Sublette Moose Project ◆ 2014 Annual Report

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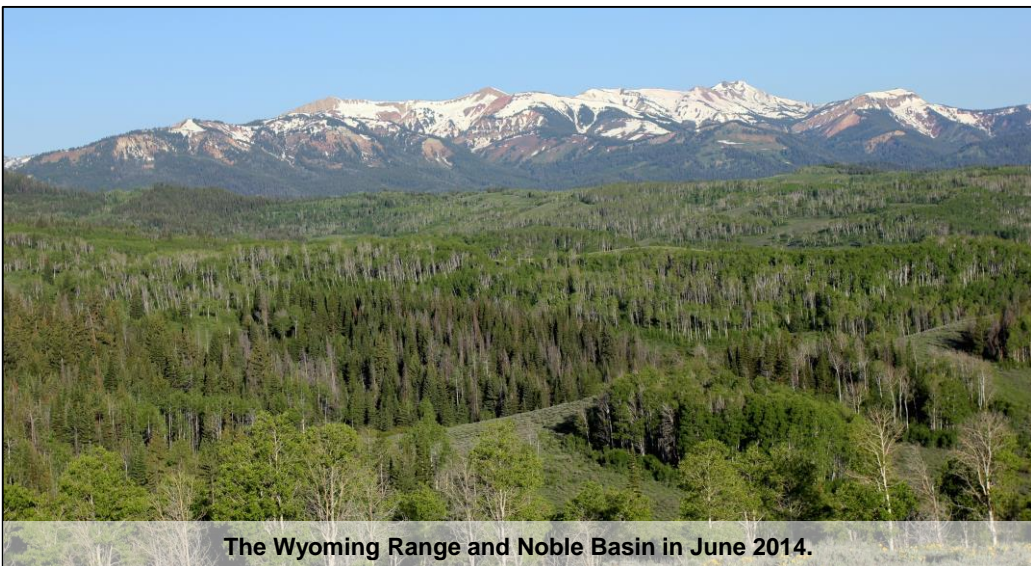
Background

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.

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

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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.

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).
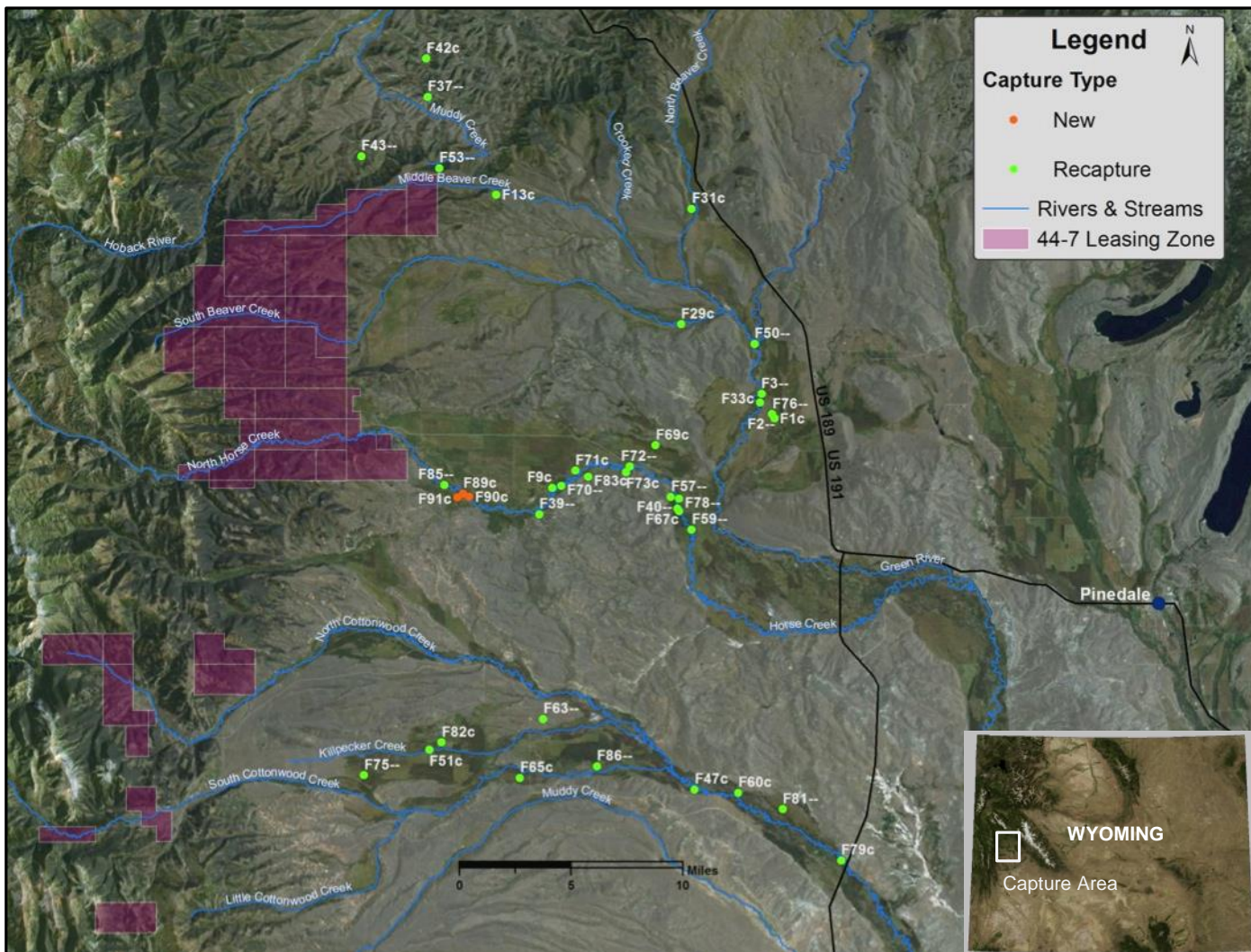
Capture Locations

