



Brooks Range Snowshoe Hares (Finally) on the Rise

Snowshoe Hare Ecology Project 2016 Update

Natural Resource Report NPS/GAAR/NRR—2017/1424





ON THE COVER

A trail camera captures an image of a snowshoe hare reaching for browse in Gates of the Arctic National Park (NPS).

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Abstract

This report briefly summarizes the work completed on the Snowshoe Hare Ecology Project (SHEP) during 2016: results from the annual track count, annual pellet count, live-trapping of hares and lynx, and information collected from trail cameras. Results indicate that after a period of nearly 20 years, the snowshoe hare population in the central Brooks Range on the eastern boundary of Gates of the Arctic National Park is building toward a peak in the population. Traditional ecological knowledge of the area tells us that the coming peak should be considerably larger than the small population increase we saw in 2008-2010.

Acknowledgments

The authors would like to thank everyone who has contributed to SHEP. In particular, we would like to thank Jack Reakoff, of Wiseman, for sharing his knowledge of the area and his insight into the interrelatedness of the ecosystem's components, of which the snowshoe hare plays an integral role. Thank you to NPS staff Melanie Flamme, Mat Sorum, Matt Cameron, Dana VanLaningham, Miranda Leftridge, Ben Hoyle, Sam Durbin and Tracy Asicksik for taking time out to help with the track count, pellet count, and lynx and hare live-trapping, and to all of the Administrative staff here at the Fairbanks Administrative Office who help me with the travel paperwork. Also, many thanks to the 2016 volunteers Dash, Dana, Kelly, Justin, Matt, Morgan, Will, Eric, Leo, Julia, Betsy, Jimena, Fiona, Carol and the North for Science students for their cheerful, careful and dedicated support of SHEP. And finally, thanks to Roy Churchwell and Laura Phillips, who reviewed this update and offered good advice on how to make it better.

Introduction

After a long hiatus, snowshoe hare (*Lepus americanus*) populations are rebounding in the Koyukuk River region surrounding Wiseman in the central Brooks Range of Alaska (see map, Fig. 1). Snowshoe hares are known for their dramatic population swings, where hare densities increase dramatically for a couple years and then plummet to scarce levels for the next several years before beginning the cycle again. Near their northern range limit in the Brooks Range, snowshoe hares seem to have a variation on that theme.

