

# ANNUAL REPORT 2016, FISHER REINTRODUCTION

Table 1. Total number of trap nights, fisher captures, individuals, females, males, new fishers, and capture percentage during fall trapping of years 2012-2016 on the Stirling district of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California.

Year	Trap Nights	# Total Fisher Captures	# Individuals Captures	Total Females	Total Males	# New Fishers Captured	Capture %
2012	2279	43	29	17	12	14	1.89%
2013	3172	34	22	17	5	8	1.07%
2014	2792	53	32	23	9	15	1.90%
2015	2865	84	46	33	13	25	2.93%
2016	2868	93	53	34	19	26	3.24%

Table 2. Total number of non-target carnivores captured during fall trapping of years 2012-2016 on the Stirling district of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California.

Species	2012	2013	2014	2015	2016
Ringtail ( <i>Bassariscus astutus</i> )	24	23	32	22	30
Opossum ( <i>Didelphis virginianus</i> )	4	4	3	14	19
Bobcat ( <i>Lynx rufus</i> )	0	1	0	0	0
Striped Skunk ( <i>Mephitis mephitis</i> )	0	1	4	1	3
Raccoon ( <i>Procyon lotor</i> )	3	0	2	1	1
Spotted Skunk ( <i>Spilogale gracilis</i> )	17	40	45	50	23
Grey Fox ( <i>Urocyon cinereoargenteus</i> )	6	14	15	54	15
Total	54	83	101	142	91

Table 3. Mean numbers (+SD, N) of estimated locations per individual fisher per year across all years of study and 2016 organized by location method. Means are for individual fishers who were followed using each particular method. The research was conducted on or near the Stirling Management area owned by Sierra Pacific Industries and located in the Northern Sierra and Southern Cascade Mountains of Northern California.

Sex	Year	All Locations	Triangulations	Walk ins	GPS	All Argos	Argos LC 2+3
Female	All Years	52 ± 86, 167	53 ± 48, 164	7 ± 5, 110	397 ± 273, 3		
	2016	57 ± 48, 35	58 ± 43, 35	8 ± 6, 24	107 ± 0, 1		
Male	All Years	167 ± 464, 79	14 ± 17, 19	2 ± 1, 8	916 ± 1030, 10	206 ± 231, 67	44 ± 59, 67
	2016	201 ± 392, 9	20 ± 0, 1		816 ± 460, 2	141 ± 177, 8	14 ± 15, 8

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Table 4. Classes for Argos locations of male fishers, error predicted by Argos services for locations in those classes, our mean observed error, standard deviation (St Dev), minimum error observed, the maximum error observed and the total number of location estimates for each location class across years 2009-2012 on the Stirling Management Area of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California. Data are from 17 tags at 26 locations.

Location Class	Predicted error	Mean (m)	Standard Deviation	Minimum (m)	Maximum (m)	n
3	<250 m	196	248	10	2482	431
2	250 – 500 m	458	461	10	3630	242
1	500 – 1500 m	1387	1227	34	6439	123
0	>1500m	2566	1730	58	7055	30
A	none	811	1128	10	6061	192
B	none	1289	1788	17	8744	349

Table 5. Mean areas ( $\pm$  SD) for 95% fixed kernel utilization distributions (UD) of fishers followed with telemetry for  $\geq$  6 months on Stirling in 2011-2015 using different smoothing parameters and Silverman's K2. All females followed were adults but 3 males in 2012 and 1 in 2014 were juveniles.

Smoothing parameter (m)	Year	Mean UD $\pm$ SD (km <sup>2</sup> ), N	
		Females	Males
750	2010	17 $\pm$ 7, 6	67 $\pm$ 6, 3
	2011	28 $\pm$ 6, 7	114 $\pm$ 20, 3
	2012	17 $\pm$ 5, 12	56 $\pm$ 45, 9
	2013	15 $\pm$ 5, 13	46 $\pm$ 27, 3
	2014	16 $\pm$ 4, 13	63 $\pm$ 33, 3
	2015	15 $\pm$ 3, 19	40 $\pm$ 9, 3
	2016	12 $\pm$ 4, 19	25 $\pm$ 2, 3
1000	2010	22 $\pm$ 8, 6	97 $\pm$ 7, 3
	2011	37 $\pm$ 8, 7	143 $\pm$ 24, 3
	2012	22 $\pm$ 8, 12	75 $\pm$ 59, 9
	2013	18 $\pm$ 6, 13	63 $\pm$ 33, 3
	2014	19 $\pm$ 5, 13	77 $\pm$ 41, 3
	2015	18 $\pm$ 4, 19	57 $\pm$ 15, 3
	2016	14 $\pm$ 4, 19	33 $\pm$ 5, 3
1500	2010	32 $\pm$ 12, 6	153 $\pm$ 34, 3
	2011	56 $\pm$ 11, 7	189 $\pm$ 30, 3
	2012	30 $\pm$ 14, 12	108 $\pm$ 84, 9
	2013	24 $\pm$ 8, 13	94 $\pm$ 45, 3
	2014	25 $\pm$ 7, 13	100 $\pm$ 53, 3
	2015	23 $\pm$ 4, 19	88 $\pm$ 27, 3
	2016	19 $\pm$ 5, 19	49 $\pm$ 12, 3

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Table 6. Model selection comparison for 14 models of survival from a known fates analysis in program MARK based on monthly fates of reintroduced fishers and their offspring in the Northern Sierra Nevada of California, December 2009 – December 2016.

Model	AICc	$\Delta$ AICc	<i>w</i>	Likelihood	K	Deviance
Reproductive (sex-specific)	291.27	0.00	0.76	1.00	2	135.59
Reproductive (sex-specific)*	294.80	3.54	0.13	0.17	4	135.11
Reproductive (sexes equal)	296.37	5.10	0.06	0.08	2	140.69
2016 vs Other Years	298.87	7.61	0.02	0.02	2	143.20
Reproductive (sexes equal)*	299.01	7.74	0.02	0.02	4	139.31
Constant	299.88	8.61	0.01	0.01	1	146.21
Sex	301.69	10.42	0.00	0.01	2	146.01
2016 vs Other Years x Sex	301.77	10.51	0.00	0.01	2	146.10
Year (cont)	302.27	11.00	0.00	0.00	4	142.57
Sex x Age Class	306.74	15.48	0.00	0.00	6	143.02
Year (discrete)	307.06	15.79	0.00	0.00	7	141.32
Sex x Year	312.08	20.81	0.00	0.00	14	132.14
Month x Year	406.21	114.95	0.00	0.00	85	74.86

\* Males and females have different rates of survival during their respective reproductive and non-reproductive seasons.

