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# Sublette Moose Project ♦ 2013 Annual Report

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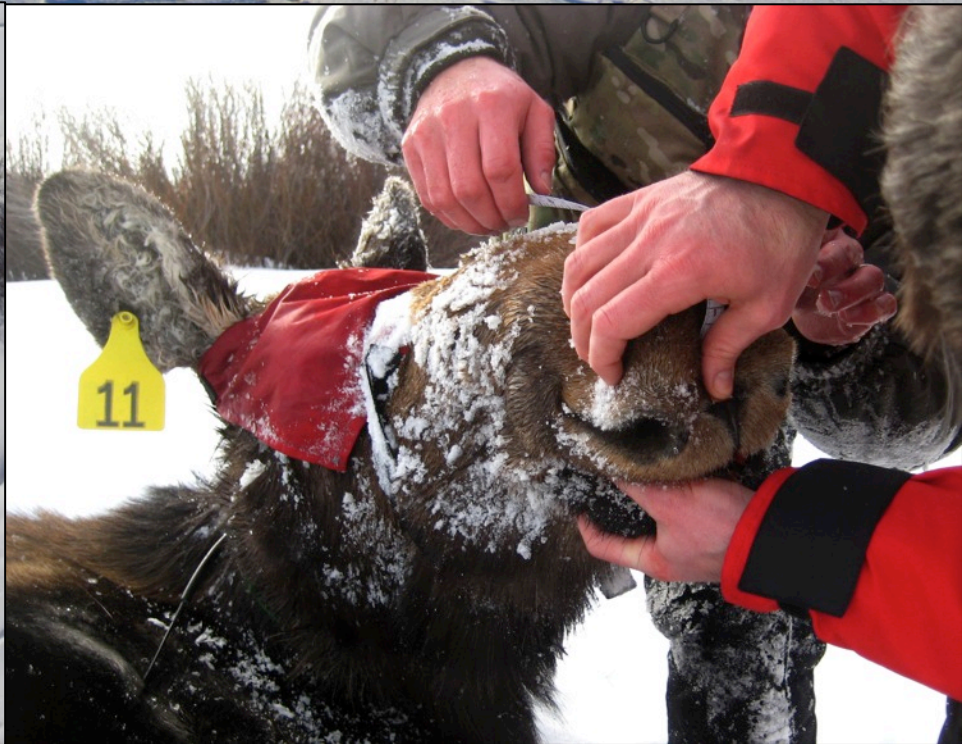
<sup>3</sup>Wyoming Game and Fish Department



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# Background

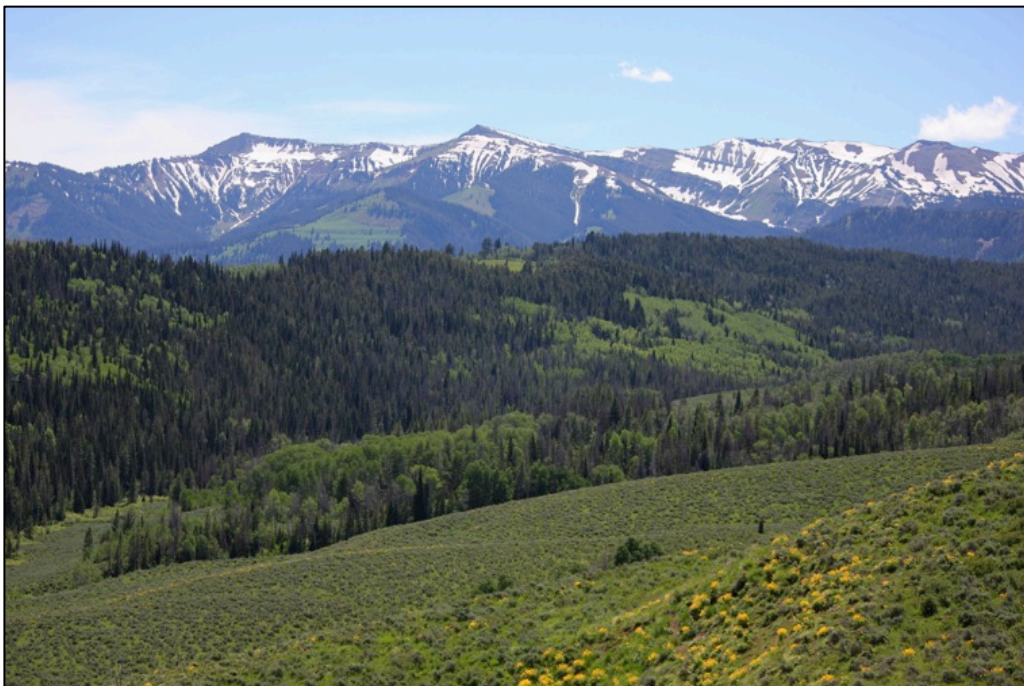
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In 2010, we initiated the Sublette Moose study at the behest of the Wyoming Governor's office to provide information on the survival and fecundity of female moose, rates of juvenile recruitment, and migration between winter and summer home ranges. 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 collaboration of sportsmen and sportswomen, conservationists, outdoor enthusiasts, and Wyoming government officials organized to offer a buyout of the leases owned by PXP in Hoback Basin. The Trust For Public Land brokered the \$8.75 million deal with PXP in December 2012.



