Final Report to

National Park Service, Fossil Butte National Monument

Understanding the impact of fire on pygmy rabbit distribution, abundance, and movement

Rocky Mountain Cooperative Ecosystem Studies Unit

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ABSTRACT

Pygmy rabbits are typically associated with mature stands of big sagebrush, which are commonly managed using prescribed fire. Portions of Fossil Butte National Monument (FOBU) were burned in 2005 as part of a larger prescribed treatment of big sagebrush perceived to be decadent. Surveys before the fire indicated that areas within the burn perimeter were occupied by pygmy rabbits. In 2008-2009, we established plots and transects inside and outside of the burn perimeter and measured vegetation characteristics during the growing season. During winter 2009, we searched plots and transects for sign of pygmy rabbits. We used the collected vegetation and presence data to create occupancy models for pygmy rabbits. In addition, we trapped and radio-collared pygmy rabbits in 3 areas within FOBU during 2008, and observed use of areas near the 2005 burn. Important predictors of occupancy by pygmy rabbits in our study were dead shrub cover and the difference between maximum and mean big sagebrush heights. Dead shrub cover, mean big sagebrush height, and maximum big sagebrush height were lower inside the burn perimeter than outside. Occupancy probabilities were 70% lower inside than outside the burn perimeter. Fire selectively removed big sagebrush within the burn perimeter and left unburned patches too small to support pygmy rabbits within the burn perimeter 3-4 yr after the fire. Although prescribed fire may accomplish some management objectives in mature stands of big sagebrush, its use as carried out in FOBU can expected to reduce or eliminate pygmy rabbits for decades.

INTRODUCTION

Although the ecology of pygmy rabbits (*Brachylagus idahoensis*) remains poorly understood, a strong association with big sagebrush (*Artemisia tridentata*), driven by seasonal dietary limitations and the habitat structure provided by mature stands, is well established (Orr 1940, Green and Flinders 1980, Katzner and Parker 1997). This small-bodied lagomorph eats forbs and grasses during the summer, but almost exclusively big sagebrush in winter (Green and Flinders 1980) and does not display a feeding preference between the subspecies of big sagebrush (White et al. 1982). Pygmy rabbits construct burrows under the three main subspecies of big sagebrush: mountain big sagebrush (*A. t.* spp. *vaseyana*), basin big sagebrush (*A. t.* spp. *tridentata*) and Wyoming big sagebrush (*A. t.* spp. *wyomingensis*) (Katzner and Parker 1998). The association between pygmy rabbits and big sagebrush is specific to mature stands, characterized by tall plants, high shrub density, and a substantial dead shrub component, all of which increase cover from predators (Katzner and Parker 1997, Gabler et al. 2001). The geographic range of pygmy rabbits corresponds with that of big sagebrush, extending over the Great Basin, including portions of Wyoming and Colorado. In Wyoming, pygmy rabbits occur over the southwestern and south-central part of the state, as far north as Pinedale and as far east as Rawlins (Purcell 2006).

Big sagebrush typifies the high desert of the western United States, where most precipitation falls as snow. The distribution of subspecies of big sagebrush is determined by elevation, soil texture, temperature, and moisture. Relative to other subspecies, mountain big sagebrush occurs at high elevations where soil moisture is higher and temperatures are cooler. Wyoming and basin big sagebrush occur at similar elevations to each other, with basin big sagebrush occurring in deeper and sandier soils (Cottrell and Bonham 1992). The sagebrush ecosystem supports a variety of vertebrates, which differ in their strength of association with big sagebrush. Welch

(2005) reported several species as dependent on big sagebrush to complete their life cycles: pygmy rabbit, sagebrush vole (*Lagurus curtatus*), Greater Sage Grouse (*Centrocercus urophasianus*), Sage Thrasher (*Oreoscoptes montanus*), Sage Sparrow (*Amphispiza belli*), and Brewer's Sparrow (*Spizella breweri*). Additionally, big sagebrush provides forage and cover to pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*).

Managers of big sagebrush use mechanical removal, herbicide treatments, or prescribed fire for habitat improvement in mature stands. The desire to restore natural fire regimes, along with low cost compared to other control methods, makes prescribed fire an attractive tool. However, estimates of pre-settlement fire return intervals lack precision, 12-200 yr (Crawford 2004). Fire does not scar sagebrush, so our understandings of historical fire regimes rely on fire scars on adjacent trees, but the conversion of tree scar data to represent fire history in sagebrush is complex (Baker 2006). In reviewing the literature on big sagebrush and fire, Welch (2005) concluded that the biology of big sagebrush does not suggest strong fire adaptation. Strikingly, big sagebrush does not sprout from its roots after fire, nor are seeds adapted for long-term storage, long-distance dispersal, or fire resistance. In addition, cheatgrass (*Bromus tectorum*) can dominate over native understory species after fire, and even alter fire regimes (Knapp 1996). Clearly, fire is not conducive to the rapid regeneration of big sagebrush.

Pygmy rabbits are currently under consideration for federal listing throughout the geographic range under the Endangered Species Act of 1973 (Federal Register 2008), with a genetically distinct population in the Columbia Basin of Washington already listed (Federal Register 2003). The reduction of the Columbia Basin population was due in part to long-term global climate cycles that reduced the area of sagebrush steppe in the western United States, thereby isolating this population of pygmy rabbits (Lyman 1991). However, loss and degradation of sagebrush habitat due to land-use change caused further range constriction of the Columbia Basin population of pygmy rabbits (Federal Register 2003). In Wyoming, the pygmy rabbits is a species of special concern because of its restricted distribution and dependence on a "vulnerable" habitat. (Wyoming Game and Fish 2005). The Wyoming Interagency Vegetation Committee (2002) cited agriculture, development, drought, grazing, and invasive species as contributing factors to sagebrush loss, fragmentation and degradation within the state. Additionally, in 2003, concern about declining populations of Greater Sage Grouse within Wyoming led to the development of a conservation plan, in which fire is an important component, that will have consequences for the sagebrush ecosystem as a whole (Wyoming Game and Fish Commission 2003). Although Rowland et al. (2006) suggested Greater Sage Grouse to be an appropriate umbrella species for pygmy rabbits, several habitat characteristics preferred by Greater Sage Grouse differ from those preferred by pygmy rabbits. Specifically, because habitat requirements of Greater Sage Grouse vary throughout the year and during different stages of their life cycle, they require a mosaic of big sagebrush in different stages of succession. However, there is no evidence that pygmy rabbits benefit from this type of successional mosaic.

Fossil Butte National Monument (FOBU) encompasses 3,319 ha of high desert in southwestern Wyoming, and while initially established to preserve fossils embedded in an ancient lake bed, also provides important habitat for elk and pronghorn, as well as pygmy rabbits. In 2005, portions of FOBU were burned as part of the larger Bureau of Land Management Rock Creek

Burn. These fires were the first in the FOBU fire management plan, although managers at FOBU wished to investigate the response of pygmy rabbits to the burn before complete implementation of the plan. The objective of this study was to determine whether pygmy rabbits persisted in areas of FOBU that had burned in 2005 and to identify whether the habitat mosaic created within the burn area included unburned patches that were suitable habitat for pygmy rabbits. Additionally, we developed survey techniques that would allow us to use tracks and fecal pellets to differentiate between cottontails and pygmy rabbits.

STUDY AREA

Located in Lincoln County in southwestern Wyoming, FOBU (41.85º N, 110.75º W) received 27 cm of precipitation annually, with mean summer and winter temperatures of 16º C and -8º C, respectively. The most common vegetation types found within FOBU were big sagebrush and low sagebrush. Although low sagebrush commonly refers to *Artemisia arbuscula* var. *arbuscula*, which is listed as probably found but not confirmed within FOBU (Fertig and Kyte 2009), we did not distinguish between it and *Artemisia arbuscula* var. *longiloba*, and use low sagebrush to refer to both varieties. Mountain and basin big sagebrush were the most abundant subspecies of big sagebrush, although Wyoming big sagebrush was common. Other common shrubs included rabbitbrush (*Chrysothamnus* spp.), mountain snowberry (*Symphoricarpos oreophilus* var. *utahensis*), winterfat (*Krascheninnikovia lanata*), Utah serviceberry (*Amelanchier utahensis*) alder-leaf mountain mahogany (*Cercocarpus montanus*), and antelope bitterbrush (*Purshia tridentata*) (Fertig and Kyte 2009). In addition, wet meadows dominated by *Carex* spp. occurred in low-lying areas and isolated stands of limber pine (*Pinus flexilis*), Douglas fir (*Pseudotsuga menziesii*), and *Populus* spp. occurred at high elevations and along drainages (Dorn et al. 1985). Fertig and Kyte (2009) reported cheatgrass in FOBU, but listed it as uncommon. Domestic livestock grazing ended in the monument in the 1980's and pygmy rabbits were not reported within FOBU at that time. Other lagomorphs that occurred in FOBU were mountain cottontails (*Sylvilagus nuttallii*), desert cottontails (*S. audubonii*), and white-tailed jackrabbits (*Lepus townsendii*) (Dorn et al. 1984).

Within FOBU, the study area used for habitat selection and occupancy estimation (600 ha) encompassed all of the burn, as well as adjacent unburned areas (Figure 1). Additionally, we trapped pygmy rabbits and cottontails opportunistically at other locations within FOBU and throughout the Wyoming portion of the geographic range of pygmy rabbits. Elevations ranged from 2,000 to 2,380 m and slopes were dominated by southwesterly and southeasterly aspects. The vegetation community within the habitat study area was representative of the vegetation types of FOBU, dominated by types classified as mountain big sagebrush and low sagebrush (Friesen et al. 2010)

The Rock Creek Fire burned 92.9 ha in FOBU; within the burn area there remained 7.6 ha of unburned vegetation distributed in 199 patches (Figure 2). Before the burn, there were 76.1 ha of big sagebrush and 16.5 ha of low sagebrush inside of the burn perimeter. The fire removed 95% of big sagebrush and 76% of low sagebrush, leaving approximately equivalent areas of big (3.6 ha) and low sagebrush (4.0 ha). The patch size of unburned vegetation ranged from <1 m^2 to >2 ha, although most of unburned patches were <100 m^2 (Figure 3). The majority of unburned patches that had areas that were >80% big sagebrush were <100 m^2; less than half of the unburned patches that were >300 m^2 had areas that were >80% big sagebrush. A majority of the unburned area was in the >2000-m^2 size class of unburned patches, which also accounted for the

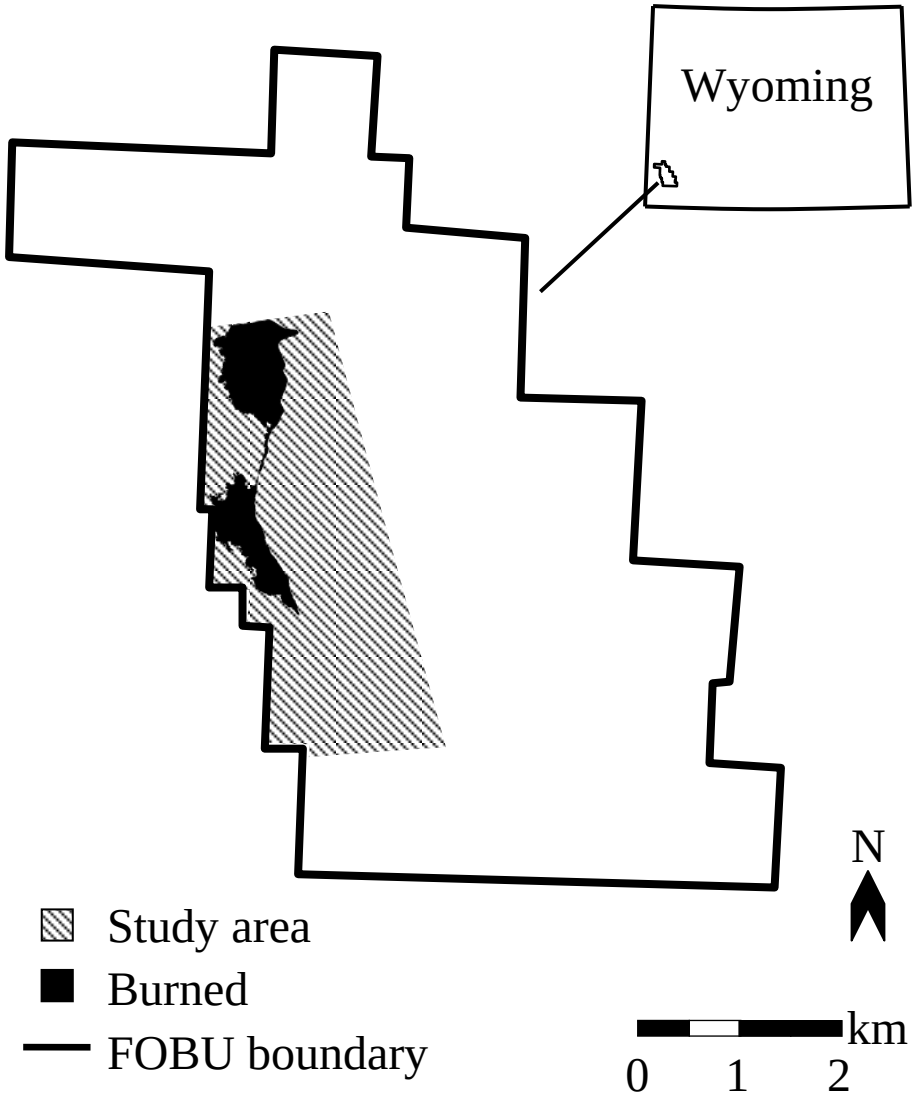

Figure 1. Area and location maps for study of habitat selection by pygmy rabbits in Fossil Butte National Monument (FOBU), Wyoming, 2008-2009. Area shown as burned underwent prescribed fire in 2005. Cross-hatched area was used to study habitat selection by pygmy rabbits.