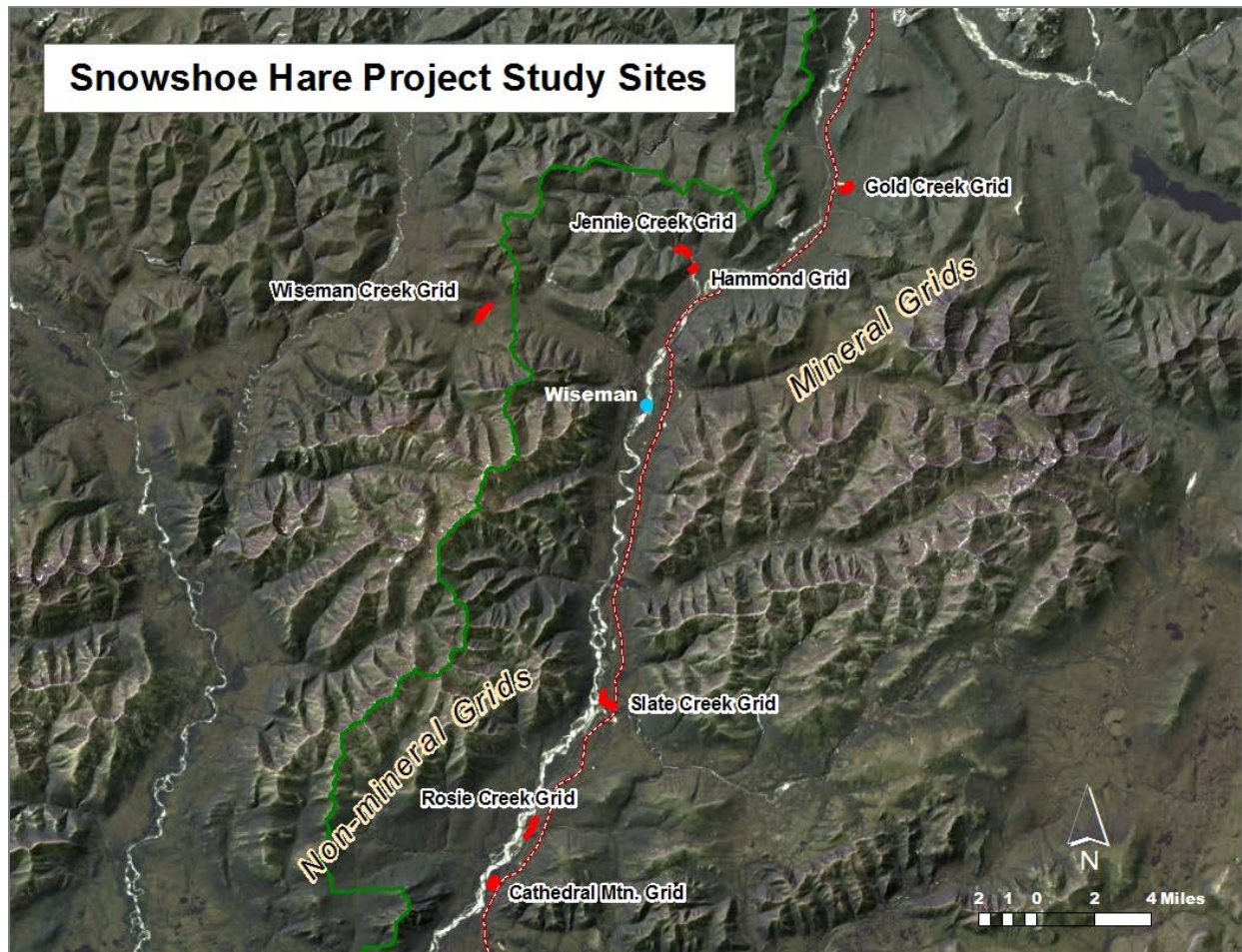


Figure 1. Map of the Snowshoe Hare Ecology Project (SHEP) study area, showing the locations of pellet grids at seven sites in the Koyukuk River region in the central Brooks Range near Wiseman, Alaska. The track count takes place within Gates of the Arctic National Park's boundary adjacent to the Wiseman Creek grid. Trap grids in 2016 were along the airstrip in Wiseman and at Rosie Creek.

Annual Hare Track Count

The National Park Service has been monitoring the snowshoe hare population using track counts in eastern Gates of the Arctic National Park near Wiseman since 1997 (Fig. 2, Appx. A-1) and talking to local residents who have witnessed the fluctuations in hare populations over time. Local ecological knowledge informs us that, rather than uniform peaks of about the same amplitude every 7 to 10 years, hares at this northern latitude tend to have “super peaks” once every couple decades, with an intervening population “bump” in the middle. NPS witnessed the last “super peak” that took place 1997 – 2001, shortly after initiating an annual hare track count in the park. Residents of Wiseman saw the previous big one around 1982, followed by a rise in the hare population a decade later, which was only a fraction of that (J. Reakoff, Wiseman resident). Since 2001, NPS documented another rise in hare numbers in 2009. And, as predicted by local ecological knowledge, it did not amount to much before hares nearly disappeared from the radar once again. The forecast for the next “super peak” is around 2018-2020. It’s been 20 years since we began monitoring hare density in the park using track counts, and about 16 years since we last saw hares in overwhelming abundance.