F3 is released from capture (2013) near Middle Beaver Creek. This female was first captured in 2011 and uses the 44-7 leasing zone every summer and fall.

While the potential for energy development in the Hoback Basin has subsided, there are still natural gas leases (44,720 acres; hereafter the 44-7 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 44-7 leasing zone, very little is known about their demography or habitat use. Consequently, we have expanded the geographic scope of this project to aid WGFD in understanding and mitigating the responses of moose to energy development, should it occur. Further, our study is providing comprehensive data on the demographic consequences of nutritional condition, disease and predation for this important Wyoming moose herd.



The Wyoming Range and Hoback Basin in June 2013.

# Capture

On February 11th through the 14th, we commenced our third year of capture operations on Sublette moose. Native Range Capture Services helped us collar 65 adult, females over the 3.5 day period— from the Hoback River watershed, south to Cottonwood Creek. We captured 28 new females in these creeks to understand moose movement and habitat use throughout the 44-7 leasing zone, as well as to increase our sample size for assessing nutritional condition and demography (i.e., pregnancy rates, adult survival, calf recruitment). We recaptured the remaining 37 females to assess their nutritional condition, age, and pregnancy and signs of *Elaeophora* infection. Twelve females from 2011 were still alive and recaptured to remove their GPS collars. These 12 moose were then fitted with VHF radio collars to track calf production and survival in summer 2013.



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Native Range Capture crew fires a net gun to immobilize and collar newly-captured female in Beaver Creek (top left and above). Researchers Dr. Kevin Monteith, Brendan Oates and Jenny Jones collect body measurements from F15 (below) to help calculate her percent body fat.