Along the Wyoming Range front, moose tend to congregate on winter ranges characterized by expansive willow bottoms in the creeks of Horse, Cottonwood, Beaver and along the Green River. These watersheds comprise some of the most significant Shiras moose habitat in the Rocky Mountains, highlighting the need to maintain and conserve their migratory routes and seasonal ranges. With the PXP leasing zone retired, we shifted our focus to moose that could potentially use the 41k leasing zone. Last February, we captured 3 new females along north Horse Creek to augment our sample size for demographic analyses.

The table and map below show locations of captured females and our observations of calf recruitment. Each location is labeled with an identification number followed by a "c" or "-" (e.g., F42c or F85--) to indicate calf presence or absence at time of capture.

Drainage:	Hoback Basin & Beaver Crk.	Green River	Horse Crk.	Cottonwood Crk.	Total
Numbered Captured:	7	6	17	10	40

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.
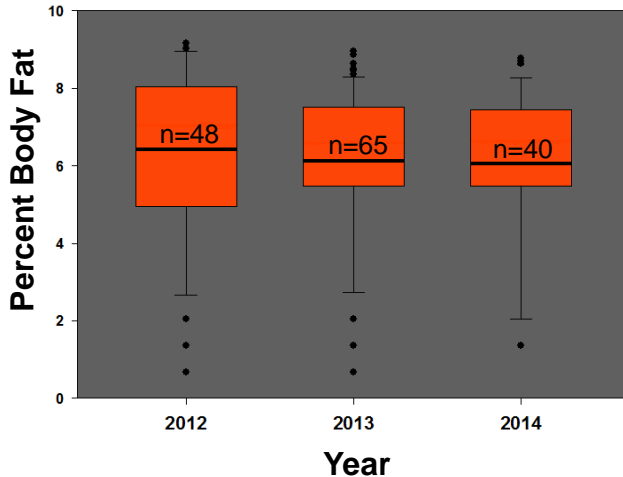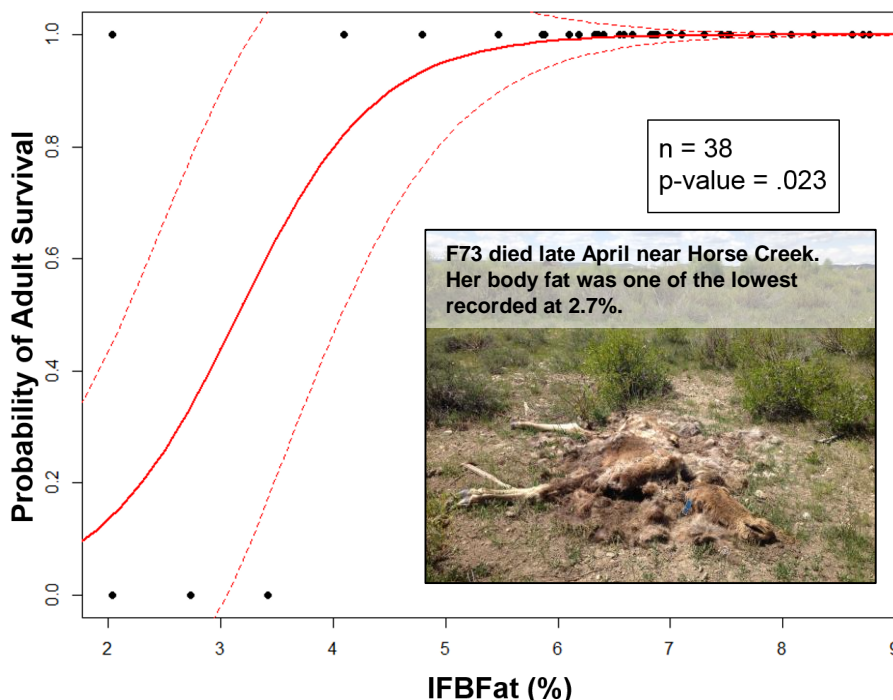