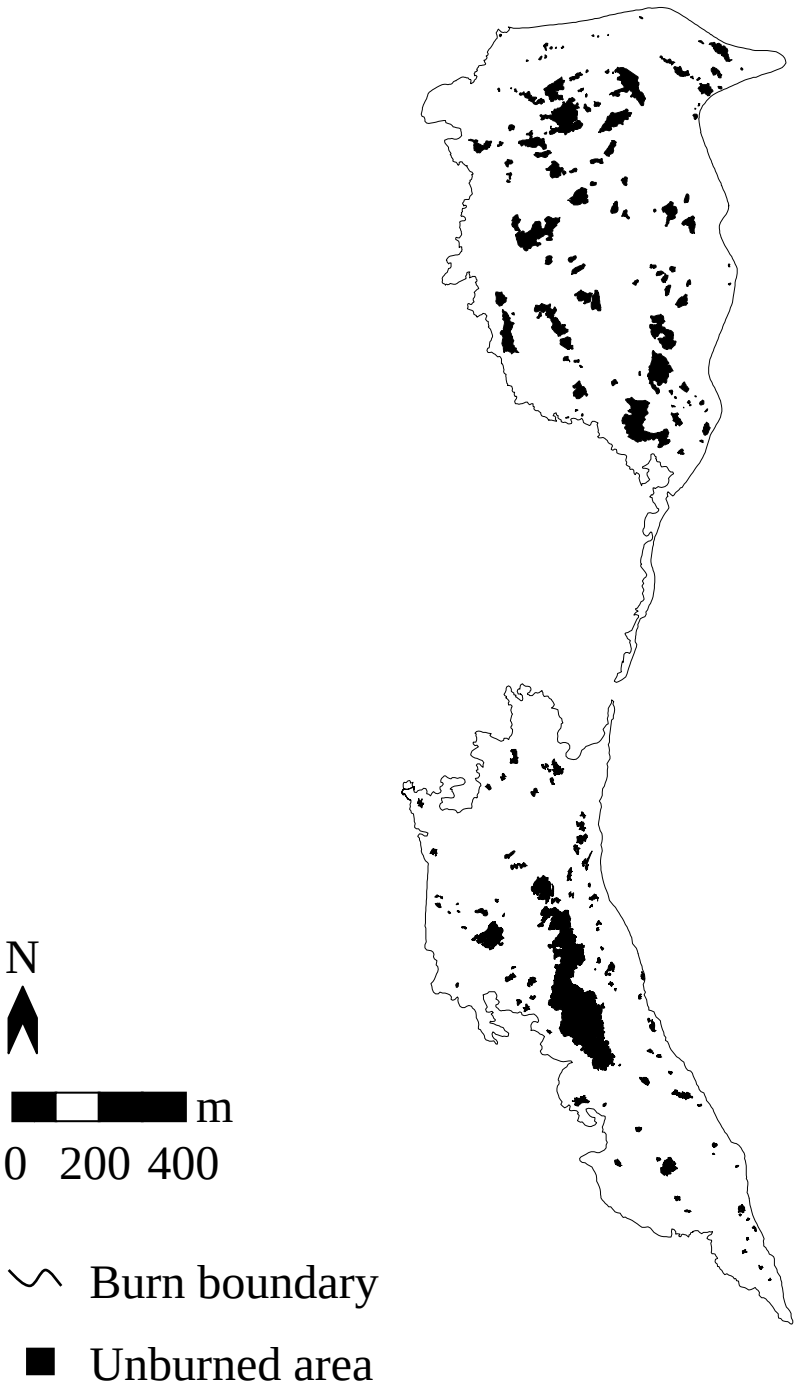

Figure 2. Perimeter of 2005 prescribed fire and unburned vegetation patches, Fossil Butte National Monument, Wyoming.

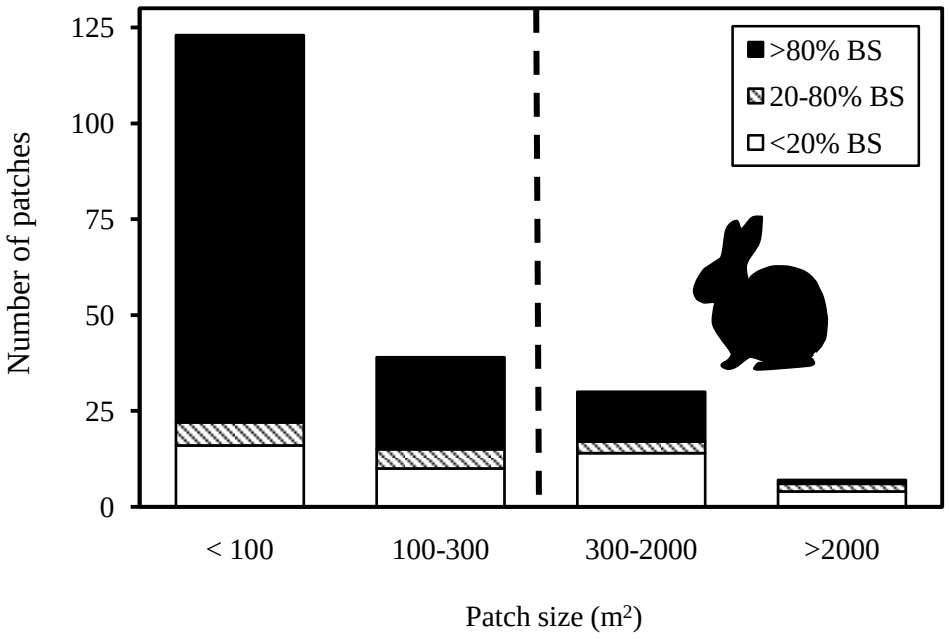

Figure 3. Number of unburned patches containing different areas of big sagebrush (BS) by patch size category within the 2005 burn perimeter, Fossil Butte National Monument, Wyoming. The area that was not big sagebrush was low sagebrush. The dashed line separates patch size categories large enough to be a core area of a pygmy rabbit from those that are not (Katzner 1994).

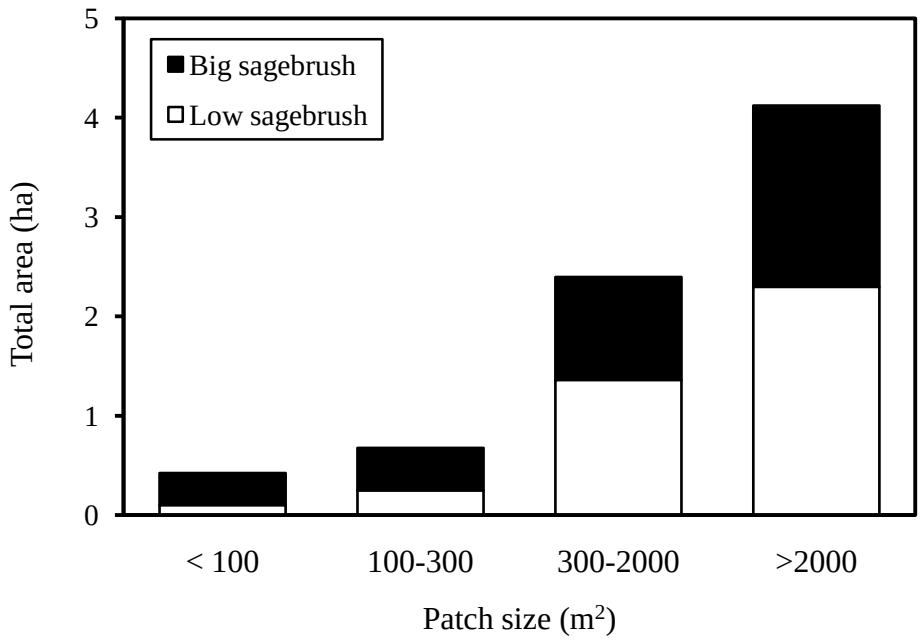

Figure 4. Total unburned area of 2 species of sagebrush by patch size category within the 2005 burn perimeter, Fossil Butte National Monument, Wyoming.

greatest unburned area of big sagebrush (Figure 4). However, all of the unburned patches were <5000 m^2, except for one patch with a total area of 21,895 m^2 that contained 72% of big sagebrush left unburned in patches >2000 m^2 and 36% of unburned big sagebrush overall; while this large patch contained only 38% low sagebrush in patches >2000 m^2 and 22% of unburned low sagebrush overall. The total area of low sagebrush that remained after the fire in patches >300m^2 was greater than that of big sagebrush.

METHODS

In June 2008, we used a Global Positioning System (GPS) to map the perimeters of the burn and unburned vegetation within the burn with sub-meter accuracy. Three years had passed since the fire, therefore we relied on blackened vegetation and soil to delineate burn boundaries. To describe the vegetation within the burn, we used Geographic Information System (GIS) methods to create a map layer of the burn boundaries, overlay the FOBU vegetation map (Friesen et al. 2010), and calculate areas of different vegetation types before and after the burn.

To determine cut-points that allowed us to use sign to predict the presence of pygmy rabbits, we captured pygmy rabbits and cottontails during June 2008-July 2009 using Tomahawk live traps (Tomahawk, WI) wrapped in burlap We trapped within as well as outside of our habitat study area at FOBU, as well as at additional locations across the geographic range of pygmy rabbits in Wyoming as part of a related study. We tested different bait types: no bait, olfactory bait (cottontail trapping scent and apple juice), and food bait (apples, canned green beans, and cabbage). During summer, we placed traps by burrow entrances and under shrubs that had pellet piles. We placed traps during winter in runways created by pygmy rabbits in snow. For every rabbit captured, we measured hind foot length (HFL) to 1 mm and collected fecal pellets from traps that had not contained edible bait. Using dial calipers, we measured each pellet along the shortest axis to 0.1 mm and calculated mean pellet diameter for individual rabbits. Initially, we created binary logistic regressions to predict the probability that sign belonged to a pygmy rabbit, but when we removed juveniles, the logistic regression resulted in nonsensical parameter and standard error estimates due to complete separation of predictor variables. We therefore calculated cut-points to discriminate between taxon by taking the mid-point between the upper bound of the 95% confidence interval of MPD and HFL of adult pygmy rabbits and the lower bound of the 95% confidence interval of MPD and HFL of adult cottontails. The University of Wyoming Animal Care and Use Committee approved procedures used in this study (Understanding the impact of fire on pygmy rabbit distribution, abundance, and movement, approved November 2007; Development of survey protocols for pygmy rabbit in the presence of cottontails, approved April 2008).

We planned to fit pygmy rabbits with radio collars in burned and unburned areas to compare habitat use. However, we were not able to find any recent pygmy rabbit sign or capture pygmy rabbits within the burn. Instead, we focused our trapping effort on rabbits that occupied unburned areas adjacent to the burn perimeter using methods described above. We fitted 10 pygmy rabbits with 5-g radio collars (Telonics, Mesa, AZ) and located each rabbit daily for the remainder of summer 2008. We varied the time of day we located rabbits to account for any diel differences in rabbit behavior and movement and only included locations that had precision <1 ha.

During summer of 2008, we established 100 (10 × 10 m) vegetation plots placed randomly across the study area (n = 26 burned, 74 unburned) placed >100 m apart. We chose the minimum

distance between plots needed for independent occupancy by pygmy rabbits by taking the square root of the mean home range area of a pygmy rabbit reported by Katzner and Parker (1997). We used the line-intercept method (Barbour et al. 1999) to measure percent total shrub cover, percent big sagebrush cover, and percent dead shrub cover. We established 10-m transects at the mid-line and at each end-line of plots (30 m of transect per plot). Additionally, we used Daubinmire frames (20 × 50 cm) set randomly along the transects (n = 6 per plot) to estimate percent cover of grasses, forbs, bare ground, and rock (Daubinmire 1959). At the same random locations, we measured vertical structure by counting the number of times vegetation hit a pole at increments of 10 cm. For analysis, we binned the number of vegetative hits in >50 cm and >70 cm categories. We calculated correlations between vegetation characteristics and used Mann-Whitney U tests to identify differences between vegetation characteristics in study units occupied and unoccupied by pygmy rabbits, as well as between burned and unburned areas.