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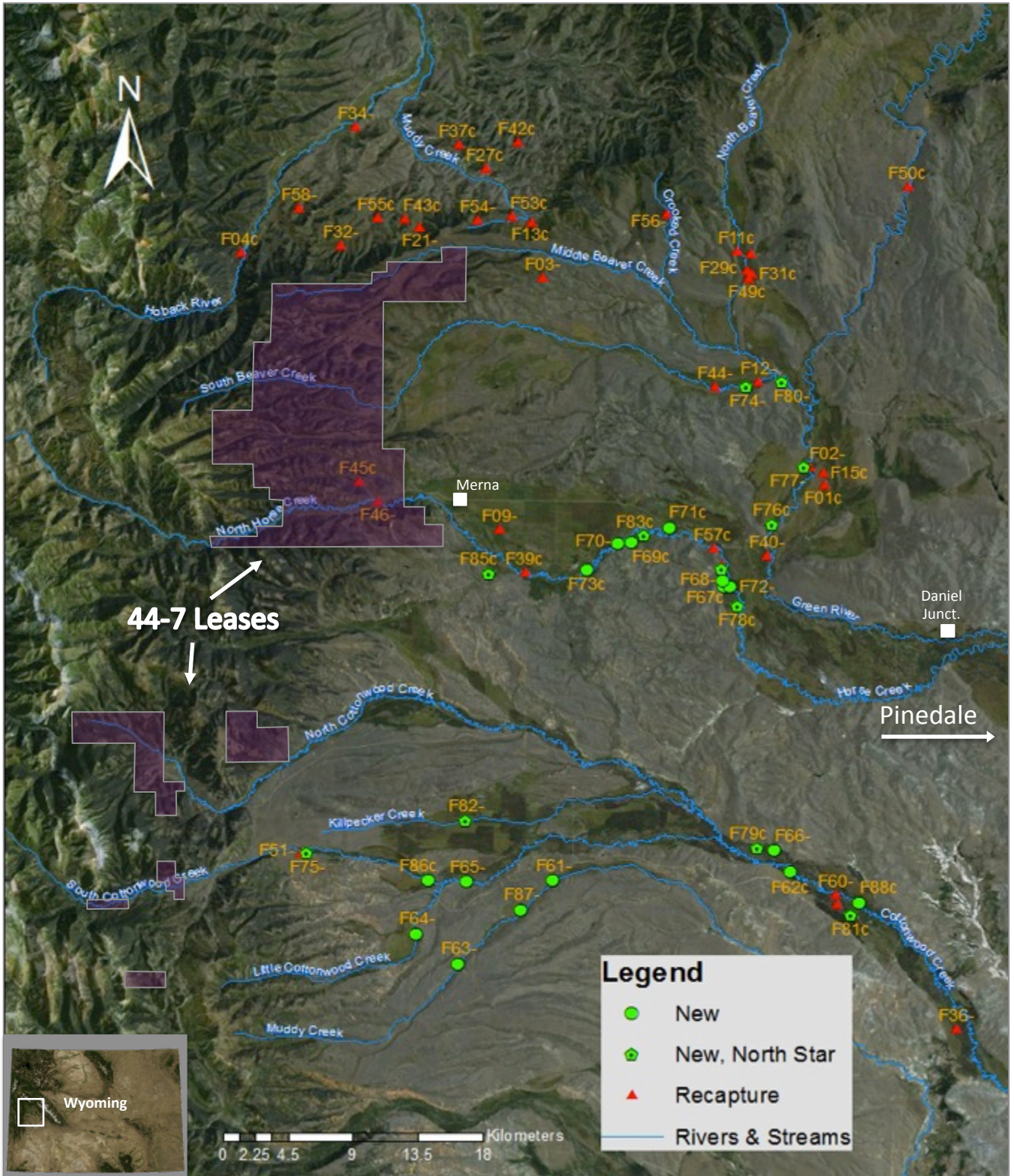


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# Capture Locations

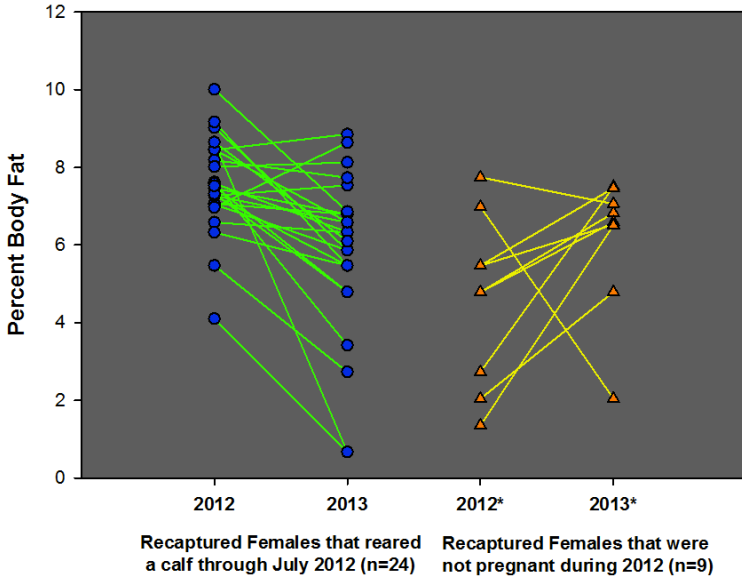
Each location is labeled with an identification number followed by a “c” or “-” (i.e. F45c or F56-) to indicate whether or not a calf was present at time of capture. Females that reared a calf from the previous summer were monitored to measure annual calf survival, which was high (64.5%). Red triangles signify recaptures (from moose captured in 2011 and 2012), green circles represent new captures, and green pentagons with black dots signify females with North Star GPS Collars.