Below: Dr. Kevin Monteith measures the body fat of moose F40 in Horse Creek using ultrasonography. The image on the right shows where body fat is deposited below the skin. She carried a total of 6.8% body fat, slightly higher than the population average (6.1%).

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Skin layer

Rump Fat

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.

Adult Survival to Body Fat

Survived

n = 38
p-value = .023

F73 died late April near Horse Creek. Her body fat was one of the lowest recorded at 2.7%.

Died

Fig. 2 (left): The estimated effect (±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.
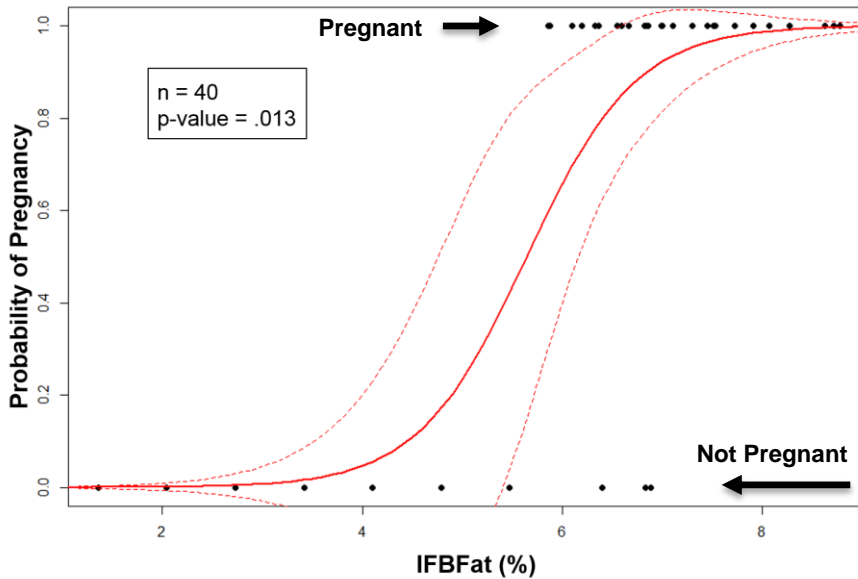
Nutrition