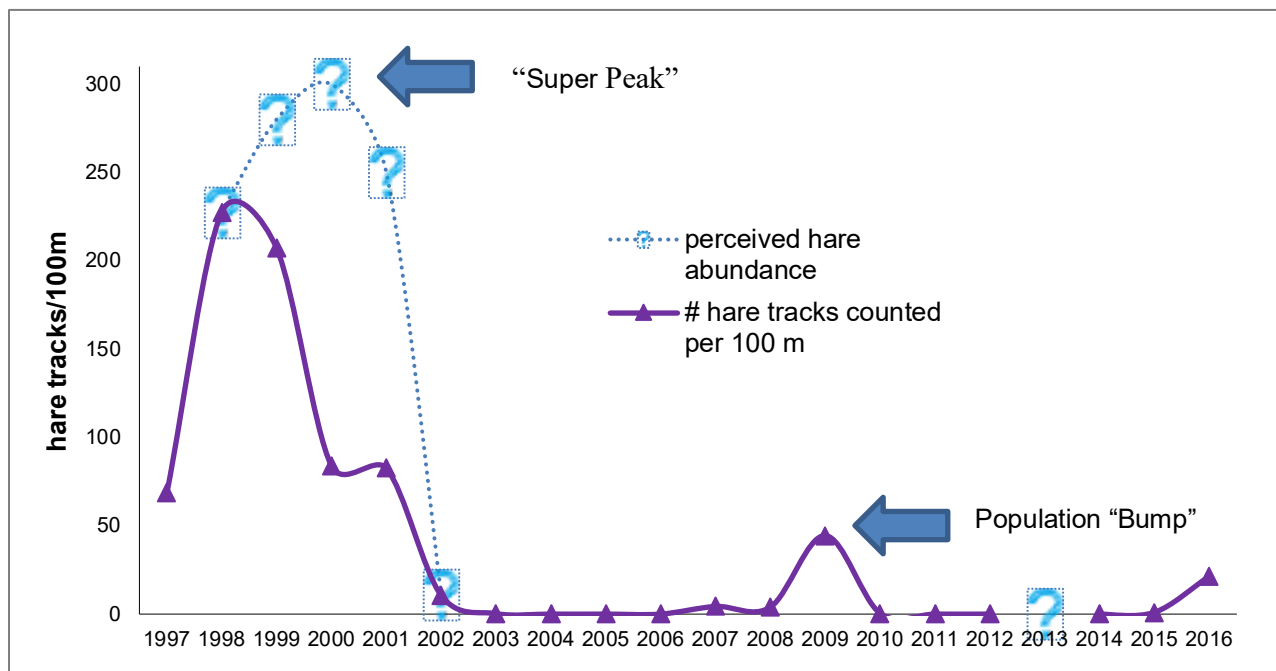


Figure 2. Snowshoe hare tracks per 100 m in eastern Gates of the Arctic National Park near Wiseman, Alaska, 1997 – 2016. The purple line shows the actual data of number of tracks counted. Due to snow conditions and the difficulty of counting layers of tracks upon tracks during peak densities, we felt that some of our counts underestimated the number of tracks that were actually present. The blue line shows (the perception that) there were many more hares in 1999-2001 than what we counted. This “perceived hare abundance” uses observations of freshly browsed vegetation, incidental hare sightings, and the increased observations of predators (e.g. lynx and owls) in the area to subjectively estimate a qualitative “data point” for a particular year that we feel is more representative of the actual population size. There was no count in 2013, but locals told us there had not been much change from the previous year, so it was assumed that the population was still very low.

Annual Hare Pellet Count

2016 marked the 10th year of monitoring hare densities using pellet counts, which began in 2007 at six sites, with a seventh site beginning in 2014 (Fig. 3, Appx. A-2, Appx. A-3). Once a year in June, 433 plots are relocated to count the annual accumulation of hare pellets. All pellets within the plot boundary are removed as they are counted to begin the next year's deposition period. As was noted in the track count at the park site, there was a general uptick in hare densities at all sites between 2008 and 2010; 2016 saw an increase at all sites. While an attempt was made when we were selecting the sites to make them as similar to each other as possible, they are all unique. Differences in hare densities among sites may be due to differences in vegetation, which influences the amount of cover and food available. These differences are described in a comprehensive report that summarizes all the data collected by the Snowshoe Hare Ecology Project (SHEP) up to the year 2011 (Natural Resource Data Series NPS/GAAR/NRDS—2015/783).