# Nutrition

Moose rely on their fat reserves to survive Wyoming's long winters, and nutritional condition is therefore an important indicator of habitat quality and survival. This year's capture expanded our longitudinal dataset of nutritional condition of captured females. We used ultrasonography to measure rump fat thickness and estimate Ingesta-Free Body Fat (hereafter, percent body fat). The following figures relate the cost of lactation (Fig. 1), adult survival (Fig. 2) and pregnancy (Fig. 3) to percent body fat.

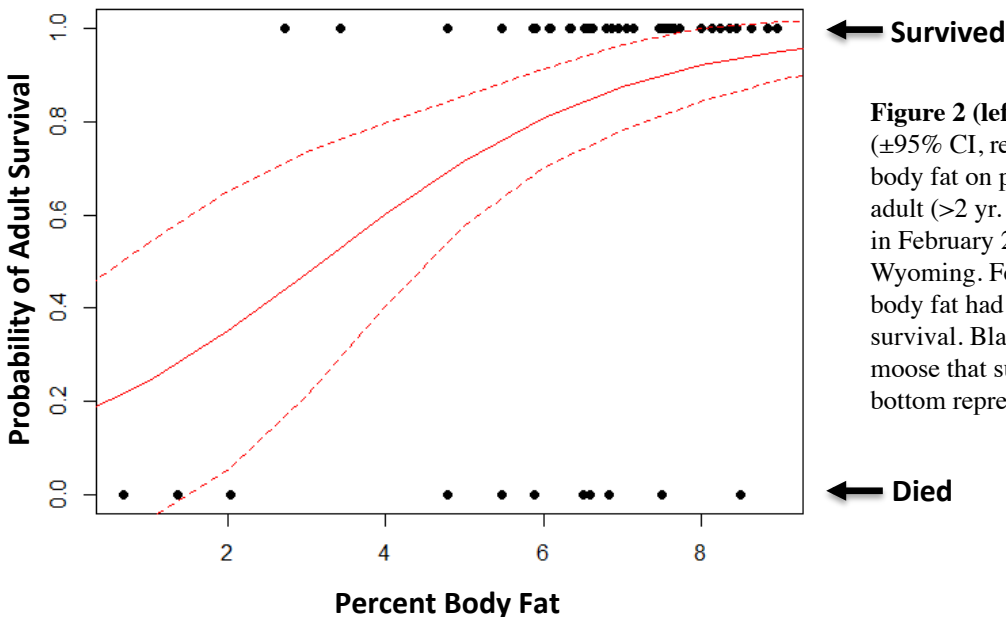
## Nutritional Cost of Lactation



**Above:** F68 waits patiently as Dr. Kevin Monteith uses ultrasound to measure her rump fat thickness. To calculate percent body fat per female, several measurements are needed, including depth of rump fat and a body condition score.

**Figure 1 (above):** Collared moose that reared a calf in July 2012 (blue circles) tended to lose fat between 2012 and 2013 captures, showing an effect of the intense energetic cost of lactation. By contrast, collared moose that were not pregnant in 2012 (orange triangles) tended to have similar or higher fat levels when captured in 2013.