In February 2009, we established 7 belt transects through both burned and unburned areas. Transects varied in length from 1410 to 3900 m and were 14 m wide. We divided each transect into 30 × 14 m sections (n = 717). During the following growing season, we counted and measured the height to 10 cm of every big sagebrush shrub that intersected the mid-line of the belt transects.

During winter (February-March) 2009, we assessed presence of pygmy rabbits by searching for sign on both plots and transects. We decided to survey during winter because pellets on snow would be recent (and therefore less likely to be confused between pygmy rabbits and juvenile cottontails) and the size of tracks on snow would be an indicator of pygmy rabbits. We visited each plot 4 times and each transect section 3 times, waiting 24 hr for sign to accumulate after snow fall or heavy winds. We collected 1 pellet group and measured 5 hind foot tracks to 1 mm. Additionally, we estimated the percentage of the plot that was covered by snow. If we found only tracks in the sample unit, we followed them until we found pellets or the tracks disappeared. In order for us to consider pygmy rabbits present, we had to find either pellets or tracks on snow and either the mean track length or the mean pellet diameter had to be below the respective cut-point for pygmy rabbit.

We used program PRESENCE v. 3.0 (Hines 2006) to test hypotheses about occupancy and detection probabilities of pygmy rabbits. Although we had chosen tracks in snow or pellets on snow a priori to indicate presence of pygmy rabbits, we used the plot data to examine how different criteria for determining species presence would affect detection probabilities (Bailey et al. 2004). The criteria we examined were: 1) pellets and tracks, one on snow; 2) pellets and tracks and burrow, one on snow; 3) pellets, on or off snow; 4) pellets, on snow; 5) pellets or tracks, on snow; 6) pellets or tracks and burrow, one on snow; 7) tracks, on snow.

We could not use all of the transect sections to model occupancy and detection probabilities because of spatial autocorrelation. Because we wished to use the transect data to examine sagebrush characteristics (including variation of means) that predicted occupancy of pygmy rabbits, we removed all of the transect sections that had <2 big sagebrush plants. We examined the spatial correlation of occupancy by using a sub-sampling approach that limited us to transect sections 120 m apart to achieve independence. We randomly chose starting transect sections, building a data set that included only sections that had >1 big sagebrush plant and were spaced 120 m apart from sections already in the data set (the “reduced transects” data set). The distance

that we needed for transect sections to have independent occupancy status was similar to that we calculated for plots.

To create occupancy models for pygmy rabbits, we first modeled detection probabilities holding occupancy constant (Bailey et al. 2004). We considered visit, percent snow cover (SC), percent total shrub cover (TSC), and percent big sagebrush cover (BSC) as covariates that might affect detection probabilities in plots. Along the reduced transects, we included visit and number of big sagebrush plants (BS) in candidate models of detection probability. We included the covariate of detection probability from the model with the lowest AIC value in all subsequent models that included covariates to model occupancy. To model occupancy in the plots, we used principle components analysis (PCA) to determine which of the predictor habitat variables best described the plots and chose the 2 top-loading variables from the first eigenvector and the top loading variable from the second eigenvector as predictors of occupancy. Additionally, because of the strong association of pygmy rabbits with big sagebrush, we also included BSC as a covariate. We included covariates in occupancy models of reduced transects that described the big sagebrush in the transect sections: BS, mean height of big sagebrush (MEAN), maximum height of big sagebrush (MAX), standard error of big sagebrush heights (SEH), and the difference between the maximum and mean sagebrush heights (DIFF). Although, the primary purpose of this study was to determine whether pygmy rabbits used areas within the burn perimeter, we did not include a burn covariate because there were no pygmy rabbits found within the burn, which would have led to large standard error estimates. We compared models in the occupancy set using $QAIC_c$ because the most general model showed evidence of over-dispersion ($\hat{c} > 1$) and we inflated the standard errors of the estimates accordingly (MacKenzie and Bailey 2004). We examined differences in occupancy probabilities using conditional occupancy estimates, which incorporate information about detection history (MacKenzie et al. 2006). We used model averaged coefficients to calculate conditional occupancy and detection probabilities (MacKenzie et al. 2006).

RESULTS

We captured 16 pygmy rabbits and 15 cottontails at FOBU. Additionally, we trapped 37 pygmy rabbits and 28 cottontails from 10 additional locations; both taxa were captured at 2 locations, while the remaining 8 locations produced capture of a single taxon. Trapping success for pygmy rabbits during the winter without bait was 5 times that during summer with bait. To distinguish between sign of adult pygmy rabbits ($n_{rabbits}$ = 45 for HFL, 37 for MPD) and adult cottontails ($n_{rabbits}$ = 28 for HFL, 11 for MPD), we used cut-points of 83 mm (HFL) and 5.5 mm (MPD) (Figure 5).

We collared pygmy rabbits in 3 areas of FOBU, only 1 of which was within our habitat study area (Figure 6). A juvenile pygmy rabbit was trapped and collared by the Fossil Lake Trail, but was killed by a raptor within 12 hr. In the area adjacent to the burn, 2 females and 1 male were collared. The male rabbit was a juvenile and mid-way through summer moved from the west side of the road to the east side, traveling through the burned area. Additionally, we collared 1 female and 1 male by the FOBU visitor center and 2 female and 2 male pygmy rabbits behind the living quarters.

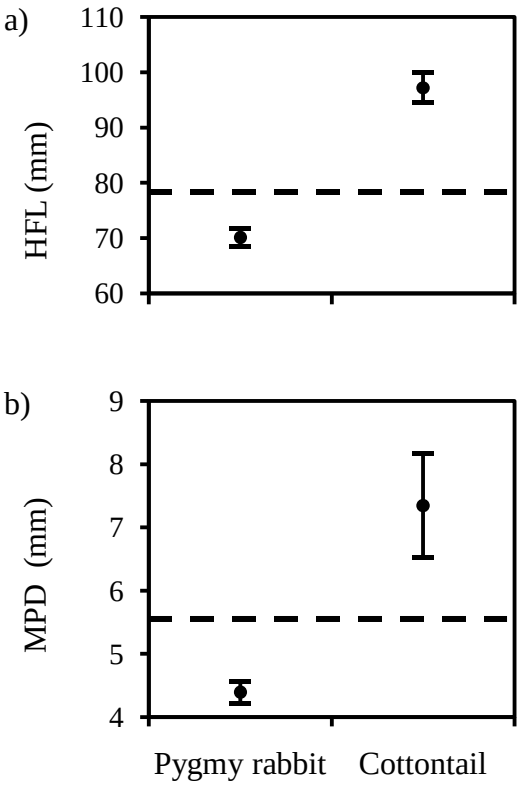

Figure 5. Morphological predictors used to distinguish pygmy rabbits from cottontails across the geographic range of pygmy rabbits in southern and southwestern Wyoming, 2008-2009. a) Mean hindfoot length (HFL) for each taxon with 95% CI and cut-point (83 mm) used to distinguish between taxa using track length. b) Mean individual pellet diameter (MPD, individual means) with 95% CI and cut-point (5.5 mm) used to

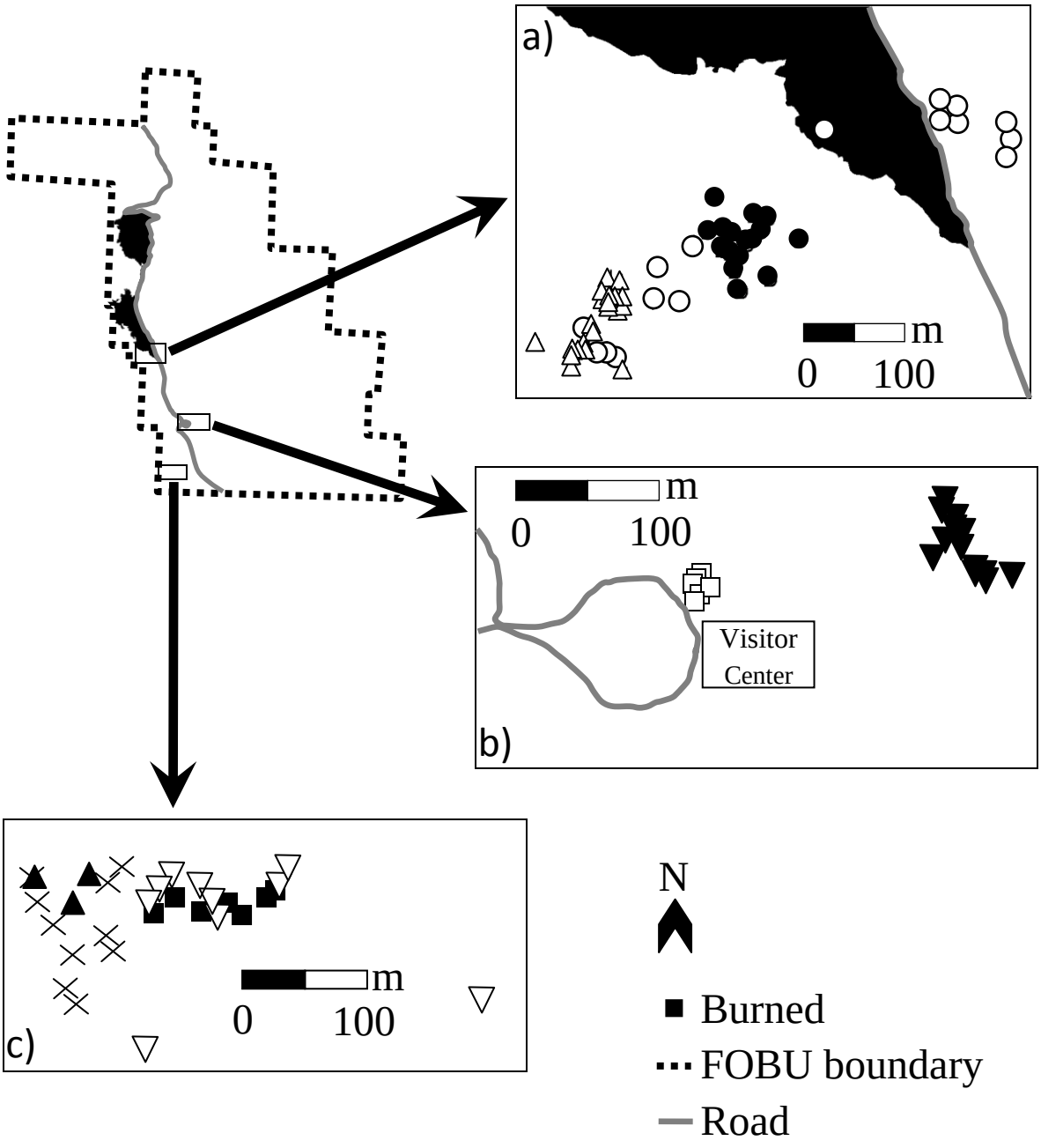

Figure 6. Locations of radio-collared pygmy rabbits within Fossil Butte National Monument (FOBU), Wyoming, summer 2008. Locations of rabbits a) adjacent to the 2005 burn perimeter, b) next to the visitor center, and c) behind the living quarters. Different symbols represent different rabbits.

Plots

Detection probability.—Detection probabilities were 0.21-0.34 and occupancy estimates were 0.08-0.13 depending on the criteria used to indicate pygmy rabbits (Table 1.). However, standard errors were large, sometimes larger than the point estimates, indicating poor precision of models that held both occupancy and detection probability constant, $\psi(\cdot)\ p(\cdot)$. When covariates were included in models of detection probability and occupancy was held constant, the model receiving the most support included total shrub cover (TSC) as a covariate (Table 2). The model, $\psi(\cdot)\ p(\text{TSC})$, received 98% of model weights and did not show evidence of over-dispersion. There was no support for the $\psi(\cdot)\ p(\cdot)$ model, which also showed evidence of poor fit.

Habitat variables.—The top 2 eigenvectors accounted for 66% of variability in vegetation characteristics. The first principal component described shrub cover within the plots with number of vegetative hits >50 cm (VS >50, 0.464 [coefficient]), dead shrub cover (DSC, 0.461), and big sagebrush cover (BSC, 0.426) as the 3 highest-loading variables. Ground cover was described by the second principal component with grass cover (GC) as the highest-loading variable (-0.588), although forb cover was almost as important (-0.505).