Table 7. The number of adult females that were radio-tracked, the number that denned, the percent of females that denned, the minimum number of kits known to have been produced (Min # kits), the mean minimum litter size (Litter Size  $\pm$  95% CI), the ratio of kits known to have been produced to females (Kits/Female), the number of natal dens found, and the number of maternal dens found for females tracked in 2010-2016 on the Stirling Management Area of Sierra Pacific Industries in the northern Sierra Nevada and southern Cascade Mountains of northern California.

Metric	2010	2011	2012	2013	2014	2015	2016	Total
Females tracked	8	9	10	11	7	18	19	82
Females denned	5	7	9	9	6	14	17	67
% Denned	63%	78%	90%	82%	86%	78%	89%	82%
Min # kits	4	13	14	17	8	21	30	107
Kits in fall	1	9	16	13	14	22	23	98
Kits Died Den	2	3	3	2	2	1	6	19
Litter Size	1.0	2.2	1.8	1.9	1.6	1.9	2.0	1.8
Juvenile Spring:Fall	0.3	0.7	1.1	0.8	1.8	1.0	0.8	0.9
Kits/Female	0.5	1.4	1.4	1.5	1.1	1.2	1.6	1.3
Natal Dens	5	7	9	9	2	14	16	62
Maternal Dens	23	13	19	16	1	30	41	143

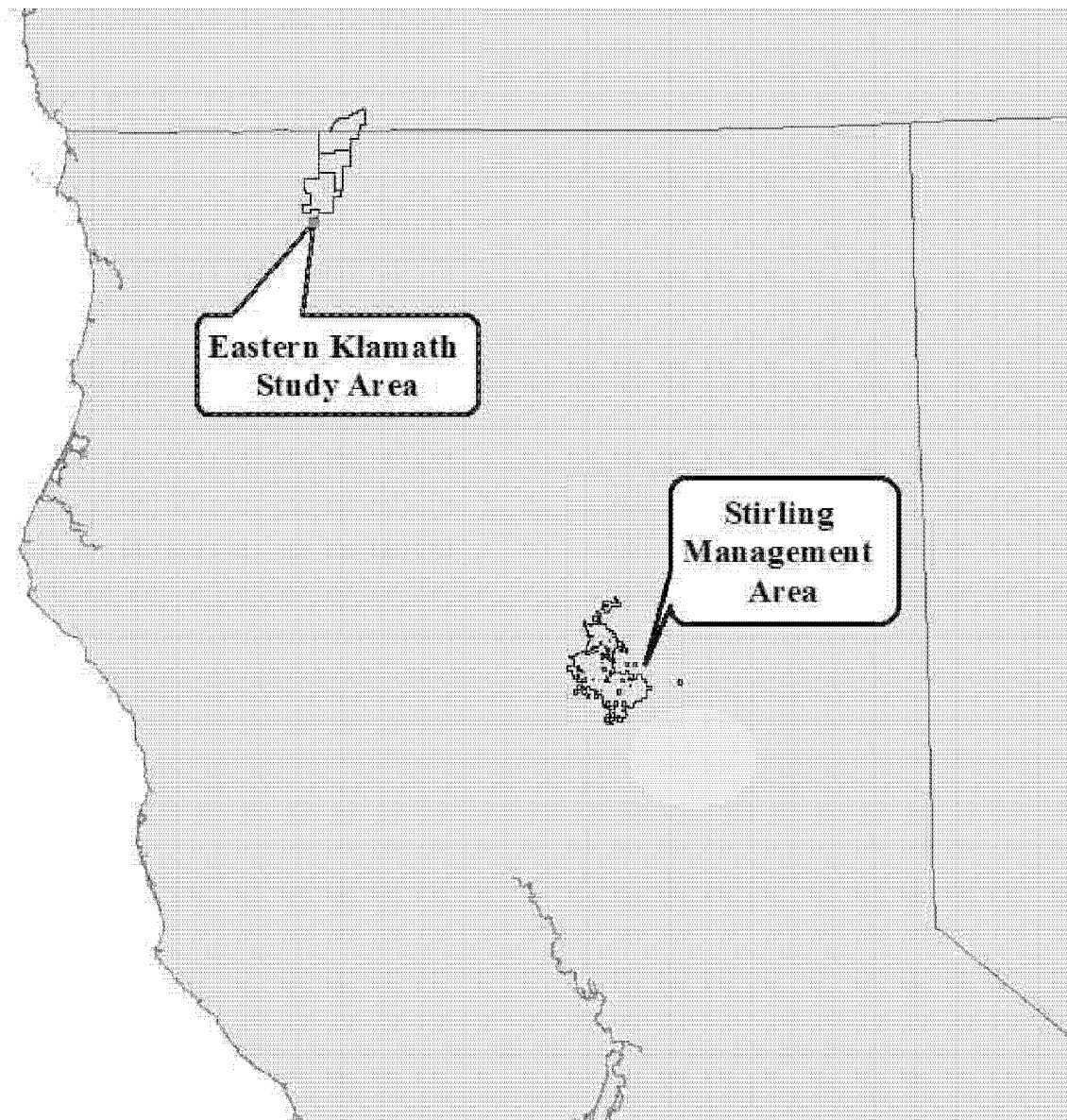
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Table 8. Numbers of den trees by species for natal and maternal dens from 2010 to 2016, and by condition of the den tree (live tree, standing snag, or other [e.g., downed log or debris pile]) on the Stirling Management Area of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California.