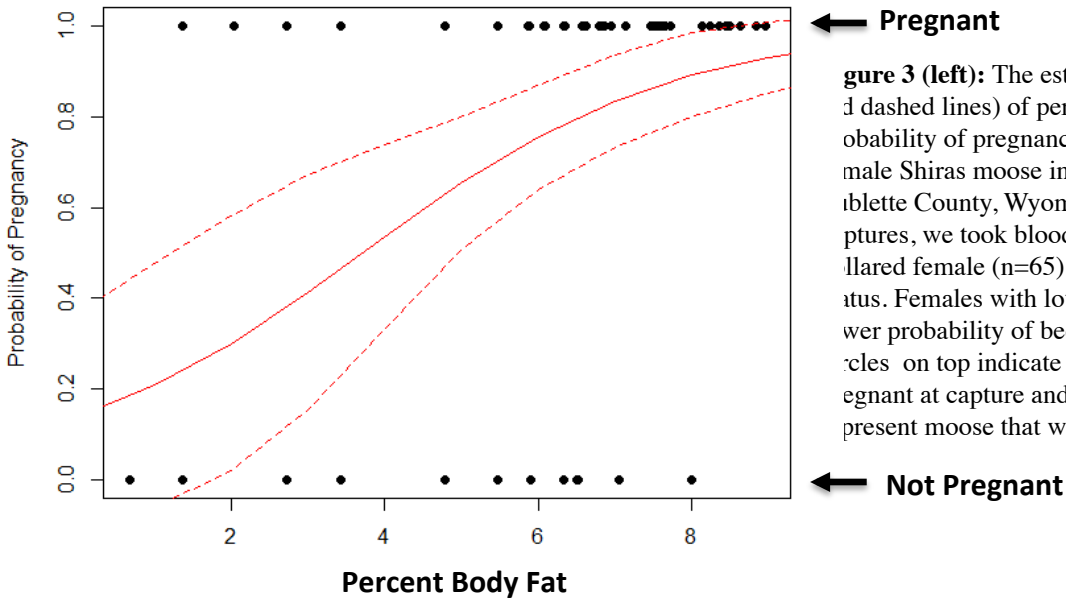
## Adult Survival to Body Fat



**Figure 2 (left):** The estimated effect ( $\pm 95\%$  CI, red dashed lines) of percent body fat on probability of survival for adult (>2 yr. old) female Shiras moose in February 2013 from Sublette County, Wyoming. Females with lower percent body fat had lower probability of survival. Black circles on top indicate moose that survived and circles on bottom represent moose that died.



## Pregnancy to Body Fat



**Figure 3 (left):** The estimated effect ( $\pm 95\%$  CI, solid and dashed lines) of percent body fat on the probability of pregnancy for adult (>2 yr. old) male Shiras moose in February 2013 from Sublette County, Wyoming. During February captures, we took blood samples from every hounded female ( $n=65$ ) to determine pregnancy status. Females with lower percent body fat had lower probability of becoming pregnant. Black circles on top indicate moose that were pregnant at capture and circles on bottom indicate moose that were not pregnant.