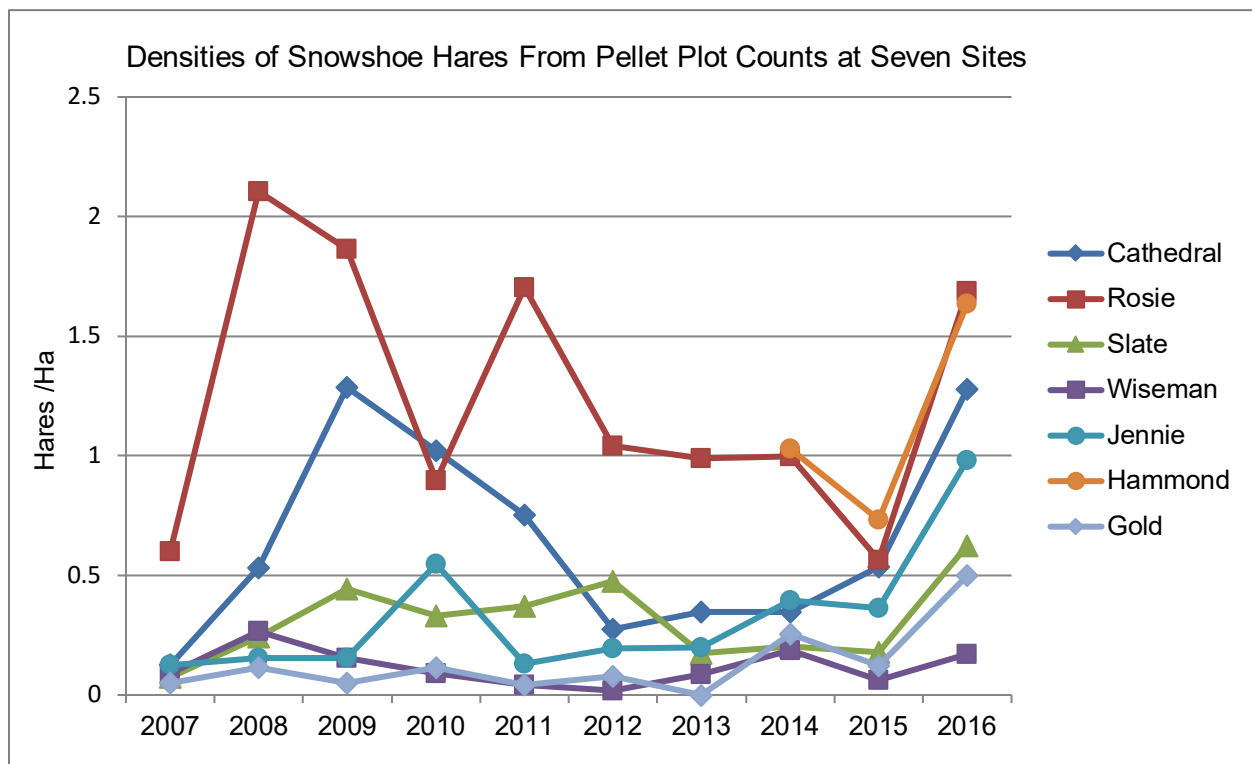


Figure 3. Snowshoe hares per hectare at seven sites, as calculated from pellet plot counts, 2007-2016, in Gates of the Arctic National Park and neighboring Dalton Highway corridor near Wiseman, Alaska. (The Hammond site count began in 2014.)