Pregnancy to Body Fat

Fig. 3 (left): The estimated effect (±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).
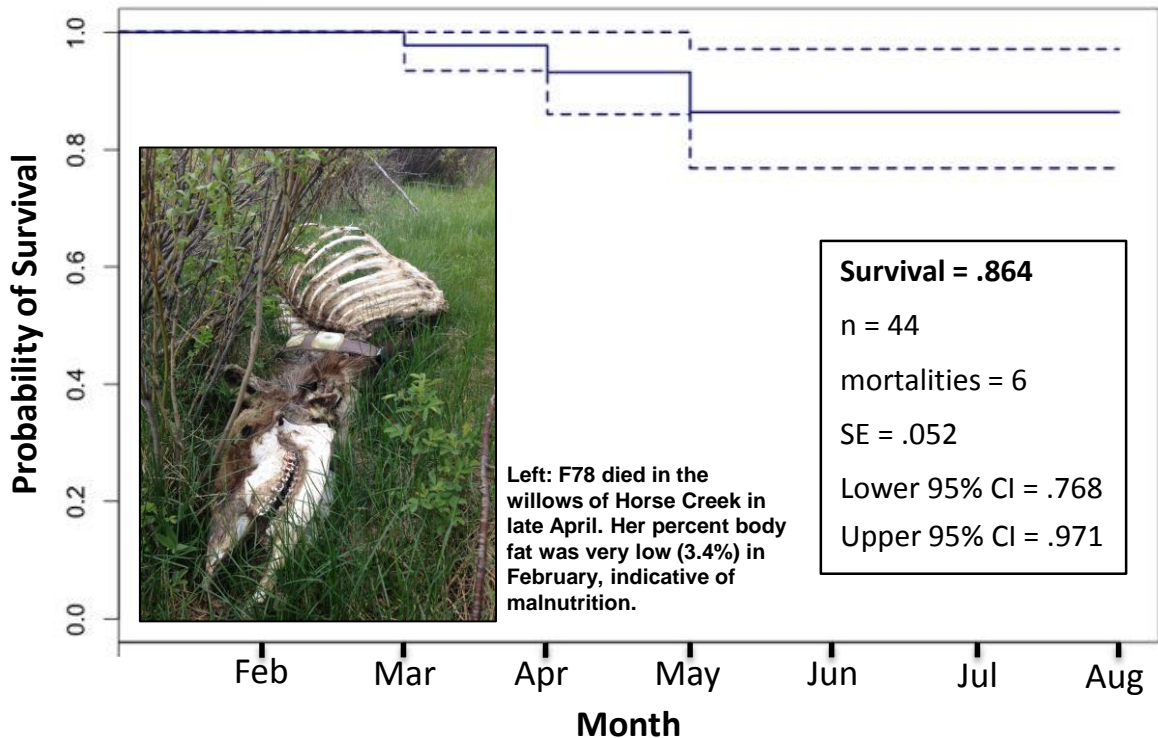
Vital Rate	2014 % (n)	2013 % (n)	2012 % (n)	2011 % (n)
Adult Survival	**86.4 (44)**	77.7 (66)	87.1 (48)	82.6 (23)
Pregnancy	**67.5 (40)**	73.8 (65)	64.5 (48)	47.8 (23)
Parturition	**76.7 (27)**	73.1 (41)	96.1 (26)	77.7 (9)
Neonate Survival	**95.5 (22)**	96.5 (29)	85.7 (28)	75.0 (8)
9-month Calf Survival	**75.0 (24)**	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.

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F40 trots into the willows of Horse creek to rejoin her calf shortly after being released

2014 Adult Survival__Kaplan-Meier Estimate

Left: F78 died in the willows of Horse Creek in late April. Her percent body fat was very low (3.4%) in February, indicative of malnutrition.