Occupancy.—We detected pygmy rabbits in 8 plots over multiple visits, giving a naïve occupancy estimate of 0.08. There was evidence of over-dispersion in the global model ($\hat{c}$ = 1.95). All models in this set contained TSC ($\beta_{TSC} = 0.05 \pm 0.03$ SE inflated) as a covariate of detection probability; DSC ($\beta_{DSC} = 0.70 \pm 0.44$ SE inflated) was the most important covariate of occupancy and models that included DSC received 85% of the model weights. Model averaged coefficient estimates suggested that the odds of a plot being occupied increased 20-fold for every 10% increase of DSC; detection probability increased 0.5-fold for every 10% increase of TSC. The model that included BSC as a covariate of occupancy received little support, as did the model that held occupancy constant across plots (Table 3).

Big sagebrush cover.—Although there was little support for models that included big sagebrush, BSC was positively correlated with DSC within the plots (Pearson's $r = 0.66$, $P < 0.001$, $n = 100$). Additionally, BSC (Mann-Whitney $U = 607$, $P = 0.002$,) and DSC (Mann-Whitney $U = 692$, $P < 0.001$,) were greater in occupied plots ($n = 8$, median BSC = 14%, median DSC = 11%) than in those that were not occupied ($n = 91$, median BSC = 2%, median DSC = 2%). BSC was not correlated with grass (Pearson's $r = -0.11$, $P = 0.26$) or forb cover (Pearson's $r = 0.08$, $P = 0.46$).

Transects

We found sign of pygmy rabbits in 33 of the 717 transect sections. When the data set was reduced to include only sections that had >1 big sagebrush plant and were spaced far enough apart to have independent occupancy status, 4 of 93 were occupied.

Occupancy.—The naïve occupancy estimate for the reduced data set was 0.04. The model that held detection probability constant received 65% of model weights when occupancy was held constant (Table 4). The model that included the number of big sagebrush (BS) as a covariate of detection probability was within 2 AIC units of the top model. Top models in the model set that included covariates of occupancy included predictors that described the height of big sagebrush plants along reduced transects. There was some evidence of over-dispersion in the

Table 1. Estimates of site occupancy (ψ) and detection probabilities (*p*) (SE inflated for $\hat{c} > 1$) using model $\psi(\cdot)\ p(\cdot)$ for different criteria sets of sign to indicate presence of pygmy rabbits within plots at Fossil Butte National Monument, Wyoming, winter 2009. Naïve estimates were the number of plots occupied given the different criteria divided by the total number of surveyed plots.

Sign type	*p*	SE	Ψ	SE	Naïve estimate
Tracks, on snow	0.22	0.18	0.08	0.06	0.05
Pellets, on snow	0.23	0.27	0.11	0.13	0.07
Pellets, on or off snow	0.34	0.11	0.11	0.04	0.09
Pellets or tracks, on snow	0.21	0.30	0.13	0.18	0.08
Pellets and tracks, one on snow	0.22	0.14	0.08	0.05	0.05
Pellets or tracks, and burrow, one on snow	0.23	0.26	0.11	0.12	0.07
Pellets and tracks and burrow, one on snow	0.27	0.16	0.06	0.04	0.04

Table 2. Model sets for detection probability of pygmy rabbits on plots and reduced transects (transect sections with >1 big sagebrush plant that were spaced apart to have independent occupancy status) in Fossil Butte National Monument, Wyoming, winter 2009. The probability of occupancy (Ψ) was held constant, while detection probability (*p*) varied with covariates, ψ(·) *p*(covariate).

Model [a]	ΔAIC_c [b]	ω [c]	K [d]
Plots			
ψ(·) *p*(TSC)	0.00	0.98	3
ψ(·) *p*(BSC)	8.76	0.01	3
ψ(·) *p*(·)	12.44	0.00	2
ψ(·) *p*(SC)	14.48	0.00	3
ψ(·) *p*(visit)	15.58	0.00	5
Reduced transects			
ψ(·) *p*(·)	0	0.65	2
ψ(·) *p*(BS)	1.92	0.25	3
ψ(·) *p*(visit)	3.71	0.10	4

[a] · = no covariate; TSC = total shrub cover (%); BSC = big sagebrush cover (%); SC = snow cover (%); visit = survey number; BS = number of big sagebrush plants that crossed the center line of the belt transects

[b] Change in AIC_c values from top model

[c] Model weight

[d] Number of parameters

Table 3. Model selection results for occupancy by pygmy rabbits in 10 × 10 m plots, Fossil Butte National Monument, Wyoming, 2008-2009. Occupancy was modeled with vegetation covariates, while detection probability varied with total shrub cover.

Model[a]	$\Delta QAIC_c$[b]	ω[c]	K[d]
ψ(DSC) *p*(TSC)	0	0.56	4
ψ(DSC, GC) *p*(TSC)	2.05	0.20	5
ψ(DSC, GC, VS >50) *p*(TSC)	3.58	0.09	6
ψ(·) *p*(TSC)	5.38	0.04	3
ψ(GC) *p*(TSC)	5.98	0.03	4
ψ(VS >50) *p*(TSC)	6.15	0.03	4
ψ(SBC) *p*(TSC)	6.96	0.02	4
ψ(VS >50, GC) *p*(TSC)	7.49	0.01	5
ψ(SBC, GC) *p*(TSC)	8.16	0.01	5
ψ(SBC, VS >50) *p*(TSC)	8.36	0.01	5
ψ(VS >50, GC, SBC) *p*(TSC)	9.69	0.00	6

[a] · = no covariate; DSC = dead shrub cover (%); TSC = total shrub cover (%); GC = grass cover (%); BSC = big sagebrush cover (%); VS >50 = number of vegetative hits over 50 cm

[b] Change in $QAIC_c$ values from top model

[c] Model weight

[d] Number of parameters

Table 4. Model selection results for occupancy by pygmy rabbits along reduced transects (transect sections with >1 big sagebrush plant that were spaced apart to have independent occupancy status), Fossil Butte National Monument, winter 2009. Occupancy was modeled using covariates describing characteristics of big sagebrush along the centerline of belt transects; detection probability was held constant.

Model[a]	ΔQAICc[b]	ω[c]	K[d]
ψ(DIFF) p(·)	0	0.17	3
ψ(DIFF, MEAN) p(·)	1.03	0.10	4
ψ(DIFF, MAX) p(·)	1.03	0.10	4
ψ(MEAN, MAX) p(·)	1.03	0.10	4
ψ(DIFF, SB) p(·)	1.60	0.08	4
ψ(DIFF, SEH) p(·)	1.83	0.07	4
ψ(SEH, MAX, MEAN) p(·)	3.20	0.03	5
ψ(DIFF, SEH, MEAN) p(·)	3.20	0.03	5
ψ(DIFF, SEH, MAX) p(·)	3.20	0.03	5
ψ(SB, MAX, MEAN) p(·)	3.25	0.03	5
ψ(DIFF, SB, MEAN) p(·)	3.25	0.03	5
ψ(DIFF, SB, MAX) p(·)	3.25	0.03	5
ψ(DIFF, MAX, MEAN) p(·)	3.26	0.03	5
ψ(·) p(·)	3.61	0.03	2

[a] · = no covariate; MEAN = mean big sagebrush height; MAX = maximum sagebrush height; SEH = SE of big sagebrush height; DIFF = MAX - MEAN; SB = number of big sagebrush plants

[b] Change in QAICc values from top model

[c] Model weight

[d] Number of parameters

global model ($\hat{c}$ = 1.24). The top model included the difference between the maximum height and mean height of big sagebrush (DIFF) as a covariate of occupancy. The odds of a transect section being occupied by a pygmy rabbit increased by a factor of 0.20 for every 10-cm increase in DIFF (β_{DIFF} = 0.19 ± 0.06 SE inflated). The weights of models that included DIFF as a covariate of occupancy summed to 77%. Models that were within 2 AIC units of the top model included mean height (MEAN, β_{MEAN} = -0.13 ± 0.03 SE inflated) and maximum height (MAX, β_{MAX} = 0.03 ± 0.01 SE inflated) of big sagebrush, as well as BS (β_{BS} = -0.01 ± 0.04 SE inflated).

Big sagebrush height —The MEAN (Mann-Whitney U = 181, P = 0.95) and MAX (Mann-Whitney U = 281, P = 0.05) was similar in occupied (n = 4, median MEAN = 60 cm, median MAX = 110 cm) and unoccupied plots (n = 89, median MEAN = 60 cm, MAX median = 90 cm). However, DIFF was twice that (Mann-Whitney U = 317, P = 0.009) in occupied (median = 50 cm) than unoccupied plots (median = 20 cm).

Occupancy and Fire

DSC was lower (Mann-Whitney U = 1352, P = 0.002) in burned plots (n = 27, median = 1%, maximum = 8%) than unburned plots (n = 72, median = 3%, maximum = 22%). Low DSC bounded the probability of occupancy by pygmy rabbits at a maximum of 0.43 (Figure 7). Greater mean conditional occupancy probability in unburned plots ($\Psi_{conditional}$ = 0.18, 95% CI inflated = 0.07, 0.28) compared to that of burned plots ($\Psi_{conditional}$ = 0.02, 95% CI inflated = 0, 0.07) reflected this limitation on occupancy due to low DSC. The MEAN (Mann-Whitney U = 1248, P < 0.001), MAX (Mann-Whitney U = 1284 , P < 0.001), and DIFF (Mann-Whitney U = 1207, P < 0.001,) were higher outside (n = 70, median MEAN = 70 cm, median MAX = 100 cm, median DIFF = 30 cm) of the burn perimeter than within (n = 23, median MEAN = 60 cm, median MAX = 70 cm, median DIFF = 10 cm). Detection probabilities were 60% to 85% higher on reduced transects than plots. Plots outside of the burn perimeter had detection probabilities that were 3-fold those within the burn (Figure 8).

DISCUSSION

Occupancy

Occupancy estimates for pygmy rabbits were considerably lower inside than outside the burn perimeter due to unsuitable habitat features inside the burn that were presumably caused by the fire. In Idaho, Rachlow and Svancara (2006) found a history of recent fire was a negative predictor of pygmy rabbits. In our study, important features of habitat to pygmy rabbits were those that described the complexity of habitat: dead shrub cover and the relationship between the mean and maximum heights of big sagebrush. Katzner and Parker (1997) also reported an association between pygmy rabbits and sites with abundant dead shrubs, hypothesizing that dead shrubs and twigs increased protection from predators and facilitated access to the subnivean environment during winter. We found that maximum sagebrush height was a positive predictor of occupancy by pygmy rabbits; likewise, Katzner and Parker (1997) found maximum shrub height to be greater in used than unused areas. Multiple studies have found mean shrub height and mean sagebrush height to be greater in occupied than unoccupied sites. Surprisingly, we found a negative relationship between mean height of big sagebrush and probability of occupancy by pygmy rabbits. Big sagebrush cover was not an important predictor in occupancy

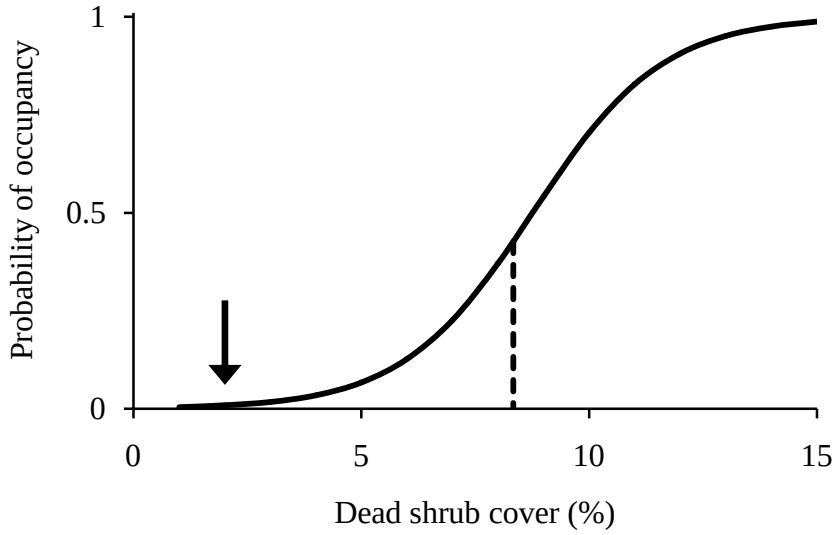

Figure 7. Logistic regression relating the probability of occupancy for pygmy rabbits to dead shrub cover based on occupancy models of plots, Fossil Butte National Monument, Wyoming, 2008-2009. The arrow indicates the mean dead shrub cover within the burn perimeter. The dashed line indicates the maximum dead shrub cover within the burn perimeter. Occupancy probabilities in plots within the burn boundary were bounded at 0.43 by maximum dead shrub cover.