Live-trapping Snowshoe Hares

Increased hare densities now allow for the use of live traps to mark and recapture hares (Figure 4). This method is a more direct method of monitoring hare densities and is considered to be the most accurate one. In August 2016 we set up live-trapping grids at two sites. One was at Rosie Creek (a “non-mineral” area) near our pellet grid, and the other was along the Wiseman airstrip (a “mineral” area). While the estimate we derived from the trap session has a great deal of uncertainty due to the low number of traps, the estimate of just under 2 hares/ha at Rosie is on par with the 1.7 hares/ha estimate from the June pellet count. The density estimate for the Wiseman airstrip was about 2.5 hares/ha. The University of Alaska Fairbanks (UAF) has promised to loan us additional traps to increase our trap grid size so we should be able to obtain more accurate density estimates in the future.

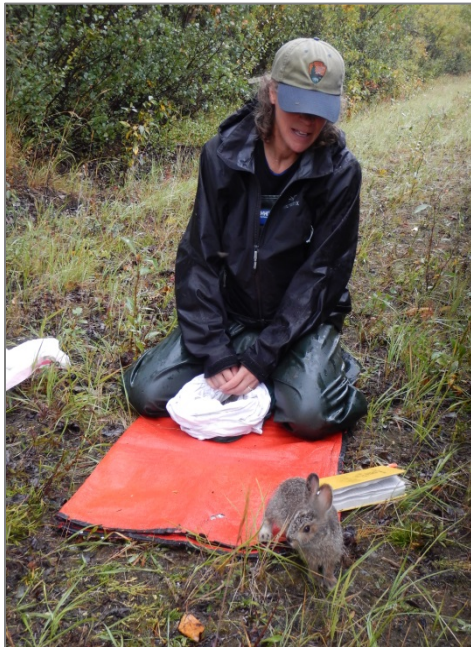


Figure 4. Biological technician Donna DiFolco releases a juvenile snowshoe hare after marking it with ear tags on the Wiseman airstrip live-trapping grid in August 2016.

In addition to obtaining density estimates from live-trapping hares, we also gain information on demographics of the population, including age (juvenile or adult), sex and movement (Appx. A-4). To learn about causes of mortality, we fitted 10 radio collars on mostly adult hares (some juvenile hares were too small to collar) captured on the Wiseman airstrip grid. Dr. Kielland of UAF and the Bonanza Creek Long-Term Ecological Research trained a local youth in the use of telemetry equipment so that the collared hares could be monitored on a regular basis (at least weekly). If a collar goes into “mortality mode,” then the antennae can be used to locate the collar and the cause of death can be determined.

Trail Cameras

During periods of peak hare densities, local observers have noted that hares visit soil licks on a regular basis. Hares again were sighted earlier this year along the Wiseman road consuming soil. This behavior does not seem to occur at all locations, however, possibly because exposed soil banks with the preferred mineral(s) are not available everywhere, particularly in winter when snow is covering most of the landscape. Observers also noted that the peak amplitudes and longevities of localized hare populations in “mineral” vs. “non-mineral” areas were different. It was for this reason that we expanded the study to include additional sites where we could monitor hare populations in both “mineral” and “non-mineral” areas. Motion sensing cameras are currently positioned in some of these areas to record the use of mineral licks by hares (Figure 5). In spring 2017, we plan to capture hares near one of the known soil licks and release them with GPS collars with the objectives of determining how often hares may be visiting these licks and how broad their home ranges are.



Figure 5. A caribou strolls past Hare Cam 3, which is pointed at an exposed soil bank in April 2016 on Gold Creek, a “mineral” area. The snowshoe hare density at Gold Creek was very low since the site was established in 2007, but recently has seen an increase in hare activity.

Another use for the trail cameras is to record molt mismatch in hares during the spring and fall seasons. As the climate changes, it's possible that hares endure longer periods of not matching the background environment—if snow arrives earlier in the fall while they are still brown and/or if the snow melts earlier in the spring when the hares are still white (Figure 6).



Figure 6. Left photo is from late September 2015, showing a brown snowshoe hare contrasting starkly against a thick blanket of snow covering the ground. Right photo is from early May 2016. The snow had melted, and this mostly white hare can easily be seen against the brown landscape.