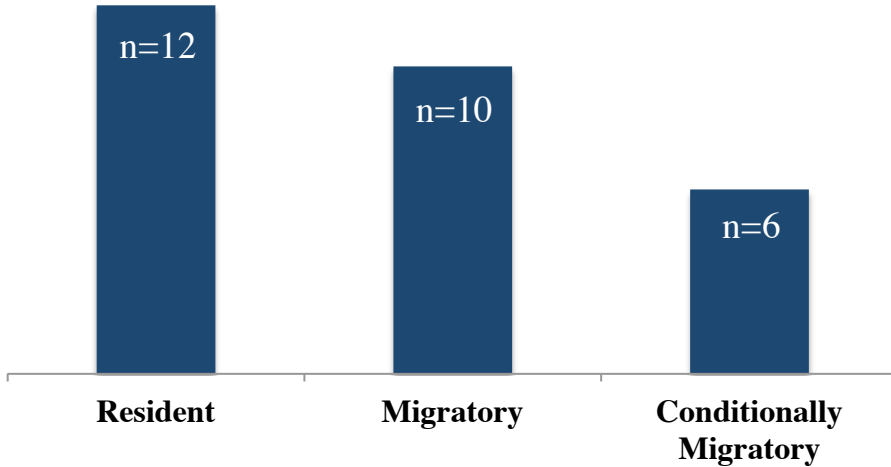
## Demography

A priority of this research is to quantify the demographic rates of the Sublette moose herd. Similar to previous years, we observed low levels of adult survival (78%) and pregnancy (74%), as well as high levels of neonate survival (97%)—see table below for Kaplan-Meier estimates. No twinning was observed this year during our summer calf flights. Preliminary demographic results indicate that Sublette moose are in poor nutritional condition, contributing to low pregnancy rates. These data indicate the potential for habitat limitation on the Wyoming Range front, the same area encompassed by the 44-7 leasing zone. We are providing much needed baseline information on how moose use the available habitat that exists in the area. These data will aid the US Forest Service as they prepare to update the Supplemental Environmental Impact Statement regarding the 44-7 leasing zone.

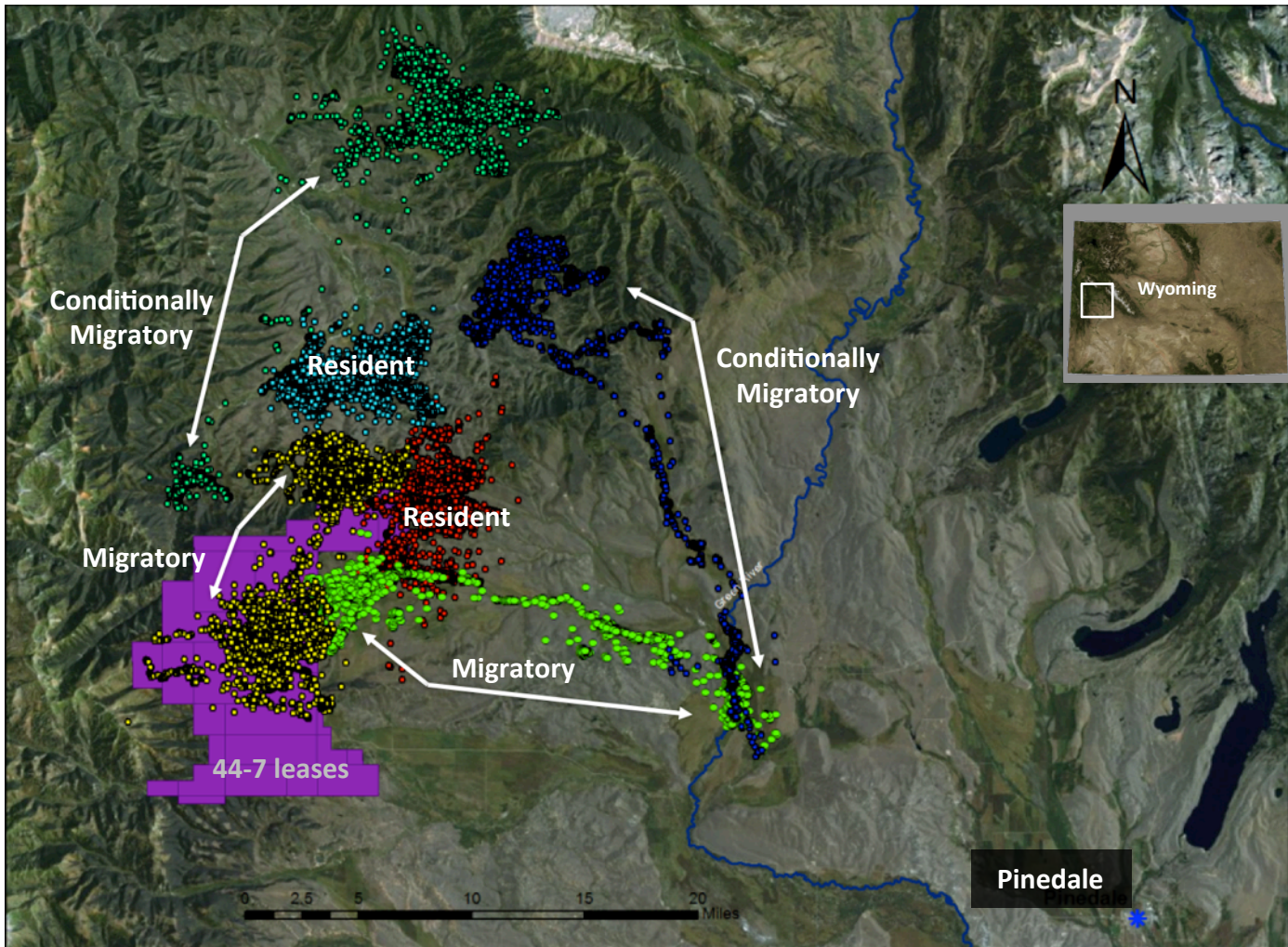
2013			2012 (%)	2011 (%)
Vital Rate	Kaplan-Meier Est. (%)	Sample Size		
Adult Survival	77.7	65	87.1	82.6
Pregnancy	73.8	65	64.5	47.8
Parturition	73.1	41	96.1	77.7
Neonate Survival	96.5	29	85.7	75.0
Calf Recruitment	64.5	31	66.6	n/a