Tree Species	Natal			Maternal			Total
	Live tree	Snag	Other	Live tree	Snag	Other	
Big Leaf Maple ( <i>Acer macrophyllum</i> )	0	0	0	0	1	0	<b>1</b>
Black oak ( <i>Quescus kelloggii</i> )	32	3	0	48	17	1	<b>101</b>
Douglas Fir ( <i>Pseudotsuga menziesii</i> )	1	1	0	5	10	0	<b>17</b>
Incense Cedar ( <i>Calocedrus decurrens</i> )	3	6	0	4	18	0	<b>31</b>
Canyon live oak ( <i>Quescus chrysolepis</i> )	0	0	0	4	0	0	<b>4</b>
Ponderosa Pine ( <i>Pinus ponderosa</i> )	1	2	0	2	1	1	<b>7</b>
Sugar Pine ( <i>Pinus lambertiana</i> )	1	1	0	1	2	0	<b>5</b>
Tanoak ( <i>Notholithocarpus densiflorus</i> )	5	0	0	5	2	0	<b>12</b>
White Fir ( <i>Abies concolor</i> )	3	1	0	1	7	0	<b>12</b>
Unidentified Conifer	0	2	0	0	10	3	<b>15</b>
<b>Total</b>	<b>46</b>	<b>16</b>	<b>0</b>	<b>70</b>	<b>68</b>	<b>5</b>	<b>205</b>

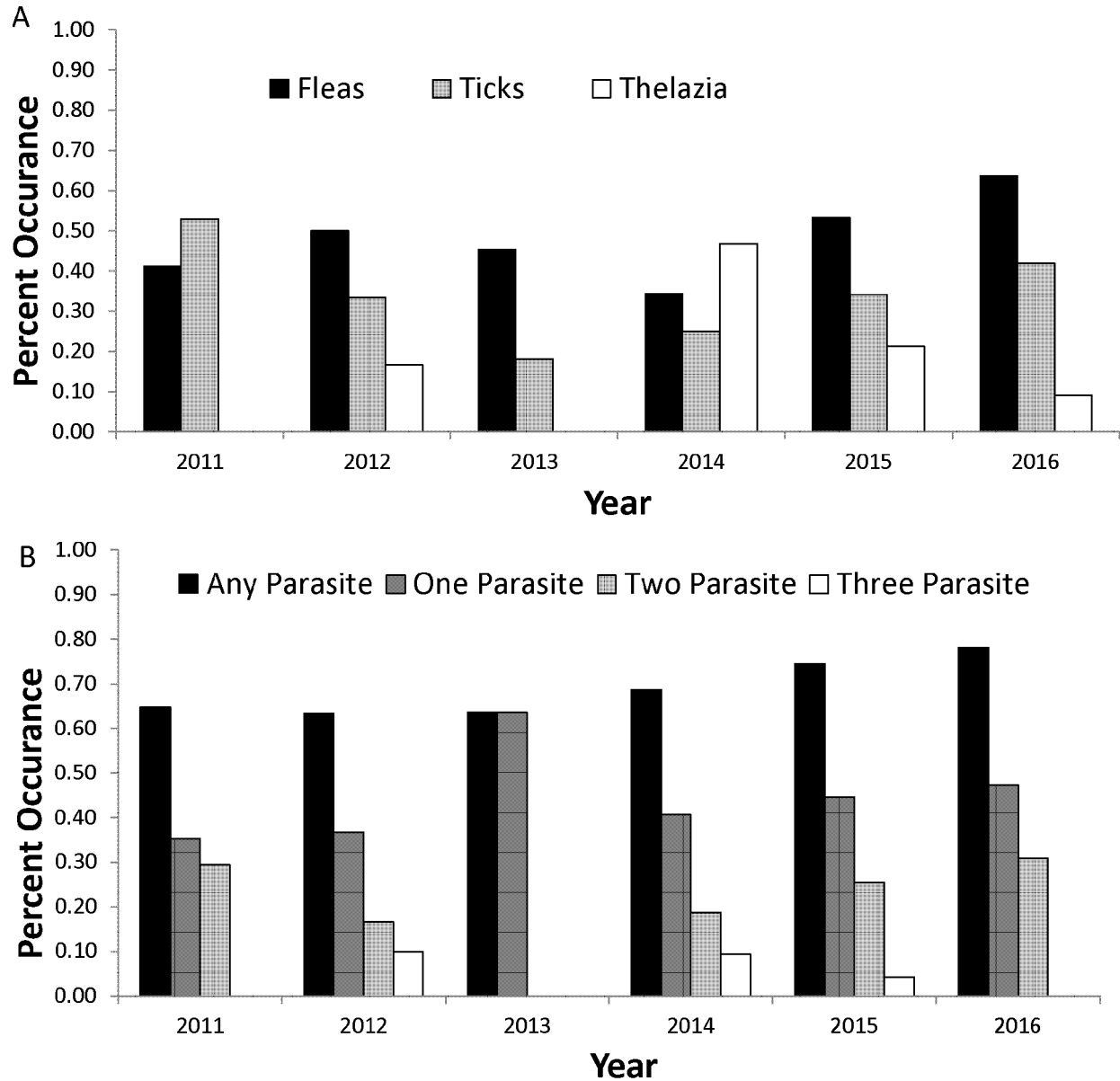
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Figure 1. Locations in northern California of the Stirling Management Area of Sierra Pacific Industries and the Eastern Klamath Study Area on the California-Oregon border.