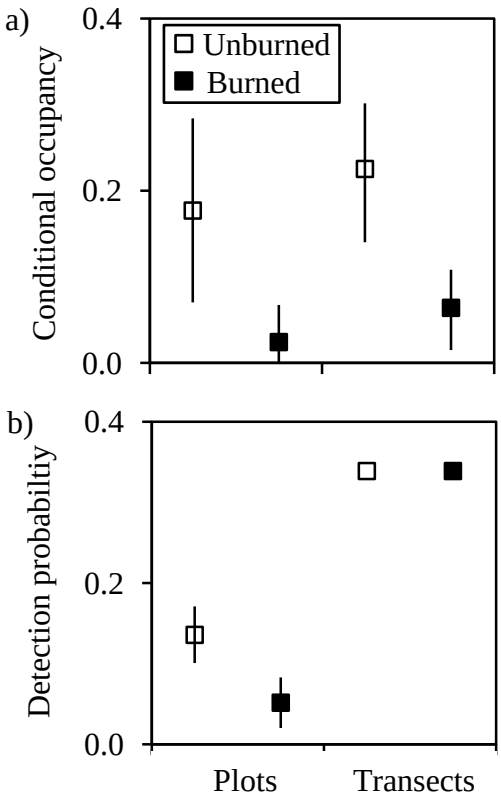

Figure 8. a) Conditional occupancy probabilities and b) detection probabilities with 95% CI for pygmy rabbits inside and outside of the burn perimeter, Fossil Butte National Monument, Wyoming, winter 2009. Estimates were derived from models based on plot data and reduced transects (transect sections that had >1 big sagebrush plant and spaced apart to have independent occupancy status) and were estimated using model-averaged coefficients. Detection probabilities of reduced transects were constant across time and space.

models, although we found sign of pygmy rabbits only in plots that contained big sagebrush. Additionally, because of the correlation between dead shrub cover and big sagebrush cover, the probabilities of occupancy in plots, even when estimated using the model that included only dead shrub cover, were low for plots with no big sagebrush. While Katzner and Parker (1997) found the number of big sagebrush plants to be greater in used than non-used areas, this attribute was not an important predictor in our study. The number of big sagebrush plants did appear in a model that was within 2 AIC units of the top model; however, the 95% confidence interval of the odds ratio included 1 and the difference between the maximum and mean sagebrush heights was also a covariate in the model.

The model set based on the reduced transects, with which we examined different characteristics of big sagebrush, indicated that the difference between maximum and mean heights of big sagebrush was an important predictor of the presence of pygmy rabbits. The variance-covariance matrices of models that included either mean or maximum height did not converge and we removed them from further analysis. However, the likelihood values would have placed these models below the $\Psi(\cdot)\ p(\cdot)$ model; the top models would have remained those that included information about both the mean and maximum big sagebrush heights. The negative coefficient of mean big sagebrush height and the positive coefficient of maximum big sagebrush height reinforced that the relationship between mean and maximum heights was important. The models following the top model, which included a combination of DIFF, MEAN, and MAX, all had the same likelihood value because all contained essentially the same information about the relationship between the mean and maximum heights of big sagebrush. The predictive ability of the difference between mean and maximum heights supported the importance of vertical complexity to pygmy rabbits reported by Katzner and Parker (1997).

Attributes of big sagebrush that are characteristic of stands occupied by pygmy rabbits are similar to those found in old-growth forests in the Pacific Northwest, which are recognized as critical habitat to many wildlife species (Thomas et al. 1988). Structural features that define old-growth include large trees, mostly Douglas fir, a dead tree component, large variance in size-class of trees, and multiple canopy layers (Franklin and Spies 1991). Analogous features common in older stands of big sagebrush that are important to pygmy rabbits: large shrubs, mostly big sagebrush (Green and Flinders 1980, Katzner 1994), large dead component (this study, Katzner 1994), variability between maximum and mean shrub height (this study), and vertical structure (Katzner and Parker 1997). Unlike old-growth forests, late successional sagebrush communities are considered by many wildlife managers to be undesirable wildlife habitats.

Land managers consider mature stands of big sagebrush undesirable partially due to low forb-grass cover in areas with high big sagebrush cover (Wyoming Interagency Vegetation Committee 2002). Despite this view of late seral big sagebrush stands, a negative relationship between big sagebrush and forb-grass cover has not been specifically demonstrated (summarized by Welch 2005), nor did we find a correlation between big sagebrush cover and grass or forb cover at FOBU. Management practices for late successional stands of big sagebrush include prescribed burning, in the expectation that it will increase forb-grass cover. Increasing big sagebrush productivity is also cited as a justification for prescribed fire. While forb-grass production in burned areas can exceed that in control area 2-3 years after fire (Cook et al. 1994, Perryman et al. 2002), Wambolt et al. (2001) found that perennial grass cover was similar

between unburned and burned sites after 7 growing seasons. Conversely, big sagebrush did not recover to control levels after 32 growing seasons. While prescribed burning can increase the productivity of a site as it is returning to equilibrium, the increase of forb-grass cover is short-lived and is followed by a period during which a burned site will have intermediate grass-forb cover and little big sagebrush cover. Furthermore, as described by Gabler et al. (2001), it is possible that pygmy rabbits modify vegetation in the area around burrows, which may further enhance characteristics perceived to be associated with mature big sagebrush stands. Green and Flinders (1980) suggested that preferential grazing on grasses led to a decrease in grass density in areas having high densities of pygmy rabbits. A reduced density of short shrubs around burrows, found by Heady and Laundré (2005), led them to speculate that burrowing activities by pygmy rabbits prevented new shrubs from becoming established, allowing already established shrubs to grow taller. A removal of young shrubs by pygmy rabbits would also reduce the perceived recruitment of big sagebrush on a site, leading to an even-aged stand.

Detection probability

Incorporating detection probabilities into occupancy estimates for a species acknowledges that it might be present at a site even when not detected. Investigators can fail to detect a species for a variety of reasons: observer and sampling method variations (Bailey et al. 2004), site characteristics that interfere with detection (Bailey et al. 2004, MacKenzie 2006), weather mediated differences in animal behavior (Bailey et al. 2004), rarity of a species (Mackenzie et al. 2005), and cryptic behavior of a species (MacKenzie 2006). We included total shrub cover as a detection probability covariate because we predicted that high shrub cover might impede our ability to detect sign. However, detection probability of pygmy rabbits in plots did not decrease with increasing shrub cover, but rather increased. When assessing the presence of a species in a sample unit, the sample unit most likely does not encompass an entire home range of an individual and not all portions of a home range are used equally. During a survey period, an animal might be in another portion of its home range other than the sample unit (Mackenzie 2006). Although our ability to detect sign may have been hindered by shrub cover, the positive relationship we observed between detection probabilities and total shrub cover indicated that pygmy rabbits more frequently used areas within their home range that had greater shrub cover than those with low shrub cover; this is congruent with findings of Katzner and Parker (1997).

The set of criteria we used to determine presence of pygmy rabbits – pellets on snow or tracks in snow – produced the lowest detection probability of all criteria sets. This was due to the requirement that sign be on snow, which we included to assure that a sample unit was currently occupied by pygmy rabbits. Pellets can persist for up to 34 months under field conditions (Sanchez et al. 2009) and juvenile cottontails produce pellets similar in size to those of pygmy rabbits. We required pellets to be on snow to insure that pygmy rabbits currently occupied the sample unit, inasmuch as fresh pellets or tracks that fell below our taxon-specific cut-points had a low probability of belonging to cottontails because juveniles were not present during our sample period. The set of criteria we used in this study yielded the highest occupancy estimates because only one type of sign – pellets or tracks – was necessary to establish presence. The low detection probability associated with our criteria reduced the chance that we declared a sample unit as occupied based on old sign of pygmy rabbits or old sign of juvenile cottontails, while the same set of criteria maximized occupancy by limiting the amount of sign we had to observe to score a sample unit as occupied. Currently, surveys for pygmy rabbits follow guidelines of

Ulmschneider (2004) that consider the condition of pellets and burrows. We chose not to require burrows as an indicator because burrows can be used by other animals and might not be present in low- and medium-use areas (Larrucea and Brussard 2008). We recommend that surveys of pygmy rabbits include a winter component because sign indicative of pygmy rabbits encountered during this time will be current and species-specific. In addition, our greater trap success during winter than during summer suggested that the former would be an appropriate time to capture pygmy rabbits to confirm presence in survey areas.

Fire

Pre-burn, Purcell (2005) did not find recent sign of pygmy rabbits in the northern portion of the burn, although she observed evidence of past use. Gruver (2003) and Purcell (2005) observed high densities of current pellets and burrows within the southern portion of the burn before the fire. Models based either on plots or reduced transects produced occupancy estimates within the burn perimeter that were <30% of those outside of the burn. The vegetation characteristics that we identified as important to pygmy rabbits — substantial dead shrub cover and vertical structure — were deficient within the burn perimeter. A majority of the plots within the burn perimeter did not fall into areas of unburned vegetation and did not contain any big sagebrush. The transects intersected with areas containing unburned big sagebrush; however, only 1 of 33 occupied sections were inside the burn perimeter. In this instance, we observed tracks on the edge of the burn during a single visit. Furthermore, during winter 2009, there was no other lagomorph sign observed within the burn perimeter, except for that of jackrabbit. Katzner (1994) described home ranges of pygmy rabbits that contained multiple core areas during winter in FOBU and the smallest core area (adaptive kernel method) was 345 m^2. Only 14 patches that were >80% big sagebrush in area were large enough (>300 m^2) to be a core area for a pygmy rabbit. The proportions of big sagebrush to low sagebrush before and after the burn show that the fire selectively burned sites dominated by big sagebrush. The large dead component of big sagebrush, especially found on older taller shrubs, was likely an important fuel source. Essentially, the fire selectively burned pygmy rabbit habitat.

The burn described in this study had a much lower percentage of unburned area left after the fire (8%) than reported in other studies (summarized by Baker 2006). Very few unburned areas within the burn were large enough (>300 m^2) and contained vegetation characteristics important to pygmy rabbits. It was unlikely these suitable areas were distributed in such a way that a single home range of a pygmy rabbit could have been assembled. Katzner and Parker (1997) described core areas for an individual pygmy rabbit in winter that were typically <50 m and never >100 m apart. We found evidence that burned areas adjacent to occupied sites outside the burn represented low-use areas. Use of such areas is likely to increase during summer when home ranges of pygmy rabbits expand and diet breadth widens to include non-sagebrush species (Katzner and Parker 1997, Sanchez and Rachlow 2008). But, core areas will likely remain outside of the burn perimeter for decades.

Pygmy rabbits apparently arrived at FOBU after domestic grazing was ended in the 1980's and were present throughout areas that would later be burned by the 2005 prescribed fire. This fire burned 92% of vegetation within the burn perimeter, a high value compared to other fires in big sagebrush (summarized by Baker 2006). The fire selectively removed big sagebrush, most likely old tall shrubs having a substantial dead component. We found nominal evidence of pygmy rabbits occupying areas within the burn perimeter: 1 telemetry location (compared to 57 that

were adjacent to the burn perimeter) of a juvenile within the burn perimeter, and 1 transect section (out of 269 within the burn perimeter) held sign of presence of pygmy rabbits on one occasion. Conditional occupancy estimates inside of the burn perimeter were only 30% of those outside. The majority of the unburned patches of big sagebrush within the burn perimeter were too small to be core area for pygmy rabbits. The recovery of big sagebrush to levels found outside of the burn perimeter can be expected to take ≥35 yr (summarized by Baker 2006).

MANAGEMENT IMPLICATIONS

Pygmy rabbits are strongly associated with late stage successional stands of big sagebrush, although they show some adaption to disturbance and successional stage. Management of big sagebrush that results in the loss of standing dead shrub material, loss of tall big sagebrush shrubs, and a decrease in the area covered by big sagebrush can be expected to have negative impacts on pygmy rabbits. Prescribed fire has the potential to selectively remove habitats that are important to pygmy rabbits, although this effect might not be intentional. When management objectives include increasing the productivity of the grass-forb understory and creating a mosaic of stands of big sagebrush at different successional stages in areas that are occupied by pygmy rabbits, removal of big sagebrush by methods other than prescribed burning should be considered. If conservation of habitat used by pygmy rabbits is a management goal, mechanical removal of big sagebrush would allow patches important to pygmy rabbits to be preserved. Further studies are needed that examine the relationship between grass-forb cover and big sagebrush across chronosequences. In addition, the use by pygmy rabbits of areas within the burn perimeter at FOBU should continue to be monitored to determine the time required for big sagebrush to recover to a stage used by pygmy rabbits.

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Appendix A. Center point of plots used in habitat selection study with pygmy rabbit presence (P = present, A = absent), Fossil Butte National Monument, Wyoming. Geographic coordinates are expressed as UTM (North American Datum 83, Zone 12).