Lynx Capture

For the past two springs we have attempted to capture and collar lynx in order to monitor their movements and activity patterns in relation to local snowshoe hare populations. In late February through mid-April of 2016, we put in a concerted effort to capture lynx using two types of foot snares with a variety of attractants, including bait, scent, visual and audio lures, in about 30 locations (Figure 7). These were checked remotely using trap monitors on a daily basis, and physically inspected every 2 to 3 days. Thus far, we have no lynx collared. A few were caught, but either escaped before they could be anesthetized, or were kittens too small to collar. However, as the lynx population increases and our trapping methods are refined, we feel confident that we'll be more successful in the coming year.



Figure 7. This lynx set was placed on a trail that had been recently used by lynx. When inspected a couple days later, we found that a lynx had passed through, following another lynx's trail, but stepped over the trap! The print in the trap was made by the trapper to encourage a lynx to follow that trail. The string seen going up the spruce tree at the right of the photo goes to a trap monitor, which changes its frequency if triggered by a sprung trap. The man-made lynx tracks look like round depressions in the snow.

Appendix

Table A-1. Snowshoe hare tracks per 100m. The numbers reported here are a conversion to # tracks/100 m. Tracks were counted along entire length of the survey route during years of low hare densities. During years of high hare densities, tracks were counted along 100m transects within each VCC^a along the survey route. For VCCs with more than one 100m transect (all but M-SW and D-WPS) track depositions in each transect within a VCC were averaged together to obtain this summary table.

Year	Vegetation Cover and Composition (VCC) ^b						Total
	L-SB	L-WA	M-SW	M-SPW	D-WS	D-WPS	
1997	0.73	0.97	3.75	12.68	21.78	28.52	68.43
1998 ^b	12.50	9.17	28.00	37.00	77.84	63.00	227.51
1999 ^b	4.70	1.00	31.80	42.87	59.60	67.20	207.17
2000 ^b	0.17	0.90	10.00	21.78	28.60	22.50	83.95
2001 ^b	6.17	7.42	12.50	15.06	14.92	26.50	82.56
2002	0.00	0.00	0.00	1.89	2.00	6.67	10.56
2003	0.00	0.00	0.00	0.15	0.00	0.14	0.29
2004	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	0.00	0.00	0.00	0.00	4.33	0.00	4.33
2008	0.05	0.00	0.05	1.95	0.00	1.94	3.99
2009	0.00	0.20	2.13	2.95	24.17	15.00	44.45
2010	0.15	0.00	0.00	0.27	0.00	0.00	0.42
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	— ^c	— ^c	— ^c	— ^c	— ^c	— ^c	— ^c
2014	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	0.00	1.00	0.00	0.00	0.00	0.00	1.00
2016	0.10	0.30	0.13	1.23	19.17	0.56	21.48

^a In VCCs, the letters stand for the following: L=light vegetation, M=moderate vegetation, D=dense vegetation, W=willows, P=poplars, S=spruce, B=shrub birch, A=alder.

^b In these years there were trails also, which were calculated into the average as 1 trail = 4 tracks.

^c No data.

Table A-2. Data from snowshoe hare pellet counts for non-mineral sites. For each site, the Pellets column is the total number of pellets counted in all plots at that site. (The number of plots per site varies from 48 to 80.) The Pellets/Plot column is the mean number of pellets per plot (total # pellets/number of plots). The Density column is the density (hares/hectare) of hares at that site using the formula: hares/ha = $0.4704 * (\text{mean pellets/plot})^{0.889}$.