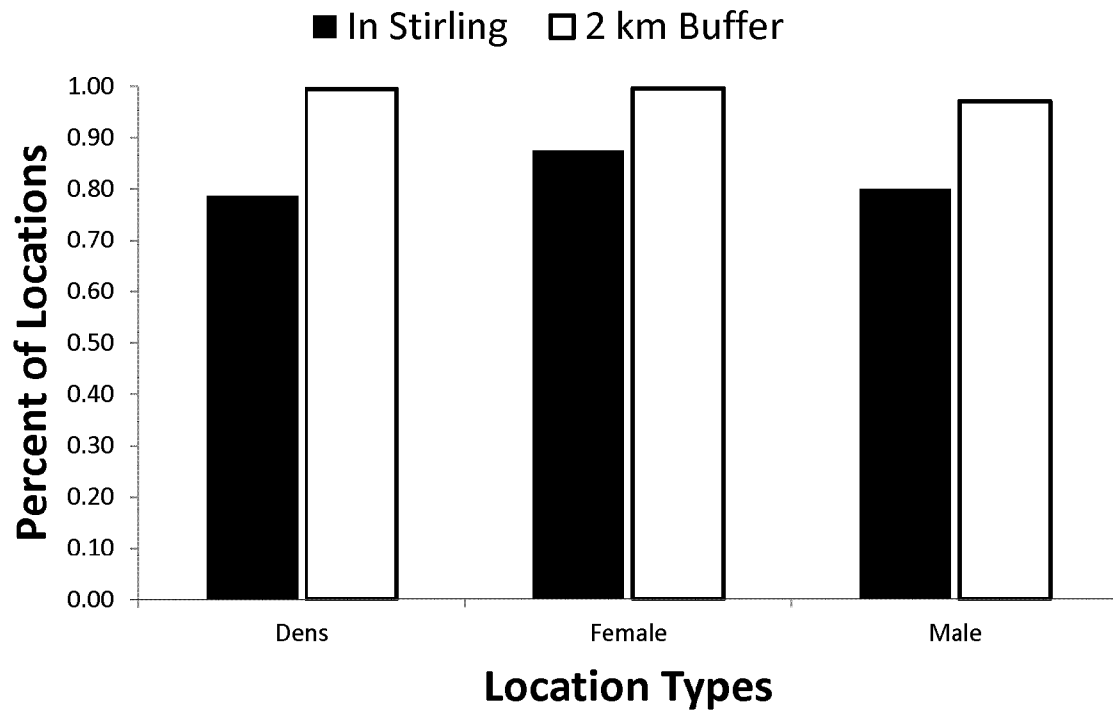
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Figure 2. Occurrence of 3 taxa of ectoparasites found on fishers from 2011-2016. Data include only fishers captured on the Stirling Management Area of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California. (a) Occurrence of parasites on fishers on Stirling by year and taxon. (b) Percentage of fishers on Stirling by year infected with any (at least one parasite of any species), 1, 2, or 3 of the most common ectoparasites by year.



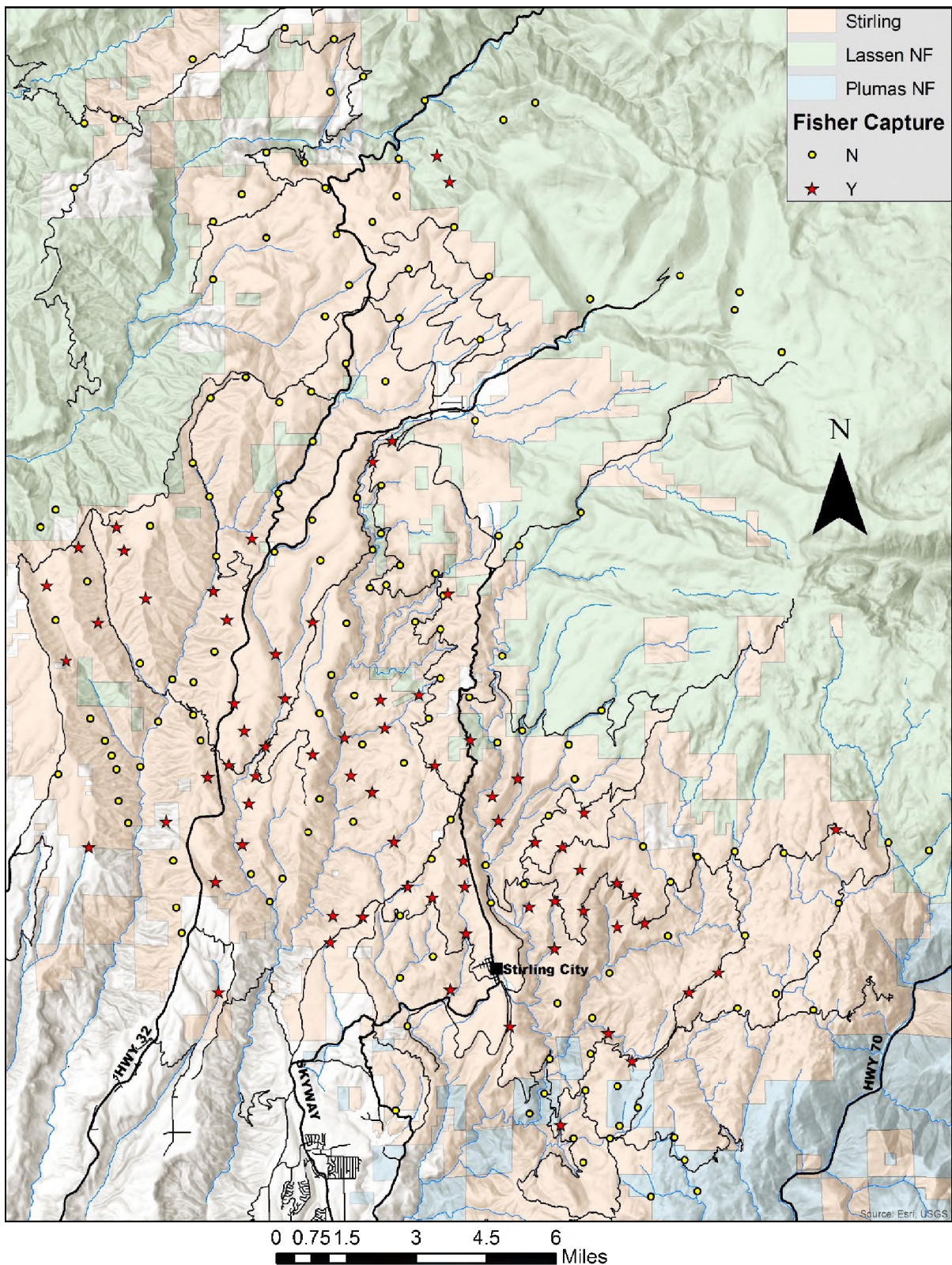
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Figure 6. The percentage of all validated locations that have occurred within the boundary for the Stirling Management Area of Sierra Pacific Industries (In Stirling) or within a 2-km buffer of the boundary (2 km Buffer) for fishers' dens, for female locations, and male locations, 2009-2016, for all translocated and Stirling-born fishers.