Plot	Northing	Easting	Pygmy rabbit
1	4631829	518851	A
2	4632198	518855	A
3	4635516	517406	A
4	4635035	518006	A
5	4633479	518209	A
6	4632499	518516	A
7	4635794	518345	A
8	4633417	518405	A
9	4631638	519216	A
10	4634309	518066	A
11	4635693	517992	A
12	4631618	518561	P
13	4635011	517645	A
14	4634013	517657	A
15	4635430	517603	A
16	4635261	518460	A
17	4633233	518301	A
18	4634641	518002	A
19	4635110	517447	A
20	4635638	518463	A
21	4632174	518276	A
22	4634430	518036	P
23	4635427	518152	A
24	4635350	518338	A
25	4634936	518520	A
26	4634214	518536	A
27	4631939	518311	A
28	4631999	519394	P
29	4634163	518056	A
30	4634868	517959	A
31	4632591	518622	A
32	4632952	518462	P
33	4633160	518204	A
34	4635028	518163	A
35	4634561	518469	P

Plot	Northing	Easting	Pygmy rabbit
36	4635463	518421	A
37	4634230	518170	A
38	4635221	518016	A
39	4632395	518618	A
40	4632633	518771	A
41	4631666	518721	A
42	4633689	518660	A
43	4635457	517743	A
44	4635114	517871	A
45	4634321	517524	A
46	4635752	517767	A
47	4633045	518590	A
48	4634404	517622	A
49	4632420	518439	A
50	4634627	518548	A
51	4634617	517534	A
52	4633851	518816	A
53	4635763	518165	A
54	4631821	518385	A
55	4634568	517866	A
56	4633403	518072	A
57	4633374	518229	A
58	4634920	518355	A
59	4633851	518713	P
60	4634921	518106	A
61	4632915	518718	A
62	4632257	519033	A
63	4634152	517650	A
64	4632306	518695	P
65	4635140	517600	A
66	4633753	518023	A
67	4635153	518133	A
68	4633236	517890	A
69	4632483	518336	A
70	4632658	518313	A
71	4631741	518545	A
72	4635077	517739	A
73	4635310	517482	A
74	4631725	519336	A
75	4631948	518948	A
76	4634385	518571	A
77	4633583	518517	A

Plot	Northing	Easting	Pygmy rabbit
78	4634651	518363	A
79	4632975	518134	A
80	4631814	519019	A
81	4631726	519136	A
82	4632239	518359	A
83	4635290	518189	A
84	4635244	517734	A
85	4633878	518460	A
86	4631984	518774	A
87	4633732	518249	A
88	4633488	517861	A
89	4634826	518627	A
90	4633954	518976	P
91	4635573	517529	A
92	4635355	518487	A
93	4635794	517671	A
94	4635786	517861	A
95	4633334	518334	A
96	4633633	518099	A
97	4635522	518553	A
98	4635098	518338	A
99	4633787	518347	A
100	4634500	517572	A

Appendix B. Beginning and ending points for transect sections in habitat selection study with pygmy rabbit presence (P = present, A = absent), Fossil Butte National Monument, Wyoming. Geographic coordinates are expressed as UTM (North American Datum 83, Zone 12).