# Movement

Our GPS collars (Telonics, Store on Board) record an hourly location, allowing fine-scale analyses of movement patterns. From previous research, we know that moose in the Jackson region are migratory between their summer and winter ranges. Compared to Jackson, Sublette moose have exhibited markedly more variation in habitat use and movement behavior, ranging from migratory to resident. Thus far, we have gathered sufficient location data from 28 individuals to distinguish between various movement behaviors (Fig. 4).

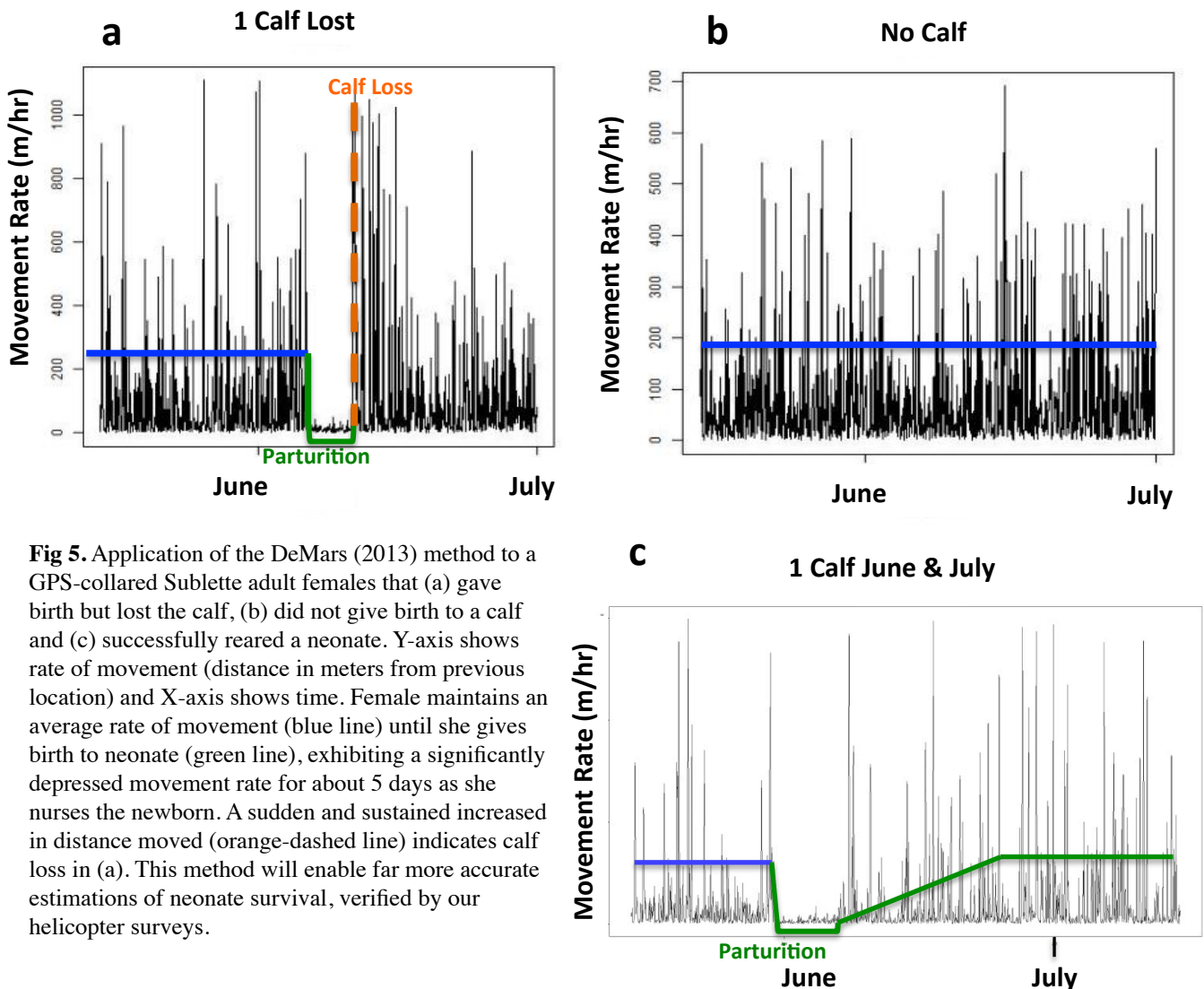


**Figure 4 with map:** Types of movement behavior exhibited by Sublette moose from 2011 to 2013. “Resident” moose do not use distinct seasonal ranges and instead stay localized within their home range. “Migratory” individuals move discretely between the same winter and summer ranges in a predictable and consistent manner. Moose that are “Conditionally Migratory” move discretely between numerous seasonal ranges, occasionally remaining in a distinct area for multiple seasons.



# Ongoing Research

**Assessing Parturition and Neonate Survival:** Parturition by large herbivores can be difficult to detect due to the brief time interval during which immobile neonates are highly vulnerable to mortality (i.e., predation, malnutrition). Date of parturition will be estimated using a recently developed method (DeMars *et al.