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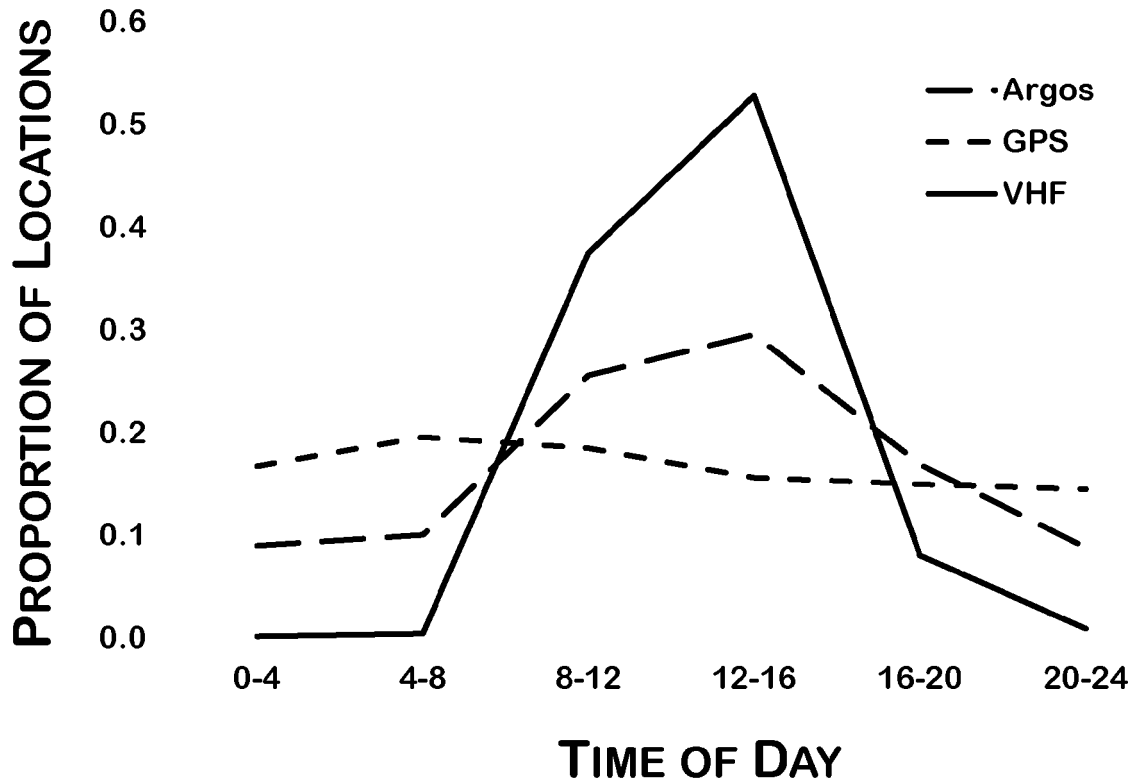
Figure 3. Map of the Stirling Management Area of Sierra Pacific Industries in the northern Sierra Nevada and southern Cascade mountains of California (green shading) and the locations of all traps set during October – November, 2016. Yellow dots represent traps that did not capture a fisher and red stars represent traps that captured at least 1 fisher.





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Figure 7. Percent of estimated locations of fishers obtained via Argos, GPS and VHF telemetry at different times of day across all years of study (2009-2015) on the Stirling Management Area of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California.



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Figure 4. Percent of fishers by age distribution based off cementum annuli estimates (ages for new fishers captured in 2016 were estimated based on body size, and development) on the Stirling Management Area of Sierra Pacific Industries in northern Sierra Nevada and southern Cascade Mountains of California.