Site Type	Site Name	Year	Pellets	Pellets/Plot	Density
Non-Mineral Site	Cathedral	2007	18	0.225	0.125
		2008	92	1.150	0.533
		2009	248	3.100	1.286
		2010	191	2.388	1.020
		2011	136	1.700	0.754
		2012	44	0.550	0.276
		2013	57	0.713	0.348
		2014	57	0.713	0.348
		2015	93	1.163	0.538
	Rosie	2016	246	3.075	1.277
		2007	63	1.313	0.599
		2008	259	5.396	2.105
		2009	226	4.708	1.865
		2010	99	2.063	0.895
		2011	204	4.250	1.703
		2012	115	2.447	1.042
		2013	111	2.313	0.991
		2014	112	2.333	0.999
		2015	59	1.229	0.565
	Slate	2016	202	4.208	1.688
		2007	10	0.125	0.074
		2008	38	0.475	0.243
		2009	75	0.938	0.444
		2010	54	0.675	0.332
		2011	61	0.763	0.370
		2012	81	1.013	0.476
		2013	26	0.325	0.173
		2014	31	0.388	0.203
		2015	27	0.338	0.179
		2016	102	1.378	0.626

Table A-3. Data from snowshoe hare pellet counts for mineral sites. For each site, the Pellets column is the total number of pellets counted in all plots at that site. (The number of plots per site varies from 48 to 76.) The Pellets/Plot column is the mean number of pellets per plot (total # pellets/number of plots). The Hammond grid was established in 2013, with first count in 2014. The Density column is the density (hares/hectare) of hares at that site using the formula: hares/ha = $0.4704 * (\text{mean pellets/plot})^{0.889}$.

Site Type	Site Name	Year	Pellets	Pellets/Plot	Density
Mineral Site	Wiseman	2007	12	0.158	0.091
		2008	40	0.526	0.266
		2009	22	0.289	0.156
		2010	12	0.158	0.091
		2011	5	0.066	0.042
		2012	2	0.026	0.019
		2013	11	0.145	0.084
		2014	27	0.355	0.187
		2015	8	0.105	0.064
	Jennie	2016	24	0.316	0.169
		2007	11	0.224	0.125
		2008	14	0.286	0.154
		2009	14	0.286	0.154
		2010	58	1.184	0.546
		2011	11	0.234	0.129
		2012	17	0.370	0.194
		2013	16	0.381	0.199
		2014	38	0.826	0.397
		2015	36	0.750	0.364
		2016	110	2.292	0.983
	Hammond	2007	—	—	—
		2008	—	—	—
		2009	—	—	—
		2010	—	—	—
		2011	—	—	—
		2012	—	—	—
		2013	—	—	—
		2014	116	2.417	1.031
		2015	79	1.646	0.733
		2016	195	4.063	1.636
	Gold	2007	6	0.080	0.050
		2008	15	0.200	0.112
		2009	6	0.080	0.050
		2010	15	0.200	0.112
		2011	5	0.067	0.042
		2012	10	0.135	0.079

Table A-3 (continued). Data from snowshoe hare pellet counts for mineral sites. For each site, the Pellets column is the total number of pellets counted in all plots at that site. (The number of plots per site varies from 48 to 76.) The Pellets/Plot column is the mean number of pellets per plot (total # pellets/number of plots). The Hammond grid was established in 2013, with first count in 2014. The Density column is the density (hares/hectare) of hares at that site using the formula: hares/ha = 0.4704 * (mean pellets/plot)^{0.889}.

Site Type	Site Name	Year	Pellets	Pellets/Plot	Density
Mineral Site (continued)	Gold (continued)	2013	0	0.000	0.000
		2014	29	0.500	0.254
		2015	13	0.224	0.124
		2016	62	1.069	0.499

Table A-4. Summary data from snowshoe hare capture-mark-recapture effort August 19-22, 2016, on two grids in the Snowshoe Hare Ecology Project study area near Wiseman, Alaska.

Grid	#Trap Days	#Captures	#Recap's	Males	Females	UnknSex	Adult	Juv	UnknAge
Rosie	4	20	7	3	5	5	4	7	2
Airstrip	3	21	5	1	10	5	4	11	1

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Volunteer Dr. Knut Kielland and NPS Intern Tracy Asicksik pause a moment while live-trapping snowshoe hares at Rosie Creek along the Middle Fork Koyukuk River in August 2016.