* 2013) that calculates the movement rate of a female from successive GPS collar locations. Calving period can be identified by several days of a depressed movement rate, and subsequent neonate survival can be identified by a gradual increase in movement rate following parturition. Parturient females that successfully raised a neonate will be evaluated until 4 weeks after birth, after which movement rates of mothers and their young are equivalent. A parturient female will be censored the date it loses its young, which can be identified by an abrupt, large and sustained increase in movement (Fig. 5a). We will use this method to verify the results and accuracy of the helicopter surveys conducted in Moreover, this evaluation will allow us to overcome previous survey limitations and vastly improve our estimates neonate survival.



**Fig 5.** Application of the DeMars (2013) method to a GPS-collared Sublette adult females that (a) gave birth but lost the calf, (b) did not give birth to a calf and (c) successfully reared a neonate. Y-axis shows rate of movement (distance in meters from previous location) and X-axis shows time. Female maintains an average rate of movement (blue line) until she gives birth to neonate (green line), exhibiting a significantly depressed movement rate for about 5 days as she nurses the newborn. A sudden and sustained increased in distance moved (orange-dashed line) indicates calf loss in (a). This method will enable far more accurate estimations of neonate survival, verified by our helicopter surveys.



# 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 landowners, Sublette County Outfitters and Guides Association Inc., and Wyoming Outfitters and Guides Association. *We are sincerely grateful to the numerous landowners who have supported the project financially and offered the use of their property for conducting this research.*