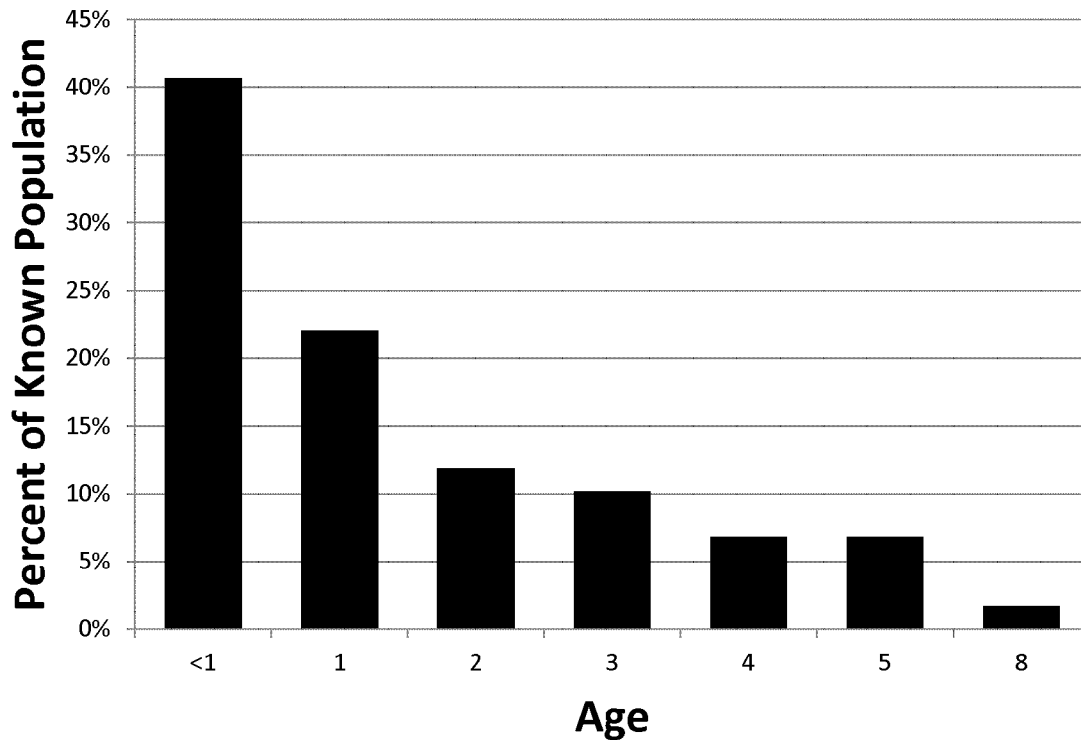
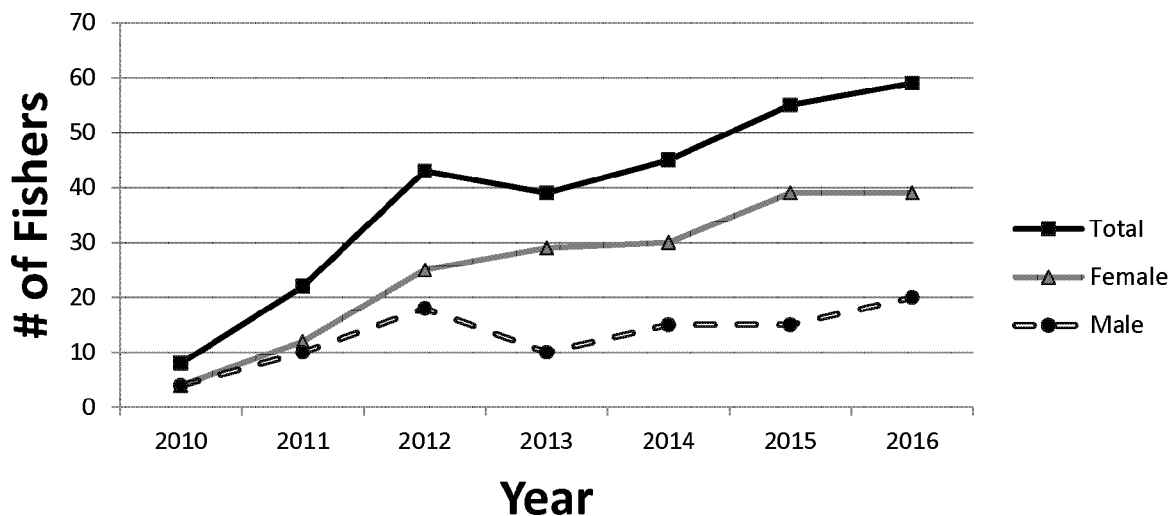
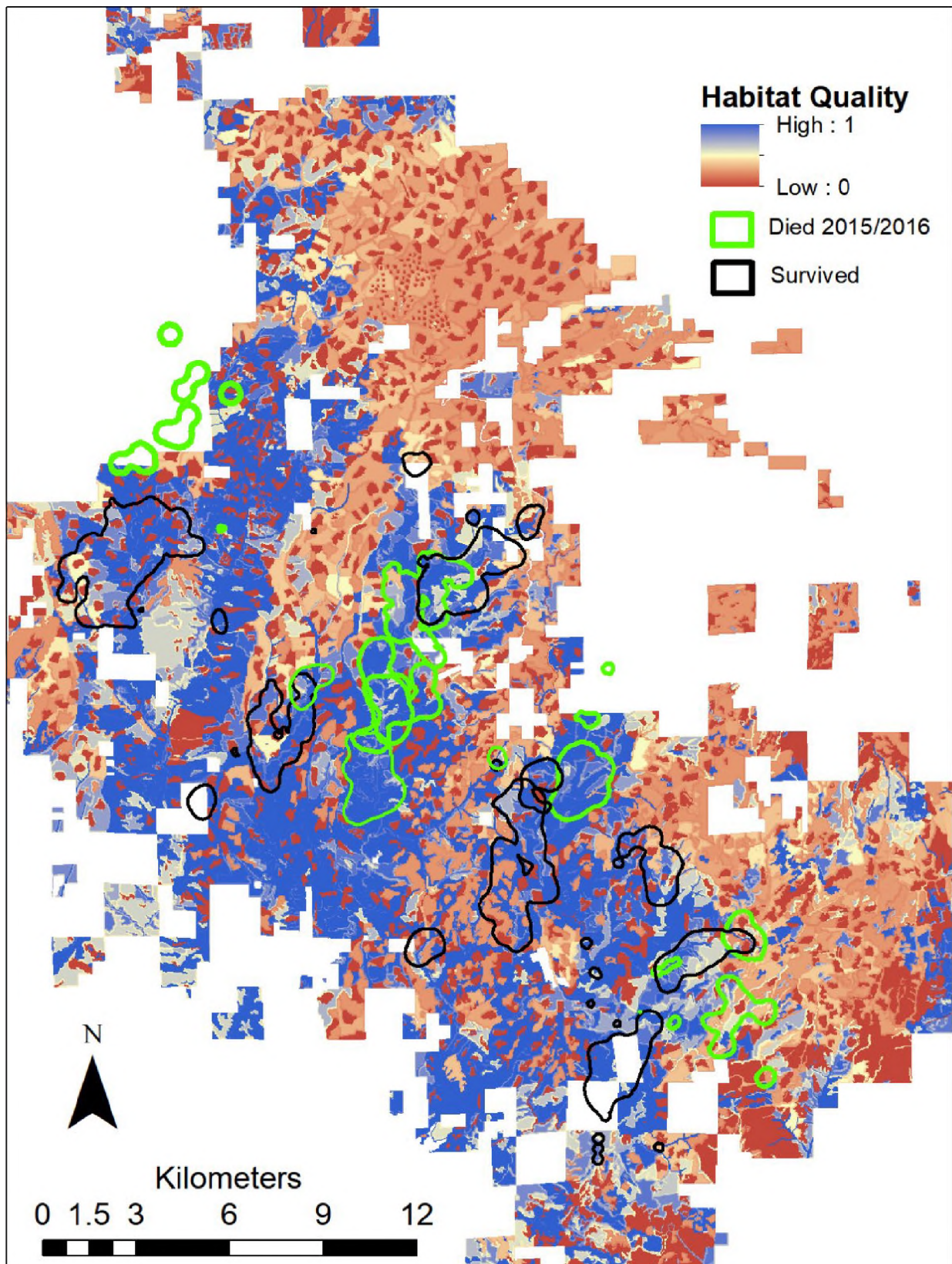


Figure 5. The minimum number of females (triangles and gray solid line), males (circles and a dashed line) and total (squares with solid black line) known to be alive for fishers living on or near the Stirling Management Area of Sierra Pacific Industries in the northern Sierra Nevada and southern Cascade Mountains of California during the autumns of 2010-2016.