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
1	1	4635829	517887	4635798	517891	A
1	2	4635798	517891	4635769	517896	A
1	3	4635769	517896	4635739	517901	A
1	4	4635739	517901	4635709	517902	A
1	5	4635709	517902	4635679	517907	A
1	6	4635679	517907	4635649	517912	A
1	7	4635649	517912	4635620	517915	A
1	8	4635620	517915	4635589	517919	A
1	9	4635589	517919	4635559	517923	A
1	10	4635559	517923	4635530	517929	A
1	11	4635530	517929	4635502	517936	A
1	12	4635502	517936	4635472	517938	A
1	13	4635472	517938	4635443	517946	A
1	14	4635443	517946	4635414	517952	A
1	15	4635414	517952	4635386	517958	A
1	16	4635386	517958	4635356	517962	A
1	17	4635356	517962	4635327	517967	A
1	18	4635327	517967	4635297	517972	A
1	19	4635297	517972	4635269	517981	A
1	20	4635269	517981	4635240	517986	A
1	21	4635240	517986	4635211	517993	A
1	22	4635211	517993	4635181	517996	A
1	23	4635181	517996	4635152	518003	A
1	24	4635152	518003	4635123	518008	A
1	25	4635123	518008	4635094	518016	A
1	26	4635094	518016	4635064	518019	A
1	27	4635064	518019	4635035	518021	A
1	28	4635035	518021	4635007	518025	A
1	29	4635007	518025	4634978	518034	A
1	30	4634978	518034	4634950	518041	A
1	31	4634950	518041	4634920	518046	A
1	32	4634920	518046	4634891	518051	A
1	33	4634891	518051	4634862	518054	A
1	34	4634862	518054	4634832	518059	A
1	35	4634832	518059	4634802	518063	A
1	36	4634802	518063	4634775	518069	A
1	37	4634775	518069	4634745	518075	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
1	38	4634745	518075	4634716	518082	A
1	39	4634716	518082	4634687	518085	A
1	40	4634687	518085	4634657	518091	A
1	41	4634657	518091	4634628	518095	A
1	42	4634628	518095	4634599	518104	A
1	43	4634599	518104	4634570	518109	A
1	44	4634570	518109	4634541	518115	A
1	45	4634541	518115	4634513	518125	A
1	46	4634513	518125	4634484	518128	A
1	47	4634484	518128	4634455	518133	A
1	48	4634455	518133	4634425	518143	A
1	49	4634425	518143	4634396	518149	A
1	50	4634396	518149	4634368	518158	A
1	51	4634368	518158	4634339	518165	A
1	52	4634339	518165	4634309	518166	A
1	53	4634309	518166	4634280	518173	A
1	54	4634280	518173	4634250	518174	A
1	55	4634250	518174	4634221	518179	A
1	56	4634221	518179	4634200	518200	A
1	57	4634200	518200	4634174	518214	A
1	58	4634174	518214	4634145	518223	A
1	59	4634145	518223	4634115	518226	A
1	60	4634115	518226	4634085	518231	A
1	61	4634085	518231	4634056	518234	A
1	62	4634056	518234	4634026	518238	A
1	63	4634026	518238	4633996	518244	A
1	64	4633996	518244	4633968	518253	A
1	65	4633968	518253	4633938	518259	A
1	66	4633938	518259	4633908	518263	A
1	67	4633908	518263	4633879	518268	A
1	68	4633879	518268	4633849	518270	A
1	69	4633849	518270	4633820	518276	A
1	70	4633820	518276	4633790	518280	A
1	71	4633790	518280	4633760	518284	A
1	72	4633760	518284	4633731	518291	A
1	73	4633731	518291	4633702	518297	A
1	74	4633702	518297	4633673	518302	A
1	75	4633673	518302	4633643	518307	A
1	76	4633643	518307	4633613	518309	A
1	77	4633613	518309	4633585	518318	A
1	78	4633585	518318	4633555	518320	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
1	79	4633555	518320	4633526	518318	A
1	80	4633526	518318	4633496	518322	A
1	81	4633496	518322	4633468	518333	A
1	82	4633468	518333	4633439	518342	A
1	83	4633439	518342	4633410	518347	A
1	84	4633410	518347	4633380	518351	A
1	85	4633380	518351	4633351	518356	A
1	86	4633351	518356	4633322	518361	A
1	87	4633322	518361	4633292	518365	A
1	88	4633292	518365	4633262	518373	A
1	89	4633262	518373	4633233	518378	A
1	90	4633233	518378	4633203	518384	A
1	91	4633203	518384	4633175	518392	A
1	92	4633175	518392	4633147	518402	A
1	93	4633147	518402	4633118	518411	A
1	94	4633118	518411	4633089	518419	P
1	95	4633089	518419	4633059	518426	P
1	96	4633059	518426	4633030	518432	P
1	97	4633030	518432	4633002	518441	A
1	98	4633002	518441	4632973	518447	A
1	99	4632973	518447	4632943	518454	A
1	100	4632943	518454	4632913	518456	A
1	101	4632913	518456	4632883	518460	A
1	102	4632883	518460	4632854	518466	A
1	103	4632854	518466	4632825	518471	A
1	104	4632825	518471	4632795	518473	A
1	105	4632795	518473	4632765	518478	A
1	106	4632765	518478	4632736	518486	A
1	107	4632736	518486	4632708	518495	P
1	108	4632708	518495	4632678	518501	A
1	109	4632678	518501	4632649	518508	A
1	110	4632649	518508	4632621	518514	A
1	111	4632621	518514	4632591	518517	A
1	112	4632591	518517	4632561	518523	A
1	113	4632561	518523	4632532	518531	P
1	114	4632532	518531	4632503	518536	A
1	115	4632503	518536	4632474	518540	A
1	116	4632474	518540	4632444	518546	A
1	117	4632444	518546	4632414	518552	A
1	118	4632414	518552	4632384	518556	A
1	119	4632384	518556	4632354	518560	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
1	120	4632354	518560	4632325	518567	A
1	121	4632325	518567	4632295	518572	A
1	122	4632295	518572	4632265	518578	A
1	123	4632265	518578	4632237	518586	A
1	124	4632237	518586	4632208	518593	A
1	125	4632208	518593	4632178	518599	A
1	126	4632178	518599	4632148	518604	A
1	127	4632148	518604	4632120	518611	P
2	1	4632087	518429	4632058	518431	A
2	2	4632115	518418	4632087	518429	P
2	3	4632144	518415	4632115	518418	P
2	4	4632173	518410	4632144	518415	P
2	5	4632202	518404	4632173	518410	P
2	6	4632232	518400	4632202	518404	P
2	7	4632260	518389	4632232	518400	A
2	8	4632289	518384	4632260	518389	A
2	9	4632318	518382	4632289	518384	A
2	10	4632348	518376	4632318	518382	A
2	11	4632375	518366	4632348	518376	A
2	12	4632403	518354	4632375	518366	A
2	13	4632432	518348	4632403	518354	A
2	14	4632462	518343	4632432	518348	A
2	15	4632491	518334	4632462	518343	A
2	16	4632520	518329	4632491	518334	A
2	17	4632549	518323	4632520	518329	A
2	18	4632579	518322	4632549	518323	P
2	19	4632609	518318	4632579	518322	A
2	20	4632637	518309	4632609	518318	A
2	21	4632664	518298	4632637	518309	A
2	22	4632693	518288	4632664	518298	A
2	23	4632722	518284	4632693	518288	A
2	24	4632752	518282	4632722	518284	A
2	25	4632782	518271	4632752	518282	A
2	26	4632811	518263	4632782	518271	A
2	27	4632841	518258	4632811	518263	A
2	28	4632870	518251	4632841	518258	A
2	29	4632899	518249	4632870	518251	A
2	30	4632928	518240	4632899	518249	A
2	31	4632957	518232	4632928	518240	A
2	32	4632987	518230	4632957	518232	P
2	33	4633016	518223	4632987	518230	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
2	34	4633045	518226	4633016	518223	A
2	35	4633075	518223	4633045	518226	A
2	36	4633104	518215	4633075	518223	A
2	37	4633131	518204	4633104	518215	A
2	38	4633159	518193	4633131	518204	A
2	39	4633188	518187	4633159	518193	A
2	40	4633217	518178	4633188	518187	A
2	41	4633246	518172	4633217	518178	A
2	42	4633275	518168	4633246	518172	A
2	43	4633304	518162	4633275	518168	A
2	44	4633334	518161	4633304	518162	A
2	45	4633364	518156	4633334	518161	A
2	46	4633394	518150	4633364	518156	A
2	47	4633423	518143	4633394	518150	A
2	48	4633452	518133	4633423	518143	A
2	49	4633481	518127	4633452	518133	A
2	50	4633510	518120	4633481	518127	A
2	51	4633539	518113	4633510	518120	A
2	52	4633569	518107	4633539	518113	A
2	53	4633598	518103	4633569	518107	A
2	54	4633627	518092	4633598	518103	A
2	55	4633656	518084	4633627	518092	A
2	56	4633684	518075	4633656	518084	A
2	57	4633714	518069	4633684	518075	A
2	58	4633744	518064	4633714	518069	A
2	59	4633773	518059	4633744	518064	A
2	60	4633803	518054	4633773	518059	A
2	61	4633831	518047	4633803	518054	A
2	62	4633861	518043	4633831	518047	A
2	63	4633889	518033	4633861	518043	A
2	64	4633917	518024	4633889	518033	A
2	65	4633946	518018	4633917	518024	P
2	66	4633976	518014	4633946	518018	A
2	67	4634006	518011	4633976	518014	A
2	68	4634034	518003	4634006	518011	A
2	69	4634064	517998	4634034	518003	A
2	70	4634094	517994	4634064	517998	A
2	71	4634123	517989	4634094	517994	A
2	72	4634152	517983	4634123	517989	A
2	73	4634182	517978	4634152	517983	A
2	74	4634211	517973	4634182	517978	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
2	75	4634241	517967	4634211	517973	A
2	76	4634271	517964	4634241	517967	A
2	77	4634300	517957	4634271	517964	A
2	78	4634330	517955	4634300	517957	A
2	79	4634360	517958	4634330	517955	A
2	80	4634390	517955	4634360	517958	A
2	81	4634419	517947	4634390	517955	A
2	82	4634448	517941	4634419	517947	A
2	83	4634477	517934	4634448	517941	A
2	84	4634506	517927	4634477	517934	A
2	85	4634536	517922	4634506	517927	A
2	86	4634565	517914	4634536	517922	A
2	87	4634594	517903	4634565	517914	A
2	88	4634623	517895	4634594	517903	A
2	89	4634652	517888	4634623	517895	A
2	90	4634680	517884	4634652	517888	A
2	91	4634709	517878	4634680	517884	A
2	92	4634738	517878	4634709	517878	A
2	93	4634767	517872	4634738	517878	A
2	94	4634796	517864	4634767	517872	A
2	95	4634825	517855	4634796	517864	A
2	96	4634855	517851	4634825	517855	A
2	97	4634884	517844	4634855	517851	A
2	98	4634913	517838	4634884	517844	A
2	99	4634944	517834	4634913	517838	A
2	100	4634973	517831	4634944	517834	A
2	101	4635002	517826	4634973	517831	A
2	102	4635031	517820	4635002	517826	A
2	103	4635060	517815	4635031	517820	A
2	104	4635090	517811	4635060	517815	A
2	105	4635120	517808	4635090	517811	A
2	106	4635150	517803	4635120	517808	A
2	107	4635181	517799	4635150	517803	A
2	108	4635210	517792	4635181	517799	A
2	109	4635240	517790	4635210	517792	A
2	110	4635269	517782	4635240	517790	A
2	111	4635299	517776	4635269	517782	A
2	112	4635328	517768	4635299	517776	A
2	113	4635358	517763	4635328	517768	A
2	114	4635387	517763	4635358	517763	A
2	115	4635417	517761	4635387	517763	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
2	116	4635447	517758	4635417	517761	A
2	117	4635476	517749	4635447	517758	A
2	118	4635504	517742	4635476	517749	A
2	119	4635533	517735	4635504	517742	A
2	120	4635562	517729	4635533	517735	A
2	121	4635591	517722	4635562	517729	A
2	122	4635620	517716	4635591	517722	A
2	123	4635650	517713	4635620	517716	A
2	124	4635679	517708	4635650	517713	A
2	125	4635708	517700	4635679	517708	A
2	126	4635737	517695	4635708	517700	A
2	127	4635765	517683	4635737	517695	A
2	128	4635794	517673	4635765	517683	A
3	1	4635800	517790	4635771	517796	A
3	2	4635771	517796	4635741	517804	A
3	3	4635741	517804	4635711	517808	A
3	4	4635711	517808	4635682	517811	A
3	5	4635682	517811	4635652	517813	A
3	6	4635652	517813	4635623	517818	A
3	7	4635623	517818	4635593	517822	A
3	8	4635593	517822	4635564	517829	A
3	9	4635564	517829	4635535	517837	A
3	10	4635535	517837	4635505	517839	A
3	11	4635505	517839	4635475	517842	A
3	12	4635475	517842	4635445	517844	A
3	13	4635445	517844	4635415	517850	A
3	14	4635415	517850	4635387	517859	A
3	15	4635387	517859	4635358	517866	A
3	16	4635358	517866	4635329	517875	A
3	17	4635329	517875	4635300	517877	A
3	18	4635300	517877	4635270	517882	A
3	19	4635270	517882	4635241	517889	A
3	20	4635241	517889	4635211	517893	A
3	21	4635211	517893	4635181	517897	A
3	22	4635181	517897	4635152	517894	A
3	23	4635152	517894	4635123	517901	A
3	24	4635123	517901	4635093	517908	A
3	25	4635093	517908	4635065	517915	A
3	26	4635065	517915	4635034	517916	A
3	27	4635034	517916	4635011	517936	A
3	28	4635011	517936	4634980	517936	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
3	29	4634980	517936	4634950	517939	A
3	30	4634950	517939	4634920	517941	A
3	31	4634920	517941	4634890	517950	A
3	32	4634890	517950	4634861	517955	A
3	33	4634861	517955	4634831	517955	A
3	34	4634831	517955	4634801	517959	A
3	35	4634801	517959	4634772	517963	A
3	36	4634772	517963	4634742	517967	A
3	37	4634742	517967	4634712	517972	A
3	38	4634712	517972	4634683	517978	A
3	39	4634683	517978	4634655	517985	A
3	40	4634655	517985	4634637	518009	A
3	41	4634637	518009	4634618	518032	A
3	42	4634618	518032	4634590	518046	A
3	43	4634590	518046	4634561	518051	A
3	44	4634561	518051	4634530	518056	A
3	45	4634530	518056	4634502	518048	A
3	46	4634502	518048	4634472	518046	A
3	47	4634472	518046	4634442	518051	A
3	48	4634442	518051	4634417	518066	A
3	49	4634417	518066	4634386	518068	A
3	50	4634386	518068	4634358	518068	A
3	51	4634358	518068	4634327	518070	A
3	52	4634327	518070	4634299	518077	A
3	53	4634299	518077	4634270	518084	A
3	54	4634270	518084	4634240	518086	A
3	55	4634240	518086	4634210	518091	A
3	56	4634210	518091	4634182	518098	A
3	57	4634182	518098	4634152	518106	A
3	58	4634152	518106	4634123	518106	A
3	59	4634123	518106	4634094	518111	A
3	60	4634094	518111	4634064	518114	A
3	61	4634064	518114	4634035	518119	P
3	62	4634035	518119	4634006	518124	A
3	63	4634006	518124	4633977	518133	A
3	64	4633977	518133	4633948	518142	A
3	65	4633948	518142	4633919	518149	A
3	66	4633919	518149	4633889	518149	A
3	67	4633889	518149	4633860	518154	A
3	68	4633860	518154	4633831	518163	A
3	69	4633831	518163	4633803	518171	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
3	70	4633803	518171	4633773	518174	A
3	71	4633773	518174	4633743	518178	P
3	72	4633743	518178	4633714	518187	P
3	73	4633714	518187	4633687	518200	P
3	74	4633687	518200	4633658	518207	P
3	75	4633658	518207	4633629	518210	P
3	76	4633629	518210	4633601	518218	A
3	77	4633601	518218	4633571	518224	A
3	78	4633571	518224	4633542	518229	A
3	79	4633542	518229	4633513	518236	A
3	80	4633513	518236	4633484	518241	A
3	81	4633484	518241	4633454	518248	A
3	82	4633454	518248	4633425	518251	A
3	83	4633425	518251	4633394	518254	A
3	84	4633394	518254	4633365	518260	A
3	85	4633365	518260	4633335	518262	A
3	86	4633335	518262	4633305	518268	A
3	87	4633305	518268	4633276	518273	A
3	88	4633276	518273	4633247	518281	A
3	89	4633247	518281	4633217	518287	A
3	90	4633217	518287	4633188	518289	A
3	91	4633188	518289	4633159	518295	A
3	92	4633159	518295	4633132	518307	A
3	93	4633132	518307	4633102	518313	P
3	94	4633102	518313	4633074	518322	A
3	95	4633074	518322	4633046	518333	A
3	96	4633046	518333	4633017	518339	P
3	97	4633017	518339	4632987	518341	A
3	98	4632987	518341	4632957	518344	A
3	99	4632957	518344	4632927	518347	A
3	100	4632927	518347	4632898	518350	A
3	101	4632898	518350	4632869	518354	A
3	102	4632869	518354	4632840	518360	A
3	103	4632840	518360	4632811	518367	A
3	104	4632811	518367	4632782	518374	A
3	105	4632782	518374	4632754	518384	A
3	106	4632754	518384	4632726	518392	A
3	107	4632726	518392	4632718	518420	A
3	108	4632718	518420	4632690	518430	A
3	109	4632690	518430	4632660	518434	A
3	110	4632660	518434	4632631	518441	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
3	111	4632631	518441	4632601	518443	A
3	112	4632601	518443	4632571	518449	A
3	113	4632571	518449	4632542	518454	A
3	114	4632542	518454	4632514	518464	A
3	115	4632514	518464	4632484	518468	A
3	116	4632484	518468	4632455	518475	A
3	117	4632455	518475	4632426	518479	P
3	118	4632426	518479	4632395	518480	P
3	119	4632395	518480	4632365	518482	P
3	120	4632365	518482	4632335	518486	P
3	121	4632335	518486	4632305	518489	A
3	122	4632305	518489	4632276	518491	A
3	123	4632276	518491	4632246	518494	A
3	124	4632246	518494	4632216	518497	A
3	125	4632216	518497	4632187	518502	A
3	126	4632187	518502	4632158	518508	A
3	127	4632158	518508	4632128	518511	A
3	128	4632128	518511	4632099	518515	A
3	129	4632099	518515	4632070	518522	A
3	130	4632070	518522	4632040	518528	A
4	1	4632782	518163	4632754	518177	A
4	2	4632810	518157	4632782	518163	A
4	3	4632839	518149	4632810	518157	A
4	4	4632868	518141	4632839	518149	A
4	5	4632897	518136	4632868	518141	A
4	6	4632927	518133	4632897	518136	A
4	7	4632951	518152	4632927	518133	A
4	8	4632979	518143	4632951	518152	A
4	9	4633008	518138	4632979	518143	A
4	10	4633024	518112	4633008	518138	A
4	11	4633050	518096	4633024	518112	A
4	12	4633079	518090	4633050	518096	A
4	13	4633109	518086	4633079	518090	A
4	14	4633137	518081	4633109	518086	A
4	15	4633167	518076	4633137	518081	A
4	16	4633195	518065	4633167	518076	A
4	17	4633225	518059	4633195	518065	A
4	18	4633255	518057	4633225	518059	A
4	19	4633285	518051	4633255	518057	A
4	20	4633314	518046	4633285	518051	A
4	21	4633344	518043	4633314	518046	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
4	22	4633374	518038	4633344	518043	A
4	23	4633404	518031	4633374	518038	A
4	24	4633433	518028	4633404	518031	A
4	25	4633462	518022	4633433	518028	A
4	26	4633490	518017	4633462	518022	A
4	27	4633520	518009	4633490	518017	A
4	28	4633549	518003	4633520	518009	A
4	29	4633580	517996	4633549	518003	A
4	30	4633609	517989	4633580	517996	A
4	31	4633638	517981	4633609	517989	A
4	32	4633667	517974	4633638	517981	A
4	33	4633696	517968	4633667	517974	A
4	34	4633726	517964	4633696	517968	A
4	35	4633754	517957	4633726	517964	A
4	36	4633784	517951	4633754	517957	A
4	37	4633812	517963	4633784	517951	A
4	38	4633841	517956	4633812	517963	A
4	39	4633869	517945	4633841	517956	A
4	40	4633897	517935	4633869	517945	A
4	41	4633926	517930	4633897	517935	A
4	42	4633954	517920	4633926	517930	A
4	43	4633982	517911	4633954	517920	A
4	44	4634011	517906	4633982	517911	A
4	45	4634041	517901	4634011	517906	A
4	46	4634070	517895	4634041	517901	A
4	47	4634100	517890	4634070	517895	A
4	48	4634129	517885	4634100	517890	A
4	49	4634158	517879	4634129	517885	A
4	50	4634189	517876	4634158	517879	A
4	51	4634219	517871	4634189	517876	A
4	52	4634249	517867	4634219	517871	A
4	53	4634278	517860	4634249	517867	A
4	54	4634307	517864	4634278	517860	A
4	55	4634335	517855	4634307	517864	A
4	56	4634364	517847	4634335	517855	A
4	57	4634393	517841	4634364	517847	A
4	58	4634423	517836	4634393	517841	A
4	59	4634452	517830	4634423	517836	A
4	60	4634481	517826	4634452	517830	A
4	61	4634511	517822	4634481	517826	A
4	62	4634539	517812	4634511	517822	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
4	63	4634569	517808	4634539	517812	A
4	64	4634599	517802	4634569	517808	A
4	65	4634629	517798	4634599	517802	A
4	66	4634657	517788	4634629	517798	A
4	67	4634687	517781	4634657	517788	A
4	68	4634717	517779	4634687	517781	A
4	69	4634747	517776	4634717	517779	A
4	70	4634775	517768	4634747	517776	A
4	71	4634805	517769	4634775	517768	A
4	72	4634834	517761	4634805	517769	A
4	73	4634862	517748	4634834	517761	A
4	74	4634891	517751	4634862	517748	A
4	75	4634921	517744	4634891	517751	A
4	76	4634951	517740	4634921	517744	A
4	77	4634980	517732	4634951	517740	A
4	78	4635010	517727	4634980	517732	A
4	79	4635038	517720	4635010	517727	A
4	80	4635068	517714	4635038	517720	A
4	81	4635098	517708	4635068	517714	A
4	82	4635104	517678	4635098	517708	A
4	83	4635117	517652	4635104	517678	A
4	84	4635147	517649	4635117	517652	A
4	85	4635176	517646	4635147	517649	A
4	86	4635205	517642	4635176	517646	A
4	87	4635235	517636	4635205	517642	A
4	88	4635264	517632	4635235	517636	A
4	89	4635294	517631	4635264	517632	A
4	90	4635323	517628	4635294	517631	A
4	91	4635352	517624	4635323	517628	A
4	92	4635382	517621	4635352	517624	A
4	93	4635412	517618	4635382	517621	A
4	94	4635442	517618	4635412	517618	A
4	95	4635472	517621	4635442	517618	A
4	96	4635502	517623	4635472	517621	A
4	97	4635532	517621	4635502	517623	A
4	98	4635562	517618	4635532	517621	A
4	99	4635591	517616	4635562	517618	A
4	100	4635620	517607	4635591	517616	A
4	101	4635647	517594	4635620	517607	A
4	102	4635676	517595	4635647	517594	A
4	103	4635705	517592	4635676	517595	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
5	1	4635576	517471	4635555	517493	A
5	2	4635555	517493	4635528	517505	A
5	3	4635528	517505	4635499	517511	A
5	4	4635499	517511	4635468	517511	A
5	5	4635468	517511	4635439	517514	A
5	6	4635439	517514	4635409	517516	A
5	7	4635409	517516	4635380	517525	A
5	8	4635380	517525	4635353	517534	A
5	9	4635353	517534	4635324	517542	A
5	10	4635324	517542	4635296	517552	A
5	11	4635296	517552	4635267	517561	A
5	12	4635267	517561	4635238	517572	A
5	13	4635238	517572	4635210	517581	A
5	14	4635210	517581	4635180	517588	A
5	15	4635180	517588	4635150	517594	A
5	16	4635150	517594	4635122	517602	A
5	17	4635122	517602	4635093	517610	A
5	18	4635093	517610	4635064	517616	A
5	19	4635064	517616	4635035	517623	A
5	20	4635035	517623	4635005	517630	A
5	21	4635005	517630	4634976	517635	A
5	22	4634976	517635	4634947	517642	A
5	23	4634947	517642	4634918	517647	A
5	24	4634918	517647	4634888	517655	A
5	25	4634888	517655	4634859	517660	A
5	26	4634859	517660	4634828	517663	A
5	27	4634828	517663	4634799	517668	A
5	28	4634799	517668	4634769	517670	A
5	29	4634769	517670	4634738	517674	A
5	30	4634738	517674	4634708	517680	A
5	31	4634708	517680	4634678	517683	A
5	32	4634678	517683	4634649	517689	A
5	33	4634649	517689	4634620	517696	A
5	34	4634620	517696	4634593	517707	A
5	35	4634593	517707	4634563	517710	A
5	36	4634563	517710	4634534	517715	A
5	37	4634534	517715	4634505	517720	A
5	38	4634505	517720	4634475	517726	A
5	39	4634475	517726	4634445	517731	A
5	40	4634445	517731	4634416	517738	A
5	41	4634416	517738	4634386	517743	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
5	42	4634386	517743	4634356	517748	A
5	43	4634356	517748	4634327	517753	A
5	44	4634327	517753	4634297	517757	A
5	45	4634297	517757	4634268	517757	A
5	46	4634268	517757	4634238	517760	A
5	47	4634238	517760	4634209	517767	A
5	48	4634209	517767	4634180	517776	A
5	49	4634180	517776	4634150	517781	A
5	50	4634150	517781	4634121	517787	A
5	51	4634121	517787	4634091	517793	A
5	52	4634091	517793	4634062	517797	A
5	53	4634062	517797	4634033	517803	A
5	54	4634033	517803	4634003	517807	A
5	55	4634003	517807	4633974	517813	A
5	56	4633974	517813	4633945	517823	A
5	57	4633945	517823	4633915	517826	A
5	58	4633915	517826	4633886	517833	A
5	59	4633886	517833	4633857	517840	A
5	60	4633857	517840	4633828	517844	A
5	61	4633828	517844	4633798	517848	A
5	62	4633798	517848	4633771	517861	A
5	63	4633771	517861	4633741	517867	A
5	64	4633741	517867	4633712	517873	A
5	65	4633712	517873	4633683	517879	A
5	66	4633683	517879	4633654	517885	A
5	67	4633654	517885	4633625	517891	A
5	68	4633625	517891	4633596	517896	A
5	69	4633596	517896	4633566	517898	A
5	70	4633566	517898	4633536	517903	A
5	71	4633536	517903	4633507	517910	A
5	72	4633507	517910	4633478	517916	A
5	73	4633478	517916	4633448	517922	A
5	74	4633448	517922	4633420	517929	A
5	75	4633420	517929	4633391	517935	A
5	76	4633391	517935	4633376	517909	A
5	77	4633376	517909	4633346	517913	P
5	78	4633346	517913	4633317	517921	A
5	79	4633317	517921	4633288	517929	A
5	80	4633288	517929	4633258	517935	A
5	81	4633258	517935	4633229	517944	A
5	82	4633229	517944	4633200	517952	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
5	83	4633200	517952	4633171	517961	A
6	1	4633036	518528	4633007	518537	A
6	2	4633065	518520	4633036	518528	A
6	3	4633095	518510	4633065	518520	A
6	4	4633124	518505	4633095	518510	A
6	5	4633154	518502	4633124	518505	A
6	6	4633183	518493	4633154	518502	A
6	7	4633211	518485	4633183	518493	A
6	8	4633240	518475	4633211	518485	A
6	9	4633268	518465	4633240	518475	A
6	10	4633298	518462	4633268	518465	A
6	11	4633329	518460	4633298	518462	A
6	12	4633359	518457	4633329	518460	A
6	13	4633389	518455	4633359	518457	A
6	14	4633418	518450	4633389	518455	P
6	15	4633447	518443	4633418	518450	A
6	16	4633478	518441	4633447	518443	A
6	17	4633507	518434	4633478	518441	A
6	18	4633537	518433	4633507	518434	P
6	19	4633566	518424	4633537	518433	A
6	20	4633596	518415	4633566	518424	P
6	21	4633626	518415	4633596	518415	P
6	22	4633653	518429	4633626	518415	P
6	23	4633682	518429	4633653	518429	A
6	24	4633712	518429	4633682	518429	A
6	25	4633741	518424	4633712	518429	A
6	26	4633770	518418	4633741	518424	A
6	27	4633799	518414	4633770	518418	A
6	28	4633828	518409	4633799	518414	A
6	29	4633857	518398	4633828	518409	A
6	30	4633884	518387	4633857	518398	A
6	31	4633912	518376	4633884	518387	A
6	32	4633941	518368	4633912	518376	A
6	33	4633970	518362	4633941	518368	A
6	34	4634000	518358	4633970	518362	A
6	35	4634028	518348	4634000	518358	A
6	36	4634059	518350	4634028	518348	A
6	37	4634089	518346	4634059	518350	A
6	38	4634118	518340	4634089	518346	A
6	39	4634147	518330	4634118	518340	A
6	40	4634142	518300	4634147	518330	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
6	41	4634165	518280	4634142	518300	A
6	42	4634194	518272	4634165	518280	A
6	43	4634223	518266	4634194	518272	A
6	44	4634252	518257	4634223	518266	A
6	45	4634281	518251	4634252	518257	A
6	46	4634311	518248	4634281	518251	A
6	47	4634341	518250	4634311	518248	A
6	48	4634371	518250	4634341	518250	A
6	49	4634400	518244	4634371	518250	A
6	50	4634430	518240	4634400	518244	A
6	51	4634459	518236	4634430	518240	A
6	52	4634489	518231	4634459	518236	A
6	53	4634518	518223	4634489	518231	A
6	54	4634548	518218	4634518	518223	A
6	55	4634577	518215	4634548	518218	A
6	56	4634606	518210	4634577	518215	A
6	57	4634636	518206	4634606	518210	A
6	58	4634663	518194	4634636	518206	A
6	59	4634693	518189	4634663	518194	P
6	60	4634722	518185	4634693	518189	A
6	61	4634751	518178	4634722	518185	A
6	62	4634777	518162	4634751	518178	A
6	63	4634808	518159	4634777	518162	A
6	64	4634837	518160	4634808	518159	A
6	65	4634866	518161	4634837	518160	A
6	66	4634896	518162	4634866	518161	A
6	67	4634926	518156	4634896	518162	A
6	68	4634956	518150	4634926	518156	A
6	69	4634985	518147	4634956	518150	A
6	70	4635015	518141	4634985	518147	A
6	71	4635045	518137	4635015	518141	A
6	72	4635074	518129	4635045	518137	A
6	73	4635104	518125	4635074	518129	A
6	74	4635132	518114	4635104	518125	A
6	75	4635161	518108	4635132	518114	A
6	76	4635191	518103	4635161	518108	A
6	77	4635220	518098	4635191	518103	A
6	78	4635249	518089	4635220	518098	A
6	79	4635279	518086	4635249	518089	A
6	80	4635308	518080	4635279	518086	A
6	81	4635338	518074	4635308	518080	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
6	82	4635367	518066	4635338	518074	A
6	83	4635396	518060	4635367	518066	A
6	84	4635425	518054	4635396	518060	A
6	85	4635453	518044	4635425	518054	A
6	86	4635483	518041	4635453	518044	A
6	87	4635511	518033	4635483	518041	A
6	88	4635540	518027	4635511	518033	A
6	89	4635570	518027	4635540	518027	A
6	90	4635589	518050	4635570	518027	A
6	91	4635617	518040	4635589	518050	A
6	92	4635646	518031	4635617	518040	A
6	93	4635676	518024	4635646	518031	A
6	94	4635705	518018	4635676	518024	A
6	95	4635734	518012	4635705	518018	A
6	96	4635763	518004	4635734	518012	A
6	97	4635793	517998	4635763	518004	A
6	98	4635822	517988	4635793	517998	A
6	99	4635848	517975	4635822	517988	A
7	1	4635854	518062	4635824	518068	A
7	2	4635824	518068	4635795	518075	A
7	3	4635795	518075	4635767	518085	A
7	4	4635767	518085	4635754	518112	A
7	5	4635754	518112	4635726	518122	A
7	6	4635726	518122	4635698	518128	A
7	7	4635698	518128	4635669	518136	A
7	8	4635669	518136	4635639	518140	A
7	9	4635639	518140	4635609	518143	A
7	10	4635609	518143	4635580	518147	A
7	11	4635580	518147	4635549	518150	A
7	12	4635549	518150	4635523	518135	A
7	13	4635523	518135	4635495	518143	A
7	14	4635495	518143	4635466	518151	A
7	15	4635466	518151	4635436	518157	A
7	16	4635436	518157	4635407	518165	A
7	17	4635407	518165	4635377	518171	A
7	18	4635377	518171	4635348	518178	A
7	19	4635348	518178	4635319	518184	A
7	20	4635319	518184	4635290	518189	A
7	21	4635290	518189	4635260	518193	A
7	22	4635260	518193	4635231	518199	A
7	23	4635231	518199	4635202	518208	A