Survival = .864

n = 44

mortalities = 6

SE = .052

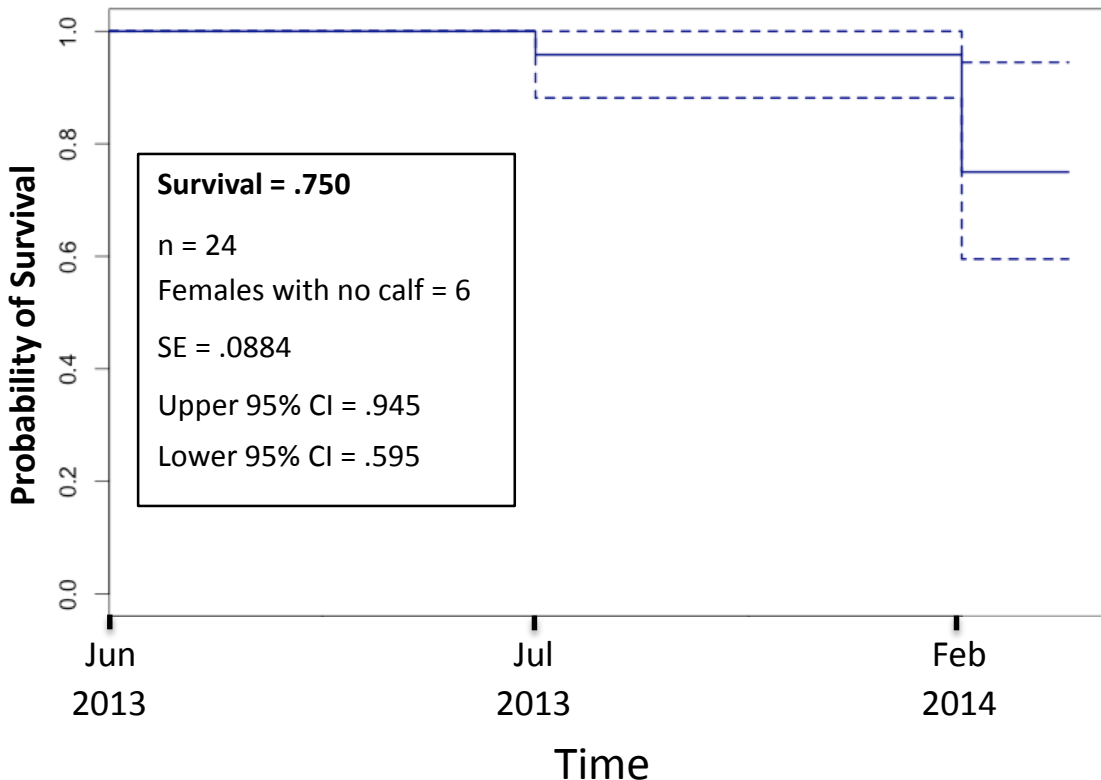Lower 95% CI = .768

Upper 95% CI = .971

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.
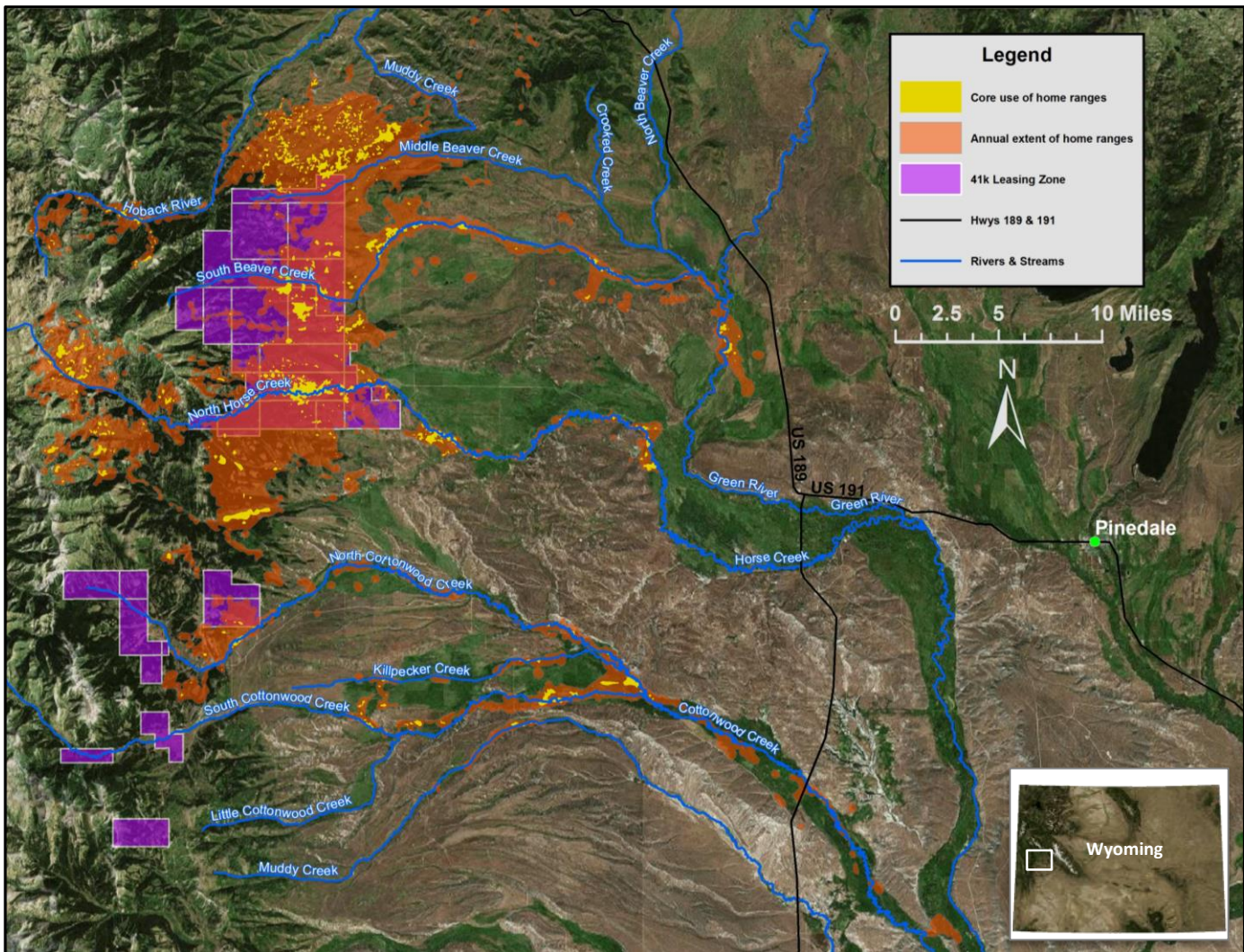

9-month Calf Survival__Kaplan-Meier Estimate

Survival = .750

n = 24

Females with no calf = 6

SE = .0884

Upper 95% CI = .945

Lower 95% CI = .595

Probability of Survival

Jun 2013   Jul 2013   Feb 2014

Time

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

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