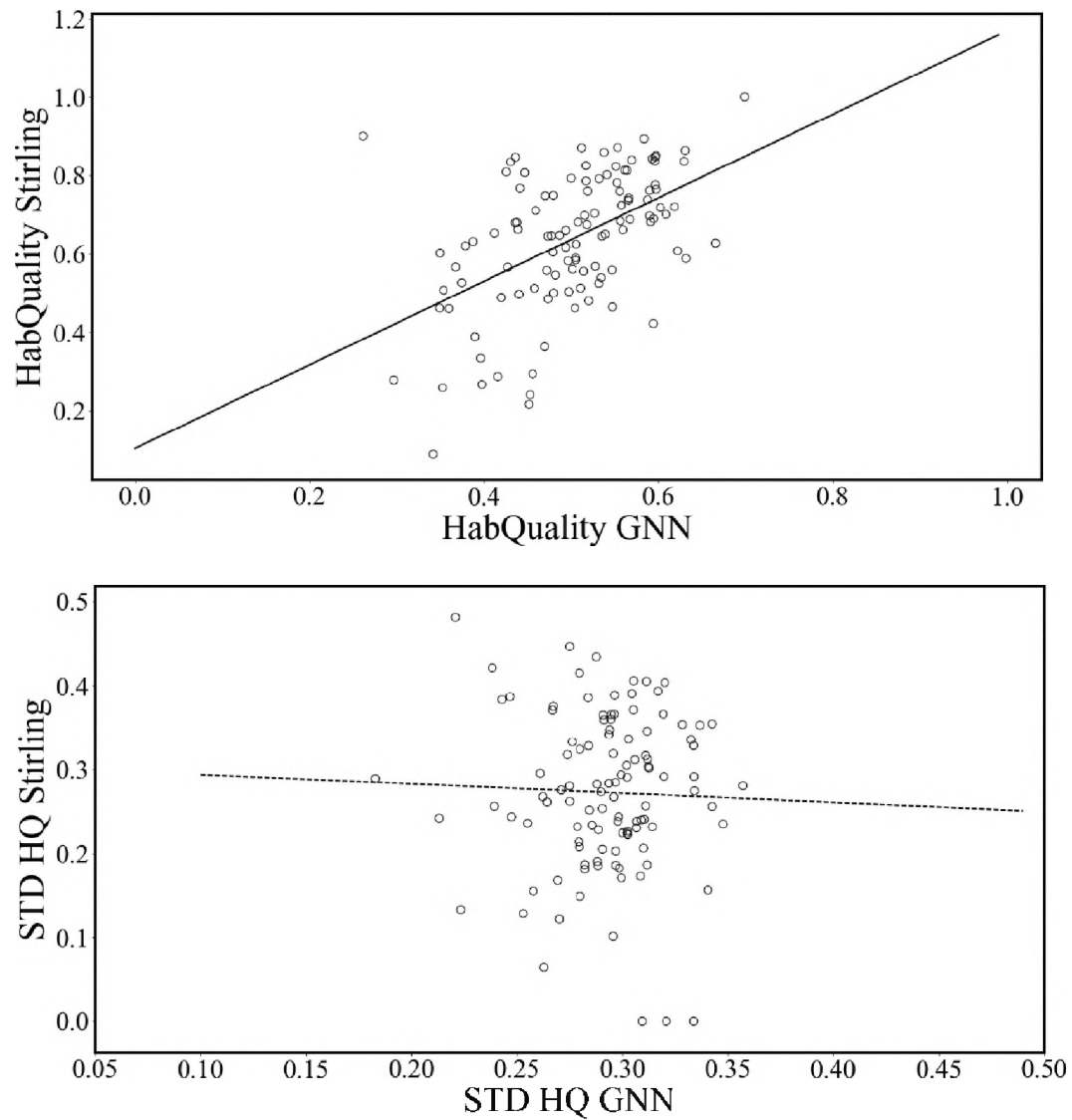
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Figure 8. Utilization distributions of fishers on Stirling during late 2015 and through 2016 compared to the mean habitat quality as described the 2015 Thomasma habitat model (generated with Sierra Pacific Industries forest inventory data).



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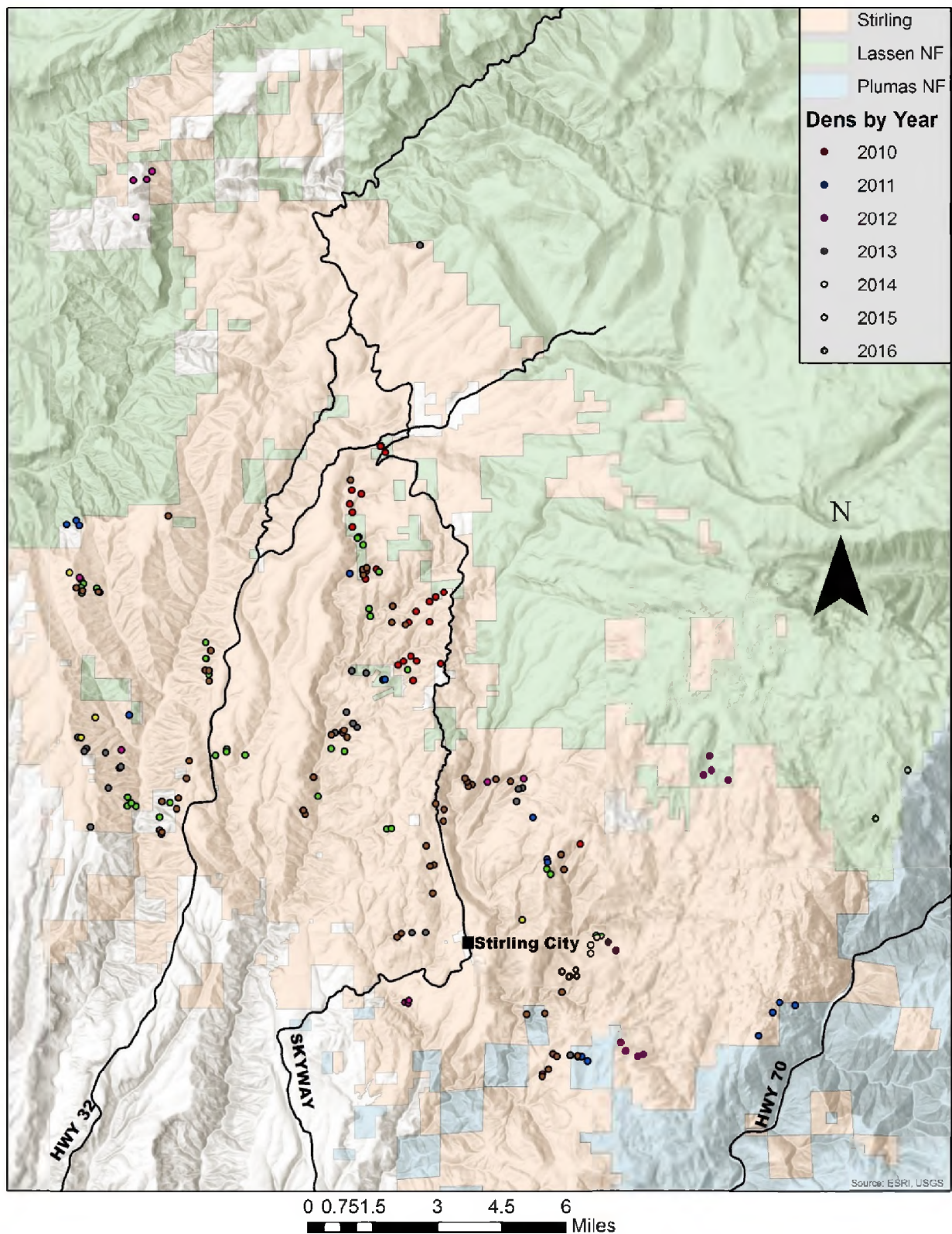
Figure 9. Top) Relationship between the mean habitat quality value for GNN and Stirling forest inventory data  
Bottom) The relationship between the standard deviation of habitat quality value for GNN and Stirling forest inventory data. For both panels, values are those that occurred within the 50% isopleth of the utilization distribution of fishers occurring in northern California from 2009-to 2016.