Transect	Section	Begin Northing	Begin Easting	End Northing	End Easting	Pygmy Rabbit
7	24	4635202	518208	4635172	518214	A
7	25	4635172	518214	4635143	518220	A
7	26	4635143	518220	4635114	518225	A
7	27	4635114	518225	4635084	518229	A
7	28	4635084	518229	4635057	518242	A
7	29	4635057	518242	4635029	518250	A
7	30	4635029	518250	4635003	518266	A
7	31	4635003	518266	4634976	518278	A
7	32	4634976	518278	4634947	518287	A
7	33	4634947	518287	4634918	518278	A
7	34	4634918	518278	4634890	518267	A
7	35	4634890	518267	4634860	518274	A
7	36	4634860	518274	4634831	518279	A
7	37	4634831	518279	4634807	518262	A
7	38	4634807	518262	4634777	518265	A
7	39	4634777	518265	4634747	518268	A
7	40	4634747	518268	4634722	518284	A
7	41	4634722	518284	4634694	518294	A
7	42	4634694	518294	4634664	518298	A
7	43	4634664	518298	4634635	518306	A
7	44	4634635	518306	4634607	518313	A
7	45	4634607	518313	4634578	518320	A
7	46	4634578	518320	4634548	518325	A
7	47	4634548	518325	4634517	518327	A