival (see Kaplan-Meier plot below). Overall, neonate and 9-month calf survival is high for this population.



Left: A view from the helicopter during June calf surveys. Several females migrate high into the Wyoming Range to give birth and raise their young. Right: F62 keeps an eye on her calf during June surveys in Cottonwood creek.

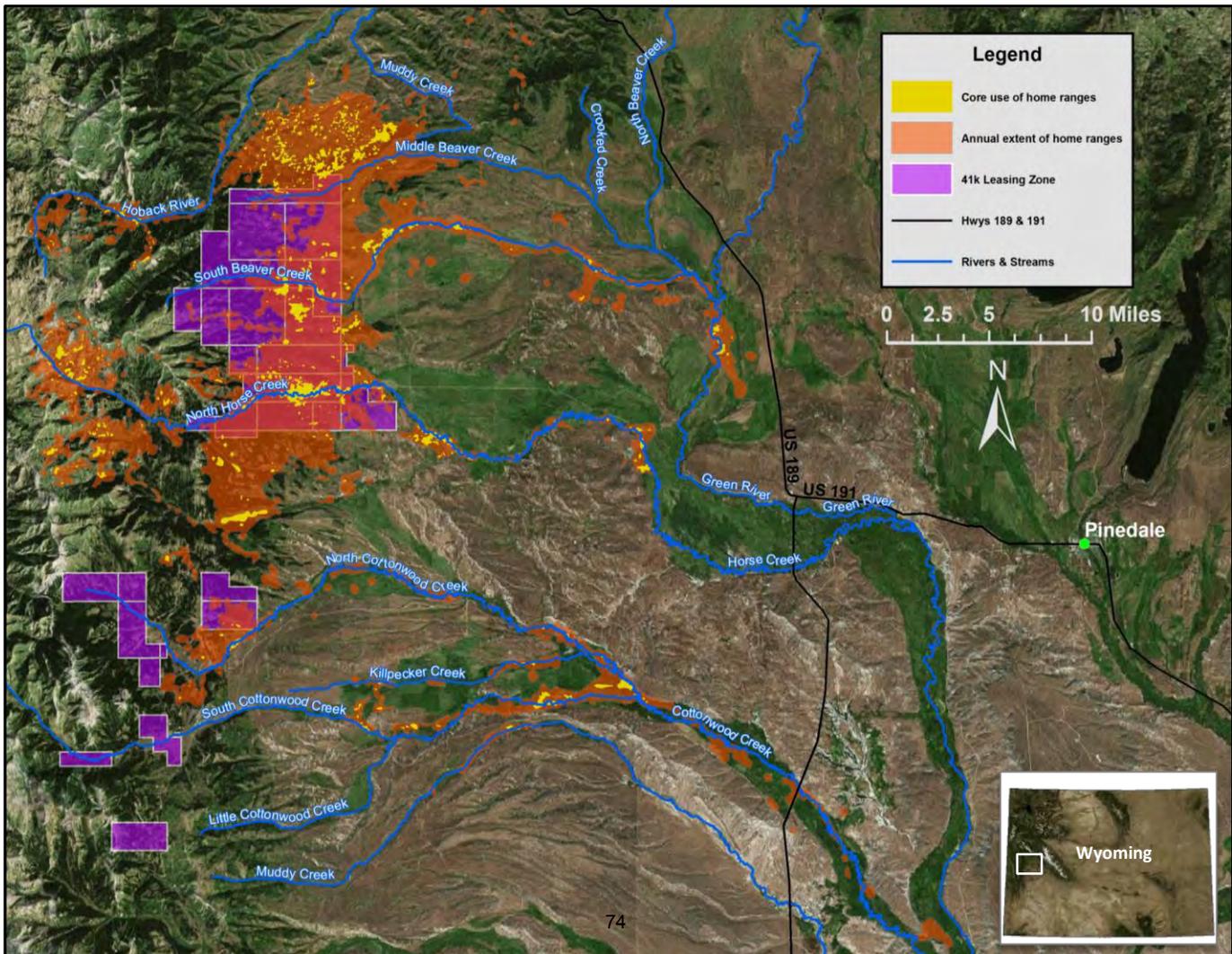
9-month Calf Survival\_\_Kaplan-Meier Estimate



## Moose Movement in the Leasing Zone

Our GPS collars (Telonics, Store-on-Board) record hourly locations, allowing fine-scale analyses of movement patterns. We applied dynamic Brownian bridge movement models (Kranstauber et al. 2012) to the location data to identify home range extent and core areas of use for 19 moose that used the 41k leasing zone at any point during our study. The map below shows aggregated home ranges of these individuals at the 60 (core use) and 99 (annual extent) percent contours. North Horse Creek is a heavily-used movement corridor for moose migrating into the Wyoming Range during late spring. Should the leasing zone be developed, the USFS will use these models to inform the placement of well pads relative to moose habitat use.

We have learned much about the Sublette moose herd, including movement, nutrition and demography. Over the next year, we will provide more detailed information on precise dates and locations of parturition events, the proportion of habitat type within home ranges and a comprehensive population model to provide WGFD with the most current information for managing one of the largest moose herds in the Rocky Mountains.



# Acknowledgements

This research would not be financially or logistically possible without the collaboration of our partners. Many thanks to the Wyoming Game and Fish Department, Bridger-Teton National Forest, Wyoming Governor's Office, Wyoming Governor's Big Game License Coalition, Plains Exploration and Production Company, private land owners, volunteers, Sublette County Outfitters and Guides Association Inc., and Wyoming Outfitters and Guides Association. **We are sincerely grateful to the numerous land owners who have supported the project financially and offered the use of their property for conducting this research.**



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