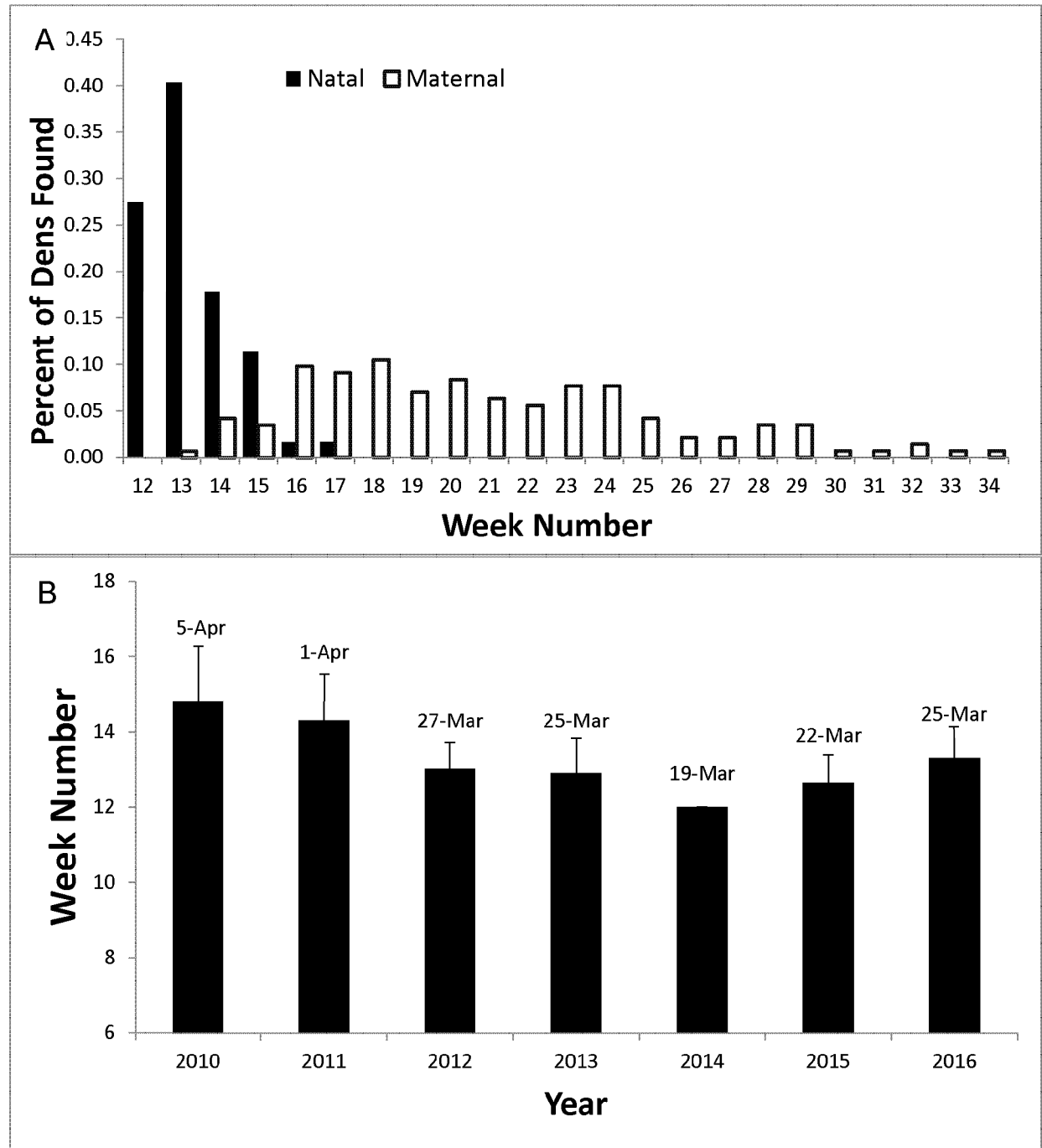
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Figure 10. Locations of female fishers' dens located during the springs and summers of 2010-2016 on, or near, the Stirling Management Area of Sierra Pacific Industries in the Northern Sierra Nevada and Southern Cascade Mountains of northern California.



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Figure 11. (A) The percent of all natal (black bars) and maternal (open bars) fisher dens found by week in 2010-2016 and (B) The mean week number  $\pm$  1 SD (mean date above bar), by year, that natal dens were found on and near the Stirling Management Area of Sierra Pacific Industries in the northern Sierra Nevada and southern Cascade Mountains of California.



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Figure 12. Study site for monitoring fisher population dynamics in response to two wildfires in Northern California. Both wildfires occurred in the summer of 2014. The Beaver Creek Fire is the northern fire and the Happy Camp Complex Fire is the southern fire depicted in this figure. The black squares show the locations of our survey sites. The light-colored area of low elevation bisecting the study site from east to west in approximately the middle is the valley containing the Klamath River. This satellite image is courtesy of Microsoft Bing base maps.

